H 2 M architects + engineers

PROJECT MANUAL

VOLUME 2 OF 3 – DIVISION 02 – DIVISION 33

SOMERS CENTRAL SCHOOL DISTRICT

250 US-202, Somers, NY 10589

CONSTRUCTION MANAGER: Triton Construction

550 7th Avenue, 14th Floor, New York NY 10018. (212) 388-5700

PRIMROSE CAMPUS:

Primrose Elementary School – Various Upgrades

110 Primrose St., Lincolndale, NY 10540
SED Control #66-21-01-06-0-002-017
Project No: SMSD2505

CONTRACT G1 – GENERAL CONSTRUCTION
CONTRACT P1 – PLUMBING CONSTRUCTION
CONTRACT M1 – MECHANICAL CONSTRUCTION
CONTRACT E1 – ELECTRICAL CONSTRUCTION

FINAL BID MANUAL

11/10/2026

H2M architects + engineers
1133 Westchester Ave, Suite N-210, White Plains, NY 10605
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The design of this project conforms to all applicable provision of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Construction Code, and the building standards of the New York State Education Department.

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A. Removal of portable equipment and furnishings from work areas.

B. Protection of existing equipment, furnishings and buildings.

C. Protection of existing pavement, sidewalks, and other site improvements scheduled to remain.

1.02 SCHEDULING

A. Schedule Work to coincide with other trades and availability of site and building access.

B. Complete new utility installations prior to connections to existing utilities.

C. Coordinate removal, storage and protection of equipment connected to existing systems scheduled to be re-installed.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING WORK

A. All existing structures, site improvements, furnishings, piping, utilities or materials stored in the existing building shall be protected against damage as may be required by the Architect/Engineer/CM. The Contractor shall be responsible for any damage to the existing or installed works and appurtenances during construction operations and such damage shall be corrected by replacing the items damaged to their original condition and position at the Contractor’s cost and expense and to the satisfaction of the Architect/Engineer/CM.

3.02 PREPARATION

A. All portable equipment and furnishings shall be removed from the area of the existing building indicated. Equipment shall be stored as directed by the Architect/Engineer/CM.

B. Existing equipment which cannot be removed from the building shall be protected from damage by the Contractor’s operation. Walls, floors and equipment shall be adequately covered by plywood or other protective materials for the duration of the contract. No holes are permitted to be cut through the walls of the existing building, nor is the roof, any walls or other permanent part of the existing building to be removed to facilitate work under this Contract unless indicated otherwise. The Contractor shall protect existing water piping and water containing equipment from freezing.

C. All existing equipment and furnishings in the existing building shall be protected from damage by the Contractor's operations.

D. The Contractor shall be required to restore the existing building , equipment, and furnishings to a condition equal to what it was prior to the Contractor starting work. Any of the above that is damaged shall be replaced at the Contractor's cost.

3.03 CLEANING UP

A. The Contractor shall keep the project site free from waste materials and rubbish during the progress of the work and shall make a thorough cleaning of the building and site when the work is completed. Cleaning shall be done to the satisfaction of the Architect/Engineer/CM.

B. After completion of the contract, the Contractor will be required to clean up the site of all excavated materials and level off all excavations and dispose of all material as directed by the Architect/Engineer/CM and leave the site in as good condition as at the beginning of the contract.

C. All material used to protect the existing building shall be removed. The existing building shall be restored to its prior condition and shall be left broom/mop clean.

D. Buildings, grounds, paving, sidewalks, etc. shall be restored and left in a condition equal or better than that existing prior to the beginning of the work.

END OF SECTION 020100

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Limited Regulated Building Materials Survey Report performed by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. dated November 2, 2026, consisting of 219 pages. This Section includes the following:

B. Related Sections include the following:
   1. Section 028200 - Asbestos Remediation.
   2. Section 028300 - Lead Remediation.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION 022600

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LIMITED REGULATED BUILDING MATERIALS SURVEY REPORT

For

Primrose Elementary School
110 Primrose Street
Lincolndale, New York 10540

TUSKERS PRIMROSE ELEMENTARY SCHOOL
Forward in Excellence

Prepared For:

Somers Central School District
250 Route 202
Somers, New York 10589

SOMERS Central School District
Forward in Excellence

Prepared By:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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Parsippany, New Jersey 07054

Craig Napolitano, CHMM
Associate

November 2, 2026
Langan Project No. 190150511

LANGAN

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Appendix B Laboratory Results and Chain-of-Custody Documentation (PCB Caulk)
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Appendix D File Search/Archive Materials/Scope of Work Drawings

ACRONYMS

RBM	Regulated Building Materials (RBM) includes but is not limited to (Asbestos Containing Materials (ACM), Lead Containing Paint (LCP), Polychlorinated Biphenyls (PCBs), Ozone Depleting Substances (ODS), Radioactive Sources, Oil-containing Equipment, Universal Waste, and Electronic Wastes
USEPA	United States Environmental Protection Agency
NYSDOL	New York State Department of Labor
AHERA	Asbestos Hazard Emergency Response Act
OSHA	Occupational Safety and Health Administration
CAA	Clean Air Act
TSCA	Toxic Substance Control Act
CFR	Code of Federal Regulation
EPA	United States Environmental Protection Agency
HEPA	High Efficiency Particulate Air
HUD	Housing and Urban Development
NESHAPS	National Standards for Hazardous Air Pollutants
RCRA	Resource Conservation and Recovery Act
PLM	Polarized Light Microscopy
TEM	Transmission Electron Microscopy
ACM	Asbestos-Containing Materials
LBP	Lead-Based Paint
PCB	Polychlorinated Biphenyls (PCB)
SF	Square Feet
LF	Linear Feet
mg/cm^2	Milligrams per square centimeter
PPM	Parts Per Million
XRF	X-ray Fluorescence
AAS	Atomic Absorption Spectrometry
TCLP	Toxicity Characteristic Leaching Procedure

EXECUTIVE SUMMARY

This report by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) on behalf of the Somers Central School District, summarizes regulated building materials (RBM) limited survey findings for the select areas of the Primrose Elementary School, at 110 Primrose Street, Lincolndale, New York 10540. To address potential exposure by the planned building renovation, the objective of this RBM survey was to identify the presence/absence of asbestos-containing materials (ACM), lead containing paint (LCP) and polychlorinated biphenyls (PCBs) containing caulk/sealants.

PROJECT INFORMATION:

Client Name:	H2M Architects+Engineers (H2M)
Professional's Project Manager:	Craig Napolitano
Professional's Project Manager Phone No.:	973.560.4610
Professional's Project Manager Email:	cnapolitano@langan.com
Professional's Project #:	101296950
Survey Date(s):	September 14,15, 16 and 17, 2026
Property Address:	110 Primrose Street, Lincolndale, New York 10540
No. of Buildings on Property:	1

Building(s)/Structure(s) Details				
Building Identification:	Construction Dates:	No. of Stories:	~ Gross Footage:	Block(s)/Lot(s)
Primrose Elementary School	1950s	1 Level	Unknown	Unknown

KEY FINDINGS

(For building spaces affected by the planned project activities as identified in June 26 Various Upgrades at Primrose Elementary School SED Submission drawings set prepared by H2M Architects+Engineers.)

Asbestos-Containing Materials (ACM)

The following is a summary of suspect building materials which were identified and reported to contain asbestos exceeding one percent (>1%) by weight and are ACM or were inaccessible for sampling and are assumed as ACM in spaces surveyed:

Material	Material Locations	Survey Results	Estimated Quantity	Notes/Comments
BUILDING INTERIORS - ACM/ASSUMED ACM FINDINGS				
Pipe insulation and mud pipe fitting insulation	Concealed in wet walls to bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	ACM	250 LF	As per AHERA report. Quantity is an allowance. May not be affected by scope of work.
Pipe insulation and mud pipe fitting insulation	Rooms A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, C-1, C-2, C-3, C-4, D-1, D-2, D-3, D-4, E-1, E-2, E-3, E-4, F-1, F-1B, F-2, F-3, F-4, K-1, K-2, K-3, K-4	ACM	50 LF	As per AHERA report. Quantity is an allowance for any mudded fittings identified. All pipe insulation observed is fiberglass.
Pipe insulation and mud pipe fitting insulation	Gymnasiums	ACM	30 LF	As per AHERA report. Quantity is an allowance if materials are affected by scope of work.
Tank Insulation	Chlorine Vault/ Water Service Room (two tanks)	ACM	1,000 SF	As per AHERA report

Material	Material Locations	Survey Results	Estimated Quantity	Notes/Comments
Pipe insulation and mud pipe fitting insulation	Chlorine Vault/Water Service Room	ACM	80 LF	As per AHERA report. Quantity directly associated with tanks
Various size and color floor tiles and associated mastic (single layer and multiple layers, exposed or concealed under non-ACM tiles/mastic)	Classrooms A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, D-1, D-2, D-3, D-4, E-1, E-2, E-3, E-4, 26-A, 27-A & 27-C	ACM	14,305 SF	As per AHERA report. .
Concealed Unit Ventilator Insulation	Rooms A-5, A-6A, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-15, B-7, B-8, D-7 & D-8	Assumed ACM	280 SF	Intrusive sampling was omitted due to building occupancy.
Ceramic wall tile grout & concealed wall tile backing, mastic, and setting bed behind ceramic wall tiles	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	5,000 SF	Intrusive sampling was omitted due to building occupancy.
Mirror Mastic	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	200 SF	Intrusive sampling was omitted due to building occupancy.
Ceramic floor tile grout & concealed mortar, setting bed, and waterproofing materials below ceramic floor tiles	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	1,100 SF	Intrusive sampling was omitted due to building occupancy.
Door core insulation	Bathrooms - Girl's 26A & D-10	Assumed ACM	42 SF	Intrusive sampling was omitted due to building occupancy.

Material	Material Locations	Survey Results	Estimated Quantity	Notes/Comments
Concealed felt paper, waterproofing, mastics or insulation boards under wood floor	Big Gymnasium	Assumed ACM	3,850 SF	Intrusive sampling was omitted due to building occupancy.
Concealed waterproofing or insulation materials (i.e. tar/felt membrane, fill material) within floor slab	Corridor HW-1F Demolition	Assumed ACM	575 SF	Intrusive sampling was omitted due to building occupancy.
Suspect electrical components within switchboards/panels	Select Building Areas	Assumed ACM	70 SF	Intrusive sampling was omitted due to building occupancy/live electrical. PE-ED 100.00 note 2 PE-ED 101.00 note 2
BUILDING EXTERIORS - ACM/ASSUMED ACM FINDINGS				
Metal panel caulk bottom of panel frame (black)	Exterior façade K wing	ACM	50 LF	As per current Langan's survey. (2026)
Window frame caulks, black over white	Exterior façade original building	ACM	10 LF	'As per current Langan's survey. (2026) May be affected by masonry replacement in F & E-wings
Expansion joint caulk type 2	Exterior façade K wing - Two locations	ACM	20 LF	As per current Langan's survey. (2026)
Expansion joint caulk type 4	Exterior façade main gym – 12 locations	ACM	200 LF	As per current Langan's survey. (2026)
Multi-layered built-up roofing and roof flashing materials (membrane layers and vapor barrier/tar on roof deck) - Exposed and under EPDM membrane	Roofs - For new fan unit installation - 42 locations	Assumed ACM	420 SF	Intrusive sampling was omitted due to building occupancy.
Concealed waterproofing materials (i.e. tar/felt membrane) on walls, columns &	School Building Façades - 50 opening receiving	Assumed ACM	600 SF	Potentially affected by unit ventilator

Material	Material Locations	Survey Results	Estimated Quantity	Notes/Comments
spandrel beams behind brick veneer & contaminated brick/cinderblock.	new unit ventilators/louvres			work.'Intrusive sampling was omitted due to building occupancy.
Concealed waterproofing materials (i.e. tar, mastic, felt, etc.) on building foundation walls	Chlorine Vault/Water Service Room	Assumed ACM	300 SF	'Intrusive sampling was omitted due to building occupancy.
Multi-layered built-up roofing materials (membrane layers and vapor barrier/tar on roof deck) - Under Pebble Roof Ballast	Flat Canopy Roof	Assumed ACM	845 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
Concealed roofing materials (membrane layers and vapor barrier/tar on roof deck) - Under Metal Roof	Slope Metal Canopy Roof	Assumed ACM	300 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
Concealed underground Transite/Metal pipe with suspect waterproofing tar/felt membrane (part of roof drain system) with trenches	Estimated concealed under entrance Canopy / concrete sidewalk	Assumed ACM	50 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
Concealed waterproofing materials (i.e. tar, mastic, felt, etc.) on canopy column foundation	Estimated concealed under entrance Canopy / concrete sidewalk	Assumed ACM	80 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
Old electrical wire insulation (exposed and within conduits) - Provided quantity reflects an approximate length of the electrical conduits exposed and concealed within wall and ceiling cavities. The size and number of wires within the conduits may vary.	Canopy Lighting System	Assumed ACM	300 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.

Non-Asbestos-Containing Materials (Non-ACM) with Asbestos at a Concentration ≤ 1%

The following materials were found to contain trace amounts of asbestos (less than 1%) and, while not classified as asbestos-containing materials (ACM), are still regulated under certain provisions of the Occupational Safety and Health Administration (OSHA) and state asbestos regulations.

NON-ACM BUT CONTAINING ASBESTOS FIBERS <1.0% FINDINGS			
Metal panel caulk around black frame	Exterior façade	Non-ACM	CHRY< 1%
Metal panel caulk on white panel	Exterior façade	Non-ACM	CHRY< 1%
Panel mastic covering fiberglass	Exterior façade	Non-ACM	CHRY< 1%
Expansion joint caulk type 1	Exterior façade K wing	Non-ACM	CHRY< 1%
Expansion joint caulk type 5	Exterior façade small gym	Non-ACM	CHRY< 1%

Based on the test results and as per the definition of asbestos containing materials (ACM) by the EPA/NYSDOL/NYCDEP, the materials identified in above table are considered as non-ACM, however, any demolition/renovation activities which would affect such materials must be performed following OSHA safe work practices including but not limited to work areas isolation, use of proper personal protective equipment, engineering controls, wet procedures, etc. **Langan strongly recommends retaining an asbestos abatement contractor to perform any demolition activities which would disturb above identified materials.** Additionally, the waste generated from such materials and any other materials which contain detectable levels of asbestos shall be disposed of at a landfill that is permitted to accept asbestos waste.

The bulk samples collected by Langan from the other suspect building materials were reported by the laboratory as "no asbestos detected". Refer to Table 1 for a summary of asbestos survey findings and Appendix A for a copy of test results and chain of custody documentation. Asbestos sampling locations are shown in Drawings ASL-01 through ASL-02.

Lead Containing Paint (LCP)

As per EPA 40 CFR Part 745, TSCA, Title IV (Lead Exposure Reduction), the term "lead based paint" (LBP) means paint or other surface coatings that contain lead equal to or more than 1.0 milligrams per centimeter (mg/cm^2) or 0.5 percent by weight. Although the EPA defines LBP as paint having lead concentrations equal or greater than 1.0 mg/cm^2, the Occupational Safety and Health Administration (OSHA) considers any paint with any measurable concentration of lead as lead containing paint (LCP).

Langan conducted 59 assays using an X-Ray Fluorescence (XRF) analyzer to screen the structure to identify lead concentrations in painted surfaces. Of these 59 XRF readings, 39 showed detectable concentrations of lead. Two (2) readings contained lead concentration above 1.0 milligram per centimeter squared (1.0 mg/cm^2).

- White paint on metal beam – Copy Room.
- White paint on CMU block – K-1.

Overall, the paint on various building components was observed in good to fair condition.

Refer to Table 2 for the XRF screening data.

PCBs Findings

PCB Bulk Product Waste is defined in USEPA Code of Federal Regulations 40 CFR 761.3 with specific disposal options identified in 40 CFR 761.62. PCB Bulk Product Waste means waste derived from manufactured products containing PCBs in a non-liquid state (e.g. caulk and glazing sealants), at any concentration where the concentration at the time of designation for disposal was ≥50 parts per million (ppm) PCBs.

Currently twenty-eight (28) bulk samples of suspect caulk were collected during the survey and submitted for PCB analysis. PCBs were detected in some of the samples analyzed, but none of these samples had concentrations greater than or equal to 50 parts per million.

Test results are summarized in Table 3.

1.0 INTRODUCTION

1.1 Purpose

This report by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) on behalf of the Somers Central School District, summarizes regulated building materials (RBM) limited survey findings for the select areas of the Primrose Elementary School, at 110 Primrose Street, Lincolndale, New York 10540.

The objective of this pre-renovation RBM survey was to identify the presence/absence of asbestos-containing materials (ACM), lead containing paint (LCP), and polychlorinated biphenyls (PCB) containing caulk/sealants affected by the planned school upgrades. The survey was limited to building spaces affected by the intended project activities as identified in June 26 Various Upgrades at Primrose Elementary School SED Submission drawings set prepared by H2M Architects+Engineers. Building spaces surveyed are depicted in Drawings ASL-01 through ASL-02.

The remainder of this report presents our observations, findings, laboratory test results of samples collected, description of approximate locations of ACM, LCP and PCB-containing materials identified, conclusions and plans showing asbestos sampling locations.

1.2 Assumptions, Limitations and Exceptions

Opinions, conclusions and recommendations presented in this report apply to the site conditions that are reasonably foreseeable based solely upon Langan's visual observations of accessible areas, laboratory test data, and current regulatory requirements. They cannot necessarily apply to conditions and features of which Langan is unaware and has not had the opportunity to evaluate. The conclusions noted in this report are intended exclusively for the purpose stated herein, at the site indicated, and for the project indicated.

No survey method can eliminate the possibility of obtaining partial, imprecise, or incomplete information. Professional judgment was exercised in gathering and analyzing

the information obtained, and Langan performed our services using that degree of skill and care ordinarily exercised under similar conditions by reputable members of Langan's profession practicing in the same or similar locality at the time of our performance. Thus, the report does not warranty, guaranty, or represent that the surveys completely defined the locations, and/or condition of any RBMs and hazardous materials. There are limitations inherent to visual surveys, and therefore, this hazmat survey does not claim to have sampled all possible suspect ACM, LCP and PCB containing materials present in the building.

Any suspect materials found during construction which differ from materials sampled as part of this survey should be assumed to be ACM, LCP and PCB containing until surveyed by a professionally trained and certified individual and tested by an accredited laboratory.

2.0 SITE DESCRIPTION

Primrose Elementary School is part of the Somers Central School District (SCSD), which was formally created in 1952 through the consolidation of numerous small, local schoolhouses that had served the area since the 19th and early 20th centuries. The surveyed Primrose Elementary School is a public school located at 110 Primrose Street, Lincolndale, NY 10540, serving grades PK–2 within the Somers Central School District. The school is situated in Westchester County and categorized as part of a fringe rural or large suburb community, depending on the classification source. Primrose Elementary is located near the Primrose Path pedestrian trail, linking it to local parklands including Van Tassell Park and Reis Park. The proximity to these amenities indicates access to adjacent open fields, wooded areas, and recreation spaces, though they are not part of the school's internal property. Primrose Elementary School was opened in 1956. The one-story subject building is constructed out of stone, brick and steel.

3.0 ASBESTOS CONTAINING MATERIALS

3.1 Terminology

<u>Suspect Asbestos-Containing Materials</u>

Asbestos was used in certain types of construction and building materials. A few examples of these materials include floor tiles, ceiling panels, thermal system insulation,

fireproofing insulation, roofing materials, etc. Until a material is examined using light microscopy or a similar technique, the building material is considered as a suspect asbestos-containing material. Any suspect ACM of unknown asbestos content (that is not tested) should be handled as if it were an asbestos containing material.

Asbestos–Containing Material (ACM)

According to Federal Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAP), OSHA, New York State Department of Labor, Industrial Code Rule 56 (NYSDOL-ICR56) regulations, a material that is confirmed to contain greater than one percent (>1%) asbestos by polarized-light microscopy (PLM) analysis is classified as ACM. Under current EPA-NESHAP and NYSDOL-ICR56 regulations, materials that are confirmed to contain one percent or less asbestos (<1%) are considered non-ACM and are not regulated. However, the Occupational Safety and Health Administration (OSHA) still regulates these materials under its asbestos regulations. Therefore, there can be situations where EPA NESHAP regulations may not apply for specific materials, but OSHA regulations are applicable.

The EPA rule concerning the application, removal, and disposal of ACM is administered under NESHAP regulations 40 CFR 61.145, Subpart M – Standard for Demolition and Renovation. NESHAP only regulates ACM when it meets certain criteria, which is called Regulated ACM (RACM). RACM consists of

- Friable asbestos material
- Category I non-friable ACM that has become friable.
- Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or
- Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by this subpart.

Whether Friable or Category I & II materials, all ACM are regulated as per the NYSDOL-ICR56 regulations.

3.2 Survey Methodology

Langan conducted an ACM survey in general accordance with the applicable requirements of current EPA NESHAP Standard 40 CFR 61, Subpart M (Asbestos), NYSDOL-ICR56, and OSHA 29 CFR 1926.1101 asbestos survey and/or sampling protocols and sound judgement of the asbestos inspector(s).

Destructive and intrusive inspection techniques were not employed. Langan inventoried, classified, and collected representative bulk samples from suspect homogeneous areas (HAs) and submitted the samples for analysis. HAs are materials that appear similar in color, texture, and date of material application. The condition and approximate location of each identified suspect ACM were documented.

Samples collected were properly packaged in individual plastic bags, sealed; catalogued and chain-of-custody documentation was completed. Laboratory analysis was performed following EPA 600/R-93/116 Method using Polarized Light Microscopy with Dispersion Staining (PLM/DS) which utilizes Visual Area Estimation (VAE) for determining concentrations of asbestos in a sample. Non-friable organically bound (NOB) materials which tested non-ACM via PLM were analyzed using transmission electron microscopy (TEM). Analytical testing was performed in accordance with NYSELAP Methods 198.1 (friable materials), 198.1(NOB), 198.4 (NOB-TEM), and 198.8 (surfacing materials containing vermiculite). Samples were analyzed by Atlas Environmental Lab, Corp. laboratory of New York (Atlas). Atlas is a member of the American Industrial Hygiene Association (AIHA), National Voluntary Laboratory Accreditation Program (NVLAP).

3.3 Files Review

Langan received and reviewed the following reports:

- AHERA Management Plan
- June 26 Various Upgrades at Primrose Elementary School Sed Submission drawings set prepared by H2M Architects+Engineers.
- 2026.03.30 – Report for Limited Asbestos Survey by Langan
- 2024.03.04 - Summary of Bulk Asbestos Analysis Results for samples collected (by Langan) withing Hallway Kindergarten Wing
- 2023.12.11- Report for Limited Asbestos Survey in Room A-2A by Langan

Refer to Appendix D for the copies of available record files reviewed.

3.4 Observations and Findings

The ACM survey of subject building areas was conducted on February 20, 2026, by Langan's Fernando Velasquez and Miroslaw Baran, NYSDOL certified asbestos inspectors and USEPA certified lead inspectors. During the survey, suspect materials observed in the surveyed building areas were documented, assessed, quantified, and sampled as necessary.

Suspect materials identified as having asbestos content greater than one percent by weight are considered to be "positive" for asbestos in accordance with the EPA/NYSDOL definition of an asbestos-containing material. In general, suspect materials identified in the building were in good to fair condition.

Refer to Table 1 for a detailed summary of asbestos survey findings. Copies of analytical results and chain of custody documentation for the samples collected during the surveys are provided in Appendix A. Asbestos sampling locations are depicted on Figures ASL-01 through ASL-02.

4.0 LEAD CONTAINING PAINT

4.1 Terminology

Lead Based Paint

As per EPA 40 CFR Part 745, TSCA, Title IV (Lead Exposure Reduction) the term ''lead-based paint'' means paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams per centimeter squared (1.0 mg/cm^2) or more than 0.5 percent by weight. Although Langan recognizes that the EPA definition of LBP is only applicable to certain residential and child-occupied structures, we are using the EPA LBP definition as a threshold for reporting.

Lead Containing Paint (LCP) or Material Containing Lead

Occupational Safety and Health Administration (OSHA) consider any measurable concentration of lead in paint or material to be lead containing paint (LCP) or lead containing material (LCM).

4.2 Limited Screening Survey Methodology

Langan personnel conducted screening of painted building components that would be potentially affected by the proposed scope of work. The purpose of the lead paint screening was to determine the general presence of lead-containing paints at the site. OSHA considers any concentration of lead in paint to be lead containing paint according to the OSHA Lead in Construction standard (29 CFR 1926.62).

A Viken Pb200e X-Ray Fluorescence (XRF) Spectrum Analyzer was used to survey the subject building for the presence of lead-containing paint (LCP). The Viken Pb200e analyzer uses a cobalt 57 radioactive source and an advanced solid-state radiation detector to generate an x-ray fluorescence spectrum of a painted surface. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter (mg/cm^2). This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint.

Not all painted surfaces were tested within the surveyed building areas as the purpose of the limited screening testing was to ascertain a general understanding of the presence of lead-containing paint and coatings throughout the building. Building components were selected for testing based upon the frequency of their appearance throughout the building and relevance for significantly impacting the proposed interior demolition and renovation activities and not for determining the potential lead hazards related to occupancy of the building.

For quality control, the XRF instrument was calibrated using a U.S. Department of Commerce National Institute of Standards and Technology (NIST) Level III 1.04 mg/cm^2 lead based paint film (positive calibration) and <0.001 mg/cm^2 lead based paint film (negative calibration). For each calibration, three (3) XRF readings were taken on the paint film. The average of these three (3) readings was then subtracted from the known lead content in the paint film. The difference was compared with an Environmental

Protection Agency (EPA)-approved tolerance range. Such calibration procedures were conducted at the start and at the end of the testing activities.

4.3 LCP Findings

Based on the XRF screening data and available file review the paint on following building components was identified to contain lead above 1.0 mg/cm^2:

- White paint on metal I-beam – Copy Room.
- White paint on structural beam – Room K-1.

Most of the painted surfaces were identified to contain detectable concentrations of lead. In general, the painted surfaces were observed to be in good to fair condition.

Refer to Table 2 for the XRF screening data.

5.0 PCBs SURVEY FINDINGS

5.1 Limited Survey Methodology

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber; in pigments, dyes, and carbonless copy paper; and many other industrial products applications.

Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. Products that may contain PCBs include transformers and capacitors, oil used in motors and hydraulic systems, fluorescent light ballasts, adhesives and tapes, caulking, plastics, etc.

PCBs are regulated under the EPA Toxic Substance Control Act (TSCA) regulations (40 CFR 261) program as well as EPA regulation 40 CFR 761. As per EPA 40 CFR 761.3, PCB-containing bulk product waste is any waste from demolition or renovation projects which contains PCBs concentration greater than 50 mg/kg. Any product containing less than 50 mg/kg PCBs is considered a non-PCB product.

The PCB screening sampling involved a visual examination of the building and sampling of suspect caulking or sealant materials. Twenty-eight (28) bulk samples of homogenous caulks were collected from the building surveyed areas and submitted to Phoenix laboratory for PCB analysis using EPA SW-846 3540C/8082A.

5.2 PCBs Findings

As per USEPA Code of Federal Regulations (40 CFR 761.3) a PCB containing bulk product is any product which contains a concentration of PCB >50 PPM. Any product which contains <50 PPM PCB is considered a non-PCB product. PCBs were detected in some of the samples analyzed for the building areas impacted by proposed scope of work, but those caulks are considered to be non-PCB product as they contained less than 50 parts per million of PCBs.

Test results are summarized in Table 3.

6.0 CONCLUSIONS

6.1 Asbestos Containing Materials

Asbestos containing materials were identified in the building areas surveyed. Refer to Table 1 for the summary of a limited asbestos survey findings. Identified ACM affected by the scope of work shall only be removed by a properly certified asbestos abatement contractor in accordance with applicable federal, state, and local regulations prior to being disturbed, including maintenance, renovation, or demolition activities. As required by the NYSDOL regulations, the abatement project must be monitored by a NYS-DOL certified project monitor. Proper notifications must be filed with the US-EPA, NYS-DOL and other regulatory agencies prior to performing such activities.

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air

pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. The EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

6.2 Lead Containing Paint

The LCP assessment that was performed was not intended to be a surface-by-surface determination of specific locations of LCP or lead-based paint, but rather the purpose of the screening measurements was to provide a general understanding if there was a presence of lead in painted coatings at the Site that could impact the planned renovation activities.

Limited painted surfaces in the building surveyed areas contain paint with lead concentrations above 1.0 mg/cm^2. Most of the painted surfaces contain detectable concentrations of lead. The OSHA Lead in Construction Standard does not currently define a specific concentration of lead that must be present within paint for it to be considered "lead-containing". Therefore, painted and glazed surfaces that contain detectable concentrations of lead must be handled in accordance with the OSHA Lead in Construction Standard. Persons performing work that could impact paint films or glazing that have detectable concentrations of lead should be informed of the testing results and take appropriate actions to comply with the OSHA Lead in Construction Standard.

Personnel performing work on lead-containing surface coatings must have at a minimum, two-hour lead awareness training in accordance with OSHA Standard 29 CFR 1926.62. If lead-containing surface coatings are required to be stripped or removed from the building component substrate in the areas noted above with lead-containing paint, then additional training would be required based upon the measured lead concentration of the surface coating and the airborne lead concentrations measured during the work activity.

The handling, disposal, and management of waste generated during any restoration, renovation, or demolition operations is regulated by the Resource Conservation and

Recovery Act (RCRA) regulations, Standards 40 CFR 240 - 280. These regulations require that a Toxic Characteristic Leaching Procedure (TCLP) test be utilized to determine if the waste generated during demolition, renovation, or removal projects is considered hazardous waste. A material is considered hazardous if it is ignitable, reactive, corrosive, or toxic. Toxicity is determined by TCLP analysis, which simulates the migration of a contaminant, such as cadmium, arsenic, or lead, in a disposal site. TCLP sampling was not part of the scope of work for this project. Therefore, prior to renovation it is recommended that representative samples of the building components to be demolished be sampled and analyzed accordingly to determine if the construction debris would be considered a hazardous waste.

6.3 Polychlorinated Biphenyls (PCBs) Containing Materials

PCBs were detected in some of the samples analyzed for the building areas impacted by proposed scope of work, but those materials are considered to be non-PCB product as they contained less than 50 parts per million of PCBs. Therefore, no remedial actions or specific recommendations regarding PCBs in the materials are necessary.

7.0 STATEMENT OF QUALIFICATIONS AND SIGNATURES

The information contained in this report is based on visual observations of the building and laboratory analytical data of the samples collected during the site visit(s). The survey was conducted by Qualified Environmental Professionals, Mr. Michael Benson and Mr. Frank Acciarto. These individuals have specific qualifications based on education, training, and/or experience to assess the property of nature, history, and setting of the Subject Properties. Certifications of the Environmental Professionals who performed this Asbestos Survey are provided in Appendix C.

Langan Engineering, Environmental, Surveying,
Landscape Architecture, and Geology, D.P.C.



Micheal Benson
NYSDOL Asbestos Inspector
Cert# 26-61OUA-SHAB



Frank Acciarito
NYSDOL Asbestos Inspector
Cert# 26-6TS1N-SHAB

TABLES

Table 1 - SUMMARY OF ASBESTOS SURVEY FINDINGS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Sample ID	Material	Material Locations	Sampling Results		Estimated Quantity of ACM	Notes/Comments
BUILDING INTERIORS - ACM/ASSUMED ACM FINDINGS						
--	Pipe insulation and mud pipe fitting insulation	Concealed in wet walls to bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	ACM	--	250 LF	As per AHERA report. Quantity is an allowance. May not be affected by scope of work.
--	Pipe insulation and mud pipe fitting insulation	Rooms A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, C-1, C-2, C-3, C-4, D-1, D-2, D-3, D-4, E-1, E-2, E-3, E-4, F-1, F-1B, F-2, F-3, F-4, K-1, K-2, K-3, K-4	ACM	--	50 LF	As per AHERA report. Quantity is an allowance for any mudded fittings identified. All pipe insulation observed is fiberglass.
--	Pipe insulation and mud pipe fitting insulation	Gymnasiums	ACM	--	30 LF	As per AHERA report. Quantity is an allowance if materials are affected by scope of work.
--	Tank Insulation	Chlorine Vault/Water Service Room	ACM	--	1,000 SF	As per AHERA report.
--	Pipe insulation and mud pipe fitting insulation	Chlorine Vault/Water Service Room	ACM	--	80 LF	As per AHERA report. Quantity directly associated with tanks
--	Various size and color floor tiles and associated mastic (single layer and multiple layers, exposed or concealed under non-ACM tiles/mastic)	Classrooms A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, D-1, D-2, D-3, D-4, E-1, E-2, E-3, E-4, 26-A, 27-A & 27-C	ACM	--	14,305 SF	As per AHERA report. .
--	Concealed Unit Ventilator Insulation	Rooms A-5, A-6A, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-15, B-7, B-8, D-7 & D-8	Assumed ACM	--	280 SF	Intrusive sampling was omitted due to building occupancy.
--	Ceramic wall tile grout & concealed wall tile backing, mastic, and setting bed behind ceramic wall tiles	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	--	5,000 SF	Intrusive sampling was omitted due to building occupancy.
--	Mirror Mastic	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	--	200 SF	Intrusive sampling was omitted due to building occupancy.
--	Ceramic floor tile grout & concealed mortar, setting bed, and waterproofing materials below ceramic floor tiles	Bathrooms - Boy's 17 & 23, Girl's 16 & 26A, Men's 21 & 33, D-9, D-10, D-11, D-12, E-7, E-8, K-1A, K-2A, K-3A & K-4A	Assumed ACM	--	1,100 SF	Intrusive sampling was omitted due to building occupancy.
--	Door core insulation	Bathrooms - Girl's 26A & D-10	Assumed ACM	--	42 SF	'Intrusive sampling was omitted due to building occupancy.
--	Concealed felt paper, waterproofing, tar, or insulation boards under wood floor	Big Gymnasium	Assumed ACM	--	3,850 SF	Intrusive sampling was omitted due to building occupancy.
--	Concealed waterproofing or insulation materials (i.e. tar/felt membrane, fill material) within floor slab	Corridor HW-1F Demolition	Assumed ACM	--	575 SF	Intrusive sampling was omitted due to building occupancy.

Table 1 - SUMMARY OF ASBESTOS SURVEY FINDINGS
Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Sample ID	Material	Material Locations	Sampling Results		Estimated Quantity of ACM	Notes/Comments
--	Suspect electrical components within switchboards/panels	Select Building Areas	Assumed ACM	--	70 SF	Intrusive sampling was omitted due to building occupancy/live electrical. PE-ED 100.00 note 2 PE-ED 101.00 note 2
BUILDING EXTERIORS - ACM/ASSUMED ACM FINDINGS						
MPC-1	Metal panel caulk bottom of panel frame (black)	Exterior façade K wing	ACM	CHRY 3.4%	50 LF	As per current Langan's survey. (2026)
WFC-1	Window frame caulk black top	Exterior façade original building	ACM	CHRY 3.1%	10 LF	As per current Langan's survey. (2026) May be affected by masonry replacement in F & E-wings
WFC-2	Window frame caulk white bottom	Exterior façade original building	ACM	CHRY 1.3%		
EJC-2	Expansion joint caulk type 2	Exterior façade K wing - Two locations	ACM	CHRY 1.3%	20 LF	As per current Langan's survey. (2026)
EJC-4	Expansion joint caulk type 4	Exterior façade main gym - 12 locations	ACM	CHRY 9.1%	200 LF	As per current Langan's survey. (2026)
--	Multi-layered built-up roofing and roof flashing materials (membrane layers and vapor barrier/tar on roof deck) - Exposed and under EPDM membrane	Roofs - For new fan unit installation - 42 locations	Assumed ACM	--	420 SF	Intrusive sampling was omitted due to building occupancy.
--	Concealed waterproofing materials (i.e. tar/felt membrane) on walls, columns & spandrel beams behind brick veneer & contaminated brick/cinderblock.	School Building Façades - 50 openings receiving new Uvs, two brick replacement locations	Assumed ACM	--	600 SF	Potentially affected by unit ventilator & brick replacement work. .'Intrusive sampling was omitted due to building occupancy.
--	Concealed waterproofing materials (i.e. tar, mastic, felt, etc.) on building foundation walls	Chlorine Vault/Water Service Room	Assumed ACM	--	300 SF	Intrusive sampling was omitted due to building occupancy.
--	Multi-layered built-up roofing materials (membrane layers and vapor barrier/tar on roof deck) - Under Pebble Roof Ballast	Flat Canopy Roof	Assumed ACM	--	845 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
--	Concealed roofing materials (membrane layers and vapor barrier/tar on roof deck) - Under Metal Roof	Slope Metal Canopy Roof	Assumed ACM	--	300 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
--	Concealed underground Transite/Metal pipe with suspect waterproofing tar/felt membrane (part of roof drain system) with trenches	Estimated concealed under entrance Canopy / concrete sidewalk	Assumed ACM	--	50 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
--	Concealed waterproofing materials (i.e. tar, mastic, felt, etc.) on canopy column foundation	Estimated concealed under entrance Canopy / concrete sidewalk	Assumed ACM	--	80 SF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.
--	Old electrical wire insulation (exposed and within conduits) - Provided quantity reflects an approximate length of the electrical conduits exposed and concealed within wall and ceiling cavities. The size and number of wires within the conduits may vary.	Canopy Lighting System	Assumed ACM	--	300 LF	As per Langan's survey. (March 2026) 'Intrusive sampling was omitted due to building occupancy.

Table 1 - SUMMARY OF ASBESTOS SURVEY FINDINGS
Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Sample ID	Material	Material Locations	Sampling Results		Estimated Quantity of ACM	Notes/Comments
NON-ACM BUT CONTAINING ASBESTOS FIBERS <1.0% FINDINGS						
MPC-2	Metal panel caulk around black frame	Exterior façade	Non-ACM	CHRY< 1.0%		As per current Langan's survey. (2026)
MPC-3	Metal panel caulk on white panel edge (black)	Exterior façade	Non-ACM	CHRY< 1.0%		As per current Langan's survey. (2026)
PMC-1	Panel mastic covering fiberglass	Exterior façade	Non-ACM	CHRY< 1.0%		As per current Langan's survey. (2026)
EJC-1	Expansion joint caulk type 1	Exterior façade K wing	Non-ACM	CHRY< 1.0%		As per current Langan's survey. (2026)
EJC-5	Expansion joint caulk type 5	Exterior façade small gym	Non-ACM	CHRY< 1.0%		As per current Langan's survey. (2026)
NON-ACM FINDINGS						
MPCR-1	Metal panel caulk repair caulk	Exterior façade	Non-ACM	--		As per current Langan's survey. (2026)
EWG-1	Exterior window glazing	Exterior new A Wing	Non-ACM	--		As per current Langan's survey. (2026)
AMM-1	Masonry mortar brick new A wing	Exterior new A Wing	Non-ACM	--		As per current Langan's survey. (2026)
WMM-1	Masonry mortar brick wall	Freestanding new brick wall	Non-ACM	--		As per current Langan's survey. (2026)
FMM-1	Masonry mortar brick original building	Exterior façade	Non-ACM	--		As per current Langan's survey. (2026)
EST-1	Exterior stucco on Building	Façade base of wall	Non-ACM	--		As per current Langan's survey. (2026)
VB-1	Vapor barrier between brick façade & concrete base	East façade east of main entrance	Non-ACM	--		As per current Langan's survey. (2026)
WSTC-1	Wall stucco at base of wall	Exterior freestanding brick wall	Non-ACM	--		As per current Langan's survey. (2026)
MMP-1	Masonry mortar patch	Exterior F wing	Non-ACM	--		As per current Langan's survey. (2026)
LDMM-1	Loading dock new brick mortar	Exterior loading dock	Non-ACM	--		As per current Langan's survey. (2026)
ELC-1	Exterior Louvre Caulk	Exterior façade D wing	Non-ACM	--		As per current Langan's survey. (2026)
EJC-3	Expansion joint caulk type 3	Exterior façade K wing	Non-ACM	--		As per current Langan's survey. (2026)
GYP-1	Gypsum board original building	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
JC-1	Joint compound original building	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
GYP-2	Gypsum board new A wing	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
JC-2	Joint compound new A wing	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
GD-1	Glue daub to white 1x1 CT (D. Brown)	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
GD-2	Glue daub to white 1x1 CT (Tan)	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
FT-1	Floor tile and mastic 12 by 12 Gray with black	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
FT-2	12 by 12 Gray/blue floor tile and mastic	Vesitbule V5	Non-ACM	--		As per current Langan's survey. (2026)
FT-3	Floor tile and mastic under FT-2	Vesitbule V5	Non-ACM	--		As per current Langan's survey. (2026)
TWB-1	Tectum wall board	Small gymnasium	Non-ACM	--		As per current Langan's survey. (2026)
TSC-1	Toilet/sink caulk	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
FGPJ-1	Fiberglass pipe wrap jacket	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)

Table 1 - SUMMARY OF ASBESTOS SURVEY FINDINGS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Sample ID	Material	Material Locations	Sampling Results		Estimated Quantity of ACM	Notes/Comments
GBM-1	Glazed block mortar	Shower room 31A	Non-ACM	--		As per current Langan's survey. (2026)
CPL-1	Ceiling plaster scratch coat	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
PB-1	Press board wall board	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
MM-1	CMU masonry mortar	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
LF-1	Linoleum flooring peel and stick	K2A	Non-ACM	--		As per current Langan's survey. (2026)
FM-1	Flooring material 12" Beige and mastic	26A	Non-ACM	--		As per current Langan's survey. (2026)
CT-1	2'by2' Stipple fissure ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-2	2'by4' Large pinhole ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-3	1'by1' Pinhole ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-4	2'by4' Stipple fissure	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-5	2'by4' Rough white ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-6	2'by2' Smooth white ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per current Langan's survey. (2026)
CT-7	2'by4' Gypsum ceiling tile	A-14	Non-ACM	--		As per current Langan's survey. (2026)
CT-8	2'by4' Smooth heavy ceiling tile	Nurse's office	Non-ACM	--		As per current Langan's survey. (2026)
SR-1	Gypsum wallboard	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
JC-1	Joint compound to gypsum wallboard	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
SP	Gypsum soffit board	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
SPJ-1	Joint compound to gypsum soffit board	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CT-1	12-inch ceiling tile (small holes - cellulose)	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CT-2	12-inch ceiling tile (large holes - wood particle)	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CT-3	4'x2' old ceiling tile (large holes - wood particle)	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CPP-1	2'x2' ceiling panel with grooves	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CPP-2	2'x4' ceiling panel with grooves	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CPP-3	2'x4' ceiling panel white rough with pinholes	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CTG-2	Glue daubs to 12-inch ceiling tile	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
TC-1	Tectum ceiling panels	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
BMR-1	Brick mortar	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
CMB-1	CMU mortar	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
SMR-1	Stone wall mortar	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
BMG-1	Black baseboard molding and glue	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)
BMG-2	Dark gray baseboard molding and glue	Throughout Surveyed Areas	Non-ACM	--		As per Langan's survey. (March 2026)

Table 1 - SUMMARY OF ASBESTOS SURVEY FINDINGS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Sample ID	Material	Material Locations	Sampling Results		Estimated Quantity of ACM	Notes/Comments
FT-1	12-inch white & red floor tile	Main Vestibule	Non-ACM	--		As per Langan's survey. (March 2026)
CG-1	Carpet glue	Main Vestibule	Non-ACM	--		As per Langan's survey. (March 2026)
CPD-1	Concrete sidewalk/pad	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
APH-1	Asphalt pavement	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
CEJ-1	Sidewalk expansion joint fill material	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
EDC-1	Exterior door caulk	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
WEJ-1	Wall expansion joint caulk - Exterior	Main Vestibule - Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
SSC-1	Sidewalk expansion joint caulk	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
CPC-1	Canopy perimeter joint caulk	Exterior	Non-ACM	--		As per Langan's survey. (March 2026)
--	1' x 1' Ceiling Tile	Hallway Kindergarten Wing	Non-ACM	--		As per prior Langan's survey. (February 2024)
--	Glue daubs to 12-inch ceiling tile	Hallway Kindergarten Wing	Non-ACM	--		As per prior Langan's survey. (February 2024)
--	Gypsum Board Above 1' x 1' Ceiling Tile	Hallway Kindergarten Wing	Non-ACM	--		As per prior Langan's survey. (February 2024)
--	Gray baseboard molding and glue	Throughout Surveyed Areas	Non-ACM	--		As per prior Langan's survey. (December 2023)

1 A material with asbestos content greater than one percent (>1.0%) is considered as an asbestos-containing material (ACM). Concentrations in weight percent.

2 ND = “None Detected” – Asbestos not detected in sampled material.

3 CHRY = Chrysotile Asbestos

4 Friable = Any material that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure, or is capable of being released into the air by hand pressure.

5 Non-Friable = Any material that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, and is not capable of being released into the air by hand pressure.

6 Potentially Friable = Any non-friable material that when dry, will be subjected to sanding, grinding, cutting or abrading, or has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Table 2 - XRF SCREENING RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Reading ID #	Component	Substrate	Color	Test Location		Total Lead mg/cm^2	Results	Comments
				Floor	Area			
1	Positive Calibration					0.90		
2	Positive Calibration					0.90		---
3	Positive Calibration					1.00		
4	Negative Calibration					0.00		
5	Negative Calibration					0.00		---
6	Negative Calibration					0.10		
7	Door Frame	Metak	Gray	1	Library Entrance	0.10	LCP	---
8	Door	Wood	Glazed	1	Library Entrance	0.00	NON	---
9	Wall	CMU	Gray	1	Library Entrance	0.00	NON	---
10	Wall	CMU	Light Gray	1	Copy Room	0.00	NON	---
11	**I-Beam**	**Metal**	**White**	**1**	**Copy Room**	**1.30**	**LBP**	**---**
12	Wall Tile	Ceramic	Gray	1	Bathroom 33	0.30	LCP	---
13	Floor Tile	Ceramic	Black	1	Bathroom 33	0.20	LCP	---
14	Wall	CMU	Gray	1	Bathroom 33	0.00	NON	---
15	Ceiling	Gypsum	White	1	Welcome 1A	0.10	LCP	---
16	Wall	Gypsum	White	1	Welcome 1A	0.10	LCP	---
17	Wall	Gypsum	Gray	1	Welcome 1A @ Hall	0.20	LCP	---
18	Entrance Panel	Wood	Red	1	Main Entrance	0.20	LCP	---
19	Wall	CMU	Brown	1	Main Office	0.10	LCP	---
20	Wall	Gypsum	Brown	1	Main Office	0.20	LCP	---
21	Wall	Gypsum	Red	1	Main Office	0.00	NON	---
22	Door Frame	Metal	Gray	1	Main Office	0.10	LCP	---
23	Safe Door	Metal	Gray	1	Main Office	-0.20	NON	---
24	.Wall	Gypsum	Gray	1	Principal's Room 3	0.20	LCP	---
25	**Structural Beam**	**CMU**	**White**	**1**	**Room K-1**	**7.10**	**LBP**	**---**
26	Ceiling Panel	Wood	Blue	1	Room K-1	0.20	LCP	---
27	Wall	CMU	Blue	1	Room K-1	0.30	LCP	---
28	Window Frame	Metal	Black	1	Room K-1	0.00	NON	---
29	Wall	CMU	Cream	1	Room K3 Bathroom	0.00	NON	---
30	Floor Tile	Ceramic	Gray	1	Room K3 Bathroom	0.20	LCP	---
31	Ceiling Panel	Wood	Yellow	1	Room K3	0.30	LCP	---
32	Door Frame	Metal	Tan	1	Room K3 Bathroom	0.20	LCP	---
33	Wall	Brick	Blue	1	A-Wing	0.00	NON	---
34	Wall	Gypsum	Blue	1	A-Wing	0.10	LCP	---
35	Wal	Gypsum	Yellow	1	Nurse's Bathroom	0.10	LCP	---
36	Wall	CMU	Yellow	1	Nurse's Bathroom	0.20	LCP	---
37	Floor Tile	Ceramice	White	1	Nurse's Bathroom	0.20	LCP	---
38	Sink	Porcelin	Glazed	1	Nurse's Bathroom	-0.20	NON	---
39	Wall	Gypsum	Gray	1	Room A-15	0.20	LCP	---
40	Door Frame	Metal	Gray	1	Room A-15	0.10	LCP	---
41	Fin Tube Cover	Metal	Off-White	1	Room A-15	0.00	NON	---
42	Wall	Gypsum	Cream	1	Room A-12	-0.10	NON	---
43	Door Frame	Metal	Gray	1	Room A-2	0.10	LCP	---
44	Wall	Gypsum	Gray	1	Room A-2	0.10	LCP	---
45	Wall	CMU	Gray	1	Room A-2	0.20	LCP	---
46	Wall	Gypsum	Lavender	1	C-Wing	0.10	LCP	---
47	Wall	CMU	Lavender	1	C-Wing	0.20	LCP	---
48	Door Frame	Metal	Gray	1	Room C-5	0.00	NON	---
49	Structural Beam	Metal	White	1	Room C-1	0.10	LCP	---
50	Door Frame	Metal	Gray	1	Hallway @ Cafeteria	-0.20	NON	---
51	Door	Metal	Gray	1	Hallway @ Cafeteria	0.00	NON	---
52	Door Framing	Gypsum	Gray	1	Hallway @ Cafeteria	0.20	LCP	---
53	Door Column	Metal	Yellow	1	Hallway @ Cafeteria	0.00	NON	---
54	Wall	CMU	Gray	Bsmt	Large Gymnasium	0.30	LCP	---
55	Ceiling	Plaster	White	Bsmt	Room 31B	0.10	LCP	---
56	Glass Block	CMU	White	Bsmt	Room 31A Showers	0.30	LCP	---
57	Wall	Wood	Black	Bsmt	Faculty Room 31	0.00	NON	---
58	Ceiling	Concrete	White	Bsmt	Faculty Room 31	0.30	LCP	---
59	Wall	Gypsum	Yellow	1	27B Hallway	-0.10	NON	---
60	Wall	CMU	Yellow	1	27B Hallway	0.10	LCP	---
61	Wall	CMU	Aqua	1	D-Wing Hallway	0.10	LCP	---
62	Wall	CMU	Blue	1	Kitchen	0.20	LCP	---

Table 2 - XRF SCREENING RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Reading ID #	Component	Substrate	Color	Test Location		Total Lead mg/cm^2	Results	Comments
				Floor	Area			
63	Wall	CMU	Cream	1	Kitchen	0.20	LCP	---
64	Door Frame	Metal	Brown	1	Kitchen	0.10	LCP	---
65	Ceiling	Concrete	Tan	1	Janitor's Office	0.20	LCP	---
66	Positive Calibration					1.00		
67	Positive Calibration					1.00		---
68	Positive Calibration					1.10		
69	Negative Calibration					-0.10		
70	Negative Calibration					0.00		---
71	Negative Calibration					-0.10		
PREVIOUS XRF SCREENING RESULTS								
109	Positive Calibration					1.00		
110	Positive Calibration					0.90		---
111	Positive Calibration					0.90		
112	Negative Calibration					0.00		
113	Negative Calibration					-0.10		---
114	Negative Calibration					0.00		
115	Wall	CMU	Beige	1	Classroom B1	0.00	NON	---
116	Wall	CMU	Purple	1	Corridor by B1	0.00	NON	---
117	Door	Wood	Varnish	1	Classroom B1	0.10	LCP	---
118	Door Frame	Metal	Gray	1	Classroom B1	-0.10	NON	---
119	Door Frame	Metal	Gray	1	Classroom B4	0.10	LCP	---
120	Door	Wood	Varnish	1	Classroom B4	0.10	LCP	---
121	Wall	Wood	Varnish	1	Classroom B3	0.00	NON	---
122	Door Frame	Metal	Gray	1	Classroom B4	0.30	LCP	---
123	Wall	Gypsum Board	Purple	1	Corridor by B7	0.00	NON	---
124	Wall	Gypsum Board	Beige	1	Classroom B7	0.00	NON	---
125	Wall	Gypsum Board	Purple	1	Corridor by B8	0.10	LCP	---
126	Wall	Gypsum Board	Beige	1	Classroom B8	0.20	LCP	---
127	Door Frame	Metal	Gray	1	Classroom B8	0.20	LCP	---
128	Wall	CMU	Purple	1	Classroom B2	0.10	LCP	---
129	Wall	CMU	Beige	1	Classroom B2	0.00	NON	---
130	Wall	CMU	Pistachio	1	Corridor by D2	0.10	LCP	---
131	Wall	CMU	Beige	1	Classroom D2	0.00	NON	---
132	Door Frame	Metal	Gray	1	Classroom D2	0.30	LCP	---
133	Door	Wood	Varnish	1	Classroom D2	0.00	NON	---
134	Wall	CMU	Pistachio	1	Corridor by D7	0.10	LCP	---
135	Wall	Gypsum Board	Beige	1	Classroom D8	0.10	LCP	---
136	Wall	CMU	Pistachio	1	Corridor by E1	-0.10	NON	---
137	Wall	CMU	Pistachio	1	Classroom E1	0.20	LCP	---
138	Door Frame	Metal	Gray	1	Classroom E4	0.20	LCP	---
139	Door	Wood	Varnish	1	Classroom E4	0.00	NON	---
140	Wall	CMU	Pistachio	1	Corridor by F4	0.10	LCP	---
141	Wall	CMU	Beige	1	Classroom F4	0.20	LCP	---
142	Door Frame	Metal	Gray	1	Classroom F4	0.20	LCP	---
143	Door	Wood	Varnish	1	Classroom F4	0.20	LCP	---
144	Window Panel	Metal	Beige	1	Main Vestibule	0.00	NON	---
145	Window Frame	Metal	Brown	1	Main Vestibule	-0.10	NON	---
146	Ceiling	Gypsum Board	White	1	Main Vestibule	0.00	NON	---
147	Door	Metal	Blue	1	Main Vestibule	0.10	LCP	---
148	Column	Metal	Brown	1	Canopy	0.10	LCP	---
149	**Column**	**Metal**	**Brown**	**1**	**Canopy**	**1.70**	**LBP**	**---**
150	**Column**	**Metal**	**Brown**	**1**	**Canopy**	**1.70**	**LBP**	**---**
151	Floor	Rubber	Yellow	1	Sidewalk Entrance	0.50	LCP	---
152	Curb	Concrete	Yellow	1	Sidewalk Entrance	0.10	LCP	---
153	Driveway	Asphalt	Yellow	1	Sidewalk Entrance	0.10	LCP	---
154	**Beam**	**Metal**	**Brown**	**1**	**Canopy**	**1.10**	**LBP**	**---**
155	Ramp	Concrete	Yellow	1	Loading Dock	0.20	LCP	---
156	Play Area	Asphalt	Blue	1	Exterior	0.00	NON	---
157	Positive Calibration					0.90		
158	Positive Calibration					0.90		---
159	Positive Calibration					1.00		
160	Negative Calibration					0.00		
161	Negative Calibration					0.10		---
162	Negative Calibration					0.00		

Table 2 - XRF SCREENING RESULTS Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540								
Reading ID #	Component	Substrate	Color	Test Location		Total Lead mg/cm^2	Results	Comments
				Floor	Area			

Note: Although Langan recognizes that the EPA definition of Lead-Based Paint (LBP) is only applicable to certain residential and child-occupied structures, we are using the EPA LBP definition as a threshold for reporting. OSHA regulates disturbances and employee exposures to any detectable concentration of lead. OSHA considers any paint or material with any measurable concentration of lead as lead containing paint (LCP) or lead containing material (LCM).

NON	= Negative Lead Result
LCP	= OSHA any detectable concentration of lead.
LBP	= Positive for lead-based paint (1.0 mg/cm2 or greater) as defined under 40 CFR Part 745.

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Toilet/Sink Caulk	TSC-1A	Room 21	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Toilet/Sink Caulk	TSC-1B	Room E-7	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	3,700 // 3.70			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Exterior Louvre Caulk	ELC-1A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Exterior Louvre Caulk	ELC-1B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Window Frame Caulk, Top - Black	WFC-1A	Original Building Exterior	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Window Frame Caulk, Top - Black	WFC-1B	Original Building Exterior	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Window Frame Caulk, Bottom - White	WFC-2A	Original Building Exterior	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Window Frame Caulk, Bottom - White	WFC-2B	Original Building Exterior	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 1	EJC-1A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 1	EJC-1B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Expansion Joint Caulk, Type 2	EJC-2A	Exterior, K-Wing	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	1,500 // 1.50			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 2	EJC-2B	Exterior, K-Wing	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	1,900 // 1.90			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 3	EJC-3A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 3	EJC-3B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 4	EJC-4A	Exterior, Gym	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	1,600 // 1.60			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Expansion Joint Caulk, Type 4	EJC-4B	Exterior, Gym	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 5	EJC-5A	Exterior, Small Gym	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Expansion Joint Caulk, Type 5	EJC-5B	Exterior, Small Gym	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Exterior Window Glazing	EWG-1A	New A-Wing	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Exterior Window Glazing	EWG-1B	New A-Wing	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Metal Panel Caulk, Black on Black Bottom	MPC-1A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Caulk, Black on Black Bottom	MPC-1B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Caulk, Black on Black Frame	MPC-2A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Caulk, Black on Black Frame	MPC-2B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Caulk, Black on White Panel to Frame	MPC-3A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

Table 3 - SUMMARY OF CAULK SAMPLE PCB ANALYSES RESULTS

Project "SED RBM @ Primrose ES" 110 Primrose St, Lincolndale, NY 10540

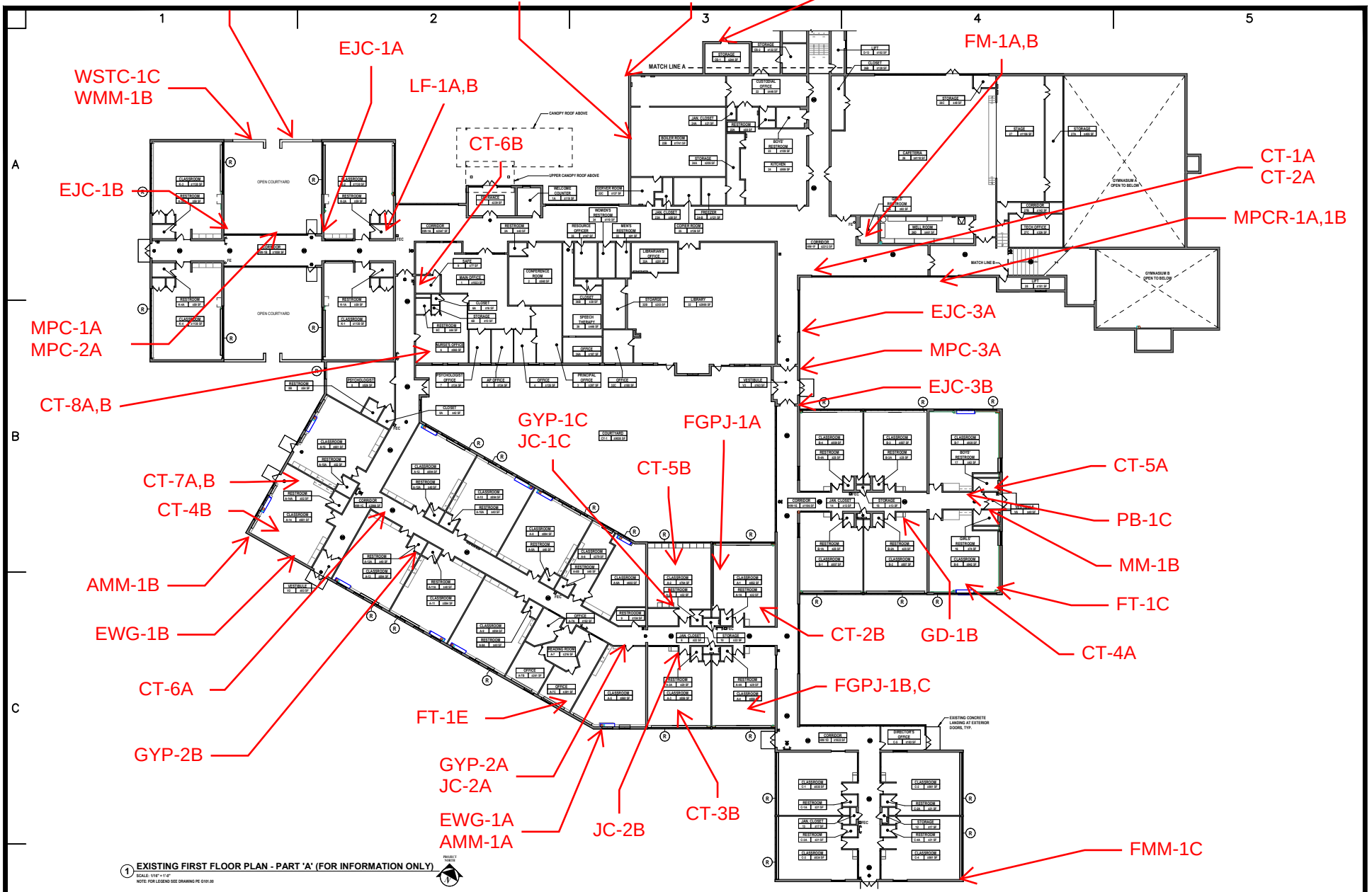
Material	Sample ID #	Material Location	PCB Type	Results [µg/Kg]//[PPM]	PCB or Non-PCB	Material Estimated Quantity	Comments
Metal Panel Caulk, Black on White Panel to Frame	MPC-3B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Repair Caulk	MPCR-1A	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			
Metal Panel Repair Caulk	MPCR-1B	Exterior Façade	PCB-1016	ND // 0.00	NON-PCB	---	___
			PCB-1221	ND // 0.00			
			PCB-1232	ND // 0.00			
			PCB-1242	ND // 0.00			
			PCB-1248	ND // 0.00			
			PCB-1254	ND // 0.00			
			PCB-1260	ND // 0.00			
			PCB-1262	ND // 0.00			
			PCB-1268	ND // 0.00			

- Not Detected at Reporting/Practical Quantitation Level ---------- = Non-PCB

<50000//50 [µg/Kg]//[PPM] ---------- = Non-PCB

>50000//50 [µg/Kg]//[PPM] ---------- **= PCB - Polychlorinated Biphenyls Containing Material**

FIGURES



GENERAL NOTES:

A. THIS PLAN IS PROVIDED TO SHOW APPROXIMATE SAMPLING LOCATIONS. THE ACTUAL LAYOUT OF THE BUILDING AND BUILDING EQUIPMENT MAY BE SLIGHTLY DIFFERENT THAN SHOWN.

LANGAN
Langan Engineering and Environmental Services, Inc.
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
NJ Certificate of Authorization No.24GA27996400

Project
SED RBM @ Primrose ES

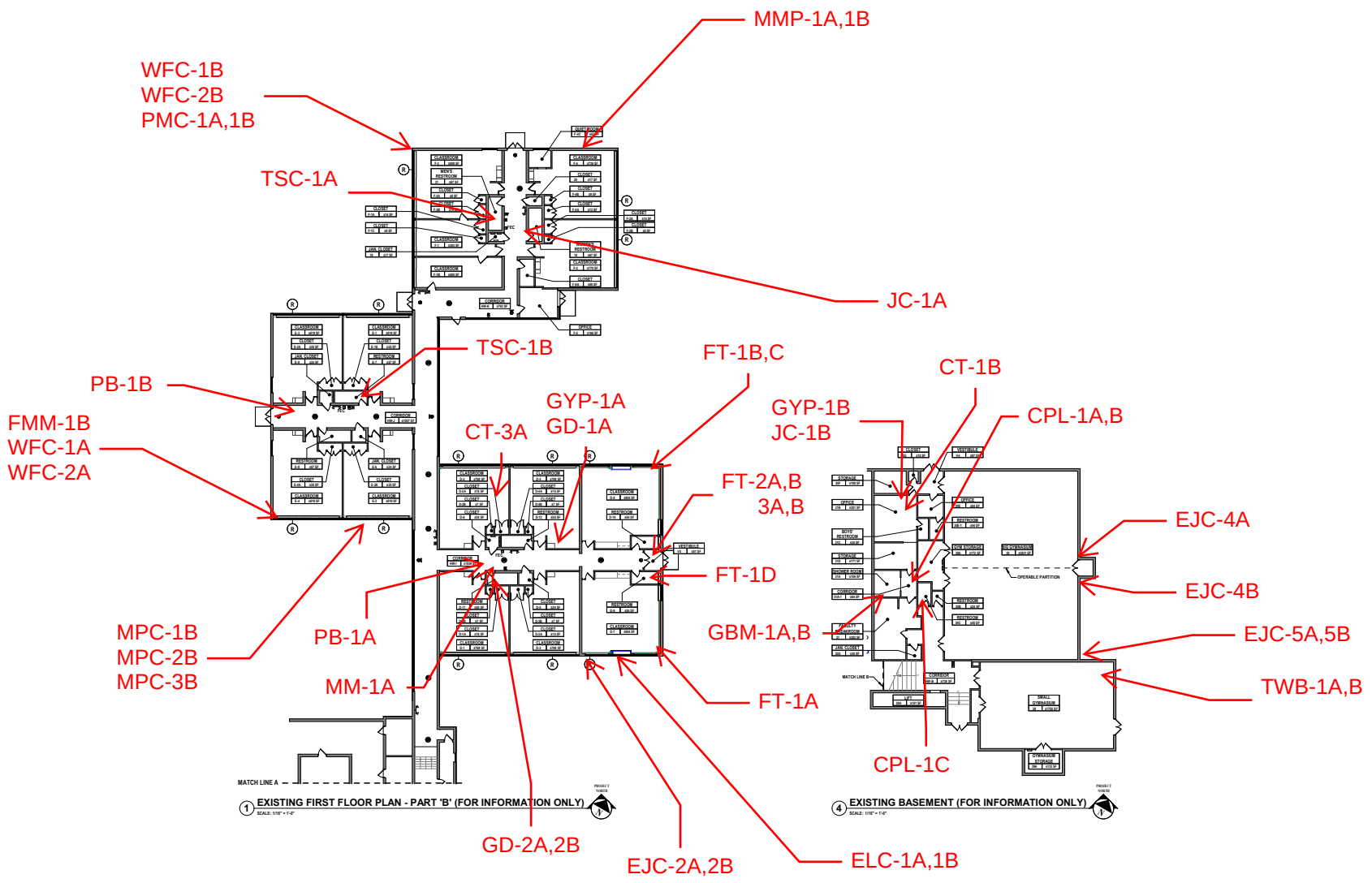
110 PRIMROSE STREET
Lincolndale, NY

Drawing Title
ASBESTOS SAMPLING LOCATIONS

Project No. 190150511
Date 10/28/2026
Drawn By M. Benson
Checked By C. Napolitano

Drawing No. ASL-01
Sheet 1 of 2

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LANGAN
Langan Engineering and Environmental Services, Inc.
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
NJ Certificate of Authorization No.24GA27996400

Project
SED RBM @ Primrose ES

110 PRIMROSE STREET
Lincolndale, NY

Drawing Title
ASBESTOS SAMPLING LOCATIONS

Project No.	190150511
Date	10/28/2026
Drawn By	M. Benson
Checked By	C. Napolitano

Drawing No.
ASL-02

Sheet 2 of 2

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A P P E N D I X A

Laboratory Test Results and Chain of Custody Documentations (Asbestos)

Atlas Environmental Lab, Corp.
255 West 36th Street, Suite# 1503
New York, NY 10018
Phone:(212) 563-0400 Fax:(212) 563-0401
www.atlasenvironmentallab.com

Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
MPC-1A	BK0926354-1	Metal Panel Caulk Bottom of Panel Frame (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	67.6	17.1	15.3	0%	100%	**NAD** Inconclusive	**3.4%CHRY**		X	X
MPC-1B	BK0926354-2	Metal Panel Caulk Bottom of Panel Frame (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	60.8	20.0	19.2	0%	100%	**NAD** Inconclusive	**Not Analyzed**		X	
MPC-2A	BK0926354-3	Metal Panel Caulk Around Black Frame (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	63.4	13.2	23.4	0%	100%	**NAD** Inconclusive	**NAD**		X	X
MPC-2B	BK0926354-4	Metal Panel Caulk Around Black Frame (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	27.0	6.1	66.9	0%	100%	**NAD** Inconclusive	**Trace CHRY**		X	X
MPC-3A	BK0926354-5	Metal Panel Caulk on White Panel Edge (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	88.5	7.7	3.8	0%	100%	**NAD** Inconclusive	**Trace CHRY**		X	X
MPC-3B	BK0926354-6	Metal Panel Caulk on White Panel Edge (Black) | Exterior Façade	Black, Homogeneous, Non-Fibrous	49.8	21.7	28.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
PMC-1A	BK0926354-7	Panel Mastic / Covering Fiberglass Panel to Metal | Exterior Façade	White, Homogeneous, Non-Fibrous	24.7	2.7	72.6	0%	100%	**NAD** Inconclusive	**Trace CHRY**		X	X
PMC-1B	BK0926354-8	Panel Mastic / Covering Fiberglass Panel to Metal | Exterior Façade	White, Homogeneous, Non-Fibrous	24.9	5.1	70.1	0%	100%	**NAD** Inconclusive	**Trace CHRY**		X	X
MPCR-1A	BK0926354-9	Metal Panel Caulk Repair Caulk | Exterior Façade	Beige, Homogeneous, Non-Fibrous	82.6	4.0	13.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X
MPCR-1B	BK0926354-10	Metal Panel Caulk Repair Caulk | Exterior Façade	Beige, Homogeneous, Non-Fibrous	50.4	6.3	43.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X

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Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
EWG-1A	BK0926354-11	Exterior Window Glazing | Exterior New A Wing	Black, Homogeneous, Non-Fibrous	60.2	15.1	24.7	0%	100%	**NAD** Inconclusive	**NAD**		X	X
EWG-1B	BK0926354-12	Exterior Window Glazing | Exterior New A Wing	Black, Homogeneous, Non-Fibrous	70.5	15.5	14.0	0%	100%	**NAD** Inconclusive	**NAD**		X	X
AMM-1A	BK0926354-13	Masonry Mortar Brick New A | Exterior New A Wing	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
AMM-1B	BK0926354-14	Masonry Mortar Brick New A | Exterior New A Wing	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
WMM-1A	BK0926354-15	Masonry Mortar Brick Wall | Exterior Freestanding Brick Wall	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
WMM-1B	BK0926354-16	Masonry Mortar Brick Wall | Exterior Freestanding Brick Wall	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
FMM-1A	BK0926354-17	Masonry Mortar Brick Original Bldg. | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
FMM-1B	BK0926354-18	Masonry Mortar Brick Original Bldg. | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
FMM-1C	BK0926354-19	Masonry Mortar Brick Original Bldg. | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
EST-1A	BK0926354-20	Exterior Stucco on Bldg. Facade Base of Wall | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		

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Client: Langan
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Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
EST-1B	BK0926354-21	Exterior Stucco on Bldg. Facade Base of Wall | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
EST-1C	BK0926354-107	Exterior Stucco on Bldg. Facade Base of Wall | Exterior Façade	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
VB-1A	BK0926354-22	Vapor Barrier Between Brick Façade & Concrete Base | Exterior Façade East Main Entrance	Black, Homogeneous, Non-Fibrous	74.9	8.4	16.7	0%	100%	NAD Inconclusive	NAD		X	X
VB-1B	BK0926354-23	Vapor Barrier Between Brick Façade & Concrete Base | Exterior Façade East Main Entrance	Black, Homogeneous, Non-Fibrous	74.8	7.0	18.1	0%	100%	NAD Inconclusive	NAD		X	X
WSTC-1A	BK0926354-24	Wall Stucco at Base of Wall | Exterior Freestanding Brick Wall	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
WSTC-1B	BK0926354-25	Wall Stucco at Base of Wall | Exterior Freestanding Brick Wall	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
WSTC-1C	BK0926354-26	Wall Stucco at Base of Wall | Exterior Freestanding Brick Wall	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
MMP-1A	BK0926354-27	Masonry Mortar Patch | Exterior F Wing	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
MMP-1B	BK0926354-28	Masonry Mortar Patch | Exterior F Wing	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		
LDMM-1A	BK0926354-29	Loading Dock New Brick Mortar | Exterior Loading Dock	Grey, Homogeneous, Friable	Not Applicable			0%	100%	NAD		X		

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
LDMM-1B	BK0926354-30	Loading Dock New Brick Mortar | Exterior Loading Dock	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
ELC-1A	BK0926354-31	Exterior Louvre Caulk | Exterior Façade	Clear, Homogeneous, Non-Fibrous	59.0	20.1	20.8	0%	100%	**NAD** Inconclusive	**NAD**		X	X
ELC-1B	BK0926354-32	Exterior Louvre Caulk | Exterior Façade	Insufficient Material										
WFC-1A	BK0926354-33	Window Frame Caulk Black Top | Exterior Façade Orig. Bldg.	Black, Homogeneous, Non-Fibrous	63.5	15.4	21.1	0%	100%	**NAD** Inconclusive	**3.1%CHRY**		X	X
WFC-1B	BK0926354-34	Window Frame Caulk Black Top | Exterior Façade Orig. Bldg.	Black, Homogeneous, Non-Fibrous	71.8	12.5	15.7	0%	100%	**NAD** Inconclusive	**Not Analyzed**		X	
WFC-2A	BK0926354-35	Window Frame Caulk White Bottom | Exterior Façade Orig. Bldg.	White, Homogeneous, Non-Fibrous	45.4	5.4	49.2	0%	100%	**NAD** Inconclusive	**0.54%CHRY**		X	X
WFC-2B	BK0926354-36	Window Frame Caulk White Bottom | Exterior Façade Orig. Bldg.	White, Homogeneous, Non-Fibrous	42.3	8.8	48.9	0%	100%	**NAD** Inconclusive	**1.3%CHRY**		X	X
EJC-1A	BK0926354-37	Expansion Joint Caulk Type 1 | Exterior Façade K Wing	White, Homogeneous, Non-Fibrous	47.3	5.0	47.7	0%	100%	**NAD** Inconclusive	**0.3%CHRY**		X	X
EJC-1B	BK0926354-38	Expansion Joint Caulk Type 1 | Exterior Façade K Wing	White, Homogeneous, Non-Fibrous	54.4	4.6	41.0	0%	100%	**NAD** Inconclusive	**0.2%CHRY**		X	X
EJC-2A	BK0926354-39	Expansion Joint Caulk Type 2 | Exterior Façade K Wing	Grey, Homogeneous, Non-Fibrous	77.6	12.8	9.5	0%	100%	**NAD** Inconclusive	**1.3%CHRY**		X	X

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
EJC-2B	BK0926354-40	Expansion Joint Caulk Type 2 | Exterior Façade K Wing	Grey, Homogeneous, Non-Fibrous	83.1	9.3	7.6	0%	100%	**NAD** Inconclusive	**Not Analyzed**		X	
EJC-3A	BK0926354-41	Expansion Joint Caulk Type 3 | Exterior Façade K Wing	Grey, Homogeneous, Non-Fibrous	68.0	3.7	28.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X
EJC-3B	BK0926354-42	Expansion Joint Caulk Type 3 | Exterior Façade K Wing	Grey, Homogeneous, Non-Fibrous	71.1	11.2	17.7	0%	100%	**NAD** Inconclusive	**NAD**		X	X
EJC-4A	BK0926354-43	Expansion Joint Caulk Type 4 | Exterior Façade Main Gym	Grey, Homogeneous, Non-Fibrous	31.4	65.6	3.0	0%	~99%	**Trace (<1%)CHRY** Inconclusive	**6.6%Anth 6.6%CHRY**		X	X
EJC-4B	BK0926354-44	Expansion Joint Caulk Type 4 | Exterior Façade Main Gym	Grey, Homogeneous, Non-Fibrous	36.2	60.4	3.4	0%	~99%	**Trace (<1%)CHRY** Inconclusive	**6.0%Anth 9.1%CHRY**		X	X
EJC-5A	BK0926354-45	Expansion Joint Caulk Type 5 | Exterior Façade Small Gym	Dark Grey, Homogeneous, Non-Fibrous	74.3	5.7	20.0	0%	100%	**NAD** Inconclusive	**Trace CHRY**		X	X
EJC-5B	BK0926354-46	Expansion Joint Caulk Type 5 | Exterior Façade Small Gym	Dark Grey, Homogeneous, Non-Fibrous	93.6	4.0	2.4	0%	100%	**NAD** Inconclusive	**NAD**		X	X
GYP-1A	BK0926354-47	Gypsum Board Orig. Bldg. | Room D-4	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		X		
GYP-1B	BK0926354-48	Gypsum Board Orig. Bldg. | Room 31-B	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		X		
GYP-1C	BK0926354-49	Gypsum Board Orig. Bldg. | Room A-2	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		X		

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
JC-1A	BK0926354-50	Joint Compound | F Hallway	White, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
JC-1B	BK0926354-51	Joint Compound | Room 31-B	White, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
JC-1C	BK0926354-52	Joint Compound | Room A-2	White, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
GYP-2A	BK0926354-53	Gypsum Board New A Wing | Room A-5	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		**X**		
GYP-2B	BK0926354-54	Gypsum Board New A Wing | Room A-13	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		**X**		
JC-2A	BK0926354-55	Joint Compound New A Wing | Room A-5	White, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
JC-2B	BK0926354-56	Joint Compound New A Wing | Room A-4	White, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
GD-1A	BK0926354-57	Glue Daub to White 1x1 CT (D. Brown) | Room D-4	Brown, Homogeneous, Non-Fibrous	54.5	17.0	28.5	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**
GD-1B	BK0926354-58	Glue Daub to White 1x1 CT (D. Brown) | Room B-2	Brown, Homogeneous, Non-Fibrous	54.5	45.2	0.3	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**
GD-2A	BK0926354-59	Glue Daub to White 1x1 CT (Tan) | Room D-11 Restroom	Tan, Homogeneous, Non-Fibrous	81.7	14.8	3.5	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
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							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
GD-2B	BK0926354-60	Glue Daub to White 1x1 CT (Tan) | Room D-11 Restroom	Tan, Homogeneous, Non-Fibrous	14.8	28.6	56.6	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1A	BK0926354-61A	Floor Tile + Mastic 12" Gray w/Black | Room D7	Grey, Homogeneous, Non-Fibrous	22.8	7.9	69.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1A	BK0926354-61B	Floor Tile + Mastic 12" Gray w/Black | Room D7	Black, Homogeneous, Non-Fibrous	67.6	12.9	19.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1B	BK0926354-62A	Floor Tile + Mastic 12" Gray w/Black | Room D8	Grey, Homogeneous, Non-Fibrous	24.3	15.0	60.7	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1B	BK0926354-62B	Floor Tile + Mastic 12" Gray w/Black | Room D8	Black, Homogeneous, Non-Fibrous	30.5	33.7	35.8	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1C	BK0926354-63A	Floor Tile + Mastic 12" Gray w/Black | Room B8	Grey, Homogeneous, Non-Fibrous	18.1	28.9	53.0	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1C	BK0926354-63B	Floor Tile + Mastic 12" Gray w/Black | Room B8	Black, Homogeneous, Non-Fibrous	42.8	18.9	38.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1D	BK0926354-64A	Floor Tile + Mastic 12" Gray w/Black | Bathroom 9	Grey, Homogeneous, Non-Fibrous	51.1	8.3	40.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1D	BK0926354-64B	Floor Tile + Mastic 12" Gray w/Black | Bathroom 9	Black, Homogeneous, Non-Fibrous	30.1	9.7	60.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-1E	BK0926354-65A	Floor Tile + Mastic 12" Gray w/Black | Room A-7C	Grey, Homogeneous, Non-Fibrous	13.4	6.0	80.7	0%	100%	**NAD** Inconclusive	**NAD**		X	X

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
FT-1E	BK0926354-65B	Floor Tile + Mastic 12" Gray w/Black | Room A-7C	Yellow, Homogeneous, Non-Fibrous	27.5	6.3	66.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-2A	BK0926354-66A	Floor Tile + Mastic 12" Gray w/Blue | Exit Vestibule D Wing	Grey, Homogeneous, Non-Fibrous	14.0	2.7	83.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-2A	BK0926354-66B	Floor Tile + Mastic 12" Gray w/Blue | Exit Vestibule D Wing	Yellow, Homogeneous, Non-Fibrous	70.2	12.9	16.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-2B	BK0926354-67A	Floor Tile + Mastic 12" Gray/Blue | Exit Vestibule D Wing	Grey, Homogeneous, Non-Fibrous	16.1	6.2	77.7	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-2B	BK0926354-67B	Floor Tile + Mastic 12" Gray/Blue | Exit Vestibule D Wing	Yellow, Homogeneous, Non-Fibrous	69.1	5.4	25.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-3A	BK0926354-68A	Floor Tile + Mastic under FT-2 | Exit Vestibule D Wing	Grey, Homogeneous, Non-Fibrous	23.1	17.4	59.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-3A	BK0926354-68B	Floor Tile + Mastic under FT-2 | Exit Vestibule D Wing	Brown, Homogeneous, Non-Fibrous	52.2	21.9	25.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-3B	BK0926354-69A	Floor Tile + Mastic under FT-2 | Exit Vestibule D Wing	Grey, Homogeneous, Non-Fibrous	20.5	16.3	63.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FT-3B	BK0926354-69B	Floor Tile + Mastic under FT-2 | Exit Vestibule D Wing	Brown, Homogeneous, Non-Fibrous	46.1	15.3	38.6	0%	100%	**NAD** Inconclusive	**NAD**		X	X
TWB-1A	BK0926354-70	Tectum Wall Board | Small Gymnasium	White, Homogeneous, Friable	Not Applicable			90%CELL	10%	**NAD**		X		

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Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
Date Received: 9/21/2026
PLM Date Analyzed: 9/23/2026
TEM Date Analyzed: *
Report Date: 10/8/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
TWB-1B	BK0926354-71	Tectum Wall Board | Small Gymnasium	White, Homogeneous, Friable	Not Applicable			90%CELL	10%	**NAD**		X		
TSC-1A	BK0926354-72	Toilet/Sink Caulk | Bathroom 21	White, Homogeneous, Non-Fibrous	51.9	3.3	44.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X
TSC-1B	BK0926354-73	Toilet/Sink Caulk | Room E-7	White, Homogeneous, Non-Fibrous	30.1	10.4	59.4	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FGPJ-1A	BK0926354-74	Fiberglass Pipe Wrap Jacket | Room A-1	White, Homogeneous, Friable	Not Applicable			90%FBGL	10%	**NAD**		X		
FGPJ-1B	BK0926354-75	Fiberglass Pipe Wrap Jacket | Room A-4	White, Homogeneous, Friable	Not Applicable			90%FBGL	10%	**NAD**		X		
FGPJ-1C	BK0926354-76	Fiberglass Pipe Wrap Jacket | Room A-4	White, Homogeneous, Friable	Not Applicable			90%FBGL	10%	**NAD**		X		
GBM-1A	BK0926354-77	Glazed Block Mortar | Shower Room 31A	Light Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
GBM-1B	BK0926354-78	Glazed Block Mortar | Shower Room 31A	Light Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
CPL-1A	BK0926354-79	Ceiling Plaster Scratch Coat | Shower Room 31A Corridor	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		
CPL-1B	BK0926354-80	Ceiling Plaster Scratch Coat | Shower Room 31A Corridor	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		X		

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Client: Langan
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Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

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							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
CPL-1C	BK0926354-81	Ceiling Plaster Scratch Coat | Bathroom 30C	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
PB-1A	BK0926354-82	Press Board Wall Board | D Hallway	Brown, Homogeneous, Friable	Not Applicable			100%CELL	0%	**NAD**		**X**		
PB-1B	BK0926354-83	Press Board Wall Board | E Hallway	Brown, Homogeneous, Friable	Not Applicable			100%CELL	0%	**NAD**		**X**		
PB-1C	BK0926354-84	Press Board Wall Board | B Hallway	Brown, Homogeneous, Friable	Not Applicable			100%CELL	0%	**NAD**		**X**		
MM-1A	BK0926354-85	CMU Masonry Mortar | New D Section	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
MM-1B	BK0926354-86	CMU Masonry Mortar | New B Section	Grey, Homogeneous, Friable	Not Applicable			0%	100%	**NAD**		**X**		
LF-1A	BK0926354-87	Linoleum Flooring Peel + Stick | K-2 Bathroom	Grey, Homogeneous, Non-Fibrous	62.8	12.3	24.9	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**
LF-1B	BK0926354-88	Linoleum Flooring Peel + Stick | K-2 Bathroom	Grey, Homogeneous, Non-Fibrous	62.9	16.6	20.5	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**
FM-1A	BK0926354-89A	Flooring Material 12" Beige + Mastic | Girls' Bath outside Café	Beige, Homogeneous, Non-Fibrous	26.9	12.6	60.6	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**
FM-1A	BK0926354-89B	Flooring Material 12" Beige + Mastic | Girls' Bath outside Café	Black, Homogeneous, Non-Fibrous	40.3	12.0	47.7	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**

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Client: Langan
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Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
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Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	All %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
FM-1B	BK0926354-90A	Flooring Material 12" Beige + Mastic | Girls' Bath outside Café	Beige, Homogeneous, Non-Fibrous	56.3	37.6	6.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
FM-1B	BK0926354-90B	Flooring Material 12" Beige + Mastic | Girls' Bath outside Café	Black, Homogeneous, Non-Fibrous	46.0	15.9	38.1	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-1A	BK0926354-91	Ceiling Tile 2'x2' Stipple Fissure | DEF Corridor	Grey, Homogeneous, Non-Fibrous	28.2	29.6	42.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-1B	BK0926354-92	Ceiling Tile 2'x2' Stipple Fissure | Room 31B	Grey, Homogeneous, Non-Fibrous	37.7	58.1	4.2	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-2A	BK0926354-93	Ceiling Tile 2'x4' L Pinhole | DEF Corridor	Brown, Homogeneous, Non-Fibrous	53.3	2.9	43.8	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-2B	BK0926354-94	Ceiling Tile 2'x4' L Pinhole | Room A-1	Brown, Homogeneous, Non-Fibrous	51.7	4.7	43.5	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-3A	BK0926354-95	Ceiling Tile 1'x1' L Pinhole | Room D-2	Brown, Homogeneous, Non-Fibrous	45.6	4.5	49.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-3B	BK0926354-96	Ceiling Tile 1'x1' L Pinhole | Room D-3	Brown, Homogeneous, Non-Fibrous	96.1	2.3	1.6	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-4A	BK0926354-97	Ceiling Tile 2'x4' Stipple Fissure | Room B-8	Grey, Homogeneous, Non-Fibrous	28.8	46.9	24.4	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-4B	BK0926354-98	Ceiling Tile 2'x4' Stipple Fissure | Room A-14	Grey, Homogeneous, Non-Fibrous	28.3	35.8	35.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X

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Client: Langan
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Project Name/No.: Primrose Elementary / 190150511
Project Address: 110 Primrose St., Lincolndale, NY 10540
Work Area:

Lab ID: BK0926354.REV2
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CT-5A	BK0926354-99	Ceiling Tile 2'x4' Rough White | Boys' Room 17	Grey, Homogeneous, Non-Fibrous	17.4	48.3	34.3	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-5B	BK0926354-100	Ceiling Tile 2'x4' Rough White | Room A-2	Grey, Homogeneous, Non-Fibrous	13.0	23.1	63.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-6A	BK0926354-101	Ceiling Tile 2'x2' Smooth White | New A Hallway	Grey, Homogeneous, Non-Fibrous	50.1	37.3	12.6	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-6B	BK0926354-102	Ceiling Tile 2'x2' Smooth White | Bathroom 9	Grey, Homogeneous, Non-Fibrous	16.7	27.3	56.0	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-7A	BK0926354-103	Ceiling Tile 2'x4' Gypsum | Room A-14	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		X		
CT-7B	BK0926354-104	Ceiling Tile 2'x4' Gypsum | Room A-14	Grey, Homogeneous, Friable	Not Applicable			5%CELL 5%FBGL	90%	**NAD**		X		
CT-8A	BK0926354-105	Ceiling Tile 2'x4' Smooth Heavy | Nurse Office	Grey, Homogeneous, Non-Fibrous	17.4	73.2	9.4	0%	100%	**NAD** Inconclusive	**NAD**		X	X
CT-8B	BK0926354-106	Ceiling Tile 2'x4' Smooth Heavy | Nurse Office	Grey, Homogeneous, Non-Fibrous	18.5	78.6	2.9	0%	100%	**NAD** Inconclusive	**NAD**		X	X

AH

**All samples except 3-6, 41-46 analyzed on 9/24/2026 by BH (TEM)*
**Samples 3-6, 41-46 analyzed on 10/2/2026 by MB (TEM) as per client's request; Samoles 35-36 analyzed on 10/8/2026 by MB (TEM) as per client's request.*

Quantitative Analysis (Semi/Full):Bulk Asbestos Analysis-PLM by EPA 600/M4-82-020 per 40 CFR or ELAP198.1 (friable) and 198.6 (NOB) samples for New York.
NAD=no asbestos detected, NA/PS=Not Analyzed/Positive Stop, Trace=<1%,FBGL=Fiberglass, CELL=Cellulose,CHRY=Chrysotile,Amo=Amosite,CRO=Crocidolite,ANTH=Anthophylite, TRE=Tremolite, ACT=Actinolite, NA=not applicable.
PLM is not consistently reliable in detecting Asbestos in floor coverings and similar non friable organically bound materials. NAD or Trace results by PLM are inconclusive.
TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos containing in NY State.
All samples were prepared and analyzed in accordance with the EPA "TEM Method for Identifying and Quantifying Asbestos in Non-Fibrous Organically Bound Bulk Samples" ELAP 198.4".
ORG%=Ashed Organic%, AII= Acid Insoluble Inorganic%, ASI= Acid Soluble Inorganic%. The measurement of uncertainty available upon request.
This "Summary of Analytical Results "shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, ELAP or any agency of the U.S Government. The results relate only to the items tested. This report may not be reproduced, except in full, without the written approval of AEL .Atlas Environmental lab did not collect the analyzed samples and thus accepts no liability with regard to their collection and/or maintenance . AEL relies on client's data. The liability of Atlas Environmental Lab corp with respect to the services charged, shall in no event exceed the amount of the invoice.
NYS-ELAP#11999, NVLAP Lab Code: 500092-0, CT Reg. ID: PH-0154
PLM Analyst: LB/EM TEM Analyst: * Approved by:

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924001~~ 190150511
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

	Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	Asbestos: PLM-NOB	Asbestos: TEM	Analysis Requested for Lead: AAS	Lead: TCLP	Analysis Requested for PCB: EPA Method 8082	Results
1	MPC - 1A	Metal Panel Caulk bottom of panel frame (Black)	Exterior Facade	↓	↓	↓				
2	MPC - 1B	↓	↓							
3	MPC - 2A	Metal Panel Caulk around black frame (Black)	↓							
4	MPC - 2B	↓	↓							
5	MPC - 3A	Metal Panel Caulk on white panel edge (Black)	↓							
6	MPC - 3B	↓	↓							
7	PMC - 1A	Panel Mastic / Covering fiberglass panel to metal	↓							
8	PMC - 1B	↓	↓							
9	MPCR - 1A	Metal Panel Caulk Repair Caulk	↓							
10	MPCR - 1B	↓	↓							
11	EWG - 1A	Exterior Window Glazing	Exterior New A Wing		↓	↓				
12	↓ 1B	↓	↓							
13	AMM - 1A	Masonry Mortar Brick NewA	↓	↓						
14	↓ 1B	↓	↓							

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amraj Hundal	Samples Analyzed By:	EMILY MYINT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9-21-26 9:00	Date & Time	09-23-26 12:50
Company: **LANGAN**		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

TEM: 9/24/26 18:07

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924301~~ 190150511
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
15 WMM-1A	Masonry Mortar Back Wall	Exterior Freestanding Back Wall							
16 ↓ 1B	↓	↓							
17 FMM- 1A	Masonry Mortar Brick original bldg	Exterior Facade							
18 ↓ -1B	↓	↓							
19 ↓ -1C	↓	↓							
20 EST- 1A	Exterior Stucco on Bldg Facade base of wall	↓							
21 ↓ -1B/C107	↓	↓							
22 VB - 1A	Vapor Barrier between brick facade + concrete base	Exterior Facade East Main Entrance		↓	↓				
23 ↓ - 1B	↓	↓							
24 WSTC- 1A	Wall Stucco at base of wall	Exterior Free standing Brick wall							
25 ↓ -1B	↓	↓							
26 ↓ -1C	↓	↓							
27 MMP - 1A	Masonry Mortar Patch	Exterior F Wing							
28 ↓ 1B	↓	↓							

Comments:

Total No. of Samples: 15

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amrai Hindi	Samples Analyzed By:	EMILY MYINT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9-21-26 9:00	Date & Time	09-23-26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924901~~ 190150571
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
29 LDMM-1A	Loading Dock New Brick Mortar	Exterior Loading Dock	↓						
30 ↓ 1B		↓							
31 ELC-1A	Exterior Louvre Caulk	Exterior Facade		↓	↓				
32 ↓ 1B		↓							
33 WFC-1A	Window Frame Caulk Black Top	Exterior Facade Orig. Bldgs							
34 ↓ 1B	↓	↓							
35 ↓ 2A	White Button								
36 ↓ 2B	↓	↓							
37 EJC 1A	Expansion Joint Caulk ~~Black Top~~ Type 1	Exterior Facade K Wing							
38 ↓ 1B	↓	↓							
39 2A	Type 2	↓							
40 ↓ 2B	↓	↓							
41 3A	Type 3								
42 ↓ 3B	↓	↓							

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.

Relinquished By:	Frank Acciarito	Samples Received By:	Amirai Hunde	Samples Analyzed By:	EMILY MYINT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9.21.26 9:00	Date & Time	09.23.26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170824901~~ 190150571
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
EJC-4A	Expansion Joint Caulk Type 4	Exterior facade Main Gym							
-4B									
-5A	Type 5	small Gym							
-5B									
Gyp - 1A	Gypsum Board Orig. Bldg.	Rm D-4							
-1B		31-B							
-1C		A-2							
JC -1A	Joint Compound	F Hallway							
-1B		Rm 31-B							
-1C		Rm A-2							
Gyp -2A	Gypsum Board New A Wing	Rm A-5							
-2B		A-13							
JC -2A	Joint Compound	A-5							
-2B		A-4							

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					X

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amerai Hunter	Samples Analyzed By:	EMILY MYCINT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9.21.26 9:00	Date & Time	09.23.26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924001~~ 190150511
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
CD - 1A	Glue Daub to White 1x1 CT	Rm D-4							
- 1B	(CD. Brown)	Rm B-2							
- 2A	(Tan)	Rm D-11 Restroom							
- 2B									
FT- 1A	Floor Tile + Mastic 12" Gray w/ Black	Rm D7							
- 1B		Rm D8							
- 1C		Rm B8							
- 1D		~~Bathroom~~ 9							
- 1E		Rm A-7C							
FT- 2A	Floor Tile + Mastic 12" Gray/Blue	Exit Vestibule D Wing							
2B									
FT- 3A	Floor Tile + Mastic under FT-2								
3B									

Comments:

Total No. of Samples: 18

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					X

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amrai Hunai	Samples Analyzed By:	EMILY MYATT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9-21-26 9:00	Date & Time	09-23-26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	170924001 190150511
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
TWB-1A	Tectum Wall Board	Small Gymnasium	↓						
↓ 1B	↓	↓	↓						
TSC-1A	Toilet/Sink Caulk	Bathroom 21		↓	↓				
↓ 1B	↓	Rm E-7		↓	↓				
FGPJ-1A	Fiberglass Pipewrap Jacket	Rm A-1	↓						
↓ -1B	↓	↓ A-4	↓						
↓ -1C	↓	↓ A-4	↓						
GBM-1A	Glazed Block Mortar	Shower Rm 31A	↓						
↓ 1B	↓	↓	↓						
CPL-1A	Ceiling Plaster Scratch Coat	Shower Rm 31A Corridor	↓						
↓ -1B	↓	↓	↓						
↓ -1C	↓	Bathroom 30C	↓						
PB-1A	Pressboard Wallboard	D Hallway	↓						
↓ -1B	↓	E Hallway	↓						

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					X

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amira Hundi	Samples Analyzed By:	
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9.21.26 9:00	Date & Time	
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924901~~ 190150511
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

	Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
84	PB - 1C	Pressboard Wallboard	B-Hallway	X						
85	MM - 1A	CMU Masonry Mortar	New D Section	↓						
86	↓ - 1B	↓	New B Section	↓						
87	LF - 1A	Linoleum Flooring Peel + Stick	K-2 Bathroom		↓	↓				
88	↓ 1B	↓	↓							
89	FM - 1A	Flooring Material 12" Beige + Mastic	Girls Bath outside Cafe							
90	↓ - 1B	↓	↓		↓	↓				
91	CT - 1A	Ceiling Tile 2'x2' Staple Fissure	DEF Corridor							
92	CT - 1B	↓	Rm 3 B							
93	CT - 2A	2'x4' L. Pinhole	DEF Corridor							
94	CT - 2B	↓	Rm A-1							
95	CT - 3A	1'x1' L. Pinhole	Rm D-2							
96	CT - 3B	↓	Rm A-3		↓	↓				

Comments:

Total No. of Samples: 13

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					X

Laboratory Instructions: Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.

Relinquished By:	Frank Acciarito	Samples Received By:	Amira Hunde	Samples Analyzed By:	EMILY MYINT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9-21-26 9:10	Date & Time	09-23-26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK0926354

Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924901~~ 190150571
		Project Manager:	Craig Napolitano
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500
		Sampled By:	FRANK J ACCIARITO
		License #:	NYS 26-6TS1N-SHAB, NYC 160689
		Sampling Date:	9/16/2026

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
CT-4A	Ceiling Tile 2'x4' Staple Fissure	Rm B-8							
-4B	↓	Rm A-14							
-5A	2'x4' Rough White	Boys Rm 17							
-5B	↓	Rm A-2							
-6A	2'x2' Smooth White	New A Hallway							
-6B	↓	Bathroom 9							
-7A	2'x4' Gypsum	Rm A-14							
-7B	↓	↓							
-8A	2'x4' Smooth Heavy	Nurse office							
-8B	↓	↓							

Comments:

Total No. of Samples: 10

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Amrai Hinds	Samples Analyzed By:	EMILY MYOTT
Signature		Signature		Signature	
Date & Time	9/17/2026	Date & Time	9_21_26 9:00	Date & Time	09.23.26 12:50
Company: LANGAN		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

Atlas Environmental Lab, Corp.
255 West 36th Street, Suite# 1503
New York, NY 10018
Phone:(212) 563-0400 Fax:(212) 563-0401
www.atlasenvironmentallab.com

Bulk Asbestos Report by PLM-TEM

Client: Langan
Collected by: Client
Project Name/No.: Somers - Primrose Elementary School / 190150511
Project Address: 110 Primrose Street, Lincolndale, NY 10540
Work Area:

Lab ID: BK1026439
Date Received: 10/26/2026
PLM Date Analyzed: 10/26/2026
TEM Date Analyzed: 10/26/2026
Report Date: 10/27/2026

Client ID#	Lab ID#	Description/ Location	Analyst Description	ORG %	AII %	ASI%	PLM			TEM	Method By ELAP		
							Fibrous%	Non Fibrous%	Asbestos% &Type	Asbestos% &Type	PLM 198.1	PLM NOB 198.6	TEM 198.4
ELC-1B	BK1026439-1	Exterior Louvre Caulk | Exterior Façade	Grey, Homogeneous, Non-Fibrous	77.8	18.5	3.7	0%	100%	**NAD** Inconclusive	**NAD**		**X**	**X**

AO

Quantitative Analysis (Semi/Full):Bulk Asbestos Analysis-PLM by EPA 600/M4-82-020 per 40 CFR or ELAP198.1 (friable) and 198.6 (NOB) samples for New York.

NAD=no asbestos detected, NA/PS=Not Analyzed/Positive Stop, Trace=<1%,FBGL=Fiberglass, CELL=Cellulose,CHRY=Chrysotile,Amo=Amosite,CRO=Crocidolite,ANTH=Anthophylite, TRE=Tremolite, ACT=Actinolite, NA=not applicable.

PLM is not consistently reliable in detecting Asbestos in floor coverings and similar non friable organically bound materials. NAD or Trace results by PLM are inconclusive.

TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos containing in NY State.

All samples were prepared and analyzed in accordance with the EPA "TEM Method for Identifying and Quantifying Asbestos in Non-Fibrous Organically Bound Bulk Samples" ELAP 198.4".

ORG%=Ashed Organic%, AII= Acid Insoluble Inorganic%, ASI= Acid Soluble Inorganic%. The measurement of uncertainty available upon request.

This "Summary of Analytical Results "shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, ELAP or any agency of the U.S Government. The results relate only to the items tested. This report may not be reproduced, except in full, without the written approval of AEL .Atlas Environmental lab did not collect the analyzed samples and thus accepts no liability with regard to their collection and/or maintenance . AEL relies on client's data. The liability of Atlas Environmental Lab corp with respect to the services charged, shall in no event exceed the amount of the invoice.

NYS-ELAP#11999, NVLAP Lab Code: 500092-0, CT Reg. ID: PH-0154

PLM Analyst: EM TEM Analyst: MB Approved by:

LANGAN

300 Kimball Drive
Parsippany, NJ 07054
Phone: 973-560-4900
Fax: 973-560-4901

CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

BK1026439

Project Name:	Somers - Primrose Elementary School		
Address:	110 Primrose Street Lincolndale, NY 10540	Auth. By:	Craig Napolitano
		Phone No:	646-210-6500
Langan Job No.:	190150511	Sampling Date:	10/22/2026
Sampled By/License #:	DREW CHESKIN 26-61X9V-SHAB / NYC119879		
	FRANK ACCIARITO / NYC160689/26-6TS1N-SHAB		

Sample ID Number	Description of Sample	Sample Location	Analysis Requested for Asbestos: PLM	PLM-NOB	TEM	Analysis Requested for Lead: AAS	TCLP	Analysis Requested for PCB: EPA Method 8082	Results
ELC-1B	Exterior Louvre Caulk	Exterior Façade		x	x				

EMILY MYINT Emyint 10.26.26 14:30

6 hours	12 hours	24 hours	48 hours	72 hours	5 days
		X			

Total No. of Samples: 1

Turnaround Request:

Laboratory Instructions: Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group.

Email Results to: dcheskin@langan.com, cnapolitano@langan.com, facciarito@langan.com, mbenson@langan.com

Relinquished By: Drew Cheskin	Date: 10/23/26	Time: Via Fedex	Received by: Amira Hindi	Date: 10/26/26	Time: 8:30
Relinquished By:	Date:	Time:	Received by:	Date:	Time:
Relinquished By:	Date:	Time:	Received by:	Date:	Time:

NOTES:

TCAL: MTaf 10.26.26

A P P E N D I X B

Laboratory Results and Chain-of-Custody Documentation (PCBs)

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13697

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: TSC-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/21/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	55		%	1	09/22/26	SC	30 - 150 %
% DCBP (Confirmation)	44		%	1	09/22/26	SC	30 - 150 %
% TCMX	54		%	1	09/22/26	SC	30 - 150 %
% TCMX (Confirmation)	48		%	1	09/22/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

PCB Comment:
Due to limited sample an elevated RL was reported.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13698

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: TSC-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	3700	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	60		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	32		%	1	09/24/26	SC	30 - 150 %
% TCMX	45		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	39		%	1	09/24/26	SC	30 - 150 %

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: TSC-1B

Phoenix I.D.: CX13698

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

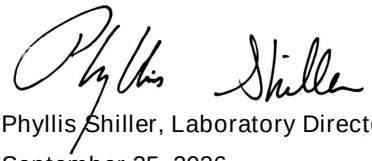
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13699

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: ELC-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/21/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	60		%	1	09/22/26	SC	30 - 150 %
% DCBP (Confirmation)	49		%	1	09/22/26	SC	30 - 150 %
% TCMX	58		%	1	09/22/26	SC	30 - 150 %
% TCMX (Confirmation)	51		%	1	09/22/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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PCB Comment:
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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13700

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: ELC-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/21/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/22/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	36		%	1	09/22/26	SC	30 - 150 %
% DCBP (Confirmation)	64		%	1	09/22/26	SC	30 - 150 %
% TCMX	43		%	1	09/22/26	SC	30 - 150 %
% TCMX (Confirmation)	50		%	1	09/22/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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If sample is a trip blank, dry weight is assumed.

PCB Comment:
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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13701

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: WFC-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	830	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	31		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	48		%	1	09/24/26	SC	30 - 150 %
% TCMX	39		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	44		%	1	09/24/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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September 25, 2026
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587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13702

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: WFC-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/21/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1221	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1232	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1242	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1248	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1254	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1260	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1262	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
PCB-1268	ND	860	ug/Kg	1	09/22/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	44		%	1	09/22/26	SC	30 - 150 %
% DCBP (Confirmation)	33		%	1	09/22/26	SC	30 - 150 %
% TCMX	39		%	1	09/22/26	SC	30 - 150 %
% TCMX (Confirmation)	40		%	1	09/22/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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If sample is a trip blank, dry weight is assumed.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13703

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: WFC-2A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1221	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1232	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1242	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1248	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1254	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1260	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1262	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1268	ND	760	ug/Kg	5	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	40		%	5	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	38		%	5	09/23/26	SC	30 - 150 %
% TCMX	36		%	5	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	40		%	5	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13704

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: WFC-2B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1221	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1232	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1242	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1248	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1254	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1260	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1262	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1268	ND	600	ug/Kg	2	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	56		%	2	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	56		%	2	09/23/26	SC	30 - 150 %
% TCMX	63		%	2	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	63		%	2	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13705

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	600	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	44		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	50		%	1	09/23/26	SC	30 - 150 %
% TCMX	54		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	48		%	1	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
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Comments:

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Phyllis Shiller, Laboratory Director
September 25, 2026
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587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
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NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13706

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1221	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1232	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1242	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1248	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1254	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1260	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1262	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1268	ND	780	ug/Kg	2	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	63		%	2	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	60		%	2	09/23/26	SC	30 - 150 %
% TCMX	81		%	2	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	67		%	2	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

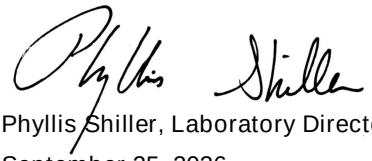
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BRL=Below Reporting Level L=Biased Low
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New York, NY 10001

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Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13707

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-2A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	1500	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	45		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	56		%	1	09/23/26	SC	30 - 150 %
% TCMX	53		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	56		%	1	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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BRL=Below Reporting Level L=Biased Low
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NY # 11301

Analysis Report

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FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13708

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-2B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	1900	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	45		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	56		%	1	09/23/26	SC	30 - 150 %
% TCMX	54		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	58		%	1	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

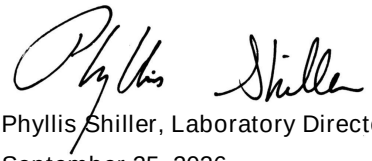
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Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13709

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-3A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1221	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1232	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1242	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1248	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1254	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1260	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1262	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
PCB-1268	ND	780	ug/Kg	5	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	65		%	5	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	58		%	5	09/24/26	SC	30 - 150 %
% TCMX	66		%	5	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	68		%	5	09/24/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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New York, NY 10001

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Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13710

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-3B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1221	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1232	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1242	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1248	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1254	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1260	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1262	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1268	ND	680	ug/Kg	2	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	50		%	2	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	49		%	2	09/23/26	SC	30 - 150 %
% TCMX	65		%	2	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	53		%	2	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

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Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13711

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-4A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1221	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1232	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1242	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1248	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1254	1600	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1260	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1262	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1268	ND	740	ug/Kg	5	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	57		%	5	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	52		%	5	09/23/26	SC	30 - 150 %
% TCMX	47		%	5	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	52		%	5	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
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P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13712

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-4B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1221	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1232	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1242	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1248	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1254	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1260	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1262	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1268	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	74		%	5	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	70		%	5	09/23/26	SC	30 - 150 %
% TCMX	64		%	5	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	70		%	5	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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NY # 11301

Analysis Report

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Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13713

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-5A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1221	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1232	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1242	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1248	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1254	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1260	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1262	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
PCB-1268	ND	770	ug/Kg	2	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	61		%	2	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	64		%	2	09/23/26	SC	30 - 150 %
% TCMX	67		%	2	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	65		%	2	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13714

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EJC-5B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1221	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1232	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1242	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1248	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1254	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1260	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1262	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1268	ND	830	ug/Kg	5	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	53		%	5	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	52		%	5	09/23/26	SC	30 - 150 %
% TCMX	47		%	5	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	52		%	5	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13715

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EWG-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	780	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	42		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	48		%	1	09/23/26	SC	30 - 150 %
% TCMX	46		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	47		%	1	09/23/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13716

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EWG-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	680	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	49		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	59		%	1	09/23/26	SC	30 - 150 %
% TCMX	56		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	56		%	1	09/23/26	SC	30 - 150 %

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: EWG-1B

Phoenix I.D.: CX13716

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

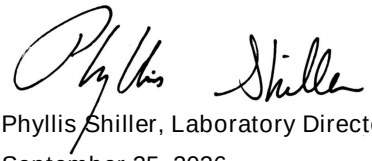
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13717

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1221	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1232	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1242	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1248	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1254	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1260	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1262	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
PCB-1268	ND	910	ug/Kg	5	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	32		%	5	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	32		%	5	09/23/26	SC	30 - 150 %
% TCMX	30		%	5	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	33		%	5	09/23/26	SC	30 - 150 %

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-1A

Phoenix I.D.: CX13717

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

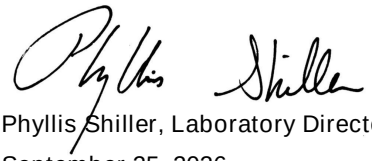
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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If sample is a trip blank, dry weight is assumed.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13718

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/22/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1221	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1232	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1242	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1248	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1254	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1260	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1262	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
PCB-1268	ND	810	ug/Kg	1	09/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	47		%	1	09/23/26	SC	30 - 150 %
% DCBP (Confirmation)	56		%	1	09/23/26	SC	30 - 150 %
% TCMX	56		%	1	09/23/26	SC	30 - 150 %
% TCMX (Confirmation)	58		%	1	09/23/26	SC	30 - 150 %

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-1B

Phoenix I.D.: CX13718

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

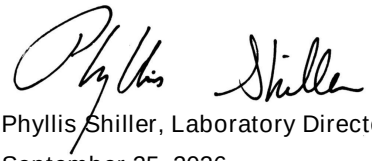
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

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Phyllis Shiller, Laboratory Director
September 25, 2026
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587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13719

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-2A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	980	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	70		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	38		%	1	09/24/26	SC	30 - 150 %
% TCMX	53		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	45		%	1	09/24/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13720

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-2B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	67		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	39		%	1	09/24/26	SC	30 - 150 %
% TCMX	52		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	46		%	1	09/24/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

PCB Comment:
Due to limited sample an elevated RL was reported.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

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587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13721

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-3A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	680	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	68		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	38		%	1	09/24/26	SC	30 - 150 %
% TCMX	52		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	46		%	1	09/24/26	SC	30 - 150 %

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-3A

Phoenix I.D.: CX13721

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

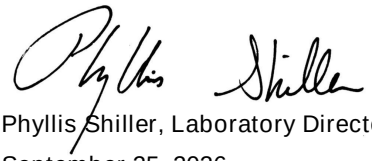
RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

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If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.



Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13722

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPC-3B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	70		%	1	09/25/26	SC	30 - 150 %
% DCBP (Confirmation)	38		%	1	09/25/26	SC	30 - 150 %
% TCMX	53		%	1	09/25/26	SC	30 - 150 %
% TCMX (Confirmation)	45		%	1	09/25/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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BRL=Below Reporting Level L=Biased Low
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Comments:

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If sample is a trip blank, dry weight is assumed.

PCB Comment:
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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

NY # 11301

Analysis Report

September 25, 2026

FOR: Attn: Darshan Desai
Langan Engineering
21 Penn Plaza, 360 West 31st St., 8th Fl
New York, NY 10001

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13723

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPCR-1A

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/25/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	68		%	1	09/25/26	SC	30 - 150 %
% DCBP (Confirmation)	37		%	1	09/25/26	SC	30 - 150 %
% TCMX	53		%	1	09/25/26	SC	30 - 150 %
% TCMX (Confirmation)	45		%	1	09/25/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
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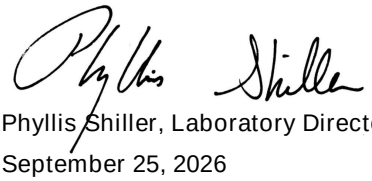
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NY # 11301

Analysis Report

September 25, 2026

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Langan Engineering
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Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:	FA	09/16/26	
Location Code:	LANGANNY	Received by:	SR1	09/21/26	11:28
Rush Request:	5 Day	Analyzed by:	see "By" below		
P.O.#:					

Laboratory Data

SDG ID: GCX13697
Phoenix ID: CX13724

Project ID: 190150511 PRIMROSE ELEMENTARY
Client ID: MPCR-1B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				09/23/26	R/NG	SW3545A
Polychlorinated Biphenyls							
PCB-1016	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	1	09/24/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	55		%	1	09/24/26	SC	30 - 150 %
% DCBP (Confirmation)	35		%	1	09/24/26	SC	30 - 150 %
% TCMX	44		%	1	09/24/26	SC	30 - 150 %
% TCMX (Confirmation)	41		%	1	09/24/26	SC	30 - 150 %

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

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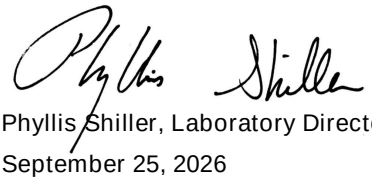
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Phyllis Shiller, Laboratory Director
September 25, 2026
Official Report Release To Follow

Sample Criteria Exceedances Report

GCX13697 - LANGANNY

Criteria: None

State: NY

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CX13698	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	3700	1000	1000	1000	ug/Kg
CX13707	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1500	1000	1000	1000	ug/Kg
CX13708	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1900	1000	1000	1000	ug/Kg
CX13711	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1600	740	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

20.8a nowcip

				Analysis Requested for Asbestos			Analysis Requested for Lead		Analysis Requested for PCB	
Project Name:	Primrose Elementary	**Langan Job No.:**	~~170924304~~ 190450511							
		Project Manager:	Craig Napolitano							
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500							
		Sampled By:	FRANK J ACCIARITO							
		License #:	NYS 26-6TS1N-SHAB, NYC 160689	PLM	PLM-NOB	TEM	AAS	TCLP	EPA Method 8082	Results
		Sampling Date:	9/16/2026							
Sample ID Number	**Description of Sample**		**Sample Location**							
TSC - 1A	Toilet/Sink Caulk		Rm 21							13697
↓ -1B	↓		Rm E-7							13698
ELC - 1A	Exterior Louvre Caulk		Exterior Facade							13699
↓ -1B	↓		↓							13700
WFC - 1A	Window Frame Caulk Top Black		Original Bldg Exterior							13701
- 1B		↓								13702
- 2A		Bottom White								13703
↓ - 2B	↓	↓	↓							13704
EJC - 1A	Expansion Joint Caulk	Type 1	Exterior Facade							13705
EJC - 1B		↓	↓							13706
- 2A		Type 2	Exterior K Wing							13707
- 2B		↓	↓							13708
- 3A		Type 3	Exterior Facade							13709
↓ - 3B	↓	↓	↓						↓	13710

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Fedex	Samples Analyzed By:	
Signature		Signature	Courtesy 9/21/26	Signature	
Date & Time	9/17/2026	Date & Time	1128	Date & Time	
Company: **LANGAN**		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

LANGAN

21 Penn Plaza, 360 West 31st St., 8th Floor, New York, NY 10001
Phone: 212-479-5400 Fax: 212-479-5444

BULK SAMPLE
CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

2018 NOCP

				Analysis Requested for Asbestos			Analysis Requested for Lead		Analysis Requested for PCB	
Project Name:	Primrose Elementary	**Langan Job No.:**	~~170824901~~ 190150511							
		Project Manager:	Craig Napolitano							
Address:	110 Primrose St, Lincolndale, NY 10540	**Phone No:**	646-210-6500							
		Sampled By:	FRANK J ACCIARITO							
		License #:	NYS 26-6TS1N-SHAB, NYC 160689	PLM	PLM-NOB	TEM	AAS	TCLP	EPA Method 8082	Results
		Sampling Date:	9/16/2026							
Sample ID Number	**Description of Sample**		**Sample Location**							
EJC - 4A	Expansion Joint Caulk Type 4		Exterior Gym							13711
- 4B										13712
- 5A	Type 5		Exterior Small Gym							13713
- 5B										13714
EWG - 1A	Exterior Window Glazing		New A Wing							13715
1B										13716
MPC - 1A	Metal Panel Caulk Black on Black bottom		Exterior Facade							13717
- 1B	Black on black Frame									13718
- 2A										13719
- 2B	Black on White panel to frame									13720
- 3A										13721
- 3B										13722
MPCR - 1A	Metal Panel Repair Caulk									13723
1B										13724

Comments:

Total No. of Samples: 14

Requested TAT:

6 hr	12 hr	24 hr	48 hr	72 hr	5 days
					x

Laboratory Instructions: **Stop analysis @ 1st positive (>1% by weight) for each homogenous sample group. Please analyze first floor tile mastic. If floor tile mastic is positive (>1%) do not analyze the associated floor tile sample.**

Relinquished By:	Frank Acciarito	Samples Received By:	Fedex	Samples Analyzed By:	
Signature		Signature	Emily S 9/21/26 1128	Signature	
Date & Time	9/17/2026	Date & Time		Date & Time	
Company: **LANGAN**		Company:			

Email results to: dcheskin@langan.com,facciarito@langan.com

A P P E N D I X C

Langan's Certifications and Laboratory Accreditations

NEW YORK STATE | Department of Labor

WORKING FOR YOU

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
300 Kimball Drive, 4th Floor, Parsippany, NJ 07054

License Number: 70336
License Class: RESTRICTED
Date of Issue: 03/18/2026
Expiration Date: 03/31/2027
Duly Authorized Representative: Craig Napolitano

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Vicki Mockler, Director
For the Commissioner of Labor

United States Environmental Protection Agency

This is to certify that

Langan Engineering, Environmental, Surveying,
Landscape Architecture & Geology D.P.C.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires July 15, 2027

LBP-2233-3
Certification #

July 01, 2024
Issued On

Marc Edmonds, Chief
Risk Assessment Management Branch 2.

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



MICHAEL BENSON SR
CLASS(EXPIRES)
C ATEC (12/26) D INSP (12/26)
I PD (12/26) H PM (12/26)

CERT# 26-610UA-SHAB
DMV# 987083458

MUST BE CARRIED ON ASBESTOS PROJECTS

United States Environmental Protection Agency

This is to certify that



Michael R Benson

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires July 04, 2029

LBP-R-I337069-1

Certification #

June 20, 2026

Issued On

Ben Conetta, Manager

Chemicals and Multimedia Programs Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR

ASBESTOS CERTIFICATE

N.Y.S



FRANK J ACCIARITO

CLASS(EXPIRES)

C ATEC (07/27) H PM (07/27)

D INSP (07/27)

CERT# 26-6TS1N-SHAB

DMV# 600811398

MUST BE CARRIED ON ASBESTOS PROJECTS

United States Environmental Protection Agency

This is to certify that



Frank J Acciarito

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires April 24, 2027

LBP-R-I220104-2

Certification #

April 05, 2024

Issued On

Ben Conetta, Manager

Chemicals and Multimedia Programs Branch

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2027
Issued April 01, 2026

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. JACKIE DARVISH
ATLAS ENVIRONMENTAL LABS CORP
255 W 36TH STREET SUITE 1503
NEW YORK, NY 10018

NY Lab Id No: 11999

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Mate	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	EPA 7000B

Sample Preparation Methods

EPA 3050B

Serial No.: 72361

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2027
Issued April 01, 2026

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. JACKIE DARVISH
ATLAS ENVIRONMENTAL LABS CORP
255 W 36TH STREET SUITE 1503
NEW YORK, NY 10018

NY Lab Id No: 11999

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved subcategories and/or analytes are listed below:

Metals I

Lead, Total	NIOSH 7082

Miscellaneous

Asbestos	40 CFR 763 APX A No. III
	NIOSH 7402
Fibers	NIOSH 7400 A RULES

Serial No.: 72362

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online.

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 500092-0

Atlas Environmental Lab (Asbestos in Bulk)

New York, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2025-10-01 through 2026-09-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Atlas Environmental Lab (Asbestos in Bulk)
255 W 36th Street Suite #1503
New York, NY 10018
Ms. Jackie Darvish
Phone: 212-563-0400 Fax: 212-563-0401
Email: jdarvish@atlasenvironmentallab.com
http://www.atlasenvironmentallab.com

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 500092-0**

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Effective 2025-10-01 through 2026-09-30

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 500092-0

Atlas Environmental Lab (Asbestos in Bulk)

New York, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2026-10-01 through 2027-09-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2027
Issued April 01, 2026

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Petroleum Hydrocarbons	
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 625.1
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A

Serial No.: 72070

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
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All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1254 (PCB-1254)	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A

Serial No.: 72070

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A P P E N D I X D

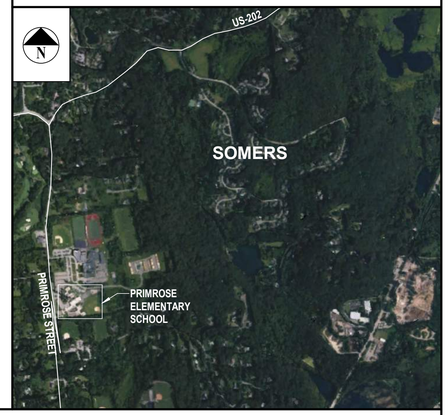
File Search/Archive Materials (available upon request)
Scope of Work Drawings

SOMERS CENTRAL SCHOOL DISTRICT
VARIOUS UPGRADES
AT PRIMROSE ELEMENTARY SCHOOL

CONTRACT G - GENERAL CONSTRUCTION
CONTRACT C - CIVIL CONSTRUCTION
CONTRACT P - PLUMBING CONSTRUCTION
CONTRACT M - MECHANICAL CONSTRUCTION
CONTRACT E - ELECTRICAL CONSTRUCTION
CONTRACT W - WATER CONSTRUCTION

110 PRIMROSE STREET
LINCOLNDALE, NY 10540
SED #: 66-21-01-06-0-002-017

LOCATION MAP



H 2 M architects + engineers
1133 Westchester Avenue, Suite N-210
White Plains, NY 10605
914.358.5623 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0016178

CONSULTANTS:

MARK	DATE	DESCRIPTION

SYMBOLS LEGEND

BRICK
BATT INSULATION
ROOM NAME / ROOM / 000 / ± S.F. / ROOM NUMBER / AREA — ROOM NUMBER DESIGNATION TAG
WINDOW ELEVATION KEY
WALL TYPE
ACOUSTIC TILE / CERAMIC TILE
RIGID INSULATION
1 Title SCALE: 1/8" = 1'-0" — DRAWING TITLE
COLUMN GRID
CONCRETE
GYPSUM BOARD
XX — REVISION TAG
DOOR NUMBER
CONCRETE BLOCK
PLYWOOD
12'-0" — PRIMARY CEILING HEIGHT TAG
10'-8" AFF — SECONDARY CEILING HEIGHT TAG
EARTH
WOOD BLOCKING
1 / A 101 — EXTERIOR ELEVATION
A / A 101 / A — INTERIOR ELEVATION
STEEL
WOOD
1 / A 101 — SECTION CUT
Ref 1 / FAD 100 — DETAIL KEY

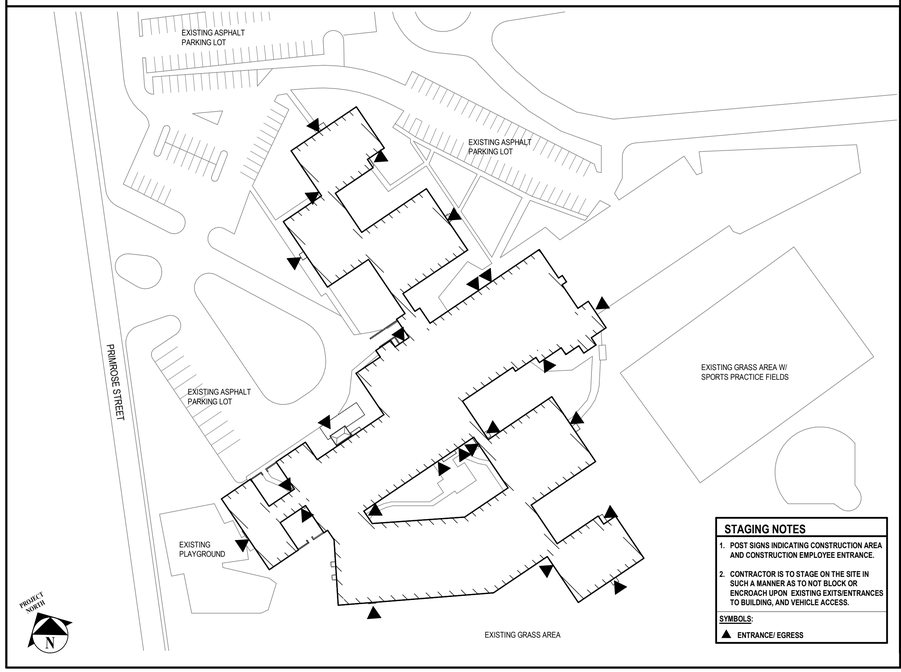
ABBREVIATIONS

AB	ANCHOR BOLT	DS	DOWN SPOUT	MR	MOISTURE RESISTANT
A/C	AIR CONDITIONING	DW	DISHWASHER	NIC	NOT IN CONTRACT
ACI	AMERICAN CONCRETE INSTITUTE	DWG	DRAWING	NTS	NOT TO SCALE
ACT	ACOUSTICAL CEILING TILE	EA	EACH	OC	ON CENTER
ACU	AIR CONDITIONING UNIT	EL	ELEVATION	OD	OUTSIDE DIAMETER
ADJ	ADJUSTABLE	ELEC	ELECTRIC/ELECTRICAL	PLYWD	PLYWOOD
A/E	ARCHITECT/ENGINEER	ELEV	ELEVATOR	PSF	POUNDS PER SQUARE FOOT
AFF	ABOVE FINISH FLOOR	EP	ELECTRICAL PANEL	PSI	POUNDS PER SQUARE INCH
ALUM	ALUMINUM	EPY	EPOXY COATING	PTD	PAINTED
ANCH	ANCHOR	EQ	EQUAL	PVC	POLYVINYL CHLORIDE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	EQUIP	EQUIPMENT	R	RADIUS OR RISER
APA	ACCESS PANEL	EXIST	EXISTING	RCP	REFLECTED CEILING PLAN
APPROX	APPROXIMATELY	EXST	EXHAUST	RD	ROOF DRAIN
ASPH	ASPHALT	FAI	FRESH AIR INTAKE	REINF	REINFORCED
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS	F.A.S.	FALL ARREST SYSTEM	RM	ROOM
AWS	AMERICAN WELDING SOCIETY	F.C.	FIRE CODE	RO	ROUGH OPENING
B	FIRE BLANKET	FD	FLOOR DRAIN	SIM	SIMILAR
BAL	BALANCE	FIN	FINISH	SPEC	SPECIFICATIONS
BB	BULLETIN BOARD	FR	FIRE RATED	SQ	SQUARE
BD	BOARD	FTG	FOOTING	SS	STAINLESS STEEL
BLDG	BUILDING	GA	GAUGE	STL	STEEL
BLK	BLOCK	GWB	GYPSUM WALL BOARD	TEMP	TEMPERATURE
BLKG	BLOCKING	GYP	GYPSUM	TER	TERRAZZO
BM	BEAM	FYP. BD.	GYPSUM BOARD	THK	THICK
B.O.	BOTTOM OF	HC	HANDICAPPED	T.O.	TOP OF
BOL	BOTTOM OF LINTEL	HM	HOLLOW METAL	TYP	TYPICAL
BOT	BOTTOM	HOR	HORIZONTAL	UTIL	UTILITY
CEIL	CEILING	HW	HOT WATER	VB	VAPOR BARRIER
CEM	CEMENT	INSUL	INSULATION/INSULATING	VCT	VINYL COMPOSITION TILE
CER	CERAMIC	INT	INTERIOR	VTR	VENT THRU ROOF
CLO	CLOSET	LAV	LAVATORY	WC	WATER CLOSET
CMU	CONCRETE MASONRY UNIT	LDR	LEADER	WH	WATER HEATER
COL	COLUMN	LT	LIGHT	WWF	WELDED WIRE FABRIC
CONC	CONCRETE	MAX	MAXIMUM		
CONST	CONSTRUCTION	MECH	MECHANICAL		
CONT	CONTINUOUS	MFR	MANUFACTURER		
CORR	CORRIDOR	MISC	MISCELLANEOUS		
CPT	CARPET	MO	MASONRY OPENING		

GENERAL NOTES

1. ALL WORK SHALL COMPLY WITH THE NEW YORK STATE FIRE PREVENTION AND BUILDING CODE AS WELL AS THE NEW YORK STATE EDUCATION DEPARTMENT MANUAL OF PLANNING STANDARDS.
2. ALL NOTES APPEARING HEREIN, WITH THOSE ON VARIOUS DRAWINGS SHALL APPLY TO ALL DRAWINGS AND FORM PART OF THE CONTRACT DOCUMENTS.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY ALL DIMENSIONS, SQUARE FOOTAGES, LOCATIONS AND QUANTITIES OF ALL ITEMS AND/OR SPACES WHETHER INDICATED IN THE DRAWINGS OR NOT.
4. DO NOT SCALE MEASURE ANY DRAWING. VERIFY THE FIGURES, DIMENSIONS AND DESIGN INTENTION SHOWN ON THE DRAWINGS BEFORE BEGINNING LAYOUT OF THE WORK AND REPORT ANY ERRORS, INACCURACIES, OR CONFLICTS TO THE ARCHITECT/ENGINEER IN WRITING BEFORE BEGINNING ANY WORK.
5. ALL WORK SHALL COMPLY WITH ALL APPLICABLE CODES, LAWS AND STATUTES AS REQUIRED. STRICTLY ADHERE TO MANUFACTURER'S PRINTED INSTRUCTIONS.
6. VERIFY EXACT LAYOUT COMPATIBILITY WITH ALL EXISTING CONDITIONS BEFORE BEGINNING WORK.
7. DISTURB ONLY THOSE AREAS OF THE SITE AFFECTED BY RENOVATION, UNLESS NOTED OTHERWISE. PROTECT ALL OTHER AREAS. CONTRACTORS SHALL BE RESPONSIBLE FOR ALL PATCH AND REPAIR OF EXISTING FINISHES WHICH ARE DAMAGED DURING CONSTRUCTION.
8. EACH CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF ANSI ICC A117.1 AND PROVIDE WHERE APPLICABLE ADA COMPLIANT BUILDING COMPONENTS.
9. THE OWNER RESERVES THE RIGHT AT ALL TIMES TO DELIVER, PLACE AND INSTALL EQUIPMENT AND FURNISHINGS AS THE WORK PROGRESSES SO LONG AS THERE IS NOT A CONFLICT WITH THE CONTRACTORS.
10. THE CONTRACTOR SHALL MAINTAIN, AT THE SITE, ONE RECORD COPY OF ALL DRAWINGS, SPECIFICATIONS AND APPROVED SHOP DRAWINGS AND APPROVED SAMPLES MARKED CURRENTLY TO RECORD ALL CHANGES DURING CONSTRUCTION.
11. ANY CHANGES TO THE SCOPE OF WORK OR IN THE CONSTRUCTION DETAILS, WHETHER DUE TO FIELD CONDITIONS OR OMISSION SHALL BE DOCUMENTED BY THE ARCHITECT PRIOR TO EXECUTION. ANY INCREASE OR DECREASE IN THE CONTRACT PRICE MUST BE APPROVED IN WRITING PRIOR TO EXECUTION.
12. THE CONTRACTOR BY PRESENTING THEIR BID FOR THE WORK, REPRESENTS THAT THEY HAVE INSPECTED THE SITE AND IS COMPLETELY FAMILIAR WITH THE SCOPE OF WORK AND ALL FIELD CONDITIONS RELATED TO, AND AFFECTING THE WORK AND ITS PERFORMANCE. EXCEPTIONS AFFECTING THE WORK AND ITS PERFORMANCE, OR CONFLICTS BETWEEN FIELD CONDITIONS, SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT / ENGINEER PRIOR TO THE SUBMISSION OF BIDS. FAILURE TO DO SO WILL NOT RESULT IN A CHANGE TO THE CONTRACT PRICE IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO PROVIDE ALL NECESSARY ACCOMMODATIONS TO COMPLETE THE SCOPE OF WORK.
13. CONTRACTORS SHALL POST A COPY OF THE PERMIT ISSUED BY THE N.Y.S. EDUCATION DEPARTMENT DURING THE ENTIRE DURATION OF PROJECT.
14. FOLLOW MANUFACTURER RECOMMENDATIONS FOR ALL HARDWARE AND FASTENERS INTO TREATED WOODS AND METALS.

STAGING PLAN (N.T.S.)



STAGING NOTES

1. POST SIGNS INDICATING CONSTRUCTION AREA AND CONSTRUCTION EMPLOYEE ENTRANCE.
2. CONTRACTOR IS TO STAGE ON THE SITE IN SUCH A MANNER AS TO NOT BLOCK OR ENCROACH UPON EXISTING EXITS/ENTRANCES TO BUILDING, AND VEHICLE ACCESS.

SYMBOLS:
▲ ENTRANCE/ EGRESS

DRAWING LIST

1) GENERAL		
PE-G 000	COVER SHEET AND GENERAL NOTES	
PE-G 100	EXISTING FIRST FLOOR PLAN - PART 'A'	
PE-G 101	CODE COMPLIANCE INFORMATION, EXISTING FIRST FLOOR PLAN - PART 'B'	
2) CIVIL		
PE-CD 100	EXISTING CONDITIONS & DEMOLITION PLAN	
PE-CS 100	DIMENSIONAL SITE PLAN	
PE-C 100	GRADING & DRAINAGE PLAN	
PE-C 500	SITE DETAILS	
3) STRUCTURAL		
PE-S 001	GENERAL NOTES	
PE-S 002	SPECIAL INSPECTIONS	
PE-S 100	TANK REMOVAL PARTIAL PLANS	
PE-S 300	SECTIONS AND DETAILS	
4) ARCHITECTURE		
PE-AD 100	FIRST FLOOR PLAN - PART 'A'	
PE-AD 101	FIRST FLOOR PLAN - PART 'B'	
PE-AD 430	RESTROOM UPGRADES DEMOLITION PLANS	
PE-A 100	FIRST FLOOR PLAN - PART 'A'	
PE-A 101	FIRST FLOOR PLAN - PART 'B'	
PE-A 200	EXTERIOR BUILDING ELEVATIONS	
PE-A 201	EXTERIOR BUILDING ELEVATIONS	
PE-A 202	EXTERIOR BUILDING ELEVATIONS	
PE-A 203	EXTERIOR BUILDING ELEVATIONS	
PE-A 204	EXTERIOR BUILDING ELEVATIONS	
PE-A 205	EXTERIOR BUILDING ELEVATIONS	
PE-A 206	EXTERIOR BUILDING ELEVATIONS	
PE-A 207	EXTERIOR BUILDING ELEVATIONS	
PE-A 400	ENLARGED CORRIDOR PLANS	
PE-A 430	RESTROOM UPGRADES PROPOSED PLANS	
PE-A 431	RESTROOM UPGRADES DETAILS, DOOR AND FINISH SCHEDULES	
PE-A 450	ENLARGED CANOPY PLANS	
PE-A 451	ENLARGED CANOPY SECTIONS AND DETAILS	
PE-A 500	ARCHITECTURAL DETAILS	
PE-A 610	WINDOW SCHEDULE	
PE-A 620	DOOR SCHEDULE	
5) MECHANICAL		
PE-M 001	GENERAL NOTES, LEGENDS, AND ABBREVIATIONS	
PE-MD 110	FIRST FLOOR DEMOLITION PLAN - PART 'A-M1' & PART 'A-M2'	
PE-MD 111	FIRST FLOOR DEMOLITION PLAN - PART 'A-M3'	
PE-MD 112	FIRST FLOOR DEMOLITION PLAN - PART 'A-M4' & PART 'A-'M5'	
PE-MD 113	FIRST FLOOR DEMOLITION PLAN - PART 'B-M1'	
PE-MD 114	FIRST FLOOR DEMOLITION PLAN - PART 'B-M2'	
PE-MD 115	FIRST FLOOR & PARTIAL ROOF DEMOLITION PLAN	
PE-MD 116	ROOF DEMOLITION PLAN - PART 'A'	
PE-MD 117	ROOF DEMOLITION PLAN - PART 'B'	
PE-M 110	FIRST FLOOR NEW WORK PLAN - PART 'A-M1' & PART 'A-M2'	
PE-M 111	FIRST FLOOR NEW WORK PLAN - PART 'A-M3'	
PE-M 112	FIRST FLOOR NEW WORK PLAN - PART 'A-M4' & PART 'A-'M5'	
PE-M 113	FIRST FLOOR NEW WORK PLAN - PART 'B-M1'	
PE-M 114	FIRST FLOOR NEW WORK PLAN - PART 'B-M2'	
PE-M 115	FIRST FLOOR & PARTIAL ROOF NEW WORK PLAN	
PE-M 116	ROOF NEW WORK PLAN - PART 'A'	
PE-M 117	ROOF NEW WORK PLAN - PART 'B'	
PE-M 500	DETAILS	
PE-M 501	DETAILS	
PE-M 600	SCHEDULES	
PE-M 601	SCHEDULES	
PE-M 650	CONTROL DIAGRAMS	
6) ELECTRICAL		
PE-E 001	LEGENDS	
PE-ED 100	FIRST FLOOR DEMOLITION PLAN - PART 'A'	
PE-ED 101	FIRST FLOOR & BASEMENT DEMOLITION PLAN - PART 'B'	
PE-ED 102	ROOF DEMOLITION PLAN - PART 'A'	
PE-ED 103	ROOF DEMOLITION PLAN - PART 'B'	
PE-ED 104	CHEMICAL STORAGE DEMOLITION PLANS	
PE-E 100	FIRST FLOOR NEW WORK PLAN - PART 'A'	
PE-E 101	FIRST FLOOR & BASEMENT NEW WORK PLAN - PART 'B'	
PE-E 102	ROOF NEW WORK PLAN - PART 'A'	
PE-E 103	ROOF NEW WORK PLAN - PART 'B'	
PE-E 104	CHEMICAL STORAGE NEW WORK PLANS	
PE-E 400	ENLARGED CANOPY PLANS	
PE-E 500	DETAILS	
PE-E 600	SCHEDULES	
PE-FAD 100	FIRST FLOOR FIRE ALARM DEMOLITION PLAN - PART 'A'	
PE-FAD 101	FIRST FLOOR & BASEMENT FIRE ALARM DEMOLITION PLAN - PART 'B'	
PE-FA 001	FIRE ALARM LEGEND	
PE-FA 100	FIRST FLOOR FIRE ALARM NEW WORK PLAN - PART 'A'	
PE-FA 101	FIRST FLOOR & BASEMENT FIRE ALARM NEW WORK PLAN - PART 'B'	
PE-FA 500	FIRE ALARM RISER AND NOTES	
7) WATER		
PE-G 020	PROCESS DIAGRAM LEGENDS	
PE-G 021	PROCESS DIAGRAM	
PE-DD 100	EXISTING AND PROCESS REMOVALS SITE PLAN	
PE-DS 100	PROCESS PIPING SITE PLAN	
PE-D 001	PROCESS NOTES AND LEGENDS	
PE-DD 110	PIPING DEMOLITION FLOOR PLAN	
PE-D 110	PIPING FLOOR PLAN	
PE-D 500	DETAILS	
PE-D 501	DETAILS	

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183
Exp. Date

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

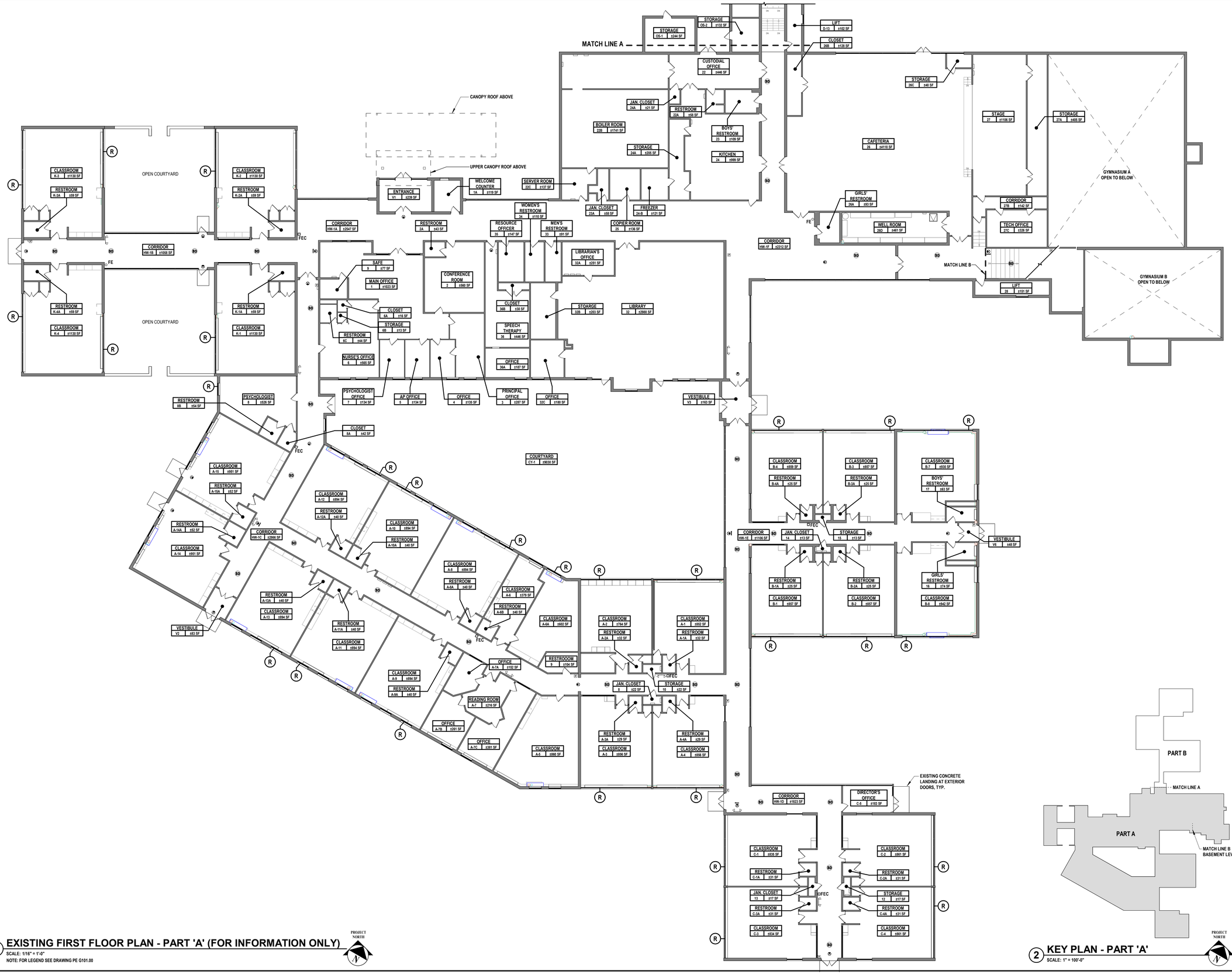
CONTRACT
ALL CONTRACTS

STATUS
SED SUBMISSION

SHEET TITLE
COVER SHEET AND GENERAL NOTES

DRAWING No.
PE-G 000.00

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1 EXISTING FIRST FLOOR PLAN - PART 'A' (FOR INFORMATION ONLY)

SCALE: 1/16" = 1'-0"

NOTE: FOR LEGEND SEE DRAWING PE G101.00

2 KEY PLAN - PART 'A'

SCALE: 1" = 100'-0"

H2M architects + engineers

1133 Westchester Avenue, Suite N-210
White Plains, NY 10605
914.358.5623 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029

KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183 Exp. Date

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SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

ALL CONTRACTS

STATUS

SED SUBMISSION

SHEET TITLE

EXISTING FIRST FLOOR PLAN - PART 'A' (FOR INFORMATION ONLY)

DRAWING No.

PE-G 100.00

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LEGEND

ROOM NAME / ROOM / 000 ± S.F. / ROOM NUMBER / AREA	ROOM NUMBER DESIGNATION TAG
FE / FEC	EXISTING FIRE EXTINGUISHER
F	EXISTING PULL STATION
ST	EXISTING FIRE ALARM STROBE
H	EXISTING HORN / STROBE COMBO
H	EXISTING FIRE ALARM HORN
B	EXISTING FIRE ALARM BELL
AED	EXISTING AUTOMATED EXTERNAL DEFIBRILLATOR
SD	EXISTING SMOKE DETECTOR
	EXISTING EXIT SIGN
EL	EXISTING EMERGENCY LIGHTING
EX / EL	EXISTING EXIT SIGN AND EMERGENCY LIGHTING
R	INDICATES EXISTING WINDOW LOCATIONS

BUILDING CODE OF NEW YORK STATE

(EXISTING BUILDING CODE OF NYS)

	EXISTING	ALLOWED	PROPOSED
BUILDING OCCUPANCY	EDUCATIONAL (GROUP E)	EDUCATIONAL (GROUP E)	NO CHANGE
CONSTRUCTION CLASSIFICATION	IIB	IIB	NO CHANGE
HEIGHT (STORIES)	1	2	NO CHANGE
HEIGHT (FEET)	17'-8"	55	NO CHANGE

APPLICABLE BUILDING CODES

- NEW YORK STATE EDUCATION DEPARTMENT MANUAL OF PLANNING STANDARDS 2022
- 2025 BUILDING CODE OF NEW YORK STATE
- 2025 EXISTING BUILDING CODE OF NEW YORK STATE
- 2025 FIRE CODE OF NEW YORK STATE
- 2025 MECHANICAL CODE OF NEW YORK STATE
- 2025 PLUMBING CODE OF NEW YORK STATE
- 2025 FUEL GAS CODE OF NEW YORK STATE
- NFPA 70 - NATIONAL ELECTRICAL CODE - 2023 EDITION
- ACCESSIBLE BUILDINGS ICC/ANSI A117.1- 2017 EDITION
- AMERICANS WITH DISABILITIES ACT

2025 EXISTING BUILDING CODE OF NEW YORK STATE COMPLIANCE & PROJECT SCOPE

ALTERATION - LEVEL 1

EBCNYS CHAPTER 6 - CLASSIFICATION OF WORK

SECTION 602- ALTERATION - LEVEL 1

602.1 SCOPE: LEVEL 1 ALTERATIONS INCLUDE THE REMOVAL AND REPLACEMENT OR THE COVERING OF EXISTING MATERIALS ELEMENTS, EQUIPMENT, OR FIXTURES USING NEW MATERIALS, ELEMENTS EQUIPMENT, OR FIXTURES THAT SERVE THE SAME PURPOSE.

602.2 APPLICATION: LEVEL 1 ALTERATIONS SHALL COMPLY WITH THE PROVISIONS OF CHAPTER 7.

EBCNYS CHAPTER 7 - ALTERATIONS - LEVEL 1

SECTION 701 - GENERAL

701.1 SCOPE: LEVEL 1 ALTERATIONS AS DESCRIBED IN SECTION 602 SHALL COMPLY WITH THE REQUIREMENTS OF THIS CHAPTER. LEVEL 1 ALTERATIONS TO HISTORIC BUILDINGS SHALL COMPLY WITH THIS CHAPTER, EXCEPT AS MODIFIED IN CHAPTER 12.

ALTERATION WORK AT THIS BUILDING CONSISTS OF THE FOLLOWING:

INTERIOR

1. REMOVAL AND REPLACEMENT OF ELECTRICAL PANEL BOARDS.
2. RESTROOM PLUMBING FIXTURE AND FINISHES REPLACEMENTS.
3. REPLACEMENT OF FLOORING THROUGHOUT.
4. REPLACEMENT OF MAIN OFFICE SUITE WIRE GLASS WINDOWS AND UPGRADES TO SAFETY GLASS.

EXTERIOR

1. REMOVAL AND REPLACEMENT OF FRONT ENTRY PAVILION & ATTACHED CANOPY.
2. REPOINTING OF EXTERIOR MASONRY.
3. REMOVAL AND REPLACEMENT OF LOUVERS.
4. REMOVAL AND REPLACEMENT OF DOOR THRESHOLDS AND CONCRETE LANDINGS.

GENERAL CODE NOTES - ALTERATION LEVEL 1

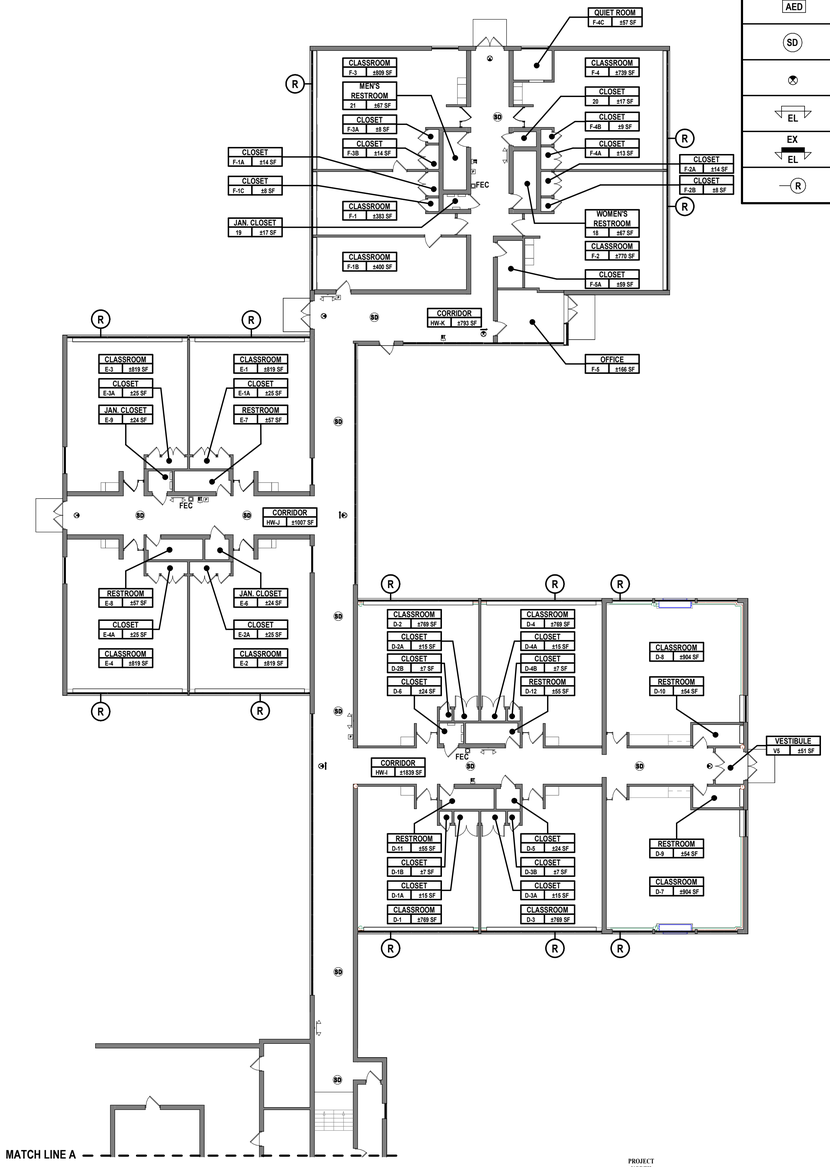
(NYS EXISTING BUILDING CODE)

1. "THE REMOVAL AND REPLACEMENT OR THE COVERING OF EXISTING MATERIALS, ELEMENTS, EQUIPMENT, OR FIXTURES USING NEW MATERIALS, ELEMENTS, EQUIPMENT, OR FIXTURES THAT SERVE THE SAME PURPOSE", IS CLASSIFIED AS AN ALTERATION LEVEL 1 PER EBCNYS SECTION 602.1.
2. EXISTING EGRESS SHALL BE MAINTAINED. EXISTING EXIT SIGNS TO REMAIN (TYP. FOR ALL)
3. EXISTING ACCESSIBILITY SHALL BE MAINTAINED. IT IS CONSIDERED TECHNICALLY INFEASIBLE TO INCREASE ACCESSIBILITY FOR EXISTING DOORS RECESSED WITHIN EXISTING CONSTRUCTION AS EXISTING CONDITIONS PROHIBIT MODIFICATION NECESSARY TO PROVIDE ACCESSIBILITY.
4. EXISTING SMOKE DETECTORS TO REMAIN (TYP. FOR ALL).
5. ALL GLAZING IN DOORS, FIXED SIDE PANELS ADJOINING DOORS, INTERIOR PARTITIONS WHERE GLAZING EXTENDS TO WITHIN 1'-6" OF FINISHED FLOOR AND GLASS PANELS GREATER THAN 50 SQ. FT. TO BE FULLY TEMPERED SAFETY GLASS PER 2406.1.
6. ACCESSIBLE ENTRANCES AND EXITS ARE PROVIDED AS REQUIRED INTO THE BUILDING FROM THE EXTERIOR PER 1105.1.
7. INTERIOR GLAZING SIZES AND TYPES SHALL COMPLY WITH FIRE RATING (UL 263, ASTM E119) PER 703.6.

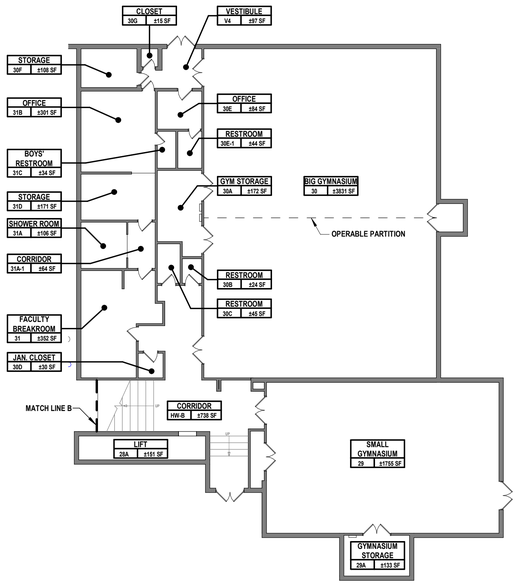
CHAPTER 7 - ALTERATION LEVEL 1

(EXISTING BUILDING CODE OF NYS)

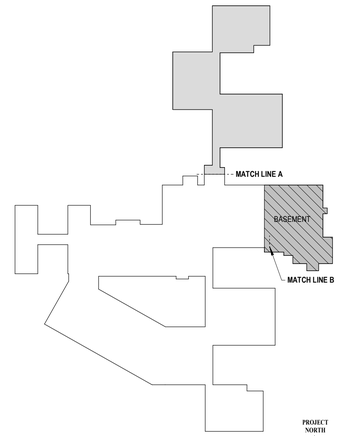
CODE SECTION	REQUIRED/ALLOWED	ACTUAL AND PROPOSED
SECTION 701.1	LEVEL 1 ALTERATIONS AS DESCRIBED IN SECTION 602 SHALL COMPLY WITH THE REQUIREMENTS OF CHAPTER 7	WORK SHALL COMPLY WITH THE BCNYS AND NYSED MANUAL OF PLANNING STANDARDS
SECTION 702 BUILDING ELEMENTS AND MATERIALS	NEWLY INSTALLED INTERIOR WALL AND CEILING FINISHES SHALL COMPLY WITH CHAPTER 8 OF THE BUILDING CODE OF NEW YORK STATE	COMPLIES
SECTION 703 FIRE SEPARATION	ALTERATIONS SHALL BE DONE IN A MANNER THAT MAINTAINS THE LEVEL OF FIRE PROTECTION PROVIDED.	COMPLIES
SECTION 704 MEANS OF EGRESS	ALTERATIONS SHALL BE DONE IN A MANNER THAT MAINTAINS THE LEVEL OF MEANS OF EGRESS PROVIDED.	COMPLIES
SECTION 706 STRUCTURAL	WHERE ALTERATION WORK INCLUDES REPLACEMENT OF EQUIPMENT THAT IS SUPPORTED BY THE BUILDING OR WHERE A REROOFING PERMIT IS REQUIRED, THE PROVISIONS OF THIS SECTION SHALL APPLY.	DOES NOT APPLY
SECTION 707 ENERGY CONSERVATION	LEVEL 1 ALTERATIONS TO EXISTING BUILDINGS OR STRUCTURES DO NOT REQUIRE THE ENTIRE BUILDING OR STRUCTURE TO COMPLY WITH THE ENERGY REQUIREMENTS OF THE ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE. THE ALTERATIONS SHALL CONFORM TO THE ENERGY REQUIREMENTS OF THE ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE AS THEY RELATE TO NEW CONSTRUCTION ONLY.	DOES NOT APPLY



1 EXISTING FIRST FLOOR PLAN - PART 'B' (FOR INFORMATION ONLY)
SCALE: 1/16" = 1'-0"



4 EXISTING BASEMENT (FOR INFORMATION ONLY)
SCALE: 1/16" = 1'-0"



2 KEY PLAN - PART 'B'
SCALE: 1" = 100'-0"

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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029 Exp. Date

KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT LIC. No. 041183

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M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

ALL CONTRACTS

STATUS

SED SUBMISSION

SHEET TITLE

CODE COMPLIANCE INFORMATION, EXISTING FIRST FLOOR PLAN - PART 'B' (FOR INFORMATION ONLY)

DRAWING No.

PE-G 101.00

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SITE IMPROVEMENTS LEGEND

DESCRIPTION	SYMBOL
SPOT ELEVATION	+121.50
TOP AND BOTTOM CURB ELEVATION	TC140.00 / BC139.50
MINOR CONTOUR	241
ROOF LEADER	RL
ROOF LEADER LINE	R — R
CLEAN OUT	
HANDICAP RAMP	



GRADING AND DRAINAGE NOTES:

1. FOR NEW CONSTRUCTION THAT MEETS EXISTING CONDITIONS, ABUTTING SURFACES SHALL BE FLUSH AND ALIGNED.
2. THE CONTRACTOR SHALL CONFIRM INVERT ELEVATIONS OF ALL ROOF DRAINS.
3. ADJUST ALL EXISTING CASTINGS AND VALVE COVERS TO MEET PROPOSED GRADE.
4. CONSTRUCTION DEBRIS AND EXCESS SOIL SHALL BE REMOVED AND LEGALLY DISPOSED OFF SITE.
5. UNSUITABLE SOILS ENCOUNTERED DURING CONSTRUCTION SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER IMMEDIATELY IN WRITING BEFORE REMOVAL OR DISTURBANCE.

PIPE MATERIAL SPECIFICATIONS:

- ROOF LEADER CONNECTIONS: 6"Ø PVC-DR18

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GRAPHIC SCALE
20 0 10 20
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1 inch = 20 ft.

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NY Engineering Certificate of Authorization No. 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · SEAN PATRICK CALLAHAN · 092068-1 · LICENSED PROFESSIONAL ENGINEER

08/31/2027
EXP. DATE

SEAN P. CALLAHAN, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 092068

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S. PETERS	A. SODERMAN	B. LEDGER	S. CALLAHAN

PROJECT No.:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED# 66-21-01-06-0-002-017

CONTRACT

CONTRACT C
CIVIL / SITE CONSTRUCTION

STATUS

SED SUBMISSION

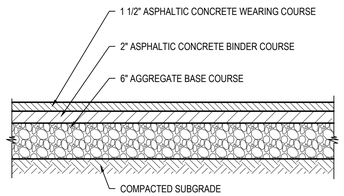
SHEET TITLE

GRADING & DRAINAGE PLAN

DRAWING No.

PE-C 100.00

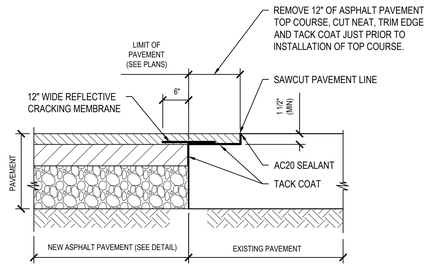
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NOTE:
COMPACT SUBGRADE TO 92% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557.

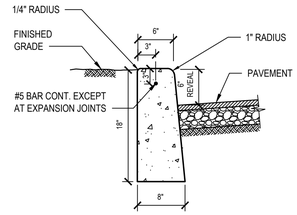
1 Asphalt Pavement - Standard Duty

SCALE: NTS (321216.13 H2MX1) - U



2 New Asphalt Pavement Key to Existing Asphalt Pavement - Standard Duty

NTS

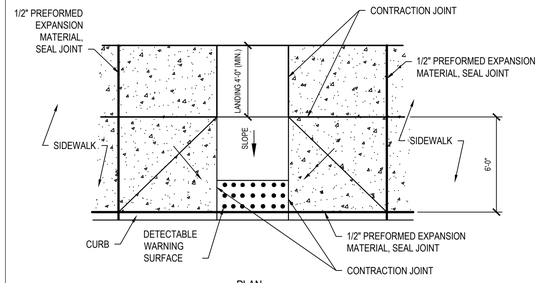


NOTES:

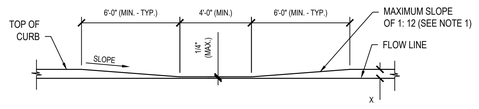
1. WOOD FLOAT AND BRUSH FINISH ON ALL SURFACES ABOVE GRADE.
2. AT ALL CURB ENDINGS, PROVIDE SMOOTH TRANSITION DOWN TO PAVED SURFACE.
3. PROVIDE 1/2" PREFORMED EXPANSION MATERIAL AT 20' ON CENTER AND AT ALL CORNERS. SET EXPANSION MATERIAL 1/2" BELOW EXPOSED SURFACES AND SEAL JOINT.
4. CONCRETE TO ACHIEVE 4,000 PSI STRENGTH AT 28 DAYS.

3 Concrete Curb

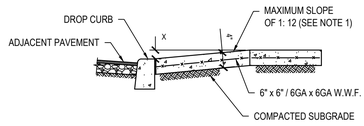
SCALE: NTS (321613.16 H2MX1)



PLAN



ELEVATION



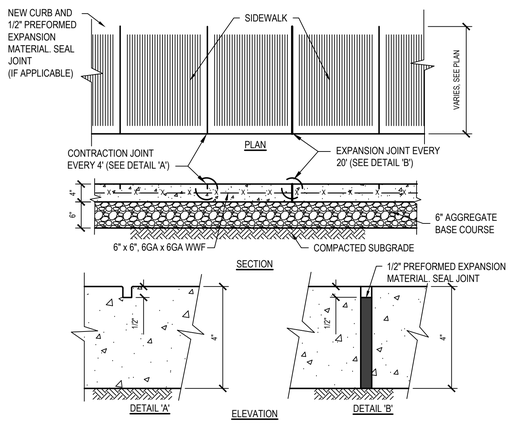
SECTION

NOTES:

1. DIMENSIONS SHOWN ARE APPLICABLE FOR INSTALLATION WITH 6" CURB REVEAL. DIMENSIONS OF FLARE AND RAMP LENGTH FOR INSTALLATION WITH ALTERNATE CURB REVEALS MAY BE MODIFIED TO MAINTAIN A RAMP SLOPE NOT TO EXCEED 1:12.
2. THE SIZE OF THE DETECTABLE WARNING FIELD SHALL BE 24" IN THE DIRECTION OF TRAVEL AND SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP EXCLUSIVE OF SIDE FLARES.
3. MAXIMUM SLOPE OF LANDING IS 2% IN ANY DIRECTION.
4. RAMP TRANSITIONS BETWEEN WALKS, GUTTERS OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT VERTICAL CHANGES (1/4" MAX.)
5. CONCRETE TO ACHIEVE 4,000 P.S.I. STRENGTH AT 28 DAYS.
6. COMPACT SUBGRADE TO 92% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557.
7. APPLY BRUSH FINISH PERPENDICULAR TO DIRECTION OF SLOPE.
8. REFER TO CONCRETE SIDEWALK DETAIL FOR INFORMATION REGARDING CONTRACTION AND EXPANSION JOINTS.

7 Concrete Handicap Ramp - Mid Block - Flare

SCALE: NTS (321313.36 H2MX2) - U

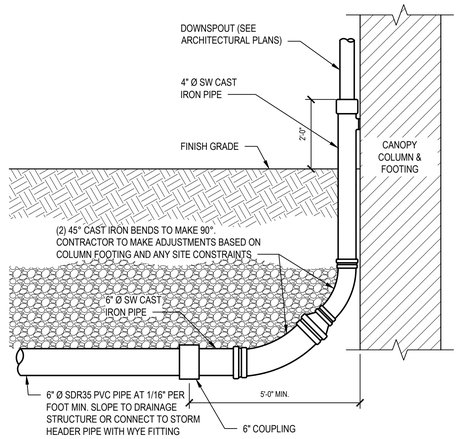


NOTES:

1. CONCRETE TO ACHIEVE 4000 PSI STRENGTH AT 28 DAYS
2. COMPACT SUBGRADE TO 92% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557.
3. APPLY BROOM FINISH PERPENDICULAR TO DIRECTION OF TRAVEL.

4 Concrete Sidewalk

SCALE: NTS 321313.33 H2MX1

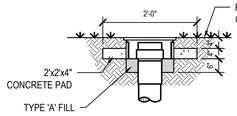


5 Downspout Boot

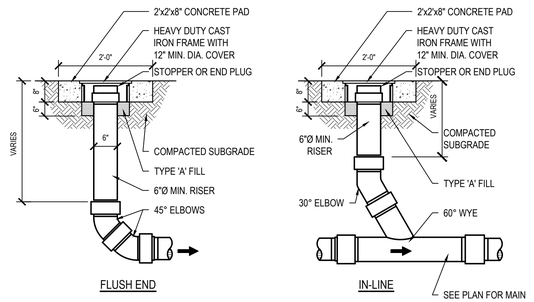
SCALE: NTS 334211.33

NOTES:

1. CAST IRON FRAME AND COVER MUST BE CAPABLE OF SUPPORTING THE AASHTO HS-20 HIGHWAY LOADING.
2. CONCRETE TO ACHIEVE 4,000 P.S.I. STRENGTH AT 28 DAYS.
3. CONCRETE PAD MAY BE OMITTED FOR CLEANOUTS IN CONCRETE SIDEWALKS.

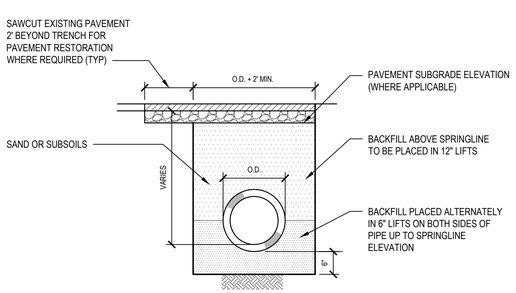


ALTERNATE CONDITION FOR LAWN AND LANDSCAPED AREAS



6 Storm Drainage Cleanout

SCALE: NTS (334915.00 H2MX1)



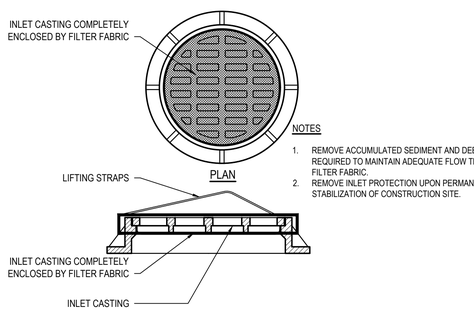
NOTES:

1. IF DEPTH OF TRENCH EXCEEDS 5', THE CONTRACTOR MUST PROVIDE SHEETING AND BRACING OR A SHEETING BOX IN ACCORDANCE WITH OSHA REGULATIONS. AS AN ALTERNATIVE, IF PERMITTED BY THE ENGINEER, THE TRENCH WALLS MAY BE CUT BACK TO A 1:1 SLOPE OR THE NATURAL ANGLE OF REPOSE FOR THE SOIL, WHICHEVER IS GREATER.
2. WITHIN 9" OF PAVEMENT SUBGRADE ELEVATION (WHERE APPLICABLE) COMPACT BACKFILL TO 92% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557. ALL OTHER BACKFILL MATERIAL TO BE COMPACTED TO 90% MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557.

8 Pipe Trench

SCALE: NTS 312333.00 (H2MX1) - U

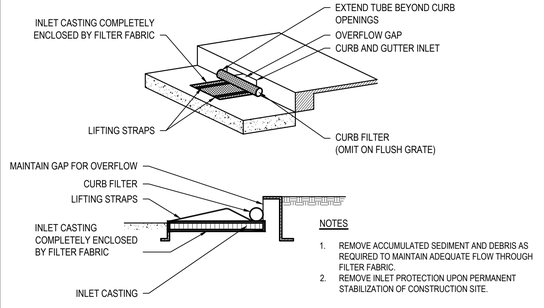
FILTER FABRIC PROPERTIES			
Mechanical Properties	Test Method	Units	MARV
Grab Tensile Strength	ASTM D 4632	lbs	365 x 200
Grab Tensile Elongation	ASTM D 4632	%	24 x 10
Puncture Strength	ASTM D 4833	lbs	90
Mullen Burst Strength	ASTM D 3786	psi	450
Trapezoid Tear Strength	ASTM D 4533	lbs	115 x 75
UV Resistance	ASTM D 4355	%	90
Apparent Opening Size	ASTM D 4751	US Std Sieve)	40
Flow Rate	ASTM D 4491	gal/min/ft²	145
Permittivity	ASTM D 4491	Sec⁻¹	2.1



9 Circular Inlet Sediment Bag Protection

SCALE: NTS 312553.13 H2MX2

FILTER FABRIC PROPERTIES			
Mechanical Properties	Test Method	Units	MARV
Grab Tensile Strength	ASTM D 4632	lbs	365 x 200
Grab Tensile Elongation	ASTM D 4632	%	24 x 10
Puncture Strength	ASTM D 4833	lbs	90
Mullen Burst Strength	ASTM D 3786	psi	450
Trapezoid Tear Strength	ASTM D 4533	lbs	115 x 75
UV Resistance	ASTM D 4355	%	90
Apparent Opening Size	ASTM D 4751	US Std Sieve)	40
Flow Rate	ASTM D 4491	gal/min/ff	145
Permittivity	ASTM D 4491	Sec⁻¹	2.1



10 Curb Inlet Sediment Bag Protection

SCALE: NTS (312553.13 H2MX1) - U

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CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · SEAN PATRICK CALLAHAN · 092068-1 · LICENSED PROFESSIONAL ENGINEER

08/31/2027 EXP. DATE

SEAN P. CALLAHAN, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 092068

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S. PETERS	A. SODERMAN	B. LEDGER	S. CALLAHAN

PROJECT No.:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED# 66-21-01-06-0-002-017

CONTRACT

CONTRACT C CIVIL / SITE CONSTRUCTION

STATUS

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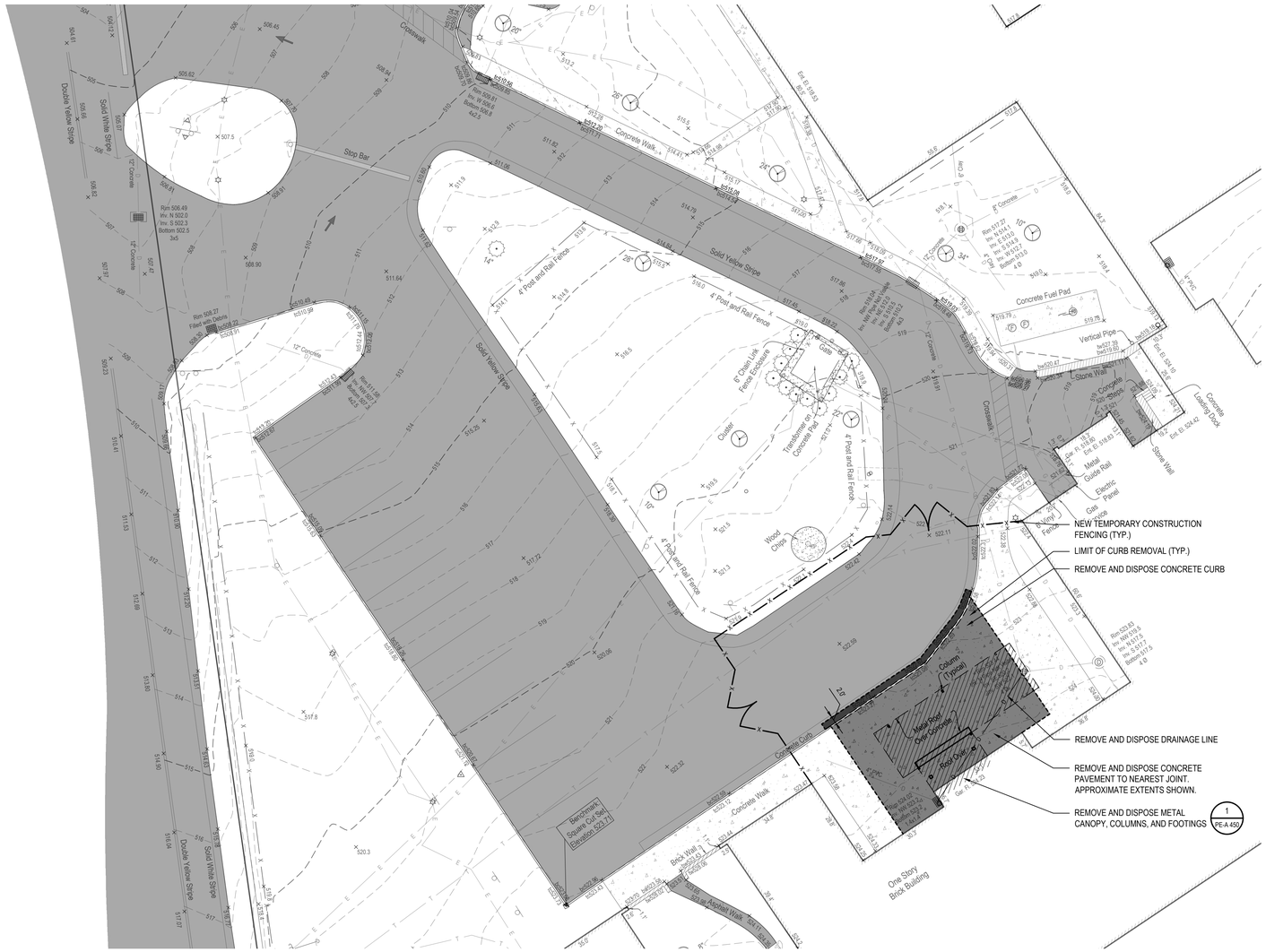
SHEET TITLE

SITE DETAILS

DRAWING No.

PE-C 500.00

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EXISTING CONDITIONS LEGEND

DESCRIPTION	SYMBOL
BENCHMARK	
DRAINAGE MANHOLE	D
INLET	
INLET	
ROOF DRAIN/LEADER	O_L
ELECTRIC RISER	O_{ER}
LIGHT	
SIGN	
FLAG POLE	O_{FP}
DECIDUOUS TREE	
CONTOUR	100
SPOT ELEVATION	100.0
TOP/BOT CURB GRADE	tc 100.50 bc 100.00
ASPHALT PAVEMENT	
CONCRETE PAVEMENT	
GRAVEL / WOOD CHIPS	
CURB	
STORM DRAIN	D D
UNDERGROUND GAS	G
UNDERGROUND ELECTRIC	E E
UNDERGROUND TELEPHONE	T T
FENCE	X X

DEMOLITION LEGEND

DESCRIPTION	SYMBOL
SAWCUT PAVEMENT LINE	
REMOVE AND DISPOSE OF EXISTING CURB	
REMOVE AND DISPOSE EXISTING ASPHALT PAVEMENT AND BASE	
REMOVE AND DISPOSE EXISTING SITE FEATURE	
REMOVE AND DISPOSE CONCRETE PAVEMENT	

TEMPORARY CONSTRUCTION FENCING LEGEND

X

C CONTRACTOR TO PROVIDE 8'-0" HIGH TEMPORARY CHAIN LINK FENCING AND GATE AS SHOWN ON DRAWINGS (EXACT LOCATION OF FENCING TO BE VERIFIED WITH OWNER AND CONSTRUCTION MANAGER). THIS FENCING SHALL BE CONSTRUCTED OF NINE GAUGE GALV. STEEL WIRE W/ 2½" GALV. LINE POST & 3" END/CORNER POST, WITH TOP RAIL & BOTTOM WIRE. PROVIDE TRAFFIC & PEDESTRIAN GATED WITH HARDWARE & LOCKS. ALL FENCING SHALL HAVE A CLOTHLY WOVEN, BLIND SCREEN MESH INSTALLED ON THE "PUBLIC" SIDE OF THE FENCE. MESH TO BE DARK GREEN OR BLACK. WHEN DIRECTED BY THE CONSTRUCTION MANAGER, THE SAME CONTRACTOR SHALL REMOVE & DISPOSE OF THIS FENCING AND ALL RELATED MATERIALS.

C CONTRACTOR TO PROVIDE 20'-0" WIDE TRAFFIC GATE W/ 4" GALV. POST AS SHOWN ON DRAWINGS

EXISTING CONDITIONS NOTES:

1. EXISTING SURVEY PREPARED BY H2M ARCHITECTS + ENGINEERS, DATED OCTOBER 13, 2025.
2. MARKOUT OF UNDERGROUND UTILITIES COMPLETED BY THE LEXIS GROUP, DATED OCTOBER 2022.
3. BENCHMARK - (SQUARE CUT SET IN CURB, SOUTH CORNER OF EXISTING PARKING LOT, EL. = 523.71).
4. LOCATION OF UNDERGROUND UTILITIES AND STRUCTURES BOTH PUBLIC AND CUSTOMER OWNED, WERE OBTAINED FROM EITHER OLD MAPS, SURVEYS, DRAWINGS/RECORDS SUPPLIED BY OTHERS AND/OR UTILITY MARKOUT. THE OWNER AND ENGINEER DO NOT GUARANTEE OR ACCEPT RESPONSIBILITY FOR ANY DAMAGE TO SUCH FACILITIES DUE TO DISCREPANCIES IN LOCATION AND SIZE SHOWN ON THE PLANS OR THOSE UTILITIES AND STRUCTURES NOT SHOWN.

SITE DEMOLITION NOTES:

1. REPORT ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE PLANS TO THE ENGINEER IN WRITING IMMEDIATELY.
2. UNDERGROUND UTILITY INFORMATION SHOWN ON THESE PLANS WAS OBTAINED FOR DESIGN PURPOSES ONLY. PROVIDE FOR CONSTRUCTION MARKOUT AND LOCATE EXISTING UNDERGROUND UTILITIES. NO EXCAVATION CAN COMMENCE UNTIL UTILITY DOCUMENTATION HAS BEEN COMPLETED.
3. NO COMPENSATION WILL BE MADE FOR ANY INCONVENIENCE CAUSED BY ENCOUNTERING UTILITIES AND STRUCTURES WHICH ARE NOT SHOWN, OR ARE INACCURATELY SHOWN ON THE PLANS.
4. REPAIR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM CONTRACTOR OPERATIONS IMMEDIATELY AT NO COST TO OWNER.
5. REPAIR ANY DAMAGE TO EXISTING SITE FEATURES SCHEDULED TO REMAIN RESULTING FROM CONTRACTOR OPERATIONS AT NO COST TO OWNER.
6. SAWCUT CONCRETE PAVEMENT BACK TO NEAREST EXPANSION/CONTROL JOINT.
7. PROVIDE TEMPORARY FENCING TO PROTECT WORK AREAS.
8. INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE SITE IMPROVEMENTS PLAN PRIOR TO ANY GROUND DISTURBANCE.
9. DELINEATE THE LIMITS OF CLEARING AND REVIEW WITH THE OWNER PRIOR TO COMMENCING WORK.
10. NOTIFY OWNER AND ENGINEER IMMEDIATELY IN WRITING WHEN UNKNOWN STRUCTURES OR SUSPECTED HAZARDOUS OR CONTAMINATED MATERIALS ARE ENCOUNTERED PRIOR TO REMOVAL OR DISTURBANCE.
11. TAKE APPROPRIATE MEASURES TO PROTECT PEDESTRIANS AND VEHICULAR TRAFFIC DURING REMOVAL ACTIVITIES, AND PROVIDE TEMPORARY MEASURES FOR THE PROTECTION AND SAFETY OF THE PUBLIC UNTIL FINAL ACCEPTANCE BY THE OWNER.
12. BACKFILL ALL VOIDS RESULTING FROM THE REMOVAL OF EXISTING SITE FEATURES. BACKFILL TO BE SOIL, FREE OF ORGANIC MATERIAL, DEBRIS, TRASH, CLAY AND STONES LARGER THAN 4 INCHES.

GRAPHIC SCALE

20 0 10 20

(IN FEET)

1 inch = 20 ft.

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CONSULTANTS:

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SEAN PATRICK CALLAHAN
092068-1
LICENSED PROFESSIONAL ENGINEER

SEAN P. CALLAHAN, P.E.
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08/31/2027
EXP. DATE

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY LICENSE PROFESSIONAL IS ILLEGAL"

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
S. PETERS	A. SODERMAN	B. LEDGER	S. CALLAHAN

PROJECT No.:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED# 66-21-01-06-0-002-017

CONTRACT

CONTRACT C CIVIL / SITE CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

EXISTING CONDITIONS & DEMOLITION PLAN

DRAWING No.

PE-CD 100.00

X:\SUSMSD [Somers School District\SMSD2505 (PES Phase 2-Various Upgrades\02-BIM-CAD\Civ-Docs\05 Civil\01 - LV100 Existing Conditions & Demolition Plan.dwg Last Modified: Jul 29, 2026 - 10:27am Plotted on: Jul 29, 2026 - 10:27am By: speters



SITE IMPROVEMENTS LEGEND

DESCRIPTION	SYMBOL
CURB	
CONCRETE DROP CURB	
ASPHALT PAVEMENT	
CONCRETE PAVEMENT SIDEWALK	
NEW CURB INLET SEDIMENT BAG	
NEW CIRCULAR INLET SEDIMENT BAG	

SITE PLAN NOTES:

1. INSPECT THE SITE PRIOR TO SUBMISSION OF BIDS AND MAKE NO ADDITIONAL CLAIMS REGARDING SITE CONDITIONS THEREAFTER.
2. ARCHITECTURAL AND STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE CIVIL DRAWINGS FOR THE LAYOUT AND CONSTRUCTION OF THE PROPOSED SITE IMPROVEMENTS. REPORT ANY DISCREPANCIES BETWEEN CIVIL, ARCHITECTURE AND STRUCTURAL DRAWINGS IN WRITING TO THE CIVIL ENGINEER PRIOR TO CONSTRUCTION.
3. NOTIFY THE OWNER AND H2M (TELEPHONE 914-358-5623) AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF THE WORK. THE SAME NOTICE SHALL BE REQUIRED WHEN RESUMING WORK AFTER ANY STOPPAGE OR DELAY.
4. COMPLETE ALL SURVEY AND STAKEOUT AS REQUIRED TO PROPERLY COMPLETE THE WORK.
5. PERFORM DAILY CLEANUP OPERATIONS INCLUDING REMOVAL OF DEBRIS AND EXCESS CONSTRUCTION MATERIAL, AND DRIVEWAY/STREET CLEANING TO THE SATISFACTION OF THE OWNER.
6. DURING ALL NON-WORKING HOURS, STORE ALL EQUIPMENT AND MATERIALS WITHIN AN AREA DESIGNATED BY THE OWNER AT THE PROJECT SITE.
7. ALL CURB DIMENSIONS SHOWN REFER TO THE FACE OF CURB.
8. ALL CONSTRUCTION TO CONFORM WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL CODE REQUIREMENTS.
9. COORDINATE CONSTRUCTION ACTIVITIES WITH OWNER TO MINIMIZE INTERRUPTION TO THE OWNER'S OPERATIONS.
10. RESTORE SURROUNDING AREAS DAMAGED OR DISTURBED DURING CONSTRUCTION. RESTORE TO NEW CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
11. RESTORE ALL DISTURBED GRASS AREAS AND ALL AREAS NOT SPECIFICALLY IDENTIFIED FOR OTHER IMPROVEMENTS WITH 4 INCHES OF TOPSOIL AND SEED.
12. SEAL ALL JOINTS BETWEEN NEW ASPHALT AND EXISTING ASPHALT WITH HOT ASPHALT CEMENT.

EROSION CONTROL NOTES:

1. DURING THE COURSE OF CONSTRUCTION, EROSION AND SEDIMENT CONTROL MEASURES ARE NECESSARY TO PREVENT THE TRANSPORT OF SEDIMENT TO UNDISTURBED AREAS, PONDS, WATER COURSES, DRAINAGE SYSTEMS, RECHARGE BASINS, AND ROADS. THE MINIMUM EROSION CONTROL MEASURES REQUIRED ARE INDICATED ON THIS PLAN. IN ADDITION, THE FOLLOWING GENERAL CONDITIONS SHALL BE OBSERVED:
   a. EXISTING VEGETATION SCHEDULED TO REMAIN SHALL BE PROTECTED AND REMAIN UNDISTURBED.
   b. INSTALL ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES AS REQUIRED TO PREVENT THE INCIDENTAL DISCHARGE OF SEDIMENT FROM THE SITE.
2. SPECIFIC METHODS AND MATERIALS EMPLOYED IN THE INSTALLATION AND MAINTENANCE OF EROSION CONTROL MEASURES MUST CONFORM TO THE LATEST EDITION OF THE "NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL".
3. INSTALL PROPRIETARY EROSION AND SEDIMENT CONTROL PRODUCTS IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
4. ADJUST EROSION AND SEDIMENT CONTROL MEASURES TO ACCOMMODATE CONSTRUCTION PHASING TO MAINTAIN EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES.
5. PROTECT EXISTING DRAINAGE INLETS WITHIN THE PROJECT LIMITS AND NEW DRAINAGE INLETS INSTALLED AS PART OF THIS PROJECT FROM SEDIMENT INTRUSION.
6. PERFORM INSPECTION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROL MEASURES ON A WEEKLY BASIS AND AFTER HEAVY OR PROLONGED STORMS. MAINTENANCE MEASURES INCLUDE, BUT ARE NOT LIMITED TO, CLEANING AND REPAIR OF ALL EROSION AND SEDIMENT CONTROL MEASURES.
7. UTILIZE APPROPRIATE MEANS TO CONTROL DUST DURING CONSTRUCTION, INCLUDING BUT NOT LIMITED TO APPLYING WATER TO BARE SOIL SURFACES.
8. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL DISTURBED AREAS ARE PERMANENTLY STABILIZED. AFTER PERMANENT STABILIZATION, REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AND ALL ACCUMULATED SEDIMENT AND DEBRIS FROM THE SITE AND DRAINAGE STRUCTURES.

TOTAL LAND DISTURBANCE = 0.05 ACRES

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) NOTES:

1. PURSUANT TO THE REQUIREMENTS OF SPDES GENERAL PERMIT FOR CONSTRUCTION ACTIVITY GP-0-25-001 ESTABLISHED BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) HAS BEEN PREPARED FOR THIS PROJECT. ADHERE TO AND IMPLEMENT ALL REQUIREMENTS OF THE SWPPP AND EROSION AND SEDIMENT CONTROL PLAN.
2. REVIEW THE SWPPP AND SIGN IN THE LOCATION SHOWN STATING THAT ALL WORK PERTAINING TO EROSION AND SEDIMENT CONTROL WILL BE PERFORMED WITHIN REQUIREMENTS OF THE SWPPP AND EROSION AND SEDIMENT CONTROL PLAN.
3. THE OWNER SHALL PROVIDE A QUALIFIED INSPECTOR WHO WILL PERFORM WEEKLY INSPECTIONS AT THE CONSTRUCTION SITE. THE QUALIFIED INSPECTOR SHALL MEET THE REQUIREMENTS OUTLINED IN SPDES GENERAL PERMIT FOR STORMWATER DISCHARGE FROM CONSTRUCTION ACTIVITY (GP-0-25-001). IF THE INSPECTIONS FIND ANY DEVIATIONS FROM THE SWPPP OR THE EROSION AND SEDIMENT CONTROL PLAN IT WILL BE NOTED. THE CONTRACTOR WILL HAVE 7 DAYS TO CORRECT ANY DEVIATIONS SO THAT IT COMPLIES WITH THE REQUIREMENTS OF THE SWPPP AND OR EROSION AND SEDIMENT CONTROL PLAN. IN THE EVENT THAT MORE THAN 5 ACRES OF SOIL IS DISTURBED AT ANY TIME, 2 WEEKLY INSPECTIONS WILL BE PERFORMED.

GRAPHIC SCALE
20 0 10 20
(IN FEET)
1 inch = 20 ft.

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DIMENSIONAL SITE PLAN

DRAWING No.

PE-CS 100.00

X:\SS\MSD] (Somers School District\SMSD2505 (PES Phase 2-Various Upgrades\02.BIM-CAD\Civ\Docs\05 Civil\02_CS100.Site Improvements Plan.dwg Last Modified: Jul 20, 2026 - 10:28am Plotted on: Jul 20, 2026 - 10:31am By: pyeters

DESIGN NOTES:

1. BUILDING CODE:
   2025 BUILDING CODE OF NEW YORK STATE

2. RISK CATEGORY:
   III

3. BUILDING GRAVITY LOADS:
   A. DEAD LOADS:
      ROOF 20 PSF
      CORRIDOR 85 PSF
      1. REFER TO PLANS FOR ADDITIONAL LOADS FROM MECHANICAL EQUIPMENT, ETC.
      2. SCOPE FOR WALL BRACKET ATTACHMENT AND DUCT OPENING IN ROOF IS INCLUDED

   B. LIVE LOADS:
      ROOF 20 PSF
      CLASSROOMS 40 PSF
      OFFICES 50 PSF
      CORRIDORS/LOBBIES/STAIRS 100 PSF

   C. SNOW LOADS:
      GROUND SNOW LOAD, pg 61 PSF
      EXPOSURE COEFFICIENT, Ce 1.0
      THERMAL COEFFICIENT, Ct 1.2
      MINIMUM SNOW LOAD, pm 35 PSF
      FLAT ROOF SNOW LOAD, pf 51.2 PSF

      SNOW DRIFT HAS BEEN ACCOUNTED FOR IN DESIGN OF ALL NEW STRUCTURAL MEMBERS AND ANALYSIS OF EXISTING STRUCTURAL MEMBERS.

4. WIND LOADS:
   BASIC WIND SPEED 123 MPH
   EXPOSURE B
   INTERNAL PRESSURE COEFF., GCpi +/- 0.18
   END ZONE WIDTH, a 10 FT

5. SEISMIC LOADS:
   SEISMIC SITE CLASS D
   SEISMIC IMPORTANCE FACTOR, Ie 1.25
   Ss = 0.260 g S1 = 0.051 g
   Sms = 0.290 g Sm1 = 0.110 g
   Sds = 0.200 g Sd1 = 0.071 g

   SEISMIC DESIGN CATEGORY B

6. SOIL DESIGN VALUES:
   SOIL BEARING CAPACITY 2,000 PSF
   SUBGRADE MODULUS 150 PSI/IN

   SOIL DESIGN VALUES ARE BASED ON PRESUMPTIVE VALUES PROVIDED IN THE NYS BUILDING CODE SECTION 1806.2

7. ANY BUILDING COMPONENT NOTED AS DELEGATED DESIGN ITEMS IN DRAWINGS AND/OR SPECIFICATIONS SHALL BE DESIGNED IN ACCORDANCE WITH MINIMUM LOADS SPECIFIED ABOVE. ANY DEVIATION FROM NOTED LOAD VALUES SHALL BE SUBMITTED BY CONTRACTOR FOR REVIEW AND APPROVAL TO EOR PRIOR TO SUBMITTING SHOP DRAWINGS AND CALCULATIONS.

8. ALL DELEGATED DESIGN SHALL BE DONE TO THE ABOVE REFERENCED BUILDING CODE VERSIONS, AND THEIR REFERENCED SUBCODES.

9. ADDITIONAL DESIGN LOADS INDICATED ON STRUCTURAL DRAWINGS ARE IDENTIFIED AS FOLLOWS:
   DL = DEAD LOAD
   LL = LIVE LOAD
   Lr = ROOF LIVE LOAD
   SL = SNOW LOAD
   WL = WIND LOAD
   EQ = SEISMIC LOAD
   FL = FLOOD LOAD

GENERAL NOTES:

1. SPECIFICATIONS ARE PART OF THE CONSTRUCTION DOCUMENTS AND MUST BE USED IN CONJUNCTION WITH THE DRAWINGS. WHERE SPECIFICATIONS ARE IN CONFLICT WITH THE GENERAL NOTES OR DRAWINGS, THE MORE RESTRICTIVE LIMITATION SHALL APPLY.

2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS BY MEASUREMENTS OR SURVEY AT THE JOB SITE AND SHALL TAKE ANY AND ALL OTHER MEASUREMENTS NECESSARY TO VERIFY THE DRAWINGS AND TO PERFORM THE WORK PROPERLY.

3. ANY DISCREPANCY BETWEEN THE DRAWINGS AND THE MEASURED DIMENSIONS OF THE EXISTING CONDITION SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. NO WORK SHALL PROCEED UNTIL SUCH DISCREPANCIES HAVE BEEN RECTIFIED, INCLUDING BUT NOT LIMITED TO FABRICATION OF MATERIALS. SUCH DISCREPANCIES BETWEEN THE DRAWINGS AND THE MEASURED DIMENSIONS SHALL NOT BE THE REASONS FOR ANY EXTRA COST OR DELAY IN THE EXECUTION OF THE WORK AND THE WORK SHALL BE PERFORMED AT NO EXTRA COST TO THE OWNER.

4. ALL CONTRACTORS ARE REQUIRED TO VISIT THE SITE AND FULLY INFORM THEMSELVES AS TO THE EXISTING CONDITIONS AND LIMITATIONS PRIOR TO SUBMITTING THEIR PROPOSAL/BID. FAILURE TO VISIT THE SITE AND NOT FAMILIARIZING THEMSELVES WITH THE CONDITIONS AND LIMITATIONS WILL IN NO WAY RELIEVE THE SUCCESSFUL BIDDER FROM FURNISHING ANY MATERIALS OR PERFORMING ANY WORK THAT MAY BE REQUIRED TO COMPLETE THE WORK IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS AT NO ADDITIONAL COST TO THE OWNER.

5. THE CONTRACT STRUCTURAL DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR ALONE IS RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND SAFETY OF THE STRUCTURE AND WORKMEN DURING THE ENTIRE CONSTRUCTION PERIOD, WHICH SHALL INCLUDE BUT NOT BE LIMITED TO: DESIGN AND INSTALLATION OF BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR NEW OR EXISTING BUILDINGS, FORMS, AND SCAFFOLDING, SHORING OF RETAINING WALLS, AND OTHER TEMPORARY SUPPORTS AS REQUIRED.

6. CONTRACTOR SHALL SCHEDULE WORK IN CONSULTATION WITH THE OWNER AND IN SUCH A WAY AS TO MINIMIZE CONFLICT WITH THE OPERATION OF ANY EXISTING BUILDINGS, FACILITIES, OR RIGHTS-OF-WAY.

7. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE REQUIREMENTS OF OSHA AND ANY OTHER GOVERNING BODIES HAVING JURISDICTION AT THE SITE.

8. IN CASE OF ANY DAMAGE TO THE CONSTRUCTION, THE CONTRACTOR SHALL REPAIR THE SAME TO THE ENTIRE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.

9. CONTRACTOR SHALL INFORM THE ENGINEER OF ANY DEMOLITION, ALTERATIONS REQUIRED, OR INTERFERENCES NOT SHOWN ON THE DEMOLITION DRAWINGS FOR RESOLUTION. THE CONTRACTOR SHALL ALLOW MINIMUM SEVEN (7) WORKING DAYS FOR RESOLUTION OF THE CONDITION UNLESS ADDITIONAL TIME IS STATED TO BE REQUIRED BY THE ENGINEER.

10. TYPICAL DETAILS ON THE DRAWINGS APPLY TO SITUATIONS OCCURRING ON THE PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT DETAILS ARE REFERENCED AT EACH LOCATION. NOTIFY ENGINEER OF CONFLICTS REGARDING APPLICABILITY OF TYPICAL DETAILS.

11. DO NOT LOAD THE FINISHED SLAB-ON-GRADE OR ELEVATED SLABS WITH ERECTION EQUIPMENT. DO NOT STACK OR STORE CONSTRUCTION MATERIALS ON DECKS/SLABS. DO NOT CAUSE IMPACT LOADS TO DECK/SLAB DURING CONSTRUCTION.

12. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL CHASES, INSERTS, OPENING, SLEEVES, FINISHES, DEPRESSIONS, PADS, AND WALL OPENINGS PRIOR TO CONSTRUCTION.

13. PRINCIPAL OPENINGS THROUGH THE FRAMING AND SLABS ARE SHOWN ON DRAWINGS. COORDINATE WITH THE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR ALL REQUIRED OPENINGS AND PROVIDE FOR ALL REQUIRED OPENINGS WHETHER SHOWN ON THE STRUCTURAL DRAWING OR NOT. VERIFY SIZE AND LOCATION OF OPENINGS WITH THE MECHANICAL CONTRACTOR. DEVIATIONS FROM THE OPENINGS SHOWN ON THE STRUCTURAL DRAWINGS MUST BE APPROVED PRIOR TO CONSTRUCTION/FABRICATION OF THE REQUIRED OPENINGS.

14. LOADING FOR MECHANICAL EQUIPMENT ARE BASED ON THE UNITS SHOWN ON THE MECHANICAL DRAWINGS. ANY CHANGED IN TYPE, SIZE, OR NUMBER OF PIECES OF EQUIPMENT SHALL BE REPORTED TO THE ENGINEER OF RECORD FOR VERIFICATION OF THE ADEQUACY OF SUPPORTING MEMBERS PRIOR TO THE PLACEMENT OF SUCH EQUIPMENT.

15. SEE ARCHITECTURAL DRAWINGS FOR ELEVATIONS NOT SHOWN AND FOR EXACT LOCATION OF ALL SLAB DEPRESSIONS AND HOUSEKEEPING PADS. THE CONTRACTOR SHALL COMPARE THE STRUCTURAL SECTIONS WITH ARCHITECTURAL SECTIONS AND REPORT ANY DISCREPANCY TO THE ARCHITECT AND/OR ENGINEER PRIOR TO FABRICATING OR INSTALLING STRUCTURAL MEMBERS.

EXCAVATION NOTES:

1. EXCAVATION SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROJECT GEOTECHNICAL REPORT. WHERE STRUCTURAL CONTRACT DOCUMENTS CONFLICT WITH THE GEOTECHNICAL REPORT, THE MORE RESTRICTIVE LIMITATION SHALL APPLY.

2. PROTECT ALL ABOVE AND BELOW GRADE UTILITIES WHICH ARE TO REMAIN.

3. PROTECT ALL PLANT LIFE, LAWNS, AND OTHER FEATURES REMAINING AS A PORTION OF THE FINAL LANDSCAPING.

4. PROTECT BENCHMARKS, EXISTING STRUCTURES, FENCES, SIDEWALKS, ROADWAYS, FINISHED PAVINGS, AND CURBS FROM EXCAVATION EQUIPMENT AND VEHICULAR TRAFFIC.

5. GRADE TOP PERIMETER OF EXCAVATION TO PREVENT SURFACE WATER FROM DRAINING INTO EXCAVATION.

6. HAND TRIM EXCAVATION. REMOVE LOOSE MATTER.

7. REMOVE LUMPED SUBSOIL, BOULDERS, AND ROCK.

8. UNSUITABLE BEARING MATERIAL, AS DEFINED IN THE PROJECT GEOTECHNICAL REPORT, IS TO BE REMOVED AND REPLACED WITH SUITABLE FILL PER THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER.

9. NOTIFY ENGINEER OF UNEXPECTED SUBSURFACE CONDITIONS AND DISCONTINUE WORK IN AFFECTED AREA UNTIL NOTIFIED TO RESUME WORK.

10. CORRECT UNAUTHORIZED EXCAVATION AT NO EXTRA COST TO OWNER IN ACCORDANCE WITH BACKFILLING NOTES.

11. STOCKPILE EXCAVATED MATERIAL IN AREA DESIGNATED ON SITE AND REMOVE EXCESS MATERIAL NOT BEING REUSED FROM SITE. DO NOT STOCKPILE EXCAVATED MATERIAL WITHIN 10 FEET, OR A DISTANCE EQUAL TO THE DEPTH OF EXCAVATION, OF THE EDGE OF EXCAVATION.

12. PROTECT EXCAVATIONS BY METHODS REQUIRED TO PREVENT CAVE-IN OR LOOSE SOIL FROM FALLING INTO EXCAVATION.

13. VERIFY LOCATION OF EXISTING STRUCTURES AND UTILITIES PRIOR TO EXCAVATION. CONTRACTOR SHALL ENSURE ALL SURROUNDING STRUCTURES ARE PROTECTED FROM ALL EFFECTS OF EXCAVATION, INCLUDING BUT NOT LIMITED TO: SETTLEMENT, SLIDING, CAVE-IN, AND VIBRATION.

14. SLOPE SIDES OF EXCAVATIONS AT A MAXIMUM SLOPE OF 1.5H:1V, UNLESS STEEPER SLOPE IS PERMITTED BY THE GEOTECHNICAL ENGINEER.

15. WHERE THE REQUIRED EXCAVATION SLOPE CANNOT BE PROVIDED, CONTRACTOR IS RESPONSIBLE FOR OBTAINING A SUPPORT OF EXCAVATION (SOE) DESIGN FOR VERTICAL EXCAVATION. SUPPORT OF EXCAVATION DESIGN SHALL INCLUDE EXCAVATION PLAN, SECTIONS, AND NOTES, AND BE SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF CONSTRUCTION.

BACKFILLING NOTES:

1. BACKFILLING SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROJECT GEOTECHNICAL REPORT. WHERE STRUCTURAL CONTRACT DOCUMENTS CONFLICT WITH THE GEOTECHNICAL REPORT, THE MORE RESTRICTIVE LIMITATION SHALL APPLY.

2. BACKFILLING SHALL BE DONE WITH TYPE C SAND: NATURAL RIVER OR BANK SAND, WASHED FREE OF SILT, CLAY, LOAM, FRIABLE OR SOLUBLE MATERIALS, AND ORGANIC MATTER. FILL SHALL BE GRADED IN ACCORDANCE WITH ANSI/ASTM C136 WITHIN THE FOLLOWING LIMITS, UNLESS DIRECTED OTHERWISE IN THE GEOTECHNICAL REPORT:

SIEVE SIZE:	PERCENT PASSING:
NO. 4	100
NO. 14	10-100
NO. 50	5-90
NO. 100	4-30
NO. 200	0-1

3. VERIFY EXISTING CONDITIONS AND SUBSTRATE ARE SUITABLE PRIOR TO BACKFILLING.

4. VERIFY EXCAVATED MATERIALS TO BE REUSED AS FILL MATERIAL ARE ACCEPTABLE PRIOR TO BACKFILLING.

5. COMPACT SUBGRADE TO 95 PERCENT MAXIMUM DRY DENSITY IN ACCORDANCE WITH ANSI/ASTMD1557.

6. CUT OUT SOFT AREAS OF SUBGRADE NOT CAPABLE OF IN-SITU COMPACTION. BACKFILL AND COMPACT TO DENSITY EQUAL TO OR GREATER THAN REQUIREMENTS FOR SUBSEQUENT BACKFILL MATERIAL.

7. BACKFILL AREAS WITH UNFROZEN MATERIALS.

8. SYSTEMATICALLY BACKFILL TO ALLOW MAXIMUM TIME FOR NATURAL SETTLEMENT. DO NOT BACKFILL OVER POROUS, WET, FROZEN OR SPONGY MATERIALS. REMOVE ANY STANDING WATER PRIOR TO BACKFILLING.

9. PLACE AND COMPACT MATERIALS IN CONTINUOUS LAYERS NOT EXCEEDING 6 INCHES COMPACTED DENSITY.

10. ALL BACKFILL MATERIALS SHALL BE COMPACTED TO 95 PERCENT MAXIMUM DRY DENSITY IN ACCORDANCE WITH ANSI/ASTM D1557. MAINTAIN OPTIMUM MOISTURE CONTENT TO ATTAIN REQUIRED DENSITY.

11. AT COMPLETION OF BASEMENT OR FOUNDATION WALL CONSTRUCTION, BACKFILL SHALL BE PLACED LEVEL WITH FINAL TOP OF WALL ELEVATION. IF FINAL GRADING, PAVING, LANDSCAPING AND/OR STORM DRAINAGE INSTALLATION ADJACENT TO THE WALL IS NOT PLACED IMMEDIATELY AFTER COMPLETION, TEMPORARY GRADING AND DRAINAGE SHALL BE PROVIDED TO ENSURE WATER RUNOFF IS NOT DIRECTED AT THE WALL OR ALLOWED TO COLLECT OR POND BEHIND THE WALL UNTIL FINAL CONSTRUCTION ADJACENT TO THE WALL IS COMPLETED.

12. DO NOT BACKFILL AGAINST BASEMENT WALL UNTIL FIRST FLOOR FRAMING IS INSTALLED. BASEMENT WALLS ARE TO BE ADEQUATELY BRACED AGAINST CONSTRUCTION ACTIVITIES UNTIL FIRST FLOOR FRAMING IS FULLY INSTALLED.

FOUNDATION NOTES:

1. FOUNDATION DESIGN IS BASED UPON THE PRESUMPTIVE VALUES PROVIDED IN THE NYS BUILDING CODE. COORDINATE STRUCTURAL PLANS AND DETAILS WITH REQUIREMENTS OF GEOTECHNICAL REPORT AND ANY ADDENDUMS THERETO.

2. FOOTING DESIGN IS BASED ON 2000 PSF NET ALLOWABLE SOIL BEARING PRESSURE.

3. REFER TO THE GEOTECHNICAL REPORT AND THE PROJECT SPECIFICATIONS FOR GENERAL REQUIREMENTS OF EARTHWORK, EXCAVATION, SUBGRADE PREPARATION, FILL AND COMPACTION, WATERPROOFING, AND OTHER PERTINENT REQUIREMENTS AND INFORMATION. IF THERE IS A CONFLICT BETWEEN GEOTECHNICAL REPORT AND STRUCTURAL PLANS OR SPECIFICATIONS, THE MORE STRINGENT CRITERIA SHALL APPLY UNLESS OTHERWISE DIRECTED BY AN RFI.

4. PROTECT PIPES AND CONDUITS RUNNING THROUGH WALLS AND SLABS WITH 1/2 INCH EXPANSION JOINT MATERIAL. LOWER CONTINUOUS FOOTINGS AND GRADE BEAMS PERPENDICULAR TO PIPE RUNS TO ALLOW PIPES TO PASS ABOVE THE FOOTING. LOWER FOOTING AND GRADE BEAMS PARALLEL TO PIPE RUNS TO AVOID DISCHARGE ONTO ADJACENT TRENCH EXCAVATIONS.

5. MAINTAIN SPECIFIED SUBGRADE AND FILL MOISTURE CONTENT UNTIL FOUNDATIONS ARE PLACED.

6. ARRANGE FOR OWNER'S INDEPENDENT TESTING AGENCY TO MONITOR CUT AND FILL OPERATIONS AND PERFORM FIELD DENSITY AND MOISTURE CONTENT TESTS TO VERIFY COMPACTION AND APPROVE FOOTING SUBGRADES PRIOR TO PLACING CONCRETE.

7. DO NOT PLACE FOOTINGS OR SLABS AGAINST SUBGRADE CONTAINING FREE WATER, FROST OR ICE.

8. MAINTAIN PROPER SITE DRAINAGE DURING CONSTRUCTION TO ENSURE SURFACE RUNOFF AWAY FROM STRUCTURES AND TO PREVENT PONDING OF SURFACE RUNOFF NEAR THE STRUCTURES.

CONCRETE NOTES:

1. PROVIDE BATCH MIXING, TRANSPORTATION, PLACING, AND CURING OF CONCRETE IN ACCORDANCE WITH RECOMMENDATIONS OF ACI 301 AND ACI 318, LATEST EDITIONS.

2. USE TYPE I PORTLAND CEMENT UNLESS NOTED OTHERWISE. PROVIDE ADMIXTURES AND SPECIAL REQUIREMENTS AS SPECIFIED. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL INFORMATION.

3. ALL CONCRETE SHALL BE NORMAL WEIGHT (145 PCF) CONCRETE, U.O.N.

4. CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH (f'c) AS FOLLOWS:
   A. FOOTINGS, PIERS, AND FOUNDATION WALLS 4,000 PSI
   B. SLABS-ON-GRADE 4,000 PSI
   C. ALL OTHER CONCRETE, U.O.N. 4,000 PSI

5. ALL CONCRETE SHALL HAVE A MAXIMUM WATER-CEMENT RATIO OF 0.50 +/- 0.10.

6. ALL CONCRETE SHALL BE AIR-ENTRAINED, WITH AN AIR CONTENT OF 6% +/- 1%. TROWEL FINISHED SLABS ON GRADE SHALL HAVE AN AIR CONTENT OF 3% +/-1%.

7. PROVIDE CONCRETE MIXES DESIGNED BY A QUALIFIED TESTING LABORATORY FOR REVIEW AND APPROVAL BY THE STRUCTURAL ENGINEER. CONCRETE MIXES SHALL INCLUDE ALL PROPOSED ADMIXTURES, AND WEIGHTS/VOLUMES OF ALL COMPONENT MATERIALS, INCLUDING SOURCE AND/OR MANUFACTURER PRODUCT INFORMATION. CONCRETE MIX DESIGNS SHALL BE PROVIDED FOR EACH TYPE OF CONCRETE REQUIRED ON PROJECT.

8. PROVIDE CONSTRUCTION AND CONTROL JOINTS AS REQUIRED BY ACI CODE AND AS INDICATED ON DRAWINGS. HORIZONTAL CONSTRUCTION JOINTS ARE NOT ALLOWED UNLESS SPECIFICALLY NOTED OR APPROVED BY STRUCTURAL ENGINEER. SUBMIT PLAN TO ENGINEER INDICATING PROPOSED CONTROL AND EXPANSION JOINT LOCATIONS IN CONCRETE SLABS FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.

9. CONCRETE SHALL BE PLACED AND CURED IN ACCORDANCE WITH ACI 305.1 AND ACI 305R FOR HOT-WEATHER CONCRETING.

10. CONCRETE SHALL BE PLACED AND CURED IN ACCORDANCE WITH ACI 306.1 AND ACI 306R FOR COLD-WEATHER CONCRETING. DO NOT PLACE CONCRETE AGAINST FROZEN SURFACES.

11. CHAMFER EXPOSED CONCRETE EDGES 3/4 INCH, UNLESS NOTED OTHERWISE.

12. WIRE BRUSH AND CLEAN CONSTRUCTION JOINTS PRIOR TO POURING NEW CONCRETE.

13. PROVIDE ADEQUATE STRUCTURAL FRAMING AS APPROVED BY STRUCTURAL ENGINEER FOR MECHANICAL OPENINGS THROUGH THE SLABS, WALLS AND FLOOR DECK.

14. PROVIDE BROOM FINISH ON ALL SLABS, U.O.N. COORDINATE FINISH WITH ARCHITECTURAL AND/OR CIVIL DRAWINGS. FOR SIDEWALKS, PROVIDE FINISH PERPENDICULAR TO DIRECTION OF TRAVEL.

CONCRETE REINFORCING NOTES:

1. PROVIDE DETAILING, FABRICATION, AND INSTALLATION OF REINFORCING AND ACCESSORIES IN ACCORDANCE WITH ACI 301, ACI 315, AND ACE 318, LATEST VERSIONS.

2. PROVIDE NEW BILLET STEEL REINFORCING BARS IN ACCORDANCE WITH ASTM A615, GRADE 60.

3. COORDINATE PLACEMENT OF CAST-IN-PLACE EMBEDS AND ANCHOR RODS. SET ANCHOR RODS WITH A TEMPLATE. SECURELY ATTACH EMBEDDED ITEMS TO FORMWORK OR REINFORCING.

4. PROVIDE CLASS "B" REINFORCEMENT SPLICES FOR CONTINUOUS REINFORCEMENT. PROVIDE STANDARD 90-DEGREE HOOKS IN ACCORDANCE WITH ACI 318, UNLESS NOTED OTHERWISE.

5. MAINTAIN THE FOLLOWING CONCRETE COVERAGE FOR REINFORCING STEEL UNLESS NOTED OTHERWISE:
   A. CONCRETE CAST AGAINST EARTH: 3 INCHES
   B. CONCRETE EXPOSED TO WEATHER:
      NO. 6 AND LARGER: 2 INCHES
      NO. 5 AND SMALLER: 1 1/2 INCHES
   C. CONCRETE NOT EXPOSED TO WEATHER AND NOT IN CONTACT WITH THE GROUND:
      SLABS AND WALLS, NO. 11 AND SMALLER: 3/4 INCHES

6. DO NOT WELD OR BEND REINFORCEMENT IN THE FIELD UNLESS SPECIFICALLY SHOWN OR APPROVED BY STRUCTURAL ENGINEER.

7. WHEN SPECIFICALLY APPROVED, PROVIDE WELDED REINFORCEMENT IN ACCORDANCE WITH ASTM A706, GRADE 60. USE LOW HYDROGEN ELECTRODES FOR WELDING OF REINFORCEMENT IN CONFORMANCE WITH "RECOMMENDED PRACTICES FOR WELDING REINFORCING STEELL," AMERICAN WELDING SOCIETY, AWS D12.1.

8. WHERE REQUIRED, PROVIDE DOWELS TO MATCH SIZE AND SPACING OF MAIN REINFORCING, U.O.N.

9. COORDINATE PLACEMENT OF REINFORCING DOWELS TO MASONRY WALLS WITH MASONRY WALL CELL LOCATIONS.

10. PROVIDE CONTINUOUS HORIZONTAL WALL REINFORCEMENT WITH 90-DEGREE BENDS AND EXTENSIONS AT CORNERS AND INTERSECTIONS AS SHOWN ON TYPICAL BAR PLACING DETAILS.

STRUCTURAL STEEL NOTES:

1. DETAIL, FABRICATE, AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH THE FOLLOWING, LATEST EDITIONS:
   A. AISC 360, "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS"
   B. AISC MANUAL OF STEEL CONSTRUCTION
   C. AISC 303, "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
   D. AWS D1.1, "STRUCTURAL WELDING CODE"

2. PROVIDE STRUCTURAL STEEL OF THE FOLLOWING ASTM DESIGNATIONS, UNLESS NOTED OTHERWISE:
   A. WIDE FLANGE SHAPES: A992
   B. CHANNELS, ANGLES, AND PLATES: A36
   C. HOLLOW STRUCTURAL SECTIONS, RECTANGULAR: A500, GR. C
   D. HOLLOW STRUCTURAL SECTIONS, CIRCULAR: A500, GR. C
   E. STRUCTURAL PIPE: A53, GR. B
   F. H-PILES: A572, GR. 50
   G. HIGH-STRENGTH PLATES: A572, GR. 50
   H. ANCHOR RODS: F1554, GR. 36

3. PROVIDE CONNECTION MATERIALS OF THE FOLLOWING ASTM DESIGNATIONS, U.O.N.:
   A. STIFFENER AND DOUBLER PLATES TO MATCH THE GRADE OF PRIMARY STRUCTURAL MEMBER.
   B. HIGH STRENGTH BOLTS: F3125, GR. A325
   C. HARDENED STEEL WASHERS: F436
   D. THREADED RODS: A36

4. WELD MINIMUM SIZE AND STRENGTH:
   A. FILLET WELDS SHALL NOT BE SMALLER THAN THE MINIMUM SIZE SPECIFIED IN TABLE J2.4 OF THE AISC MANUAL.
   B. PROVIDE MINIMUM EFFECTIVE THROAT THICKNESS OF PARTIAL PENETRATION GROOVE WELDS AS SPECIFIED IN TABLE J2.3 OF THE AISC MANUAL.
   C. SIZE WELDS IN TENSION CONNECTIONS TO DEVELOP THE FULL TENSILE STRENGTH OF THE MEMBER ELEMENT JOINED ON ALL SHOP AND FIELD WELDS, UNLESS NOTED OTHERWISE ON DRAWINGS.
   D. WHERE CONNECTIONS ARE NOTED ON DRAWINGS AS MOMENT CONNECTIONS, PROVIDE WELDS TO DEVELOP THE FULL FLEXURAL CAPACITY OF THE LESSER MEMBER.
      PROVIDE ELECTRODES FOR FIELD AND SHOP WELDING THAT CONFORM TO ASTM A233 (CLASS 70).
   E. ALL WELDS ARE CONTINUOUS FOR THE FULL LENGTH OF THE CONNECTION, UNLESS NOTED OTHERWISE ON DRAWINGS.

5. PROVIDE MINIMUM OF TWO BOLTS PER BOLTED CONNECTION. MINIMUM BOLT DIAMETER SHALL BE 3/4 INCH.

6. PROVIDE BOLTS, NUTS, AND WASHERS THAT ARE HOT DIP GALVANIZED ACCORDING TO ASTM A153, CLASS C, WHEN USED TO CONNECT STEEL ELEMENTS THAT ARE HOT DIP GALVANIZED AFTER FABRICATION.

7. SUBMIT CALCULATIONS FOR CONNECTION DESIGNS NOT FULLY DETAILED ON DRAWINGS. DESIGN CONNECTIONS UNDER SUPERVISION OF A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE PROJECT IS BEING CONSTRUCTED, AND EMPLOYED BY THE STEEL FABRICATOR. DESIGN CALCULATIONS SHALL BE SIGNED AND SEALED BY FABRICATOR'S REGISTERED PROFESSIONAL ENGINEER. SHOP DRAWINGS SUBMITTED WITHOUT COMPLETE DESIGN CALCULATIONS MAY NOT BE REVIEWED.

8. PROVIDE SIMPLE SHEAR CONNECTIONS FOR STEEL CONNECTIONS NOT FULLY DETAILED BY UTILIZING HIGH STRENGTH BEARING BOLTS IN SINGLE OR DOUBLE SHEAR. PROVIDE DOUBLE ANGLE BOLTED CONNECTIONS WHERE POSSIBLE. CONNECTION DESIGNER SHALL DESIGN SHEAR CONNECTION FOR THE LARGER OF:
   A. REACTION SHOWN ON DRAWINGS, OR
   B. MAXIMUM END REACTION RESULTING FROM THE APPLICATION OF THE ALLOWABLE UNIFORM LOADS LISTED IN TABLES OF PART 2 OF THE AISC MANUAL OF STEEL CONSTRUCTION, PLUS ANY LOADS OR REACTIONS OF MEMBERS SUPPORTED BY BEAM WITHIN THREE FEET OF BEAM END AND VERTICAL COMPONENTS OF FORCES IN BRACE MEMBERS FRAMING INTO BEAM.

9. STEEL FABRICATION:
   A. FABRICATE AND ASSEMBLE STRUCTURAL MEMBERS / ASSEMBLIES IN SHOP TO GREATEST EXTENT POSSIBLE.
   B. SPLICING OF STRUCTURAL STEEL MEMBERS IS PROHIBITED WITHOUT PRIOR APPROVAL OF THE ENGINEER OF RECORD.
   C. FABRICATOR SHALL BE RESPONSIBLE FOR ALL ERRORS OF DETAILING ON THE SHOP DRAWINGS, ERRORS IN FABRICATION, AND THE CORRECT FITTING OF STRUCTURAL STEEL MEMBERS.
   D. ERECTION TOLERANCES SHALL CONFORM TO THE AISC CODE OF STANDARD PRACTICE.
   E. FIELD MODIFICATION OF STRUCTURAL STEEL IS PROHIBITED WITHOUT PRIOR APPROVAL OF THE ENGINEER OF RECORD.
   F. CLEAN STEEL OF RUST, LOOSE MILL SCALE, AND OTHER FOREIGN MATERIALS WHERE REQUIRED FOR FABRICATION, FITTING UP, WELDING, PRIMING, OR PAINTING.
   G. DO NOT CUT STRUCTURAL STEEL MEMBERS FOR THE WORK OF OTHER TRADES WITHOUT PRIOR REVIEW AND APPROVAL OF THE ENGINEER OF RECORD.

10. HOT DIP GALVANIZE AFTER FABRICATION ALL STRUCTURAL STEEL AND THEIR CONNECTIONS PERMANENTLY EXPOSED TO WEATHER OR CORROSIVE ENVIRONMENTS. ITEMS INCLUDED BUT NOT LIMITED TO:
   A. SHELF ANGLES
   B. LOOSE LINTELS
   C. PLATES EMBEDDED IN CONCRETE

11. EXAMINE THE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR OTHER ITEMS THAT REQUIRE HOT-DIPPED GALVANIZATION.

12. PROVIDE DECK SUPPORT PLATES AND/OR ANGLES AT ALL COLUMNS.

13. FURNISH STEEL SHOP DRAWINGS FOR ARCHITECT'S AND STRUCTURAL ENGINEER'S REVIEW PRIOR TO FABRICATION. INCLUDE WELDING PROCEDURES, TESTING PROGRAMS FOR WELDING AND HIGH STRENGTH BOLTING, COATING MATERIAL, AND ERECTION SEQUENCE ON SHOP DRAWINGS. SHOP DRAWINGS SHALL NOT BE REPRODUCTIONS OF CONTRACT DOCUMENTS. SHOP DRAWINGS SHALL BE PREPARED UNDER THE SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF THE PROPOSED CONSTRUCTION, AND ALL DRAWINGS AND CALCULATIONS SHALL BE SIGNED AND SEALED BY SAID ENGINEER.

14. HEADED STUDS (SHEAR AND ANCHOR) AND DEFORMED ANCHORS:
   A. PROVIDE HEADED STUDS (SHEAR AND ANCHOR) MADE OF MATERIALS CONFORMING TO ASTM A108.
   B. PROVIDE DEFORMED ANCHORS MADE OF MATERIAL CONFORMING TO ASTM A496.
   C. WELD STUDS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. MANUAL ARC (STICK) WELDING OF HEADED STUDS AND/OR DEFORMED ANCHORS IS NOT ALLOWED.

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04/30/2027
Exp. Date

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
J.NEUBAUER	J.NEUBAUER	M.HORNBERGER	D.AIELLO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G
GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

STRUCTURAL GENERAL NOTES

DRAWING No.

PE-S 001.00

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SPECIAL INSPECTIONS:

SPECIAL INSPECTION SHALL MEET THE REQUIREMENTS OF THE ABOVE REFERENCED BUILDING CODE, CHAPTER 17. SPECIAL INSPECTOR(S) SHALL BE RETAINED BY THE OWNER TO PERFORM THE REQUIRED SPECIAL INSPECTIONS. THE NAMES AND QUALIFICATIONS OF THE PERSONS AND/OR FIRMS WHO ARE TO PERFORM THE SPECIAL INSPECTIONS SHALL BE PROVIDED TO THE BUILDING OFFICIAL FOR APPROVAL PRIOR TO THE START OF CONSTRUCTION. THE SPECIAL INSPECTOR(S) SHALL COMPLETE AND SUBMIT ALL FORMS, REPORTS, AND CERTIFICATES REQUIRED BY THE JURISDICTION WHERE CONSTRUCTION OR WORK IS LOCATED.

1. THE SPECIAL INSPECTOR(S) SHALL:
   - A. OBSERVE THE WORK ASSIGNED FOR CONFORMANCE TO THE APPROVED DRAWINGS AND SPECIFICATIONS.
   - B. FURNISH INSPECTION REPORTS TO ENGINEER OF RECORD AND BUILDING DEPARTMENT. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION, THEN, IF NOT CORRECTED, TO THE ATTENTION OF THE ENGINEER AND THE BUILDING DEPARTMENT.
   - C. SUBMIT TO THE ENGINEER OF RECORD AND THE BUILDING DEPARTMENT A SIGNED FINAL REPORT STATING THAT THE WORK WAS IN CONFORMANCE WITH THE APPROVED DRAWINGS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE BUILDING CODE.

2. SPECIAL INSPECTION NOTES:
   - A. WHERE FABRICATION OF STRUCTURAL LOAD-BEARING MEMBERS AND ASSEMBLIES IS BEING PERFORMED ON THE PREMISES OF A FABRICATOR'S SHOP, SPECIAL INSPECTION OF THE FABRICATED ITEMS IS REQUIRED DURING THE PERFORMANCE OF THE WORK EXCEPT WHERE THE FABRICATOR HAS BEEN APPROVED TO PERFORM THE WORK WITHOUT SPECIAL INSPECTION IN ACCORDANCE WITH THE APPLICABLE BUILDING CODE. WHERE SPECIAL INSPECTION HAS BEEN EXEMPTED DURING FABRICATION, FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE IN LIEU OF THE INSPECTION, STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS.
   - B. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE SPECIAL INSPECTOR(S) WITH ADVANCE NOTICE, NO LESS THAN 72 HOURS, OF THE INITIATION OF ANY WORK REQUIRED TO HAVE SPECIAL INSPECTIONS. ALL WORK PERFORMED WITHOUT REQUIRED SPECIAL INSPECTION WILL BE SUBJECT TO REMOVAL.
   - C. THE CONSTRUCTION OR WORK FOR WHICH SPECIAL INSPECTION IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED FOR SPECIAL INSPECTION UNTIL COMPLETION OF THE REQUIRED INSPECTIONS AND/OR TESTS.
3. STRUCTURAL OBSERVATION NOTES:
   - A. WHERE REQUIRED BY THE BUILDING CODE OR BUILDING OFFICIAL, OR ELECTED BY THE OWNER OR ENGINEER OF RECORD, THE ENGINEER OF RECORD OR A DESIGNATED REGISTERED PROFESSIONAL ENGINEER ACTING ON THE OWNER'S OR ENGINEER'S BEHALF MAY PERFORM STRUCTURAL OBSERVATIONS DURING CONSTRUCTION.
   - B. STRUCTURAL OBSERVATIONS DO NOT INCLUDE, OR WAIVE THE RESPONSIBILITY FOR, THE PERFORMANCE OF SPECIAL INSPECTIONS AS REQUIRED HEREIN, OR FOR ANY OTHER INSPECTIONS AS REQUIRED BY THE BUILDING CODE OR BUILDING OFFICIAL.

4. SPECIAL INSPECTIONS AND TESTS OF ELEMENTS OF BUILDINGS AND STRUCTURES SHALL MEET THE APPLICABLE REQUIREMENTS LISTED BELOW.
   - A. STEEL CONSTRUCTION:
     - a. STRUCTURAL STEEL:
       - SPECIAL INSPECTION AND NONDESTRUCTIVE TESTING OF STRUCTURAL STEEL ELEMENTS IN BUILDINGS, STRUCTURES, AND PORTIONS THEREOF SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF AISC 360, LATEST EDITION.
     - b. COLD-FORMED STEEL DECK:
       - SPECIAL INSPECTIONS AND QUALIFICATION OF WELDING SPECIAL INSPECTOR(S) FOR COLD-FORMED STEEL FLOOR AND ROOF DECK SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE INSPECTION REQUIREMENTS OF SDI QA/QC.
     - c. OPEN-WEB STEEL JOISTS AND JOIST GIRDERS:
       - SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS IN BUILDINGS, STRUCTURES, AND PORTIONS THEREOF SHALL BE IN ACCORDANCE WITH BUILDING CODE TABLE 1705.2.3.
     - d. COLD-FORMED STEEL TRUSSES SPANNING 60 FEET OR GREATER:
       - SPECIAL INSPECTOR SHALL VERIFY THAT THE TEMPORARY INSTALLATION RESTRAINT/BRACING AND THE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT/BRACING ARE INSTALLED IN ACCORDANCE WITH THE APPROVED TRUSS SUBMITTAL PACKAGE.
   - B. CONCRETE CONSTRUCTION:
     - a. SPECIAL INSPECTIONS OF CONCRETE CONSTRUCTION SHALL BE PERFORMED AS LISTED BELOW AND IN ACCORDANCE WITH BUILDING CODE TABLE 1705.3, EXCEPT AS ALLOWED PER THE EXEMPTIONS LISTED IN BUILDING CODE SECTION 1705.3.
     - b. PERIODIC INSPECTION OF REINFORCING STEEL AND PRESTRESSING TENDON MATERIAL AND PLACEMENT.
     - c. PERIODIC INSPECTION OF REINFORCING STEEL WELDING, INCLUDING BAR MATERIAL AND WELDS AS REQUIRED.
     - d. PERIODIC INSPECTION OF ANCHORS CAST IN FRESH CONCRETE.
     - e. INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE PER ACI 318, SECTION 17.8.
     - f. PERIODIC VERIFICATION OF USE OF REQUIRED DESIGN MIX.
     - g. FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE TEMPERATURE OF THE FRESH CONCRETE PRIOR TO CONCRETE PLACEMENT.
     - h. CONTINUOUS INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.
     - i. PERIODIC VERIFICATION OF MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.
     - j. INSPECT PRESTRESSED CONCRETE FOR APPLICATION OF PRESTRESSING FORCES AND GROUTING OF BONDED PRESTRESSING TENDONS.
     - k. PERIODIC INSPECTION OF ERECTION OF PRECAST CONCRETE MEMBERS.
     - l. VERIFY IN-SITU CONCRETE STRENGTH:
       - PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE, AND
       - PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.
     - m. PERIODIC INSPECTION OF FORMWORK FOR SHAPE, LOCATION, AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.
   - C. MASONRY CONSTRUCTION:
     - a. SPECIAL INSPECTIONS AND TESTS OF MASONRY CONSTRUCTION, INCLUDING VERTICAL MASONRY FOUNDATION ELEMENTS, SHALL BE PERFORMED IN ACCORDANCE WITH THE QUALITY ASSURANCE PROGRAM REQUIREMENTS OF TMS 402 AND TMS 602, LATEST EDITIONS, EXCEPT AS SPECIFICALLY EXEMPTED BY BUILDING CODE SECTION 1705.4
   - D. WOOD CONSTRUCTION:
     - a. SPECIAL INSPECTIONS OF PREFABRICATED WOOD STRUCTURAL ELEMENTS SHALL BE IN ACCORDANCE WITH BUILDING CODE 1704.2.5 AND THE NOTES ABOVE FOR SHOP FABRICATION.
     - b. HIGH LOAD WOOD DIAPHRAGMS SHALL BE INSPECTED FOR: GRADE AND THICKNESS OF WOOD STRUCTURAL PANEL SHEATHING, NOMINAL SIZE OF FRAMING MEMBERS AT PANEL EDGES, AND FASTENER SIZE AND SPACING.
     - c. METAL-PLATE CONNECTED WOOD TRUSSES SPANNING 60 FEET OR GREATER:
       - SPECIAL INSPECTOR SHALL VERIFY THAT THE TEMPORARY INSTALLATION RESTRAINT/BRACING AND THE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT/BRACING ARE INSTALLED IN ACCORDANCE WITH THE APPROVED TRUSS SUBMITTAL PACKAGE.
   - E. SOILS:
     - a. SPECIAL INSPECTIONS AND TESTS OF EXISTING SITE SOIL CONDITIONS, FILL PLACEMENT, AND LOAD-BEARING REQUIREMENTS SHALL BE PERFORMED IN ACCORDANCE WITH BUILDING CODE SECTION 1705.6 AND TABLE 1705.6, INCLUDING:
       - PERIODIC VERIFICATION THAT MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.
       - PERIODIC VERIFICATION THAT EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER BEARING MATERIAL.
       - PERIODIC CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.
       - CONTINUOUS VERIFICATION OF USE OF PROPER FILL MATERIALS, FILL MATERIAL DENSITIES, AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.
       - PERIODIC INSPECTION OF SUBGRADE PREPARATION PRIOR TO PLACEMENT OF COMPACTED FILL.
   - F. DEEP FOUNDATIONS:
     - a. SPECIAL INSPECTIONS AND TESTS SHALL BE PERFORMED DURING INSTALLATION OF DRIVEN DEEP FOUNDATIONS IN ACCORDANCE WITH BUILDING CODE SECTION 1705.7 AND TABLE 1705.7.
     - b. SPECIAL INSPECTIONS AND TESTS SHALL BE PERFORMED DURING INSTALLATION OF CAST-IN-PLACE DEEP FOUNDATIONS IN ACCORDANCE WITH BUILDING CODE SECTION 1705.8 AND TABLE 1705.8.
     - c. SPECIAL INSPECTIONS SHALL BE PERFORMED DURING THE INSTALLATION OF HELICAL PILE FOUNDATIONS IN ACCORDANCE WITH BUILDING CODE SECTION 1705.9.
   - G. MAIN WIND-FORCE RESISTING SYSTEM: [>> ENGR NOTE: THIS DOES NOT ALWAYS APPLY, SEE BC SECTION 1705.11 FOR APPLICABILITY <<]
     - a. ELEMENTS OF THE MAIN WIND-FORCE RESISTING SYSTEM SHALL BE INSPECTED IN ACCORDANCE WITH BUILDING CODE SECTION 1705.11
   - H. MAIN SEISMIC-FORCE RESISTING SYSTEM: [>> ENGR NOTE: THIS DOES NOT ALWAYS APPLY, SEE BC SECTIONS 1705.12 AND 1705.13 FOR APPLICABILITY <<]
     - a. ELEMENTS OF THE MAIN SEISMIC-FORCE RESISTING SYSTEM SHALL BE INSPECTED IN ACCORDANCE WITH BUILDING CODE SECTIONS 1705.12 AND 1705.13.
   - I. SPECIAL INSPECTIONS SHALL BE PROVIDED FOR ANY OTHER ELEMENTS NOT LISTED AS ABOVE AS DEEMED NECESSARY BY THE BUILDING OFFICIAL.

TABLE 1705.3 REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE	PERIODIC STAGES	REQ.
1. INSPECT REINFORCEMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT.	-	X	ACI 318: Ch. 20, 25.2, 25.3, 26.1 - 26.6.3	1705.3, 1908.4	PRIOR TO STARTING POURS WHERE CONCRETE IS TO BE SAMPLED	Y
2. REINFORCING BAR WELDING: A. VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A706	-	X	AWS: D1.4 ACI 318: 26.6.4	1705.3, 1705.3.1	PRIOR TO ENCLOSING	Y
B. INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM 5/16", AND	X	X				Y
C. INSPECT ALL OTHER WELDS.	-	-				Y
3. INSPECT ANCHORS CAST IN CONCRETE.	-	X	ACI 318: 17.8.2	1705.3	-	Y
4. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS. A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS.	X	X	ACI 318: 17.8.2	1705.3	WHEN INSTALLED	Y
B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.A.	X	X	ACI 318: 18.7.2.4			Y
5. VERIFY USE OF REQUIRED DESIGN MIX.	-	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1705.3, 1904.1-2, 1908.2-3	EACH TIME FRESH CONCRETE IS SAMPLED	Y
6. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	-	ASTM C 172, C31 ACI 318: 26.4, 26.12	1705.3, 1908.10	EACH TIME CONCRETE CYLINDERS TAKEN	Y
7. INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	-	ACI 318: 26.5	1705.3, 1908.6-8	EACH TIME FRESH CONCRETE IS SAMPLED	Y
8. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	-	X	ACI 318: 28.5.3 - 26.5.5	1705.3, 1908.9	(1) UNANNOUNCED INSPECTION FOR EVERY 250 CY. OF CONCR. PLACED FOR ENTIRE PROJ.	Y
9. INSPECT PRESTRESSED PRESTRESSED CONCRETE FOR: A. APPLICATION OF PRESTRESSING FORCES; AND	X	X	ACI 318: 26.10	1705.3	-	N
B. GROUTING OF BONDED PRESTRESSING TENDONS.	X	X			-	N
10. INSPECT ERECTION OF PRECAST CONCRETE MEMBERS.	-	-	ACI 318: Ch. 26.8	1705.3	PRIOR TO ENCLOSING	N
11. VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	-	-	ACI 318: 26.11.2	1705.3	-	N
12. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	-	ACI 318 26.11.2(b)	-	-	Y
13. MATERIAL TESTS - IN ABSENCE OF SUFFICIENT DATA OR DOCUMENTATION FOR MATERIALS.	-	-	ACI 318 Ch. 19 - 20	-	-	Y

FOR SI: 1 INCH = 25.4 mm.
A. WHERE APPLICABLE, SEE SECTION 1705.12. SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE.
B. SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR THE ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2. IN ACI 318, OR OTHER QUALIFICATION PROCEDURES. WHERE SPECIFIED REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.

TABLE 1704.3 REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION 2018 NYBC

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE	PERIODIC STAGES	REQ.
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS COMPLIANCE: A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	-	X	-	-	PRIOR TO ENCLOSING	Y
B. CERTIFICATE OF COMPLIANCE REQUIRED (SHOP DRAWINGS)	-	X	-	-	CONTRACTOR TO SUBMIT SHOP DRAWINGS	Y
2. INSPECTION OF HIGH STRENGTH BOLTING: A. BEARING-TYPE CONNECTION	-	X	AISC 360, SECTION M2.5	1704.3.3	PRIOR TO ENCLOSING	Y
B. SLIP-CRITICAL CONNECTIONS	X	X			PRIOR TO ENCLOSING	N
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL A. IDENTIFICATION MARKUPS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS	-	X	ASTM A6 OR ASTM A558	1708.4	PRIOR TO ENCLOSING	Y
B. MANUFACTURER'S CERTIFIED MILL TEST REPORTS	-	X			CONTRACTOR TO SUBMIT	Y
4. MATERIAL VERIFICATION OF FILLER MATERIALS: A. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS	-	X	AISC 360, SEC. A3.5 -	1708.4	PRIOR TO ENCLOSING	Y
B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED (SHOP DRAWINGS)	-	X			CONTRACTOR TO SUBMIT AS SHOP DRAWINGS	Y
5. INSPECTION OF WELDING: A. STRUCTURAL STEEL 1. COMPLETE & PARTIAL PENETRATION GROOVE WELD	-	X	AWS D1.1	-		Y
2. MULTI-PASS FILLET WELDS.	-	X	AWS D1.1	-		N
3. SINGLE-PASS FILLET WELDS > 5/16" (7.9 MM)	-	X	AWS D1.1	-		N
4. SINGLE-PASS FILLET WELDS < 5/16" (7.9 MM)	-	X	AWS D1.1	-		Y
5. FLOOR & ROOF DECK WELDS	-	X	AWS D1.3	-		N
B REINFORCING STEEL 1. VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A 706	-	X	AWS D1.4 ACI 318: 3.5.2	-	PRIOR TO ENCLOSING	N
2. REINFORCING STEEL-RESISTING FLEXURAL & AXIAL FORCES IN INTERMEDIATE & SPECIAL MOMENT FRAMES, & BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS, & SHEAR REINFORCEMENT	-	X		-		N
3. SHEAR REINFORCEMENT	-	X		-		N
4. OTHER REINFORCING STEEL	-	X		-		N
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS A. DETAILS SUCH AS BRACING AND STIFFENING	-	-	-	1704.3.2	PRIOR TO ENCLOSING	N
B. MEMBER LOCATIONS	-	-	-			N
C. APPLICATION OF JOINT DETAILS AT EACH CONNECTION	-	-	-			N
7. COLD-FORMED STEEL DECK A. SDI DECK INSPECTION PROGRAM	X	X	SDI QA/QC 2022 C1/C2 & D1-D4 APPENDIX 1	1705.2, 1705.2.2	PRIOR TO ENCLOSING	Y
B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED (SHOP DRAWINGS & SUBMITTALS)	-	X	SDI QA/QC 2022 B1/B2	1705.2, 1705.2.2		Y

TABLE 1705.6 REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD	IBC REFERENCE	PERIODIC STAGES	REQ.
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	-	X	-	-	AT COMPLETION OF EXCAVATION	Y
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	-	X	-	-	AT COMPLETION OF EXCAVATION	Y
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	-	X	-	-	AT COMPLETION OF COMPACTION	Y
4. DURING FILL PLACEMENT, VERIFY USE OF PROPER MATERIALS AND PROCEDURES IN ACCORDANCE WITH THE PROVISIONS OF THE APPROVED GEOTECHNICAL REPORT. VERIFY DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	-	-	-	-	Y
5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	-	X	-	-	AT COMPLETION OF EXCAVATION	Y

LIST OF ABBREVIATIONS:

NOTE: ABBREVIATIONS MAY OR MAY NOT APPEAR WITH PUNCTUATIONS

AB	ANCHOR BOLT	JST	JOIST
AC	ALASKA CEDAR (WOOD)	JNT	JOINT
ABT	ABOUT		
ABV	ABOVE	K	KIP
ADDL	ADDITIONAL	KSI	KIPS PER SQUARE INCH
ADJ	ADJACENT	KSF	KIPS PER SQUARE FOOT
ALT	ALTERNATE		
AMP	AMPLITUDE	L	ANGLE (STEEL SHAPE)
ANCH	ANCHOR	LB(S)	POUND(S)
AGGR	AGGREGATE	LG	LONG
APPROX	APPROXIMATE(LY)	LONG	LONGITUDINAL
ARCH	ARCHITECT(URE)(URAL)	LVL	LAMINATED VENEER LUMBER
		LWC	LIGHTWEIGHT CONCRETE
BD	BOARD		
BF	BRACED FRAME	MANUF	MANUFACTURER
BLDG	BUILDING	MAX	MAXIMUM
BLK	BLOCK	MC	MISCELLANEIOUS CHANNEL (STEEL SHAPE)
BLKG	BLOCKING	MEZZ	MEZZANINE
BLW	BELOW	MF	MOMENT FRAME
BM	BEAM	MECH	MECHANICAL
BN	BOUNDARY NAILING	MIN	MINIMUM
BOT	BOTTOM	MTL	METAL
BO	BOTTOM OF		
BOC	BOTTOM OF CONCRETE	(N)	NEW
BOF	BOTTOM OF FOOTING	N/A	NOT APPLICABLE
BOS	BOTTOM OF STEEL	NO	NUMBER
BRG	BEARING	NWC	NORMAL WEIGHT CONCRETE
B.S.	BOTH SIDES		
BSMT	BASEMENT	OC	ON CENTER
BTWN	BETWEEN	OD	OUTSIDE DIAMETER
		OF	OUTSIDE FACE
C	CHANNEL (STEEL SHAPE)	OH	OPPOSITE HAND
C/C	CENTER TO CENTER	OPNG	OPENING
CFS	COLD-FORMED STEEL	OPP	OPPOSITE
CIP	CAST-IN-PLACE	ORIG	ORIGINAL
CJ	CONSTRUCTION JOINT		
CJP	COMPLETE JOINT PENETRATION	PAF	POWDER ACTUATED FASTENER
CLG	CEILING	PCF	POUNDS PER CUBIC FOOT
CLR	CLEAR	PCI	POUNDS PER CUBIC INCH
CMU	CONCRETE MASONRY UNIT	PDF	POWDER DRIVEN FASTENER
COL	COLUMN	PEF	(PLYWOOD) PANEL EDGE FASTENER
COLL	COLLECTOR	PEN	(PLYWOOD) PANEL EDGE NAILING
CONC	CONCRETE	PERF	PERFORATED
CONT	CONTINUOUS	PIPE-X	EXTRA STRONG PIPE
CNXN	CONNECTION	PIPE-XX	DOUBLE EXTRA STRONG PIPE
CTR	CENTER	PJP	PARTIAL JOINT PENETRATION
CTSK	COUNTERSUNK	PEN	PENETRATION
		PL	PLATE
d	PENNY WEIGHT (NAILS)	PLWD	PLYWOOD
DBL	DOUBLE	PP	PARTIAL PENETRATION
DE	DECK EDGE	PSF	POUNDS PER SQUARE FOOD
DEMO	DEMOLITION	PSI	POUNDS PER SQUARE INCH
DTL	DETAIL	PSL	PARALLEL STRAND LUMBER
DIAM	DIAMETER	PT	PRESSURE TREATED
DISCONT	DISCONTINUOUS		
DN	DOWN	REINF	REINFORCEMENT
DO	DITTO	REQD	REQUIRED
DWG(S)	DRAWING(S)	RR	ROOF RAFTERS
(E)	EXISTING	SAD	SEE ARCHITECTURAL DRAWINGS
EA	EACH	SHTG	SHEATHING
EF	EACH FACE	SIM	SIMILAR
EJ	EXPANSION JOINT	SOG	SLAB ON GRADE
EN	EDGE NAILING	SQ	SQUARE
EO	EDGE OF	STAGG	STAGGER(ED)
EOD	EDGE OF DECK	STL	STEEL
EOS	EDGE OF SLAB	STRUCT	STRUCTURAL
EQ	EQUAL (EQUIVALENT)	SYM	SYMMETRICAL
ES	EACH SIDE		
EW	EACH WAY	T&B	TOP AND BOTTOM
EXP	EXPANSION	TD	TIE-DOWN
EXT	EXTERIOR	THD	THREADED
		THK	THICK(NESS)
FDN	FOUNDATION	TN	TOENAIL
FIN	FINISH(ED)	TO	TOP OF
FF	FINISHED FLOOR	TOBS	TOP OF BRICK SHELF
FLR	FLOOR	TOC	TOP OF CONCRETE
FN	FIELD NAIL	TOF	TOP OF FOOTING
FO	FACE OF	TOG	TOP OF GRATING
FOC	FACE OF CONCRETE	TOP	TOP OF PIER/PEDESTAL
FOS	FACE OF STEEL OR STUD	TOS	TOP OF STEEL
FT	FOOT OR FEET	TOSh	TOP OF SHELF
FTG	FOOTING	TOSl	TOP OF SLAB
		TOW	TOP OF WALL
GA	GAUGE	TRANS	TRANSVERSE
GALV	GALVANIZED	TR	THREADED ROD
GB	GRADE BEAM	TWS	THREADED WELDED STUD
GLB	GLULAM BEAM	TYP	TYPICAL
GLC	GLULAM COLUMN		
GYP	GYPSUM	UON	UNLESS OTHERWISE NOTED
HORIZ	HORIZONTAL	VERT	VERTICAL
HD	HOLDOWN		
HDG	HOT-DIP GALVANIZED	W/	WITH
HDR	HEADER	WF	WIDE FLANGE (STEEL SHAPE)
HGR	HANGER	WO	WHERE OCCURS
HK	HOOK	W/O	WITHOUT
HSS	HOLLOW STRUCTURAL SECTION	WP	WORK-POINT
		WT	WIDE FLANGE TEE (STEEL SHAPE)
ID	INSIDE DIAMETER	WWF	WELDED WIRE FABRIC
IF	INSIDE FACE		
IN	INCH		
INCL	INCLUDED		
INFO	INFORMATION		
INSUL	INSULATION		
INT	INTERIOR		

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CONSULTANTS:

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04/30/2027
Exp. Date

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J.NEUBAUER	J.NEUBAUER	M.HORNBERGER	D.AIELLO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

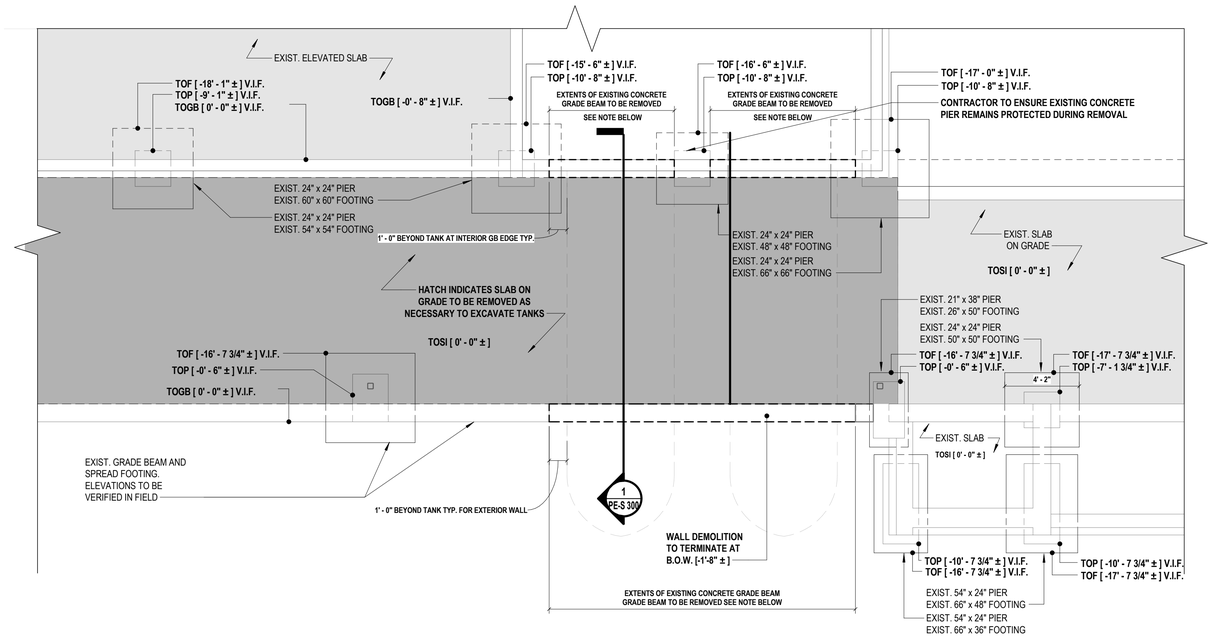
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STRUCTURAL SPECIAL INSPECTIONS

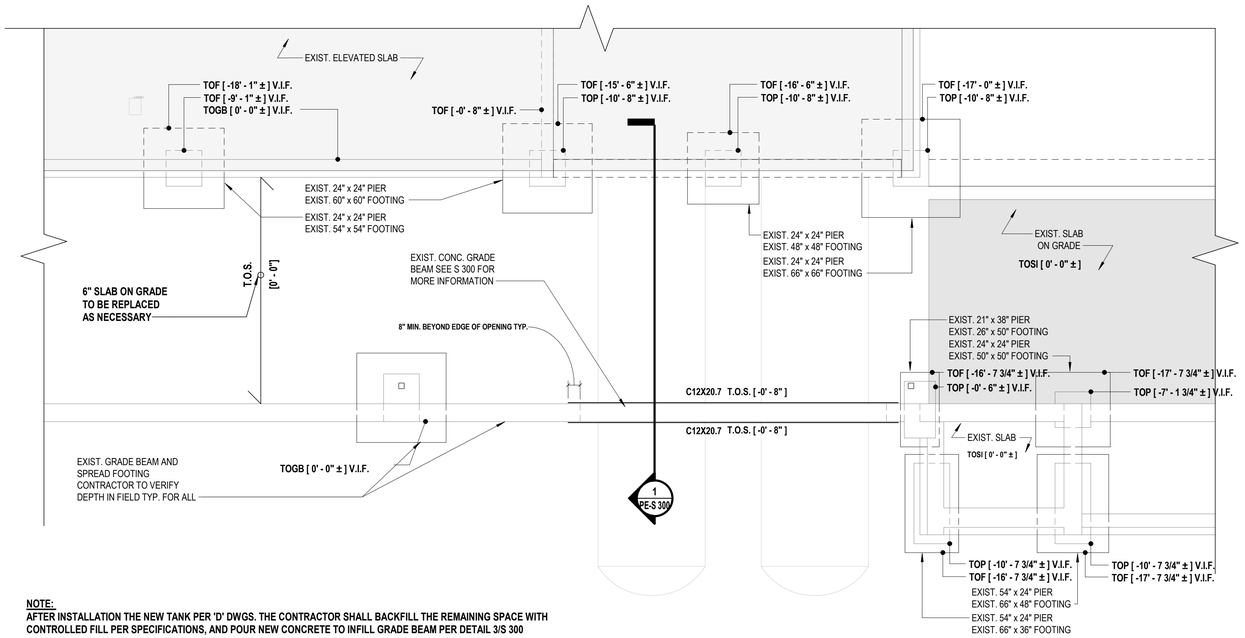
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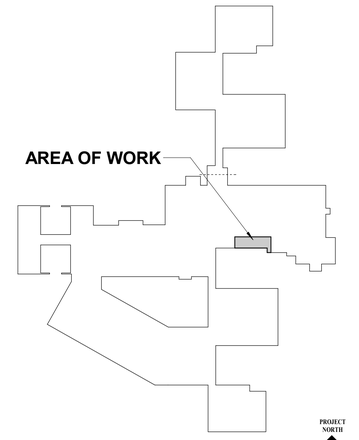
NOTE:
CONTRACTOR TO ENSURE PROPER BRACING OF WALL IS ACHIEVED PRIOR TO REMOVAL

1 Tank Removal - Demo Plan
SCALE: 1/4" = 1'-0"



NOTE:
AFTER INSTALLATION THE NEW TANK PER 'D' DWGS. THE CONTRACTOR SHALL BACKFILL THE REMAINING SPACE WITH CONTROLLED FILL PER SPECIFICATIONS, AND POUR NEW CONCRETE TO INFILL GRADE BEAM PER DETAIL 3/S 300

2 Tank Removal - Proposed Plan
SCALE: 1/4" = 1'-0"



KEY PLAN
SCALE: 1" = 100'-0"

FOUNDATION PLAN NOTES:

1. ELEVATIONS SHOWN THUS [ ] ARE RELATIVE TO FINISHED FIRST FLOOR ELEVATION [0'-0"].
2. BACKFILLING SHALL NOT COMMENCE AT AREAS ADJACENT TO BASEMENT FOUNDATION WALLS UNTIL THE WALL HAS BEEN PROPERLY LATERALLY BRACED.
3. ENSURE ADEQUATE BRACING OF EXISTING FOUNDATION WALL IS PROVIDED AS EXCAVATION TO EXPOSE THE WALL IS OCCURING.
4. ALL EXCAVATED EARTH SHALL BE REPLACED WITH CONTROLLED FILL AS PER SPECIFICATION.
5. REFER TO 'A' DWGS FOR WATERPROOFING REQUIREMENTS.

SLAB PLAN NOTES:

1. ELEVATIONS SHOWN THUS [ ] ARE RELATIVE TO FINISHED FIRST FLOOR ELEVATION [0'-0"].
2. PROVIDE 1/2" PRE-MOLDED EXPANSION JOINT AROUND PERIMETER OF CONCRETE SLAB ON GRADE WHERE IT ABUTS THE FOUNDATION WALL OF THE BUILDING.
3. PROVIDE CONTINUOUS 12 GA. POURSTOP WITH 18 GA. CELL CLOSURE AROUND PERIMETER OF FLOOR SLAB WHERE IT ABUTS THE FOUNDATION WALL.

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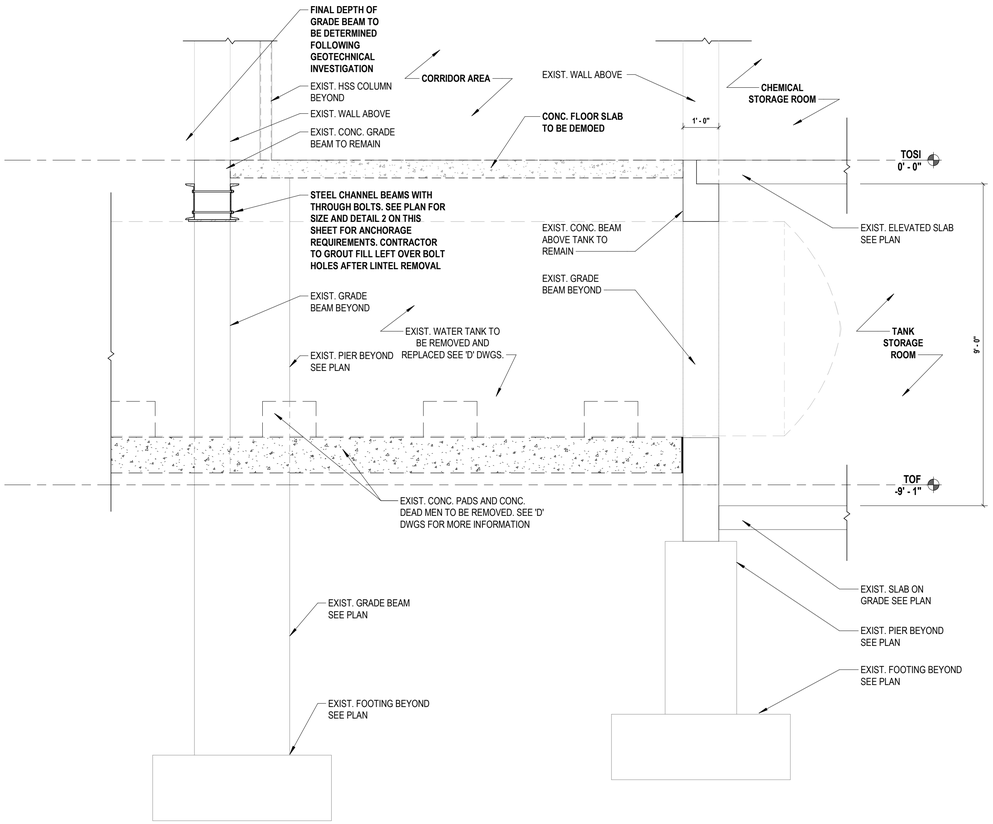
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STRUCTURAL
TANK REMOVAL PARTIAL PLANS

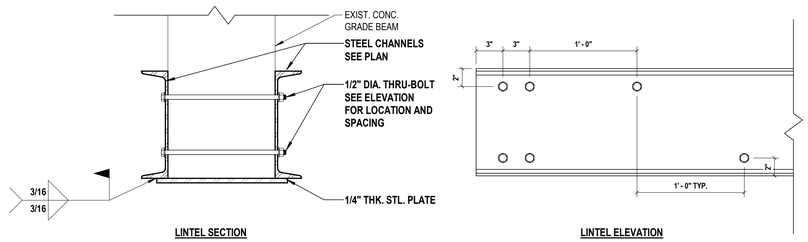
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1 Tank Removal Section

SCALE: 1/2" = 1'-0"

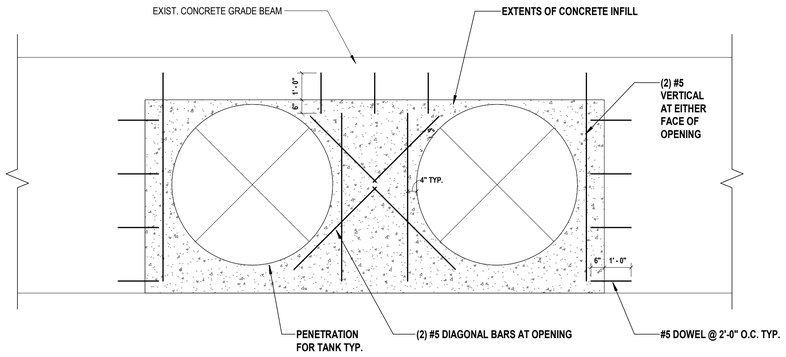


LINTEL SECTION

LINTEL ELEVATION

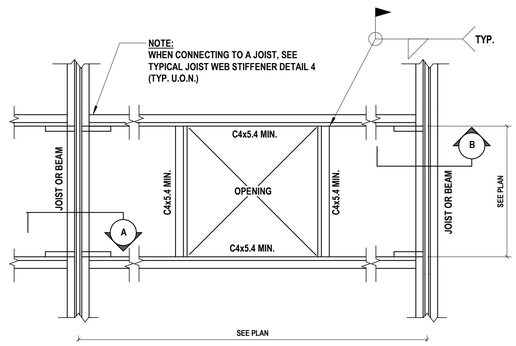
2 Lintel at Existing Concrete Grade Beam

SCALE: 1 1/2" = 1'-0"



3 Gradebeam Infill Detail

SCALE: 3/8" = 1'-0"

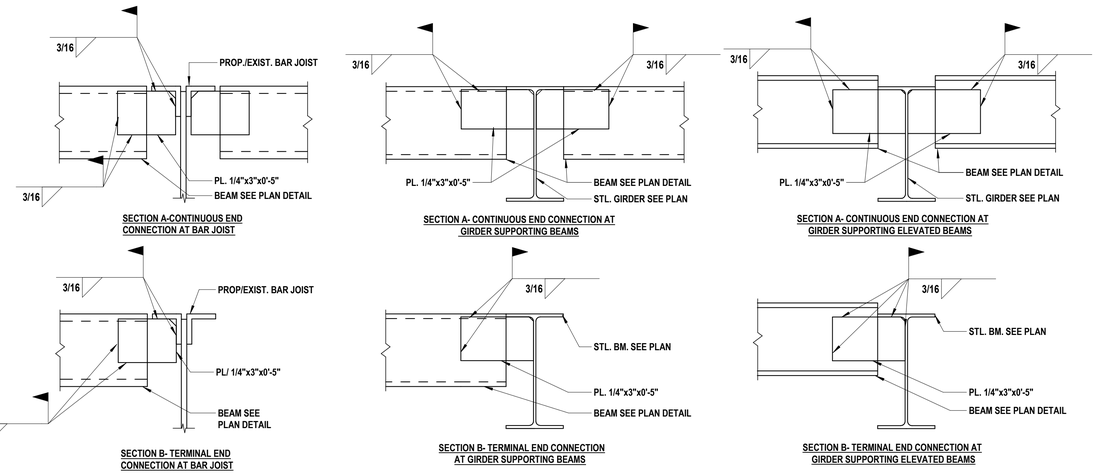


NOTE:
MAX. SIZE OPENING 60"x60"
MAX. UNIT WEIGHT 1000#
SEE 'M' DWGS. FOR OPENING LOCATIONS

MEMBER SIZE
C4x5.4 U.O.N. IN PLANS

PLAN

NOTE:
PROVIDE 1/8" FILLET WELD FOR ATTACHING TO EXISTING STEEL THAT IS LESS THAN 1/4". PROVIDE 3/16" WELD FOR ATTACHING TO EXISTING STEEL THAT IS EQUAL TO OR GREATER THAN 1/4" THICK.



4 Typical Framed Roof Opening at Steel Joist or Beam

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STRUCTURAL SECTIONS AND DETAILS

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PHASE 2 - CASEWORK IN FRONT OF HVAC WORK - UV WILL BE SMALLER ALSO

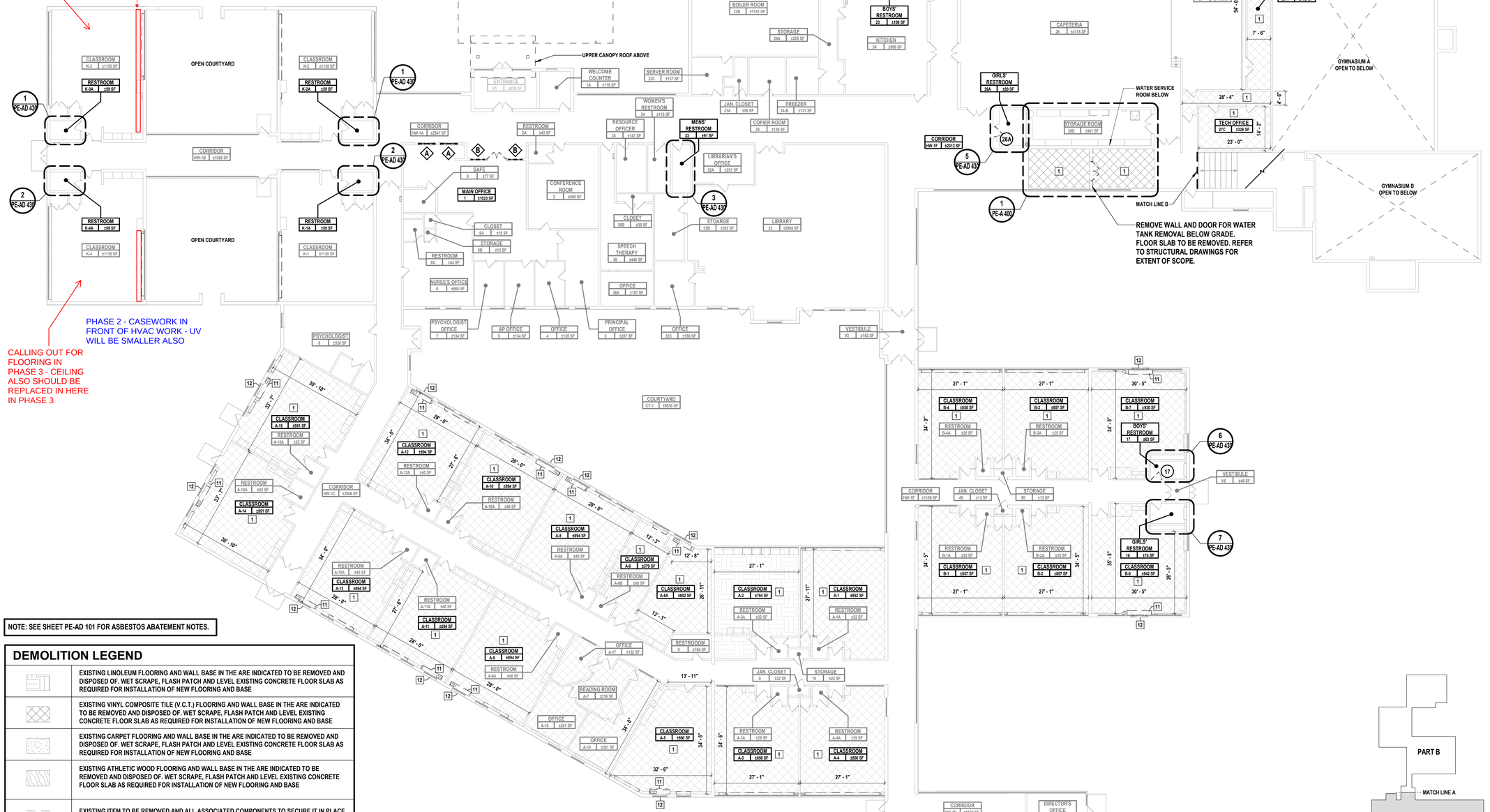
CALLING OUT FOR FLOORING IN PHASE 3 - CEILING ALSO SHOULD BE REPLACED IN HERE IN PHASE 3



PHASE 2 - CASEWORK IN FRONT OF HVAC WORK - UV WILL BE SMALLER ALSO

CALLING OUT FOR FLOORING IN PHASE 3 - CEILING ALSO SHOULD BE REPLACED IN HERE IN PHASE 3

MATCH LINE A



NOTE: SEE SHEET PE-AD 101 FOR ASBESTOS ABATEMENT NOTES.

DEMOLITION LEGEND

	EXISTING LINOLEUM FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING VINYL COMPOSITE TILE (V.C.T.) FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING CARPET FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING ATHLETIC WOOD FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING ITEM TO BE REMOVED AND ALL ASSOCIATED COMPONENTS TO SECURE IT IN PLACE. CONTRACTOR TO PREP OPENINGS TO RECEIVE NEW DOOR AND WINDOWS
A	INDICATES WINDOW TAGS FOR WORK IN CONTRACT - FIELD VERIFY ALL WINDOW SIZES

DEMOLITION NOTES

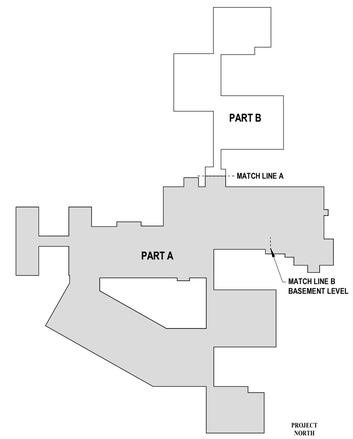
1	FLOOR FINISHES	REMOVE AND DISPOSE OF EXISTING WALL BASE, AND FLOOR FINISHES DOWN TO SUB-FLOOR. CONTRACTOR SHALL BE RESPONSIBLE TO INSPECT THE EXISTING CONCRETE SLAB-FLOOR CONDITION AND PATCH ALL EXPOSED SURFACES AS NEEDED TO ENSURE A TRUE SMOOTH AND LEVEL FLOOR FINISH FREE OF DIPS, WAVES, DEPRESSIONS, AND TELEGRAPHING OF THE LEVELING COMPOUND OR IMPERFECTIONS OF THE SLAB BELOW. ASSUME FLOOR PREP THAT MAY INCLUDE FLASH PATCH EXISTING MATERIALS IN EACH ROOM.
11	UNIT VENTILATOR	GC SHALL COORDINATE WITH MECHINCAL CONTRACTOR ON REMOVAL OF EXISTING LOUVER, WALL BOX, AND UNIT VENTILATOR. COORDINATE WITH MECHANICAL CONTRACTOR FOR LOCATIONS.
12	LOUVER	REMOVE AND DISPOSE OF EXISTING LOUVER. GC TO COORDINATE WITH MECHANICAL CONTRACTOR IN PREPARATION OF EXISTING OPENING FOR NEW LOUVER.

GENERAL NOTES

1. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL WALL MOUNTED ITEMS TO REMAIN THROUGHOUT THE COURSE OF WORK, UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND QUANTITIES PRIOR TO START OF WORK.
3. ALL ITEMS TO BE DEMOLISHED OR REMOVED WHICH MAY NOT HAVE BEEN NOTED, OR FOUND AFTER THE WORK HAS BEEN COMPLETED IS THE RESPONSIBILITY OF THE CONTRACTOR. BEYOND THE NOTED ITEMS THE CONTRACTOR IS RESPONSIBLE FOR ALL ITEMS TO BE DEMOLISHED AND REMOVED AS REQUIRED TO ACCOMMODATE NEW CONSTRUCTION.

1 **DEMOLITION FIRST FLOOR PLAN - PART 'A'**
SCALE: 1/16" = 1'-0"

PROJECT NORTH



2 **KEY PLAN - PART 'A'**
SCALE: 1" = 100'-0"

PROJECT NORTH

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REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A. Exp. Date
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M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

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SOMERS CENTRAL SCHOOL DISTRICT

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SED #: 66-21-01-06-0-002-017

CONTRACT

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SHEET TITLE

FIRST FLOOR PLAN - PART 'A'

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ASBESTOS ABATEMENT NOTES

1. ALL ASBESTOS ABATEMENT WORK SHALL CONFORM TO ALL APPLICABLE CODE REQUIREMENTS ALONG WITH SPECIFICATION SECTION 028200 AND INDUSTRIAL CODE RULE 56.
2. MATERIALS TO BE REMOVED ARE ASSUMED TO CONTAIN THE PRESENCE OF ASBESTOS AND ARE SUBJECT TO VERIFICATION PRIOR TO CONSTRUCTION:
   - 9" x 9" FLOOR TILE & MASTIC
   - PIPE INSULATION &FITTINGS
   - WOOD DOOR CORE INSULATION
   - RADIATOR BACKING INSULATION
   - ROOF FLASHING MATERIALS
   - ELECTRICAL WIRE INSULATION AT CANOPY
   - CONCEALED WATERPROOFING MATERIALS AT CANOPY
   - CONCEALED WINDOW AND DOOR LINTEL FLASHING MATERIALS
   - EXTERIOR WINDOW CAULK
3. SPECIFICATION SECTION 022600 "HAZARDOUS MATERIAL REPORT" FOR ADDITIONAL INFORMATION ON THE MATERIALS AND THEIR LOCATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE TO PERFORM PERSONAL AIR MONITORING ON ITS EMPLOYEES IN ACCORDANCE WITH OSHA REGULATIONS.
5. THIRD-PARTY PROJECT MONITORING AND AIR SAMPLING SHALL BE CONDUCTED BY A CONSULTANT FIRM HIRED DIRECTLY BY THE OWNER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE TO FILE FOR ALL PERMITS AND NOTIFY ALL REGULATORY AGENCIES AS REQUIRED FOR THE WORK AND PAY ALL FEES ASSOCIATED WITH SUCH.
7. UPON COMPLETION OF THE DEMOLITION WORK, THE CONTRACTOR SHALL SUBMIT COPIES OF ALL WASTE MANIFEST AND LANDFILL RECEIPTS TO THE ARCHITECT AS PART OF THE REQUIRED CLOSEOUT DOCUMENTS.
8. ALL OPENINGS AND PENETRATIONS INCLUDING BUT NOT LIMITED TO WINDOWS, DOORS, DUCTS, LOUVERS AND GRILLES SHALL BE COVERED WITH A MINIMUM OF TWO (2) LAYERS OF 6 MIL PLASTIC.
9. REFER TO SPECIFICATION SECTION 028000 FOR SPECIFIC ABATEMENT PROCEDURES.

GENERAL NOTES

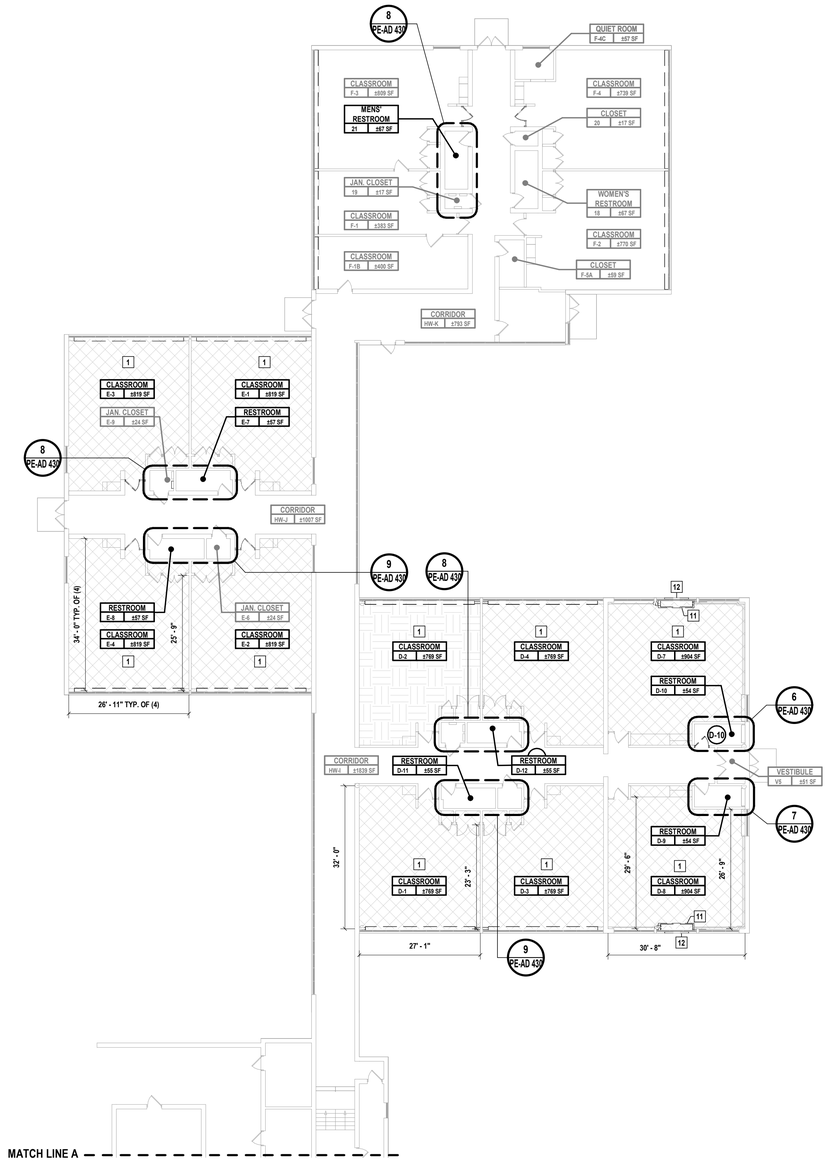
1. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL WALL MOUNTED ITEMS TO REMAIN THROUGHOUT THE COURSE OF WORK, UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS, AND ENSURE ALL HARDWARE WILL WORK WITH NEW DOOR SELECTION.
3. THE CONTRACTOR SHALL PREP EXISTING HOLLOW METAL FRAMES THAT ARE IN THE SCOPE OF WORK, ANY UNUSED OPENINGS SHALL BE FILLED IN, AND NEW OPENINGS SHALL BE PROVIDED AS REQUIRED.
4. REFER TO DOOR SCHEDULE FOR COORDINATION OF HARDWARE, CONTRACTOR TO FIELD VERIFY DOOR SWINGS PRIOR TO PLACING ORDER.

DEMOLITION LEGEND

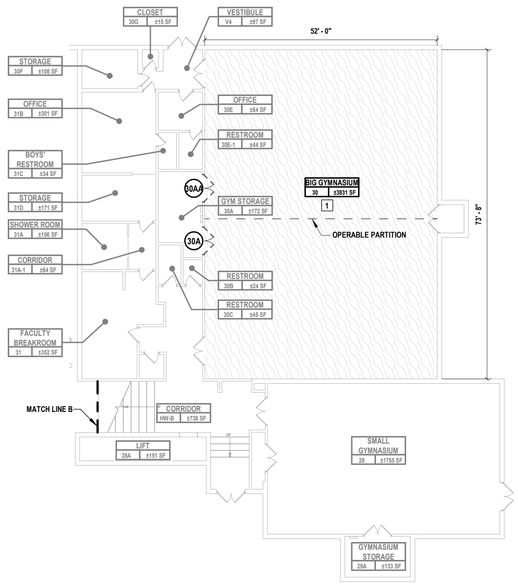
	EXISTING LINOLEUM FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING VINYL COMPOSITE TILE (V.C.T.) FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING CARPET FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING ATHLETIC WOOD FLOORING AND WALL BASE IN THE ARE INDICATED TO BE REMOVED AND DISPOSED OF. WET SCRAPE, FLASH PATCH AND LEVEL EXISTING CONCRETE FLOOR SLAB AS REQUIRED FOR INSTALLATION OF NEW FLOORING AND BASE
	EXISTING ITEM TO BE REMOVED AND ALL ASSOCIATED COMPONENTS TO SECURE IT IN PLACE. CONTRACTOR TO PREP OPENINGS TO RECEIVE NEW DOOR AND WINDOWS
A	INDICATES WINDOW TAGS FOR WORK IN CONTRACT - FIELD VERIFY ALL WINDOW SIZES

DEMOLITION NOTES

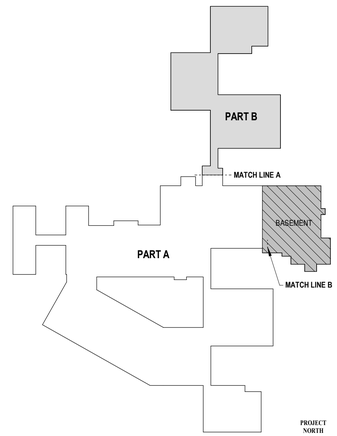
1	FLOOR FINISHES	REMOVE AND DISPOSE OF EXISTING WALL BASE, AND FLOOR FINISHES DOWN TO SUB-FLOOR. CONTRACTOR SHALL BE RESPONSIBLE TO INSPECT THE EXISTING CONCRETE SLAB-FLOOR CONDITION AND PATCH ALL EXPOSED SURFACES AS NEEDED TO ENSURE A TRUE SMOOTH AND LEVEL FLOOR FINISH FREE OF DIPS, WAVES, DEPRESSIONS, AND TELEGRAPHING OF THE LEVELING COMPOUND OR IMPERFECTIONS OF THE SLAB BELOW. ASSUME FLOOR PREP THAT MAY INCLUDE FLASH PATCH EXISTING MATERIALS IN EACH ROOM.
11	UNIT VENTILATOR	GC SHALL COORDINATE WITH MECHINCAL CONTRACTOR ON REMOVAL OF EXISTING LOUVER, WALL BOX, AND UNIT VENTILATOR. COORDINATE WITH MECHANICAL CONTRACTOR FOR LOCATIONS.
12	LOUVER	REMOVE AND DISPOSE OF EXISTING LOUVER. GC TO COORDINATE WITH MECHANICAL CONTRACTOR IN PREPARATION OF EXISTING OPENING FOR NEW LOUVER.



1 **DEMOLITION FIRST FLOOR PLAN - PART 'B'**
SCALE: 1/16" = 1'-0"



3 **DEMOLITION BASEMENT FLOOR PLAN**
SCALE: 1/16" = 1'-0"



2 **KEY PLAN - PART 'B'**
SCALE: 1" = 100'-0"

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NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A. Exp. Date
NY PROFESSIONAL ARCHITECT Lic. No. 041183

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

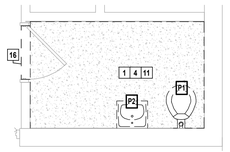
SHEET TITLE

FIRST FLOOR PLAN - PART 'B'

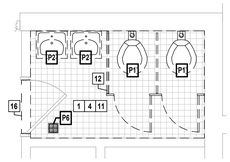
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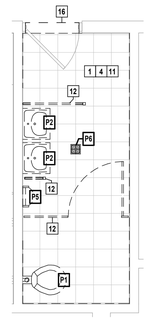
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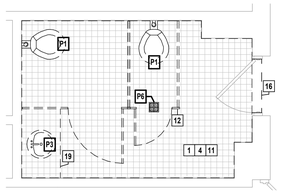
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SCALE: 1/4" = 1'-0"



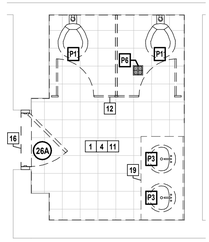
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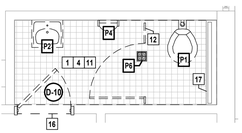
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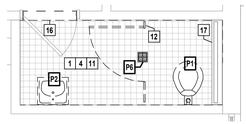
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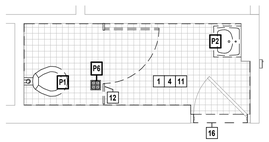
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SCALE: 1/4" = 1'-0"



6 RESTROOM TYPE E1
SCALE: 1/4" = 1'-0"



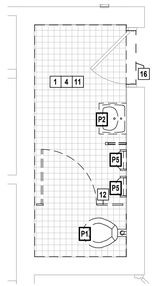
7 RESTROOM TYPE E2
SCALE: 1/4" = 1'-0"



8 RESTROOM TYPE F1
SCALE: 1/4" = 1'-0"



9 RESTROOM TYPE F2
SCALE: 1/4" = 1'-0"



11 RESTROOM TYPE G
SCALE: 1/4" = 1'-0"

DEMOLITION NOTES - CONTRACT G

1	FLOOR FINISH	EXISTING TILE FLOOR TO BE REMOVED COMPLETELY DOWN TO EXISTING CONCRETE FLOOR SLAB BELOW. REMOVALS SHALL INCLUDE TILE, MASTIC, GROUT, REINFORCING MESH, AND ALL DEVICES / MATERIALS USED TO SECURE THE TILE FINISH IN PLACE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSPECTING THE CONDITION OF THE SLAB, PATCH AND LEVEL AS NEEDED TO ENSURE A LEVEL FLOOR FREE OF DIPS, WAVES, DEPRESSIONS, AND TELEGRAPHING OF THE LEVELING COMPOUND AND IMPERFECTIONS IN THE SLAB FROM BELOW AS REQUIRED TO ENSURE A LEVEL SURFACE FOR NEW FINISHES.
4	TOILET ACCESSORIES	REMOVE AND DISPOSE OF ALL EXISTING TOILET ACCESSORIES (MIRRORS, PAPER TOWEL DISPENSERS, TOILET PAPER DISPENSERS, SOAP DISPENSERS, HAND DRYERS, ETC.) & ALL SUPPORTING HARDWARE. PREPARE ALL WALLS TO RECEIVE NEW FINISHES INCLUDING FILLING HOLES, REPAIRING CRACKS IN EXISTING WALLS, SANDING, AND PREPARING ALL SURFACES FOR A NEW TILE FINISH.
11	WALL TILE AND BASE	CONTRACTOR SHALL COMPLETELY REMOVE AND DISPOSE OF ALL EXISTING CERAMIC WALL TILE COMPLETELY DOWN TO THE EXISTING MASONRY BACK UP WALL BELOW. REMOVALS SHALL INCLUDE TILE, THINSET, MORTAR SETTING BED, GROUT, REINFORCED MESH, TRIM, AND ALL DEVICES USED TO SECURE THE TILE IN PLACE. THE CONTRACTOR SHALL PREPARE WALL FOR NEW WALL FINISH.
12	PARTITION SYSTEM	REMOVE AND DISPOSE OF EXISTING TOILET PARTITION SYSTEMS INCLUDING BRACKETS AND FILLING OF ANCHOR LOCATIONS.
16	DOOR THRESHOLD	REMOVE AND DISPOSE OF EXISTING DOOR THRESHOLD. PREPARE FLOOR SURFACE FOR NEW THRESHOLD TO BE INSTALLED.
17	RADIATOR COVER	REMOVE AND DISPOSE OF EXISTING RADIATOR COVER.
19	VANITY	REMOVE AND DISPOSE OF EXISTING VANITY AND SUPPORTS. PREPARE AREA FOR NEW LAVATORY INSTALLATION. COORDINATE WITH PLUMBING CONTRACTOR FOR VANITY SINK REMOVAL.

GENERAL DEMOLITION NOTES

1. ALL DEMOLITION WORK SHALL BE IN COMPLIANCE WITH ALL FEDERAL AND NEW YORK STATE APPLICABLE BUILDING AND LIFE AND SAFETY REGULATIONS.
2. THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ADJOINING SURFACES AND FINISHES OUTSIDE THE CONTRACT AREA OR SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE EXISTING CONDITIONS AND/OR FINISHES DAMAGED DURING CONSTRUCTION INCLUDING PATCHING AND PAINTING DEEMED NECESSARY BY THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.
3. THE CONTRACTOR SHALL TAKE CARE AS TO ADEQUATELY PROTECT ALL ADJOINING CLASSROOMS, CLOSETS, CORRIDORS, CRITICAL BARRIERS (DUCTS, VENTS, ETC.), AND OTHER SPACES FROM DUST AND DEBRIS DURING THE DEMOLITION AND INSTALLATION OF THE NEW WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO WIPE DOWN AND CLEAN ALL AFFECTED ROOMS UPON COMPLETION OF THE PROJECT.
4. CONTRACTORS SITE ACCESS AND BUILDING ENTRY POINT SHALL BE AS PER DRAWING HS-G 000.00 AND VERIFIED BY OWNER. THE CONTRACTOR SHALL ADEQUATELY PROTECT THE WALLS, FLOOR, AND FINISHES WITHIN STAIRWELLS AND ALL OTHER AREAS USED FOR ACCESS TO CONTRACT AREAS FROM DAMAGE DURING THE PROJECT DURATION. THE CONTRACTOR SHALL BE RESPONSIBLE TO PATCH & RESTORE ALL SURFACES DAMAGED DURING CONSTRUCTION TO THE SATISFACTION OF THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.
5. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL OFF SITE IN ACCORDANCE WITH CONTRACT SPECIFICATIONS.
6. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF ANY DEFECTIVE OR NON-WORKING EQUIPMENT PRIOR TO WORK STARTING AND FOLLOWING INSTALLATION OF NEW FINISHES VERIFY ALL ITEMS ARE IN PROPER WORKING ORDER UPON COMPLETION.
7. THE CONTRACTOR SHALL REVIEW SCOPE OF DEMOLITION WORK WITH OWNER AND COORDINATE WHICH ITEMS WILL BE REMOVED CAREFULLY AND RETURNED TO DISTRICT.
8. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT TO DISCONNECT, REMOVE, AND STORE ALL REMOVABLE EQUIPMENT (INCLUDING CASEWORK, DESKS, CHAIRS, ETC.) TO PERFORM ALL REQUIRED DEMOLITION. UPON COMPLETION, CONTRACTOR SHALL REINSTALL ALL EQUIPMENT AND ENSURE PROPER WORKING CONDITION. CLEAN ALL SURFACES PRIOR TO SUBSTANTIAL COMPLETION.
9. PROTECTING EXISTING CEILING LIGHTING FIXTURES, INCLUDING, BUT NOT LIMITED TO THE FIXTURE, TRIM, SUPPORTS, AND ALL DEVICES USED TO SECURE THE LIGHTING IN PLACE.

DEMOLITION PLAN LEGEND

(NOT ALL MAY BE USED)

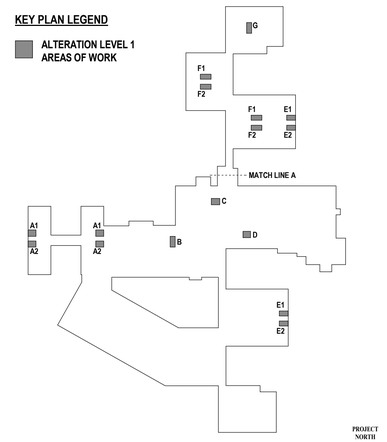
	INDICATES WALL TO BE REMOVED AND DISPOSED OF. SEE DEMOLITION NOTES FOR ADDITIONAL INFORMATION
	INDICATES EXISTING WALL TO REMAIN
	INDICATES EXISTING DOOR TO BE REMOVED AND DISPOSED OF. SEE DEMOLITION NOTES FOR ADDITIONAL INFORMATION
	INDICATES EXISTING TOILET PARTIONS TO BE REMOVED AND DISPOSED OF. SEE DEMOLITION NOTES FOR ADDITIONAL INFORMATION
	INDICATES EXISTING DOOR TO REMAIN.

DEMOLITION NOTES - CONTRACT P

P1	FLOOR MOUNTED TOILET	REMOVE AND DISPOSE OF EXISTING TOILET.
P2	WALL HUNG SINGLE SINK	REMOVE AND DISPOSE OF EXISTING SINK AND CARRIER ARMS.
P3	VANITY SINK	REMOVE AND DISPOSE OF EXISTING VANITY SINK AND PLUMBING.
P4	WALL HUNG URINAL	REMOVE AND DISPOSE OF EXISTING URINAL.
P5	FLOOR MOUNTED URINAL	REMOVE AND DISPOSE OF EXISTING URINAL.
P6	FLOOR DRAIN COVER	REMOVE AND DISPOSE OF EXISTING FLOOR DRAIN COVER.

KEY PLAN LEGEND

ALTERATION LEVEL 1 AREAS OF WORK



10 KEY PLAN - AREAS OF WORK
SCALE: 1" = 100'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183
Exp. Date

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G & P GENERAL & PLUMBING CONSTRUCTION

STATUS

90% SUBMISSION

SHEET TITLE

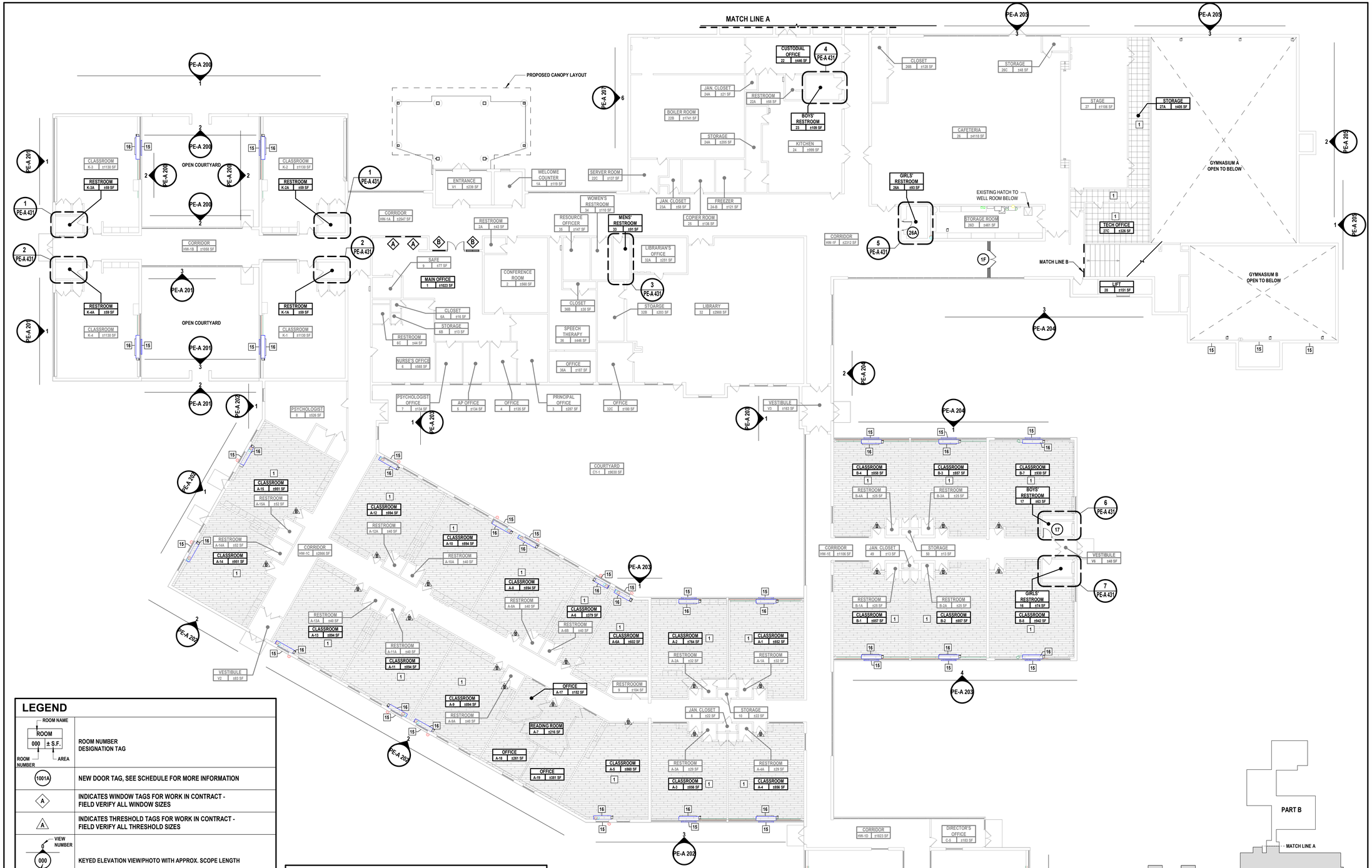
RESTROOM UPGRADES DEMOLITION PLANS

DRAWING No.

PE-AD 430.00

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LEGEND

ROOM NAME / ROOM / 000 / ± S.F. / ROOM NUMBER / AREA	ROOM NUMBER DESIGNATION TAG
1001A	NEW DOOR TAG, SEE SCHEDULE FOR MORE INFORMATION
A	INDICATES WINDOW TAGS FOR WORK IN CONTRACT - FIELD VERIFY ALL WINDOW SIZES
A	INDICATES THRESHOLD TAGS FOR WORK IN CONTRACT - FIELD VERIFY ALL THRESHOLD SIZES
VIEW NUMBER / 000 / SHEET NUMBER	KEYED ELEVATION VIEW/PHOTO WITH APPROX. SCOPE LENGTH
	NEW LUXURY VINYL TILE (L.V.T.) AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.
	NEW VINYL COMPOSITE TILE (V.C.T.) FLOORING AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.
	NEW ATHLETIC WOOD FLOORING AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.

GENERAL NOTES

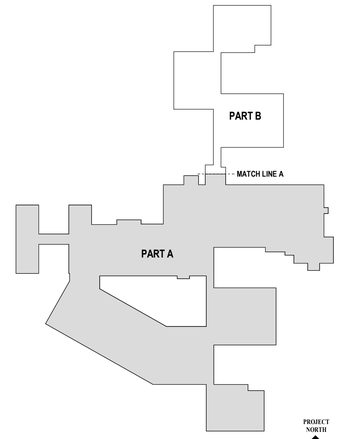
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2. ALL NEW FLOORING TRANSITIONS TO EXISTING FLOORING SHALL HAVE A NEW TRANSITION STRIP INSTALLED. SEE 1/PE-A 620 FOR THRESHOLD DETAIL.

CONSTRUCTION NOTES

1	FLOOR FINISHES	PROVIDE AND INSTALL NEW FLOOR FINISH AND NEW WALL BASE AS SCHEDULED. VERIFY DIMENSIONS OF FLOORING AND BASE IN FIELD. PATTERN DIRECTION TO BE COORDINATED WITH ARCHITECT DURING CONSTRUCTION.
15	LOUVER	GC SHALL COORDINATE WITH MECHANICAL CONTRACTOR FOR PLACEMENT OF NEW LOUVER AND WALL BOX WITHIN INSULATED WALL PANELS AT UNIT VENTILATOR LOCATIONS.
16	NEW UNIT VENTILATOR	GC SHALL COORDINATE WITH MECHANICAL CONTRACTOR THE LOCATION AND INSTALLATION OF NEW UNIT VENTILATORS. PATCHING OF EXISTING WALL AROUND NEW UNIT VENTILATOR SHALL BE REQUIRED. PATCH AND REPAIR WALL AS NEEDED. PAINT REPAIRED PORTION OF WALL TO MATCH EXISTING WALL PAINT. PROVIDE NEW WALL BASE AS NEEDED ALONG WALL AND AROUND NEW UNIT VENTILATOR.

1 FIRST FLOOR PLAN - PART 'A'
SCALE: 1/16" = 1'-0"

2 KEY PLAN - PART 'A'
SCALE: 1" = 100'-0"



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PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

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SED #: 66-21-01-06-0-002-017

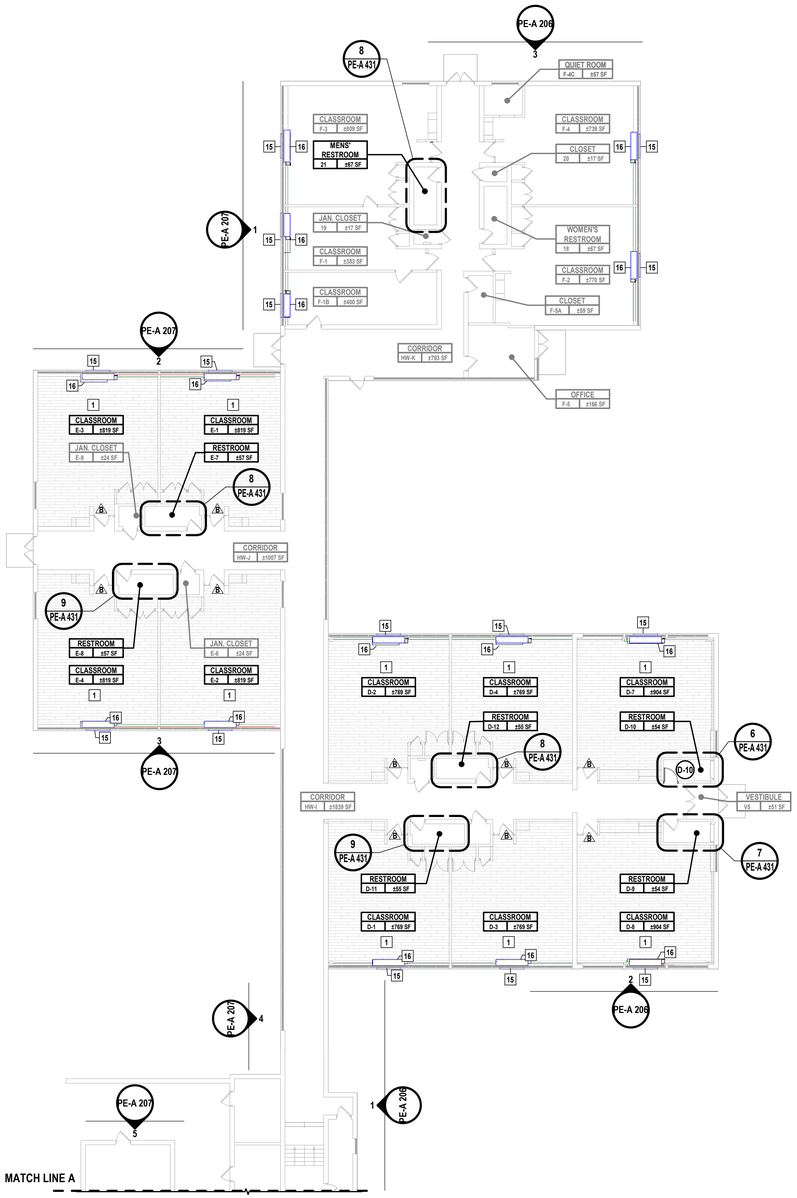
CONTRACT
CONTRACT G GENERAL CONSTRUCTION

STATUS
SED SUBMISSION

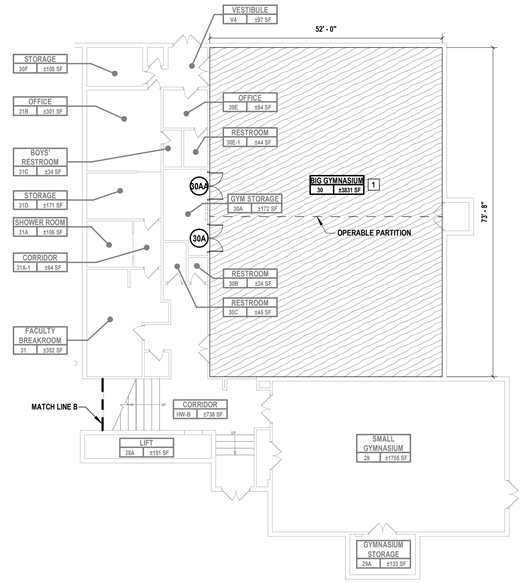
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FIRST FLOOR PLAN - PART 'A'

DRAWING No.
PE-A 100.00

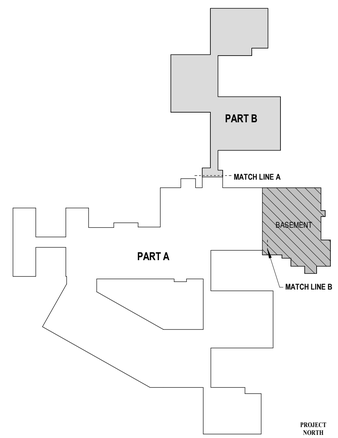
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1 FIRST FLOOR PLAN - PART 'B'
SCALE: 1/16" = 1'-0"



3 BASEMENT FLOOR PLAN
SCALE: 1/16" = 1'-0"



2 KEY PLAN - PART 'B'
SCALE: 1" = 100'-0"

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	NEW LUXURY VINYL TILE (L.V.T.) AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.
	NEW VINYL COMPOSITE TILE (V.C.T.) FLOORING AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.
	NEW ATHLETIC WOOD FLOORING AND WALL BASE IN THE AREA INDICATED SHALL BE INSTALLED.

CONSTRUCTION NOTES

1	FLOOR FINISHES	PROVIDE AND INSTALL NEW FLOOR FINISH AND NEW WALL BASE AS SCHEDULED. VERIFY DIMENSIONS OF FLOORING AND BASE IN FIELD. PATTERN DIRECTION TO BE COORDINATED WITH ARCHITECT DURING CONSTRUCTION.
15	LOUVER	GC SHALL COORDINATE WITH MECHANICAL CONTRACTOR FOR PLACEMENT OF NEW LOUVER AND WALL BOX WITHIN INSULATED WALL PANELS AT UNIT VENTILATOR LOCATIONS.
16	NEW UNIT VENTILATOR	GC SHALL COORDINATE WITH MECHANICAL CONTRACTOR THE LOCATION AND INSTALLATION OF NEW UNIT VENTILATORS. PATCHING OF EXISTING WALL AROUND NEW UNIT VENTILATOR SHALL BE REQUIRED. PATCH AND REPAIR WALL AS NEEDED. PAINT REPAIRED PORTION OF WALL TO MATCH EXISTING WALL PAINT. PROVIDE NEW WALL BASE AS NEEDED ALONG WALL AND AROUND NEW UINIT VENTILATOR.

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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183
Exp. Date

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT G GENERAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
FIRST FLOOR PLAN - PART 'B'

DRAWING No.
PE-A 101.00

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1 NORTH ELEVATION - K-WING
N.T.S.





2 NORTH ELEVATION - K-WING COURTYARD
N.T.S.







3 NORTH ELEVATION - K-WING COURTYARD
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PATTERNS & SYMBOLS LEGEND

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M. LUCK	C. HENRY	S.MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

EXTERIOR BUILDING ELEVATIONS

DRAWING No.

PE-A 200.00

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1 **WEST ELEVATION - K-WING**
N.T.S.



2 **SOUTH ELEVATION - K-WING**
N.T.S.







3 **SOUTH ELEVATION - K-WING COURTYARD**
N.T.S.

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CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT G GENERAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
EXTERIOR BUILDING ELEVATIONS

DRAWING No.
PE-A 201.00

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1 **WEST ELEVATION - A-WING**
N.T.S.







2 **SOUTH ELEVATION - A-WING LEFT SIDE**
N.T.S.





3 **SOUTH ELEVATION - A-WING RIGHT SIDE**
N.T.S.

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LINCOLNDALE, NY 10540

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CONTRACT

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STATUS

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SHEET TITLE

EXTERIOR BUILDING ELEVATIONS

DRAWING No.

PE-A 202.00

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1 NORTH ELEVATION - A-WING COURTYARD
N.T.S.



2 SOUTH ELEVATION - C-WING
N.T.S.





3 EAST ELEVATION - C-WING LEFT SIDE
N.T.S.



4 SOUTH ELEVATION - B-WING SOUTH WALL
N.T.S.



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H2M architects + engineers
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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183
Exp. Date

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DESIGNED BY:	DRAWN BY:	CHCED BY:	REVIEWED BY:
M. LUCK	C. HENRY	S.MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT G GENERAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
EXTERIOR BUILDING ELEVATIONS

DRAWING No.
PE-A 203.00

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1 NORTH ELEVATION - B-WING
N.T.S.





2 EAST ELEVATION - CORRIDOR
N.T.S.





3 SOUTH ELEVATION - GYMNASIUM
N.T.S.

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CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

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LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

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CENERAL CONSTRUCTION

STATUS

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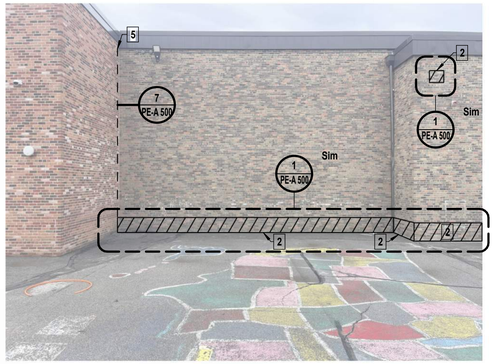
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EXTERIOR BUILDING ELEVATIONS

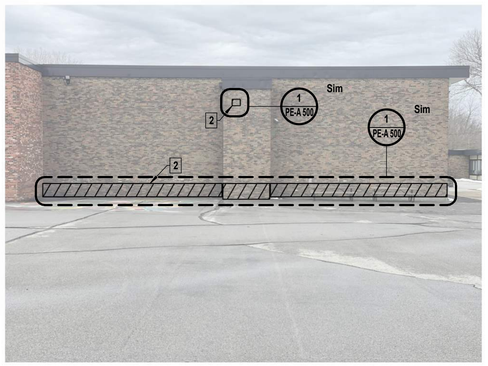
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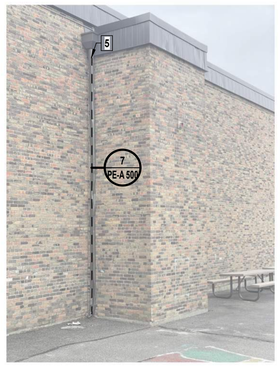
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1 EAST ELEVATION - GYMNASIUM LEFT SIDE
N.T.S.







2 EAST ELEVATION - GYMNASIUM RIGHT SIDE
N.T.S.





3 NORTH ELEVATION - GUMNASIUM
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Katrina N. Pacheco 09/30/2029
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PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

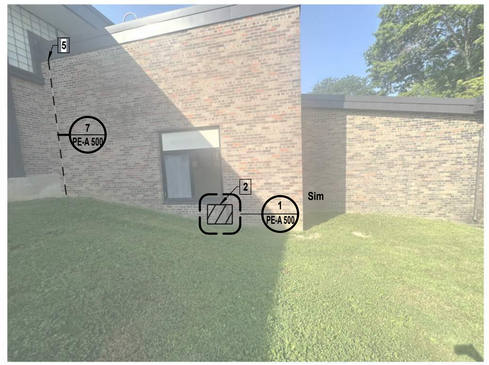
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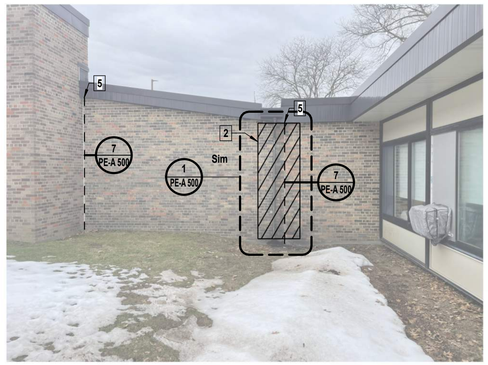
EXTERIOR BUILDING ELEVATIONS

DRAWING No.

PE-A 205.00

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1 EAST ELEVATION - PLAN 'B' CORRIDOR
N.T.S.





2 SOUTH ELEVATION - D-WING
N.T.S.





3 NORTH ELEVATION - F-WING
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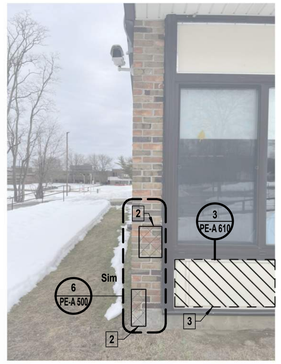
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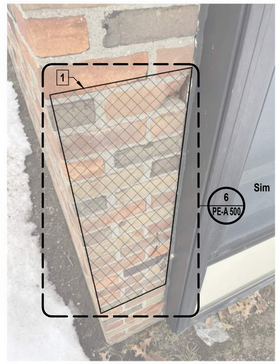


1 **WEST ELEVATION - F-WING**
N.T.S.





2 **NORTH ELEVATION - E-WING**
N.T.S.

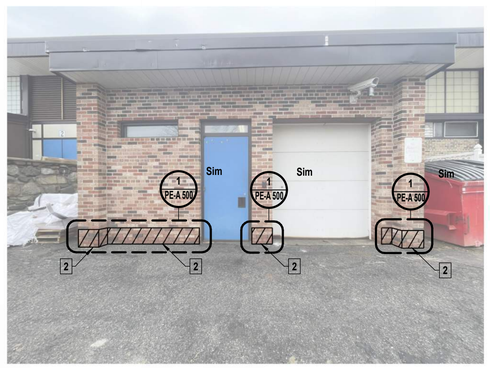




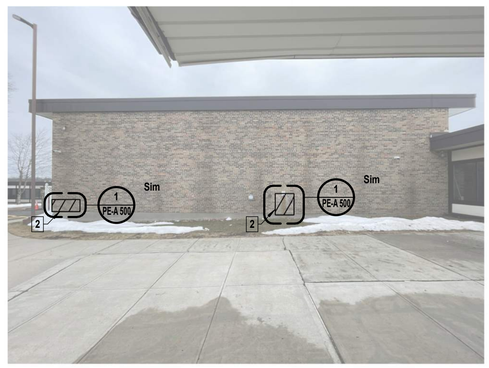
3 **SOUTH ELEVATION - E-WING**
N.T.S.



4 **WEST ELEVATION - PLAN 'B' CORRIDOR**
N.T.S.



5 **NORTH ELEVATION - LOADING DOCK WALL**
SCALE: 1/4" = 1'-0"



6 **WEST ELEVATION - MAIN ENTRANCE WALL**
SCALE: 1/4" = 1'-0"

GENERAL CONSTRUCTION WORK NOTES:

1. THESE DRAWINGS SERVE AS A GRAPHICAL REPRESENTATION OF THE INTENDED SCOPE OF THE WORK, AND CONSTITUTE ONE PORTION OF THE CONSTRUCTION DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION BETWEEN THESE DRAWINGS AND THE SPECIFICATIONS.
2. ALL EXISTING EXTERIOR FACADE MOUNTED EQUIPMENT INCLUDING BUT NOT LIMITED TO LIGHT FIXTURES, SECURITY DEVICES, SIGNAGE, ETC. SHALL BE PROTECTED DURING SCOPE OF WORK. CONTRACTOR SHALL REPAIR OR REPLACE EQUIPMENT OR DEVICE AS NEEDED IF DAMAGED. CONTRACTOR SHALL HAVE A LICENSED ELECTRICAL CONTRACTOR TEMPORARILY REMOVE, MAINTAIN AND RECONNECT ANY CONDUIT, WIRING OR DEVICES REQUIRED TO PERFORM ANY SCOPE ASSOCIATED WITH THIS WORK. VERIFY IN FIELD ALL CONDITIONS.
3. ALL MASONRY MORTAR ON SCOPE ELEVATIONS SHALL BE INSPECTED FOR CRACKS OR DAMAGE AND SHALL BE BROUGHT TO THE ARCHITECT AND THE DISTRICTS CONSTRUCTION REPRESENTATIVES ATTENTION IMMEDIATELY.
4. CONTRACTOR SHALL BE RESPONSIBLE TO CLEAN OUT ALL EXISTING WEEP HOLES WHERE WORK IS BEING PERFORMED. REMOVE ALL DIRT, DEBRIS OR OTHER MATERIALS TO MAKE SURE THEY ARE CLEAR TO ENSURE WEEP SYSTEM FUNCTIONALITY.
5. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ALL TEMPORARY BRACING AND SHORING TO MAINTAIN THE STRUCTURAL INTEGRITY OF THE BUILDING, AS REQUIRED TO COMPLETE THE MASONRY REPAIR SCOPE OF WORK.
6. ALL NEW AND EXISTING MASONRY SURFACES SHALL BE LOW-PRESSURE POWER WASHED ACROSS ALL ELEVATIONS AS PART OF THE SCOPE OF WORK. REMOVE ALL DIRT, DEBRIS, STAINS, MOSS AND EFFLORESCENCE. PROTECT ALL OPENINGS INCLUDING BUT NOT LIMITED TO; DOORS, WINDOWS, LOUVERS AND GRILLES DURING POWER WASHING, AS WELL AS ALL WALL-MOUNTED ITEMS REMAINING IN PLACE.
7. ALL EXISTING CAST STONE WITHIN WORK AREA SHALL BE LOW-PRESSURE POWER WASHED. REMOVE ALL DIRT, DEBRIS, STAINS, MOSS AND EFFLORESCENCE. PROTECT ALL OPENINGS INCLUDING BUT NOT LIMITED TO; DOORS, WINDOWS, LOUVERS AND GRILLES DURING POWER WASHING. RAKE OUT EXISTING JOINTS BETWEEN STONE COPINGS AND BRICK AND INSTALL NEW FLEXIBLE SILICONE SOFT JOINT WITH BACKER OR JOINT TAPE TO ENSURE TWO SIDE ADHESION. SILICONE SEALANT WITH BACKER ROD TO MATCH EXISTING MORTAR COLOR.
8. ALL NEW AND EXISTING EXPOSED CAST STONE AND MASONRY SURFACES SHALL BE LOW-PRESSURE POWER WASHED AND ACROSS ALL ELEVATIONS AS PART OF THE SCOPE OF THE WORK. REMOVE ALL DIRT, DEBRIS, STAINS, MOSS, AND EFFLORESCENCE. PROTECT ALL OPENINGS INCLUDING BUT NOT LIMITED TO DOORS, WINDOWS, LOUVERS AND GRILLES, AS WELL AS ALL WALL-MOUNTED ITEMS REMAINING IN PLACE.

PATTERNS & SYMBOLS LEGEND

KEYNOTE	PATTERN	DESCRIPTION
1		**SELECTIVE MASONRY REPLACEMENT:** REMOVE AND REPLACE DAMAGED / DETERIORATED BRICK MASONRY THROUGHOUT AREA INDICATED. REBUILD BACK-UP AS REQUIRED AND REPLACE ANY UNSOUND MATERIALS THAT ARE REMOVED. INSTALL NEW BRICK MASONRY TO MATCH EXISTING COLOR, FINISH, COURSING AND PATTERN IN COMPLETELY FILLED BED, ENDS, AND HEAD OF MORTAR JOINTS.
2		**RE-POINTING:** RAKE OUT EXISTING JOINTS TO A MINIMUM DEPTH OF 3/4" THROUGHOUT AREA INDICATED, AND RE-POINT ALL JOINTS IN BRINK MASONRY. REBUILD BACK UP AS REQUIRED AND REPLACE ANY UNSOUND MATERIALS THAT WERE REMOVED. TAKE CARE NOT TO DAMAGE EDGES OF EXISTING MASONRY TO REMAIN.
3		**INSULATED WINDOW PANELS:** REMOVE AND REPLACE INSULATED WINDOW PANELS THROUGHOUT AREA INDICATED IN KIND. COORDINATE INSTALLATION OF NEW LOUVERS WHERE IDENTIFIED ON FLOOR PLANS. GC SHALL COORDINATE WITH MC ON LOUVER LOCATIONS AND SIZES AT NEW UNIT VENTILATORS THROUGHOUT.
4		**CAST STONE REPAIR/REPLACEMENT:** REPOINT EXISTING CAST STONE MORTAR JOINTS. REMOVE AND REPLACE CRACKED, DAMAGED, OR DETERIORATED 4 1/2" THICK CAST STONE IN KIND.
5		**CONTROL / EXPANSION JOINT REPLACEMENT:** RAKE OUT EXISTING JOINT BETWEEN MASONRY TO A MINIMUM DEPTH OF 1". FURNISH AND INSTALL NEW FLEXIBLE SILICONE SOFT JOINT WITH BACKER ROD OR EXPANSION JOINT FILLER TO PREVENT THREE-SIDED ADHESION THE FULL WIDTH, AND LENGTH OF JOINT. COLOR TO MATCH EXISTING MORTAR.
6		**ENVELOPE CAULKING REPLACEMENT:** EXISTING WINDOW CAULK AND DEBRIS TO BE REMOVED IN ITS ENTIRETY, CONTRACTOR TO CLEAN OPENING AND PROVIDE CAULKING. WINDOW TO BE PROTECTED.

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White Plains, NY 10605
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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
Exp. Date
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	C. HENRY	S.MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G
GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

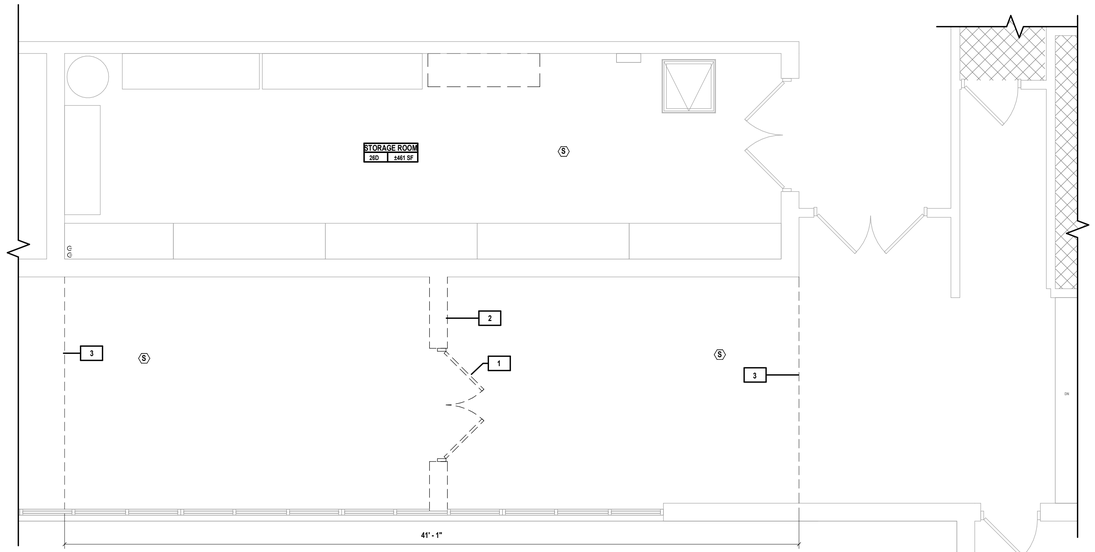
EXTERIOR BUILDING ELEVATIONS

DRAWING No.

PE-A 207.00

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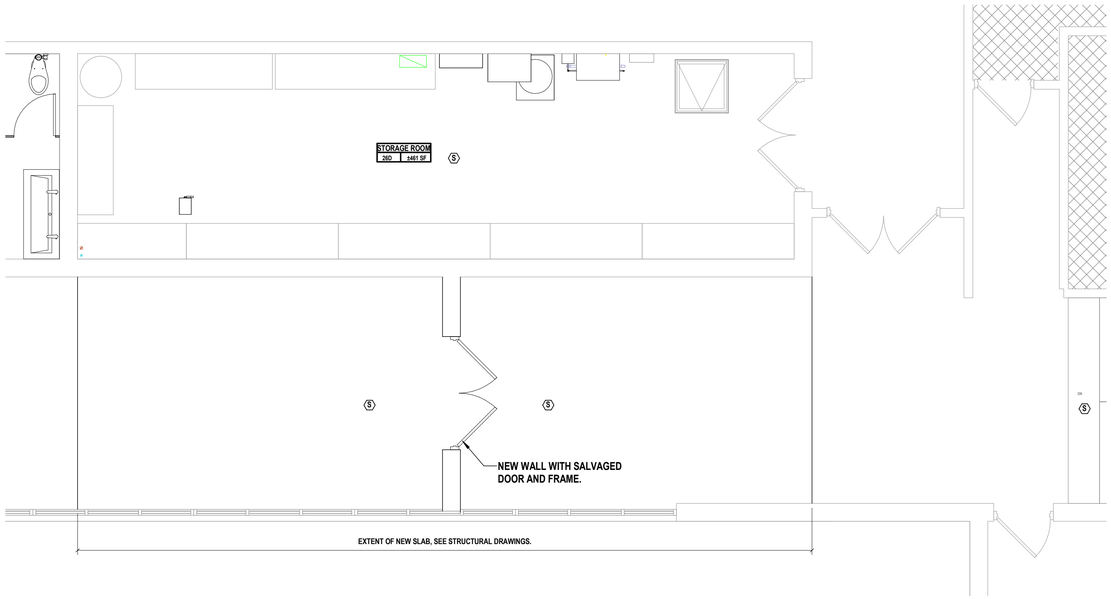
1 ENLARGED CORRIDOR DEMOLITION PLAN
SCALE: 1/4" = 1'-0"

GENERAL NOTES

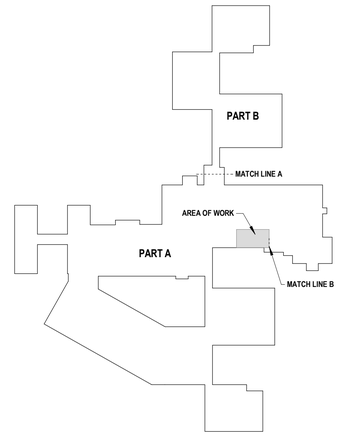
1. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL WALL MOUNTED ITEMS TO REMAIN THROUGHOUT THE COURSE OF WORK, UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS, AND ENSURE ALL HARDWARE WILL WORK WITH NEW DOOR SELECTION.
3. THE CONTRACTOR SHALL PREP EXISTING HOLLOW METAL FRAMES THAT ARE IN THE SCOPE OF WORK, ANY UNUSED OPENINGS SHALL BE FILLED IN, AND NEW OPENINGS SHALL BE PROVIDED AS REQUIRED.
4. REFER TO DOOR SCHEDULE FOR COORDINATION OF HARDWARE, CONTRACTOR TO FIELD VERIFY DOOR SWINGS PRIOR TO PLACING ORDER.

DEMO KEY NOTES

1. REMOVE DOOR AND DOOR FRAME IN IT'S ENTIRETY. STORE FOR REUSE.
2. DEMOLISH WALL IN ITS ENTIRETY. EXTERIOR WALL / WINDOW INTERSECTION TO BE CAREFULLY PROTECTED DURING WALL DEMOLITION.
3. EXTENT OF SLAB REMOVAL. SAWCUT AT DASHED LINES. DEMOLISH SLAB IN ITS ENTIRETY.



2 ENLARGED PROPOSED CORRIDOR PLAN
SCALE: 1/4" = 1'-0"



3 KEY PLAN - PART 'B'
SCALE: 1" = 100'-0"

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L. RAUSCHER	L. RAUSCHER	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

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VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

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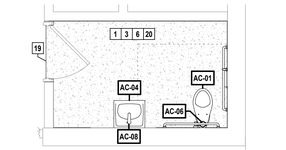
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ENLARGED CORRIDOR PLANS

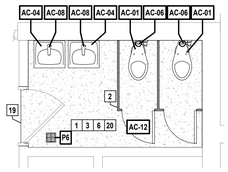
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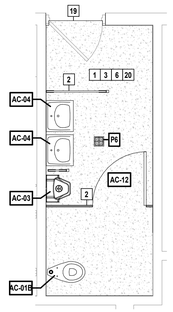
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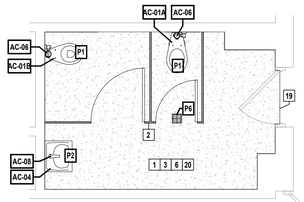
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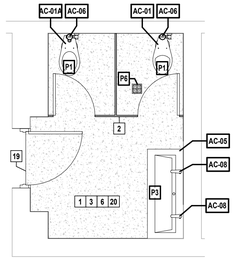
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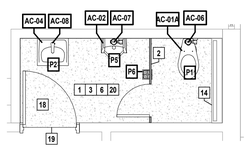
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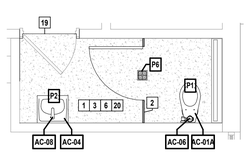
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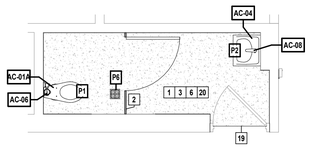
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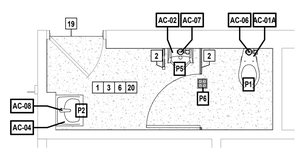
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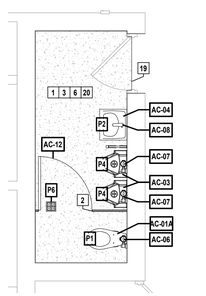
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SCALE: 1/4" = 1'-0"



8 RESTROOM TYPE F1
SCALE: 1/4" = 1'-0"



9 RESTROOM TYPE F2
SCALE: 1/4" = 1'-0"



11 RESTROOM TYPE G
SCALE: 1/4" = 1'-0"

CONSTRUCTION LEGEND

ROOM	INDICATES ROOM NAME FOR WORK IN CONTRACT		EXISTING DOOR TO REMAIN
11	KEYED CONSTRUCTION NOTE INDICATOR		NEW DOOR
#	INDICATES DOOR TAGS FOR WORK IN CONTRACT - CONTRACTOR SHALL FIELD VERIFY ALL DOOR SIZES		INDICATES FLOOR FINISH FOR WORK IN CONTRACT
#	INDICATES THRESHOLD TAGS FOR WORK IN CONTRACT		EXISTING WALL TO REMAIN

GENERAL CONSTRUCTION NOTES

1. TOILET ROOM DIMENSIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS FOR QUANTITY TAKEOFFS AND FABRICATION OF MATERIALS.
2. VERIFY EXACT LAYOUT COMPATIBILITY WITH ALL EXISTING CONDITIONS BEFORE BEGINNING WORK.
3. PLUMBING CONTRACTOR SHALL ADJUST LOCATIONS OF WATER SUPPLIES AND WASTE AS REQUIRED FOR NEW FIXTURES.
4. ALL WORK SHALL BE IN COMPLIANCE WITH ALL FEDERAL AND NEW YORK STATE APPLICABLE BUILDING AND LIFE AND SAFETY REGULATIONS.
5. CONTRACTOR SHALL INSTALL WALL TILES SO THAT THEY ARE VERTICALLY PLUMB WITHIN 1/8" FROM THE FACE OF THE BASE TILE TO THE FACE OF THE UPPERMOST TILE.
6. REPAIR, RESTORE, AND REFINISH TO ORIGINAL APPEARANCE ALL WALL AND CEILING FINISHES THAT WERE DISTURBED IN THE COMPLETION OF THE WORK.
7. PROVIDE AND TURN OVER TO THE SCHOOL DISTRICT ALL EXTRA MAINTENANCE MATERIALS IN THE QUANTITIES INDICATED WITHIN THE SPECIFICATIONS.
8. PRIOR TO BEGINNING INSTALLING NEW CEILINGS, THE CONTRACTOR SHALL DETERMINE THE SET-OUT POINT AND REVIEW WITH THE ARCHITECT. THE INTENT IS TO HAVE FULL TILES CENTERED BETWEEN WALLS EACH DIRECTION. CUT TILES WILL ONLY BE USED ALONG THE PERIMETER OF THE NEW SPACE WITH A MINIMUM DIMENSION OF FOUR (4) INCHES IN ANY DIRECTION.
9. VERIFY LOCATION OF ALL ACCESSORIES PRIOR TO INSTALLATION WITH OWNER & ARCHITECT

CONSTRUCTION NOTES - CONTRACT G

1	FLOOR FINISHES	PROVIDE NEW FLOOR FINISH AND WALL BASE. REFER FINISH SCHEDULE.
2	PARTITION SYSTEM	INSTALL NEW BATHROOM PARTITIONS.
3	WALL PAINT	PROVIDE NEW WALL PAINT. REFER ACCENT PAINT DETAIL FOR LAYOUT.
6	ACCESSORY FIXTURES	PROVIDE WALL MOUNTED ACCESSORY FIXTURES, WHICH INCLUDE TOILET TISSUE DISPENSER, SANITARY NAPKIN DISPOSAL, MIRROR.
14	RADIATOR	EXISTING RADIATOR TO REMAIN.
18	DOOR LEAF	PROVIDE NEW WOOD DOOR IN KIND. PAINT TO MATCH INTERIOR BATHROOM PARTITIONS AND ACCENT PAINT COLOR SELECTION. COLOR SELECTION SHALL BE CONFIRMED WITH ARCHITECT PRIOR TO APPLICATION.
19	THRESHOLD	NEW EPOXY FLOOR FINISH TO MEET EXISTING FLOOR FINISH
20	WALL MOUNTED DEVICES	EXISTING ELECTRICAL DEVICES ON WALL TO REMAIN. PROTECT DURING APPLICATION OF NEW WALL PAINT, VERIFY LOCATION IN FIELD.

FIXTURE SCHEDULE

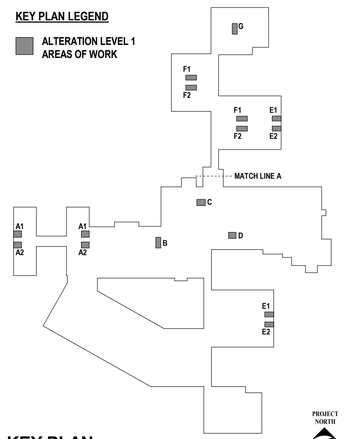
FIXTURE NO.	NAME	BRAND	MODEL #	QUANTITY	ADA
AC-01	TOILET FLOOR MOUNTED (JUNIOR)	SLOAN	ST-2309	4	Yes
AC-01A	TOILET FLOOR MOUNTED (JUVENILE)	SLOAN	ST-2449	7	Yes
AC-01B	TOILET FLOOR MOUNTED (ADA)	Sloan Valve	ST-2029	2	Yes
AC-02	URINAL WALL HUNG	SLOAN VALVE	SU-1009	2	Yes
AC-03	URINAL FLOOR MOUNTED	KOHLER CO.	K-25039-T	3	Yes
AC-04	LAVAOTRY SINGLE WALL HUNG	Sloan Valve	SS-3103	11	Yes
AC-05	LAVATORY DOUBLE WALL HUNG	Sloan Valve	ELRF-82000	1	Yes
AC-06	FLUSHOMETER - TOILET	Sloan Valve	G2-8111	12	
AC-07	FLUSHOMETER - URINAL	Sloan Valve	G2-8186	4	
AC-08	FAUCET	Sloan Valve	EAF-150	11	
AC-12	TOILET PARTITION	SCRANTON PRODUCTS		9	

CONSTRUCTION NOTES - CONTRACT P

P1	FLOOR MOUNTED TOILET	PROVIDE NEW FLOOR MOUNTED TOILET WITH FLUSH SENSOR. INSTALL 1-INCH COLD WATER, 3-INCH SANITARY, AND 2-INCH VENT TO TOILET WITH WAX SEAL AND SEALANT.
P2	WALL HUNG SINK	PROVIDE NEW SINGLE LAVATORY WITH FAUCET AND SOAP DISPENSER. INSTALL 1/2-INCH COLD AND HOT WATER TO FAUCET WITH NEW STOP VALVES AND STAINLESS STEEL FLEXIBLE HOSES. INSTALL 1-1/2-INCH SANITARY AND VENT TO SINK. ADA INSTALLATIONS SHALL INCLUDE INSULATION AROUND THE DRAIN AND SUPPLY PIPING IN EXPOSED PIPING APPLICATIONS BELOW SINK. PROVIDE TEMPERATURE LIMITING DEVICE FOR ON THE HOT WATER LINE TO ALL HAND SINKS AND SET AT 105 DEGREE F. PROVIDE SUPPORT CARRIER AND MOUNT AS PER THE SPECIFICATIONS.
P3	WALL HUNG SINK (DOUBLE)	PROVIDE DOUBLE LAVATORY WITH FAUCET AND SOAP DISPENSER. INSTALL 1/2-INCH COLD AND HOT WATER TO FAUCET WITH NEW STOP VALVES AND STAINLESS STEEL FLEXIBLE HOSES. INSTALL 1-1/2-INCH SANITARY AND VENT TO SINK. ADA INSTALLATIONS SHALL INCLUDE INSULATION AROUND THE DRAIN AND SUPPLY PIPING IN EXPOSED PIPING APPLICATIONS BELOW SINK. PROVIDE TEMPERATURE LIMITING DEVICE FOR ON THE HOT WATER LINE TO ALL HAND SINKS AND SET AT 105 DEGREE F. PROVIDE SUPPORT CARRIER AND MOUNT AS PER THE SPECIFICATIONS.
P4	FLOOR MOUNTED URINAL	PROVIDE NEW FLOOR MOUNTED URINAL. INSTALL 3/4-INCH COLD WATER, 2-INCH SANITARY AND 1-1/2-INCH VENT TO URINAL. INSTALL AS PER THE SPECIFICATIONS.
P5	WALL MOUNTED URINAL	PROVIDE NEW WALL MOUNTED URINAL. INSTALL 3/4-INCH COLD WATER, 2-INCH SANITARY AND 1-1/2-INCH VENT TO URINAL. FOR WALL MOUNTED FIXTURE, PROVIDE SUPPORT CARRIER AND MOUNT AS PER THE SPECIFICATIONS.
P6	FLOOR DRAIN COVER	PROVIDE NEW FLOOR DRAIN COVER.

KEY PLAN LEGEND

ALTERATION LEVEL 1 AREAS OF WORK



10 KEY PLAN
SCALE: 1" = 100'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A. Exp. Date
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M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G & P GENERAL & PLUMBING CONSTRUCTION

STATUS

90% SUBMISSION

SHEET TITLE

RESTROOM UPGRADES PROPOSED PLANS

DRAWING No.

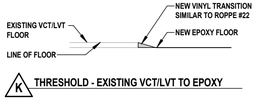
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FINISH SCHEDULE

ROOM NUMBER	FLOORING		NORTH WALL		EAST WALL		SOUTH WALL		WEST WALL		COMMENTS
	FINISH	BASE	MAT.	FIN.	MAT.	FIN.	MAT.	FIN.	MAT.	FIN.	
K-3A	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
K-4A	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
K-1A	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
K-2A	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
21	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
D-12	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
D-11	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
D-9	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
D-10	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
E-7	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
E-8	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
16	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
17	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
33	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
23	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	
26A	E.P.	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	EXIST	E.P.	



THRESHOLD - EXISTING VCT/LVT TO EPOXY

1 THRESHOLDS - INTERIOR

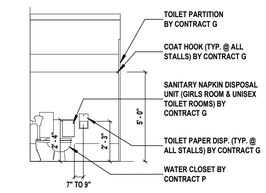
SCALE: 3" = 1'-0"

FINISH ABBREVIATIONS

CG	CORNER GUARD	P.T./PT	PAINT
C.M.U.	CONCRETE MASONRY UNIT	S.A.C./SAC	SUSPENDED ACOUSTICAL CEILING
CONC.	CONCRETE	STRUCT.	STRUCTURE
C.F.T./CFT	CERAMIC FLOOR TILE	V.C.T./VCT	VINYL COMPOSITE TILE
C.W.T./CWT	CERAMIC WALL TILE	EXIST.	EXISTING
D.F.	DRINKING FOUNTAIN	EXT	EXTERIOR
E.P.	EPOXY PAINT	HM	HOLLOW METAL
EXP.	EXPOSED	U.S.	UNDERSIDE
G.W.B./GWB	GYPSUM WALL BOARD		
L.V.T./LVT	LUXURY VINYL TILE		
R.B./RB	RUBBER BASE		
RUBBER	RUBBER FLOORING		

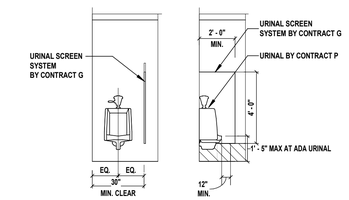
PLUMBING FIXTURE SCHEDULE

FIXTURE TAG	DESCRIPTION	MINIMUM CONNECTION SIZES								SPECIFICATION	REMARKS
			COLD WATER		HOT WATER		DRAIN		VENT		
		MAX FLOW	SIZE	WFU	SIZE	WFU	SIZE	DFU			
AC-04	LAVATORY - WALL MOUNT - ADA COMPLIANT - CENTER HOLE - SENSOR FAUCET	0.5 GPM	1/2"	0.5	1/2"	0.5	1-1/2"	1	1-1/2"	SINK: VITREOUS CHINA DROP-IN, SELF-RIMMING, SINGLE HOLE., ASME A112.19.2, FRONT OVERFLOW. FAUCET: DECK MOUNTED, ADA COMPLIANT, INTEGRATED SIDE MIXER, VANDAL RESISTANT, CHROME, GRID STRAINER, WITH 0.5 GPM AERATOR. COMPLIES WITH ASME A112.18.1 AND NSF 372.	PROVIDE BRASS ANGLE STOP VALVES WITH FLEXIBLE STAINLESS STEEL SUPPLIES, AND 1-1/2" BRASS P-TRAP. PROVIDE CARRIER SUPPORT WATTS WCA-411 OR APPROVED EQUAL. HOT WATER SHALL NOT EXCEED 105°F. INSULATE ALL EXPOSED DRAIN AND SUPPLY PIPING WITH TRUBRO LAVGUARD FOR HC FIXTURES.
AC-05	LAVATORY - DOUBLE WALL MOUNT - ADA COMPLIANT - SENSOR FAUCET	0.5 GPM	1/2"	0.5	1/2"	0.5	1-1/2"	1	1-1/2"	DOUBLE SINK: WALL MOUNTED, SLOANSTONE SOLID SURFACE, ROUND FRONT, ADA COMPLIANT. FAUCET: DECK MOUNTED, ADA COMPLIANT, INTEGRATED SIDE MIXER, VANDAL RESISTANT, CHROME, GRID STRAINER, WITH 0.5 GPM AERATOR. COMPLIES WITH ASME A112.18.1 AND NSF 372.	PROVIDE BRASS ANGLE STOP VALVES WITH FLEXIBLE STAINLESS STEEL SUPPLIES, AND 1-1/2" BRASS P-TRAP. PROVIDE CARRIER SUPPORT WATTS WCA-411 OR APPROVED EQUAL. HOT WATER SHALL NOT EXCEED 105°F. INSULATE ALL EXPOSED DRAIN AND SUPPLY PIPING WITH TRUBRO LAVGUARD FOR HC FIXTURES.
AC-01	WATER CLOSET - FLOOR MOUNTED - TOP SPUD - JUNIOR	1.28 GPF	1"	10	---	---	3"	4	1-1/2"	TOILET: VITREOUS CHINA, FLOOR MOUNTED, JUNIOR HEIGHT (10.75"), ASME A112.19.2. PROVIDE TOILET SEAT CHURCH 1580CT OR APPROVED EQUAL. FLUSH VALVE: EXPOSED SENSOR FLUSHOMETER, POLISHED CHROME, ADA COMPLIANT, VANDAL RESISTANT. COMPLIES WITH ASSE 1037. PROVIDE REQUIRED BATTERIES AND NO PIPE SEALANT ALLOWED.	
AC-01A	WATER CLOSET - FLOOR MOUNTED - TOP SPUD - JUVENILE	1.28 GPF	1"	10	---	---	3"	4	1-1/2"	TOILET: VITREOUS CHINA, FLOOR MOUNTED, JUVENILE HEIGHT (13.5"), ASME A112.19.2. PROVIDE TOILET SEAT CHURCH 295CT OR APPROVED EQUAL. FLUSH VALVE: EXPOSED SENSOR FLUSHOMETER, POLISHED CHROME, ADA COMPLIANT, VANDAL RESISTANT. COMPLIES WITH ASSE 1037. PROVIDE REQUIRED BATTERIES AND NO PIPE...	
AC-01B	WATER CLOSET - FLOOR MOUNTED - TOP SPUD - ADA	1.28 GPF	1"	10	---	---	3"	4	1-1/2"	TOILET: VITREOUS CHINA, FLOOR MOUNTED, ASME A112.19.2. PROVIDE TOILET SEAT CHURCH 295CT OR APPROVED EQUAL. FLUSH VALVE: EXPOSED SENSOR FLUSHOMETER, POLISHED CHROME, ADA COMPLIANT, VANDAL RESISTANT. COMPLIES WITH ASSE 1037. PROVIDE REQUIRED BATTERIES AND NO PIPE SEALANT ALLOWED.	
AC-02	URINAL - WALL MOUNTED - ADA COMPLIANT - TOP SPUD	0.125 GPF	3/4"	5	---	---	2"	4	2"	URINAL: VITREOUS CHINA, ADA HEIGHT, WALL MOUNTED, ASME A112.19.2. FLUSH VALVE: EXPOSED SENSOR FLUSHOMETER, POLISHED CHROME, ADA COMPLIANT, VANDAL RESISTANT. COMPLIES WITH ASSE 1037. PROVIDE REQUIRED BATTERIES AND NO PIPE SEALANT ALLOWED.	PROVIDE CARRIER SUPPORT WATTS CA-311 OR APPROVED EQUAL.
AC-03	URINAL - FLOOR MOUNTED - ADA COMPLIANT - TOP SPUD	0.125 GPF	3/4"	5	---	---	2"	4	2"	URINAL: VITREOUS CHINA, FLOOR MOUNTED, ASME A112.19.2. FLUSH VALVE: EXPOSED SENSOR FLUSHOMETER, POLISHED CHROME, ADA COMPLIANT, VANDAL RESISTANT. COMPLIES WITH ASSE 1037. PROVIDE REQUIRED BATTERIES AND NO PIPE SEALANT ALLOWED.	



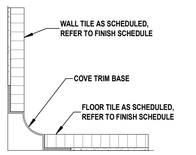
3 TOILET - TYPICAL

SCALE: 1/4" = 1'-0"



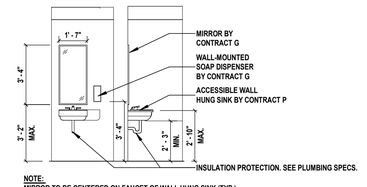
4 URINAL - ACCESSIBLE

SCALE: 1/4" = 1'-0"



2 C.T. BASE

SCALE: 1/4" = 1'-0"



NOTE:
MIRROR TO BE CENTERED ON FAUCET OF WALL HUNG SINK (TYP.)
REFER PLAN FOR LOCATION OF SOAP DISPENSER

5 WALL HUNG SINK

SCALE: 1/4" = 1'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A. (Exp. Date)
NY PROFESSIONAL ARCHITECT Lic. No. 041183

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S. MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G & P GENERAL & PLUMBING CONSTRUCTION

STATUS

90% SUBMISSION

SHEET TITLE

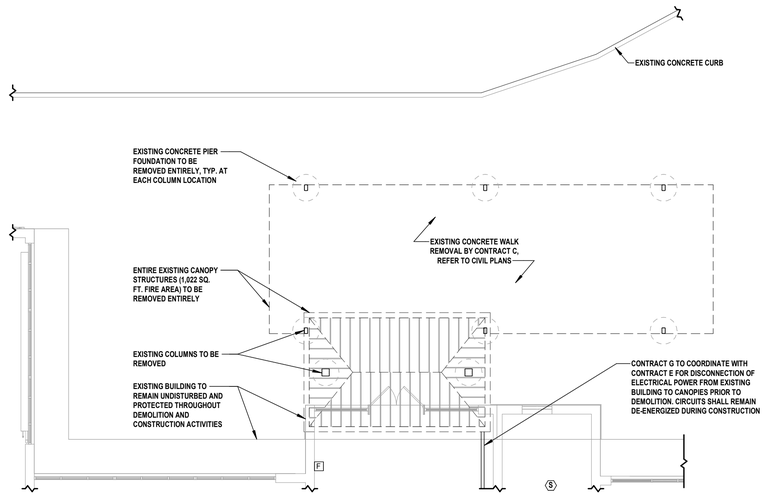
RESTROOM UPGRADES DETAILS, DOOR AND FINISH SCHEDULES

DRAWING No.

PE-A 431.00

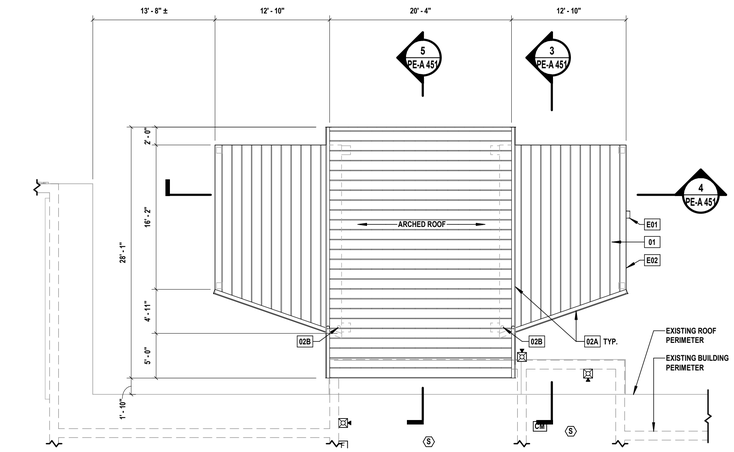
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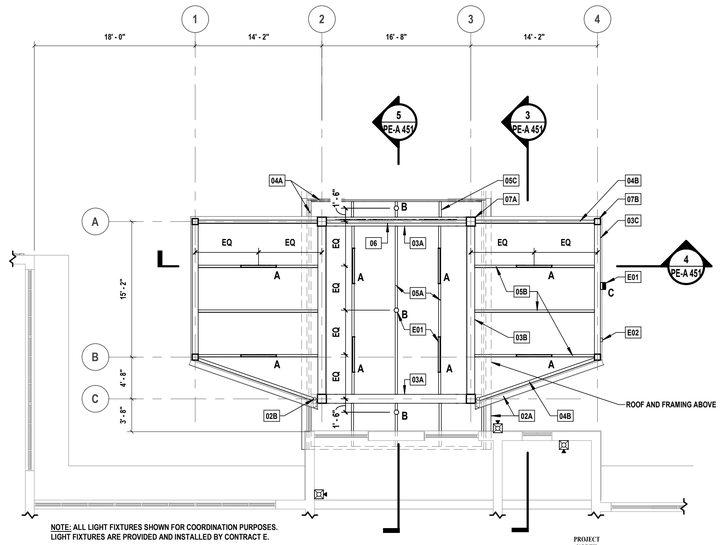
1 ENTRY CANOPY - DEMOLITION PLAN

SCALE: 1/8" = 1'-0"



2 ENTRY CANOPY - PROPOSED ROOF PLAN

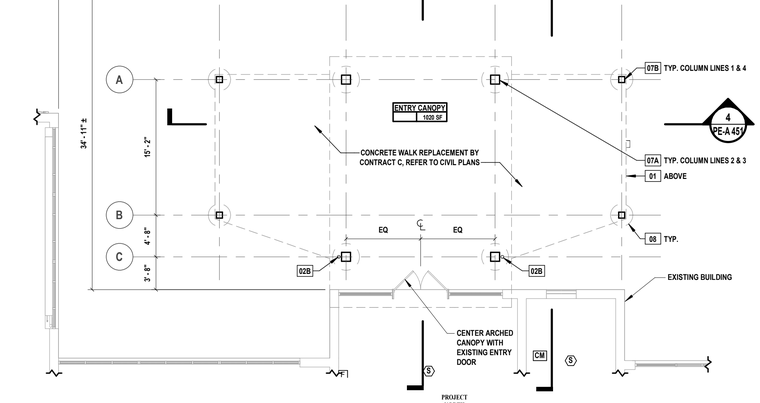
SCALE: 1/8" = 1'-0"



NOTE: ALL LIGHT FIXTURES SHOWN FOR COORDINATION PURPOSES. LIGHT FIXTURES ARE PROVIDED AND INSTALLED BY CONTRACT E.

4 ENTRY CANOPY - PROPOSED REFLECTED CEILING PLAN

SCALE: 1/8" = 1'-0"



3 ENTRY CANOPY - PROPOSED COLUMN PLAN

SCALE: 1/8" = 1'-0"

CANOPY KEY NOTES

KEY	DESCRIPTION
01	CONTRACT G TO PROVIDE AND INSTALL NEW 24ga. MEGA-RIB METAL ROOFING
02A	CONTRACT G TO PROVIDE AND INSTALL NEW 0.050" ALUM. SEAMLESS HALF ROUND GUTTER WITH HANGERS @ 24" O.C. GUTTERS TO BE 7" DEEP WITH MINIMUM 1/8" PER FOOT SLOPE. PROVIDE ALL NECESSARY FRAMING REQUIRED TO ATTACH AND SUPPORT THE GUTTER SYSTEM.
02B	CONTRACT G TO PROVIDE AND INSTALL NEW 0.050" ALUM. 4" DIAMETER DOWNSPOUT. CONNECT DOWNSPOUT TO BELOW GRADE STORM DRAINAGE, SEE DETAIL 6/PE-A 451
03A	GIRDER: 12"x12" STEEL HSS - ARCHED - CONTRACT G
03B	GIRDER: 12"x12" STEEL HSS - SLOPED (ARCH CANOPY) - CONTRACT G
03C	GIRDER: 8"x12" STEEL HSS - SLOPED (SIDE CANOPIES) - CONTRACT G
04A	FASCIA: 3"x8" STEEL HSS (ARCH CANOPY) - CONTRACT G
04B	FASCIA: 3"x12" STEEL HSS (SIDE CANOPIES) - CONTRACT G
05A	PURLIN: 4"x12" TALL STEEL HSS (ARCH CANOPY) - CONTRACT G
05B	PURLIN: 4"x8" STEEL HSS (SIDE CANOPIES) - CONTRACT G
05C	PURLIN: 4"x8" STEEL HSS - CANTILEVERED EXTENSION (ARCH CANOPY) - CONTRACT G
06	BEAM: 4"x12" STEEL HSS (ARCH CANOPY) - CONTRACT G
07A	COLUMN: 12"x12" STEEL HSS (ARCH CANOPY, COLUMN LINES 2 & 3) - CONTRACT G
07B	COLUMN: 8"x8" STEEL HSS (SIDE CANOPIES, COLUMN LINES 1 & 4) - CONTRACT G
08	CONTRACT G TO PROVIDE AND INSTALL NEW POURED CONCRETE FOOTING AS PER DELEGATED DESIGN, SEE BASIS OF DESIGN DETAIL 6/PE-A 451
09	CONTRACT G TO PROVIDE AND INSTALL NEW 8" TALL FLAT CUT PIN MOUNTED ALUMINUM SIGNAGE WITH 1" STANDOFFS (ARCH CANOPY)
C01	NEW CONCRETE WALK PROVIDED BY CONTRACT C, REFER TO CIVIL DWGS. CONTRACT G TO COORDINATE.
C02	NEW STORM DRAIN PROVIDED BY CONTRACT C, REFER TO CIVIL DWGS. CONTRACT G TO COORDINATE.
E01	NEW LIGHT FIXTURE PROVIDED AND INSTALLED BY CONTRACT E, CONTRACT G TO COORDINATE WITH CONTRACT E.
E02	NEW PHOTOCELL PROVIDED AND INSTALLED BY CONTRACT E, CONTRACT G TO COORDINATE WITH CONTRACT E.

GENERAL NOTES - CONTRACT G

1. DRAWINGS AND SPECIFICATIONS PROVIDE MINIMUM REQUIREMENTS AND DESIGN INTENT FOR THE PRE-FABRICATED CANOPY STRUCTURE AND CONCRETE PIER FOUNDATIONS. CONTRACTOR SHALL PROVIDE DRAWINGS AND CALCULATIONS FOR BOTH THE PRE-FABRICATED CANOPY STRUCTURE AND PIER FOUNDATIONS. DRAWINGS AND CALCULATIONS SHALL BE SEALED BY NEW YORK STATE LICENSED ENGINEER AND SUBMITTED TO ARCHITECT FOR REVIEW AND APPROVAL.
2. PRE-FABRICATED CANOPY STRUCTURE COMPONENT AND MEMBER SIZES SHOWN ON THE DRAWINGS ARE MINIMUM SIZES AND SHALL BE THE RESPONSIBILITY OF THE DELEGATED DESIGN ENGINEER TO DETERMINE ACTUAL SIZES AND THICKNESS.
3. CONTRACT G SHALL COORDINATE THE DISCONNECTION OF ELECTRICAL POWER FROM EXISTING BUILDING TO EXISTING CANOPIES PRIOR TO DEMOLITION WITH CONTRACT E. CONTRACT E SHALL BE RESPONSIBLE FOR ALL DE-ENERGIZATION AND RE-ENERGIZATION OF ELECTRICAL POWER. CIRCUITS SHALL REMAIN DE-ENERGIZED DURING CONSTRUCTION.

STRUCTURAL DESIGN CRITERIA & NOTES
CONTRACT - G

1. BUILDING CODE:
   2025 BUILDING CODE OF NEW YORK STATE IN CONJUNCTION WITH THE 2024 INTERNATIONAL BUILDING CODE.
2. RISK CATEGORY:
   III
3. BUILDING GRAVITY LOADS:
   A. DEAD LOADS: BY CANOPY DESIGNER
   B. LIVE LOADS: ROOF 20 PSF
   C. SNOW LOADS:

GROUND SNOW LOAD, pg	61.0 PSF
EXPOSURE COEFFICIENT, Ce	1.0
THERMAL COEFFICIENT, Ct	1.2
MINIMUM SNOW LOAD, pm	35.0 PSF
FLAT ROOF SNOW LOAD, pf	51.2 PSF
RAIN-ON-SNOW SURCHARGE	0.0 PSF

4. WIND LOADS:

BASIC WIND SPEED	123 MPH
EXPOSURE	B
END ZONE WIDTH, a	3 FT
DESIGN WIND ZONE:	DESIGN WIND PRESSURE:
MWFRS ROOF (PRESSURE, MAX.)	19.0 PSF
MWFRS ROOF (SUCTION, MAX.)	-16.0 PSF
C&C ROOF (ZONE 3)	45.0, -42.0 PSF
C&C ROOF (ZONE 2)	35.0, -32.0 PSF
C&C ROOF (ZONE 1)	22.5, -21.0 PSF

COMPONENT AND CLADDING VALUES LISTED ARE BASED ON 10 SQUARE FOOT "EFFECTIVE AREA" AS DEFINED BY ASCE 7 - MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES. ALL ITEMS SPECIFIED TO BE DESIGNED BY OTHERS SHALL BE DESIGNED TO WITHSTAND COMPONENT AND CLADDING LOADS SHOWN, UNLESS SPECIFICALLY NOTED OTHERWISE IN PLANS, SPECIFICATIONS OR BY RFI RESPONSE. WIND LOADS MAY BE REDUCED BASED ON INCREASED "EFFECTIVE AREA" WHEN CALCULATIONS ARE SUBMITTED AND REVIEWED BY ENGINEER OF RECORD PRIOR TO FINAL DESIGN SUBMISSION. SUBMITTAL SHALL INCLUDE EFFECTIVE AREA ASSUMPTIONS FOR EACH COMPONENT AND WIND LOAD CALCULATIONS USING PARAMETERS SPECIFIED HEREIN.

REFER TO PREFABRICATED METAL BUILDING ENGINEERING DRAWINGS (BY OTHERS) FOR WIND LOADS ON PREFABRICATED METAL BUILDINGS.

5. SEISMIC LOADS:

SEISMIC SITE CLASS	DEFAULT
SEISMIC IMPORTANCE FACTOR, Ie	1.25
Ss = 0.26 g	S1 = 0.05 g
Sms =0.29 g	Sm1 =0.11 g
Sds =0.2 g	Sd1 =0..071 g
SEISMIC DESIGN CATEGORY	B

6. SOIL DESIGN VALUES: PRESUMED MINIMUMS USED FOR CL, ML, MH, AND CH

SOIL BEARING CAPACITY	1,500 PSF
PASSIVE BEARING CAPACITY	100 PSF/FT
COHESION	130 PSF

7. ANY BUILDING COMPONENT NOTED AS DELEGATED DESIGN ITEMS IN DRAWINGS AND/OR SPECIFICATIONS SHALL BE DESIGNED IN ACCORDANCE WITH MINIMUM LOADS SPECIFIED ABOVE. ANY DEVIATION FROM NOTED LOAD VALUES SHALL BE SUBMITTED BY CONTRACTOR FOR REVIEW AND APPROVAL TO EOR PRIOR TO SUBMITTING SHOP DRAWINGS AND CALCULATIONS.

8. CANOPY STRUCTURE AND SUPPORTING FOUNDATIONS SHALL BE A DELEGATED DESIGN. STAMPED AND SIGNED STRUCTURAL DRAWINGS AND DESIGN CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW PRIOR TO CONSTRUCTION.

8. ALL DELEGATED DESIGN SHALL BE DONE TO THE ABOVE REFERENCED BUILDING CODE VERSIONS, AND THEIR REFERENCED SUBCODES.

9. ADDITIONAL DESIGN LOADS INDICATED ON STRUCTURAL DRAWINGS ARE IDENTIFIED AS FOLLOWS:
   DL = DEAD LOAD
   LL = LIVE LOAD
   Lr = ROOF LIVE LOAD
   SL = SNOW LOAD
   WL = WIND LOAD
   EQ = SEISMIC LOAD
   FL = FLOOD LOAD

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CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT Lic. No. 041183 Exp. Date

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. MAGAZU	M. MAGAZU	S. MANDIC	L. FEELEY

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

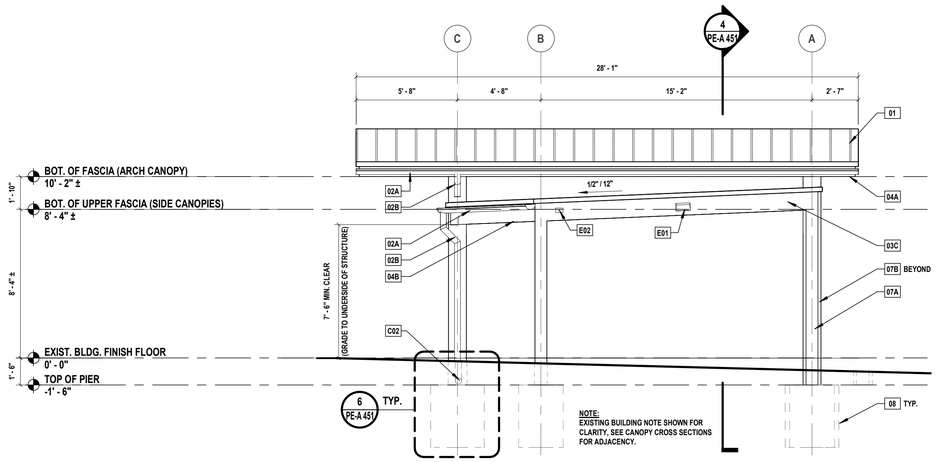
ENLARGED CANOPY PLANS

DRAWING No.

PE-A 450.00

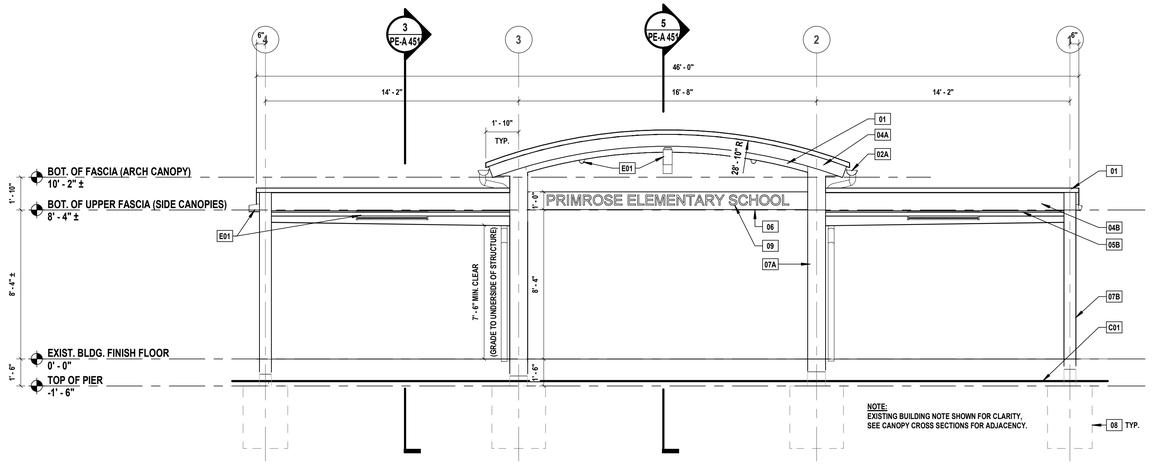
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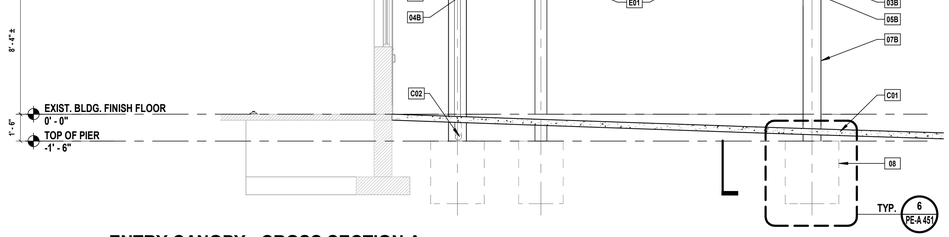
1 ENTRY CANOPY - SIDE ELEVATION (TYP.)

SCALE: 1/4" = 1'-0"



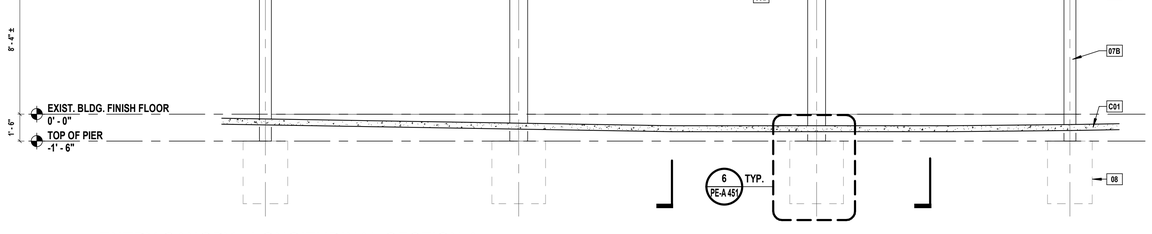
2 ENTRY CANOPY - FRONT ELEVATION

SCALE: 1/4" = 1'-0"



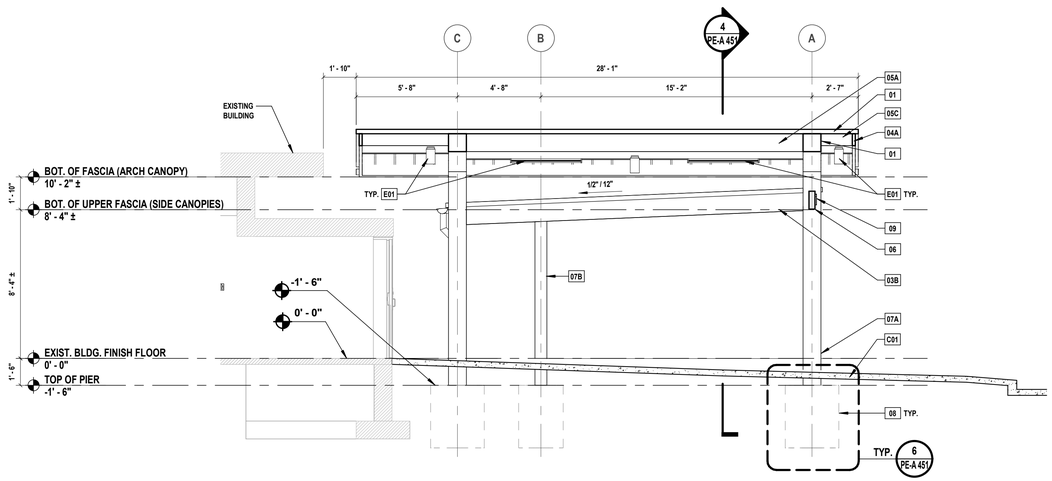
3 ENTRY CANOPY - CROSS SECTION A

SCALE: 1/4" = 1'-0"



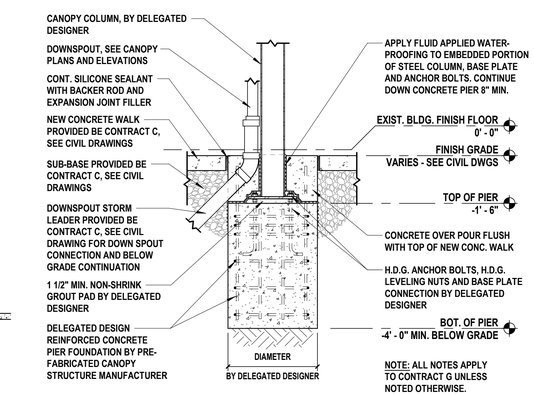
4 ENTRY CANOPY - LONGITUDINAL SECTION A

SCALE: 1/4" = 1'-0"



5 ENTRY CANOPY - CROSS SECTION B

SCALE: 1/4" = 1'-0"



6 CONCRETE PIER DETAIL

SCALE: 1/2" = 1'-0"

CANOPY KEY NOTES 2

KEY	DISCRIPTION
01	CONTRACT G TO PROVIDE AND INSTALL NEW 24ga. MEGA-RIB METAL ROOFING
02A	CONTRACT G TO PROVIDE AND INSTALL NEW 0.050" ALUM. SEAMLESS HALF ROUND GUTTER WITH HANGERS @ 24" O.C. GUTTERS TO BE 7" DEEP WITH MINIMUM 1/8" PER FOOT SLOPE. PROVIDE ALL NECESSARY FRAMING REQUIRED TO ATTACH AND SUPPORT THE GUTTER SYSTEM.
02B	CONTRACT G TO PROVIDE AND INSTALL NEW 0.050" ALUM. 4" DIAMETER DOWNSPOUT. CONNECT DOWNSPOUT TO BELOW GRADE STORM DRAINAGE, SEE DETAIL 6/PE-A 451
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09	CONTRACT G TO PROVIDE AND INSTALL NEW 8" TALL FLAT CUT PIN MOUNTED ALUMINUM SIGNAGE WITH 1" STANDOFFS (ARCH CANOPY)
C01	NEW CONCRETE WALK PROVIDED BY CONTRACT C, REFER TO CIVIL DWGS. CONTRACT G TO COORDINATE.
C02	NEW STORM DRAIN PROVIDED BY CONTRACT C, REFER TO CIVIL DWGS. CONTRACT G TO COORDINATE.
E01	NEW LIGHT FIXTURE PROVIDED AND INSTALLED BY CONTRACT E, CONTRACT G TO COORDINATE WITH CONTRACT E.
E02	NEW PHOTOCELL PROVIDED AND INSTALLED BY CONTRACT E, CONTRACT G TO COORDINATE WITH CONTRACT E.

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White Plains, NY 10605
914.358.5623 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

REGISTERED ARCHITECT KATRINA PACHECO 041183 STATE OF NEW YORK

09/30/2029
Exp. Date

KATRINA N. PACHECO, R.A.
NY PROFESSIONAL ARCHITECT LIC. No. 041183

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. MAGAZU	M. MAGAZU	S. MANDIC	L. FEELEY

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

ENLARGED CANOPY SECTIONS AND DETAILS

DRAWING No.

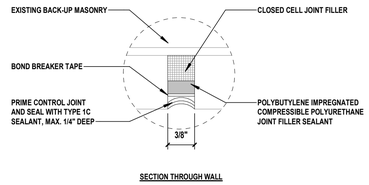
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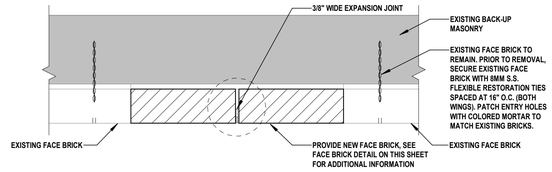


1 MASONRY POINTING
SCALE: 1 1/2" = 1'-0"

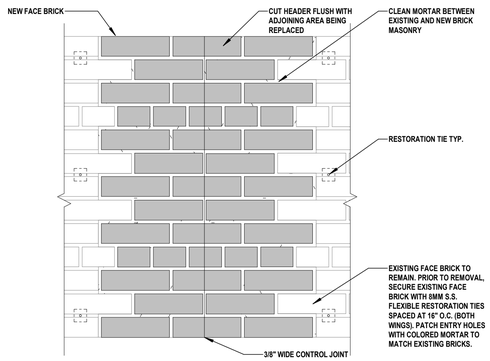


SECTION THROUGH WALL

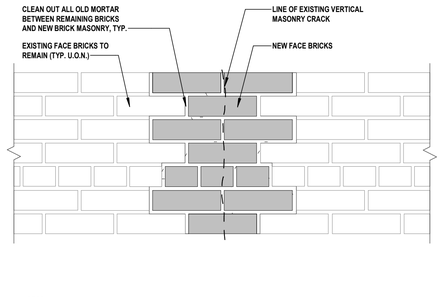
2 EXTERIOR MASONRY WALL - CONTROL JOINT-SECTION
SCALE: 12" = 1'-0"



3 EXTERIOR MASONRY WALL - EXPANSION JOINT-PLAN
SCALE: 1 1/2" = 1'-0"

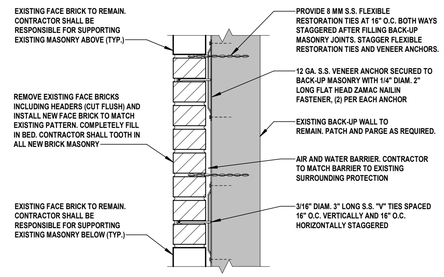


4 EXTERIOR MASONRY WALL - EXPANSION JOINT-ELEVATION
SCALE: 1 1/2" = 1'-0"



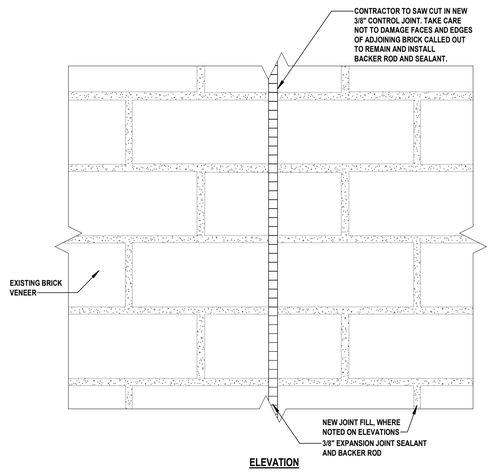
NOTES:
1. REPLACE HATCHED BRICKS/BLOCKS WITH NEW BRICKS/BLOCKS.
2. DO NOT REPLACE HEADER BRICKS IF NOT CRACKED.
3. ALL JOINTS BETWEEN BRICK HEAD AND BED JOINTS ARE TO BE FILLED SOLID.

5 MASONRY STITCH REPAIR
SCALE: 1 1/2" = 1'-0"



NOTE: REPLACE EXISTING MASONRY THROUGH-WALL AND COUNTER FLASHING WITH NEW WHERE INDICATED ON ELEVATIONS.

6 BLOCK REPLACEMENT - FACE BRICK/ SPLIT FACE
SCALE: 1 1/2" = 1'-0"



ELEVATION

7 NEW EXPANSION JOINT - ELEVATION
SCALE: 3" = 1'-0"

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Katrina N. Pacheco 09/30/2029
KATRINA N. PACHECO, R.A. Exp. Date
NY PROFESSIONAL ARCHITECT Lic. No. 041183

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S. MANDIC	C. HENRY	S. MANDIC	L. FEELEY

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

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SED #: 66-21-01-06-0-002-017

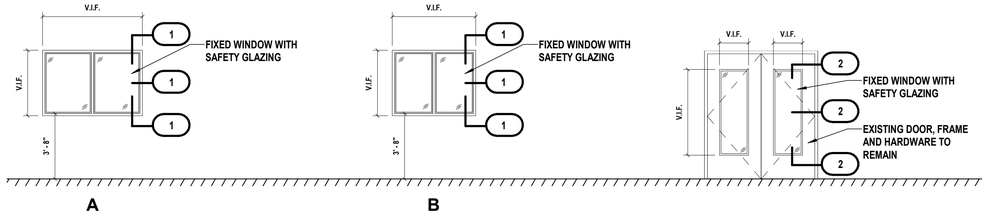
CONTRACT
CONTRACT G GENERAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
ARCHITECTURAL DETAILS

DRAWING No.
PE-A 500.00

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Window Types

SCALE: 1/4" = 1'-0"

NOTES:

1. REFER TO WINDOW SCHEDULE, HARDWARE SETS, AND PROJECT MANUAL FOR HARDWARE INFORMATION.
2. ALL REQUIRED PREP AND MODIFICATIONS TO EXISTING WALL ASSEMBLIES TO ACCOMMODATE WINDOWS SHALL BE INCLUDED IN BID PRICE.
3. CONTRACTOR TO VERIFY ALL EXISTING OPENING SIZES, CONDITIONS AND SWINGS PRIOR TO ORDERING ANY MATERIAL, SHOULD ANY CONFLICTS ARISE, ARCHITECT SHALL BE NOTIFIED IMMEDIATELY.
4. WINDOWS FRAMES TO RECEIVE PAINTED FINISH, COLOR TO MATCH EXISTING COLOR.

WINDOW SCHEDULE

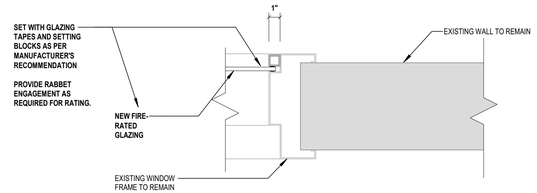
TYPE	FRAME MATERIAL	FRAME FINISH	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	COMMENTS
A	EXIST.	PT	1/PE-A 610 SIM	1/PE-A 610 SIM	1/PE-A 610 SIM	EXISTING WIRE GLASS TO BE REPLACED WITH NEW FIRE-RATED GLAZING
B	EXIST.	PT	1/PE-A 610 SIM	1/PE-A 610 SIM	1/PE-A 610 SIM	EXISTING WIRE GLASS TO BE REPLACED WITH NEW FIRE-RATED GLAZING

DOOR TYPE NOTES

1. FRAMES AND DOORS SCHEDULED FOR EXISTING OPENINGS - VERIFY IN FIELD EXISTING OPENING SIZES AND RECORD ON SHOP DRAWINGS.
2. ALL DOORS INDICATED ARE TO BE ADJUSTED TO ELIMINATE RATTLE AND OR PLAY WHEN DOOR IS LATCHED
3. ALL DOORS ARE TO HAVE STOPS
4. UNDERCUT DOORS WHERE MARBLE THRESHOLDS ARE CALLED OUT INSTALL KICKPLATES ON PUSH SIDE OF DOOR (TYP).
5. FIRE RATED DOORS AND FRAMES REQUIRE LABELS
6. BACKER ROD AND SEALANT SHALL BE PROVIDED AT ALL LOCATIONS WHERE DOOR/WINDOW FRAMES MEET OTHER FINISHES
7. ALL GLAZING IN DOORS, FIXED SIDE PANELS ADJOINING DOORS, INTERIOR PARTITIONS WHERE GLAZING EXTENDS TO WITHIN 1'-6" OF FINISHED FLOOR AND GLASS PANELS GREATER THAN 50 SF TO BE FULLY TEMPERED SAFETY GLASS PER CHAPTER 24 OF THE 2025 BCNYS.

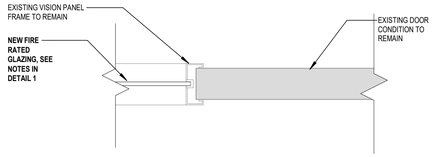
ABBREVIATIONS

APPROX.	APPROXIMATE
C.M.U.	CONCRETE MASONRY UNIT
CONC.	CONCRETE
EXIST.	EXISTING
FF/ F.F.	FACTORY FINISH
INT.	INTERIOR
P.T./PT	PAINT
SIM	SIMILAR
TBD	TO BE DETERMINED
TYP.	TYPICAL



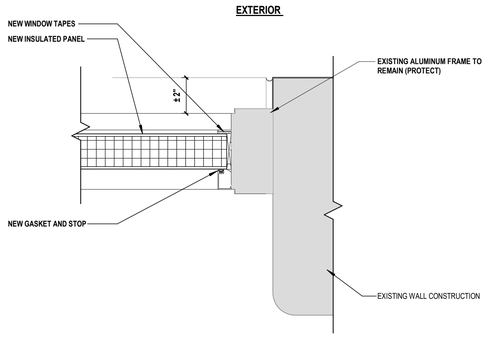
1 INT. WINDOW CONDITION

SCALE: 3" = 1'-0"



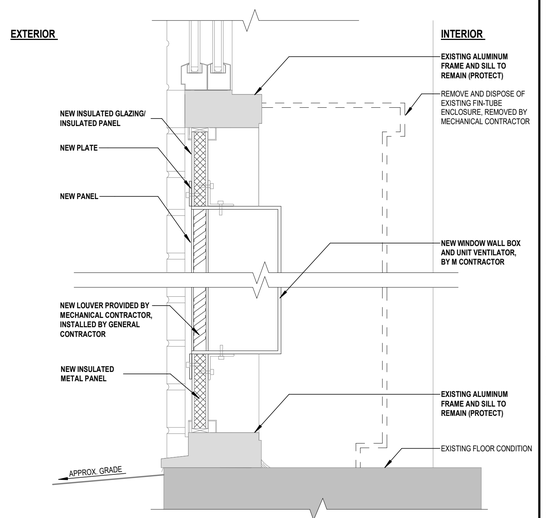
2 INT. DOOR VISION PANEL CONDITION

SCALE: 3" = 1'-0"



3 INSULATED PANEL JAMB

SCALE: 3" = 1'-0"



4 THROUGH-WALL WALL BOX UNIT DETAIL

SCALE: 12" = 1'-0"

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CONSULTANTS:

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09/30/2029
Exp. Date
KATRINA N. PACHECO, R.A.
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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
M. LUCK	M. LUCK	S.MANDIC	K. PACHECO

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

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110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT G GENERAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

WINDOW SCHEDULE

DRAWING No.

PE-A 610.00

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DOOR SCHEDULE

DOOR NO.	FROM NAME	FROM NUMBER	TO NAME	TO NUMBER	DOOR TYPE	DOOR MATERIAL	DOOR FINISH	DOOR LEAF WIDTH	DOOR LEAF HEIGHT	DOOR LEAF THICKNESS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	FIRE RATING	HARDWARE SET	COMMENTS
1F	CORRIDOR	HW-1F			2A	EXIST.	EXIST.	6' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.		REMOVE, MAINTAIN AND RESTALL ALL EXSITING DOOR, FRAME, AND HARDWARE
17	CORRIDOR	HW-1E	BOYS' RESTROOM	17	2A	WOOD	FF	3' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.	TBD	REMOVE, MAINTAIN, AND REINSTALL ALL EXISTING HARDWARE
26A	CORRIDOR	HW-1F	GIRLS' RESTROOM	26A	2A	WOOD	FF	3' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.	TBD	REMOVE, MAINTAIN, AND REINSTALL ALL EXISTING HARDWARE
30A	GYM STORAGE	30A	BIG GYMNASIUM	30	3A	WOOD	FF	6' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.	TBD	WIRE GLASS REPLACE TO FIRE RATED GLAZING
30AA	GYM STORAGE	30A	BIG GYMNASIUM	30	3A	WOOD	FF	6' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.	TBD	WIRE GLASS REPLACE TO FIRE RATED GLAZING
D-10	CORRIDOR	HW-I	RESTROOM	D-10	2A	WOOD	FF	3' - 0"	7' - 0"	1 3/4"	EXIST.	EXIST.	PT	45 MIN.	TBD	REMOVE, MAINTAIN, AND REINSTALL ALL EXISTING HARDWARE

NOTES:

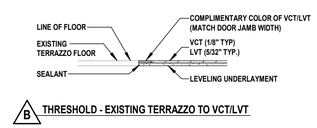
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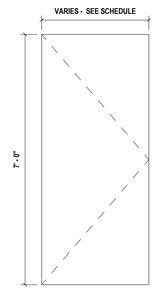
ABBREVIATIONS

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EXIST.	EXISTING
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P.T./PT	PAINT
SIM	SIMILAR
TBD	TO BE DETERMINED
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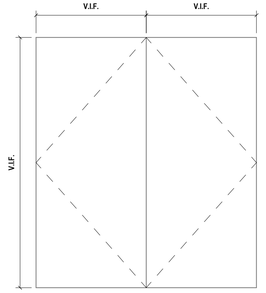


B THRESHOLD - EXISTING TERRAZZO TO VCT/LVT

1 THRESHOLDS - INTERIOR
SCALE: 3" = 1'-0"



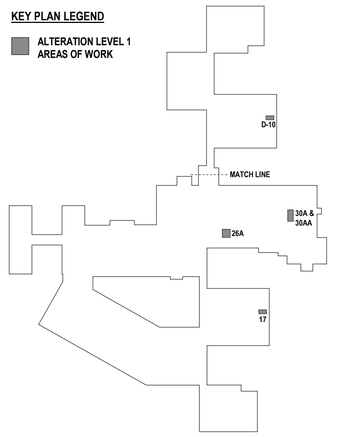
2 TYPE - 2A
SCALE: 1/2" = 1'-0"



3 TYPE - 3A
SCALE: 1/2" = 1'-0"

KEY PLAN LEGEND

ALTERATION LEVEL 1 AREAS OF WORK



5 KEY PLAN
SCALE: 1" = 100'-0"

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SHEET TITLE

DOOR SCHEDULE

DRAWING No.

PE-A 620.00

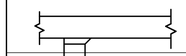
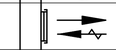
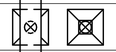
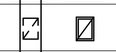
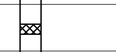
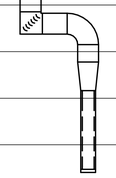
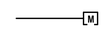
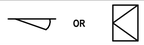
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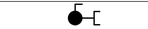
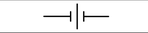
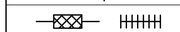
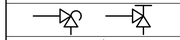
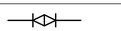
ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
BCU	BUILDING CONTROL UNIT
BTU	BRITISH THERMAL UNIT
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
COMM.	COMMUNICATION
CV	CONTROL VALVE
(D)	DEMOLISH
DB	DRY BULB
DCV	DEMAND CONTROLLED VENTILATION
DEG. F	DEGREES FAHRENHEIT
DIA	DIAMETER
DX	DIRECT EXPANSION
'E'	ELECTRICAL CONTRACTOR
(E)	EXISTING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATING
ESP	EXTERNAL STATIC PRESSURE
FAI	FRESH AIR INTAKE
FD	FLOOR DRAIN
FLA	FULL LOAD AMPS
FT. H20	FEET OF WATER
'G'	GENERAL CONSTRUCTION CONTRACTOR
GPM	GALLONS PER MINUTE
GPH	GALLONS PER HOUR
H	HEIGHT
'H'	HVAC CONTRACTOR
HP	HORSEPOWER
IN.	INCHES
IN. W.C. (W.G.)	INCHES WATER COLUMN (WATER GAUGE)
KW	KILOWATTS
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LCD	LIQUID CRYSTAL DISPLAY
LDB	LEAVING DRY BULB TEMPERATURE
LWB	LEAVING WET BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
M	METER
MAX	MAXIMUM
MBH	1,000 BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MIN	MINIMUM
MNF	MANUFACTURER
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NPT	NATIONAL PIPE THREAD
NTS	NOT TO SCALE
OAI	OUTDOOR AIR INTAKE
OD	OUTER DIAMETER
OED	OPEN ENDED DUCT
'P'	PLUMBING CONTRACTOR
PD	PRESSURE DROP
PSIG	LBS / SQUARE INCH (GAUGE PRESSURE)
RD	ROOF DRAIN
RPM	REVOLUTIONS PER MINUTE
RPZ	REDUCED PRESSURE ZONE
SAT	SUPPLY AIR TEMPERATURE
SEER	SEASONAL ENERGY EFFICIENCY RATING
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TYP	TYPICAL
VFD	VARIABLE FREQUENCY DRIVE
W	WIDTH
WAC	WINDOW AIR CONDITIONER
WB	WET BULB
WMS	WIRE MESH SCREEN

DUCTWORK LEGEND

SYMBOL	ABBREV	DESCRIPTION
		NEW DUCTWORK WITH 45 DEGREE TAKE OFF
	VD	VOLUME DAMPER
	CD	ROUND SUPPLY CEILING DIFFUSER
	SEE AIR DEVICE SCHEDULE	SIDEWALL SUPPLY, RETURN OR EXHAUST
	SEE AIR DEVICE SCHEDULE	SQUARE SUPPLY CEILING DIFFUSER
	SEE AIR DEVICE SCHEDULE	CEILING RETURN OR EXHAUST GRILLE
		FLEX DUCT
	FC	FLEXIBLE CONNECTION
		TURNING VANES
		RECTANGULAR TO ROUND TRANSITION
	AL	ACOUSTICAL LINING
		END CAP
	SEE AIR DEVICE SCHEDULE	SUPPLY DIFFUSER WITH DIRECTIONAL FLOW (SOLID HATCH INDICATES BLANK OFF PANEL)
		SUPPLY DUCT DROP
		RETURN/EXHAUST DUCT DROP
		SUPPLY DUCT RISE
		RETURN/EXHAUST DUCT RISE
	DSD	DUCT SMOKE DETECTOR
	MD	MOTORIZED DAMPER WITH ACTUATOR
	AD	ACCESS DOOR
	FD/AD	FIRE DAMPER WITH ACCESS DOOR
	FD/AD	FIRE DAMPER AT FLOOR PENETRATION WITH ACCESS DOOR
	FSD/AD	FIRE SMOKE DAMPER WITH ACCESS DOOR
		WORK TO BE REMOVED
		POINT OF DISCONNECTION FROM EXISTING
		POINT OF RECONNECTION TO EXISTING

PIPING LEGEND

SYMBOL	ABBREV	DESCRIPTION
		NEW WORK
		WORK TO BE REMOVED
		PIPING DOWN/ PIPING UP
		BALL VALVE WITH HOSE END CONNECTION
	TH	THERMOMETER
	U	UNION
	FPC	FLEXIBLE PIPE CONNECTION/ FLEX PIPE
		DIRECTION OF FLOW
	PSR	PRESSURE SAFETY AND RELIEF VALVE
	PRV	PRESSURE REDUCING VALVE
	BV	BALL VALVE
	BA	BALANCING VALVE
	BFV	BUTTERFLY VALVE
		TEMPERATURE SENSOR WITH THERMOWELL
	GA	GATE VALVE
	GB	GLOBE VALVE
	AV	AUTOMATIC AIR VENT
	CV	2-WAY ELECTRONIC CONTROL VALVE
	CV	3-WAY ELECTRONIC CONTROL VALVE
	CV	2-WAY PNEUMATIC CONTROL VALVE
	CV	3-WAY PNEUMATIC CONTROL VALVE
		PLUG VALVE
	STR	STRAINER
	STR	STRAINER WITH BLOW OFF VALVE WITH HOSE END CONNECTION
	FD	FLOOR DRAIN
		AIR SEPARATOR
		STEAM TRAPS (INDICATE TYPE)
	CH	CHECK VALVE
	PG	PRESSURE GAUGE WITH GAUGE COCK
	RED	REDUCER
	CO	CLEANOUT END CAP
		PIPE GUIDE
		PIPE ANCHOR
		CAPPED PIPE
		PUMP
		POINT OF DISCONNECTION FROM EXISTING
		POINT OF RECONNECTION TO EXISTING
	TDV	TRIPLE DUTY VALVE

CONTROLS LEGEND

SYMBOL	DESCRIPTION
C	CARBON MONOXIDE SENSOR
T	THERMOSTAT
S	DIGITAL TEMPERATURE SENSOR
H	HUMIDITY SENSOR
P	PRESSURE SENSOR
C2	CARBON DIOXIDE SENSOR

GENERAL NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. THE CONTRACTOR, BY PRESENTING THEIR BID FOR THE WORK, REPRESENTS THAT HE/SHE HAS INSPECTED THE SITE AND IS COMPLETELY FAMILIAR WITH THE SCOPE OF WORK AND ALL FIELD CONDITIONS RELATED TO, AND AFFECTING THE WORK AND ITS PERFORMANCE. EXCEPTIONS AFFECTING THE WORK AND ITS PERFORMANCE, OR CONFLICTS BETWEEN FIELD CONDITIONS, SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO THE SUBMISSION OF BIDS.
3. PERFORM ALL WORK IN ACCORDANCE WITH THE PLUMBING CODE, FIRE CODE, MECHANICAL CODE, ENERGY CONSERVATION CODE, AND FUEL GAS CODE OF NEW YORK STATE AND REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.
4. COMPLY WITH THE NATIONAL ELECTRIC CODE AND THE REQUIREMENTS OF DIVISION 26 FOR ALL ELECTRICAL INSTALLATIONS.
5. FIRE STOP ALL OPENINGS IN FIRE RATED CONSTRUCTION FOR PIPING, DUCTWORK, CONDUIT, ETC. PROVIDE FIRE DAMPERS AND ACCESS DOORS IN ALL OPENINGS IN FIRE RATED FLOORS, PARTITIONS, AND WALLS FOR DUCTWORK AS PER THE MECHANICAL CODE OF NEW YORK STATE. (SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE RATED CONSTRUCTION.)
6. DO NOT SCALE DRAWINGS. DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITELY FIXED BY DIMENSIONS ARE APPROXIMATE. COORDINATE CONTRACT DOCUMENTS, PROJECT REQUIREMENTS, WORK OF OTHERS, AND EQUIPMENT AND MATERIALS PURCHASED WITH FIELD DIMENSIONS. INSTALL ALL EQUIPMENT AS PER MANUFACTURER'S REQUIREMENTS TO PROVIDE PROPER CLEARANCE FOR INSTALLATION, OPERATION, AND MAINTENANCE. CONTRACTOR'S INTENDED MEANS AND METHODS OF INSTALLATION AND CONTRACTOR'S FABRICATED ITEMS SHALL ENSURE A PROPER "FIT" AND INSTALLATION. BRING ANY CONFLICTS TO THE ATTENTION OF THE ARCHITECT/ENGINEER DURING THE SUBMITTAL PHASE FOR RESOLUTION PRIOR TO PURCHASING ANY EQUIPMENT.
7. MAINTAIN MAXIMUM HEADROOM AND SPACE CONDITIONS AT ALL POINTS. WHERE HEADROOM AND SPACE CONDITIONS APPEAR INADEQUATE, NOTIFY THE ARCHITECT/ENGINEER PRIOR TO PROCEEDING WITH INSTALLATION. MAINTAIN A MINIMUM OF 6'-8" CLEARANCE FROM FINISHED FLOOR TO UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS OR WALKING AREAS.
8. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION. MAKE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK. OBTAIN THE APPROVAL OF THE ARCHITECT/ENGINEER FOR MODIFICATIONS.
9. PROVIDE PRODUCTS OF ONE MANUFACTURER WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF MATERIAL OR EQUIPMENT IS REQUIRED.
10. INSTALL ALL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS. REFER TO DETAILS FOR ADDITIONAL PIPING AND EQUIPMENT INSTALLATION REQUIREMENTS.
11. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER TO ENSURE MANUFACTURER CERTIFIED ACCURACY.
12. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL PIPING AND DUCT TRANSITIONS REQUIRED FOR FINAL CONNECTIONS TO EQUIPMENT.
13. COORDINATE LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS WITH ALL OTHER TRADES. COORDINATE ALL PIPING AND EQUIPMENT SUPPORTED FROM STRUCTURE WITH GENERAL CONSTRUCTION WORK.
14. COORDINATE INSTALLATION OF SUPPLY AND RETURN GRILLES WITH INSTALLATION OF FINISHED CEILINGS.
15. COMPLETE ALL PRESSURE TESTS BEFORE ANY MECHANICAL EQUIPMENT, DUCTWORK, OR PIPING INSULATION IS APPLIED.
16. TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). PERFORM ALL TESTING, ADJUSTING, AND BALANCING IN ACCORDANCE WITH THE SPECIFICATIONS.
17. MAKE ALL ATTACHMENTS TO JOISTS, TRUSSES, OR JOIST GIRDERS AT PANEL POINTS. PROVIDE FORGED OR CAST BEAM CLAMPS; THE USE OF ROLLED STEEL C-CLAMPS IS NOT PERMITTED. REFER TO SPECIFICATION SECTION 230529 FOR ADDITIONAL INFORMATION.
18. PROVIDE CONCRETE PADS A MINIMUM OF 6 INCHES HIGH FOR ALL FLOOR MOUNTED EQUIPMENT. EXTEND PAD 4 INCHES BEYOND THE EQUIPMENT ON ALL SIDES.
19. INTERNALLY LINE ALL SUPPLY, RETURN AND OUTDOOR AIR DUCTWORK WITHIN 20 FEET UPSTREAM AND DOWNSTREAM OF FANS/AIR HANDLING EQUIPMENT WITH 1" THICK ACOUSTIC DUCT LINER. INTERNALLY LINED DUCTWORK MEETING THIS REQUIREMENT SHALL ALSO BE PROVIDED WITH EXTERNALLY APPLIED INSULATION AS REQUIRED BY THE SPECIFICATIONS. SEE SPECIFICATION SECTION 230719 FOR ADDITIONAL REQUIREMENTS.
20. PROVIDE TRAPPED DRAIN PIPING FROM DRAIN PANS OF ALL COOLING COILS, FANS, AND OTHER ACTIVE DRAINS EXPOSED TO SYSTEM AIR STREAM. PROVIDE TRAP AT CONNECTION, WATER SEAL DEPTH 1 INCH GREATER THAN UNIT OPERATING PRESSURE. DIRECT DRAINS TO NEAREST FLOOR DRAIN, MOP SINK, OR OTHER LOCATION APPROVED BY ARCHITECT/ENGINEER.
21. INSTALL PIPING, DUCTWORK, AND CONDUIT CONCEALED IN AREAS HAVING HUNG CEILINGS AND/OR FURRED SPACES UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

WORK IN EXISTING AREAS

1. EXISTING CONDITIONS, INCLUDING EQUIPMENT, DUCT AND PIPE SIZES AND LOCATIONS, INDICATED ON THE DRAWINGS ARE DIAGRAMMATIC. CONFIRM ALL EXISTING CONDITIONS PRIOR TO PROCEEDING WITH THE WORK.
2. CUT AND ROUGH PATCH EXISTING CONSTRUCTION AS REQUIRED FOR THE PERFORMANCE OF THE WORK. FINISH PATCHING AND FLASHING REQUIREMENTS ARE SHOWN ON THE ARCHITECTURAL DRAWINGS. PERFORM ALL CUTTING AND PATCHING WORK IN A MANNER SUCH THAT EXISTING WARRANTEES/GUARANTEES ARE NOT VOIDED, USE QUALIFIED PERSONNEL IN PERFORMANCE OF WORK.

CONTRACT 'M' SCOPE NOTES

1. FURNISH ALL LOUVERS FOR INSTALLATION BY CONTRACT 'G'. SUBMIT LOUVER COLOR AND CONFIGURATION TO THE ARCHITECT/ENGINEER FOR APPROVAL.
2. FURNISH AND INSTALL ALL NECESSARY CONTROL WIRING, CONDUIT, AND ACCESSORIES AS REQUIRED TO PROVIDE FULLY FUNCTIONING SYSTEMS AND SEQUENCES OF OPERATION.
3. FURNISH ALL LINTELS FOR DUCT AND PIPE PENETRATIONS IN INTERIOR MASONRY WALLS FOR INSTALLATION BY CONTRACT 'G'.
4. FURNISH ALL SLEEVES FOR PIPE AND CONDUIT FLOOR, WALL, PARTITION, AND ROOF PENETRATIONS FOR INSTALLATION BY CONTRACT 'G'.
5. FURNISH ALL CURBS FOR ALL ROOF MOUNTED EQUIPMENT AND DUCT PENETRATIONS FOR INSTALLATION BY CONTRACT 'G'.
6. REMOVE CHASE ENCLOSURE COVER WHEN PERFORMING WORK IN ANY CHASE, AND REINSTALL THE CHASE ENCLOSURE COVER WHEN WORK IS COMPLETE.
7. PERFORM ALL CUTTING AND PATCHING AS REQUIRED IN THE EXECUTION OF THE WORK. FINISH PATCHING AND FLASHING IS PART OF CONTRACT 'G'

LEGENDS/ABBREVIATIONS NOTES

1. ABBREVIATIONS AND SYMBOLS ON THIS SHEET DO NOT DEFINE THE SCOPE OF WORK.

EXISTING SYSTEM PRE-MODIFICATION/DEMOLITION TESTING

1. OBTAIN THE SERVICES OF A TESTING AND BALANCING COMPANY TO PERFORM OPERATIONAL TESTS PRIOR TO THE [MODIFICATION / DEMOLITION] OF THE EXISTING AIR SYSTEM(S). SUBMIT REPORT TO ENGINEER FOR REVIEW/RECORD PURPOSES WITH FINDINGS INCLUDING, BUT NOT LIMITED TO, EXISTING FAN CURVES, PRESSURE READINGS, AIRFLOW MEASUREMENTS, ENTERING AIR TEMPERATURE, LEAVING AIR TEMPERATURE, EQUIPMENT/MOTOR NAMEPLATE DATA, ETC.
2. OBTAIN THE SERVICES OF A TESTING AND BALANCING COMPANY TO PERFORM OPERATIONAL TESTS PRIOR TO THE [MODIFICATION / DEMOLITION] OF THE EXISTING HYDRONIC SYSTEM(S). SUBMIT REPORT TO ENGINEER FOR REVIEW/RECORD PURPOSES WITH FINDINGS INCLUDING, BUT NOT LIMITED TO, EXISTING PUMP CURVES, PRESSURE READINGS, HYDRONIC FLOW MEASUREMENTS, ENTERING WATER TEMPERATURE, LEAVING WATER TEMPERATURE, EQUIPMENT/MOTOR NAMEPLATE DATA, ETC.
3. VERIFY EXISTING EQUIPMENT CALLED TO BE REPLACED 'IN-KIND' IS OPERATIONAL (HAS POWER AND RESPONDS TO EXISTING CONTROLS) PRIOR TO PERFORMING ANY DISCONNECTIONS OR REMOVALS. REPORT ANY DEFICIENCIES IN EXISTING SERVICES OR CONTROLS EXPECTED TO BE RE-USED FOR THE 'IN-KIND' REPLACEMENT TO ENGINEER IN WRITING PRIOR TO REMOVALS. CONTRACTOR IS RESPONSIBLE TO CORRECT ANY DEFICIENCIES NOT REPORTED PRIOR TO DEMOLITION TO PROVIDE A FULLY OPERATIONAL EQUIPMENT REPLACEMENT.

SYSTEM COMMISSIONING NOTES (NYS)

1. COMMISSION ALL NEW BUILDING MECHANICAL SYSTEMS IN ACCORDANCE WITH THE REQUIREMENTS OF THE 2025 NEW YORK STATE (NYS) ENERGY CONSERVATION CONSTRUCTION CODE (ECCC) SECTION C408. COMMISSIONING SHALL BE PERFORMED BY AN APPROVED THIRD-PARTY COMMISSIONING AGENCY HIRED BY THE ASSIGNED CONSTRUCTION MANAGER / CONTRACTOR. REFER TO SPECIFICATION SECTIONS 019113 - GENERAL COMMISSIONING REQUIREMENTS AND 230800 - COMMISSIONING OF MECHANICAL SYSTEMS FOR MORE INFORMATION.
2. PROVIDE DRAWINGS, OPERATION & MAINTENANCE (O&M) MANUALS, AND SYSTEM BALANCING REPORTS TO BUILDING OWNER OR OWNER'S AUTHORIZED AGENT WITHIN 90 DAYS OF THE DATE OF RECEIPT OF THE CERTIFICATE OF OCCUPANCY OR LETTER OF COMPLETION IN ACCORDANCE WITH THE 2025 NYS ECCC SECTION C408.2.5.
3. COMMISSIONING AGENT SHALL PROVIDE FINAL COMMISSIONING REPORT TO THE BUILDING OWNER OR OWNER'S AUTHORIZED AGENT WITHIN 90 DAYS OF THE RECEIPT OF THE CERTIFICATE OF OCCUPANCY OR LETTER OF COMPLETION IN ACCORDANCE WITH THE REQUIREMENTS OF THE 2025 NYS ECCC SECTION C408.2.5.4.

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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

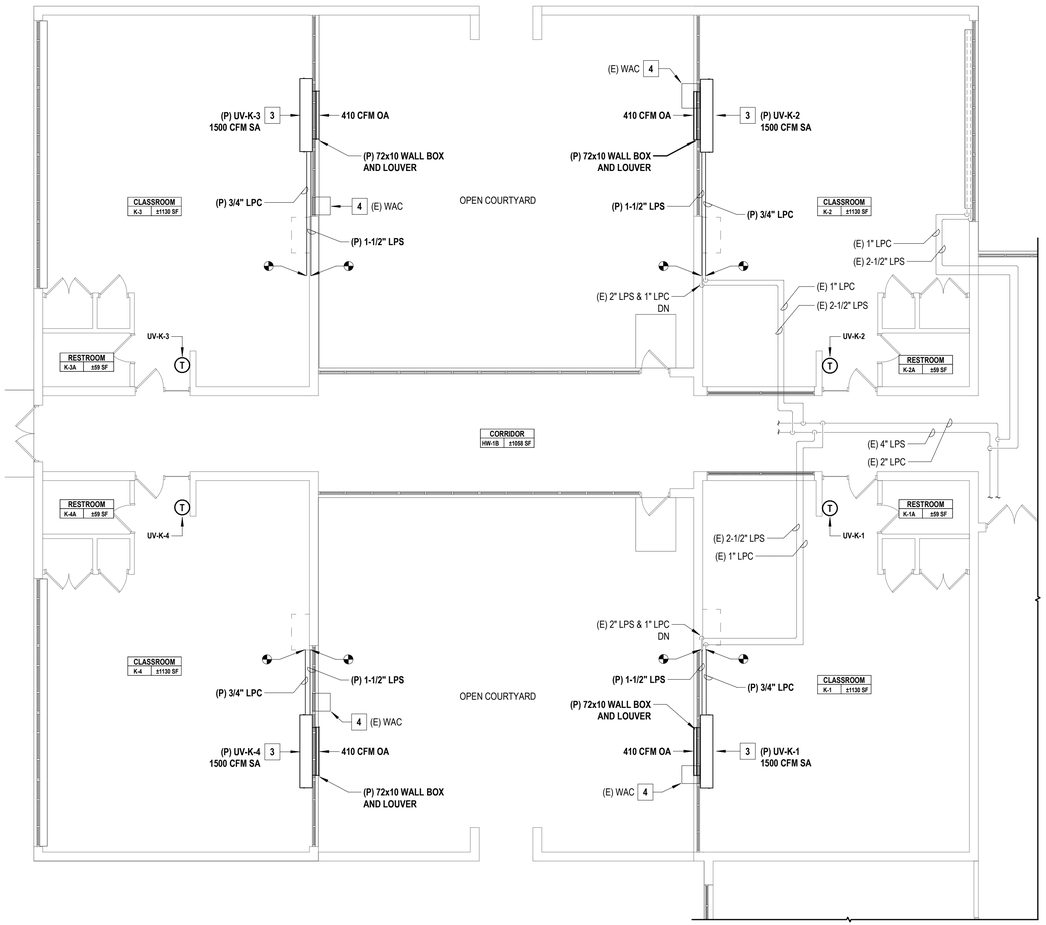
SHEET TITLE

MECHANICAL GENERAL NOTES, LEGENDS, AND ABBREVIATIONS

DRAWING No.

PE-M 001.00

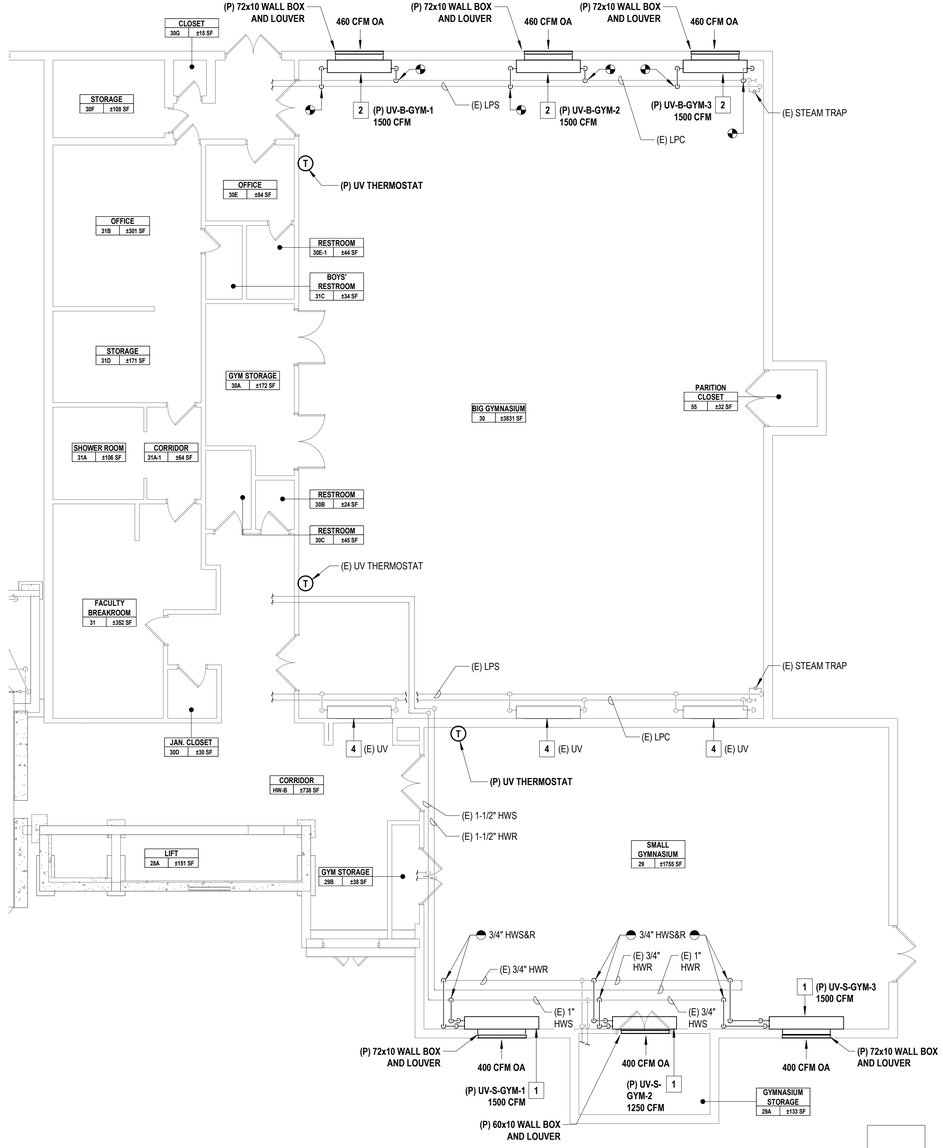
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1 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M1'

SCALE: 1/8" = 1'-0"

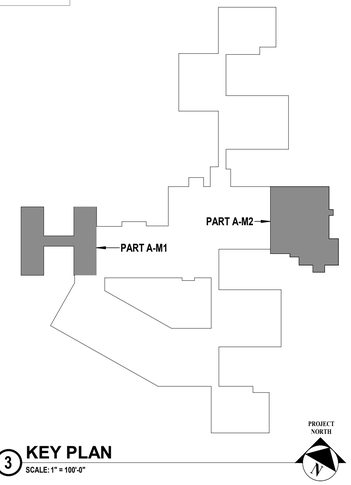
PROJECT NORTH



2 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M2'

SCALE: 1/8" = 1'-0"

PROJECT NORTH



3 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

GENERAL NOTES

1. THE EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON LIMITED FIELD SURVEY AND EXISTING DOCUMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO THE COMMENCEMENT OF DEMOLITION / NEW WORK AND PURCHASE OF NEW EQUIPMENT. SHOULD THERE BE A CONFLICT, THE CONTRACTOR SHALL ALERT THE ARCHITECT / ENGINEER IN WRITING.
2. THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ADJOINING SURFACES OUTSIDE THE CONTRACT AREA OR SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING EXISTING CONDITIONS AND / OR FINISHES DAMAGED DURING CONSTRUCTION, INCLUDING PATCHING AND PAINTING DEEMED NECESSARY BY THE ARCHITECT / ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
3. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL LEGALLY OFF-SITE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND AS PER THEIR SCOPE OF WORK.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S SERVICE AND OPERATING CLEARANCES, RECOMMENDATIONS, INSTALLATION INSTRUCTIONS, AND PREVAILING CODE.
5. THE CONTRACTOR SHALL FURNISH AND INSTALL DUCT / PIPING SUPPORTS AS REQUIRED. MINIMUM EVERY 10'-0" AND CHANGE IN DIRECTION.

X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW HOT WATER UNIT VENTILATOR IN THE SMALL GYMNASIUM WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. THE CONTRACTOR SHALL SHIFT THE EXISTING UNISTRUT SUPPORT RACK AS REQUIRED TO SUPPORT THE NEW UNIT VENTILATOR. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT. THE CONTRACTOR SHALL INSTALL UNIT VENTILATORS AT APPROXIMATELY THE SAME HEIGHT AS THE EXISTING (FIELD VERIFY MOUNTING HEIGHT).
2. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW STEAM UNIT VENTILATOR IN THE BIG GYMNASIUM WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT. THE CONTRACTOR SHALL INSTALL UNIT VENTILATORS AT APPROXIMATELY THE SAME HEIGHT AS THE EXISTING (FIELD VERIFY MOUNTING HEIGHT). THE CONTRACTOR SHALL PROVIDE DESIGN FOR NEW UNIT VENTILATOR SUPPORT SYSTEM DURING SUBMITTAL PHASE.
3. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW FLOOR-MOUNTED STEAM UNIT VENTILATOR WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. INSTALL LOUVER MINIMUM 12" ABOVE GRADE. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT.
4. EXISTING TO REMAIN.

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CONSULTANTS:

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CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M1' & PART 'A-M2'

DRAWING No.

PE-M 110.00

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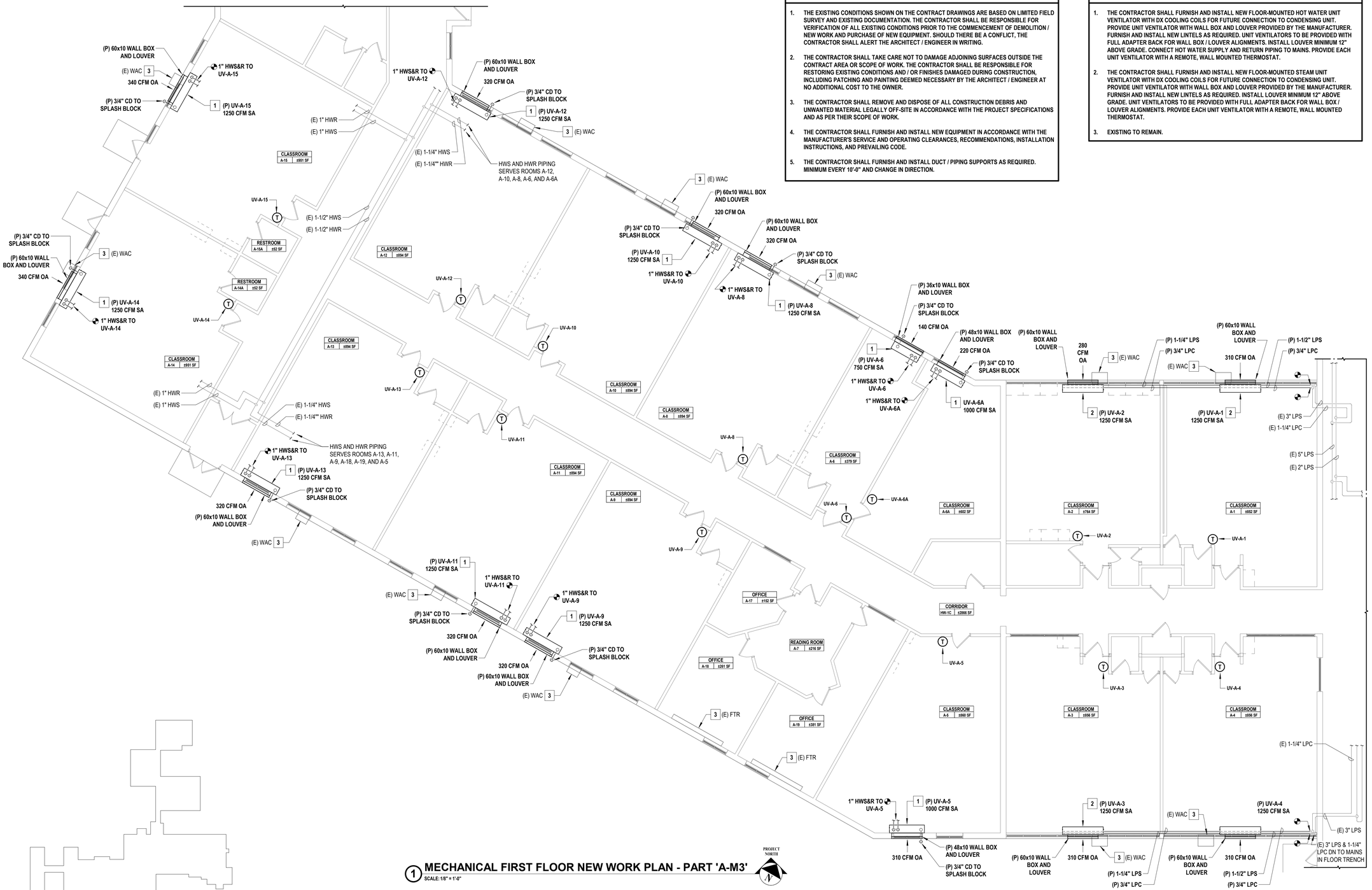
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GENERAL NOTES

1. THE EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON LIMITED FIELD SURVEY AND EXISTING DOCUMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO THE COMMENCEMENT OF DEMOLITION / NEW WORK AND PURCHASE OF NEW EQUIPMENT. SHOULD THERE BE A CONFLICT, THE CONTRACTOR SHALL ALERT THE ARCHITECT / ENGINEER IN WRITING.
2. THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ADJOINING SURFACES OUTSIDE THE CONTRACT AREA OR SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING EXISTING CONDITIONS AND / OR FINISHES DAMAGED DURING CONSTRUCTION, INCLUDING PATCHING AND PAINTING DEEMED NECESSARY BY THE ARCHITECT / ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
3. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL LEGALLY OFF-SITE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND AS PER THEIR SCOPE OF WORK.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S SERVICE AND OPERATING CLEARANCES, RECOMMENDATIONS, INSTALLATION INSTRUCTIONS, AND PREVAILING CODE.
5. THE CONTRACTOR SHALL FURNISH AND INSTALL DUCT / PIPING SUPPORTS AS REQUIRED. MINIMUM EVERY 10'-0" AND CHANGE IN DIRECTION.

X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW FLOOR-MOUNTED HOT WATER UNIT VENTILATOR WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. INSTALL LOUVER MINIMUM 12" ABOVE GRADE. CONNECT HOT WATER SUPPLY AND RETURN PIPING TO MAINS. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT.
2. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW FLOOR-MOUNTED STEAM UNIT VENTILATOR WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. INSTALL LOUVER MINIMUM 12" ABOVE GRADE. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT.
3. EXISTING TO REMAIN.



1 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M3'

SCALE: 1/8" = 1'-0"

2 KEY PLAN

SCALE: 1" = 100'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028 Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

Pursuit of Excellence

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M
MECHANICAL CONSTRUCTION

STATUS

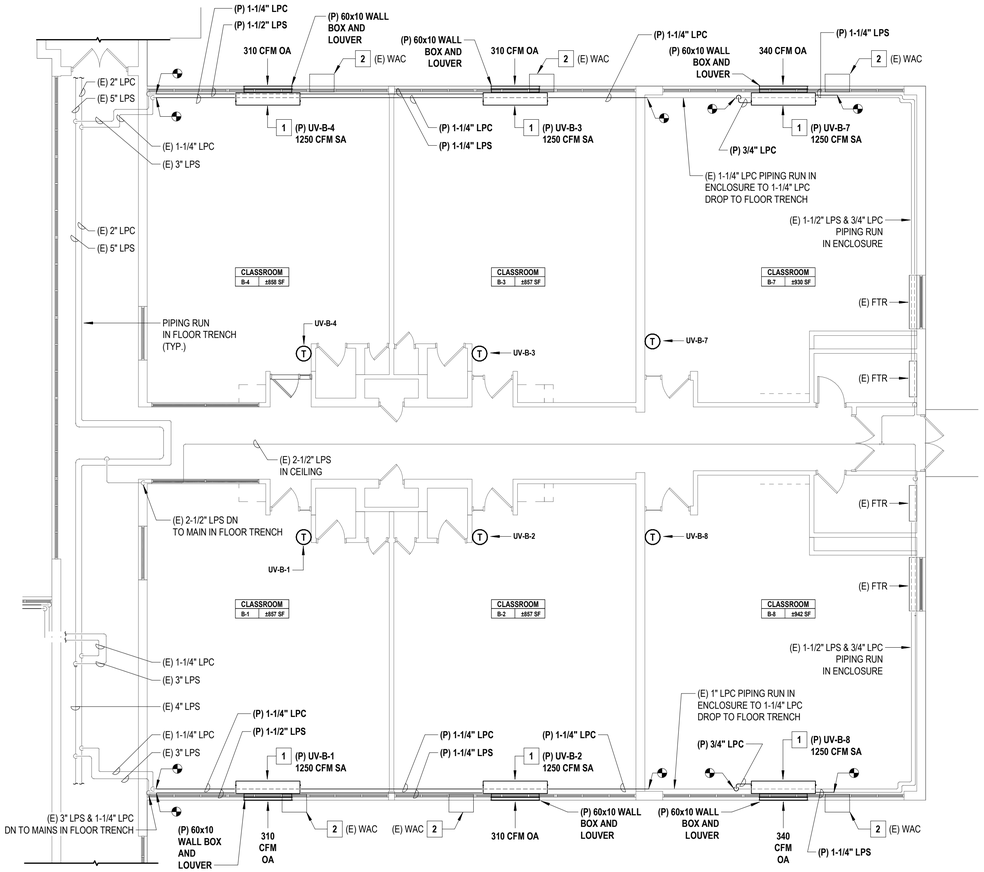
SED SUBMISSION

SHEET TITLE

MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M3'

DRAWING No.

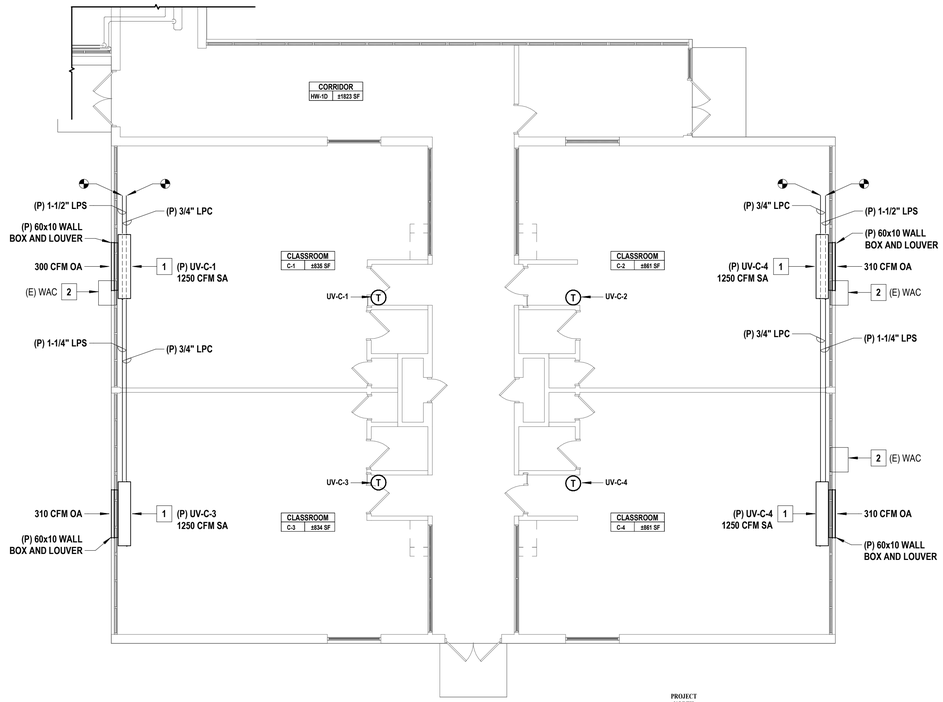
PE-M 111.00



1 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M4'

SCALE: 1/8" = 1'-0"

PROJECT NORTH



2 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M5'

SCALE: 1/8" = 1'-0"

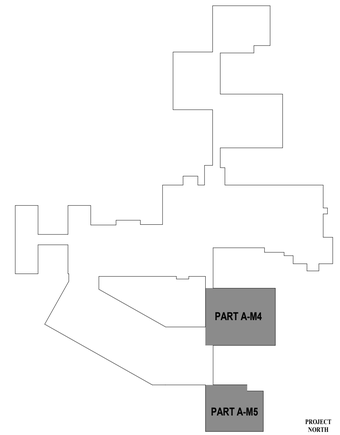
PROJECT NORTH

GENERAL NOTES

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2. EXISTING TO REMAIN.



3 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK JOHN C. MORRIS III LICENSED PROFESSIONAL ENGINEER 057554-1

05/31/2028 Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

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PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

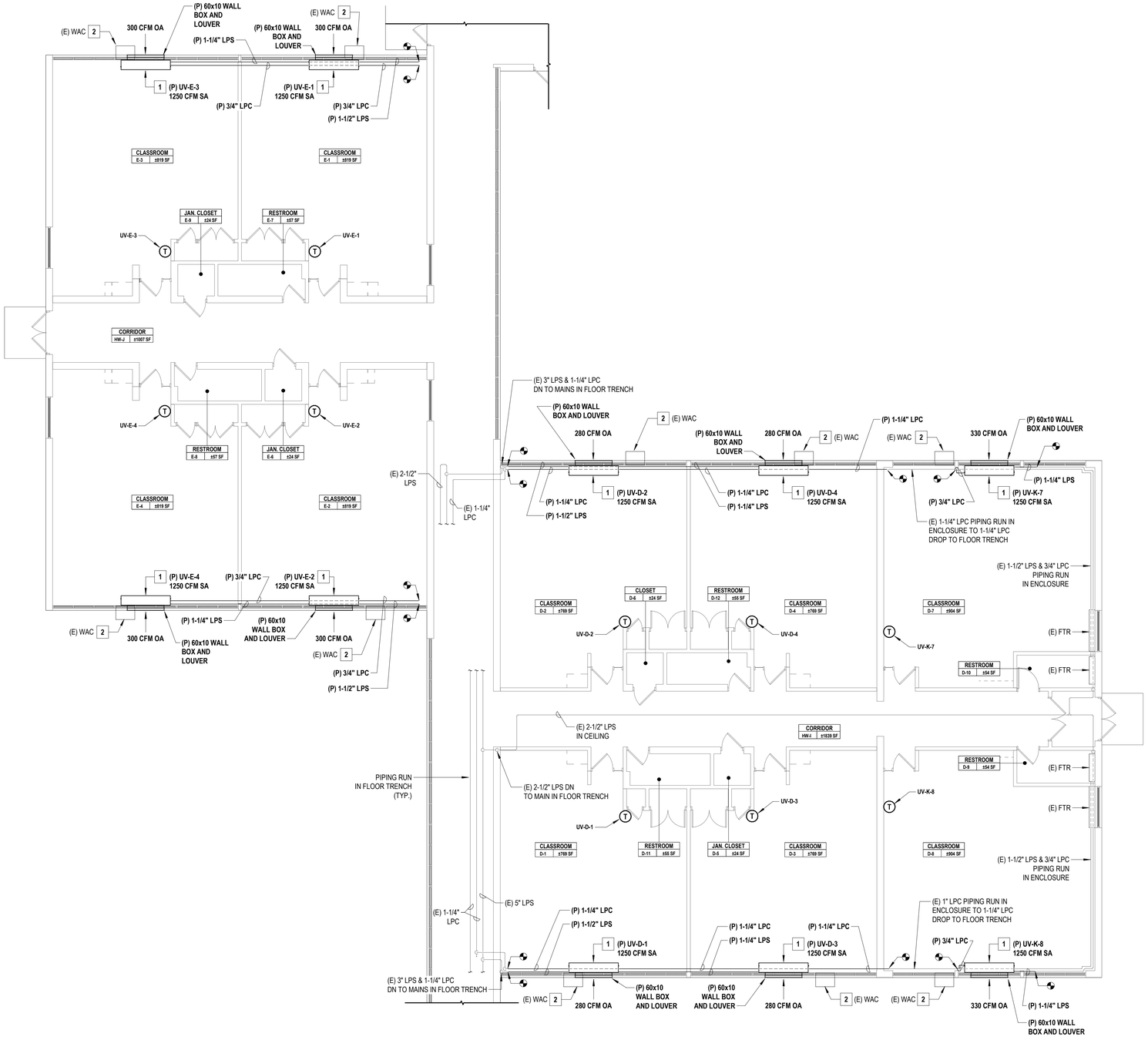
MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'A-M4' & PART 'A-'M5'

DRAWING No.

PE-M 112.00

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1 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'B-M1'

SCALE: 1/8" = 1'-0"

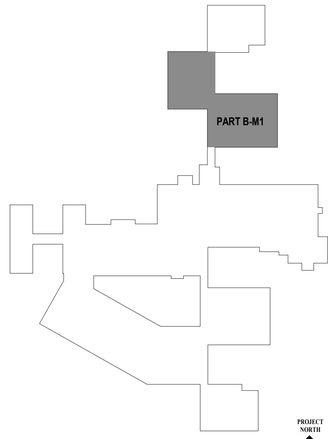
PROJECT NORTH

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X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW FLOOR-MOUNTED STEAM UNIT VENTILATOR WITH DX COOLING COILS FOR FUTURE CONNECTION TO CONDENSING UNIT. PROVIDE UNIT VENTILATOR WITH WALL BOX AND LOUVER PROVIDED BY THE MANUFACTURER. FURNISH AND INSTALL NEW LINTELS AS REQUIRED. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK FOR WALL BOX / LOUVER ALIGNMENTS. INSTALL LOUVER MINIMUM 12" ABOVE GRADE. PROVIDE EACH UNIT VENTILATOR WITH A REMOTE, WALL MOUNTED THERMOSTAT.
2. EXISTING TO REMAIN.



2 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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05/31/2028
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W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'B-M1'

DRAWING No.

PE-M 113.00

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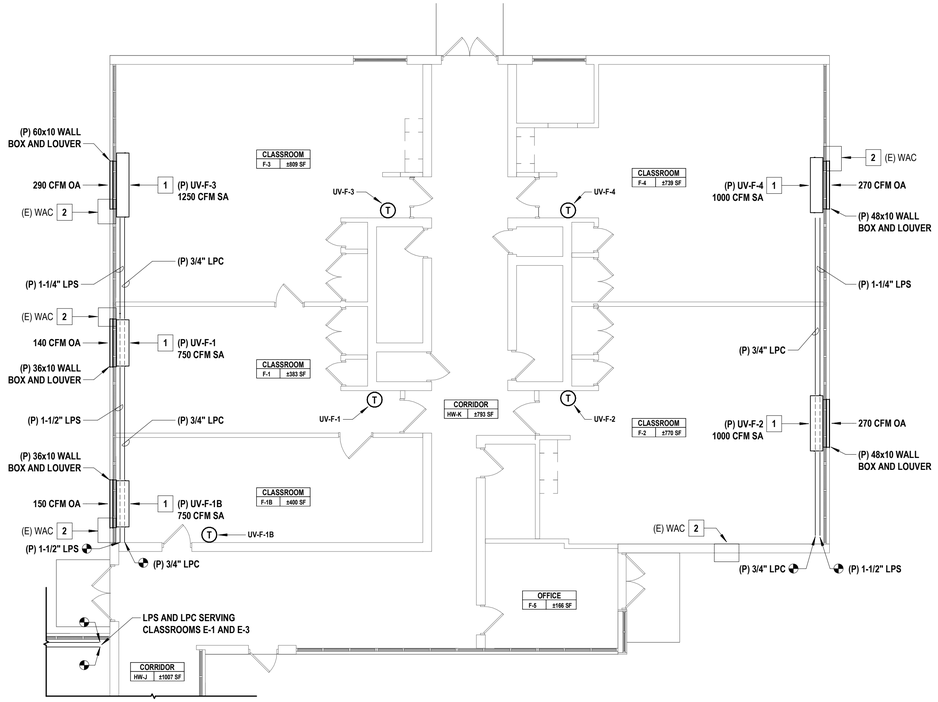
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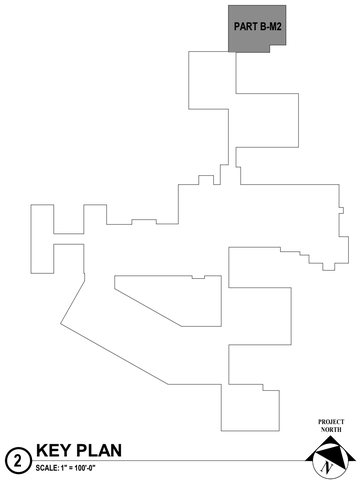
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2. EXISTING TO REMAIN.



1 MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'B-M2'
SCALE: 1/8" = 1'-0"

PROJECT NORTH



2 KEY PLAN
SCALE: 1" = 100'-0"

PROJECT NORTH

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CONSULTANTS:

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STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
Exp. Date

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W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M
MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

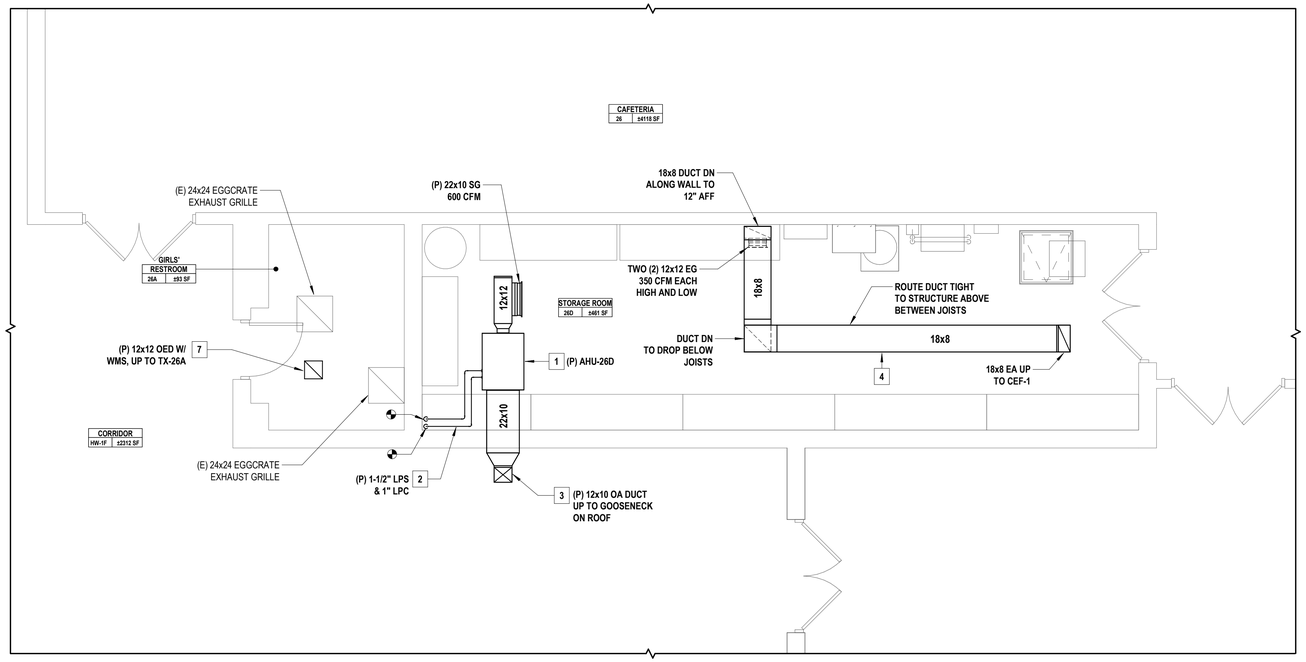
MECHANICAL FIRST FLOOR NEW WORK PLAN - PART 'B-M2'

DRAWING No.

PE-M 114.00

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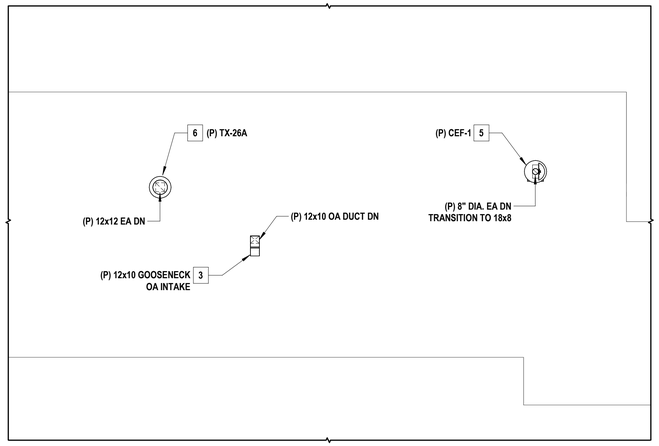
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1 PARTIAL FIRST FLOOR NEW WORK PLAN - CHEMICAL STORAGE

SCALE: 1/4" = 1'-0"

PROJECT NORTH



2 PARTIAL ROOF NEW WORK PLAN

SCALE: 1/8" = 1'-0"

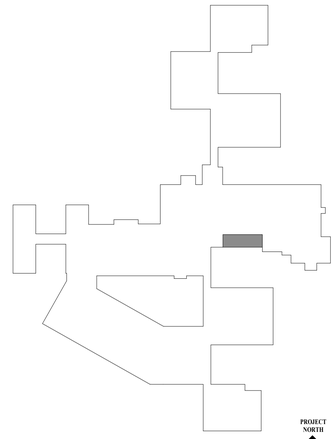
PROJECT NORTH

GENERAL NOTES

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4. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO MAINTAIN THE ROOF WARRANTY.
5. THE CONTRACTOR SHALL TAKE CARE TO INSTALL ALL NEW ROOFTOP EQUIPMENT A MINIMUM OF 10'-0" AWAY FROM ALL ROOF EDGES.
6. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S SERVICE AND OPERATING CLEARANCES, RECOMMENDATIONS, INSTALLATION INSTRUCTIONS, AND PREVAILING CODE.
7. THE CONTRACTOR SHALL FURNISH AND INSTALL DUCT / PIPING SUPPORTS AS REQUIRED. MINIMUM EVERY 10'-0" AND CHANGE IN DIRECTION.

X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW AIR HANDLING UNIT "AHU-26D" IN APPROXIMATELY THE LOCATION SHOWN. FURNISH AND INSTALL ALL REQUIRED EQUIPMENT HANGERS AND SUPPORTS.
2. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW 1-1/2" LPS AND 1" LPC PIPING, VALVES, INSULATION, AND ALL REQUIRED APPURTENANCES TO SERVE NEW AIR HANDLING UNIT "AHU-26D". RECONNECT PIPING TO THE NEAREST PIPING MAIN AT THE POINT INDICATED ON THE DRAWING.
3. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW OUTSIDE AIR INTAKE DUCTWORK, INSULATION, HANGERS AND SUPPORTS, AND RELATED APPURTENANCES. SIZE DUCTWORK AS INDICATED. DUCTWORK SHALL TERMINATE THROUGH ROOF WITH A GOOSENECK VENT. REFER TO ROOF PLAN ON THIS DRAWING. THE CONTRACTOR SHALL LOOK TO RE-USE THE EXISTING ROOF OPENING, AND MODIFY THE ROOF OPENING AS REQUIRED.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EXHAUST DUCTWORK AS SHOWN ON THE DRAWING. COORDINATE FINAL INSTALLATION LOCATION WITH EXPOSED JOISTS AND SHELVING.
5. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EXHAUST FAN "CEF-1" IN APPROXIMATELY THIS LOCATION. INSTALL FAN ON NEW WIND-RATED ROOF CURB.
6. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW REPLACEMENT EXHAUST FAN "TX-26A" IN APPROXIMATELY THIS LOCATION TO SERVE GIRL'S RESTROOM 26A. INSTALL FAN ON NEW WIND-RATED ROOF CURB.
7. EXHAUST FAN TX-26A DUCTWORK SHALL TERMINATE WITH AN OPEN-ENDED DUCT WITH WIRE MESH SCREEN ABOVE THE DROP CEILING. EXISTING EGGCRATE EXHAUST GRILLES TO REMAIN.



3 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M
MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

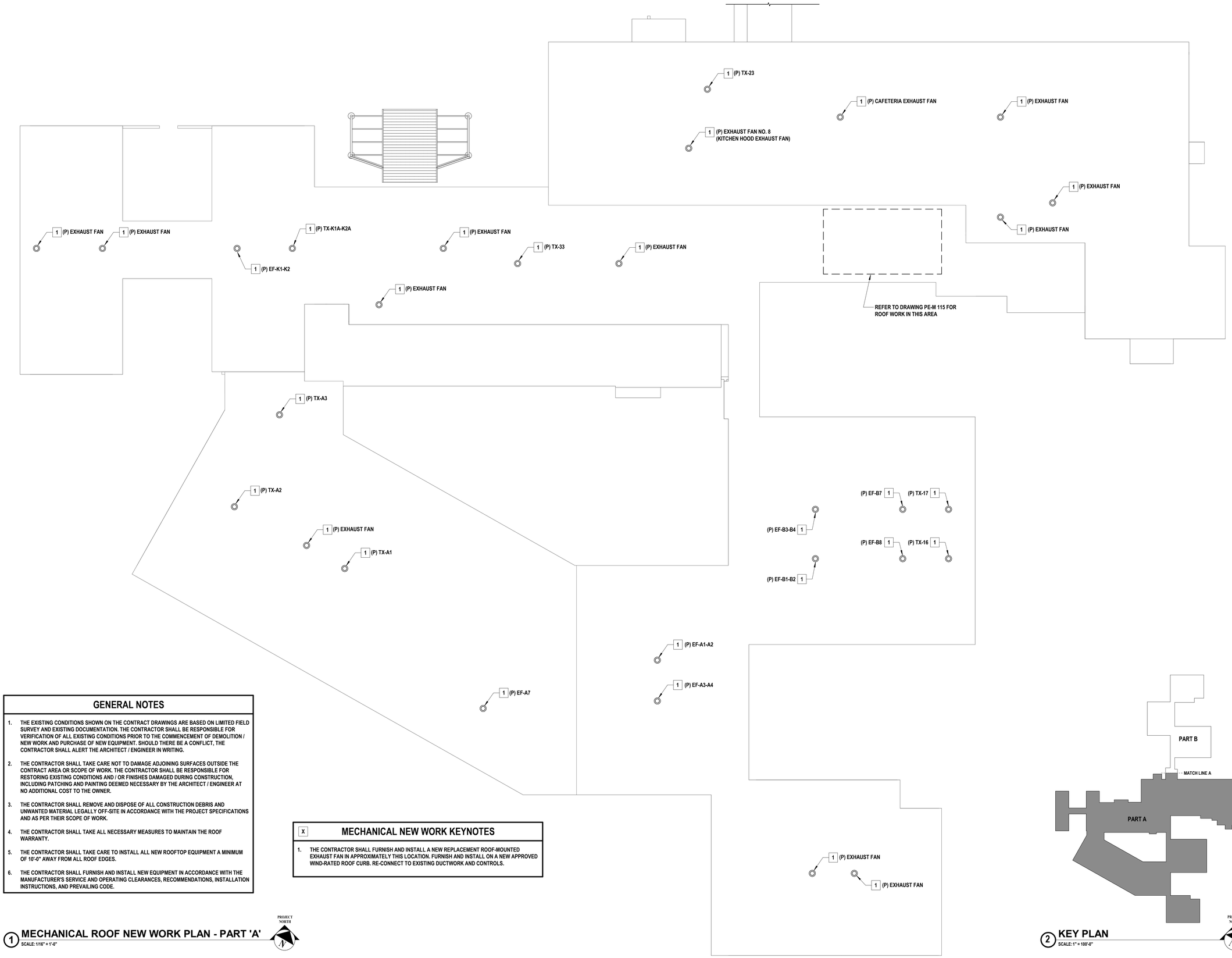
MECHANICAL
FIRST FLOOR & PARTIAL ROOF
NEW WORK PLAN

DRAWING No.

PE-M 115.00

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X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL A NEW REPLACEMENT ROOF-MOUNTED EXHAUST FAN IN APPROXIMATELY THIS LOCATION. FURNISH AND INSTALL ON A NEW APPROVED WIND-RATED ROOF CURB. RE-CONNECT TO EXISTING DUCTWORK AND CONTROLS.

1 MECHANICAL ROOF NEW WORK PLAN - PART 'A'

SCALE: 1/16" = 1'-0"

PROJECT NORTH

2 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

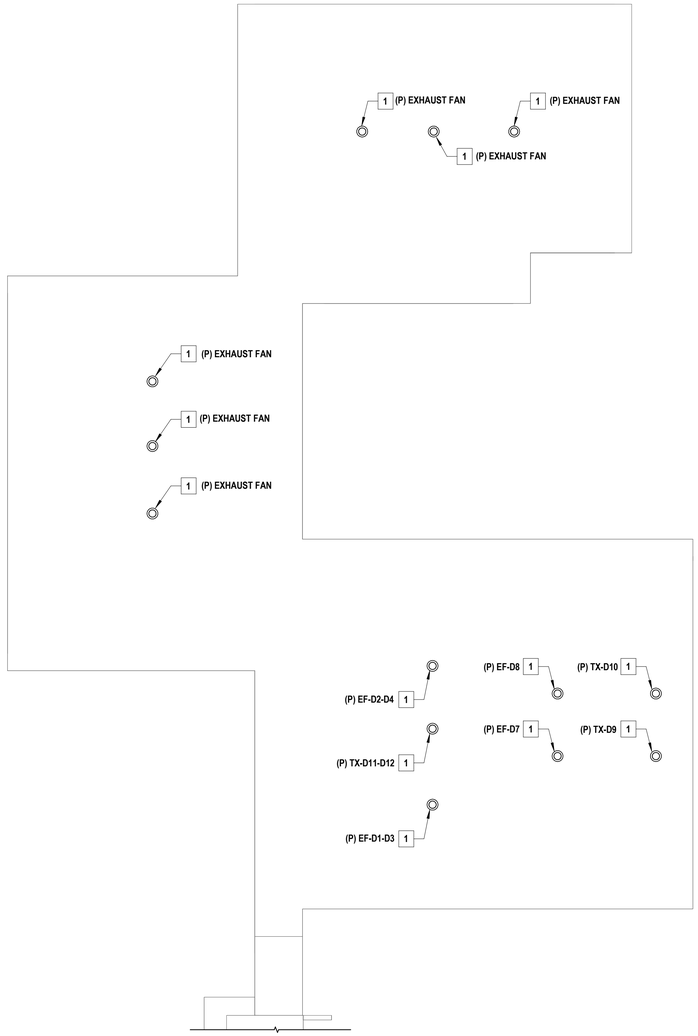
MECHANICAL ROOF NEW WORK PLAN - PART 'A'

DRAWING No.

PE-M 116.00

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1 MECHANICAL ROOF NEW WORK PLAN - PART 'B'

SCALE: 1/16" = 1'-0"

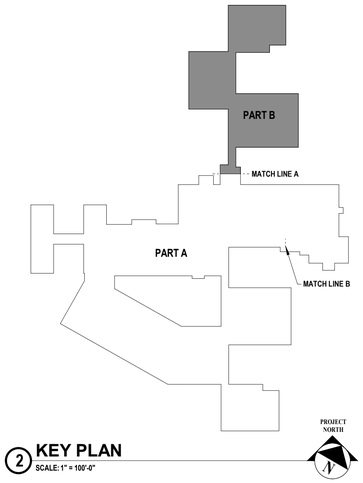
PROJECT NORTH

GENERAL NOTES

1. THE EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON LIMITED FIELD SURVEY AND EXISTING DOCUMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO THE COMMENCEMENT OF DEMOLITION / NEW WORK AND PURCHASE OF NEW EQUIPMENT. SHOULD THERE BE A CONFLICT, THE CONTRACTOR SHALL ALERT THE ARCHITECT / ENGINEER IN WRITING.
2. THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ADJOINING SURFACES OUTSIDE THE CONTRACT AREA OR SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING EXISTING CONDITIONS AND / OR FINISHES DAMAGED DURING CONSTRUCTION, INCLUDING PATCHING AND PAINTING DEEMED NECESSARY BY THE ARCHITECT / ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
3. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL LEGALLY OFF-SITE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND AS PER THEIR SCOPE OF WORK.
4. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO MAINTAIN THE ROOF WARRANTY.
5. THE CONTRACTOR SHALL TAKE CARE TO INSTALL ALL NEW ROOFTOP EQUIPMENT A MINIMUM OF 10'-0" AWAY FROM ALL ROOF EDGES.
6. THE CONTRACTOR SHALL FURNISH AND INSTALL NEW EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S SERVICE AND OPERATING CLEARANCES, RECOMMENDATIONS, INSTALLATION INSTRUCTIONS, AND PREVAILING CODE.

X MECHANICAL NEW WORK KEYNOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL A NEW REPLACEMENT ROOF-MOUNTED EXHAUST FAN IN APPROXIMATELY THIS LOCATION. FURNISH AND INSTALL ON A NEW APPROVED WIND-RATED ROOF CURB. RE-CONNECT TO EXISTING DUCTWORK AND CONTROLS.



2 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

H 2 M architects + engineers

1133 Westchester Avenue, Suite N-210
White Plains, NY 10605
914.358.5623 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
Exp. Date

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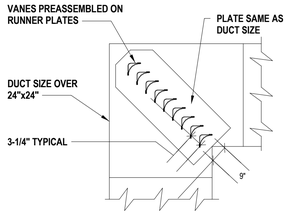
MECHANICAL
ROOF NEW WORK PLAN - PART 'B'

DRAWING No.

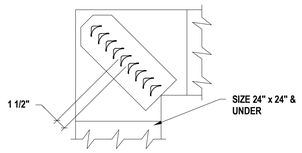
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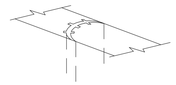


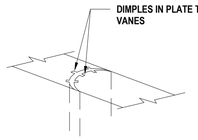
SQUARE ELBOW WITH TYPE "A" DOUBLE THICKNESS VANES



SQUARE ELBOW WITH TYPE "B" DOUBLE THICKNESS VANES.

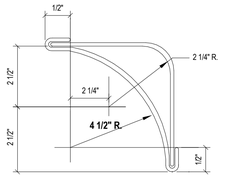
PREFERENCE FOR SECURING EDGE 1ST WELD OR 2ND RIVET





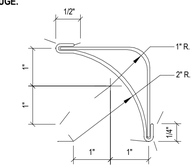
NOTE:

1. USE GALVANIZED STEEL FOR VANES IN EITHER STEEL OR ALUMINUM DUCTWORK.



TYPE "A"

TYPE "A" DOUBLE THICKNESS VANES FOR USE IN DUCTS GREATER THAN 24" x 24" IN SIZE. USE SAME GAUGE GALVANIZED IRON AS DUCT NOT TO EXCEED 20 GAUGE.

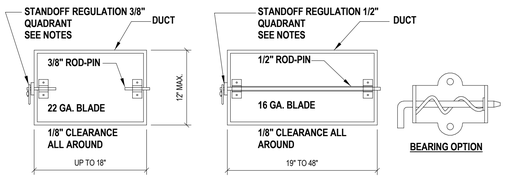


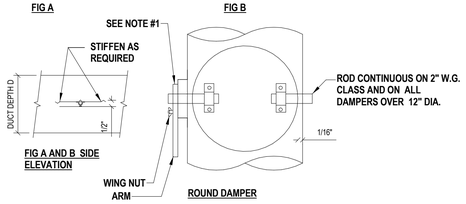
TYPE "B"

DOUBLE THICKNESS VANES FOR USE IN DUCTS 24" x 24" AND UNDER

1 TURNING VANES DETAIL

SCALE:NTS



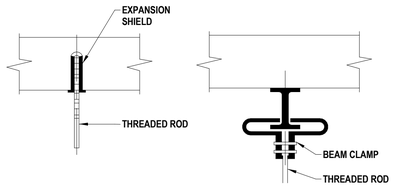


NOTES:

1. PROVIDE 2" HIGH STANDOFF REGULATORS FOR EXTERNALLY INSULATED DUCTWORK. PROVIDE REGULATORS WITH SEALS.
2. STANDOFF BASE HEIGHT TO MATCH INSULATION THICKNESS. BASE CONSTRUCTION 16 GAUGE.
3. RAPIT DAMPER REGULATORS AND JIFFY DAMPERS ARE NOT ACCEPTABLE ON RECTANGULAR OR ROUND DUCTWORK.

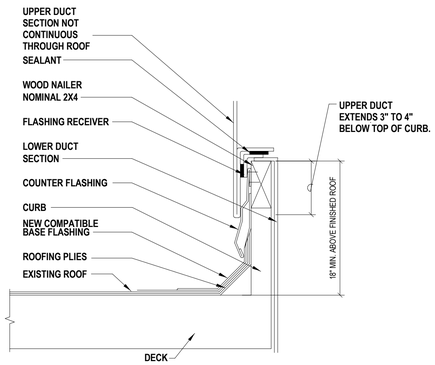
4 VOLUME DAMPER DETAIL

SCALE:NTS



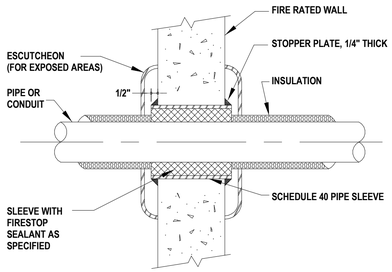
8 PIPE HANGER SUPPORT DETAIL

SCALE:NTS



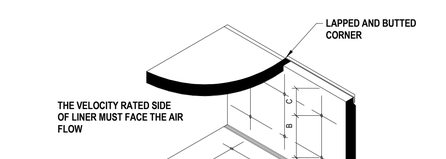
5 DUCTWORK ROOF PENETRATION DETAIL

SCALE:NTS



9 PIPE / CONDUIT WALL PENETRATION DETAIL

SCALE:NTS



MAXIMUM SPACING FOR FASTENERS. ACTUAL INTERVALS ARE APPROXIMATE.

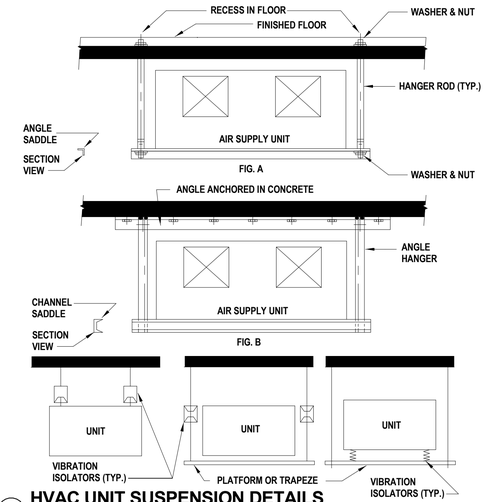
LINER ADHERED TO THE DUCT WITH 90% MIN. AREA COVERAGE OF ADHESIVE

VELOCITY*	DIMENSIONS			
	A	B	C	E
0-1500 FPM	3"	12"	4"	18"
1501-3500 FPM	3"	6"	4"	16"

* UNLESS A LOWER LEVEL IS SET BY MANUFACTURER OR LISTING AGENCY

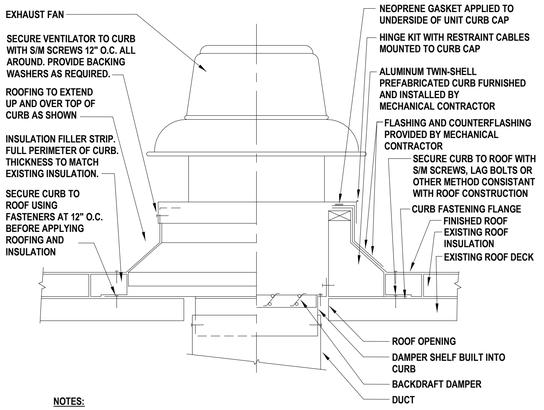
2 ACOUSTICAL LINER FASTENING DETAIL

SCALE:NTS



6 HVAC UNIT SUSPENSION DETAILS

SCALE:NTS

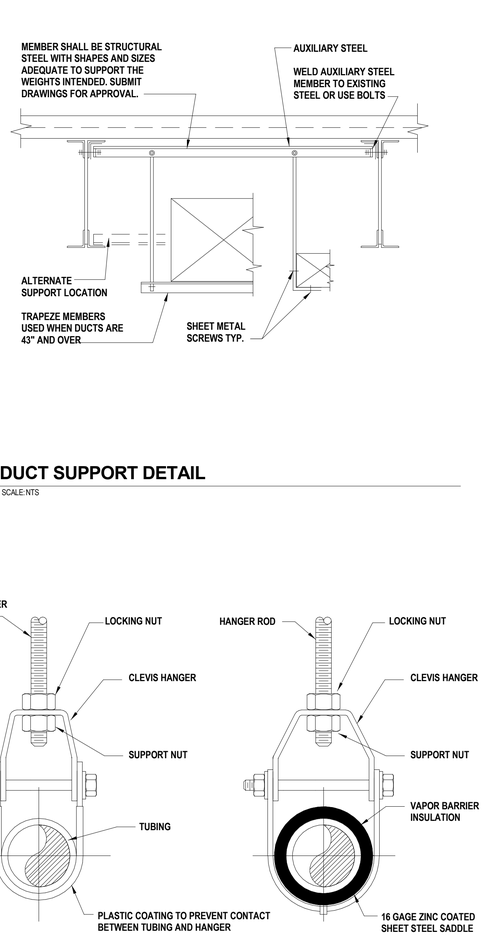


NOTES:

1. CURBS AND EXHAUST FANS SHALL BE FROM THE SAME MANUFACTURER. MECHANICAL CONTRACTOR SHALL RE-USE OR MODIFY EXISTING ROOF CURB AS REQUIRED.
2. ROOF OPENING IN ACCORDANCE WITH THE MANUFACTURER'S APPROVED SHOP DRAWINGS. MECHANICAL CONTRACTOR SHALL RE-USE OR MODIFY EXISTING ROOF OPENING WHERE REQUIRED.
3. ALL FLASHING AND ROOF WORK BY MECHANICAL CONTRACTOR.

10 DOWNBLAST EXHAUST FAN & CURB DETAIL

SCALE:NTS

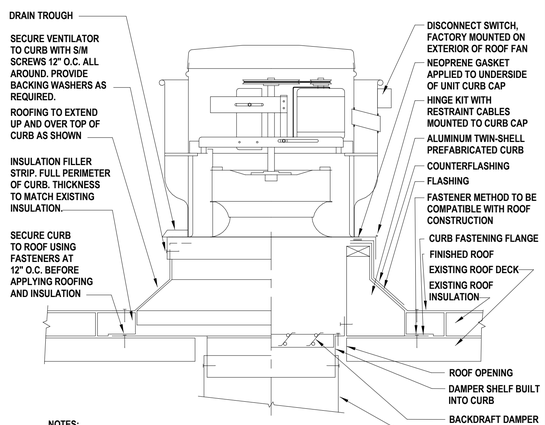


3 DUCT SUPPORT DETAIL

SCALE:NTS

7 PIPE HANGER DETAIL

SCALE:NTS



NOTES:

1. CURBS AND EXHAUST FANS SHALL BE FROM THE SAME MANUFACTURER.
2. ROOF OPENING IN ACCORDANCE WITH THE MANUFACTURER'S APPROVED SHOP DRAWINGS. MECHANICAL CONTRACTOR SHALL RE-USE OR MODIFY EXISTING ROOF OPENING WHERE POSSIBLE.
3. ALL FLASHING AND ROOF WORK BY MECHANICAL CONTRACTOR.

11 UPBLAST EXHAUST FAN & CURB DETAIL

SCALE:NTS

H2M architects + engineers

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White Plains, NY 10605
914.358.5623 • www.h2m.com
NY Architecture & Landscape Architecture: No Certificate Required
NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

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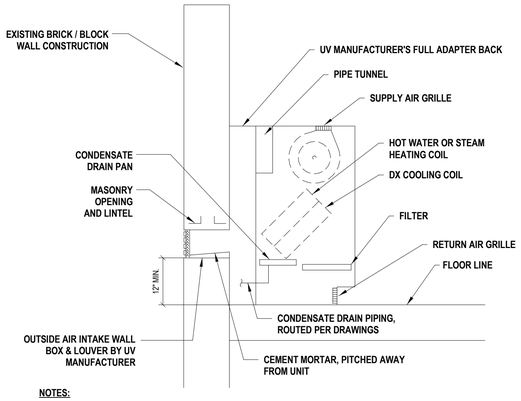
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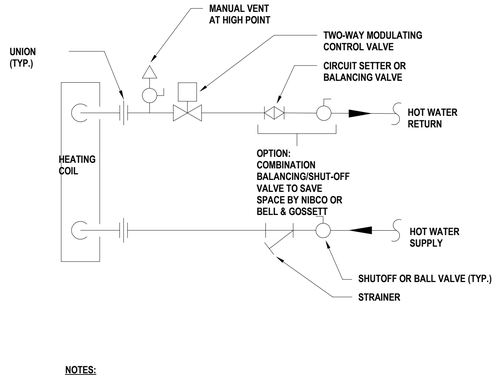


NOTES:

1. PROVIDE ALL BLOCKING AS NECESSARY TO PROVIDE AN AIR TIGHT SEAL FOR THE OUTDOOR AIR INTAKE PLENUM.
2. UNIT VENTILATORS TO BE PROVIDED WITH FULL ADAPTER BACK TO ALLOW FOR WALL BOX & LOUVER TO BE ELEVATED WHERE REQUIRED.

1 UNIT VENTILATOR DETAIL

SCALE:NTS

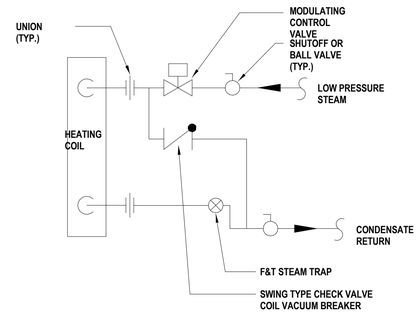


NOTES:

1. ALL COMPONENTS SHALL BE ENCLOSED WITHIN UNIT VENTILATOR CABINET.
2. COMPLY WITH MANUFACTURER'S RECOMMENDATIONS & INSTALLATION INSTRUCTIONS.

2 UNIT VENTILATOR HOT WATER COIL PIPING DETAIL

SCALE:NTS

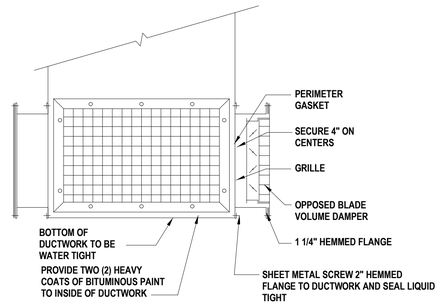


NOTES:

1. ALL COMPONENTS SHALL BE ENCLOSED WITHIN UNIT VENTILATOR CABINET.
2. COMPLY WITH MANUFACTURER'S RECOMMENDATIONS & INSTALLATION INSTRUCTIONS.

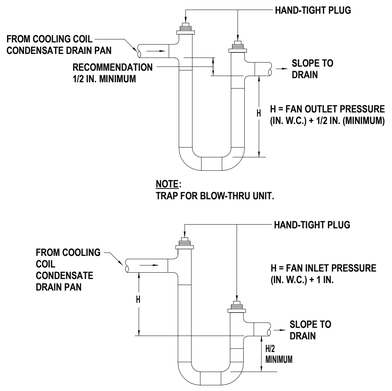
3 UNIT VENTILATOR STEAM COIL PIPING DETAIL

SCALE:NTS



4 AIR REGISTER MOUNTING DETAIL

SCALE: NTS



NOTE:
TRAP FOR BLOW-THRU UNIT.

NOTE:
TRAP FOR DRAW-THRU UNIT.

THE CONTRACTOR SHALL FURNISH AND INSTALL CONDENSATE DRAIN PIPING AS PER HVAC EQUIPMENT MANUFACTURER'S INSTALLATIONS INSTRUCTIONS / RECOMMENDATIONS AND ALL APPLICABLE CODES.

5 CONDENSATE DRAIN PIPING DETAIL

SCALE:NTS

AIR CONDITIONING CONDENSATE

AIR CONDITIONING CONDENSATE PIPING SHALL COMPLY WITH THE 2025 PLUMBING CODE OF NEW YORK STATE, CHAPTER 3, SECTION 314 - CONDENSATE DISPOSAL, AND THE 2025 MECHANICAL CODE OF NEW YORK STATE, CHAPTER 3, SECTION 307 - CONDENSATE DISPOSAL, WHICHEVER IS MORE STRINGENT.

AIR CONDITIONING CONDENSATE PIPING FROM AIR CONDITIONING UNITS SHALL BE SIZED ACCORDING TO THE CONDENSATE-GENERATING CAPACITY OF THE UNITS SERVED. BRANCHES FROM INDIVIDUAL UNITS SHALL BE NO SMALLER THAN THE DRAIN OPENING OR DRAIN CONNECTION ON THE UNIT. TRAPS SHALL BE PROVIDED AT EACH AIR CONDITIONING UNIT OR COOLING COIL TO MAINTAIN ATMOSPHERIC PRESSURE IN THE WASTE PIPING. CONDENSATE WASTE PIPING SHALL BE SLOPED NOT LESS THAN 1/8" PER FOOT. DRAINAGE FITTINGS SHALL BE USED IN SIZES 1-1/4" AND LARGER. MINIMUM PIPE SIZING SHALL BE AS FOLLOWS:

3/4" PIPE SIZE UP TO 20 TONS COOLING CAPACITY.
1" PIPE SIZE OVER 20 TONS TO 40 TONS COOLING CAPACITY.
1-1/4" PIPE SIZE OVER 40 TONS TO 90 TONS COOLING CAPACITY.
1-1/2" PIPE SIZE OVER 90 TONS TO 125 TONS COOLING CAPACITY.
2" PIPE SIZE OVER 125 TONS TO 250 TONS COOLING CAPACITY.

DISCHARGE OF AIR CONDITIONING CONDENSATE SHALL NOT BE PERMITTED TO CREATE A NUISANCE SUCH AS BY FLOWING ACROSS THE GROUND OR PAVED SURFACES. UNLESS EXPRESSLY PROHIBITED BY THE AUTHORITY HAVING JURISDICTION, THE POINT OF INDIRECT DISCHARGE FOR AIR CONDITIONING CONDENSATE SHALL BE ONE OF THE FOLLOWING:

a. THE BUILDING SANITARY DRAINAGE SYSTEM (FLOOR DRAIN PROVIDED UNDER PLUMBING DRAWINGS).
b. THE BUILDING STORM DRAINAGE SYSTEM.
c. AN APPROVED OUTDOOR LOCATION.
d. WITHIN DWELLINGS, A TUB WASTE AND OVERFLOW, LAVATORY TAILPIECE, OR LAUNDRY SINK WITHIN SAME DWELLING.

6 A/C CONDENSATE DRAINAGE CODES DETAIL

SCALE:NTS

7 CONDENSATE DRAIN PIPE DETAIL

SCALE:NTS

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VENTILATION SCHEDULE

ROOM NUMBER	ROOM NAME	OCCUPANCY CATEGORY	FLOOR AREA (SQ. FT.)	PROGRAM OCCUP. LOAD	OUTSIDE AIR PER OCCUP. REQUIRED	OUTSIDE AIR PER SF REQUIRED	UNCORRECTED OUTSIDE AIR CFM	SPACE VENT EFFECT.	REQUIRED OUTSIDE AIR CFM	ACTUAL CFM		EQUIPMENT SERVING SPACE	NOTES
										OUTSIDE AIR	SUPPLY AIR		
A-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	852	17	10	0.12	273	0.9	303	310	1,250	NEW UV-A-1	1-5
A-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	764	15	10	0.12	244	0.9	272	280	1,250	NEW UV-A-2	1-5
A-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	856	17	10	0.12	274	0.9	304	310	1,250	NEW UV-A-3	1-5
A-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	856	17	10	0.12	274	0.9	304	310	1,250	NEW UV-A-4	1-5
A-6	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	379	8	10	0.12	121	0.9	135	140	750	NEW UV-A-6	1-5
B-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	857	17	10	0.12	274	0.9	305	310	1,250	NEW UV-B-1	1-5
B-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	857	17	10	0.12	274	0.9	305	310	1,250	NEW UV-B-2	1-5
B-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	857	17	10	0.12	274	0.9	305	310	1,250	NEW UV-B-3	1-5
B-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	858	17	10	0.12	275	0.9	305	310	1,250	NEW UV-B-4	1-5
C-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	835	17	10	0.12	267	0.9	297	300	1,250	NEW UV-C-1	1-5
C-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	861	17	10	0.12	276	0.9	306	310	1,250	NEW UV-C-2	1-5
C-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	834	17	10	0.12	267	0.9	297	300	1,250	NEW UV-C-3	1-5
C-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	861	17	10	0.12	276	0.9	306	310	1,250	NEW UV-C-4	1-5
D-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	769	15	10	0.12	246	0.9	273	280	1,250	NEW UV-D-1	1-5
D-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	769	15	10	0.12	246	0.9	273	280	1,250	NEW UV-D-2	1-5
D-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	769	15	10	0.12	246	0.9	273	280	1,250	NEW UV-D-3	1-5
D-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	769	15	10	0.12	246	0.9	273	280	1,250	NEW UV-D-4	1-5
E-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	819	16	10	0.12	262	0.9	291	300	1,250	NEW UV-E-1	1-5
E-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	819	16	10	0.12	262	0.9	291	300	1,250	NEW UV-E-2	1-5
E-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	819	16	10	0.12	262	0.9	291	300	1,250	NEW UV-E-3	1-5
E-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	819	16	10	0.12	262	0.9	291	300	1,250	NEW UV-E-4	1-5
F-1	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	383	8	10	0.12	123	0.9	136	140	750	NEW UV-F-1	1-5
F-1B	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	400	8	10	0.12	128	0.9	142	150	750	NEW UV-F-1B	1-5
F-2	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	744	15	10	0.12	238	0.9	265	270	1,000	NEW UV-F-2	1-5
F-3	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	809	16	10	0.12	259	0.9	288	290	1,250	NEW UV-F-3	1-5
F-4	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	738	15	10	0.12	236	0.9	262	270	1,000	NEW UV-F-4	1-5
K-1	CLASSROOM (KNEERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	1,133	23	10	0.12	363	0.9	403	410	1,500	NEW UV-K-1	1-5
K-2	CLASSROOM (KINDERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	1,133	23	10	0.12	363	0.9	403	410	1,500	NEW UV-K-2	1-5
K-3	CLASSROOM (KINDERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	1,133	23	10	0.12	363	0.9	403	410	1,500	NEW UV-K-3	1-5
K-4	CLASSROOM (KINDERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	1,133	23	10	0.12	363	0.9	403	410	1,500	NEW UV-K-4	1-5
A-5	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	860	17	10	0.12	275	0.9	306	310	1,000	REPLACEMENT UV-A-5	1-5
A-6A	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	602	12	10	0.12	193	0.9	214	220	1,000	REPLACEMENT UV-A-6A	1-5
A-8	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-8	1-5
A-9	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-9	1-5
A-10	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-10	1-5
A-11	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-11	1-5
A-12	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-12	1-5
A-13	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	894	18	10	0.12	286	0.9	318	320	1,250	REPLACEMENT UV-A-13	1-5
A-14	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	951	19	10	0.12	304	0.9	338	340	1,250	REPLACEMENT UV-A-14	1-5
A-15	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	951	19	10	0.12	304	0.9	338	340	1,250	REPLACEMENT UV-A-15	1-5
B-7	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	930	19	10	0.12	298	0.9	331	340	1,250	REPLACEMENT UV-B-7	1-5
B-8	CLASSROOM	EDUC., CLASSROOM (AGE 5-8)	942	19	10	0.12	301	0.9	335	340	1,250	REPLACEMENT UV-B-8	1-5
K-7	CLASSROOM (KINDERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	904	18	10	0.12	289	0.9	321	330	1,250	REPLACEMENT UV-K-7	1-5
K-8	CLASSROOM (KINDERGARTEN)	EDUC., CLASSROOM (AGE 5-8)	904	18	10	0.12	289	0.9	321	330	1,250	REPLACEMENT UV-K-8	1-5
29	SMALL GYMNASIUM	SPECTATOR AREA, SPORTS	1,755	112	7.5	0.06	945	0.8	1,182	1,190	4,250	REPLACEMENT UV-S-GYM-1,2,3	1-2,6
30	BIG GYMNASIUM	SPECTATOR AREA, SPORTS	3,831	258	7.5	0.06	2,165	0.8	2,706	2,710	9,000	REPLACEMENT UV-B-GYM-1,2,3, 3 EXISTING UVs	1-2,7

NOTES:

1. VENTILATION SCHEDULE IS BASED ON THE 2025 NEW YORK STATE MECHANICAL CODE, INCLUDING ASHRAE STANDARD 62.1 AND GOOD ENGINEERING PRACTICE.
2. ASHRAE VENTILATION STANDARD 62.1 SHALL BE USED AS A SECONDARY REFERENCE SOURCE IF A PARTICULAR ROOM IS NOT INCLUDED IN THE IMC.
3. FOR TYPICAL CLASSROOM UNIT VENTILATOR ON A WINDOW WALL WITH RELIEF AIR ON OPPOSING CORRIDOR WALL (MOUNTED HIGH OR LOW) SHOULD USE A ZONE AIR DISTRIBUTION EFFECTIVENESS OF Ez = 0.9.
4. OCCUPANCIES BASED ON EITHER ACTUAL SEATING AND/OR CODE DENSITIES OF THE "NET" (NOT GROSS) OCCUPIABLE FLOOR AREA. CLASSROOMS: 35P/1000SF FOR AGE 9 PLUS. 25P/1000SF FOR AGES 5-8.
5. PRIMROSE SERVES STUDENTS IN KINDERGARTEN THROUGH 2ND GRADE (4 TO 8 YEARS OLD).
6. SMALL GYMNASIUM HAS 112 P NOT TO EXCEED. Ez = 0.8 (UVs MOUNTED HIGH). USE ASSEMBLY - SPECTATOR AREA VALUES (NOT PLAYING AREA VALUES WITH MUCH LOWER OCCUPANCIES). MULTI-PURPOSE ASSEMBLY USED AS WORST-CASE MODELING.
7. BIG GYMNASIUM HAS 258 P NOT TO EXCEED. Ez = 0.8 (UVs MOUNTED HIGH). USE ASSEMBLY - SPECTATOR AREA VALUES (NOT PLAYING AREA VALUES WITH MUCH LOWER OCCUPANCIES). MULTI-PURPOSE ASSEMBLY USED AS WORST-CASE MODELING.

UNIT VENTILATOR SCHEDULE

TAG	CLASSROOM SERVED	MANUFACTURER	MODEL NO.	ORIENTATION / MOUNTING	CEILING TYPE	UNIT CONFIGURATIONS			SUPPLY FAN DATA				DX CLG COIL	STEAM HEATING COIL DATA						HOT WATER HEATING COIL DATA						ELECTRICAL DATA				PHYSICAL DATA				WALL SLEEVE			LOUVER		NOTES
						SUPPLY AIR	RETURN AIR	OUTSIDE AIR	AIRFLOW		MOTOR			HTG CAP	PRESS.	FLOW	AIR TEMP		HTG CAP	FLOW	WPD	AIR TEMP		WATER TEMP														
									TOTAL CFM	O.A. CFM	TYPE	SIZE (HP)	(TONS)	(MBH)	(PSI)	(LB/HR)	ENT (F)	LVG (F)	(MBH)	(GPM)	MAX (FT)	ENT (F)	LVG (F)	ENT (F)	LVG (F)	V/PH/HZ	FLA (AMPS)	MCA (AMPS)	MOP (AMPS)	DEPTH OR LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	WGT (LBS)	DEPTH OR LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	WIDTH (IN)	HEIGHT (IN)	
NEW UNIT VENTILATORS:																																					
UV-A-1	CR A-1	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-2	CR A-2	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	280	HS-ECM	1/2	3.0	41	2	42.5	54.3	84.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-3	CR A-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-4	CR A-4	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-6	CR A-6	CARRIER	40UV10750	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	750	140	HS-ECM	1/2	1.5	N/A	-	-	-	-	18.0	0.9	10.0	56.9	79.2	190	150	115/1/60	6.8	8.5	15	21.83	62	30.26	445	8	36	10.38	35.5	9.75	1-9,12
UV-B-1	CR B-1	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-B-2	CR B-2	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-B-3	CR B-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-B-4	CR B-4	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	44	2	45.6	52.6	85.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-C-1	CR C-1	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	300	HS-ECM	1/2	3.0	43	2	44.6	53.2	85.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-C-2	CR C-2	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	48	2	49.7	52.6	88.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-C-3	CR C-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	53	2	54.9	52.6	91.9	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-C-4	CR C-4	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	310	HS-ECM	1/2	3.0	53	2	54.9	52.6	91.9	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-D-1	CR D-1	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	280	HS-ECM	1/2	3.0	41	2	42.5	54.3	84.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-D-2	CR D-2	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	280	HS-ECM	1/2	3.0	41	2	42.5	54.3	84.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-D-3	CR D-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	280	HS-ECM	1/2	3.0	41	2	42.5	54.3	84.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-D-4	CR D-4	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	280	HS-ECM	1/2	3.0	41	2	42.5	54.3	84.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-E-1	CR E-1	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	300	HS-ECM	1/2	3.0	43	2	44.6	53.2	85.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-E-2	CR E-2	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	300	HS-ECM	1/2	3.0	43	2	44.6	53.2	85.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-E-3	CR E-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	300	HS-ECM	1/2	3.0	52	2	53.9	53.2	91.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-E-4	CR E-4	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	300	HS-ECM	1/2	3.0	52	2	53.9	53.2	91.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-F-1	CR F-1	CARRIER	40UV10750	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	750	140	HS-ECM	1/2	1.5	22	2	22.8	56.9	84.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	36	10.38	35.5	9.75	1-9,12
UV-F-1B	CR F-1B	CARRIER	40UV10750	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	750	150	HS-ECM	1/2	1.5	22	2	22.8	56.0	83.2	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	62	30.26	445	8	36	10.38	35.5	9.75	1-9,12
UV-F-2	CR F-2	CARRIER	40UV11000	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,000	270	HS-ECM	1/2	2.5	45	2	46.6	51.1	92.8	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	74	30.26	510	8	48	10.38	47.5	9.75	1-9,12
UV-F-3	CR F-3	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	290	HS-ECM	1/2	3.0	51	2	52.8	53.8	91.5	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-F-4	CR F-4	CARRIER	40UV11000	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,000	270	HS-ECM	1/2	2.5	46	2	47.7	51.1	93.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	74	30.26	510	8	48	10.38	47.5	9.75	1-9,12
UV-K-1	CR K-1	CARRIER	40UV11500	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,500	410	HS-ECM	1/2	3.5	57	2	59.1	50.9	86.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	98	30.26	630	8	72	10.38	71.5	9.75	1-9,12
UV-K-2	CR K-2	CARRIER	40UV11500	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,500	410	HS-ECM	1/2	3.5	78	2	80.8	50.9	99.0	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	98	30.26	630	8	72	10.38	71.5	9.75	1-9,12
UV-K-3	CR K-3	CARRIER	40UV11500	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,500	410	HS-ECM	1/2	3.5	78	2	80.8	50.9	99.0	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	98	30.26	630	8	72	10.38	71.5	9.75	1-9,12
UV-K-4	CR K-4	CARRIER	40UV11500	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,500	410	HS-ECM	1/2	3.5	78	2	80.8	50.9	99.0	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	98	30.26	630	8	72	10.38	71.5	9.75	1-9,12
REPLACEMENT UNIT VENTILATORS:																																					
UV-A-5	CR A-5	CARRIER	40UV11000	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,000	310	HS-ECM	1/2	2.5	N/A	-	-	-	-	44.0	4.4	10.0	48.3	89.0	190	170	115/1/60	6.8	8.5	15	21.83	74	30.26	510	8	48	10.38	47.5	9.75	1-9,12
UV-A-6A	CR A-6A	CARRIER	40UV11000	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,000	220	HS-ECM	1/2	2.5	N/A	-	-	-	-	30.0	3.0	10.0	54.6	82.4	190	170	115/1/60	6.8	8.5	15	21.83	74	30.26	510	8	48	10.38	47.5	9.75	1-9,12
UV-A-8	CR A-8	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-9	CR A-9	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-10	CR A-10	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-11	CR A-11	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-12	CR A-12	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-13	CR A-13	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	320	HS-ECM	1/2	3.0	N/A	-	-	-	-	43.0	4.3	10.0	52.1	83.9	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-14	CR A-14	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	340	HS-ECM	1/2	3.0	N/A	-	-	-	-	54.0	5.4	10.0	51.0	91.0	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-A-15	CR A-15	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	340	HS-ECM	1/2	3.0	N/A	-	-	-	-	54.0	5.4	10.0	51.0	91.0	190	170	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-B-7	CR B-7	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	340	HS-ECM	1/2	3.0	88	2	91.2	51.0	116.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-B-8	CR B-8	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	340	HS-ECM	1/2	3.0	88	2	91.2	51.0	116.1	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-K-7	CR K-7	CARRIER	40UV11250	VERT., FLR.	N/A	TOP GR.	BOTT. GR.	NEW WB/GR	1,250	330	HS-ECM	1/2	3.0	88	2	91.2	51.5	116.7	N/A	-	-	-	-	-	-	115/1/60	6.8	8.5	15	21.83	86	30.26	570	8	60	10.38	59.5	9.75	1-9,12
UV-K-8	CR K-8	CARRIER	40UV

INDOOR AIR HANDLING UNIT SCHEDULE

TAG	AREA SERVED	MANUFACTURER	MODEL NO.	SUPPLY FAN DATA						STEAM HEATING COIL DATA											ELECTRICAL DATA			PHYSICAL DATA					NOTES
				AIRFLOW		TSP	ESP	DRIVE	SPEED	HEATING CAPACITY	AIR TEMP		COIL APD	COIL VEL.	ROWS	FINS PER	STEAM PRESS.	COND. LOAD	STEAM PIPE	COND PIPE	V/PH/HZ	MOTOR SIZE	TYPE	L	W	H	WEIGHT	
				SA CFM	OA CFM	(IN WC)	(IN WC)		(RPM)	(MBH)	ENT (F)	LVG (F)	(IN. WC)	(FPM)		INCH	(PSIG)	(LBS/HR)	(IN)	(IN)		(HP)		(IN)	(IN)	(IN)	(LBS)	
AHU-26D	STORAGE ROOM 26D	CARRIER	39SH	600	600	1.04	0.50	DIRECT	1323	43.33	0	66.9	0.13	335.2	2	8	2	45.14	1.5	1	115/1/60	0.5	HI-EFF ODP	38	28	14	199	1-7

NOTES:
1. COMPONENTS: SUPPLY FAN, STEAM COIL, FILTER.
2. CEILING MOUNTED WITH SPRING VIBRATION ISOLATORS.
3. INTERLOCK WITH ASSOCIATED CHEMICAL STORAGE EXHAUST FAN CEF-1 AND EXISTING ATC/DDC CONTROL SYSTEM.
4. UNIT INSULATION: STANDARD MICROMAT Rx (1 INCH).
5. PROVIDE MANUFACTURER'S WARRANTY.
6. 2" PLEATED MERV 8 FILTERS.
7. MOTOR START/STOP STATION.

CHEMICAL STORAGE EXHAUST FAN SCHEDULE

TAG	AREA SERVED	LOCATION	MANUFACTURER	MODEL NO.	TYPE	DRIVE	AIRFLOW	ESP	MOTOR DATA					PHYSICAL DATA						NOTES
									V/PH/HZ	SIZE (HP)	FLA (AMPS)	SPEED RPM	TYPE	BASE DIAM. (IN)	HEIGHT (IN)	DUCT INLET DIAM. (IN)	TOP OUTLET DIAM. (IN)	FAN WEIGHT (LB)	CURB WEIGHT (LB)	
							(CFM)	(IN WG)												
CEF-1	STORAGE ROOM 26D	ROOF	PLASTEC	JET 25, J25SS6P025	POLYPROPYLENE UPBLAST INLINE BLOWER	DIRECT	700	0.25	115/1/60	0.25	4.16	1,120	TEFC	29.71	41.31	7.86	7.86	32.54	45	1-10

NOTES:
1. FACTORY-INSTALLED & WIRED, DISCONNECT SWITCH, IP65/NEMA 4X RATING, UL502 LISTED.
2. GALVANIZED ALUMINUM INSULATED ROOF CURB (CURBGV24).
3. GRAVITY-OPERATED BACKDRAFT DAMPER (BD200).
4. DISCHARGE STACK (ST200).
5. DISCHARGE NOZZLE (SN200).
6. STACK GUYWIRE BAND (STGB200).
7. INTERLOCK EXHAUST FAN WITH ASSOCIATED AIR HANDLING UNIT AHU-26D.
8. PROVIDE MANUFACTURER'S STANDARD WARRANTY.
9. AMCA CERTIFIED.
10. NONFLAMMABLE FUMES - MOTOR OUT OF THE AIRSTREAM.

EXHAUST FAN SCHEDULE

TAG	ORIGINAL EQUIPMENT TAG	SERVICE TYPE	ROOM(S) SERVED	LOCATION	MANUFACTURER	MODEL	TYPE	DRIVE	AIRFLOW (CFM)	ESP (IN WG)	FAN SPEED (RPM)	SOUND POWER (SONES)	MOTOR DATA					PHYSICAL DATA								NOTES
													V/P/H	HP	FLA (AMPS)	MCA	MOP	DUCT CONN.		FAN DIMENSIONS		ROOF OPENING		WEIGHT W/O ACC. (LBS.)	
																		L (IN)	W (IN)	W (IN)	H (IN)	L (IN)	W (IN)		
TX-D9	EF-1 (1995 DRAWINGS)	TOILETS	RESTROOM D-9	ROOF	GREENHECK	G-080-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	130	0.25	1110	4.6	115/1/60	1/6	2.8	3.5	15	10	10	22	27	12.5	12.5	40	1-13
TX-D10	EF-2 (1995 DRAWINGS)	TOILETS	RESTROOM D-10	ROOF	GREENHECK	G-080-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	130	0.25	1110	4.6	115/1/60	1/6	2.8	3.5	15	10	10	22	27	12.5	12.5	40	1-13
EF-D7	EF-3 (1995 DRAWINGS)	CLASSROOM	CLASSROOM D-7	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,250	0.25	885	6.7	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-D8	EF-4 (1995 DRAWINGS)	CLASSROOM	CLASSROOM D-8	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,250	0.25	885	6.7	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
TX-16	EF-5 (1995 DRAWINGS)	TOILETS	GIRL'S RESTROOM 16	ROOF	GREENHECK	G-080-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	130	0.25	1110	4.6	115/1/60	1/6	2.8	3.5	15	10	10	22	27	12.5	12.5	40	1-13
TX-17	EF-6 (1995 DRAWINGS)	TOILETS	BOY'S RESTROOM 17	ROOF	GREENHECK	G-080-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	130	0.25	1110	4.6	115/1/60	1/6	2.8	3.5	15	10	10	22	27	12.5	12.5	40	1-13
EF-B8	EF-7 (1995 DRAWINGS)	CLASSROOM	CLASSROOM B-8	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,250	0.25	885	6.7	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-B7	EF-8 (1995 DRAWINGS)	CLASSROOM	CLASSROOM B-7	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,250	0.25	885	6.7	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-A3-A4	EXHAUST FAN NO. 1 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS A-3 & A-4	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,055	0.25	812	6.0	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-A1-A2	EXHAUST FAN NO. 2 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS A-1 & A-2	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,055	0.25	812	6.0	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-B1-B2	EXHAUST FAN NO. 3 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS B-1 & B-2	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,055	0.25	812	6.0	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-B3-B4	EXHAUST FAN NO. 4 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS B-3 & B-4	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	1,055	0.25	812	6.0	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-K1-K2	EXHAUST FAN NO. 5 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS K-1 & K-2	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	975	0.25	782	5.6	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
TX-K1A-K2A	EXHAUST FAN NO. 6 (1957 DRAWINGS)	TOILETS	RESTROOMS K-1A & K-2A	ROOF	GREENHECK	G-098-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	255	0.25	895	3.7	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
TX-33	EXHAUST FAN NO. 7 (1957 DRAWINGS)	TOILETS	MEN'S RESTROOM 33 / WOMEN'S RESTROOM 34	ROOF	GREENHECK	G-100-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	550	0.25	1010	3.9	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
TX-26A	EXHAUST FAN NO. 9 (1957 DRAWINGS)	TOILETS	GIRL'S RESTROOM 26A	ROOF	GREENHECK	G-097-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	150	0.50	1,250	5.7	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1,4-13
TX-23	EXHAUST FAN NO. 12 (1957 DRAWINGS)	TOILETS	BOY'S RESTROOM 23, RESTROOM 22A, JAN CLOSET 24A	ROOF	GREENHECK	G-100-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	550	0.25	1010	3.9	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
EF-D1-D3	EXHAUST FAN NO. 13 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS D-1 & D-3	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	975	0.25	782	5.6	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
EF-D2-D4	EXHAUST FAN NO. 14 (1957 DRAWINGS)	CLASSROOM	CLASSROOMS D-2 & D-4	ROOF	GREENHECK	G-140-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	975	0.25	782	5.6	115/1/60	1/4	3.8	4.8	15	16	16	28	36	18.5	18.5	68	1-13
TX-D11-D12	EXHAUST FAN NO. 15 (1957 DRAWINGS)	TOILETS	RESTROOMS D-11 & D-12, CLOSETS D-5 & D-6	ROOF	GREENHECK	G-100-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	550	0.25	1010	3.9	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
EF-A7	EF-1 (1999 DRAWINGS)	CLASSROOM / OFFICE	READING ROOM A-7, OFFICES A-7A,B,C	ROOF	GREENHECK	G-100-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	500	0.375	970	3.6	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
TX-A1	EF-2 (1999 DRAWINGS)	TOILETS	A-WING RESTROOM 9, A-6B,8A,9A,10A,11A,12A,13A	ROOF	GREENHECK	G-120-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	800	0.50	1,149	8.0	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	59	1-13
TX-A2	EF-3 (1999 DRAWINGS)	TOILETS	A-WING RESTROOM A-14A,15A	ROOF	GREENHECK	G-098-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	400	0.50	1,302	6.8	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13
TX-A3	EF-4 (1999 DRAWINGS)	TOILETS	CLOSET 8A, RESTROOM 8B	ROOF	GREENHECK	G-097-VG	CENTRIFUGAL, DOWNBLAST	DIRECT	150	0.50	1,250	5.7	115/1/60	1/4	3.8	4.8	15	12	12	24	36	14.5	14.5	54	1-13

NOTES:
1. EXHAUST FANS SHALL BE INTERLOCKED WITH EXISTING BUILDING MANAGEMENT SYSTEM.
2. FAN IS INTENDED TO BE A REPLACEMENT-IN-KIND. AIRFLOW AND STATIC PRESSURE READINGS ARE BASED ON ORIGINAL DESIGN DRAWINGS. PROVIDE ALL REQUIRED INTERLOCKS.
3. RE-INTEGRATE FAN INTO EXISTING CONTROLS SEQUENCES (FIELD-VERIFY).
4. PROVIDE VARI-GREEN EC MOTOR WITH DIAL-ON-MOTOR FOR BALANCING.
5. FAN SHALL BE UL-705 LISTED, AMCA CERTIFIED.
6. PROVIDE FAN WITH NEW HIGH-WIND RATED ROOF CURB (12 INCHES HIGH).
7. PROVIDE FIELD-APPLIED FOAMED CURB SEAL.
8. PROVIDE NEMA-3R TOGGLE DISCONNECT SWITCH.
9. JUNCTION BOX SHALL BE MOUNTED & WIRED IN WEATHER-PROTECTED MOTOR COMPARTMENT.
10. PROVIDE ALUMINUM BIRDSCREEN, GALVANIZED, 84% FREE AREA.
11. ALUMINUM WHEEL MATERIAL.
12. PROVDE WITH GRAVITY BACKDRAFT DAMPER.
13. PROVIDE WITH THE MANUFACTURER'S STANDARD WARRANTY.

DIFFUSER, REGISTER, & GRILLE SCHEDULE

TAG	TYPE	MANUFACTURER	MODEL	MOUNT TYPE	MODULE SIZE (INCH)	NECK SIZE (INCH)	AIRFLOW RANGE (CFM)	MAX NC RATING	MAX PRESS LOSS (IN WG)	NOTES
SG-1	SUPPLY GRILLE	TITUS	300RL	SURFACE	NECK + 2"	22x10	0-700	20	0.05	1,3-4
EG-1	EXHAUST GRILLE	TITUS	355FL	SURFACE	NECK + 2"	12x12	0-400	20	0.05	2-4

NOTES:
1. SUPPLY GRILLE SHALL BE STEEL CONSTRUCTION WITH DOUBLE DEFLECTION BLADES SPACED AT 3/4".
2. EXHAUST GRILLES SHALL BE STEEL CONSTRUCTION WITH 35-DEGREE FIXED DEFLECTION BLADES SPACED AT 1/2".
3. PROVIDE DEVICES WITH OPPOSED BLADE VOLUME DAMPERS.
4. COLOR SELECTION BY ARCHITECT.

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05/31/2028 Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

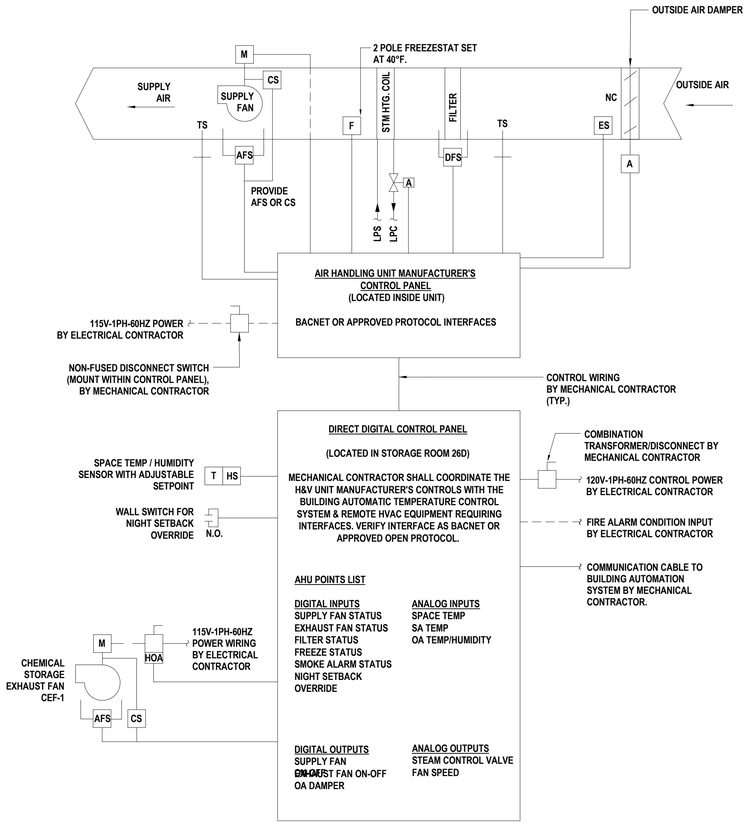
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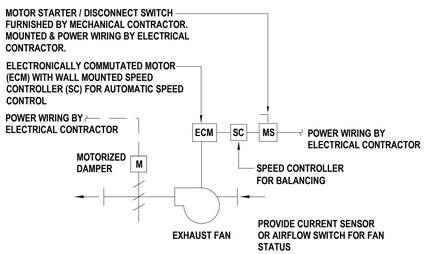
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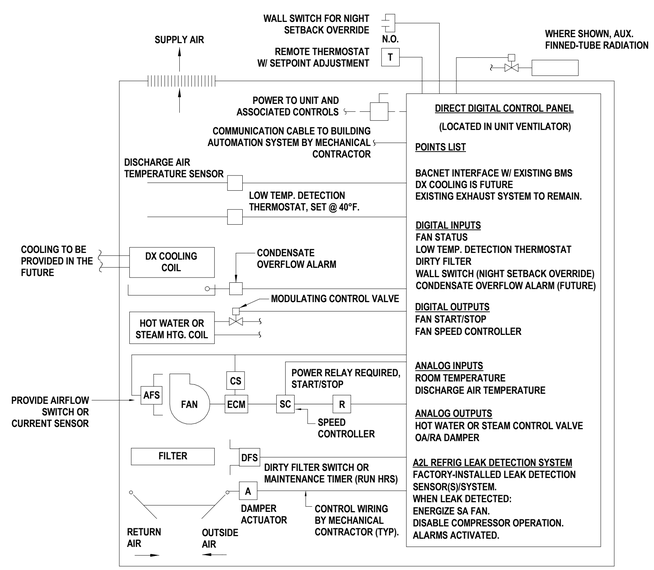
1 AIR HANDLING UNIT (AHU-26D) CONTROL DIAGRAM

SCALE:NTS



3 EXHAUST FAN CONTROL SCHEMATIC

SCALE: NTS



2 UNIT VENTILATOR (UV) CONTROL DIAGRAM

SCALE:NTS

CONTROLS LEGEND, SYMBOLS AND ABBREVIATIONS

A	ACTUATOR
AFS	AIRFLOW SWITCH
AFMS	AIRFLOW MONITORING STATION
AHU	AIR HANDLING UNIT
ATC	AUTOMATIC TEMPERATURE CONTROLS
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACKDRAFT DAMPER
BSB	BRANCH SELECTOR BOX
CO2	CARBON DIOXIDE
CS	CURRENT SENSOR
CU	CONDENSING UNIT
DDC	DIRECT DIGITAL CONTROLS
DFS	DIRTY FILTER SWITCH
DSD	DUCT SMOKE DETECTOR
EA	EXHAUST AIR
ECM	ELECTRONICALLY COMMUTATED MOTOR
EF	EXHAUST FAN
ES	END SWITCH
F	FREEZESTAT
HOA	HAND-OFF-AUTOMATIC
HS	HUMIDITY SENSOR
M	MOTOR
MA	MIXED AIR
MS	MOTOR STARTER
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OCC	OCCUPANCY SENSOR
R	RELAY
RA	RETURN AIR
RH	RELATIVE HUMIDITY
SA	SUPPLY AIR
SC	SPEED CONTROLLER
SF	SUPPLY FAN
SP	STATIC PRESSURE SENSOR
SW	SWITCH
T	THERMOSTAT
TEMP	TEMPERATURE
TS	TEMPERATURE SENSOR
UV	UNIT VENTILATOR
VFD	VARIABLE FREQUENCY DRIVE

GENERAL NOTES:

1. ALL POWER WIRING ABOVE 120V TO BE PROVIDED AND INSTALLED BY THE ELECTRICAL CONTRACTOR, INCLUDING POWER WIRING FOR ALL CONTROL PANELS.
2. ALL WIRING SHALL BE INSTALLED IN APPROPRIATELY SIZED E.M.T. INSTALLATION FOR ALL ELECTRICAL DEVICES. WIRING SHALL FOLLOW WIRING METHODS SPECIFIED ON THE CONTRACT "E" DRAWINGS AND SPECIFICATIONS.
3. LOW VOLTAGE "CONTROL" WIRING, SHALL BE PROVIDED AND INSTALLED BY THE MECHANICAL CONTRACTOR, EXCEPT AS NOTED.
4. REFER TO SPECIFICATIONS FOR SEQUENCE OF OPERATIONS. SEE SPECIFICATIONS FOR ADDITIONAL DETAILS.
5. UNITARY CONTROLLERS SHALL HAVE INTERNAL CONTROL LOGIC CAPABLE OF FULL OPERATION OF THE EQUIPMENT IN THE EVENT THE EQUIPMENT IS NOT CONNECTED TO THE BMS.

THERMOSTAT NOTES:

1. ALL THERMOSTATS SHALL HAVE LOCKING COVERS TO PREVENT TAMPERING AND VANDALISM.

MOTOR STARTER NOTES:

1. ALL SAFETY DEVICES SHALL BE WIRED SO THEY STOP THE MOTOR WITH THE HAND-OFF-AUTO SWITCH IN THE HAND AS WELL AS THE AUTO POSITION. THIS WILL NORMALLY MEAN BREAKING THE COMMON WIRE FROM THE HAND-OFF-AUTO TO THE STARTER'S HOLDING COIL THRU THE SAFETY DEVICES.

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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

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W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

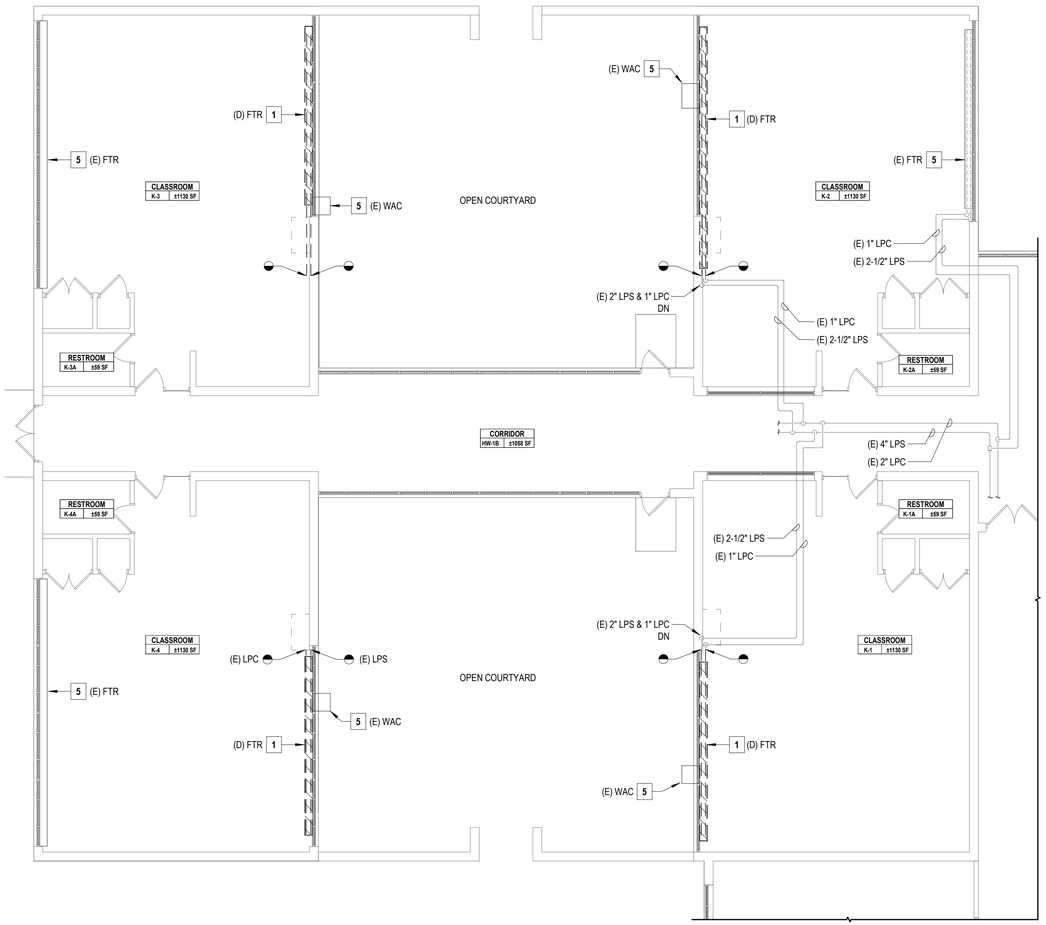
SHEET TITLE

MECHANICAL CONTROL DIAGRAMS

DRAWING No.

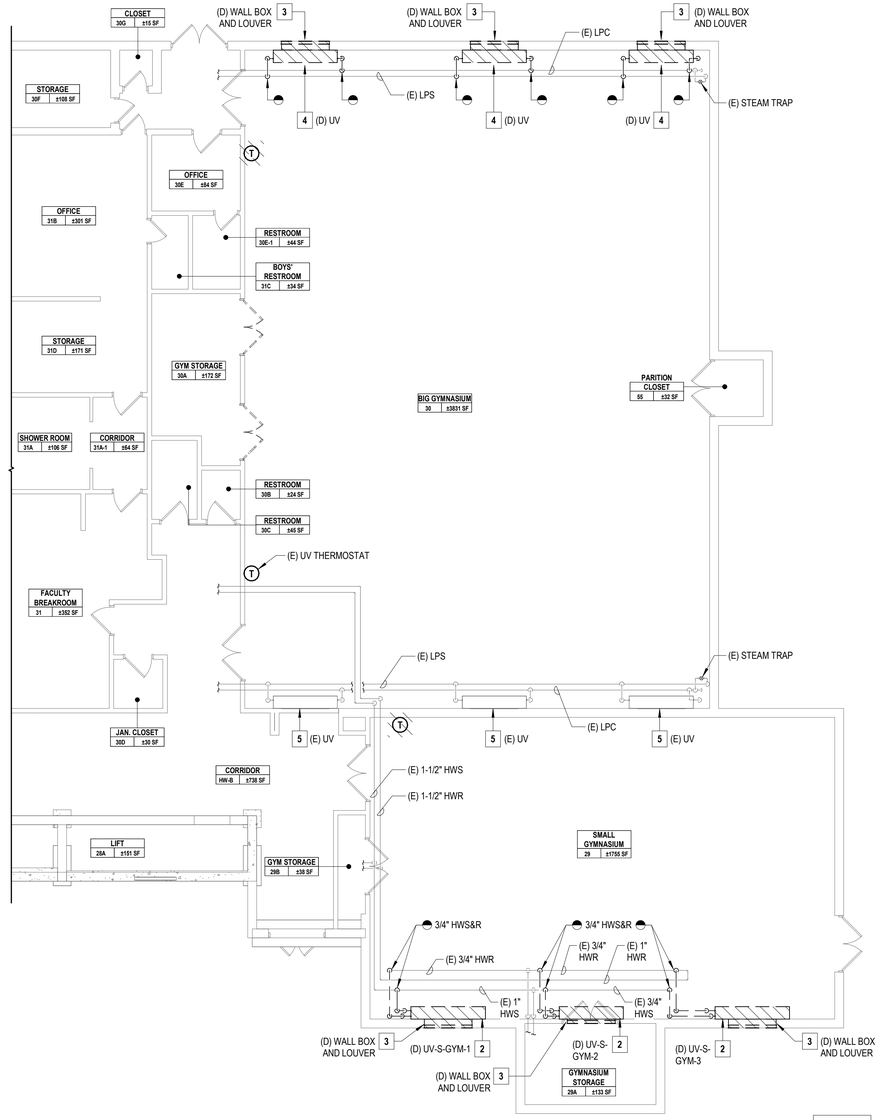
PE-M 650.00

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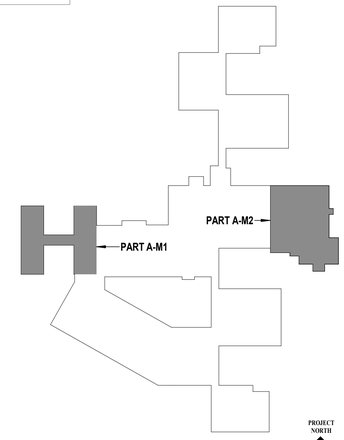
1 MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'A-M1'

SCALE: 1/8" = 1'-0"



2 MECHANICAL BASEMENT DEMOLITION PLAN - PART 'A-M2'

SCALE: 1/8" = 1'-0"



3 KEY PLAN

SCALE: 1" = 100'-0"

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3. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL LEGALLY OFF-SITE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND AS PER THEIR SCOPE OF WORK.

X MECHANICAL DEMOLITION KEYNOTES

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2. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE EXISTING HOT WATER UNIT VENTILATOR SERVING THE SMALL GYMNASIUM. DISCONNECT, REMOVE, AND DISPOSE OF ASSOCIATED HOT WATER SUPPLY AND RETURN PIPING BACK TO THE POINT INDICATED ON THE DRAWING. TEMPORARILY CAP PIPING.
3. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE WALL BOX AND OUTSIDE AIR INTAKE LOUVER ASSOCIATED WITH THE INDICATED UNIT VENTILATOR. TEMPORARILY SEAL OPENINGS IN WALL TO MAKE WEATHERTIGHT UNTIL NEW LOUVERS ARE INSTALLED DURING THE NEW WORK PHASE.
4. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE EXISTING STEAM UNIT VENTILATOR SERVING THE BIG GYMNASIUM. DISCONNECT, REMOVE, AND DISPOSE OF THE ASSOCIATED STEAM AND CONDENSATE RETURN PIPING, PIPING INSULATION, AND RELATED APPURTENANCES BACK TO THE POINT INDICATED ON THE DRAWING. TEMPORARILY CAP PIPING. DISCONNECT, REMOVE, AND DISPOSE OF THE ASSOCIATED EQUIPMENT HANGERS AND SUPPORTS.
5. EXISTING TO REMAIN.

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CONTRACT

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SHEET TITLE

MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'A-M1' & PART 'A-M2'

DRAWING No.

PE-MD 110.00

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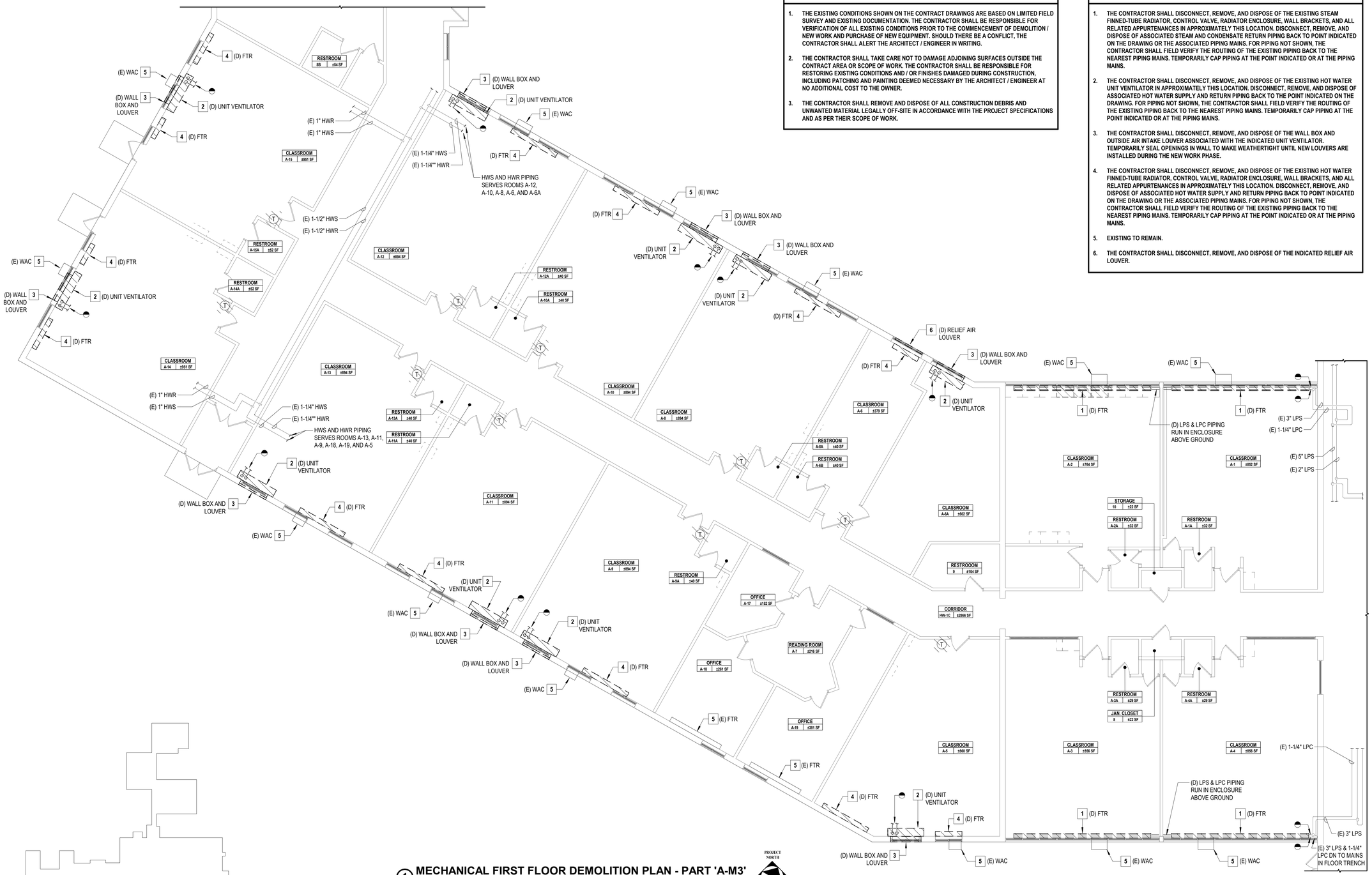
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5. EXISTING TO REMAIN.
6. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE INDICATED RELIEF AIR LOUVER.



1 MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'A-M3'

SCALE: 1/8" = 1'-0"

2 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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CONTRACT
CONTRACT M
MECHANICAL CONSTRUCTION

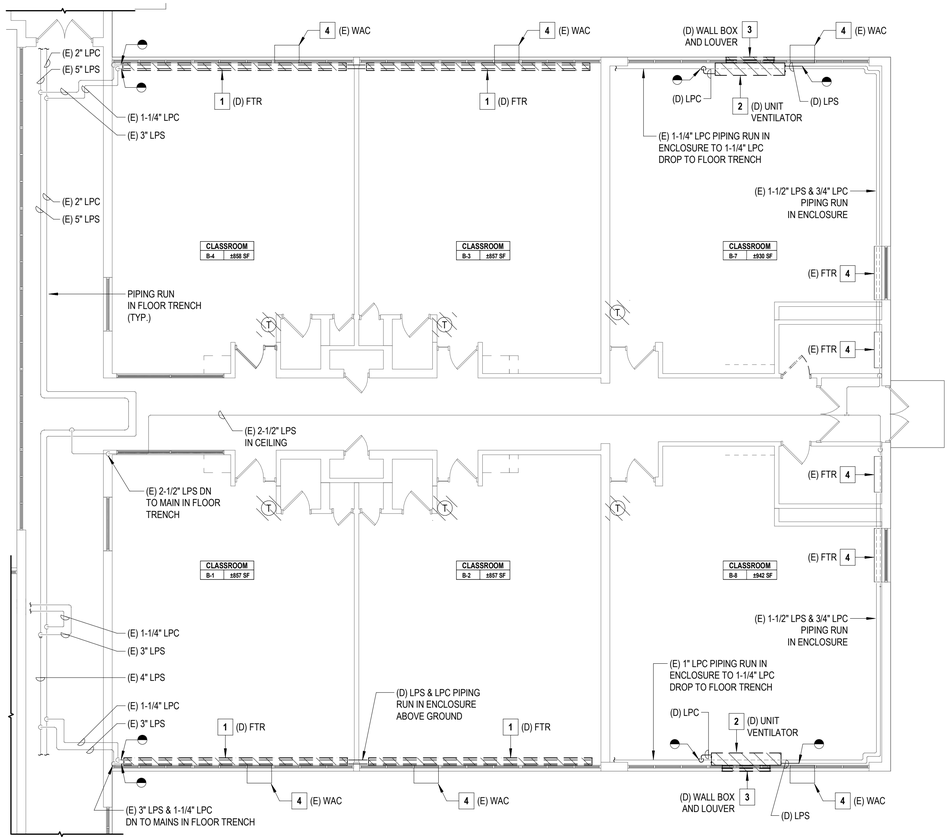
STATUS
SED SUBMISSION

SHEET TITLE
MECHANICAL
FIRST FLOOR DEMOLITION PLAN - PART 'A-M3'

DRAWING No.
PE-MD 111.00

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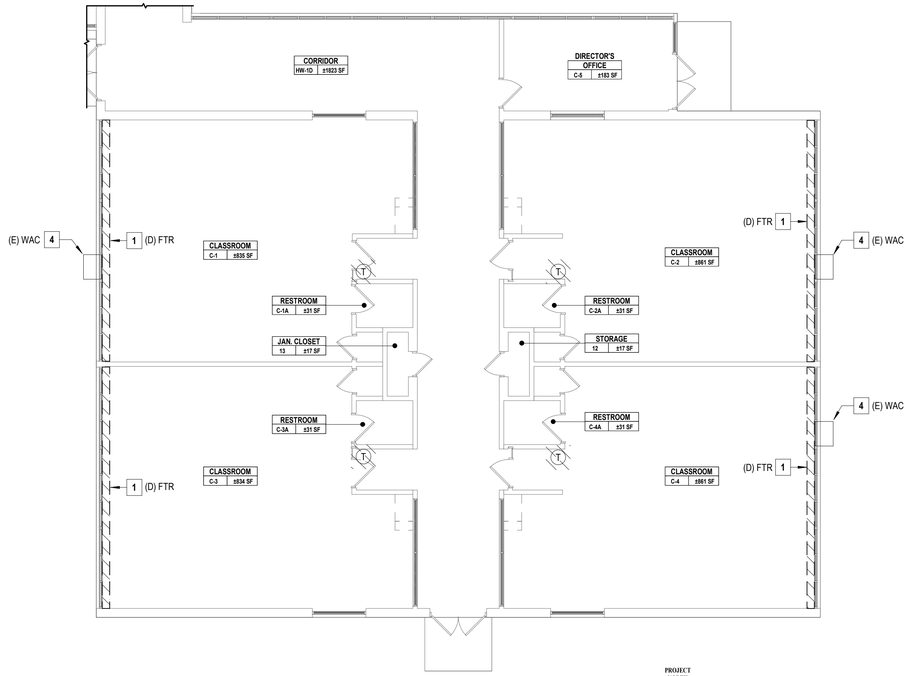
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1 MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'A-M4'

SCALE: 1/8" = 1'-0"

PROJECT NORTH



2 MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'A-M5'

SCALE: 1/8" = 1'-0"

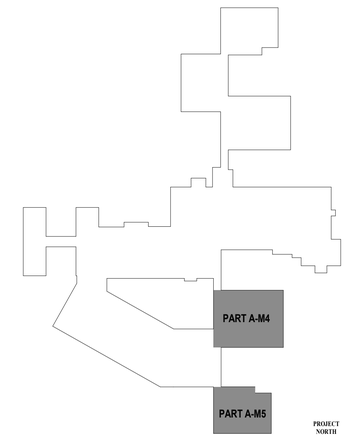
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4. EXISTING TO REMAIN.



PROJECT NORTH

3 KEY PLAN

SCALE: 1" = 100'-0"

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MECHANICAL
FIRST FLOOR DEMOLITION PLAN - PART 'A-M4' & PART 'A-'M5'

DRAWING No.

PE-MD 112.00

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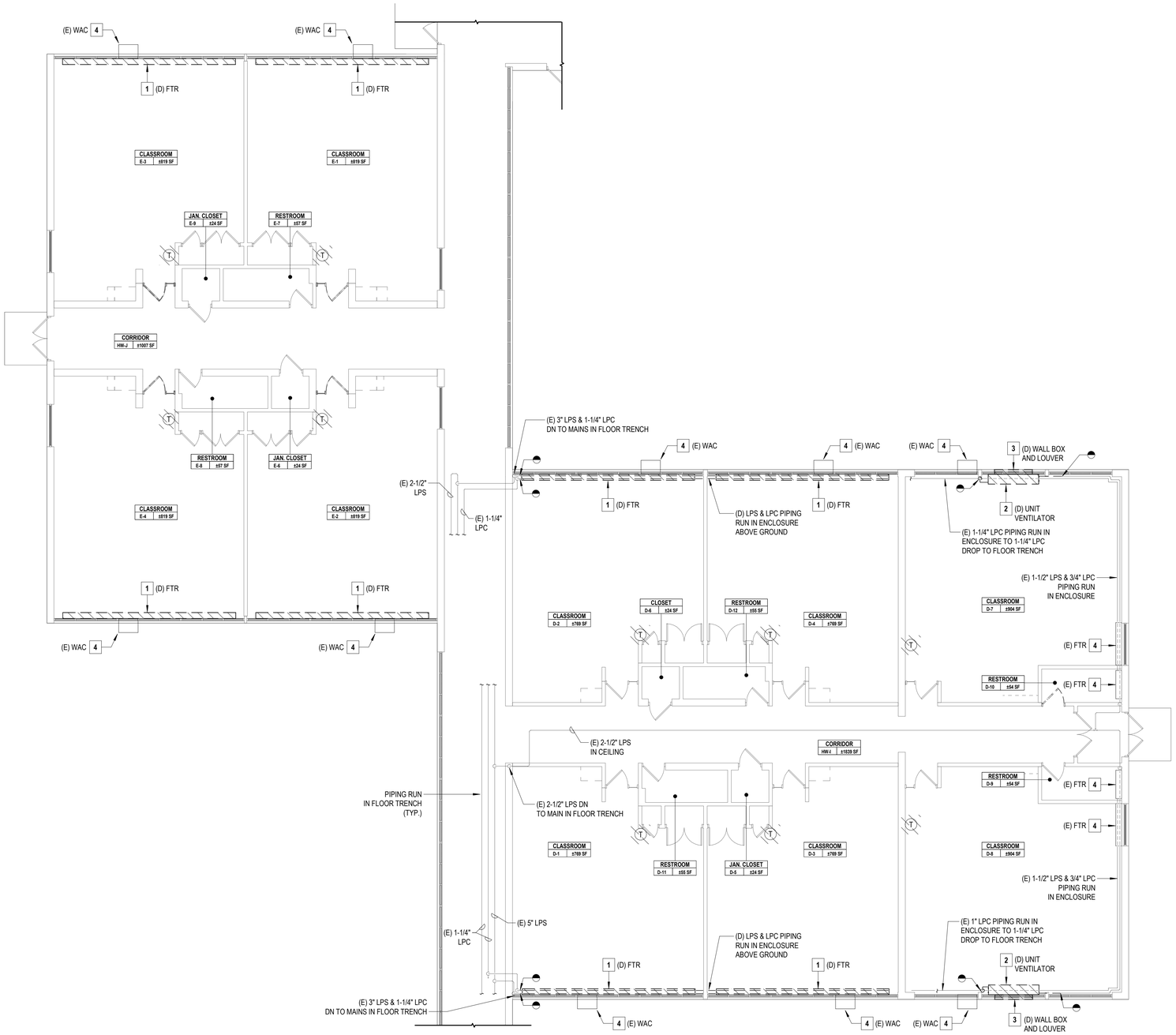
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GENERAL NOTES

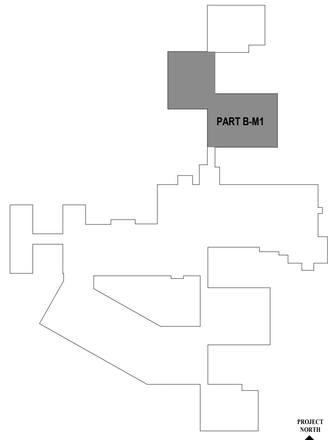
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SCALE: 1/8" = 1'-0"



2 KEY PLAN
SCALE: 1" = 100'-0"

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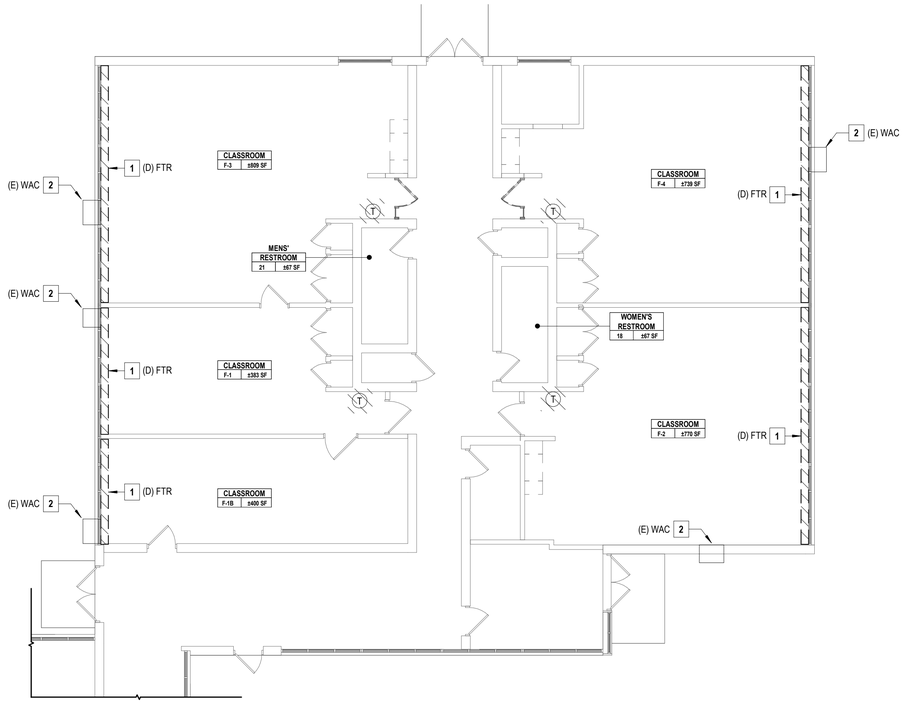
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GENERAL NOTES

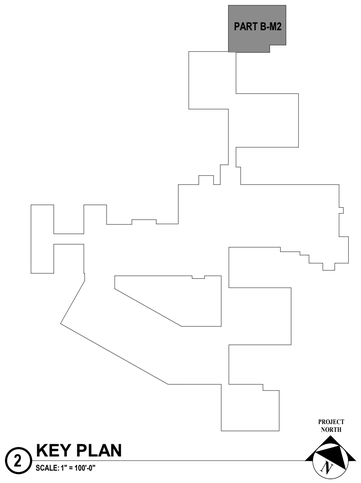
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2 KEY PLAN
SCALE: 1" = 100'-0"

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CONSULTANTS:

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STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 057554

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
W. MAGIERA	W. MAGIERA	K. WEILER	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT M
MECHANICAL CONSTRUCTION

STATUS

SED SUBMISSION

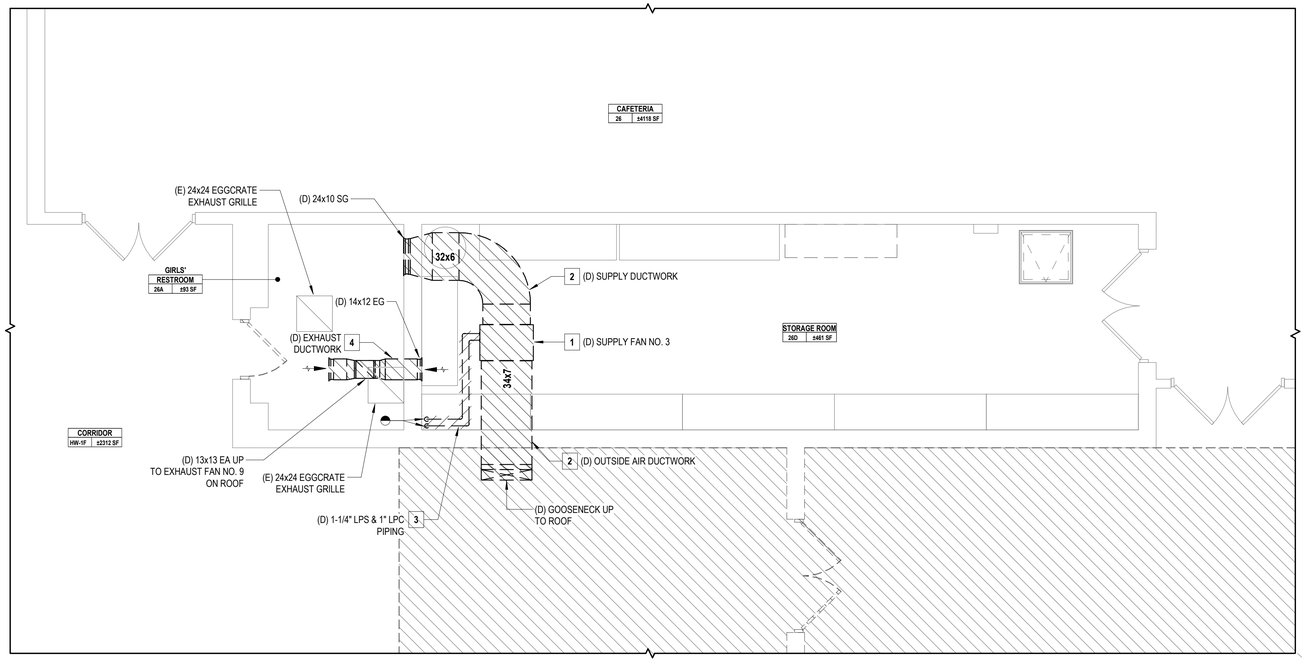
SHEET TITLE

MECHANICAL FIRST FLOOR DEMOLITION PLAN - PART 'B-M2'

DRAWING No.

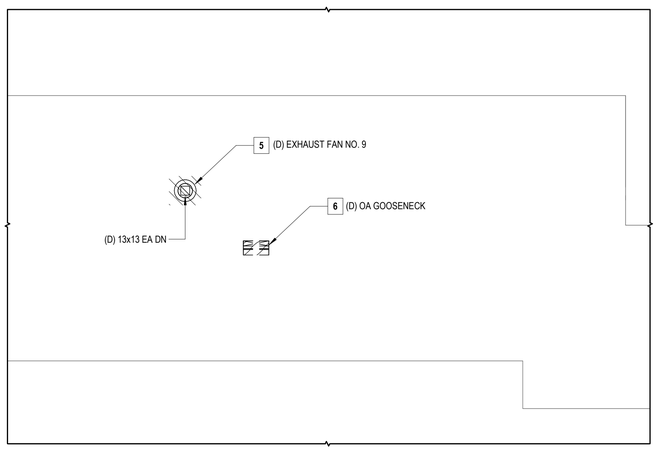
PE-MD 114.00

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1 PARTIAL FIRST FLOOR DEMOLITION PLAN - CHEMICAL STORAGE

SCALE: 1/4" = 1'-0"



2 PARTIAL ROOF DEMOLITION PLAN

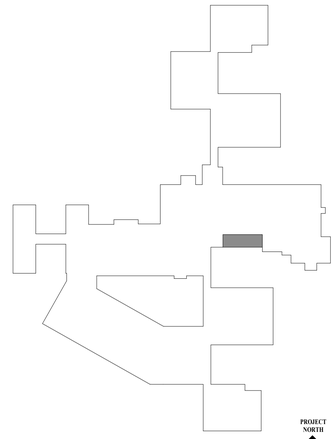
SCALE: 1/8" = 1'-0"

GENERAL NOTES

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3. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CONSTRUCTION DEBRIS AND UNWANTED MATERIAL LEGALLY OFF-SITE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND AS PER THEIR SCOPE OF WORK.

X MECHANICAL DEMOLITION KEYNOTES

1. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF EXISTING SUPPLY FAN NO. 3 AND ASSOCIATED EQUIPMENT HANGERS AND SUPPORTS IN APPROXIMATELY THIS LOCATION.
2. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE SUPPLY AND OUTSIDE AIR INTAKE DUCTWORK ASSOCIATED WITH SUPPLY FAN NO. 3, INCLUDING ALL DUCT SUPPORTS, INSULATION, WALL GRILLES, AND RELATED APPURTENANCES.
3. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE STEAM AND CONDENSATE RETURN PIPING ASSOCIATED WITH SUPPLY FAN NO. 3, INCLUDING ALL VALVES, PIPING INSULATION, AND RELATED APPURTENANCES. CAP PIPING AT THE FLOOR.
4. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE EXHAUST DUCTWORK, EXHAUST GRILLES, AND RELATED APPURTENANCES ASSOCIATED WITH EXHAUST FAN NO. 9.
5. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF EXISTING EXHAUST FAN NO. 9 AND ASSOCIATED ROOF CURB IN APPROXIMATELY THE LOCATION SHOWN. DISCONNECT, REMOVE, AND DISPOSE OF EXISTING BACKDRAFT DAMPER.
6. THE CONTRACTOR SHALL DISCONNECT, REMOVE, AND DISPOSE OF THE EXISTING OUTSIDE AIR INTAKE GOOSENECK VENT ASSOCIATED WITH SUPPLY FAN NO. 3, TEMPORARILY SEAL ROOF OPENING UNTIL NEW GOOSENECK VENT IS INSTALLED DURING THE NEW WORK PHASE.



2 KEY PLAN

SCALE: 1" = 100'-0"

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White Plains, NY 10605
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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

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STATE OF NEW YORK · JOHN C. MORRIS III · LICENSED PROFESSIONAL ENGINEER · 057554-1

05/31/2028
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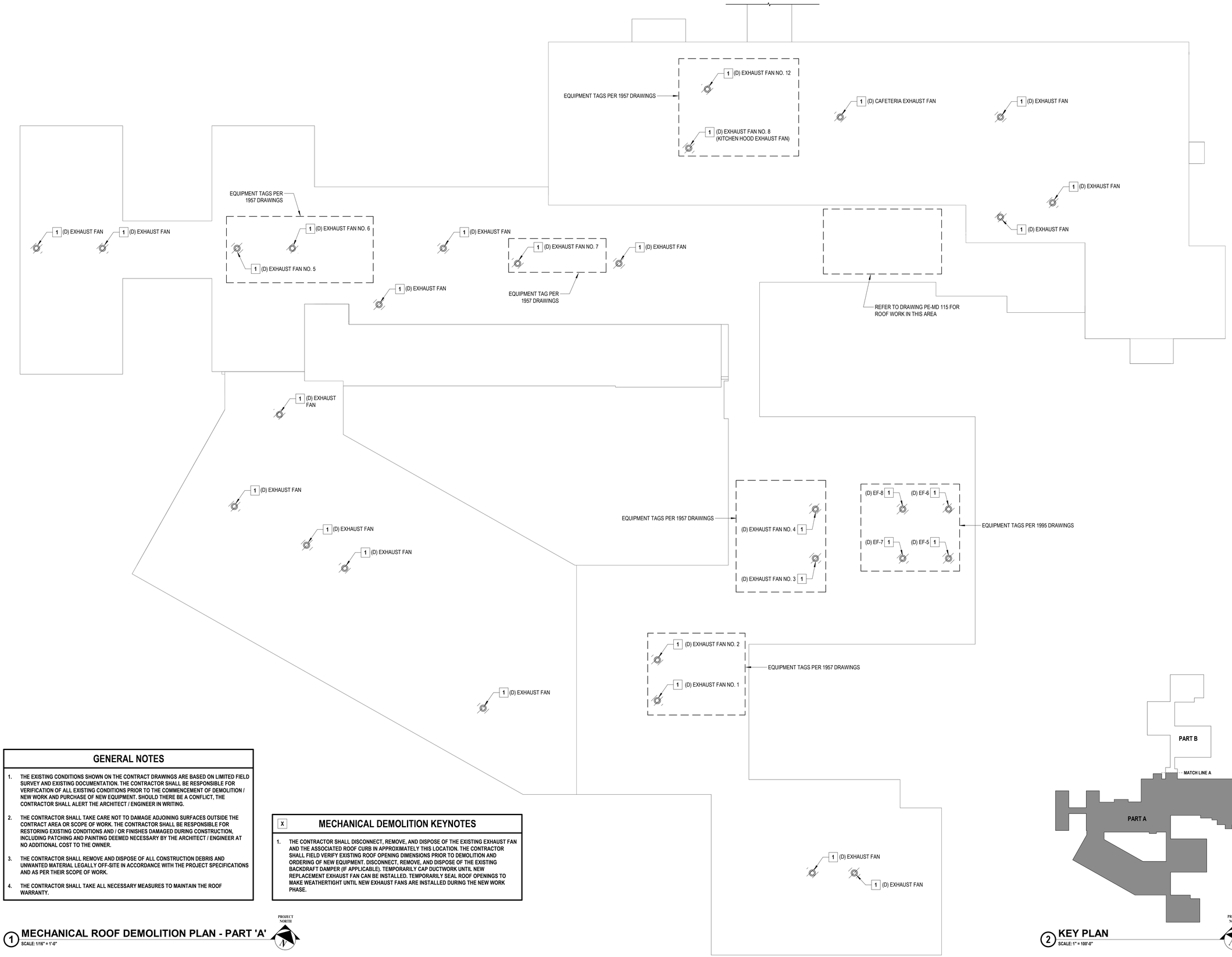
SHEET TITLE

MECHANICAL FIRST FLOOR & PARTIAL ROOF DEMOLITION PLAN

DRAWING No.

PE-MD 115.00

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GENERAL NOTES

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4. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO MAINTAIN THE ROOF WARRANTY.

X MECHANICAL DEMOLITION KEYNOTES

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1 MECHANICAL ROOF DEMOLITION PLAN - PART 'A'

SCALE: 1/16" = 1'-0"

PROJECT NORTH

2 KEY PLAN

SCALE: 1" = 100'-0"

PROJECT NORTH

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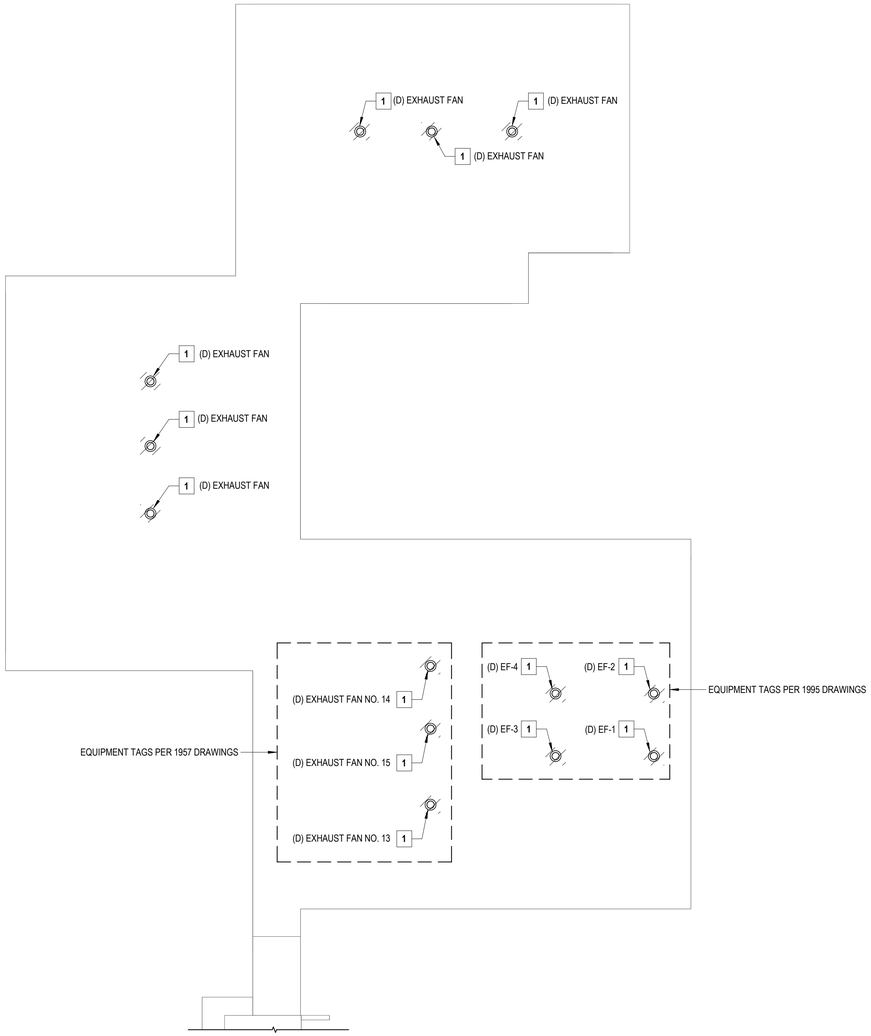
SED SUBMISSION

SHEET TITLE

MECHANICAL ROOF DEMOLITION PLAN - PART 'A'

DRAWING No.

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1 MECHANICAL ROOF DEMOLITION PLAN - PART 'B'

SCALE: 1/16" = 1'-0"

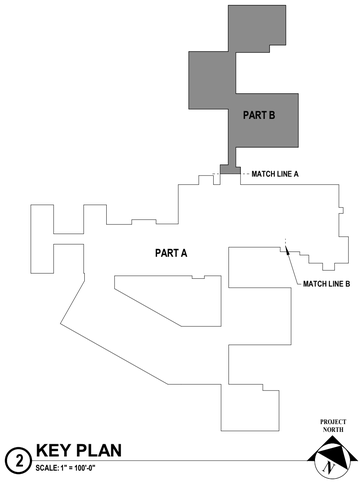
PROJECT NORTH

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2 KEY PLAN

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SHEET TITLE

MECHANICAL ROOF DEMOLITION PLAN - PART 'B'

DRAWING No.

PE-MD 117.00

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ELECTRICAL LEGEND

SYMBOL	DESCRIPTION	COMMENTS
S_3	THREE - WAY SWITCH	46" AFF TO CL UON
S_4	FOUR - WAY SWITCH	46" AFF TO CL UON
S_I	ILLUMINATED SWITCH	46" AFF TO CL UON
S^A	SINGLE POLE SWITCH; "A" INDICATES SWITCH CONTROL	46" AFF TO CL UON
S_D	SINGLE POLE DIMMER SWITCH	46" AFF TO CL UON
S_{3D}	THREE - WAY DIMMER SWITCH	46" AFF TO CL UON
S_K	SINGLE POLE KEYED SWITCH	46" AFF TO CL UON
S_{K3}	KEYED THREE - WAY SWITCH	46" AFF TO CL UON
S_{K4}	KEYED FOUR - WAY SWITCH	46" AFF TO CL UON
S_M	HORSEPOWER RATED SWITCH, WITH INDICATOR (CONTRACTOR SHALL COORDINATE VOLTAGE AND PHASE WITH EQUIPMENT)	46" AFF
S_P	SWITCH AND PILOT LIGHT	
S_T	SWITCH WITH THERMAL OVERLOAD PROTECTION (CONTRACTOR SHALL COORDINATE VOLTAGE AND PHASE WITH EQUIPMENT)	
S_{OS}	OCCUPANCY SENSOR WITH MANUAL OVERRIDE, WALL MOUNT	
TC	TIME CLOCK	
PC	PHOTOCELL	
PB	PUSH BUTTON	
E,G	EMERGENCY SHUT OFF SWITCH; 'E' INDICATES ELECTRICAL; 'G' INDICATES GAS	
OS	OCCUPANCY SENSOR, CEILING MOUNT	
	OCCUPANCY SENSOR POWER PACK, MOUNTED ABOVE CEILING	
	2 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN WALL OR CEILING	
	5 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN WALL OR CEILING	
	3 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN OR BELOW SLAB	
LP1-35	DEDICATED HOME RUN TO PANEL LP1 FOR CIRCUIT No. 35 ONLY. 2 #12 AWG + #12 AWG GND IN 3/4" E.C. CONCEALED IN WALL OR CEILING	
TL	120V, 20 A TWIST LOCK RECEPTACLE.	FLUSH
	DUPLEX RECEPTACLE: 120V, 20A. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
	QUAD RECEPTACLE, DOUBLE DUPLEX RECEPTACLE: 120V, 20A. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
C	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "C" INDICATES CEILING MOUNT.	FLUSH
	DUPLEX RECEPTACLE: 120V, 20A; FLOOR MOUNTED.	FLUSH
IG	ISOLATED GROUND DUPLEX RECEPTACLE. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
GFI	DUPLEX RECEPTACLE: 120V, 20A; WITH GROUND FAULT INDICATOR. COORDINATE MOUNTING HEIGHT WITH MECHANICAL CONTRACTOR TO CLEAR BASEBOARDS.	FLUSH
UC	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "UC" INDICATES UNDER COUNTER	AS PER ENGINEER
CT	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "CT" INDICATES COUNTER TOP.	AS PER ENGINEER
WP	DUPLEX RECEPTACLE: 120V, 20A; SUBSCRIPT "WP" INDICATED WEATHER PROOF	AS PER ENGINEER
40 240	SPECIAL PURPOSE OUTLET: 240V, 40A. VERIFY NEMA CONFIGURATION WITH EQUIPMENT MANUFACTURER.	AS PER ENGINEER
TL	TWISTED LOCK RECEPTACLE: 125V, 20A, 3 WIRE; UNLESS OTHERWISE NOTED.	AS PER ENGINEER
	SURFACE RACEWAY WITH 2 GROUNDED AND ISOLATED TYPE DUPLEX RECEPTACLES AND 1 DATA OUTLET PER POSITION, 18" AFF UNLESS OTHERWISE NOTED.	
	TELEPHONE/POWER POLE	
M_{S1}	MAGNETIC STARTER "S1"; SEE STARTER SCHEDULE	
DS_{DS1}	DISCONNECTION SWITCH "DS1"; SEE DISCONNECT SWITCH SCHEDULE.	
J	JUNCTION BOX	
J_{4X}	NEMA 4X STAINLESS STEEL JUNCTION BOX WITH GASKET COVER.	
J_S	JUNCTION BOX RECESSED IN WALL WITH BLANK COVER. PROVIDE 3/4" E.C. AND DRAG LINE TO ABOVE FINISHED CEILING. MOUNT 18" AFF, UNLESS OTHERWISE NOTED.	
J_M	FOR MONITOR, JUNCTION BOX RECESSED IN WALL WITH BLANK COVER. PROVIDE 3/4" E.C. AND DRAG LINE TO ABOVE FINISHED CEILING.	
T_{T1}	TRANSFORMER "T1"; SEE TRANSFORMER SCHEDULE.	
	ELECTRICAL PANEL "P1", RECESSED; SEE PANEL SCHEDULE.	
P1	ELECTRICAL PANEL "P1", SURFACE MOUNT; SEE PANEL SCHEDULE.	
	CONDUIT GOING UP.	
	CONDUIT GOING DOWN.	
	PULLBOX	
T	TELEPHONE. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
TV	CABLE TELEVISION. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
D	DATA. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
D/T	COMBINED DATA AND TV. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	
S	SECURITY CAMERA. PROVIDE 3/4" E.C. WITH DRAG LINE TO AFC AND EMPTY J. BOX RECESSED IN WALL WITH BLANK COVER.	

ABBREVIATION	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
AFC	ABOVE FINISHED CEILING
AFG	ABOVE FINISHED GRADE
AMP, A	AMPERE
ATS	AUTOMATIC TRANSFER SWITCH; SEE TRANSFER SWITCH SCHEDULE
AWG	AMERICAN WIRE GAUGE
BFC	BELOW FINISHED CEILING
CL	CENTERLINE
CT	COUNTERTOP
EC	ELECTRICAL CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFI	GROUND FAULT INDICATOR
PSEG	PUBLIC SERVICE ELECTRIC AND GAS COMPANY (LOCAL ELECTRIC UTILITY)
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUGS ONLY
NTS	NOT TO SCALE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UC	UNDERCOUNTER
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VDC	VOLT DIRECT CURRENT
X-FMR	TRANSFORMER
WP	WEATHERPROOF

SYMBOL	DESCRIPTION	COMMENTS
T	LINE VOLTAGE THERMOSTAT, 120V, 10A.	
	CIRCUIT BREAKER WITH TRIP AND POLES AS NOTED.	
TS1	TRANSFER SWITCH TS1; SEE TRANSFER SWITCH SCHEDULE.	
M.C.B 30A/2P PANEL "P1"	DISTRIBUTION PANEL P1 WITH 30A, 2 POLE M.C.B.; SEE DISTRIBUTION PANEL SCHEDULE.	
	DISCONNECT SWITCH DS1, 100A, 3 POLES; SEE DISCONNECT SWITCH SCHEDULE.	
DS3 100A/3P	FUSED DISCONNECT SWITCH DS2, FUSED AT 40A, 3 POLES; SEE DISCONNECT SWITCH SCHEDULE.	
G1	GENERATOR SET G1	
M	ELECTRIC METER AND METER PAN AS PER PSEG REQUIREMENTS.	
5	MOTOR, NUMBER INDICATED HORSEPOWER.	
	CURRENT TRANSFORMER.	
PTS	VOLTAGE TRANSFORMER.	
T2	TRANSFORMER WITH SIZE, PRIMARY AND SECONDARY VOLTAGES AS NOTED.	
RVRM 10	REDUCED VOLTAGE SOLID STATE RAMPING MODULE, SIZED FOR 10 H.P.	
RVSS 150	REDUCED VOLTAGE SOLID STATE STARTER, SIZED FOR 150 H.P.	
VFD 25	VARIABLE FREQUENCY DRIVE, RATED FOR 25 H.P.	
FVNR 5	FULL VOLTAGE NON-REVERSING STARTER, NEMA SIZE 6	
FVR 5	FULL VOLTAGE REVERSING STARTER, NEMA SIZE 5	
JJS	FAST ACTING SOLID STATE FUSES AS PER MANUFACTURER.	
	MULTIPLE BRANCH CIRCUITS AS REQUIRED.	
LNR	5% LINE REACTOR, UNLESS OTHERWISE NOTED	
	CONTROL CIRCUIT; MIN 2 #12 AWG IN 3/4" E.C. UNLESS OTHERWISE NOTED ON PLANS	

CONTROLS LEGEND

SYMBOL	DESCRIPTION	COMMENTS
	PUMP OR BLOWER MOTOR	
	FLOR METER	
M	MOTOR CONTROLLED VALVE WITH LIMIT SWITCHES	
LS	LIMIT SWITCH	
FT	FLOW TRANSMITTER	
FS	FLOW SWITCH	
PT	PRESSURE TRANSMITTER	
PS	PRESSURE SWITCH	
LT	LEVEL TRANSMITTER	
LE	LEVEL ELECTRODES	
DP	DIFFERENTIAL PRESSURE TRANSMITTER	
	SOLENOID VALVE	
	PITOT TUBE AND AIR PRESSURE SWITCH	
TLDS	PITOT TUBE AND AIR PRESSURE SWITCH	
PID	PROPORTIONAL - INTEGRAL - DERIVATIVE SINGLE LOOP CONTROLLER	
SC TP—A	SINGLE CONDITIONER TIME PULSE DURATION TO ANALOG	

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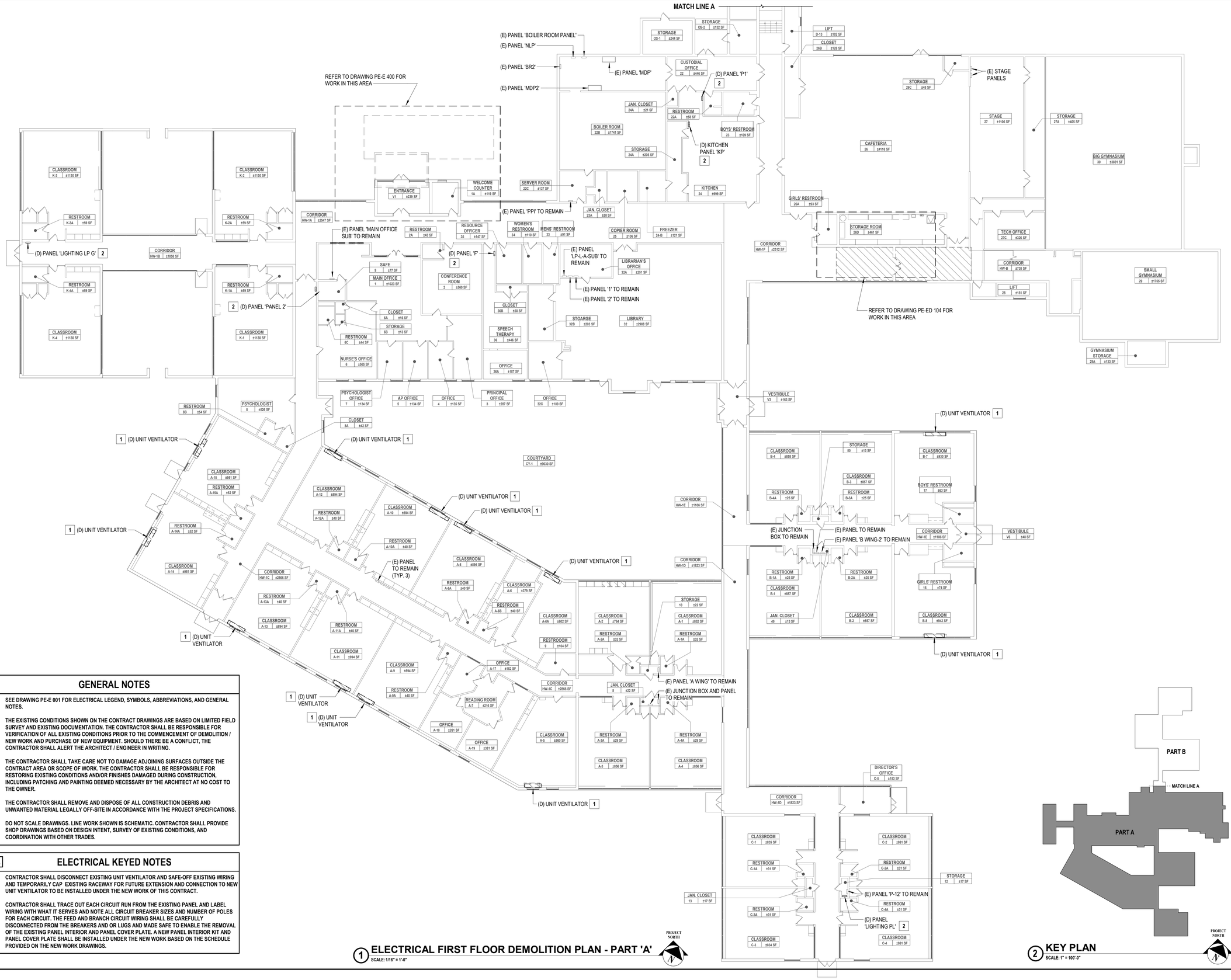
SHEET TITLE

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1 ELECTRICAL FIRST FLOOR DEMOLITION PLAN - PART 'A'
SCALE: 1/16" = 1'-0"

2 KEY PLAN
SCALE: 1" = 100'-0"

PROJECT NORTH

H2M architects + engineers
1133 Westchester Avenue, Suite N-210
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CONSULTANTS:

MARK	DATE	DESCRIPTION

5.31.2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 101554

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

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S. FREEMAN	W. TESTA	S. SOUSSOU	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
ELECTRICAL
FIRST FLOOR DEMOLITION PLAN - PART 'A'

DRAWING No.
PE-ED 100.00

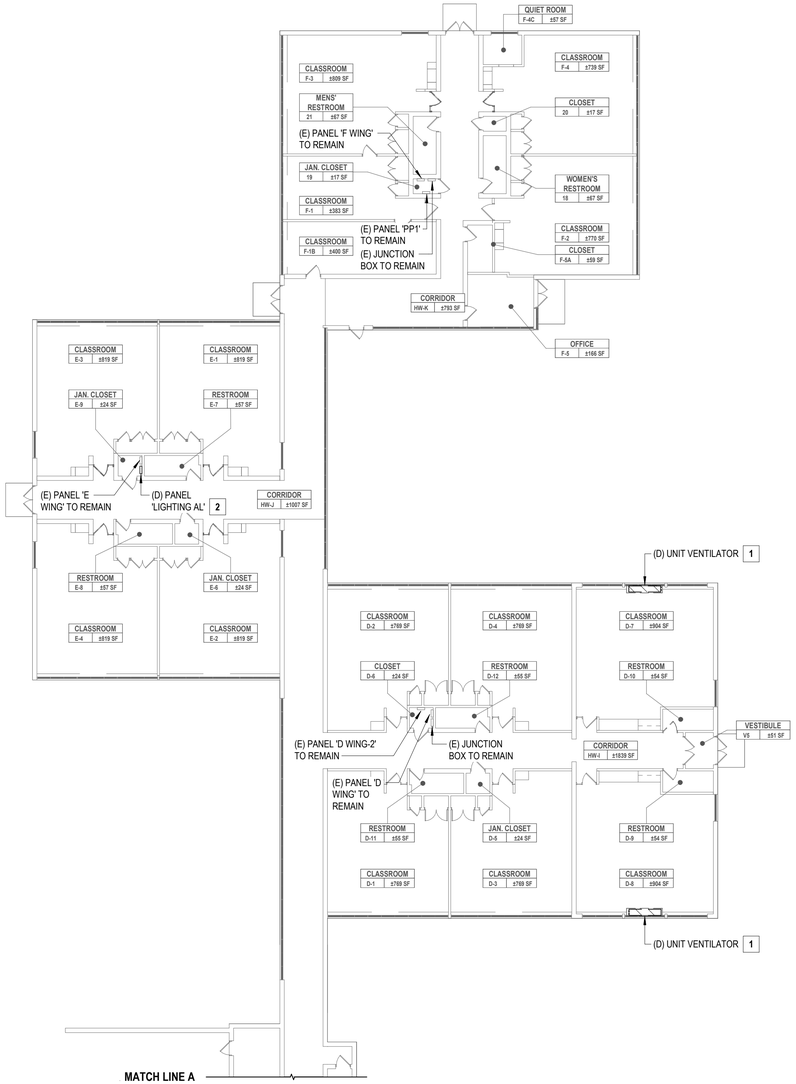
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GENERAL NOTES

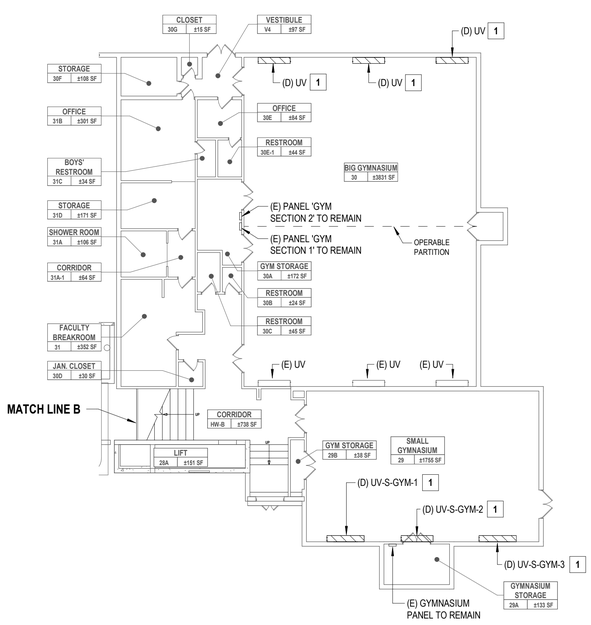
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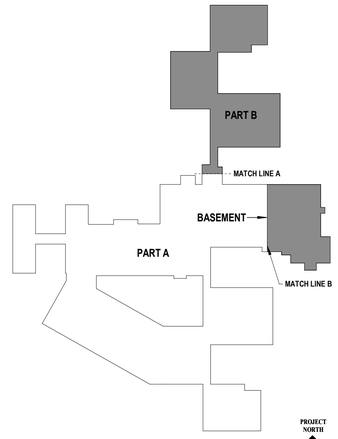
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1 ELECTRICAL FIRST FLOOR DEMOLITION PLAN - PART 'B'
SCALE: 1/16" = 1'-0"



2 ELECTRICAL BASEMENT DEMOLITION PLAN
SCALE: 1/16" = 1'-0"



2 KEY PLAN
SCALE: 1" = 100'-0"

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Exp. Date

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S. FREEMAN	W. TESTA	S. SOUSSOU	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT E ELECTRICAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
ELECTRICAL FIRST FLOOR & BASEMENT DEMOLITION PLAN - PART 'B'

DRAWING No.
PE-ED 101.00

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MATCH LINE A

(D) EXHAUST FAN NO. 12 1

(D) CAFETERIA EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN NO. 8 (KITCHEN HOOD EXHAUST FAN) 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN NO. 6 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN NO. 7 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN NO. 5 1

(D) EXHAUST FAN 1

REFER TO DRAWING PE-ED 104 FOR WORK IN THIS AREA

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

1 (D) EXHAUST FAN NO. 4

1 (D) EF-4

(D) EF-2 1

1 (D) EXHAUST FAN NO. 3

1 (D) EF-3

(D) EF-1 1

1 (D) EXHAUST FAN NO. 2

(D) EXHAUST FAN 1

1 (D) EXHAUST FAN NO. 1

(D) EXHAUST FAN 1

(D) EXHAUST FAN 1

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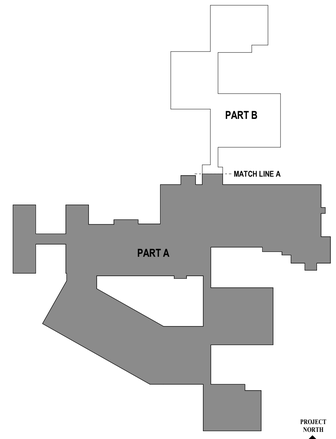
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PROJECT NORTH

1 ELECTRICAL ROOF DEMOLITION PLAN - PART 'A'

SCALE: 1/16" = 1'-0"



PROJECT NORTH

2 KEY PLAN

SCALE: 1" = 100'-0"

H 2 M architects + engineers

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Exp. Date

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CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT E ELECTRICAL CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

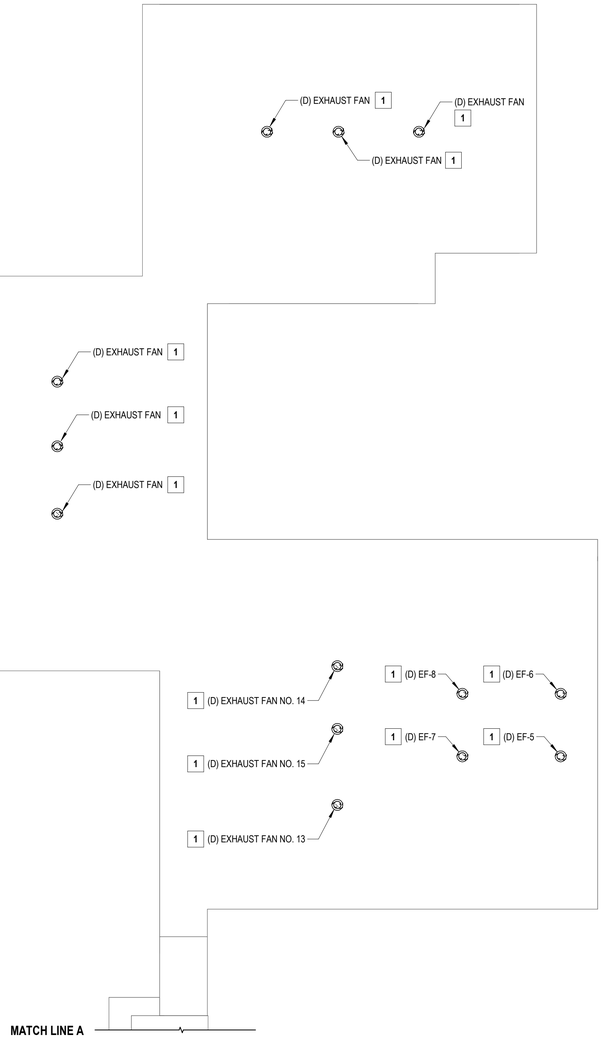
ELECTRICAL ROOF DEMOLITION PLAN - PART 'A'

DRAWING No.

PE-ED 102.00

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1 ELECTRICAL ROOF DEMOLITION PLAN - PART 'B'

SCALE: 1/16" = 1'-0"

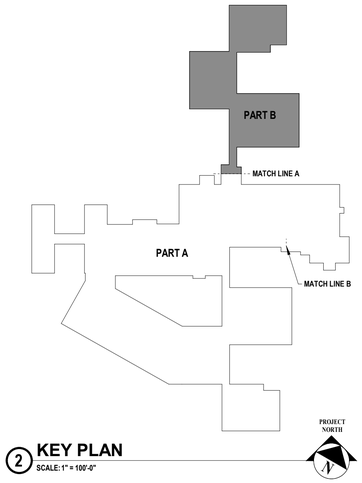
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2 KEY PLAN

SCALE: 1" = 100'-0"

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LINCOLNDALE, NY 10540**

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CONTRACT

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ELECTRICAL CONSTRUCTION**

STATUS

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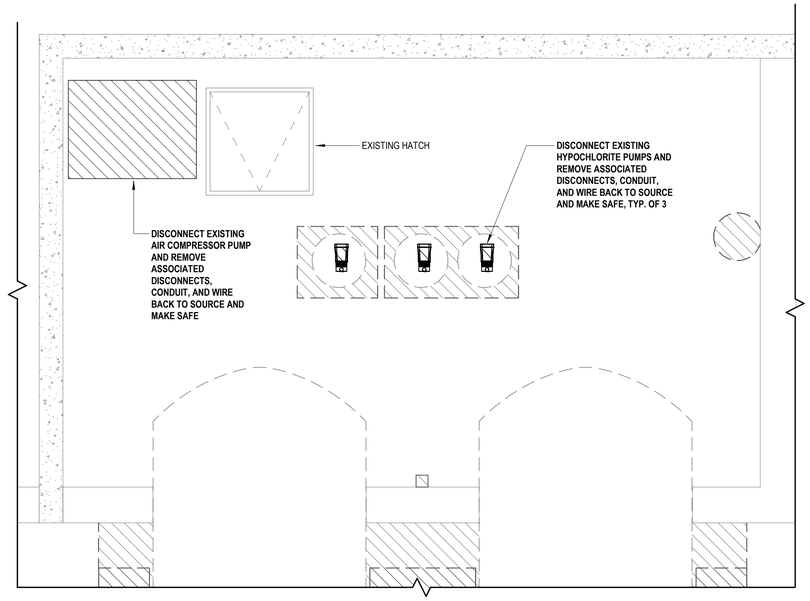
**ELECTRICAL
ROOF DEMOLITION PLAN - PART 'B'**

DRAWING No.

PE-ED 103.00

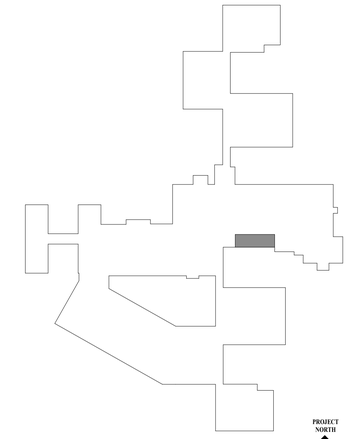
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1 WATER SYSTEM VAULT ELECTRICAL DEMOLITION PLAN

SCALE: 1/2" = 1'-0"



4 KEY PLAN

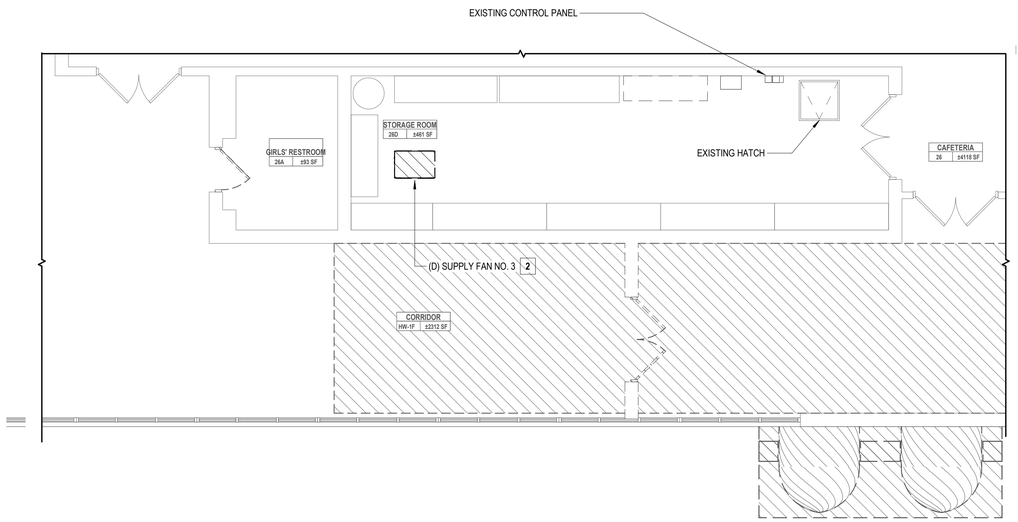
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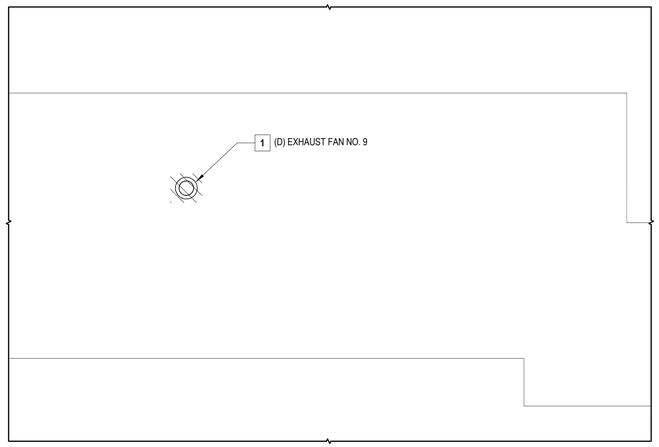
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2 CHEMICAL STORAGE FIRST FLOOR ELECTRICAL DEMOLITION PLAN

SCALE: 3/16" = 1'-0"



3 CHEMICAL STORAGE ROOF ELECTRICAL DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

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SED #: 66-21-01-06-0-002-017

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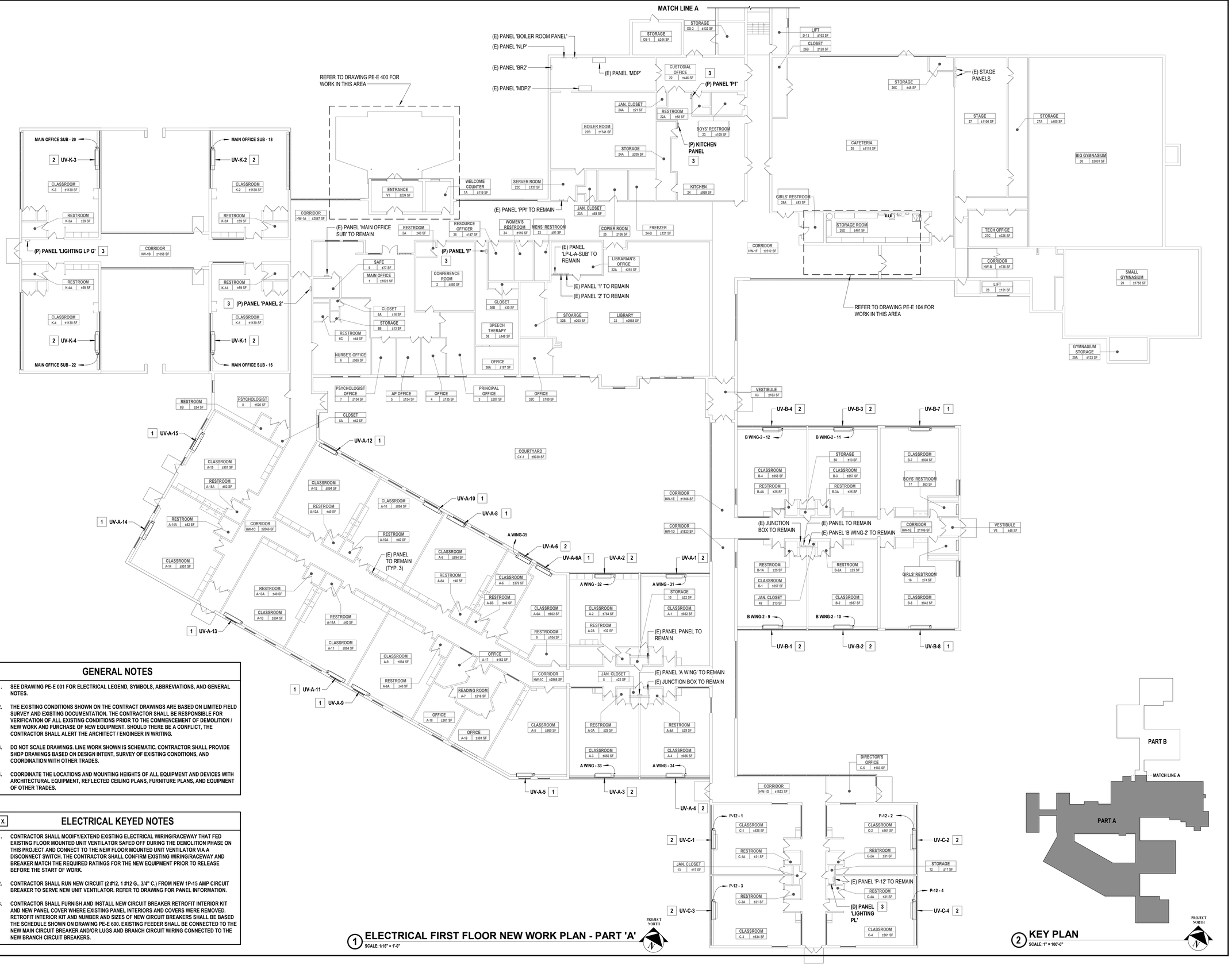
ELECTRICAL CHEMICAL STORAGE DEMOLITION PLANS

DRAWING No.

PE-ED 104.00

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4. COORDINATE THE LOCATIONS AND MOUNTING HEIGHTS OF ALL EQUIPMENT AND DEVICES WITH ARCHITECTURAL EQUIPMENT, REFLECTED CEILING PLANS, FURNITURE PLANS, AND EQUIPMENT OF OTHER TRADES.

X. ELECTRICAL KEYED NOTES

1. CONTRACTOR SHALL MODIFY/EXTEND EXISTING ELECTRICAL WIRING/RACEWAY THAT FED EXISTING FLOOR MOUNTED UNIT VENTILATOR SAFED OFF DURING THE DEMOLITION PHASE ON THIS PROJECT AND CONNECT TO THE NEW FLOOR MOUNTED UNIT VENTILATOR VIA A DISCONNECT SWITCH. THE CONTRACTOR SHALL CONFIRM EXISTING WIRING/RACEWAY AND BREAKER MATCH THE REQUIRED RATINGS FOR THE NEW EQUIPMENT PRIOR TO RELEASE BEFORE THE START OF WORK.
2. CONTRACTOR SHALL RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) FROM NEW 1P-15 AMP CIRCUIT BREAKER TO SERVE NEW UNIT VENTILATOR. REFER TO DRAWING FOR PANEL INFORMATION.
3. CONTRACTOR SHALL FURNISH AND INSTALL NEW CIRCUIT BREAKER RETROFIT INTERIOR KIT AND NEW PANEL COVER WHERE EXISTING PANEL INTERIORS AND COVERS WERE REMOVED. RETROFIT INTERIOR KIT AND NUMBER AND SIZES OF NEW CIRCUIT BREAKERS SHALL BE BASED THE SCHEDULE SHOWN ON DRAWING PE-E 600. EXISTING FEEDER SHALL BE CONNECTED TO THE NEW MAIN CIRCUIT BREAKER AND/OR LUGS AND BRANCH CIRCUIT WIRING CONNECTED TO THE NEW BRANCH CIRCUIT BREAKERS.

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SHEET TITLE
ELECTRICAL FIRST FLOOR NEW WORK PLAN - PART 'A'

DRAWING No.
PE-E 100.00

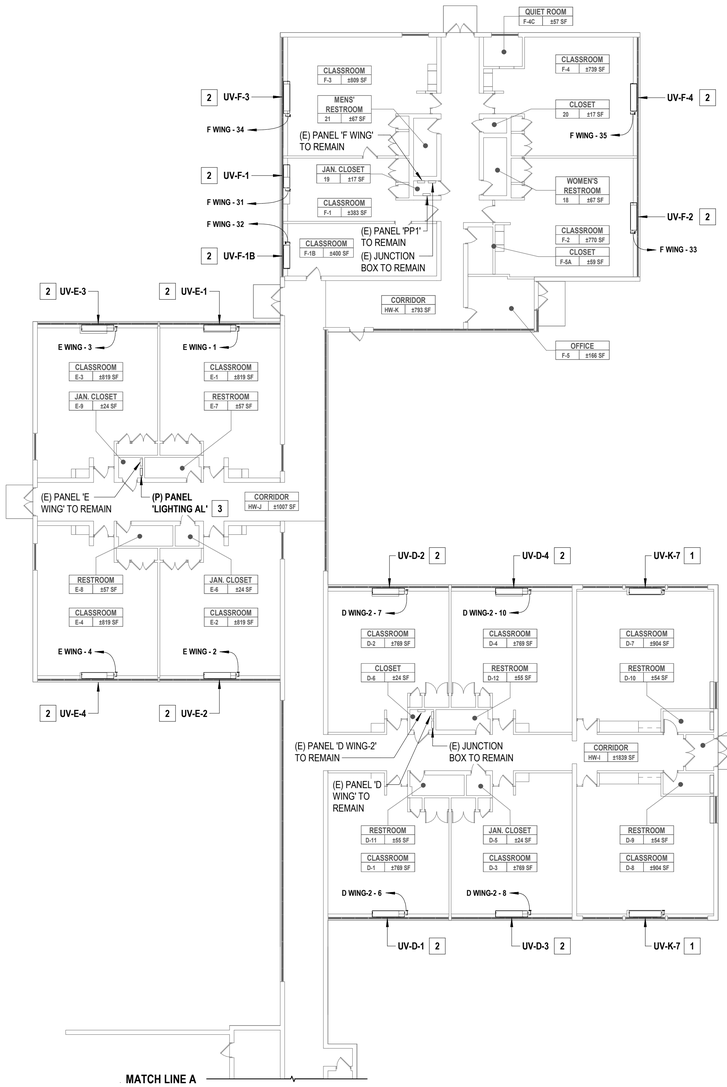
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GENERAL NOTES

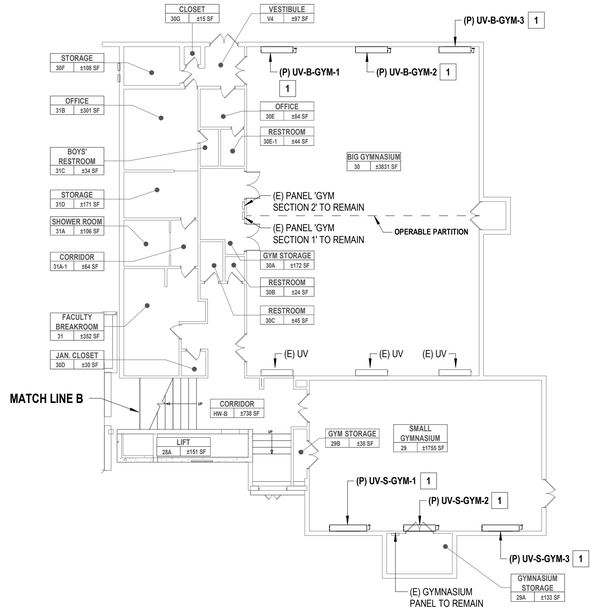
1. SEE DRAWING PE-E 001 FOR ELECTRICAL LEGEND, SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES.
2. THE EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS ARE BASED ON LIMITED FIELD SURVEY AND EXISTING DOCUMENTATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO THE COMMENCEMENT OF DEMOLITION / NEW WORK AND PURCHASE OF NEW EQUIPMENT. SHOULD THERE BE A CONFLICT, THE CONTRACTOR SHALL ALERT THE ARCHITECT / ENGINEER IN WRITING.
3. DO NOT SCALE DRAWINGS. LINE WORK SHOWN IS SCHEMATIC. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS BASED ON DESIGN INTENT, SURVEY OF EXISTING CONDITIONS, AND COORDINATION WITH OTHER TRADES.
4. COORDINATE THE LOCATIONS AND MOUNTING HEIGHTS OF ALL EQUIPMENT AND DEVICES WITH ARCHITECTURAL EQUIPMENT, REFLECTED CEILING PLANS, FURNITURE PLANS, AND EQUIPMENT OF OTHER TRADES.

X. ELECTRICAL KEYED NOTES

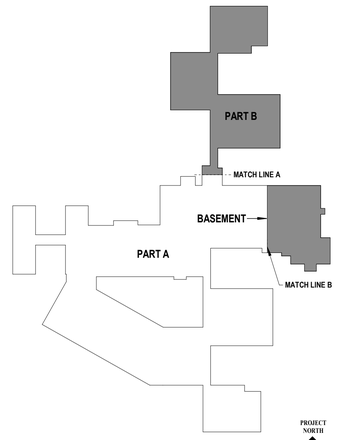
1. CONTRACTOR SHALL MODIFY/EXTEND EXISTING ELECTRICAL WIRING/RACEWAY THAT FED EXISTING UNIT VENTILATOR SAFED OFF DURING THE DEMOLITION PHASE ON THIS PROJECT AND CONNECT TO THE NEW UNIT VENTILATOR VIA A DISCONNECT SWITCH. THE CONTRACTOR SHALL CONFIRM EXISTING WIRING/RACEWAY AND BREAKER MATCH THE REQUIRED RATINGS FOR THE NEW EQUIPMENT PRIOR TO RELEASE BEFORE THE START OF WORK.
2. CONTRACTOR SHALL RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) FROM NEW 1P-15 AMP CIRCUIT BREAKER TO SERVE NEW UNIT VENTILATOR. REFER TO DRAWING FOR PANEL INFORMATION.
3. CONTRACTOR SHALL FURNISH AND INSTALL NEW CIRCUIT BREAKER RETROFIT INTERIOR KIT AND NEW PANEL COVER WHERE EXISTING PANEL INTERIORS AND COVERS WERE REMOVED. RETROFIT INTERIOR KIT AND NUMBER AND SIZES OF NEW CIRCUIT BREAKERS SHALL BE BASED THE SCHEDULE SHOWN ON DRAWING PE-E 600. EXISTING FEEDER SHALL BE CONNECTED TO THE NEW MAIN CIRCUIT BREAKER AND/OR LUGS AND BRANCH CIRCUIT WIRING CONNECTED TO THE NEW BRANCH CIRCUIT BREAKERS.



1 ELECTRICAL FIRST FLOOR NEW WORK PLAN - PART 'B'
SCALE: 1/16" = 1'-0"



2 ELECTRICAL BASEMENT NEW WORK PLAN
SCALE: 1/16" = 1'-0"



3 KEY PLAN
SCALE: 1" = 100'-0"

H 2 M architects + engineers

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White Plains, NY 10605
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NY Engineering Certificate of Authorization No.: 0018178

CONSULTANTS:

MARK	DATE	DESCRIPTION

5.31.2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 101764

"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL."

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
S. FREEMAN	W. TESTA	S. SOUSSOU	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED SUBMISSION

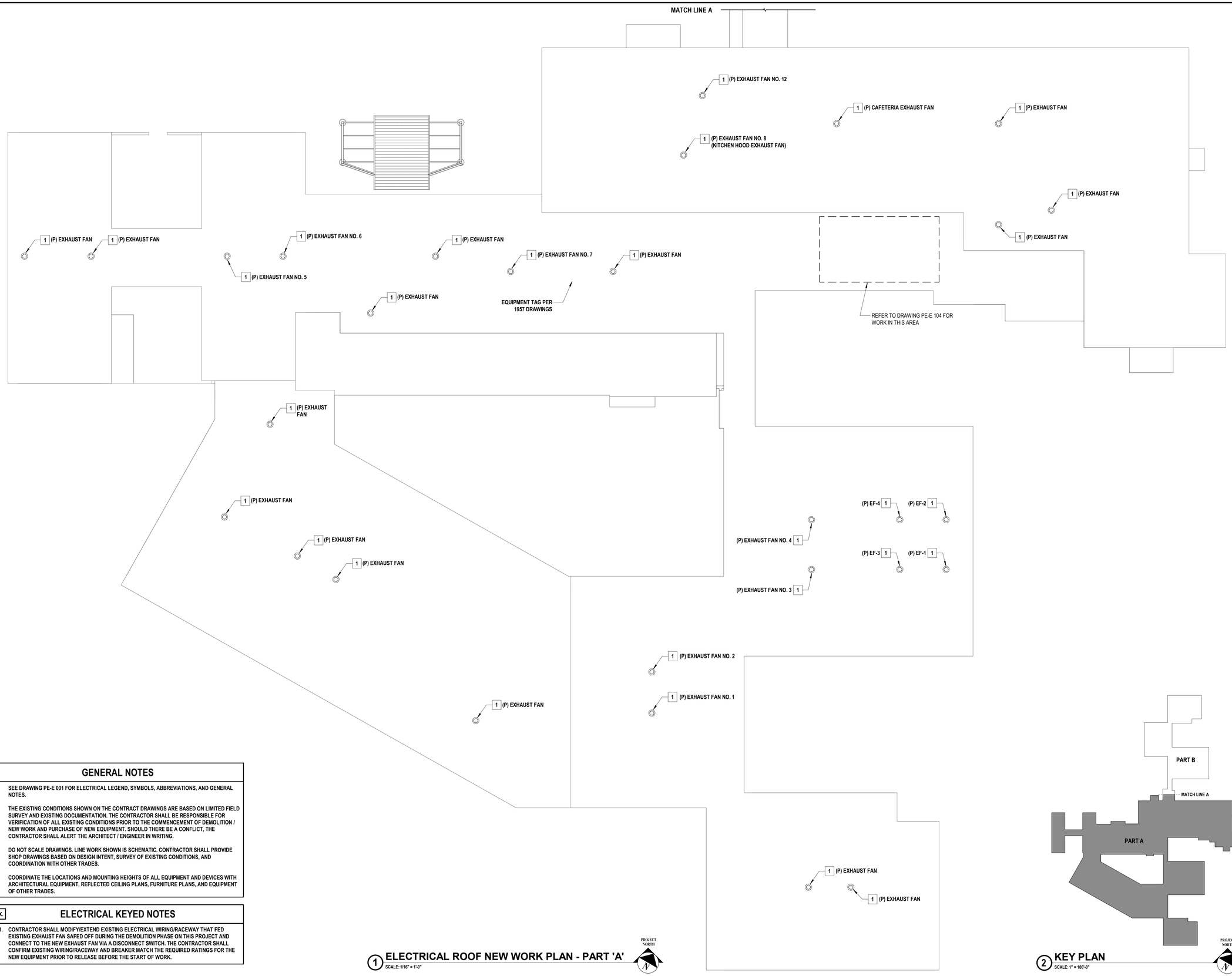
SHEET TITLE

ELECTRICAL FIRST FLOOR & BASEMENT NEW WORK PLAN - PART 'B'

DRAWING No.

PE-E 101.00

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1 ELECTRICAL ROOF NEW WORK PLAN - PART 'A'
SCALE: 1/16" = 1'-0"

2 KEY PLAN
SCALE: 1" = 100'-0"

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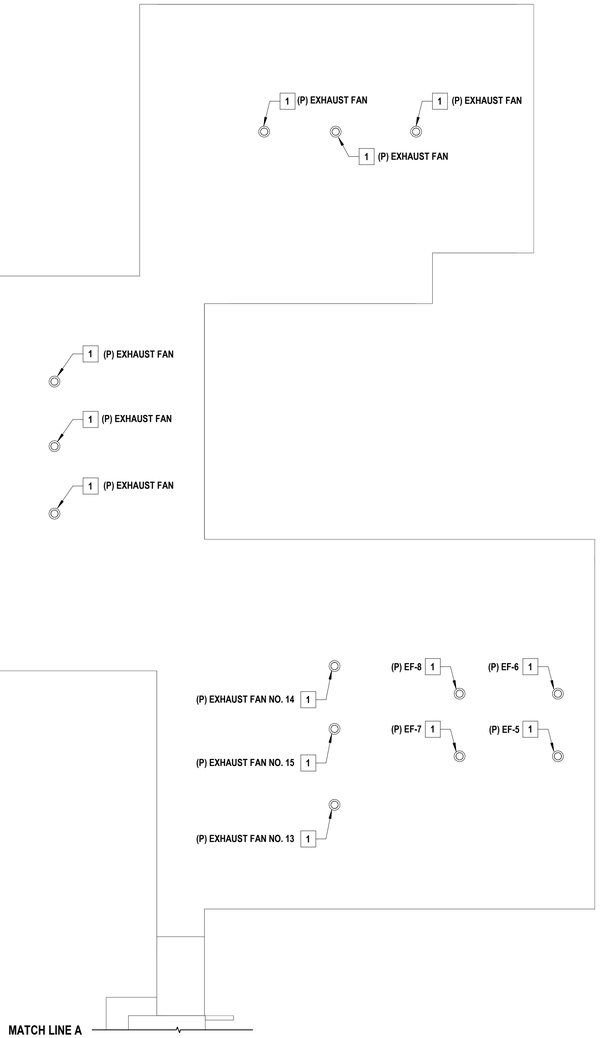
CONTRACT
CONTRACT E ELECTRICAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
ELECTRICAL ROOF NEW WORK PLAN - PART 'A'

DRAWING No.
PE-E 102.00

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1 ELECTRICAL ROOF NEW WORK PLAN - PART 'B'

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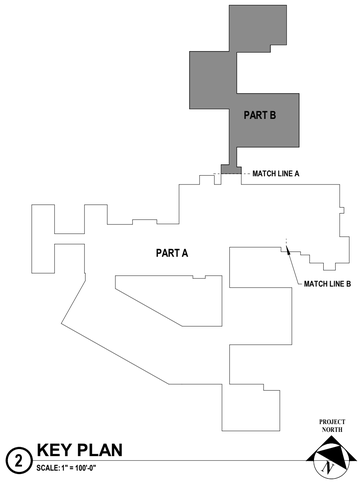
PROJECT NORTH

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2 KEY PLAN

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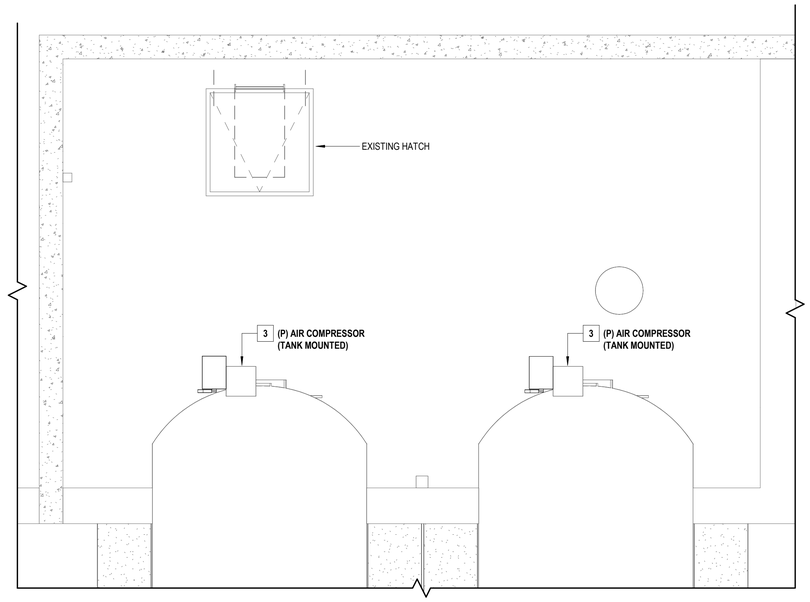
ELECTRICAL
ROOF NEW WORK PLAN - PART 'B'

DRAWING No.

PE-E 103.00

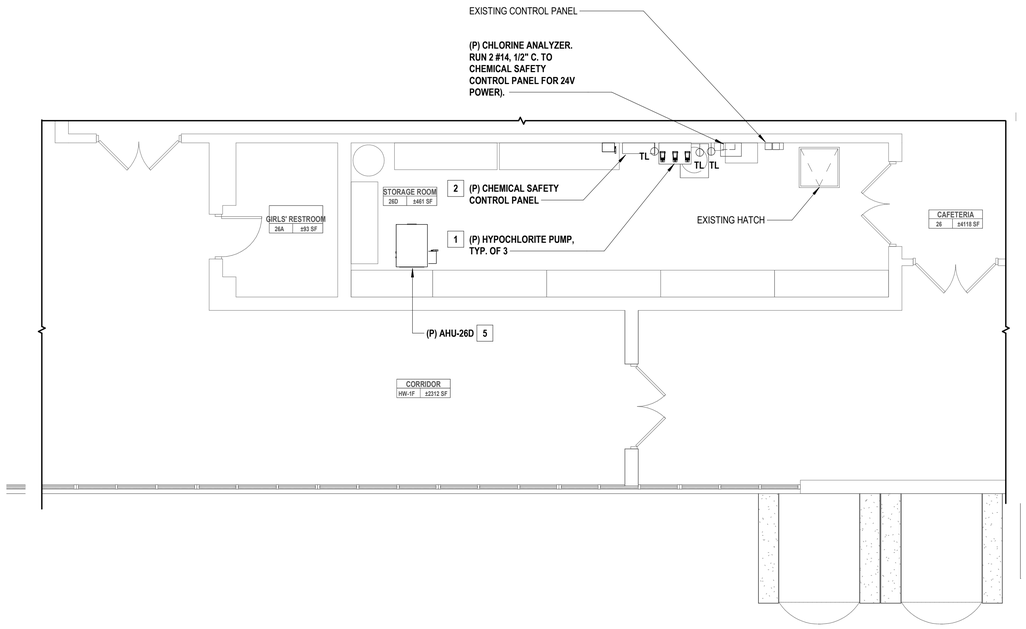
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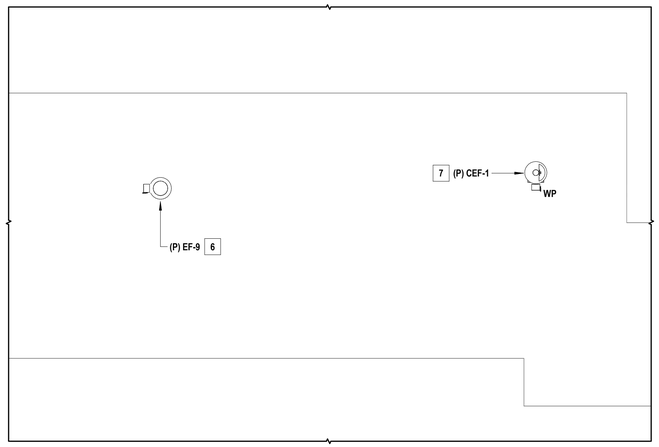
1 CHEMICAL STORAGE VAULT ELECTRICAL NEW WORK PLAN

SCALE: 1/2" = 1'-0"



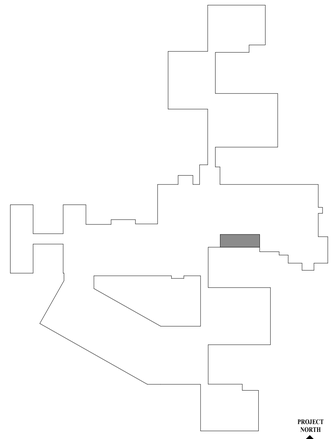
2 CHEMICAL STORAGE FIRST FLOOR ELECTRICAL NEW WORK PLAN

SCALE: 3/16" = 1'-0"



3 CHEMICAL STORAGE ROOF ELECTRICAL NEW WORK PLAN

SCALE: 1/8" = 1'-0"



4 KEY PLAN

SCALE: 1" = 100'-0"

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X. ELECTRICAL NEW WORK KEYED NOTES

1. CONTRACTOR SHALL FURNISH AND INSTALL (3) 120V, 15 AMP TWIST LOCK RECEPTACLES FOR NEW HYPOCHLORITE PUMPS. RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) TO A NEW 1P-20 AMP CIRCUIT BREAKER TO BE INSTALLED IN SPACE #81 IN EXISTING PANEL 'GYM SECTION 2' TO FEED THE THREE RECEPTACLES
2. CONTRACTOR SHALL RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) TO A NEW 1P-20 AMP CIRCUIT BREAKER TO BE INSTALLED IN SPACE #83 IN EXISTING PANEL 'GYM SECTION 2' TO FEED THE NEW CHEMICAL SAFETY CONTROL PANEL VIA A NEW 1P-20 AMP DISCONNECT SWITCH.
3. CONTRACTOR SHALL RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) TO A NEW 1P-20 AMP CIRCUIT BREAKER TO BE INSTALLED IN SPACE #82 IN EXISTING PANEL 'GYM SECTION 2' TO FEED THE NEW AIR COMPRESSOR VIA A NEW 1P-20 AMP DISCONNECT SWITCH.
4. CONTRACTOR SHALL RUN NEW CIRCUIT (2 #12, 1 #12 G., 3/4" C.) TO A NEW 1P-20 AMP CIRCUIT BREAKER TO BE INSTALLED IN SPACE #84 IN EXISTING PANEL 'GYM SECTION 2' TO FEED THE NEW AIR COMPRESSOR VIA A NEW 1P-20 AMP DISCONNECT SWITCH.
5. CONTRACTOR SHALL EXTEND THE EXISTING CIRCUIT (2 #12, 1 #12 G., 3/4") THAT FED THE EXISTING 'SUPPLY FAN NO. 3' TO THE NEW AIR HANDLING UNIT 'AHU-26D' VIA A NEW 1P-20 DISCONNECT SWITCH.
6. CONTRACTOR SHALL EXTEND THE EXISTING CIRCUIT (2 #12, 1 #12 G., 3/4") THAT FED THE EXISTING EXHAUST FAN 'EF-9' TO THE NEW EXHAUST FAN 'EF-9' VIA A NEW 1P-20 WEATHER PROOF DISCONNECT SWITCH.
7. CONTRACTOR SHALL FURNISH AND INSTALL A NEW CIRCUIT (2#12, 1 #12 G., 3/4") TO FEED THE NEW CHEMICAL EXHAUST FAN 'CEF-1' VIA A NEW 1P-20 WEATHERPROOF DISCONNECT SWITCH FED A FROM NEW 1P-20 AMP CIRCUIT BREAKER TO BE INSTALLED IN SPACE 39 IN EXISTING PANEL 'GYM SECTION 1'.

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CONSULTANTS:

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Exp. Date

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SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

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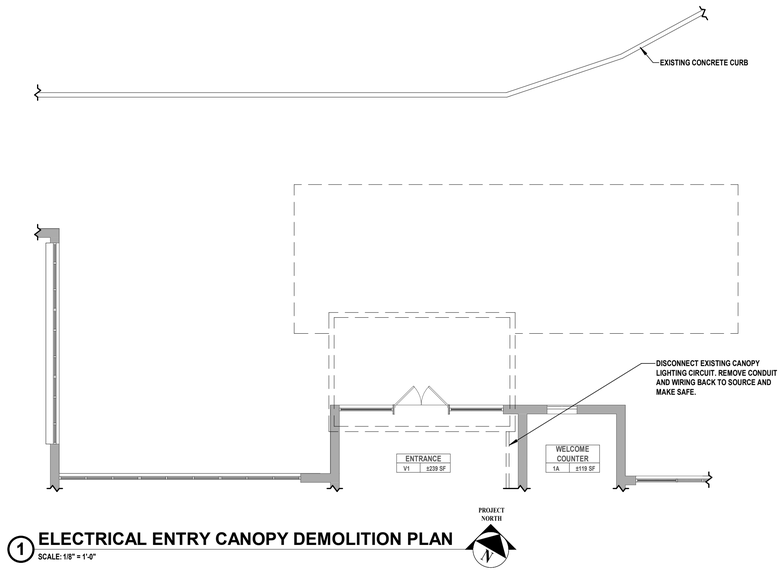
SHEET TITLE

ELECTRICAL CHEMICAL STORAGE NEW WORK PLANS

DRAWING No.

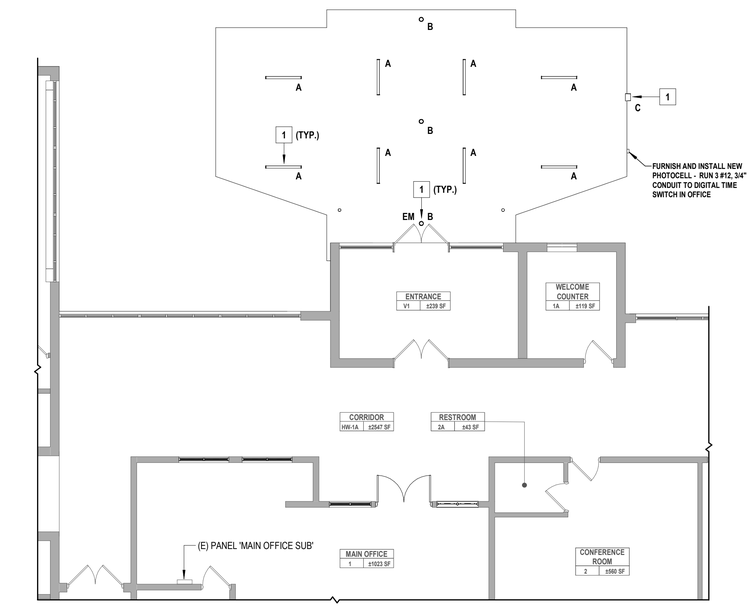
PE-E 104.00

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1 ELECTRICAL ENTRY CANOPY DEMOLITION PLAN

SCALE: 1/8" = 1'-0"



2 ELECTRICAL ENTRY CANOPY NEW WORK PLAN

SCALE: 1/8" = 1'-0"

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5. ALL CONDUIT RUN ON THE EXTERIOR OF THE BUILDING SHALL BE RIGID METAL CONDUIT (RMC) AND EXPOSED IN THE INTERIOR OF THE BUILDING SHALL BE ELECTRICAL METAL TUBING (EMT). METAL-CLAD "MC" CABLE MAY RUN ABOVE DROP CEILINGS.
6. ALL WIRING SHALL BE THHN/THWN-2 COPPER.
7. CONTRACT E SHALL BE RESPONSIBLE FOR THE DISCONNECTION OF ELECTRICAL POWER FROM EXISTING BUILDING TO EXISTING CANOPIES PRIOR TO DEMOLITION. CIRCUITS SHALL REMAIN DE-ENERGIZED DURING CONSTRUCTION.

X. ELECTRICAL KEYED NOTES

1. THE NEW CIRCUIT (2 #12, 1 #12 G., 3/4" CONDUIT) FOR ALL CANOPY LIGHT FIXTURES SHALL BE FROM 120/208V, 100 AMP PANEL 'MAIN OFFICE SUB' RUN VIA NEW DIGITAL TIME SWITCH. PROVIDE NEW 1P-20 AMP CIRCUIT BREAKER IN SPACE #12 FOR NEW LIGHT FIXTURES. PROVIDE UNSWITCHED HOT WIRE FOR TYPE 'B' EMERGENCY LIGHT FIXTURE REMOTE BATTERY PACK.
2. A DIGITAL TIME SWITCH (TORK CAT. NO. GDLC100A-NC) SHALL BE MOUNTED ADJACENT TO PANEL 'MAIN OFFICE SUB' FOR CONTROL OF NEW CANOPY LIGHTS. PROVIDE A NEW 1P-20 AMP CIRCUIT BREAKER IN PANEL 'MAIN OFFICE SUB' SPACE #14 FOR TIME SWITCH CIRCUIT (2 #12, #12G., 3/4" CONDUIT).

LIGHTING FIXTURE SCHEDULE

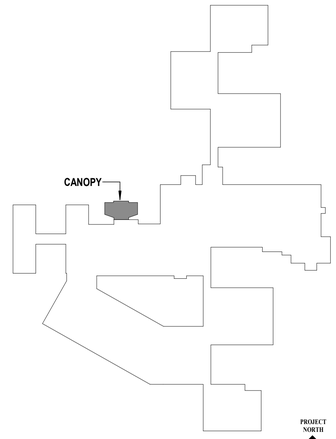
SYMBOL	TYPE	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	MOUNTING	LAMPS	VOLTAGE	FIXTURE WATTAGE
	A	KENALL OR APPROVED EQUAL	MLHA3-48-F-MW-PP-1000LF-35K8-DIM1-DV	3.5" X 48" LED LINEAR SURFACE MOUNTED LIGHT FIXTURE, ALUMINUM BODY, DIE CAST FLAT END CAPS, POLYCARBONATE LENS, 0-10V DIMMING DRIVER, WHITE FINISH, WET LOCATION LISTED	SURFACE	LED	120	32
○	B	THE KIRLIN COMPANY OR APPROVED EQUAL	LSR-1000L-120-80-89 EMERGENCY: LSR-1000L-120-80-89-ERH	6" X 10" DIAMETER LED CYLINDER, ALUMINUM HOUSING, MEDIUM FLOOD DISTRIBUTION, 1000 LUMEN, TEMPERED PRISMATIC LENS, SURFACE MOUNT, 0-10V DIMMING DRIVER, WHITE FINISH, WET LOCATION LISTED. EMERGENCY: REMOTE EMERGENCY BATTERY PACK (MOUNTED ABOVE DROP CEILING IN CORRIDOR)	SURFACE	LED	120	10.3
▯	C	BEACON OR APPROVED EQUAL	RWL1-48L-15-3K8-4W-UNV-DBT WP-BB-DBT	9.7" X 5" LED WALLPACK, DIE-CAST ALUMINUM HOUSING, TYPE IV WIDE DISTRIBUTION, 0-10V DIMMING DRIVER, 2000 LUMENS, DARK BRONZE MATTE TEXTURED FINISH, SURFACE MOUNTING PLATE, WET LOCATION LISTED.	WALL	LED	120	14.5

NOTES:

1. VERIFY CEILING TYPE AND OPERATING VOLTAGE BEFORE ORDERING LIGHTING FIXTURES. COORDINATE COMPATIBILITY OF FIXTURES WITH CANOPY CONSTRUCTION FOR AVAILABLE SPACE, CLEARANCE, ACCESSIBILITY, ETC.
2. THE LIGHTING MANUFACTURERS AND CATALOG NUMBERS INDICATED IN THE ABOVE LIGHTING FIXTURE SCHEDULE REPRESENT THE BASIS OF DESIGN SELECTIONS FOR THIS PROJECT AND COMPLY WITH THE ILLUMINATING ENGINEERING SOCIETY (IES) LIGHTING LIBRARY ILLUMINATION LEVEL REQUIREMENTS AND ASHRAE 90.1-2019. SHOULD THE CONTRACTOR ELECT TO SUBSTITUTE AN ALTERNATE MANUFACTURER FOR ANY OF THE LIGHT FIXTURE TYPES, PERFORMANCE OF THE FIXTURE IS CRITICAL AND PROVIDING PHOTOMETRIC DATA IS AMONG REQUIREMENTS IN DETERMINING WHETHER THE SUBMITTED LIGHT FIXTURE CAN PROVIDE THE REQUIRED NORMAL AND EMERGENCY LIGHTING ILLUMINATION LEVELS BASED ON THE QUANTITY AND LOCATIONS OF THE LIGHT FIXTURES INDICATED ON THE CONTRACT LIGHTING PLAN DRAWINGS.

EMERGENCY TYPE LEGEND:

○ EM
FIXTURES WITH SUBSCRIPT 'EM' SHALL INCLUDE AN INTEGRAL OR REMOTE EMERGENCY BATTERY PACK TO PROVIDE A MINIMUM OF 90 MINUTES OF EMERGENCY LIGHTING.



3 KEY PLAN

SCALE: 1" = 100'-0"

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S. FREEMAN	W. TESTA	S. SOUSSOU	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS
SED SUBMISSION

SHEET TITLE
ELECTRICAL
ENLARGED CANOPY PLANS

DRAWING No.
PE-E 400.00

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COPPER BRANCH CIRCUIT WIRE SIZING TABLES - 208V - 3% VOLTAGE DROP													
C/B TRIP		208V, 3P, 3W 120/208V, 3P, 4W			208V, 2P, 2W 120/208V, 2P, 3W				120V, 1P, 2W				
15	DISTANCE IN FEET	177	273	429	153	236	371	578	88	136	214	333	500	625
	MINIMUM WIRE SIZE	12	10	8	12	10	8	6	12	10	8	6	4	3
20	DISTANCE IN FEET	132	205	322	115	177	279	433	66	102	161	250	375	469
	MINIMUM WIRE SIZE	12	10	8	12	10	8	6	12	10	8	6	4	3
30	DISTANCE IN FEET	136	214	334	118	186	289	433	68	107	167	250	313	375
	MINIMUM WIRE SIZE	10	8	6	10	8	6	4	10	8	6	4	3	2
40	DISTANCE IN FEET	161	250	375	139	217	325	406	80	125	188	234	281	352
	MINIMUM WIRE SIZE	8	6	4	8	6	4	3	8	6	4	3	2	1
50	DISTANCE IN FEET	129	200	300	111	173	260	325	64	100	150	188	225	281
	MINIMUM WIRE SIZE	8	6	4	8	6	4	3	8	6	4	3	2	1
60	DISTANCE IN FEET	167	250	313	144	217	271	325	83	125	156	188	234	
	MINIMUM WIRE SIZE	6	4	3	6	4	3	2	6	4	3	2	1	
70	DISTANCE IN FEET	214	268	322	186	232	279	348	107	134	161	201		
	MINIMUM WIRE SIZE	4	3	2	4	3	2	1	4	3	2	1		
80	DISTANCE IN FEET	188	235	281	163	203	244	305	94	117	141	176		
	MINIMUM WIRE SIZE	4	3	2	4	3	2	1	4	3	2	1		
90	DISTANCE IN FEET	208	250	313	181	217	271		104	125	156			
	MINIMUM WIRE SIZE	3	2	1	3	2	1		3	2	1			
100	DISTANCE IN FEET	188	225	281	163	195	244		94	113	141			
	MINIMUM WIRE SIZE	3	2	1	3	2	1		3	2	1			

NOTES:

1. READ ACROSS TO THE RIGHT FROM C/B TRIP TO DESIRED VOLTAGE CHARACTERISTICS AND NEXT GREATER DISTANCE THAN CIRCUIT IN QUESTION.
2. READ DOWN TO MINIMUM WIRE SIZE.
3. DISTANCES ARE TO THE CENTER OF CONCENTRATED LOAD SUCH AS CLASSROOM LIGHTING OR THE MIDPOINT OF DISTRIBUTED LOAD SUCH AS CORRIDOR LIGHTING.
4. EQUIPMENT GROUNDING CONDUCTORS SHALL BE INCREASED IN SIZE PROPORTIONATELY PER N.E.C.

NOTES TO PANELBOARD SCHEDULES AND BRANCH CIRCUIT WIRE SIZING TABLES

WIRE SIZING

UNLESS OTHERWISE INDICATED, MINIMUM WIRE AMPACITY SHALL BE GREATER THAN OR EQUAL TO THE BRANCH CIRCUIT TRIP BASED ON COPPER CONDUCTOR WITH 90-DEGREE C THHN INSULATION APPLIED AT ITS 75-DEGREE C AMPACITY.

REFER TO THE BRANCH CIRCUIT WIRE SIZING TABLES FOR DISTANCE LIMITATIONS FOR THE MINIMUM WIRE SIZE AND FOR SELECTING THE PROPER WIRE SIZE FOR THE DISTANCE AND VOLTAGE DROP INVOLVED.

NUMBER OF CONDUCTORS

UNLESS OTHERWISE INDICATED, QUANTITIES OF WIRES SHALL BE BASED ON AN INDIVIDUAL HOMERUN FOR EACH CIRCUIT AS FOLLOWS.

	PHASE CONDUCTOR	FULL CIRCUIT SIZE NEUTRAL CONDUCTOR	FULL CIRCUIT SIZE EQUIPMENT GROUNDING CONDUCTOR	FULL CIRCUIT SIZE ISOLATED GROUND CONDUCTOR
1 POLE CIRCUIT	1	1	1	0
1 POLE DATA/ COMPUTER CIRCUIT	1	1	1	1
2 POLE CIRCUIT	2	1	1	0
3 POLE CIRCUIT	3	1	1	0
3 POLE MOTOR CIRCUIT DELTA	3	0	1	0
3 POLE MOTOR CIRCUIT WYE	3	1	1	0

CONSECUTIVE INDIVIDUAL 20 AMP LINE TO NEUTRAL BRANCH CIRCUITS MAY NOT BE COMBINED INTO MULTIWIRE BRANCH CIRCUITS HAVING HOMERUNS WITH A COMMON NEUTRAL CONDUCTOR.

SINGLE PHASE, TWO POLE, TWO WIRE, LINE TO LINE, BRANCH CIRCUITS AND SINGLE PHASE, TWO POLE, THREE WIRE, LINE TO LINE PLUS NEUTRAL, BRANCH CIRCUITS SHALL HAVE INDIVIDUAL UNCOMBINED HOMERUNS.

COMBINED TWO AND THREE CIRCUIT HOMERUNS SHALL HAVE SEPARATE NEUTRALS FOR EACH CIRCUIT BUT A COMMON EQUIPMENT GROUNDING CONDUCTOR AND A COMMON ISOLATED GROUNDING CONDUCTOR MAY BE USED.

	PHASE CONDUCTOR	FULL CIRCUIT SIZE NEUTRAL CONDUCTOR	FULL CIRCUIT SIZE EQUIPMENT GROUNDING CONDUCTOR	FULL CIRCUIT SIZE ISOLATED GROUND CONDUCTOR
TWO 1 POLE HOMERUNS	2	2	1	0
TWO 1 POLE DATA/COMP. CIRCUIT HOMERUNS	2	2	1	1
THREE 1 POLE HOMERUNS	3	3	1	0
THREE 1 POLE DATA/COMP. CIRCUIT HOMERUNS	3	3	1	1

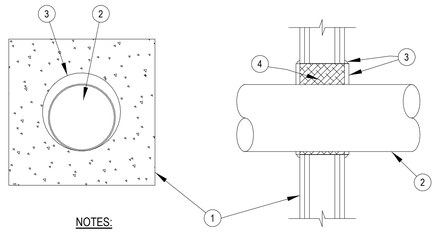
WIRE DERATING

1. COMBINED HOMERUNS SHALL HAVE THE MINIMUM BRANCH CIRCUIT WIRE SIZE INCREASED IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL ADJUSTMENT FACTORS FOR NUMBER OF CURRENT CARRYING CONDUCTORS IN A RACEWAY.
2. NEUTRAL CONDUCTORS FOR FLUORESCENT AND HIGH INTENSITY DISCHARGE LIGHTING CIRCUITS ARE CURRENT CARRYING CONDUCTORS.
3. INDIVIDUAL NEUTRAL CONDUCTOR FOR COMBINED HOMERUNS FOR DATA / COMPUTER OUTLETS ARE CURRENT CARRYING CONDUCTORS.
4. NEUTRAL CONDUCTORS FOR DIMMING CIRCUITS ARE CURRENT CARRYING CONDUCTORS.

RACEWAY SIZING

1. ALL RACEWAYS SHALL BE SIZED IN ACCORDANCE WITH THE CURRENT NATIONAL ELECTRICAL CODE IN EFFECT AS A MINIMUM SIZE. THE MORE COMMON SIZES ARE INCLUDED HERE FOR THE CONTRACTOR'S CONVENIENCE.

WIRE SIZE	NO. OF CONDUCTORS	MINIMUM CONDUIT SIZE	WIRE SIZE	NO. OF CONDUCTORS	MINIMUM CONDUIT SIZE
12	3	3/4"	8	3	3/4"
12	4	3/4"	8	4	3/4"
12	5	3/4"	8	5	3/4"
12	6	3/4"	8	6	1"
12	7	3/4"	8	7	1"
12	8	3/4"	8	8	1"
10	3	3/4"	6	3	3/4"
10	4	3/4"	6	4	3/4"
10	5	3/4"	6	5	1"
10	6	3/4"	6	6	1"
10	7	3/4"	6	7	1-1/4"
10	8	3/4"	6	8	1-1/4"

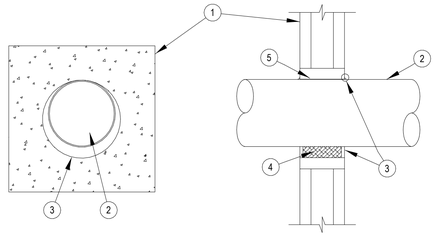


NOTES:

1. RATED GYPSUM WALL BOARD ASSEMBLY.
2. MAXIMUM 10" TRADE SIZE STEEL CONDUIT OR EMT.
3. STI SPECSEAL SERIES 100 SEALANT INSTALLED TO A 1/2" DEPTH FLUSH TO THE END OF THE SLEEVE WITH AN ADDITIONAL 1/4" CROWN APPLIED AROUND THE SLEEVE / WALL INTERFACE. ANNULUS RANGING FROM 1/8" MINIMUM TO 2 1/4" MAXIMUM.
4. STEEL SLEEVE PACKED WITH MINERAL WOOL BATT, TO FULL THICKNESS RECESSED FROM BOTH SIDES TO ACCOMMODATE FILL MATERIAL.

1 OR 2 HOUR RATED FIRESTOP FOR METALLIC CONDUIT THRU GYPSUM BOARD WALLS

1 SCALE:NONE U.L. SYSTEM NUMBER W-L-1054



NOTES:

1. CONCRETE SLAB OR CONCRETE OVER STEEL DECK.
2. MAXIMUM 8" TRADE SIZE STEEL CONDUIT. ANNULUS RANGING FROM POINT CONTACT" TO 1.4" MAXIMUM.
3. STI SPECSEAL SERIES 100 SEALANT INSTALLED TO A 1/2" DEPTH. **
4. MINERAL WOOL BATT, NOMINAL 4PCF. TO FULL THICKNESS RECESSED FROM BOTH SIDES TO ACCOMMODATE FILL MATERIAL.
5. STEEL SLEEVE.

*NOTE: A MINIMUM ANNULAR SPACE OF 1/4" AND A 28 GAUGE STEEL COVER PLATE ARE REQUIRED FOR A 4 HOUR RATING.

**NOTE: AT POINT CONTACT APPLY A 3/8" COVE BEAD OF SEALANT BETWEEN PIPE AND BOTH SURFACES OF WALL.

2 HOUR RATED FIRESTOP FOR METALLIC CONDUIT THRU MASONRY WALLS

2 SCALE:NONE U.L. SYSTEM NUMBER C-AJ-1150

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CONSULTANTS:

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Exp. Date

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110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

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SHEET TITLE

ELECTRICAL DETAILS

DRAWING No.

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PANEL INFORMATION					ELECTRICAL DATA						BREAKER SIZES										PANEL DIMENSIONS			NOTES
PANEL NAME	PANEL LOCATION		EXISTING MANUFACTURER	MOUNTING	VOLTAGE	PHASE	AMPS	MLO / MCB	MCB (IF APPLICABLE)	SPACES	1 POLE			2 POLE		3 POLE					WIDTH (IN.)	HEIGHT (IN.)	DEPTH (IN.)	
	ROOM NAME	ROOM NUMBER									15A	20A	SPACE	20A	30A	20A	30A	100A	SPACE				
PANEL 'F'	SPEECH THERAPY	36	EMPIRE	FLUSH	120/208	3	100A	MCB	100A	30	23	5	-	-	1	-	-	-	-	22	36	-	
'PANEL 2'	A-WING CORRIDOR	HW-1C	EMPIRE	FLUSH	120/208	3	100A	MCB	100A	34	14	11	-	3	-	-	-	1	-	22	39	-	
PANEL 'LIGHTING LP G'	K-WING CORRIDOR	HW-1B	WESTINGHOUSE	FLUSH	120/208	3	100A	MCB	100A	20	15	1	1	-	-	-	1	-	-	17	32	-	
KITCHEN PANEL	KITCHEN	24	EMPIRE	FLUSH	120/208	3	250A	MCB	N/A	30	-	-	-	-	-	7	-	2	1	19	57	-	PANEL IS BROKEN INTO TWO SECTIONS. BREAKER SIZES SHOWN ON THIS LINE REPRESENT THE TOP SECTION.
										14	8	3	1	1	-	-	-	-	-				PANEL IS BROKEN INTO TWO SECTIONS. BREAKER SIZES SHOWN ON THIS LINE REPRESENT THE BOTTOM SECTION.
PANEL 'LIGHTING PL'	STORAGE	12	WESTINGHOUSE	SURFACE	120/208	1	100A	MCB	100A	24	21	3	-	-	-	-	-	-	-	20	41	7	
PANEL 'LIGHTING AL'	JAN. CLOSET	E-9	WESTINGHOUSE	SURFACE	120/208	1	100A	MCB	100A	24	21	3	-	-	-	-	-	-	-	20	41	7	
PANEL 'P1'	KITCHEN	24	EMPIRE	FLUSH	120/208	3	125	MLO	-	30	26	4	-	-	-	-	-	-	-	22	30	-	

NOTE: CONTRACTOR TO FIELD VERIFY PARAMETERS LISTED AS "N/A"

1 PANEL REPLACEMENT SCHEDULE

SCALE: NONE

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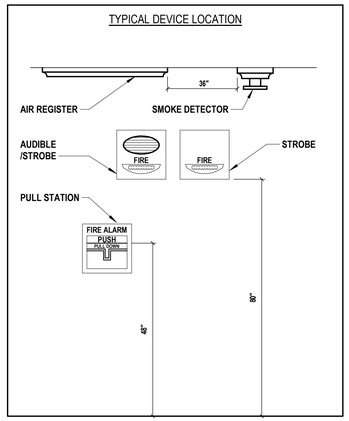
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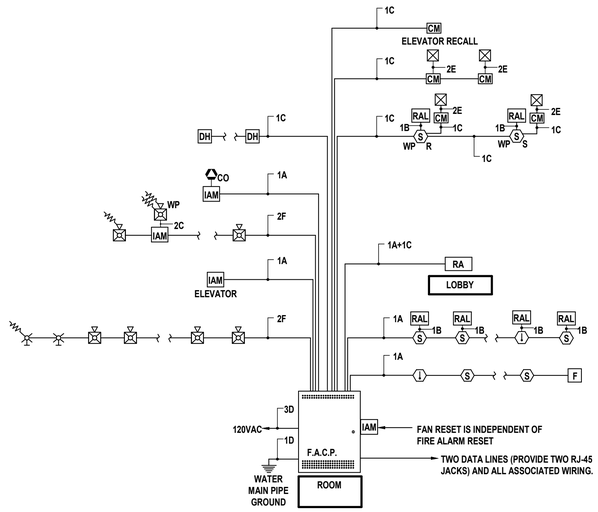
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FIRE ALARM LEGEND

SYMBOL	DESCRIPTION	COMMENTS
FACP	FIRE ALARM CONTROL PANEL.	
RA	REMOTE ANNUNCIATOR WITH BACKBOX.	
S	SMOKE DETECTOR.	
S	SMOKE ALARM. SMOKE ALARMS SHALL BE EQUIPPED WITH 10-YEAR BATTERY BACKUP, VISUAL INDICATOR AND LOCAL SOUNDER BASE (520 MHZ, LOW FREQUENCY).	
S CO	COMBINATION SMOKE/CARBON MONOXIDE ALARM. ALARMS SHALL BE EQUIPPED WITH 10-YEAR BATTERY BACKUP, VISUAL INDICATOR, AND LOCAL SOUNDER BASE (520 MHZ, LOW FREQUENCY).	
RAL S	ABOVE CEILING SMOKE DETECTOR WITH REMOTE ALARM LAMP.	
RAL S CM S/R	DUCT DETECTOR WITH REMOTE ALARM LAMP; "S" DENOTES SUPPLY, "R" DENOTES RETURN. PROVIDE WEATHERPROOF ENCLOSURE WHERE DETECTOR CANNOT BE INSTALLED INSIDE BUILDING. PROVIDE 120V FEED FOR WEATHERPROOF ENCLOSURE FROM NEAREST CONVENIENCE OUTLET POWER FEED.	
RAL S CM	DUCT SMOKE DETECTOR WITH REMOTE ALARM LAMP AND CONTROL MODULE FOR FIRE SMOKE DAMPERS.	
	HEAT DETECTOR.	
F	HEAT DETECTOR 200°.	
CO	CARBON MONOXIDE DETECTOR.	
MH	ADDRESSABLE MINI HORN (520 MHZ, LOW FREQUENCY).	
	HORN/STROBE COMBO.	
	SPEAKER/STROBE COMBINATION	
WP	WEATHER PROOF HORN/STORBE COMBO WITH BACKBOX.	
AM	ADAPTER MODULE WITH MOUNTING PLATE.	
SH	SMOKE HATCH (F.B.O.).	
	STROBE.	
DH	MAGNETIC DOOR HOLDER.	
F	MANUAL PULL STATION WITH BACKBOX.	
CM	CONTROL MODULE (ADDRESSABLE RELAY).	
IAM	INDIVIDUAL ADDRESSABLE MODULE.	
AES	AUTOMATIC EXTINGUISHING SYSTEM.	
	MOTOR STARTER.	
	END OF LINE RESISTOR.	
BT	BEAM DETECTOR TRANSMITTER.	
BR	BEAM DETECTOR RECEIVER.	
SP	SURGE PROTECTOR.	
S EL	SMOKE DETECTOR FOR ELEVATOR RECALL.	
SRP	SUPPRESSION RELEASING PANEL.	
MS	MAINTENANCE SWITCH.	
SOL	SOLENOID (F.B.O.).	
PS	PRESSURE SWITCH.	
TS	TAMPER SWITCH	
FS	FLOW SWITCH	
CS	COIL SUPERVISORY (F.B.O.).	
B	SPRINKLER ALARM BELL.	
KB	KNOX BOX.	
HFSS	HOOD RANGE FIRE SUPPRESSION SYSTEM.	
DCM	DOOR CONTROL MODULE.	
FSS	FIRE SMOKE SHUTTER.	
MM	INDIVIDUAL ADDRESSABLE MONITOR MODULE.	

TYPICAL DEVICE LOCATION





WIRE LEGEND

	WIRE DESCRIPTION	TYPE	NOTES
A	1 PAIR TWISTED SHIELDED #18 AWG	FPLP	-
B	1 PAIR #18 AWG. NON-SHIELDED	FPLP	-
C	1 PAIR #14 AWG. NON SHIELDED	FPLP	-
D	#12 AWG. NON SHIELDED	THHN	*
E	#14 AWG. NON SHIELDED	THHN	-
F	1 PAIR TWISTED SHIELDED #16 AWG.	FPLP	-

	CONTROL UNIT ANNUNCIATION					NOTIFICATION					SUPPLIMENTARY			
	ACTUATE COMMON ALARM SIGNAL INDICATOR	ACTUATE VISUAL ALARM SIGNAL	ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR	ACTUATE COMMON TROUBLE SIGNAL	ACTUATE ZONE INDICATION	ACTUATE FULL BUILDING EVACUATION SIGNAL	DISPLAY CHANGE OF STATUS	TRANSMIT FIRE ALARM SIGNAL TO SUPERVISING STATION	TRANSMIT SUPERVISION SIGNAL TO SUPERVISING STATION	TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION	HVAC FAN SHUTDOWN	INITIATE EXTERIOR STROBE		
MANUAL PULL STATION	●	●			●	●	●	●				●	●	
SMOKE DETECTOR	●	●			●	●	●	●				●	●	
HEAT DETECTOR	●	●			●	●	●	●				●	●	
DUCT DETECTOR	●	●			●	●	●	●				●	●	
CARBON MONOXIDE DETECTOR					●		●		●					
FIRE PANEL AC POWER FAILURE			●							●				
FA SYSTEM LOW BATTERY				●							●			
OPEN CIRCUIT				●							●			
GROUND FAULT				●							●			
NOTIFICATION APPLIANCE CIRCUIT SHORT				●							●			
AIR ASPIRATION DETECTOR	●	●			●	●	●	●				●	●	

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CONTRACT

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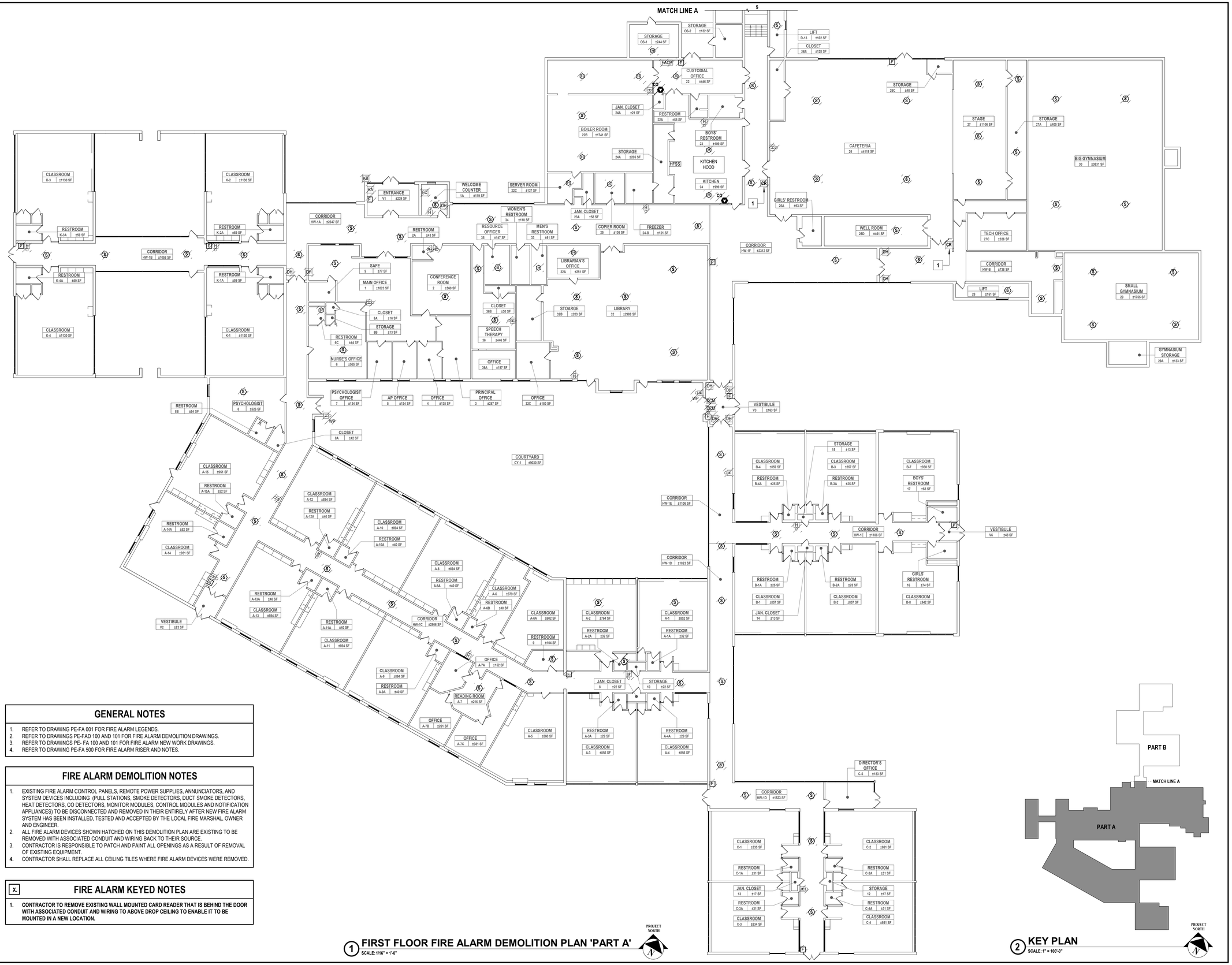
SHEET TITLE

ELECTRICAL
FIRE ALARM LEGEND

DRAWING No.

PE-FA 001.00

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GENERAL NOTES

1. REFER TO DRAWING PE-FA 001 FOR FIRE ALARM LEGENDS.
2. REFER TO DRAWINGS PE-FAD 100 AND 101 FOR FIRE ALARM DEMOLITION DRAWINGS.
3. REFER TO DRAWINGS PE- FA 100 AND 101 FOR FIRE ALARM NEW WORK DRAWINGS.
4. REFER TO DRAWING PE-FA 500 FOR FIRE ALARM RISER AND NOTES.

FIRE ALARM DEMOLITION NOTES

1. EXISTING FIRE ALARM CONTROL PANELS, REMOTE POWER SUPPLIES, ANNUNCIATORS, AND SYSTEM DEVICES INCLUDING (PULL STATIONS, SMOKE DETECTORS, DUCT SMOKE DETECTORS, HEAT DETECTORS, CO DETECTORS, MONITOR MODULES, CONTROL MODULES AND NOTIFICATION APPLIANCES) TO BE DISCONNECTED AND REMOVED IN THEIR ENTIRELY AFTER NEW FIRE ALARM SYSTEM HAS BEEN INSTALLED, TESTED AND ACCEPTED BY THE LOCAL FIRE MARSHAL, OWNER AND ENGINEER.
2. ALL FIRE ALARM DEVICES SHOWN HATCHED ON THIS DEMOLITION PLAN ARE EXISTING TO BE REMOVED WITH ASSOCIATED CONDUIT AND WIRING BACK TO THEIR SOURCE.
3. CONTRACTOR IS RESPONSIBLE TO PATCH AND PAINT ALL OPENINGS AS A RESULT OF REMOVAL OF EXISTING EQUIPMENT.
4. CONTRACTOR SHALL REPLACE ALL CEILING TILES WHERE FIRE ALARM DEVICES WERE REMOVED.

X. FIRE ALARM KEYED NOTES

1. **CONTRACTOR TO REMOVE EXISTING WALL MOUNTED CARD READER THAT IS BEHIND THE DOOR WITH ASSOCIATED CONDUIT AND WIRING TO ABOVE DROP CEILING TO ENABLE IT TO BE MOUNTED IN A NEW LOCATION.**

1 **FIRST FLOOR FIRE ALARM DEMOLITION PLAN 'PART A'**
SCALE: 1/16" = 1'-0"

2 **KEY PLAN**
SCALE: 1" = 100'-0"

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ELECTRICAL FIRST FLOOR FIRE ALARM DEMOLITION PLAN - PART 'A'

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PE-FAD 100.00

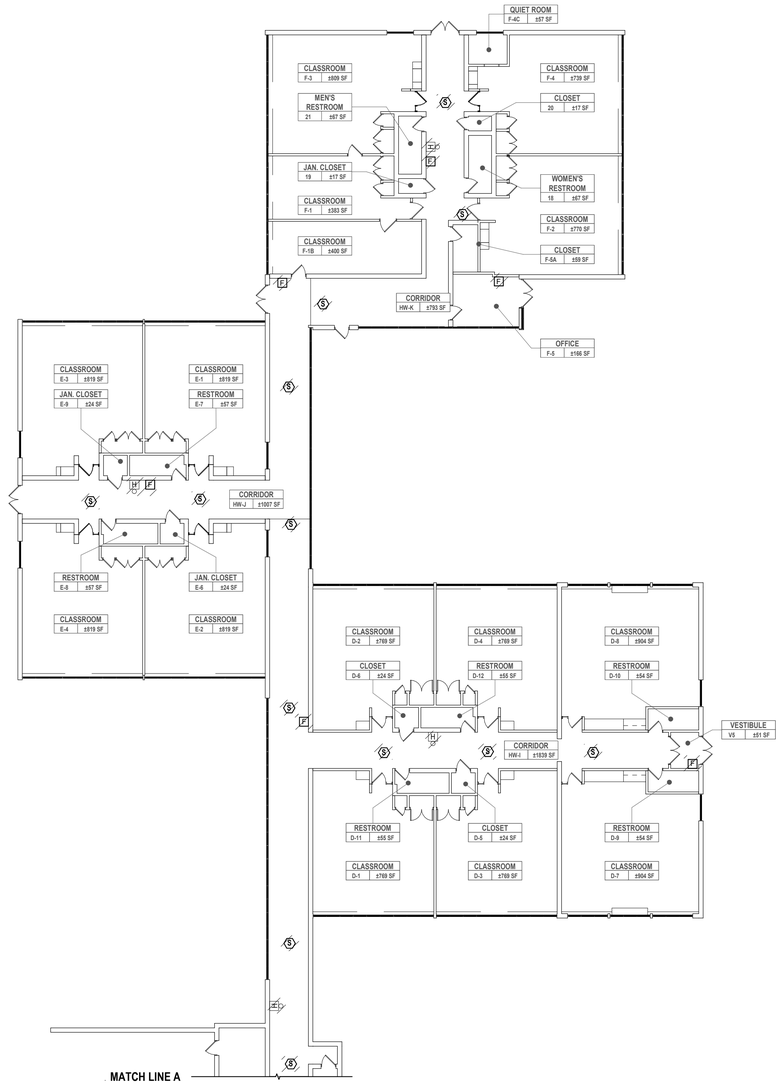
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GENERAL NOTES

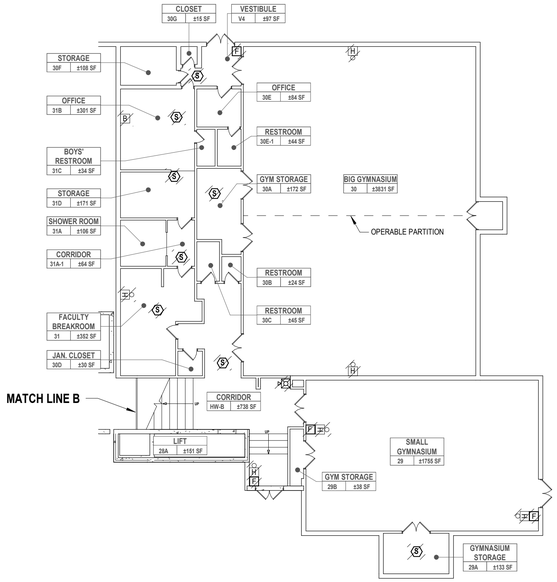
1. REFER TO DRAWING PE-FA 001 FOR FIRE ALARM LEGENDS.
2. REFER TO DRAWINGS PE-FAD 100 AND 101 FOR FIRE ALARM DEMOLITION DRAWINGS.
3. REFER TO DRAWINGS PE- FA 100 AND 101 FOR FIRE ALARM NEW WORK DRAWINGS.
4. REFER TO DRAWING PE-FA 500 FOR FIRE ALARM RISER AND NOTES.

FIRE ALARM DEMOLITION NOTES

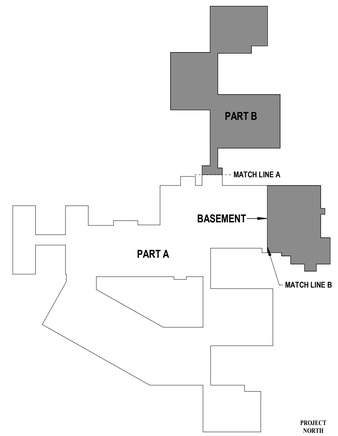
1. EXISTING FIRE ALARM CONTROL PANELS, REMOTE POWER SUPPLIES, ANNUNCIATORS, AND SYSTEM DEVICES INCLUDING (PULL STATIONS, SMOKE DETECTORS, DUCT SMOKE DETECTORS, HEAT DETECTORS, CO DETECTORS, MONITOR MODULES, CONTROL MODULES AND NOTIFICATION APPLIANCES) TO BE DISCONNECTED AND REMOVED IN THEIR ENTIRELY AFTER NEW FIRE ALARM SYSTEM HAS BEEN INSTALLED, TESTED AND ACCEPTED BY THE LOCAL FIRE MARSHAL, OWNER AND ENGINEER.
2. ALL FIRE ALARM DEVICES SHOWN HATCHED ON THIS DEMOLITION PLAN ARE EXISTING TO BE REMOVED WITH ASSOCIATED CONDUIT AND WIRING BACK TO THEIR SOURCE.
3. CONTRACTOR IS RESPONSIBLE TO PATCH AND PAINT ALL OPENINGS AS A RESULT OF REMOVAL OF EXISTING EQUIPMENT.
4. CONTRACTOR SHALL REPLACE ALL CEILING TILES WHERE FIRE ALARM DEVICES WERE REMOVED.



1 FIRST FLOOR FIRE ALARM DEMOLITION PLAN 'PART B'
SCALE: 1/16" = 1'-0"



2 BASEMENT FIRE ALARM DEMOLITION PLAN
SCALE: 1/16" = 1'-0"



3 KEY PLAN
SCALE: 1" = 100'-0"

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CONSULTANTS:

MARK	DATE	DESCRIPTION

5.31.2028
Exp. Date

J. CHRIS MORRIS III, P.E.
NY PROFESSIONAL ENGINEER Lic. No. 097554

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S. FREEMAN	W. TESTA	S. SOUSSOU	C. MORRIS

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT E
ELECTRICAL CONSTRUCTION

STATUS

SED SUBMISSION

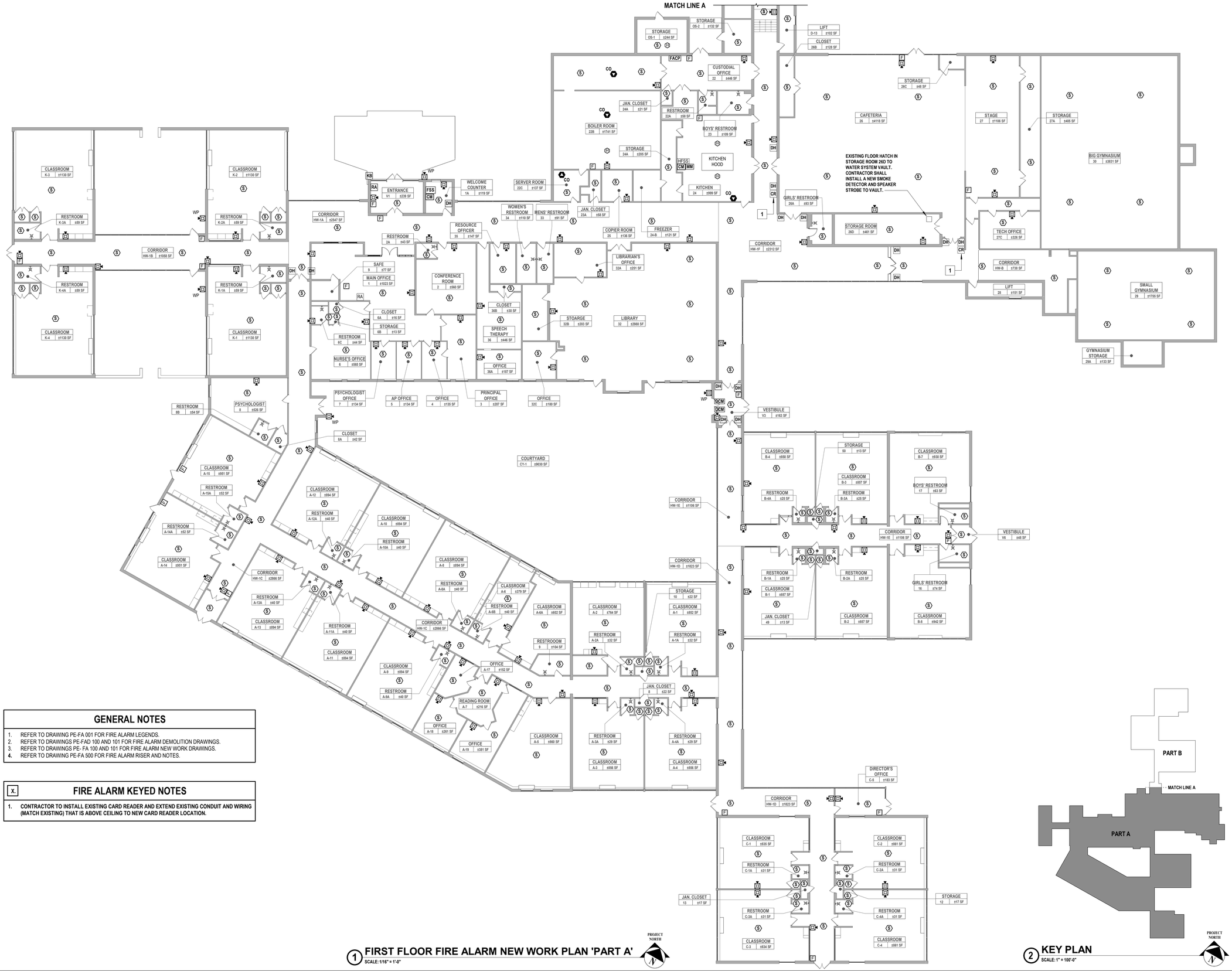
SHEET TITLE

ELECTRICAL
FIRST FLOOR & BASEMENT FIRE ALARM DEMOLITION PLAN - PART 'B'

DRAWING No.

PE-FAD 101.00

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4. REFER TO DRAWING PE-FA 500 FOR FIRE ALARM RISER AND NOTES.

X. FIRE ALARM KEYED NOTES

1. CONTRACTOR TO INSTALL EXISTING CARD READER AND EXTEND EXISTING CONDUIT AND WIRING (MATCH EXISTING) THAT IS ABOVE CEILING TO NEW CARD READER LOCATION.

1 FIRST FLOOR FIRE ALARM NEW WORK PLAN 'PART A'

SCALE: 1/16" = 1'-0"

2 KEY PLAN

SCALE: 1" = 100'-0"

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ELECTRICAL FIRST FLOOR FIRE ALARM NEW WORK PLAN - PART 'A'

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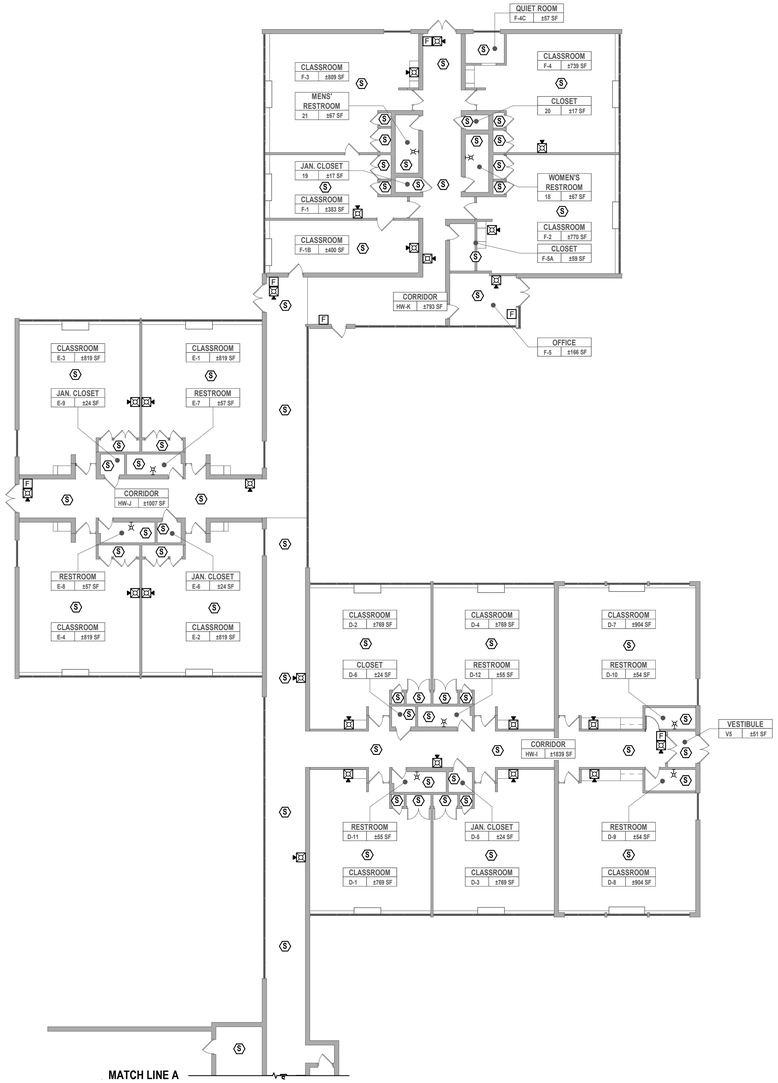
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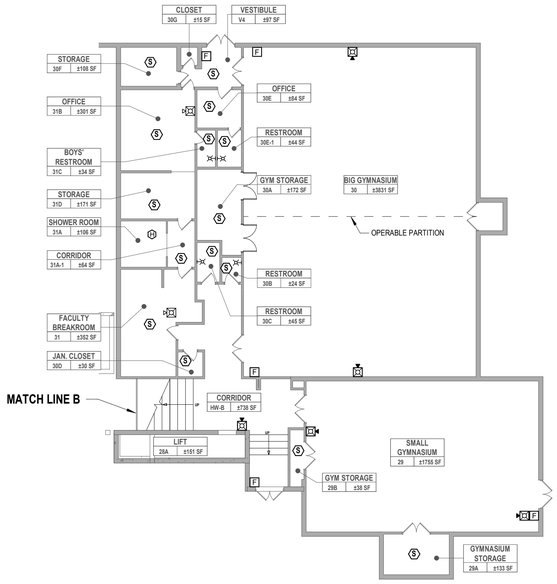
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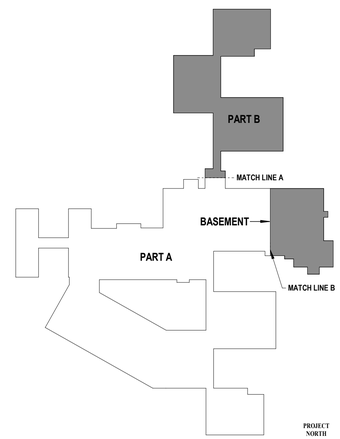
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1 **FIRST FLOOR FIRE ALARM NEW WORK PLAN 'PART B'**
SCALE: 1/16" = 1'-0"



2 **BASEMENT FIRE ALARM NEW WORK PLAN**
SCALE: 1/16" = 1'-0"



3 **KEY PLAN**
SCALE: 1" = 100'-0"

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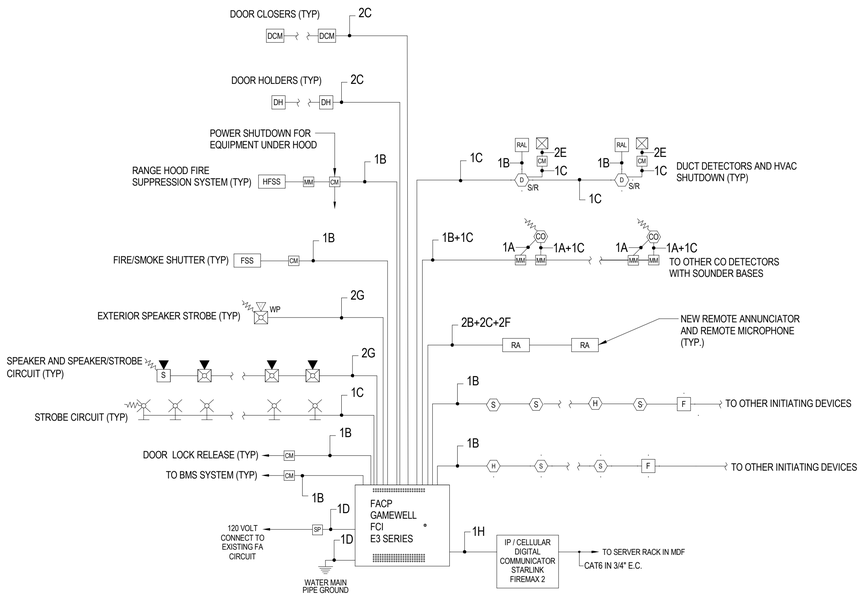
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FIRST FLOOR & BASEMENT FIRE ALARM NEW WORK PLAN - PART 'B'

DRAWING No.

PE-FA 101.00

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1 Fire Alarm Riser Diagram (Note #22)

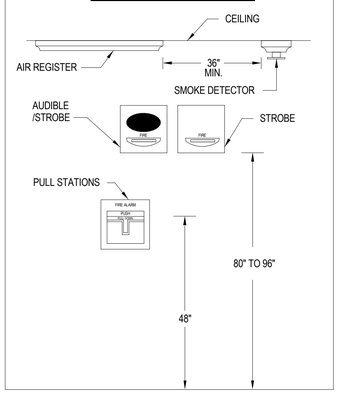
SCALE:NOT TO SCALE

WIRE LEGEND			
	WIRE DESCRIPTION	TYPE	NOTES
A	1 PAIR TWISTED SHIELDED #18	FPLP	-
B	1 PAIR #18 AWG. NON SHIELDED	FPLP	-
C	1 PAIR #14 AWG. NON SHIELDED	FPLP	-
D	#12 AWG. NON SHIELDED	THHN	1
E	#14 AWG. NON SHIELDED	THHN	-
F	1 PAIR TWISTED SHIELDED #16	FPLP	-
G	1 PAIR TWISTED SHIELDED #14	FPLP	-
H	MANUFACTURER RECOMMENDED CABLE	-	-

NOTES:

1. PROVIDE ALL 120 VOLT CIRCUITS IN CONDUIT.

TYPICAL DEVICE LOCATIONS



2 Fire Alarm Device Mounting Height Detail

SCALE:NOT TO SCALE

NOTES:

1. ALL WIRING TO BE INSTALLED ACCORDING TO THE LATEST REVISION OF THE NATIONAL ELECTRIC CODE OR AS DICTATED BY CONTRACT SPECIFICATIONS, AND THE 2022 EDITION OF N.F.P.A 72 OR AS REQUIRED BY LOCAL ORDINANCE.
2. ALL CONDUCTORS MUST BE TEST FREE OF OPENS, SHORTS AND GROUNDS.
3. GROUNDING MUST COMPLY WITH THE NATIONAL ELECTRIC CODE. GROUNDING MUST BE No. 12 A.W.G.
4. ALL PANEL TERMINATIONS TO BE SUPERVISED BY A FACTORY AUTHORIZED TECHNICIAN PRIOR TO POWERING EQUIPMENT.
5. FOR COMPONENT WIRING AND INSTALLATION INFORMATION REFER TO MANUFACTURERS REQUIREMENTS.
6. REFER TO CONTRACT DRAWINGS FOR APPROXIMATE DEVICE LOCATIONS. DRAWINGS REPRESENT DEVICE QUANTITIES. SHOP DRAWINGS SHALL BE SUBMITTED SHOWING SCALED LOCATIONS. CONTRACTOR TO SUBMIT PLANS STAMPED BY LICENSED NEW YORK PROFESSIONAL ENGINEER ONLY. SHOP DRAWINGS WITHOUT P.E. STAMP WILL BE AUTOMATICALLY REJECTED.
7. EXISTING FIRE ALARM SYSTEM INCLUDING ALL DEVICES TO BE DISCONNECTED AND REMOVED IN ITS ENTIRETY AFTER NEW FIRE ALARM HAS BEEN TESTED AND ACCEPTED BY LOCAL FIRE MARSHALL, OWNER AND ENGINEER ALL EQUIPMENT, CONDUIT AND WIRING TO BE REMOVED FROM DEVICE BACK TO THEIR ORIGINAL SOURCE.
8. CONTRACTOR RESPONSIBLE TO PATCH & PAINT ALL OPENINGS AS A RESULT OF REMOVAL OF EXISTING EQUIPMENT.
9. INSTALL DETECTORS A MINIMUM OF 3'-0" FROM ANY SUPPLY OR RETURN AIR REGISTERS.
10. WHEN INSTALLING SHIELDED CABLE THE FOLLOWING MUST BE OBSERVED:
    A. METALLIC CONTINUITY MUST BE MAINTAINED THROUGHOUT THE CABLE RUN.
    B. THE CABLE SHIELD MUST BE ISOLATED FROM GROUND AND TERMINATED ONLY IN THE ASSOCIATED CONTROL PANEL AT THE TERMINAL INDICATED ON THE CONTROL PANEL DRAWINGS. THE REMOTE END OF THE SHIELD (AT LAST DEVICE) MUST BE TAPED AND ISOLATED FROM GROUND.
11. ALL STROBE APPLIANCES SHALL BE SYNCHRONIZED. ALL ALARM INDICATING APPLIANCES (SPEAKERS) SHALL SOUND A "TEMPORAL 3' CODE PATTERN FOR SMOKE ALARM AND A "TEMPORAL 4' CODE PATTERN FOR CO ALARM.
12. AFTER ALARM INDICATION, ALL FANS SHALL BE MANUALLY RESET INDEPENDENT FROM F.A.C.P. SYSTEM RESET. PROVIDE ALL REQUIRED HARDWARE ACCESSORIES, MOTOR STARTERS, CONTROLS, POWER AND CONTROL WIRING AND CONDUITS TO PROVIDE INDEPENDENT RESET OF ALL FANS AFTER ALARM INDICATION.
13. INSTALL ALL DEVICES IN ACCORDANCE WITH A.D.A REQUIREMENTS. ALL DEVICES SHALL BE MOUNTED AS FOLLOWS:
    A. - MANUAL PULL STATIONS 48" O.C. TO HANDLE
    B. - ALARM INDICATING APPLIANCE 80" A.F.F.
    C. - VERIFY WITH CONTRACT SPECIFICATIONS FOR ANY DEVIATIONS.
14. ALL STROBES SHALL BE WIRED TO REMAIN ACTIVE AFTER SPEAKERS ARE SILENCED. STROBES SHALL REMAIN ACTIVE UNTIL ALARM IS RESOLVED.
15. PROVIDE AND INSTALL ALL NECESSARY CONTROL (RELAY) MODULES, SYNCHRONIZATION MODULES, ISOLATION MODUELS AND MONITOR MODULES AS REQUIRED BY MANUFACTURER.
16. CONTRACTOR TO INSTALL NECESSARY & REQUIRED POWER SUPPLY UNITS TO ENSURE PROPER OPERATION AT ALL MAGNETIC DOOR HOLDERS, CO DETECTOR, ETC. AS SHOWN ON DRAWINGS OR REQUIRED BY THE MANUFACTURER.
17. PROVIDE AND INSTALL ALL REQUIRED RELAYS TO RELEASE ELECTRIC DOOR LATCHES.
18. COORDINATE EXACT LOCATION OF REMOTE ANNUNCIATOR AND F.A.C.P. WITH AHJ AND OWNER.
19. PROVIDE ALL REQUIRED DUCT SMOKE DETECTORS. CONTRACTOR TO INSTALL DUCT SMOKE DETECTORS. CONTRACTOR TO INTERFACE ALL DUCT DETECTORS WITH FACP.
20. CONTRACTOR SHALL PROVIDE ALL COMMUNICATION WIRING FOR EACH FACP. PROVIDE ALL REQUIRED WIRING/CONDUIT TO LOCATE COMMUNICATIONS IN FACP. PROVIDE CAT 6 CABLE AND DATA JACKS AS REQUIRED.
21. FIRE ALARM RISER DIAGRAM IS SCHEMATIC. REFER TO FLOOR PLANS FOR DEVICE TYPES AND QUANTITIES.
22. PROTECTIVE SHIELDS (STOPPER II) SHALL BE PROVIDED FOR ALL PULL STATIONS. SHIELDS SHALL FIT OVER MANUAL PULL STATIONS AND SHALL INCLUDE A BATTERY OPERATED PIERCING HORN WHEN THE SHIELD IS OPENED.
23. PLENUM WIRING TO BE USED IN ALL AREAS. CONDUIT MUST BE USED IN ALL MECHANICAL ROOMS, ELECTRICAL ROOMS AND AREAS WITH OPEN CEILINGS.
24. ALL EQUIPMENT TO BE SURFACE MOUNTED ON MASONRY WALLS WITH WIRING RUN IN METAL SURFACE RACEWAY IN FINISHED AREAS.
25. ALL EQUIPMENT TO BE RECESSED MOUNTED ON DRYWALL WALLS WITH WIRING RUN CONCEALED.
26. ALL EQUIPMENT TO BE SURFACE MOUNTED ON MASONRY WALLS AND CEILINGS WITH WIRING RUN IN EMT CONDUIT IN UNFINISHED (BOILER ROOMS, STORAGE ROOMS ETC.) AREAS.
27. ALL EQUIPMENT MOUNTED ON THE ROOF AND EXTERIOR OF THE BUILDING TO HAVE WIRING RUN IN RMC CONDUIT.
28. ALL HVAC EQUIPMENT WITH A CFM RATING OF 1000 CFM OR GREATER SHALL BE INTERCONNECTED TO THE FIRE ALARM SYSTEM AND SHUT DOWN UPON FIRE ALARM SYSTEM ALARM ACTIVATION. CONTRACTOR SHALL ALSO PROVIDE AND INSTALL NEW SUPPLY AND RETURN DUCT SMOKE DETECTORS WITH REMOTE LED'S FOR ALL HVAC UNITS WITH A CFM RATING OF 2000 CFM OR GREATER. CONTRACTOR SHALL INTERFACE WITH ALL EXISTING STARTERS AND PROVIDE NEW STARTERS WHERE REQUIRED.
29. ISOLATION MODULES SHALL BE INSTALLED TO LIMIT THE NUMBER OF FIRE ALARM DEVICES ON A CIRCUIT PER THE CODE.
30. FIRE ALARM SYSTEM SHALL HAVE 20% SPACE CAPACITY TO ALLOW FOR ADDITIONAL DEVICES.
31. FIRE ALARM SYSTEM SHALL HAVE BATTERY BACKUP CAPACITY TO PROVIDE 24 HOURS OF STANDBY AND 15 MINUTES OF ALARM.
32. FURNISH AND INSTALL PROTECTIVE GUARDS FOR ALL NEW FIRE ALARM DEVICES IN THE GYM.
33. CONTRACTOR SHALL REPLACE CEILING TILES (MATCH EXISTING) WHERE EXISTING FIRE ALARM DEVICES ARE REMOVED.
34. THE BRANCH CIRCUIT SUPPLYING THE FIRE ALARM EQUIPMENT(S) SHALL SUPPLY NO OTHER LOADS. THE LOCATION OF THE BRANCH-CIRCUIT OVERCURRENT PROTECTIVE DEVICE SHALL BE PERMANENTLY IDENTIFIED AT THE FIRE ALARM CONTROL UNIT. THE CIRCUIT DISCONNECTING MEANS SHALL HAVE RED IDENTIFICATION, SHALL BE ACCESSIBLE ONLY TO QUALIFIED PERSONNEL, AND SHALL BE IDENTIFIED AS "FIRE ALARM CIRCUIT." THE RED IDENTIFICATION SHALL NOT DAMAGE THE OVERCURRENT PROTECTIVE DEVICES OR OBSCURE THE MANUFACTURER'S MARKINGS. THE FIRE ALARM BRANCH-CIRCUIT DISCONNECTING MEANS SHALL BE PERMITTED TO BE SECURED IN THE "ON" POSITION.
35. CONTRACTOR SHALL FURNISH AND INSTALL A 18" X 24" FRAMED FLOOR PLAN OF THE SCHOOL WITH FA DEVICES INDICATED AT THE FACP AND REMOTE ANNUNCIATOR LOCATIONS.
36. CONTRACTOR TO INCLUDE THE FOLLOWING FA DEVICES WITH 30' OF CONDUIT AND WIRING INSTALLED IN THE BID. IF NOT USED, THE DEVICES SHALL BE TURNED OVER TO THE OWNER FOR "ATTIC STOCK".
    (5) PULL STATION)
    (10) SMOKE DETECTORS
    (5) HEAT DETECTORS
    (10) SPEAKER / STROBES)
    (5) STROBES
    (4) DUCT DETECTORS W/ REMOTE TEST STATIONS
    (5) MONITOR MODULES
    (5) CONTROL MODULES
    (6) ELECTROMAGNETIC DOOR HOLDERS

	CONTROL UNIT & ANNUNCIATOR						NOTIFICATION				SUPPLEMENTARY					
	ACTUATE COMMON ALARM SIGNAL INDICATOR	ACTUATE VISUAL ALARM SIGNALS	ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR	ACTUATE COMMON TROUBLE SIGNAL	DISPLAY DEVICE TYPE AND LOCATION	ACTUATE FULL BUILDING EVACUATION SIGNALS	DISPLAY CHANGE OF STATUS	TRANSMIT FIRE ALARM SIGNAL TO SUPERVISING STATION	TRANSMIT SUPERVISION SIGNAL TO SUPERVISING STATION	TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION	ACTIVATE CO DETECTOR SOUNDER BASE	HVAC UNIT SHUTDOWN	INITIATE EXTERIOR STROBE	RELEASE MAG. DOOR HOLDERS	RELEASE ELECTRIC DOOR LOCKS	
MANUAL PULL STATION	●	●			●	●	●	●					●	●	●	
SMOKE DETECTOR	●	●			●	●	●	●					●	●	●	
HEAT DETECTOR	●	●			●	●	●	●					●	●	●	
DUCT DETECTOR			●		●		●		●			●				
CARBON MONOXIDE DETECTOR			●		●		●		●		●					
FIRE PANEL AC POWER FAILURE				●			●			●						
FA SYSTEM LOW BATTERY				●			●			●						
OPEN CIRCUIT				●			●			●						
GROUND FAULT				●			●			●						
NOTIFICATION APPLIANCE CIRCUIT SHORT				●			●			●						
RANGE HOOD FIRE SUPPRESSION SYSTEM	●	●			●	●	●	●					●	●	●	

3 Fire Alarm Sequence of Operation

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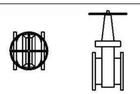
ELECTRICAL FIRE ALARM RISER AND NOTES

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PIPING VALVE LEGEND

IMAGE	VALVE
	BALL VALVE
	CHECK VALVE
	FLANGED GATE VALVE

PIPING FITTING LEGEND

IMAGE	FITTING
	PVC BEND
	PVC TEE

GENERAL CONSTRUCTION EQUIPMENT SCHEDULE

PRODUCT	MANUFACTURER		QUANTITY	MISC.	NOTES
CHEMICAL PUMPS	PULSATRON	SERIES A - LB04 (0-1.00 GPH)	3	0.43 GPH, 100 PSI	1
SODIUM HYPOCHLORITE STORAGE TANK	POLY PROCESSING	1000055	3	55 GAL - SINGLE WALLED	1
HYDROPNEUMATIC TANK	HIGHLAND TANK	N/A	2	5,000 GALLONS PRESSURE SETTING 64 PSI	1
CHLORINE ANALYZER	HACH	CL17	1		

NOTE:
1. NSF / ANSI 61 CERTIFIED

PROCESS PIPING COLOR CHART

SERVICE	COLOR
RAW WATER	OLIVE GREEN
POTABLE WATER	DARK BLUE
CHLORINE	YELLOW

ABBREVIATIONS

ABBREVIATION	DEFINITION
%	PERCENT
@	AT
A.F.F.	ABOVE FINISHED FLOOR
C.L.D.I.	CEMENT-LINED DUCTILE IRON
CFM	CUBIC FEET PER MINUTE
DCV	DOUBLE CHECK VALVE
FLG	FLANGED
FPT	FEMALE PIPE THREAD
FRP	FIBERGLASS REINFORCED PLASTIC
GAC	GRANULAR ACTIVATED CARBON
GHS	GLOBALLY HARMONIZED SYSTEM
HP	HORSE POWER
I.D.	INSIDE DIAMETER
MAX.	MAXIMUM
MIN.	MINIMUM
MPT	MALE PIPE THREAD
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NO.	NUMBER
NPT	NATIONAL PIPE THREAD
O.C.	ON CENTER
O.C.E.W.	ON CENTER EACH WAY
O.D.	OUTSIDE DIAMETER
PE	PLAIN END
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
RPZ	REDUCED PRESSURE ZONE DEVICE
S.S.	STAINLESS STEEL
T&B	TOP AND BOTTOM
T&C	THREADED AND COUPLED
TYP	TYPICAL
W/	WITH
°	DEGREES
±	PLUS OR MINUS, APPROXIMATELY
Ø	DIAMETER

PROCESS NOTES:

1. THE CONTRACTOR SHALL SUPPORT AND ANCHOR ALL EXPOSED PIPING IN ACCORDANCE WITH THE SPECIFICATIONS. WHERE METHODS OF SUPPORT ARE SHOWN, SUCH METHODS SHALL BE CONSIDERED AS SUGGESTED. SUCH SUGGESTED METHODS SHALL NOT RELIEVE THE CONTRACTOR FROM INSTALLING ALL PIPING IN ACCORDANCE WITH SPECIFIED REQUIREMENTS.
2. THE CONTRACTOR SHALL PROVIDE JOINT RESTRAINT FOR ALL FLANGED ADAPTERS. EACH FLANGED ADAPTER SHALL BE TIE RODDED UTILIZING 3/4"Ø STEEL THREADED ROD. INSTALL TWO (2) RODS PER JOINT, EQUALLY SPACED, AND RODDED BACK TO THE NEAREST FLANGED JOINT. ALL NUTS SHALL BE STAINLESS STEEL. INSTALL JAM NUTS. THE CONTRACTOR'S METHOD OF INSTALLING RODS SHALL BE MECHANICALLY RESTRAINED.
3. PROCESS IDENTIFICATION SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS. VALVE DESIGNATIONS AND EQUIPMENT NAMES SHALL BE AS SHOWN ON PROCESS DRAWINGS.
4. ALL MEASUREMENT AND CONTROL PRIMARY ELEMENTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. MAINTAIN MANUFACTURER'S REQUIRED DISTANCE UPSTREAM AND DOWNSTREAM BETWEEN FLOW METERS AND PIPING ELEMENTS SUCH AS FITTINGS AND VALVES. SHOW SEPARATION DISTANCES ON PIPING LAYOUT DRAWINGS SPECIFIED TO BE PROVIDED.
5. ALL REDUCERS ARE TO BE CONCENTRIC, UNLESS OTHERWISE NOTED.
6. THE CONTRACTOR SHALL SUBMIT, FOR ENGINEERS REVIEW AND APPROVAL, PIPING LAYOUT DRAWINGS TO A SCALE OF ½"=1'-0". THE CONTRACTOR SHALL NOT INSTALL INSERTS IN CONCRETE OR BOX FOR WALL AND DECK OPENINGS UNTIL THE LOCATIONS AND ELEVATIONS OF ALL SLAB AND WALL PENETRATIONS HAVE BEEN VERIFIED AND CHECKED FOR ACCURACY BY THE CONTRACTOR. THE LOCATIONS OF WALL SLEEVES, OPENINGS AND OTHER CONCRETE INSERTS SHOWN ON THE DRAWINGS ARE BASED ON EQUIPMENT AND VALVES WHICH MAY OR MAY NOT HAVE DIMENSIONS EQUAL TO THAT BEING USED FOR THE PROJECT. LAYOUT DRAWINGS SHALL BE PREPARED IN ACCORDANCE WITH THE SPECIFICATIONS. THE LAYOUT DRAWINGS SHALL USE THE DIMENSIONS OF EQUIPMENT AND VALVES BEING USED FOR THE PROJECT OR PROVISIONS SHALL BE MADE TO ACCOUNT FOR DIMENSIONAL DIFFERENCES IN EQUIPMENT. THE CONTRACTOR SHALL SUBMIT THE LAYOUT DRAWINGS FAR ENOUGH IN ADVANCE SO THAT CONCRETE INSERTS CAN BE ORDERED AND INSTALLED IN SEQUENCE AND IN ACCORDANCE WITH THE CONSTRUCTION SCHEDULE. PREPARE PIPE LAYOUT DRAWINGS AND SUBMIT DETAILS OF SUPPORT FOR ALL PROCESS PIPING, BOTH BURIED AND EXPOSED, WITH A DIAMETER EQUAL TO OR GREATER THAN 6'.
7. ALL MECHANICAL JOINT FITTINGS SHALL BE PROVIDED WITH THRUST BLOCKING AS DETAILED ON THE DRAWINGS. IN ADDITION TO THRUST BLOCKING, EACH MECHANICAL JOINT SHALL BE MECHANICALLY RESTRAINED.
8. CORE DRILL FLOORS AND WALLS TO INSTALL SMALL PIPING AS REQUIRED. UNLESS SPECIFICALLY DIMENSIONED ON THE DRAWINGS, VERIFY LOCATIONS OF CORE DRILLING WITH ENGINEER PRIOR TO DRILLING.
9. SINGLE LINE REPRESENTATIONS OF SMALL PIPING ARE DIAGRAMMATIC AND ARE NOT SHOWN TO SCALE.
10. CONTRACTOR SHALL PROVIDE AND COORDINATE THE INSTALLATION OF ALL ACCESS PANELS THAT ARE NEEDED TO ACCESS OR SERVICE ITEMS INSTALLED AS PART OF THEIR SCOPE OF WORK.
11. ALL PROCESS EQUIPMENT, LARGE AND SMALL PIPING, VALVES AND APPURTENANCES CALLED OUT OR SHOWN ON PROCESS DRAWINGS ARE TO BE FURNISHED AND INSTALLED NEW BY THE CONTRACTOR, UNLESS OTHERWISE NOTED.
12. CONTRACTOR SHALL FURNISH AND INSTALL NEW SPOOL PIECES AND SPACERS, WITH LENGTHS AND DIMENSIONS AS REQUIRED, TO COMPLETE PIPING SYSTEMS SHOWN ON PROCESS DRAWINGS.
13. UNUSED MANUFACTURER SUPPLIED FIELD SERVICES SHALL BE CREDITED TO THE OWNER AS SPECIFIED.
14. CONSTRUCT THRUST BLOCKS WHERE SHOWN ON THE DRAWINGS. DOWEL THRUST BLOCKS INTO SLAB AS SPECIFIED.
15. ALL NEW PIPING SHALL BE PREPARED, PRIMED AND PAINTED IN ACCORDANCE WITH THE SPECIFICATIONS. ALL COLORS SHALL BE AS APPROVED BY THE OWNER/ENGINEER.
16. POUR CONCRETE SUPPORT PEDESTALS FOR ALL PIPING IN LOCATIONS SHOWN ON THE PLAN SHEETS. HEIGHT AS REQUIRED TO SUPPORT PIPING. PEDESTALS SHALL BE POURED USING A BAG MIX AND DOWELED INTO THE SLAB WITH FOUR (4) 5/8"Ø THREADED ROD WITH A MINIMUM PROJECTION OF 6" EQUALLY SPACED.
17. THE WESTCHESTER COUNTY DEPARTMENT OF HEALTH SHALL BE NOTIFIED AT LEAST 48 HOURS PRIOR TO TESTING OF THE NEW TANKS.
18. UPON COMPLETION AND PRIOR TO USE, TWO SETS OF AS-BUILTS PLANS TOGETHER WITH THE P.E. CERTIFICATION OF CONSTRUCTION AND ACCEPTABLE RESULTS OF LEAKAGE TESTING SHALL BE FORWARDED TO WESTCHESTER COUNTY DEPARTMENT OF HEALTH. RESULTS MUST BE ACCEPTED BY WESTCHESTER COUNTY DEPARTMENT OF HEALTH PRIOR TO USE OF NEW TANKS.
19. DISINFECTION AND BACTERIOLOGICAL TESTING OF NEW PIPES AND APPURTENANCES WILL BE PERFORMED IN ACCORDANCE WITH AWWA C651 EXCEPT FOR SECTION 4.4.2 (TABLET METHOD).
20. CONTRACTOR SHALL SUBMIT ANY CHANGES MADE DURING CONSTRUCTION TO THE ENGINEER. THE ENGINEER AND OWNER WILL NOT APPROVE ANY CHANGES WITHOUT THE PRIOR APPROVAL OF THE WESTCHESTER COUNTY DEPARTMENT OF HEALTH. THE ENGINEER AND OWNER TAKE NO RESPONSIBILITIES FOR DELAYS IN THE PROJECT DUE TO THE PROCESS OF RECIEVING AN APPROVAL FROM THE WESTCHESTER COUNTY DEPARTMENT OF HEALTH.

PHASING NOTES:

1. OPERATIONAL DOWNTIME LIMITED TO 4 HOURS.
2. THE OWNER MUST BE NOTIFIED 72 HOURS PRIOR TO ANY DISRUPTION TO THEIR NORMAL OPERATION.
3. EXCAVATE, BRACE, SUPPORT FLOOR AS NECESSARY TO REMOVE EXISTING HYDROPNEUMATIC TANKS.
4. SHUT OFF SCHOOL SERVICE VALVE AND REMOVE STORAGE TANKS.
5. TANKER TRUCK FOR WATER SUPPLY SHALL BE PROVIDED FOR THE DURATION OF CONSTRUCTION UNTIL HEALTH DEPARTMENT APPROVAL IS RECEIVED.
6. INSTALL NEW HYDROPNEUMATIC TANKS, CHLORINE CONTACT PIPE, RELOCATE CHLORINATION SYSTEM, VALVES, FITTINGS AND ACCESSORIES.
7. TEST, DISINFECT, AND SAMPLE. WASTE WATER SHALL BE NEUTRALIZED AND DUMPED TO GRADE.
8. UPON SATISFACTORY SAMPLE RESULTS AND HEALTH DEPARTMENT APPROVAL. CONNECT TO SYSTEM.
9. THE CONTRACTOR SHALL INCLUDE ALL COSTS FOR LABOR AND MATERIALS REQUIRED FOR LIMITING OPERATIONAL DOWNTIME TO 4 HOURS WITHIN THEIR BID PRICING FOR ALL WORK WITHIN THE PROJECT SCOPE, INCLUDING BUT NOT LIMITED TO PHASING SPECIFIED WITHIN THE DRAWINGS.

PIPING SCHEDULE

ABBREVIATION	DESCRIPTION	MATERIAL
DR	DRAIN	SCHEDULE 80 PVC
FW	FINISHED WATER	SCHEDULE 80 PVC W/ INSULATION
HYDI	SODIUM HYPOCHLORITE (DISINFECTION)	TYGON TUBING IN CONTAINMENT
PS	PRESSURE SENSING	TYPE K COPPER W/ INSULATION
SP	SAMPLING LINE	S.S. TUBING
WD	WELL DISCHARGE	SCHEDULE 80 PVC W/ INSULATION

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CONSULTANTS:

MARK	DATE	DESCRIPTION

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05/31/2029
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J. ALVES	A. VELEZ		

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT W WATER CONSTRUCTION

STATUS

SED SUBMISSION

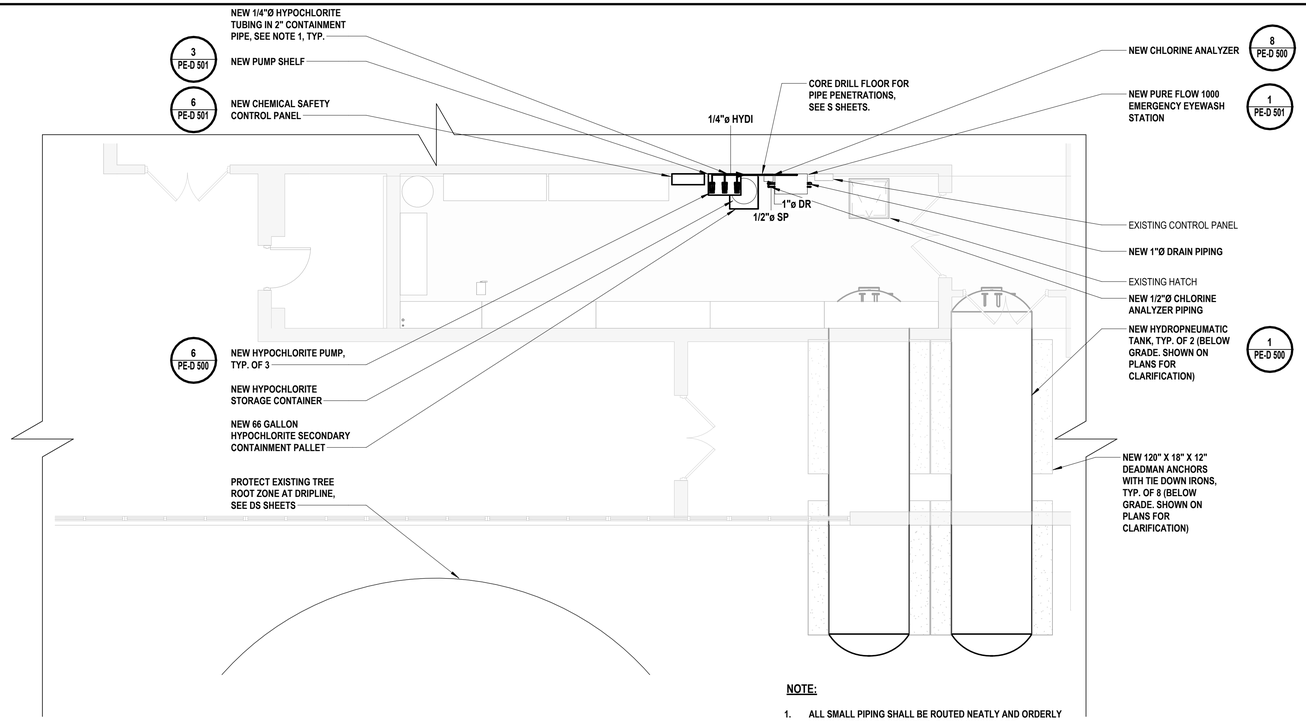
SHEET TITLE

PROCESS NOTES AND LEGENDS

DRAWING No.

PE-D 001.00

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1 First Floor New Piping View

SCALE: 3/16" = 1'-0"

NOTE:

1. ALL SMALL PIPING SHALL BE ROUTED NEATLY AND ORDERLY USING HARDWARE SPECIFIED. PATHS SHOWN ARE DIAGRAMMATIC. CONTRACTOR SHALL INSTALL SMALL PIPING OUT OF WALKING PATHS AND SHALL NOT INSTALL ABOVE ELECTRICAL EQUIPMENT.
2. ALL EQUIPMENT, PIPING, FITTINGS, AND VALVING SHALL BE INSTALLED, TESTED, AND HEALTH DEPARTMENT APPROVED PRIOR TO FINAL TIE IN TO EXISTING PIPING.
3. ONCE HEALTH DEPARTMENT APPROVAL IS RECEIVED TEMPORARY SHUT DOWN FOR TIE IN INFLUENT AND EFFLUENT OF NEW SYSTEM TO EXISTING PIPING. SHUT DOWN SHALL BE NO LONGER THAN 4 HOURS AND SHALL BE COMPLETED DURING AFTER SCHOOL HOURS.

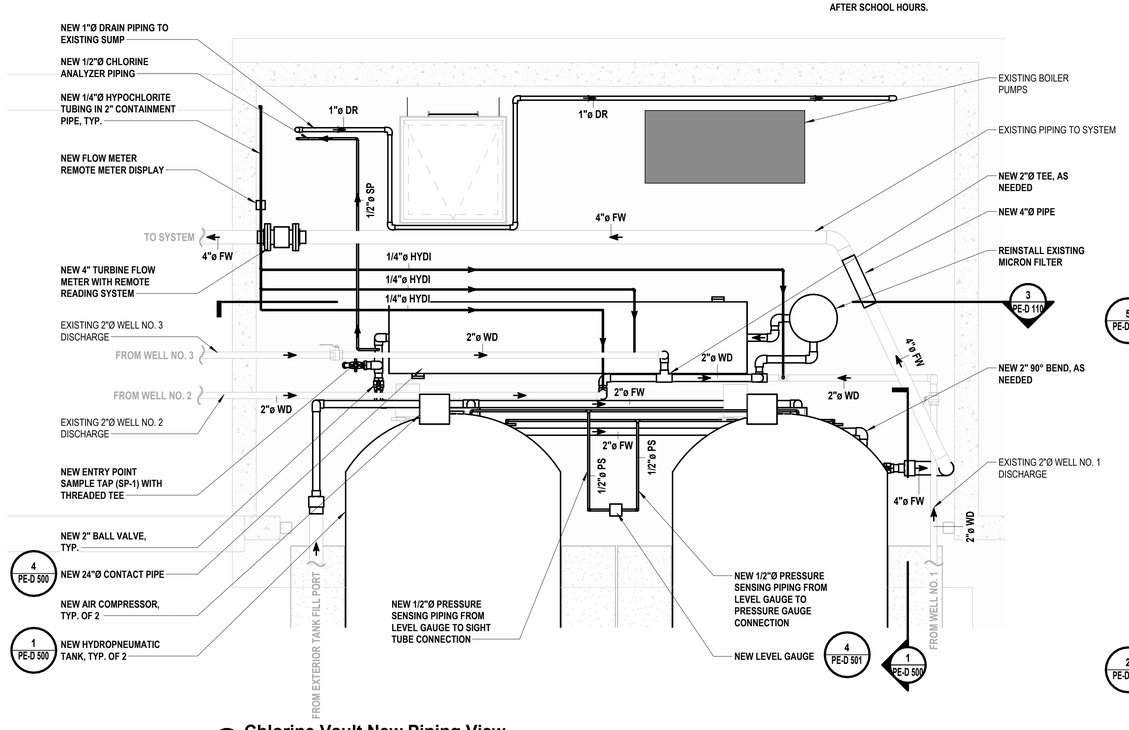
CT CALCULATION:
*A MINIMUM CT OF 8 (mg * min)/L IS REQUIRED FOR 4 LOG REMOVAL AT 5°c

DESIRED CHLORINE RESIDUAL = 0.7 mg/L
MAX PIPE FLOW = 20 GPM
BAFFLING FACTOR = 1

24" PIPE SEGMENT :

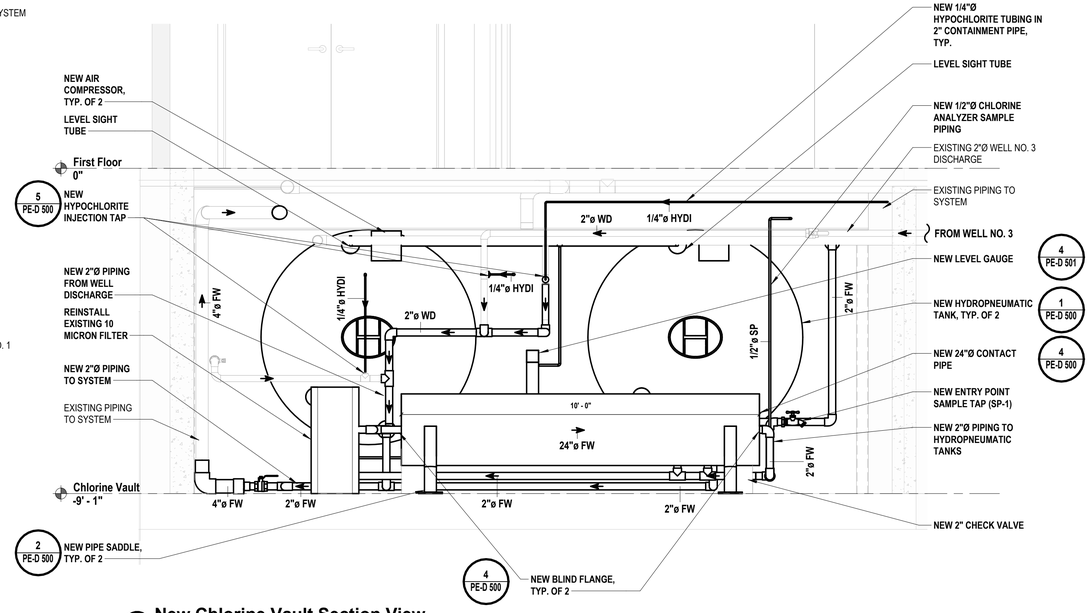
AREA OF 24" PIPE = 3.14 FT^2
24" PIPE LENGTH = 10 FT (MIN.)
VOLUME OF PIPE = 31.4FT^3

$$CT = \frac{0.7\ mg/l * 31.4FT^3 * 7.48\ gal/FT^3 * 1}{20\ gpm} = 8.22\ \frac{mg * min}{L}$$



2 Chlorine Vault New Piping View

SCALE: 1/2" = 1'-0"



3 New Chlorine Vault Section View

SCALE: 1/2" = 1'-0"

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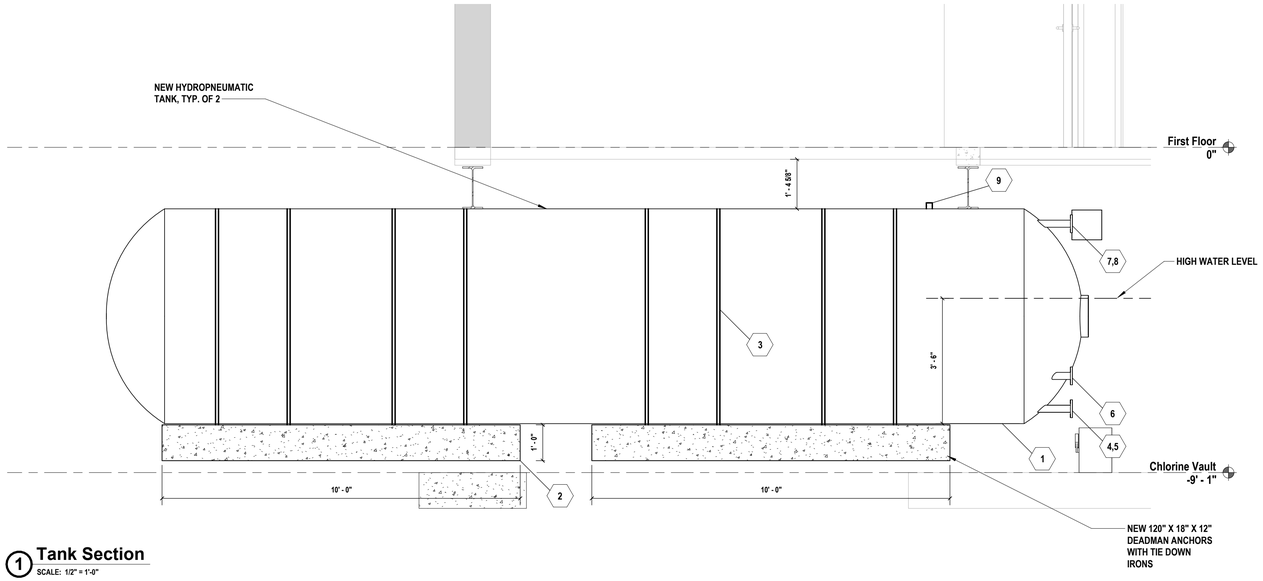
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PIPING FLOOR PLAN

DRAWING No.

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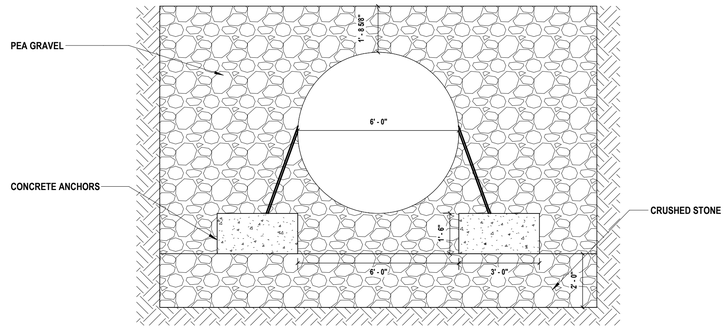
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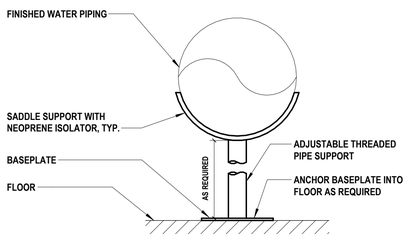


1 Tank Section
SCALE: 1/2" = 1'-0"

TANK FITTING SCHEDULE

PORT	INSTRUCTIONS / DESCRIPTIONS
1	HYDROPNEUMATIC TANK
2	PRECAST DEADMAN SYSTEM WITH HOLD DOWN STRAP AND TURNBUCKLE ASSEMBLY
3	6' DIAMETER TANK ANCHORING SYSTEM
4	2" FLANGED HILLSIDE NOZZLE FOR WELL SUPPLY
5	2" FLANGED HILLSIDE NOZZLE FOR SYSTEM DISCHARGE
6	2" FLANGED HILLSIDE NOZZLE FOR PRESSURE GAUGE AND SWITCH
7	2" FLANGED HILLSIDE NOZZLE FOR SIGHT TUBE CONNECTION
8	1" FLANGED HILLSIDE NOZZLE FOR AIR COMPRESSOR FILL
9	2" HALF COUPLING FOR HYDROTEST, SEAL WELD STEEL PLUG AFTER TESTING
10	4" X 4" X 1/4" MASONRY RING



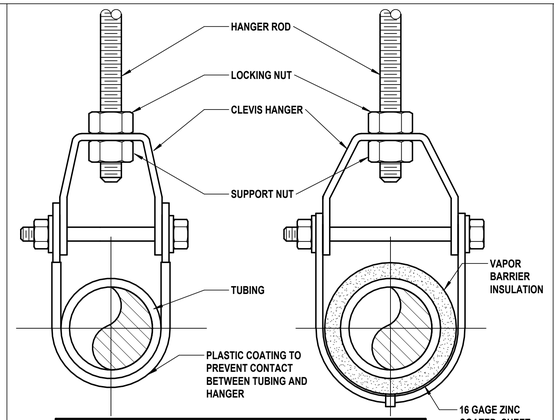


SINGLE PIPE SADDLE SUPPORT

NOTES:

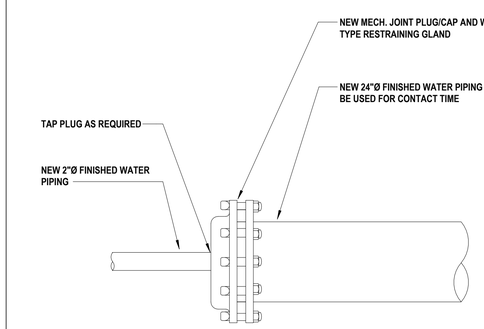
1. ALL PIPE SUPPORT MATERIALS SHALL BE 304 STAINLESS STEEL.
2. PIPING SUPPORTS SHALL BE UTILIZED FOR FLANGED PIPING≥ 6"Ø AND SPACED NO LESS THAN 10' - 0" O.C.

2 Pipe Saddle Support Detail
SCALE: NTS

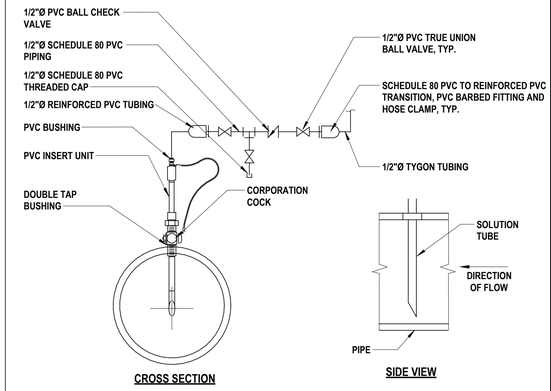


HANGER ROD SCHEDULE			
PIPE SIZE	ROD SIZE	PIPE SIZE	ROD SIZE
UP TO 2"	3/8" DIA.	4" THRU 5"	5/8" DIA.
2 1/2" THRU 3"	1/2" DIA		

3 Small Piping Hanger Detail
SCALE: NTS



4 Contact Pipe Connection Detail
SCALE: NTS

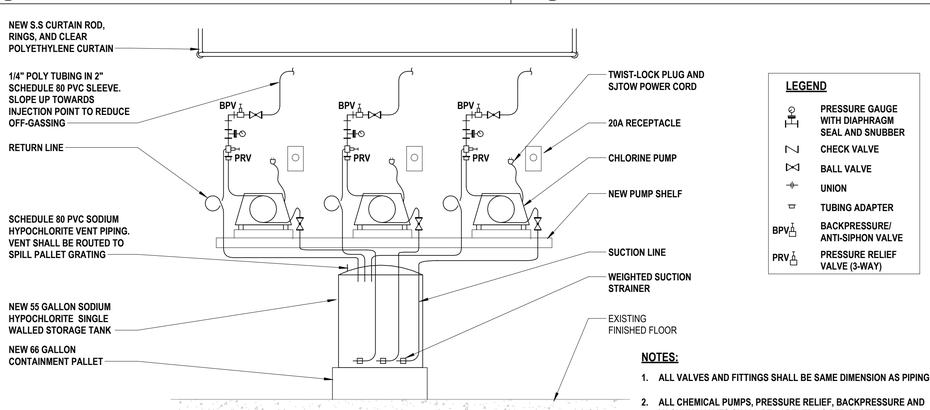


CROSS SECTION

SIDE VIEW

NOTE:
ALL VALVES & FITTINGS SHALL BE SAME DIMENSION AS TUBING

5 Calcium Hypochlorite Injection Tap Detail
SCALE: NTS



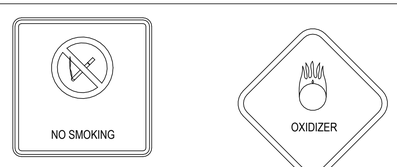
LEGEND

- PRESSURE GAUGE WITH DIAPHRAGM SEAL AND SNUBBER
- CHECK VALVE
- BALL VALVE
- UNION
- TUBING ADAPTER
- BPV — BACKPRESSURE/ ANTI-SIPHON VALVE
- PRV — PRESSURE RELIEF VALVE (3-WAY)

NOTES:

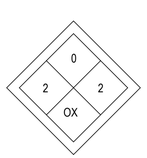
1. ALL VALVES AND FITTINGS SHALL BE SAME DIMENSION AS PIPING.
2. ALL CHEMICAL PUMPS, PRESSURE RELIEF, BACKPRESSURE AND VACUUM VALVES SHALL BE LABELED AS PER SECTION 230553.
3. CONTRACTOR TO PROVIDE SPARE PUMP AND SPARE PARTS KIT .
4. TANK COVER CAN BE LOOSENED TO BE USED AS AN EMERGENCY VENT .

6 Sodium Hypochlorite Treatment System Detail
SCALE:NTS



NOTE:

1. "NO SMOKING" SIGNS SHALL BE PLACED CONSPICUOUSLY WITHIN AND AT ALL ENTRANCES TO CHEMICAL ROOM'S BUILDING.

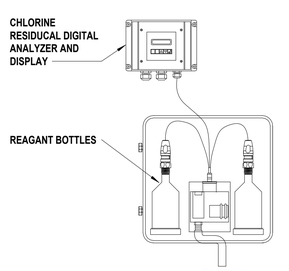


~15% SODIUM HYPOCHLORITE SOLUTION

NOTES:

1. SIGN SHALL BE LOCATED ON EACH TANK.
2. SIGN SHALL MEASURE 12"x12" SQUARE ON POINT. SIGN SHALL BE YELLOW; SYMBOL AND LETTERING SHALL BE BLACK.
3. THE WORD OXIDIZER MUST BE CENTERED ON THE SIGN HORIZONTAL CENTER LINE IN LETTERS 2-1/2" HIGH WITH A 15/32" STROKE.
4. THE OVERALL HEIGHT OF THE SYMBOL MUST BE 4-5/16".
5. THE SIGN SHALL NOT BE OBSCURED BY MARKINGS, ATTACHMENTS PLACEMENT OF OBJECTS OR OTHER MATERIALS.

7 Sodium Hypochlorite Signage Detail
SCALE:NTS



NOTES:

BASED ON MODEL CL-17 MANUFACTURED BY HACH.

8 Chlorine Analyzer CL-17
SCALE: NTS

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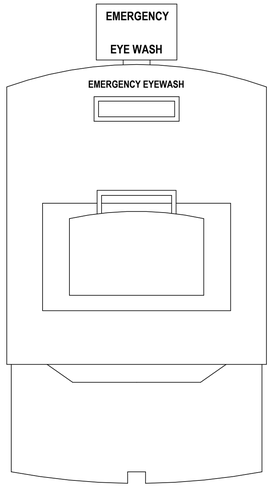
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DETAILS

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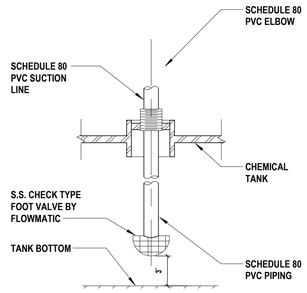
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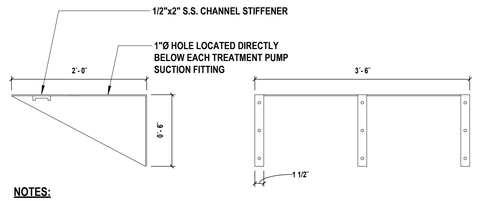
NOTES:

BASED ON MODE 32-001000 FENDALL PURE FLOW 1000 EYEWASH STATION MANUFACTURED BY HONEYWELL.

1 Emergency Eyewash Station Detail
SCALE:NTS



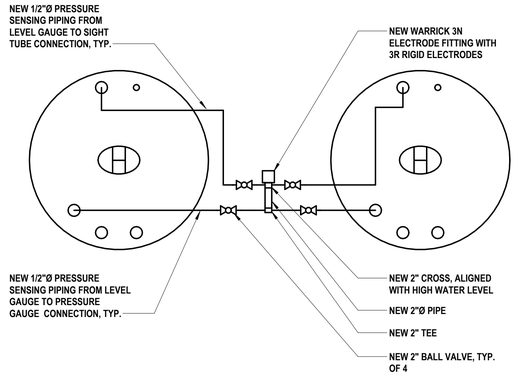
2 Suction Line Detail
SCALE:NTS



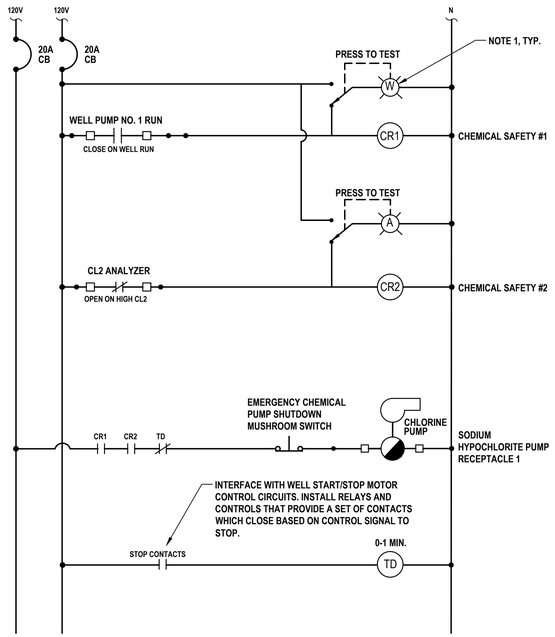
NOTES:

1. ALL COMPONENTS; BRACKETS, TOP, AND BACK PANEL SHALL BE 3/16" IN THICKNESS, TYPE 304 S.S.
2. ALL EXPOSED S.S. SURFACES SHALL BE POLISHED TO A NO. 4 BRIGHT FINISH.
3. ALL WELDS SHALL BE CONTINUOUS AND GROUND/SMOOTH.

3 Pump Shelf Detail
SCALE:NTS



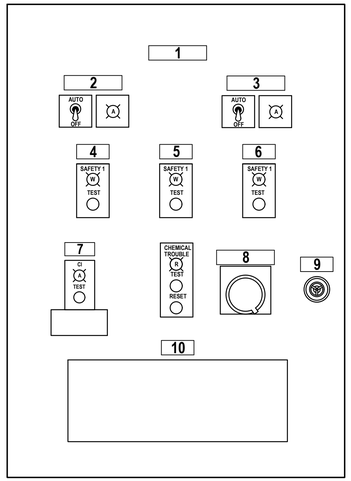
4 Level Gauge Detail
SCALE:NTS



5 'CTP' Chemical Safety Control Diagram
SCALE:NTS

NOTES:

1. ALL PILOT LIGHTS SHOWN SHALL BE MOUNTED ON THE FACE OF THE CHEMICAL TREATMENT PANEL.
2. LOGIC SHOWN IS FOR INTERLOCKING OF CHEMICAL TREATMENT SAFETIES. REFER TO SPECIFICATIONS FOR ADDITIONAL CONTROLS NOT SHOWN.
3. TYPICAL WIRING FOR WELL AND CHLORINE PUMPS 2 AND 3.



6 'CTP' Elevation
SCALE:NTS

'CTP' ELEVATION SCHEDULE

ITEM	DESCRIPTION	COLOR/TYPE
1	CHEMICAL TREATMENT PANEL 'CTP'	
2	CHLORINE	AMBER
3	FUTURE	AMBER
4	WELL NO. 1 RUNNING RELAY	WHITE
5	WELL NO. 2 RUNNING RELAY	WHITE
6	WELL NO. 3 RUNNING RELAY	WHITE
7	CL2 ANALYZER	AMBER
8	MODE SWITCH, SEL3	SEL3
9	ALARM HORN	
10	PROCEDURE	

CONTROL PANEL LEGEND

SEL3	SELECTOR SWITCH - THREE POSITION

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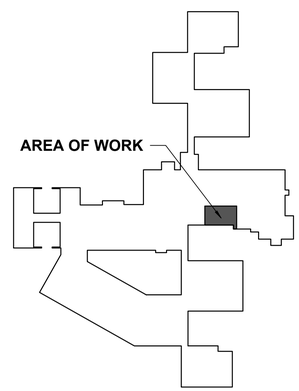


LEGEND

DESCRIPTION	SYMBOL
EXISTING WATER MAIN	W
EXISTING WATER SERVICE	WS
EXISTING STORM DRAIN	D D
EXISTING SEWER	S
EXISTING VALVE	⊗
EXISTING HYDRANT	
REMOVE AND DISPOSE OF EXISTING WATER MAIN	W W
REMOVE AND DISPOSE OF EXISTING PIPING (GENERAL)	

SITE REMOVALS NOTES:

1. REPORT ANY DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THE PLANS TO THE ENGINEER IN WRITING IMMEDIATELY.
2. UNDERGROUND UTILITY INFORMATION SHOWN ON THESE PLANS WAS OBTAINED FOR DESIGN PURPOSES ONLY. PROVIDE FOR CONSTRUCTION MARKOUT AND LOCATE EXISTING UNDERGROUND UTILITIES. NO EXCAVATION CAN COMMENCE UNTIL UTILITY DOCUMENTATION HAS BEEN COMPLETED.
3. AFTER MARKOUT AND PRIOR TO DISTURBING THE SITE, UNCOVER ALL SUBSURFACE UTILITIES AND STRUCTURES WITHIN LIMITS OF DISTURBANCE TO CONFIRM THEIR LOCATION AND DEPTH.
4. NO COMPENSATION WILL BE MADE FOR ANY INCONVENIENCE CAUSED BY ENCOUNTERING UTILITIES AND STRUCTURES WHICH ARE NOT SHOWN, OR ARE INACCURATELY SHOWN ON THE PLANS.
5. REPAIR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM CONTRACTOR OPERATIONS IMMEDIATELY AT NO COST TO OWNER.
6. REPAIR ANY DAMAGE TO EXISTING SITE FEATURES SCHEDULED TO REMAIN RESULTING FROM CONTRACTOR OPERATIONS AT NO COST TO OWNER.
7. LOCATE ALL COMPONENTS OF ANY EXISTING IRRIGATION SYSTEMS PRIOR TO CONSTRUCTION AND PROTECT THROUGHOUT THE DURATION OF THE CONTRACT. REPAIR ALL DAMAGED COMPONENTS AT NO ADDITIONAL COST TO THE OWNER.
8. SAWCUT CONCRETE PAVEMENT BACK TO NEAREST EXPANSION/CONTROL JOINT.
9. PROVIDE TEMPORARY FENCING TO PROTECT WORK AREAS.
10. INSTALL EROSION CONTROL MEASURES PRIOR TO ANY GROUND DISTURBANCE.
11. DELINEATE THE LIMITS OF CLEARING AND REVIEW WITH THE OWNER PRIOR TO COMMENCING WORK.
12. NOTIFY OWNER AND ENGINEER IMMEDIATELY IN WRITING WHEN UNKNOWN STRUCTURES OR SUSPECTED HAZARDOUS OR CONTAMINATED MATERIALS ARE ENCOUNTERED PRIOR TO REMOVAL OR DISTURBANCE.
13. TAKE APPROPRIATE MEASURES TO PROTECT PEDESTRIANS AND VEHICULAR TRAFFIC DURING REMOVAL ACTIVITIES, AND PROVIDE TEMPORARY MEASURES FOR THE PROTECTION AND SAFETY OF THE PUBLIC UNTIL FINAL ACCEPTANCE BY THE OWNER.
14. BACKFILL ALL VOIDS RESULTING FROM THE REMOVAL OF EXISTING SITE FEATURES. BACKFILL TO BE SOIL, FREE OF ORGANIC MATERIAL, DEBRIS, TRASH, CLAY AND STONES LARGER THAN 4 INCHES
15. REFER TO OTHER CONTRACT DRAWINGS FOR LIMITS AND SCOPE OF RESPECTIVE REMOVALS NOT INCLUDED IN THIS CONTRACT. COORDINATE WITH ALL OTHER CONTRACTORS AS REQUIRED.



Key Plan
SCALE: 1" = 100'-0"

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GRAPHIC SCALE
20 0 10 20
(IN FEET)
1 inch = 20 ft.

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CONSULTANTS:

MARK	DATE	DESCRIPTION

STATE OF NEW YORK · JOSEPH J. TODARO · 071079 · LICENSED PROFESSIONAL ENGINEER

mm/dd/year
JOSEPH J. TODARO, P.E. EXP. DATE
NY PROFESSIONAL ENGINEER Lic. No. 071079
"IN ACCORDANCE WITH ARTICLE 145, SECTION 7209 OF THE NYS EDUCATION LAW, ALTERATION OF THIS DOCUMENT EXCEPT BY LICENSE PROFESSIONAL IS ILLEGAL"

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
J. ALVES	A. VELEZ		

PROJECT No.:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT
SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET
LINCOLNDALE, NY 10540

SED# 66-21-01-06-0-002-017

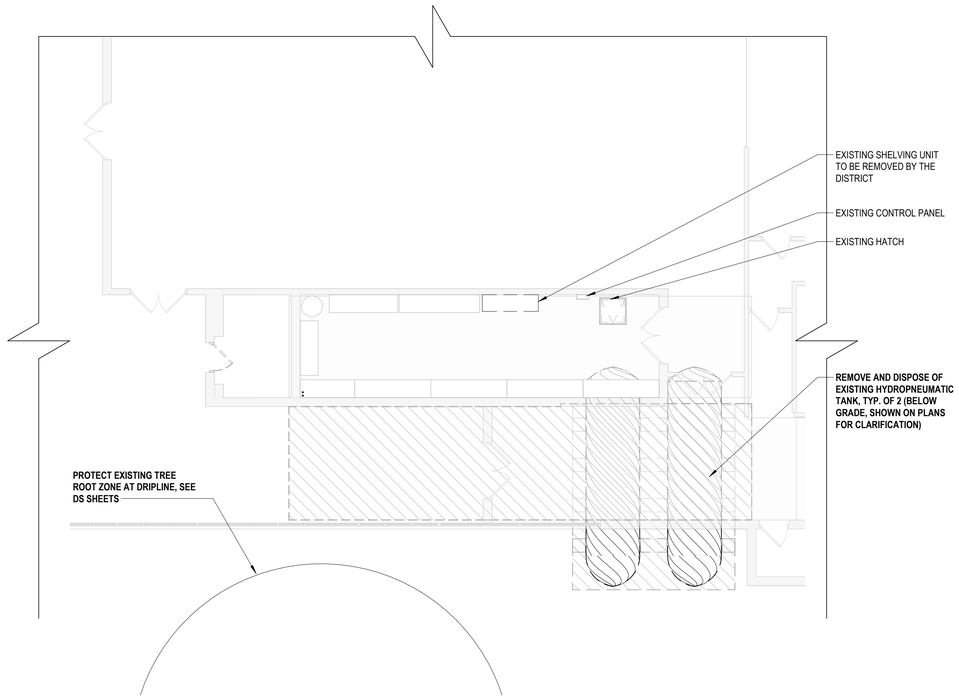
CONTRACT
CONTRACT W
WATER CONSTRUCTION

STATUS
SED SUBMISSION

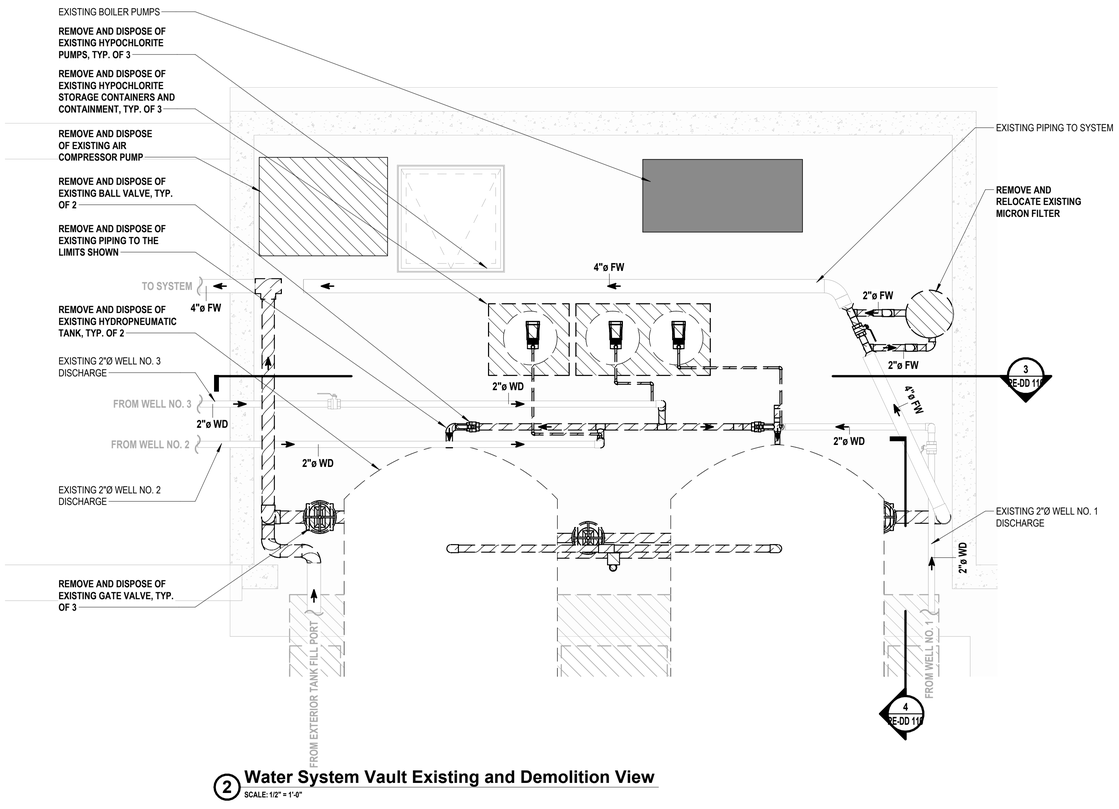
SHEET TITLE
EXISTING AND PROCESS REMOVALS SITE PLAN

DRAWING No.
PE-DD 100.00

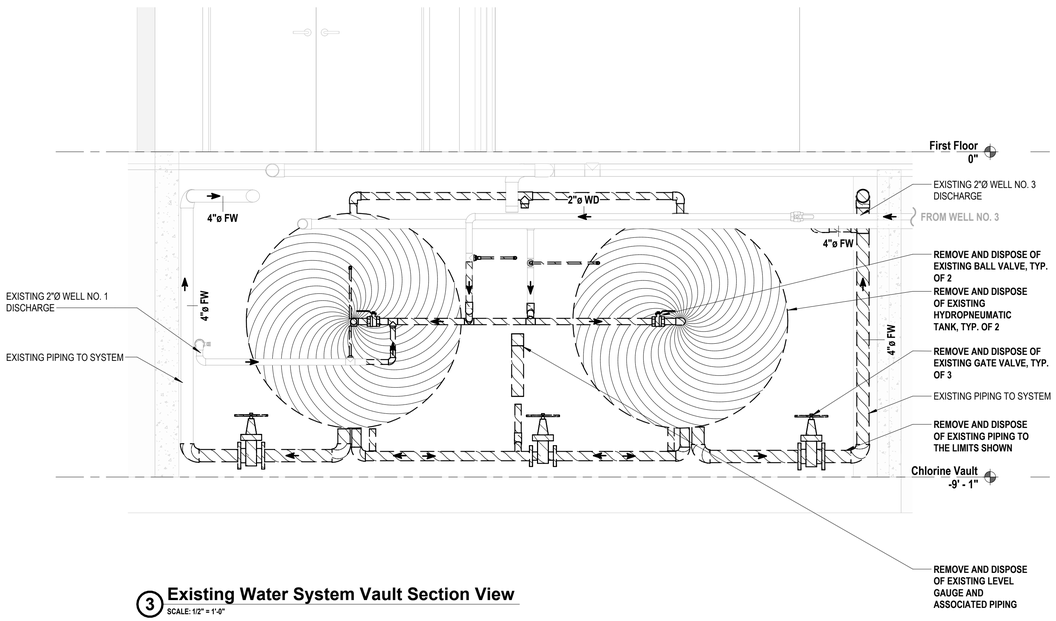
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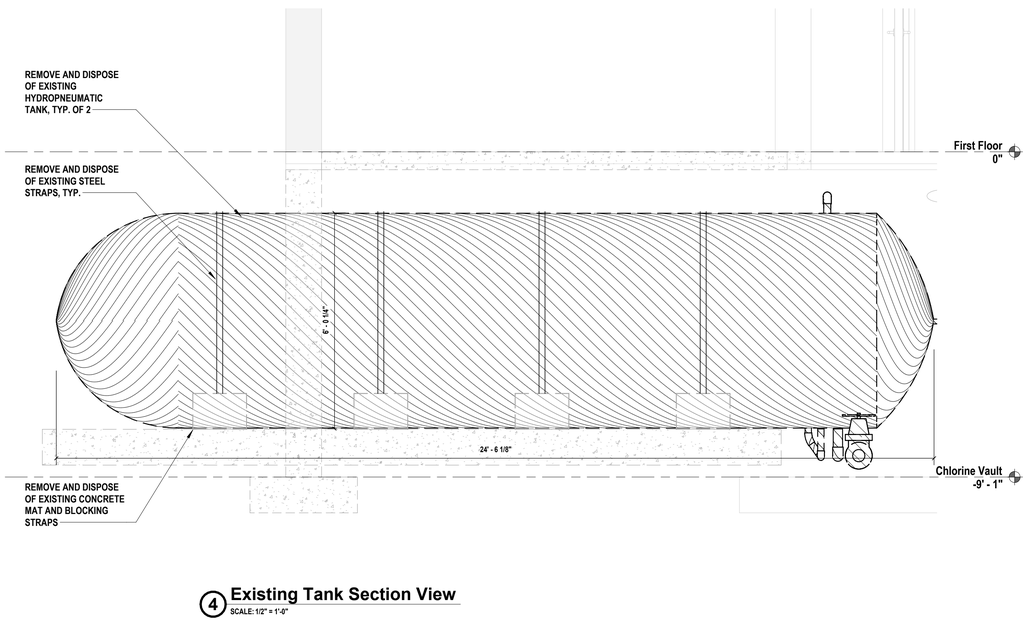
1 First Floor Existing and Demolition View
SCALE: 1/8" = 1'-0"



2 Water System Vault Existing and Demolition View
SCALE: 1/2" = 1'-0"



3 Existing Water System Vault Section View
SCALE: 1/2" = 1'-0"



4 Existing Tank Section View
SCALE: 1/2" = 1'-0"

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J. ALVES	M. RIVERA A. VELEZ		

PROJECT No:	DATE:	SCALE:
SMSD2505	JULY 2026	AS SHOWN

CLIENT

SOMERS CENTRAL SCHOOL DISTRICT

VARIOUS UPGRADES AT PRIMROSE ELEMENTARY SCHOOL

110 PRIMROSE STREET LINCOLNDALE, NY 10540

SED #: 66-21-01-06-0-002-017

CONTRACT

CONTRACT W WATER CONSTRUCTION

STATUS

SED SUBMISSION

SHEET TITLE

PIPING DEMOLITION FLOOR PLAN

DRAWING No.

PE-DD 110.00

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1
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NEW
HYDROPNEUMATIC
TANK, TYP. OF 2
EXISTING TANK
FILL PORT
1
PE-DS 100
PROTECT EXISTING
TREE ROOT ZONE
AT DRIPLINE
EXISTING
WELL NO. 2
EXISTING
WELL NO. 3
EXISTING
WELL NO. 1
Land of the Town of Somers
(Van Tassel Memorial Park)
27.12-2-3
725.06'
Wooded Area
Asphalt Play Area
Basketball
Hoop
Top Concrete Is Rock Level
Concrete Pad
Concrete Curb
Gate
Fence
Chain Link Fence
Wood Fence
Guide Rail
Utility Pole
Gas Service
Overhead Wires
Vertical Pipe
Concrete Foot Pad
Concrete Step
Concrete Wall
Retaining Wall
Brick Wall
Stone Wall
Roof Drain
Roof Overhang
Roof Line
Bollard
Hydrant
Manhole
Catch Basin
Inlet
Curb Inlet
Flared End
Drainage Inlet
Drainage Manhole
Drainage Flared End
Drainage Catch Basin
Drainage Curb Inlet
Drainage Inlet
Drainage Pipe
Drainage Swale
Drainage Ditch
Drainage Culvert
Drainage Headwall
Drainage Endwall
Drainage Wingwall
Drainage Apron
Drainage Grate
Drainage Cover
Drainage Frame
Drainage Invert
Drainage Elevation
Drainage Slope
Drainage Direction
Drainage Flow

VALVES AND PIPE ACCESSORIES

- ANTI-SIPHON VALVE
- AUTOMATIC AIR VENT/AIR RELEASE VALVE
- BALL VALVE
- BACK PRESSURE VALVE
- BUTTERFLY VALVE
- BUTTERFLY VALVE (NORMALL CLOSED)
- CHECK VALVE
- CONTROL VALVE
- DOUBLE CHECK VALVE
- GATE VALVE
- GLOBE VALVE
- PLUG VALVE
- PRESSURE REDUCING VALVE
- PRESSURE RELIEF VALVE
- RPZ DEVICE
- SOLENOID VALVE
- WYE STRAINER
- CHEMICAL INJECTION POINT
- DIELECTRIC UNION
- DUPLEX STRAINER
- FILTER AND STRAINER
- RUPTURE DISC
- SAMPLE POINT
- SIGHT GLASS
- STATIC MIXER

LARGE PIPING FITTINGS

- BLIND FLANGE
- BLOW-OFF GOOSENECK
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- FLANGED CONNECTING PIPE JOINT
- FLEXIBLE CONNECTION
- HYDRANT
- PIPE PLUG
- QUICK CONNECTION COUPLING
- VENT

VALVE OPERATORS

- MOTOR OPERATED
- SOLENOID
- SPRING DIAPHRAGM ACTUATOR

FLOW CONTROL

- ELECTROMAGNETIC FLOW METER
- ORIFICE PLATE
- TURBINE FLOW METER
- VENTURI FLOW METER

PROCESS EQUIPMENT

- AST — AIR STRIPPING TOWER
- BLOWER
- CENTRIFUGAL PUMP
- CLEARWELL ACCESS HATCH
- GAC — LIQUID PHASE CARBON ADSORPTION VESSEL
- IXP — ION EXCHANGE (PERCHLORATE) VESSEL
- OXF — OXIDATION AND FILTRATION VESSEL
- RECYCLE TANK
- BRINE TANK
- NO3 — ION EXCHANGE (NITRATE) VESSEL
- STRUCTURE — STRUCTURE NAME
- VCA — VAPOR PHASE CARBON ADSORPTION UNIT
- VERTICAL LINESHAFT PUMP
- VERTICAL LINESHAFT PUMP (PITLESS ADAPTER)
- SUBMERSIBLE PUMP
- FIXED SPEED PUMP MOTOR
- V V — VFD PUMP MOTOR
- HYDI — CHEMICAL METERING PUMP
- GAC — DECHLORINATION UNIT
- GROUND STORAGE TANK
- VERTICAL CHEMICAL BULK STORAGE TANK
- HYDROPNEUMATIC TANK
- LDP / UV/AOP CHAMBER — UV / AOP CHAMBER

LINE STYLES

- NEW PROCESS FLOW LINE
- EXISTING PROCESS FLOW LINE
- HARD WIRED SIGNAL LINE
- ETHERNET SIGNAL LINE
- MODBUS SIGNAL LINE
- FIBER OPTIC SIGNAL LINE

IDENTIFICATION LETTERS

	FIRST LETTERS		SUCCEEDING LETTERS		
	MEASURED VARIABLE	VARIABLE MODIFIER	READOUT / PASSIVE FUNCTION	OUTPUT / ACTIVE FUNCTION	MODIFIER
A	ANALYSIS		ALARM		AUTO
B	BURNER, COMBUSTION				
C				CONTROL, COMMAND	CLOSE
D		DIFFERENTIAL			DEVIATION
E	VOLTAGE		SENSOR / ELEMENT		
F	FLOW			FEEDBACK	
G			GLASS, GAUGE		
H	HAND				HIGH, HAND
I	CURRENT		INDICATING		
J	POWER		SCAN		
K	TIME			CONTROL STATION	
L	LEVEL				LOW, LOCAL
M					MIDDLE, INTERMEDIATE
N					
O			ORIFICE, RESTRICTION		OPEN, OFF
P	PRESSURE		POINT		
Q	QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE		
R	RADIATION		RECORD		RUN, REMOTE
S	SPEED, FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MALFUNCTION	
V	VIBRATION			VALVE, DAMPER, LOUVER	
W	WEIGHT		WELL, PROBE		
X	UNCLASSIFIED	X-AXIS	ACCESSORY DEVICE		
Y	EVENT, STATE	Y-AXIS		AUXILIARY DEVICES	
Z	POSITION	Z-AXIS		DRIVER, ACTUATOR	

DUCT AND DUCT ACCESSORIES

- AIR FILTER
- AIR — AIRFLOW MONITORING STATION
- DUCT HEATER
- DUCT TRANSITION
- DUCT WORK
- FLEXIBLE DUCT CONNECTOR
- ?-?? — VOLUME DAMPER
- ?-?? NC — VOLUME DAMPER (NORMALLY CLOSED)

MEASUREMENT ABBREVIATIONS

ABS	ABSOLUTE
AVG	AVERAGE
CL	CHLORINE
COL	COLOR
COND	ELECTRIC CONDUCTIVITY
DP	DIFFERENTIAL PRESSURE
FL	FLUORIDE
H2S	HYDROGEN SULFIDE
H2O2	HYDROGEN PEROXIDE
HUM	HUMIDITY
LSR	LASER
MAG	MAGNETIC
MAN	MANOMETER
MS	MAGNETOSTRICTIVE
NO3	NITRATE
NO2	NITRITE
OP	ORIFICE PLATE
pH	HYDROGEN ION
PT	PITOT TUBE
RTD	RESISTANCE TEMP DETECTOR
TC	THERMOCOUPLE
TOC	TOTAL ORGANIC CARBON
TUR	TURBINE
TURB	TURBIDITY
US	ULTRASONIC
UV	ULTRAVIOLET
UVT	ULTRAVIOLET TRANSMITTANCE
VAC	VACUUM
VENT	VENTURI TUBE

INSTRUMENTATION DEVICE AND FUNCTION SYMBOLS

PROCESS CONTROL SYSTEM	DISCRETE INSTRUMENT OR SIGNAL	LOCATION AND ACCESSIBILITY
◯	◯	• LOCATED IN FIELD • NOT PANEL, CABINET OR CONSOLE MOUNTED • VISIBLE AT FIELD LOCATION • NORMALLY OPERATOR ACCESSIBLE
◯	⊖	• LOCATED IN OR ON FRONT OF CENTRAL OR MAIN PANEL OR CONSOLE • VISIBLE ON FRONT OF PANEL OR ON VIDEO DISPLAY • NORMALLY OPERATOR ACCESSIBLE AT PANEL FRONT OR CONSOLE
⊖	⊖	• LOCATED IN OR ON FRONT OF SECONDARY OR LOCAL PANEL OR CONSOLE • VISIBLE ON FRONT OF PANEL OR ON VIDEO DISPLAY • NORMALLY OPERATOR ACCESSIBLE AT PANEL FRONT OR CONSOLE

DISCRETE INSTRUMENT OR SIGNAL LEGEND:

XXXX A / $$##C B

XXXX: MEASURED VARIABLE
$$: PROCESS AREA
##: UNIQUE IDENTIFIER
A: MODIFIER OR MEASUREMENT ABBREVIATION
B: MODIFIER
C: UNIQUE IDENTIFIER MODIFIER (OPTIONAL)

PROCESS AREA ABBREVIATIONS

00	MISCELLANEOUS NON-PROCESS
01	WELL DISCHARGE
02	HYPOCHLORITE TREATMENT (OXIDATION)
03	OXIDATION & FILTRATION
04	ION EXCHANGE (NITRATE)
05	PACKED TOWER AERATION
06	ION EXCHANGE (PERCHLORATE)
07	GRANULAR ACTIVATED CARBON ADSORPTION (LIQUID)
08	SODIUM HYDROXIDE TREATMENT (pH ADJUSTMENT)
09	HYPOCHLORITE TREATMENT (DISINFECTION)
10	FINISHED WATER
11	GRANULAR ACTIVATED CARBON ADSORPTION (VAPOR)
12	ADVANCED OXIDATION PROCESS (AOP)
13	HYDROGEN PEROXIDE

SERVICE ABBREVIATIONS

BO	BLOW-OFF
BI	BACKWASH INFLUENT
CA	COMPRESSED AIR CONNECTION
CF	CARBON FILL
DC	DISINFECTION CONNECTION
EF	PROCESS EFFLUENT
FC	FLUSH CONNECTION
FW	FINISHED WATER
H2O2	HYDROGEN PEROXIDE
HYDI	HYPOCHLORITE (DISINFECTION)
HYOX	HYPOCHLORITE (OXIDATION)
IN	PROCESS INFLUENT
NAOH	SODIUM HYDROXIDE
PR	PRESSURE RELIEF
PS	PRESSURE SENSING
RL	RECIRCULATION
SC	SPENT CARBON
SP	SAMPLING LINE
WD	WELL DISCHARGE
WT	WASTE WATER

NOMINAL SIZES

04	4"
06	6"
08	8"
10	10"
12	12"
14	14"
16	16"
20	20"
24	24"
30	30"
32	32"
34	34"
36	36"
38	38"
40	40"
42	42"
44	44"

PROCESS DIAGRAM ANNOTATION SYMBOLS

- SERVICE ABBREVIATION / PROCESS AREA / NOMINAL PIPE SIZE — 06-01-BO — FLOW DIRECTION (PIPE)
- SERVICE ABBREVIATION / PROCESS AREA / NOMINAL DUCT SIZE — 30-11-IN — FLOW DIRECTION (CIRCULAR DUCT)
- SERVICE ABBREVIATION / PROCESS AREA / DUCT HEIGHT x WIDTH — 20x20-11-EF — FLOW DIRECTION (RECTANGULAR DUCT)
- MATCH LINE
- G 022 / G 022 — TIE-IN (CONTINUED ELSEWHERE ON OTHER SHEET)
- A / A — TIE-IN (CONTINUED ELSEWHERE ON SAME SHEET, OR OTHER SHEET IF REFERENCED)
- UNCONNECTED PROCESS LINE

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CONSULTANTS:

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STATE OF NEW YORK — JOSEPH J. TODARO — 071079 — LICENSED PROFESSIONAL ENGINEER

05/31/2029 Exp. Date

JOSEPH J. TODARO, P.E.
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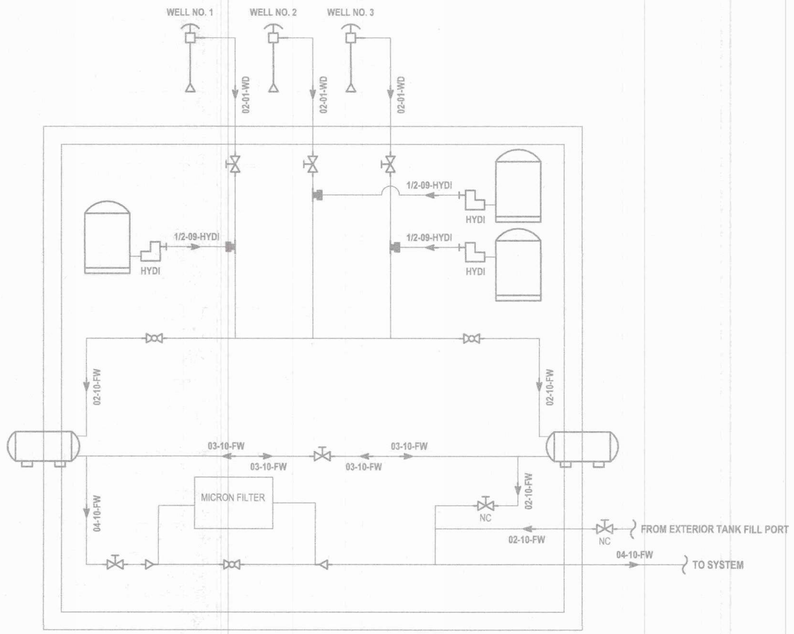
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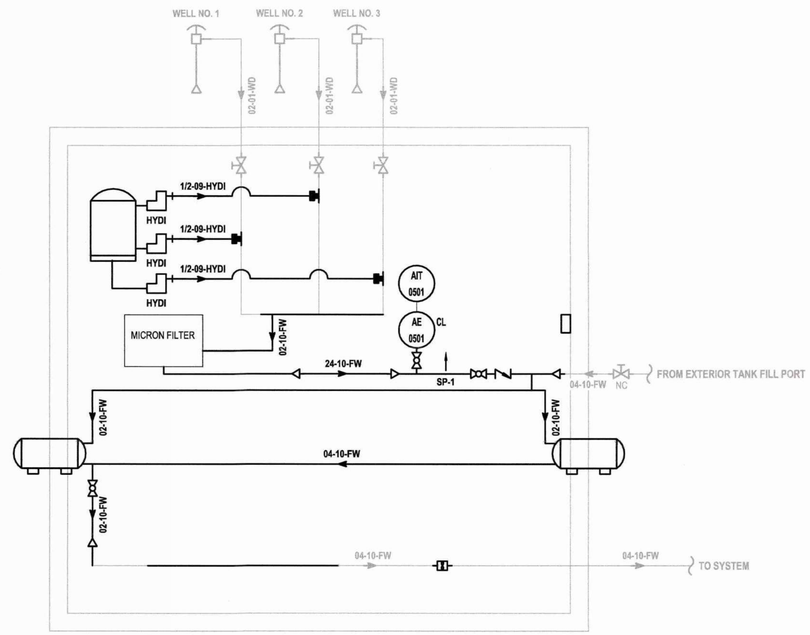
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PROCESS DIAGRAM LEGENDS

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1 Existing Process & Instrumentation Diagram
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2 New Process & Instrumentation Diagram
SCALE: NO SCALE

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110 PRIMROSE STREET
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SED #: 66-21-01-06-0-002-017

CONTRACT
CONTRACT W
WATER CONSTRUCTION

STATUS
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SHEET TITLE
PROCESS DIAGRAM

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Disconnecting, capping or sealing, and abandoning in-place or removing site utitilities.
   4. Salvage of existing items to be reused or recycled.
   5. Recovery of Refrigerant materials.
   6. Identification of utilities.

B. Related Requirements:
   1. Section 011100 - SUMMARY OF WORK and Section 011400 - WORK RESTRICTIONS for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements for each School.
   2. Section 020100 - Maintenance of Existing Conditions.
   3. Section 311000 for site clearing and removal of above and below-grade improvements.
   4. Section 230015 - Mechanical Demolition.
   5. 260010 - Electrical Demolition.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, store, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

E. LEAD-SAFE working practices - an EPA term defining Contractor required procedures for containing work areas, minimizing dust and cleaning up when working with possible lead paint during construction projects.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.05 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at each Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure, if applicable.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.
   6. Review procedures for turning over salvaged materials to the Owner and protected off-site storage of materials to be reused in the work of the project.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting the public, pedestrian access and circulation areas and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: Submit a list of items to be removed, salvaged and delivered to Owner prior to start of demolition.

E. Pre-demolition Photographs and/or Video: Show existing conditions of adjoining existing construction and site conditions, including finish surfaces that could potentially be construed as having been damaged by Demolition activities. Submit two copies prior to commencing Demolition work.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerants, stating that all refrigerants that w present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.07 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous waste by a landfill facility licensed to accept hazardous wastes.

1.08 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.09 REGULATORY REQUIREMENTS

A. Comply with governing EPA and NYSDEC notification regulations before beginning Selective Demolition.

B. Conform to applicable state and local codes for demolition of structures, safety of adjacent structures, dust control, runoff control, disposal and utility removal and cap offs.

C. Obtain required permits from Regulatory and Governing Authorities.

D. Notify affected utility companies before starting Work and comply with their requirements.

E. Do not close or obstruct roadways, sidewalks or adjacent utilities without approval by authorities having jurisdiction and Architect.

F. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials. Hazardous and/or contaminated material removal are not the responsibility of this Contractor except where noted. Removal of all refrigerant from air conditioning and other cooling equipment is part of this contract for such equipment scheduled to be removed. Removal of light fixtures where indicated is part of this Contract.

1.10 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Assume all existing paint is lead base paint. Employ lead safe working practices when cutting, removing, and/or disturbing existing painted materials. EPA LEAD-SAFE working practices: http://www.epa.gov/lead/pubs/renovation.htm. See also OSHA 29 CFR Section 1926.62(a).

E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use and is included in this Division of the specifications. Examine report and / or the appropriate specification section to become aware of locations where hazardous materials are present.
   1. Hazardous material remediation is specified elsewhere in the Contract Documents.
   2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
   3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.
   2. Provide a Fire Watch or other method acceptable to the authority having jurisdiction should the existing fire protection facilities have to be shut down during the work.
   3. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to Owner, Construction Manager, and Architect.

1.11 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to perform an engineering survey of condition of buildings to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Section 011100 - SUMMARY OF WORK.

B. Existing Services/Systems to be removed, relocated, or abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies. Provide 5 days notice to the Architect prior to any utility shut-downs.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap, plug or reconnect remaining piping with same or compatible piping material.
      b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug or reconnect remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.
   1. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerants, stating that all refrigerants that were present was recovered and that recovery was performed according to EPA regulations and other authorities having jurisdiction regulations. Include name and address of technician and date(s) refrigerant was recovered.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building. Maintain existing required widths of egress pathways throughout.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.04 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Septic and/or holding tanks shall be pumped out by a licensed professional septic system contractor. Metal tanks shall be removed and disposed of in accordance with authorities having jurisdiction. Backfill tank excavations with select granular fill. Concrete tanks, distribution boxes

and drywells if outside the new structure footprint and pavement areas may be crushed (after pumping) and compacted in place or filled with lean concrete unless prohibited by local codes. Concrete septic tanks, drywells and distribution boxes within the new structure footprint and/or pavement areas shall be removed, backfilled in lifts and compacted with select granular fill.

B. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 1 inch (25 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.07 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.08 SELECTIVE DEMOLITION SCHEDULE

A. Remove, store, relocate, salvage and protect the following materials and equipment:
   1. Existing Items to Be Removed: Items indicated on contract drawings and items listed in technical specifications sections.
   2. Existing Items to Be Removed, relocated and/or Salvaged: Items required to be removed, relocated salvaged and/or stored to complete the work as indicated or called for in these construction documents.

B. Existing Items to Remain: to complete and conform to the work of the project shall be as indicated on the contract drawings and items listed in the technical specification sections.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Broad Scope: Asbestos containing materials (ACM) have been identified at the project site. Samples of various suspect materials have been collected and analyzed; additional samples may be required as existing materials are removed or revealed during the course of work. The scope of work and procedures outlined herein shall be followed by a New York State Department of Labor (NYS DOL) certified asbestos abatement contractor.

B. Related Sections:
   1. Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.

C. SCOPE OF WORK
   1. Removal of the following items described in the asbestos survey as positive for asbestos, in accordance with NYSDOL Industrial Code Rule (ICR) 56:
      a. Refer to construction drawings.
   2. Asbestos Containing materials must be removed only by a New York State Department of Labor (NYS DOL) licensed asbestos abatement contractor (herein referred to as the “Contractor”).
   3. The Contractor shall be aware of all conditions of the Project and is responsible for field verifying quantities and locations of all ACM to be removed from the building prior to submission of any bid. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work. The quantities presented in this Specification are approximate and should not be used solely as the basis for any bid. In the event that suspect materials not included in this Specification are encountered while the work is in progress, such material shall be tested for asbestos content or assumed positive for asbestos content, and removed in accordance with the procedures herein. Any discovery of new ACM shall not delay the progress of the Work. Payment for any additional work shall be considered on a case-by-case basis by the Engineer and Owner.
   4. All Work shall be performed in strict accordance with the Contract Documents and all applicable codes, rules, and regulations. Where conflicts occur between the Contract Documents and applicable codes, rules, and regulations, the more stringent shall apply.
   5. The Contractor's industrial hygiene practices during asbestos abatement will be monitored by the Owner’s representative. The Contractor shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.

1.02 SPECIAL JOB CONDITIONS

A. Any special job conditions, including variances to be obtained by the Contractor, are described herein.
   1. The contractor shall be responsible for obtaining any site specific variances.

1.03 CODES, PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56, 40 CFR 61, and 29 CFR 1926, as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.

C. State Licenses: The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
   1. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in, or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Industrial Code Rule 56.

2. The Contractor shall comply fully with the variances secured from regulatory agencies in the performance of the Work. The Contractor shall also be responsible for paying and complying with any additional variances. Should the Contractor choose to apply for any variance, approval from the Engineer is first required. In the event that the Contractor chooses to use more than one NYS Applicable Variance in the same Work Area simultaneously, the Contractor is responsible for complying with all conditions of each variance and any New York State Department of Labor (NYS DOL) interpretations concerning the use of these variances together.

D. Agency Notifications: The Contractor shall prepare written notification to EPA Region 2, and to the New York State Department of Labor (NYS DOL) at least 10 days prior to commencement of Work, when applicable. The Contractor shall be responsible for use and payment of any notifications required for performance of the Work.

E. It is the sole responsibility of the Contractor to determine what, if any patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He/She shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, and Construction Manager harmless from loss, including attorney's fees, on account thereof.

F. Before commencement of Work, the Contractor shall review and adhere to the Contract Documents. Failure to adhere to the Contract Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
5. 29 CFR 1926, "Construction Industry" (OSHA)
6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
7. 29 CFR 1926.2, "Variances from safety and health standards" (OSHA)
8. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
9. 29 CFR 1926.1200 "Confined Spaces in Construction" (OSHA)
10. 40 CFR 61, Subpart A, "General Provisions" (EPA)
11. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
12. 49 CFR 171-172, Transportation Standards (DOT)
13. 40 CFR Part 763, “Asbestos Hazard Emergency Response Act” (AHERA)

C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
4. New York State Department of Health (NYSDOH) Training Requirements

D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

1.05 AUTHORITY TO STOP WORK

A. The Owner shall have the authority to stop the abatement work at any time a determination is made that conditions are not within Specification and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the Owner. Standby time to resolve the problems shall be at the contractor's expense.

1.06 SUBMITTALS

A. Pre-contract Submittals. After bids are opened, the apparent low bidder shall submit the following documentation, in accordance with the project deadlines outlined in the Contract Documents. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
   1. Contractor license issued by New York State Department of Labor.
   2. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
   3. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
   4. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
      a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
      b. Any litigation or arbitration proceedings arising out of performance on past Projects.
      c. Any liquidated damages assessed within the last 2 years.
   5. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.

B. Pre-Work Submittals. The Contractor shall submit 3 copies of the documents listed below, in accordance with the project deadlines outlined in the Contract Documents:
   1. Progress Schedule:
      a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
      b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
   2. Notifications: As required by Federal, State and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
   3. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
   4. Abatement Work Plan: Provide plans which clearly indicate the following:
      a. All Work Areas/containments numbered sequentially.
      b. Locations and types of all decontamination enclosures.
      c. Entrances and exits to the Work Areas/containments.
      d. Type of abatement activity/technique for each Work Area/containment.
      e. Number and location of negative air units and exhaust.
      f. Proposed location and construction of storage facilities and field office.
      g. Location of water and electrical connections to building services.
   5. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
   6. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (encapsulant, surfactant, mastic remover, etc.).
   7. Laboratory: Submit the NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.

C. Project Close-out Submittal. Submit the following at the closeout of the Project:
   1. Copies of all waste disposal manifests, seals, and disposal logs.
   2. OSHA compliance air monitoring records conducted during the Work.
   3. Daily progress log.
   4. Entry and exit log.
   5. A list of each Worker used in the performance of the Project, including name, social security number, and New York State Department of Labor (NYS DOL) certification number.

1.07 HEALTH & SAFETY

A. Worker Protection: The Contractor shall comply with OSHA and provide and maintain all safety measures necessary to properly protect all individuals that enter the work area.

B. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Contractor shall immediately act in such a manner to prevent such threatened loss or injury.

C. Fire Protection, And Emergency Egress: The Contractor shall be responsible to the security and safeguarding of all areas turned over by the Owner to the Contractor. The Contractor shall designate to his workers and other building occupants the means of egress in case of emergency.

D. The Contractor shall establish emergency and fire exits from the work area. First aid kit, two (2) full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.

E. Contractor shall provide fire watch and logbook throughout the entire term of the project, to protect against fire and unauthorized entry into and around the work area. Any intrusion or incident shall be documented in the logbook. Fire watch personnel shall be present during off-hours shift such as night shift, weekends and holidays when abatement work is not in progress. Fire watch shall be a certified asbestos handler by New York State Department of Labor (NYS DOL).

1.08 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, and in accordance with the deadlines outlined in the Contract Documents, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Engineer, if requested.

B. Agenda for this conference shall include but not necessarily be limited to:
   1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
   2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
   3. Owner & Engineer’s duties, functions, and authority.
   4. Contractor's Work procedures including:
      a. Methods of job site preparation and removal methods.
      b. Respiratory protection.
      c. Disposal procedures.
      d. Cleanup procedures.
      e. Fire exits and emergency procedures.
   5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
   6. Temporary utilities.
   7. Handling of furniture and other moveable objects.
   8. Storage of removed asbestos containing materials.
   9. Waste disposal requirements and procedures.

C. In conjunction with the conference, if requested, the Contractor shall accompany the Owner and/or Engineer on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.09 PROJECT MONITORING, AIR SAMPLING, AND INSPECTIONS

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) or Engineer who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement period.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant/Engineer for the air sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant/Engineer during the course of the Project.

C. The Consultant/Engineer shall provide the following administrative services:
   1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
   2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
   3. Review and approve the Contractor's OSHA compliance testing laboratory.

D. The Consultant/Engineer shall provide abatement project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, pre-abatement, during-abatement and clearance sampling.
   1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) using NIOSH Method 7400. Results shall be available within 24 hours of completion of sampling.
   2. If the air sampling during abatement reveals airborne fiber levels at or above 0.01 fibers/cc or the background level (whichever is greater) outside the Work Area, then the Owner shall issue an immediate Stop Work order. The Contractor shall then inspect the barriers for leakage and HEPA vacuum and/or wet clean the surface outside the Work Area. The Contractor shall bear the burden of any and all costs incurred by this delay.
   3. Final air clearance sampling will be conducted by Transmission Electron Microscopy (TEM) in accordance with 40 CFR Part 763 (AHERA), as applicable.

1.10 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being utilized (OSHA Monitoring).

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by an New York State DOH ELAP approved laboratory.

1.11 WORK SUPERVISION

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
   2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
   3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.

B. If the Project Supervisor is not on-site, all Work shall be stopped. The Project Supervisor shall remain on-site whenever asbestos removal is being performed. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Engineer.

C. The Project Supervisor shall maintain the Project Log Book required by New York State Department of Labor and Section 2.03 of the specifications and the Waste Disposal Log required by Section 4.04 of the specifications.

D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.12 DELIVERY AND STORAGE

A. Deliver non-contaminated materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.
   1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
   2. Protect materials from unintended contamination.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.13 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos Work Areas.

B. Provide temporary 120-208 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
   1. Where available, obtain from Owner's existing electrical system. Otherwise provide power from other sources (i.e. generator).
   2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
   3. Provide adequate "weatherproof" receptacles, to incorporate use by the APM for air sampling equipment.
   4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
   1. The entire Work Area shall be kept illuminated at all times work is in progress.
   2. Provide lighting adequate for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

2.02 DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall be imprinted with U.S. Department of Transportation required markings.

B. If the asbestos waste has the potential to damage or puncture the disposal bags, burlap sacks shall be utilized as a liner inside the polyethylene disposal bags to prevent puncture or damage to the disposal bags. In addition, 30 or 55 gallon capacity fiber or metal drums capable of being

sealed air and water tight may also be used. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated in accordance with 40 CFR Part 61 NESHAPS.

D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.03 HEPA VACUUM EQUIPMENT

A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

2.04 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should the area beyond the Work Area(s) become contaminated with asbestos containing materials or elevated fiber levels, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for asbestos removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. New York State (NYS) DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.

C. Perform all asbestos removal Work using wet removal procedures. Dry removal procedures are not permitted.

D. The following documents shall be posted at the site at an easily accessible location:
1. Company Asbestos Abatement license.
2. Worker's asbestos handling certificates (copies are acceptable provided Workers have original certificates in their possession).
3. Project specifications.
4. Project drawings.
5. Notifications and variances.
6. Applicable regulations.
7. Material Safety Data Sheets.
8. Abatement Work plan.
9. List of emergency telephone numbers.
10. Waste Disposal Log.

E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

A. Full (five room) Decontamination Facility: The Contractor shall provide a full decontamination enclosure system for large asbestos projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).

B. Remote Decontamination Facility: The Contractor shall provide a remote personnel decontamination enclosure system for small asbestos projects, asbestos projects that utilize

multiple tents, and exterior asbestos roof projects in accordance with OSHA Standard 29 CFR 1926.1101 and 12NYCRR Part 56 (ICR 56).

C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor.

3.03 WASTE DECONTAMINATION ENCLOSURE

A. Waste/Equipment Decontamination Enclosure System: This system is located adjacent to the work area and personnel decontamination system. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. A remote decontamination unit may be used that complies with subpart 56-9 of NYS Industrial Code Rule 56 of Title 12, section 30 of the Labor Law. This remote enclosure system must be on the property and stationary, within 50 feet of the building.

B. Where only one egress from the Work Area exists, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.

C. The waste wash room water shall be drained, collected, and filtered as specified in 12NYCRR Part 56 (ICR 56).

D. In small asbestos projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

A. Personnel Entrance and Decontamination Procedures for Gross Removal Operations utilizing full decontamination facility, the following entry/exit procedures shall be used for gross removal using full containment:

1. All workers and authorized visitors shall enter the work area through the worker decontamination enclosure system.
2. All individuals who enter the work area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each work area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity.
3. Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator (with new filters, if appropriate) and clean protective clothing before entering the work area through the shower room and equipment room.
4. Each worker or authorized visitor shall, each time he/she leaves the work area: remove gross contamination from clothing before leaving the work area; proceed to the equipment room and remove all clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
5. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the work area is not permitted outside the work area.

B. Personnel Entrance and Decontamination Procedures for Removal Operations utilizing remote decontamination facility: The following entry/exit procedures shall be used for removal work areas.

1. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the

facility, agents, contractor(s), the project, each Work Area, and worker respiratory protection employed. The job supervisor shall be responsible for the maintenance of the log during the abatement activity.

2. Each worker shall remove street clothes in the clean room; wear two disposable suits, including gloves, hoods and non-skid footwear; and put on a clean respirator (with new filters) before entering the work area.
3. Each worker shall, before leaving the work area or tent, shall clean the outside of the respirators and outer protective clothing by wet cleaning and/or HEPA vacuuming. The outer disposable suit shall be removed in the work area and the worker shall then proceed to the shower room. The inner disposable suit and respirator shall be wet wiped and HEPA vacuumed thoroughly before removing and prior to aggressive shower.
4. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately.

3.05 WORK AREA PREPARATION

A. Work Area preparation shall be performed in accordance with 12NYCRR Part 56 (ICR 56), the Contract Documents and the approved Asbestos Work Plan.

B. Temporary lighting within the work area and decontamination system shall be provided as required to achieve minimum illumination levels.

C. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil polyethylene or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation, he/she shall be responsible for reinsulation, if reinsulation of removed ACM is part of the Contract or Project.

D. Emergency exits. Emergency exits and routes shall be established and clearly marked with florescent paint or other effective designations to permit easy location from anywhere within the work area. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.

E. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.

F. If, required, suspended ceiling tiles shall only be removed after Work Area preparation is complete. Non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.

G. For tent enclosures: the Contractor shall use negative pressure ventilation equipment to continuously exhaust the enclosed area. A minimum of two (2) volume changes per hour is required. All required air monitoring must be successfully completed before the tent/barrier is collapsed.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement.

B. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.

C. At no time will the unit exhaust indoors, within 50 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building.

D. The Contractor shall provide either a manometer or a photohelic style negative air pressure gauge with chart recorder to measure and record negative pressure differential across the Work Area barriers without interruption 24 hours per day as directed by the Environmental Consultant.

E. There shall be at least a 12-hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers. Unless otherwise specified in the variance(s) utilized by the contractor.

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Asbestos-containing materials shall be removed in accordance with 12NYCRR Part 56 (ICR 56), the Contract Documents and the approved Asbestos Work Plan.

B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.

C. One Worker shall continuously apply amended water while ACM is being remove

D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

E. Power or pressure washers will not be allowed to be used for asbestos removal or clean-up procedures.

3.08 ACM WASTE CONTAINERIZING, DECONTAMINATION AND LOAD OUT PROCEDURES

A. Packaging of ACM shall conform to OSHA Standard 29 CFR 1926.1101, DOT 49 CFR 171, 172, and 173, and EPA Standard 40 CFR Part 61 and the requirements as herein specified. Materials to be transported through a non-Work area building space shall be placed in hard wall shipping containers for handling.

B. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

C. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

D. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 WORK AREA CLEANING PROCEDURES

A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, decontamination procedures shall be followed as specified in ICR 56, unless otherwise stated in the variance(s) utilized by the Contractor.

B. Following each decontamination procedure (i.e., first, second, and third cleanings) the APM shall inspect the Work Area for effectiveness of the cleanings. If necessary, additional cleaning shall be performed by the Contractor as directed by the APM.

C. As a result of any air sampling results that indicate high fiber levels, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

A. Tent enclosures may only be used in areas specifically permitted by New York State (NYS) Code Rule 56 or a Project specific variance issued by the New York State (NYS).

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.

D. During removal activity, a HEPA vacuum or small capacity negative pressure filtration unit shall be used to provide a negative air pressure inside the tent. A minimum of six air changes per hour is required.

E. Workers shall wear two disposable suits for all phases of Work. Workers exiting the tent shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another tent.

F. ACM removal shall follow procedures defined in Article 3.07.

G. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be transported to the decontamination enclosure and then bagged for a third time and transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

H. The APM shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.

3.11 GLOVEBAG REMOVAL

A. Glovebag removals may only be used as specifically permitted by New York State (NYS) Code Rule 56 , Applicable Variance 108 (AV 108) Glovebag Operations, or a Project specific variance issued by the New York State (NYS) Department of Labor. Glovebags may only be used on piping.

B. As specified in applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications. Removal and disposals must also be conducted in conformance with all Project variance conditions.

C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

D. Remote personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.

E. The glovebags shall be smoke tested by the APM before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.

F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.

1. Finishes unable to be restored shall be replaced under this Contract.
2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where re-insulation is part of the required work.

3.13 ASBESTOS WASTE

A. Applicable Regulations: All asbestos waste shall be stored, transported and disposed of in accordance with the following regulations as a minimum:
   1. NYS DEC 6 NYCRRNYRCC part 360 and 364.
   2. US EPA NESHAPS 40 CFR 61.
   3. US EPA Asbestos Waste Management Guidance EPA/530-SW85.

B. Waste Storage Containers.
   1. As work progresses, remove sealed and labeled bags of ACM from the Work area and place in a lockable trailer, dumpster, or other container approved for storage or transport of asbestos waste. Open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).
   2. The container interior shall be plasticized and sealed with a minimum of two (2) layers of 6 mil polyethylene.
   3. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

   4. The danger sign legend, text size, style and arrangement shall conform to the requirements of EPA Standard 40 CFR Part 61.149 (d) (1).
   5. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
   6. Once the container is loaded at the site, the door(s) will be locked at all times.
   7. Before the container is removed from the Project Site for transportation to the Disposal Site, the door(s) shall be locked. The locks shall be removed at the Disposal Site by the operator of the Disposal Facility.
   8. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

3.14 DISPOSAL AND TRANSPORTATION OF ASBESTOS-CONTAMINATED WASTES

A. Sealed and labeled disposal bags or waste wrapped in two layers of plastic sheeting sealed airtight shall be used to transport asbestos-contaminated waste to the landfill. Procedures for hauling and disposal shall comply with 40 CFR, Part 61, 49 CFR, Part 171 and 172, and other applicable state, regional, and local government regulations.
   1. An asbestos waste shipment record or waste manifest shall accompany asbestos waste, which is transported to a disposal site.
   2. The waste manifest shall be completed by the Contractor.
   3. The waste manifest shall have the appropriate signatures of the APM, the Contractor, and the Hauler representatives prior to any waste being removed from the site.
   4. Copies of the completed waste manifest shall be retained by APM and the Contractor and shall remain on site for inspection. The Contractor shall forward originals of the waste manifest, which include final sign-off by the disposal facility, to Consultant/Engineer within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

3.15 DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.

B. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.

C. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site without unauthorized stops.

END OF SECTION

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PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Related Sections:
   1. Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.

B. This lead-based paint and material removal project will consist of the localized removal of loose and/or damaged lead based paint in the areas indicated in the report attached herewith.

C. The work shall include, but not be limited to removal and disposal of the following:
   1. All positive lead containing materials greater than regulatory level of 1.0 described in the lead paint inspection report attached within Specification Section 022600 - HAZARDOUS MATERIALS ASSESSMENT.

D. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.

E. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

F. Refer to SSPC C3/5 requirements, when applicable, when removing lead on commercial buildings and superstructures including on all steel where impact is not incidental and activities include but are not limited to; abrasive blasting, water jetting, power tool usage, and other large dust producing remedial activities.

1.02 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. The Contractor must maintain current licenses pursuant to New York State Department of Labor, Department of Environmental Conservation and Environmental Protection Agency for all Work related to this Project, including the removal, handling, transport, and disposal of lead containing materials.

C. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any lead Project have prior experience on similar projects. If in the course of the project there should be materials or surfaces that contain asbestos, the contractor and all workers must be certified by the NYS Department of Labor as handlers and contractor/supervisors. It is then the responsibility of the contractor to also follow the asbestos specification for this project.

D. It is the sole responsibility of the Contractor to determine what, if any, patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. He shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, Environmental Consultant, and Construction Manager harmless from loss, including attorney's fees, on account thereof.

E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.03 SUBMITTALS

A. Pre-contract Submittals: Within 3 days after bids are opened, the three apparent low bidders shall submit the following documentation. Failure to submit all required documentation truthfully or in a timely manner may be cause for rejection of the bid.
   1. Contractor certifications issued by the Environmental Protection Agency.
   2. The number of years engaged in lead-based paint renovation and remolding projections.

3. A list of Projects performed within the past two (2) years and include the dollar value of all Projects. Provide Project references to include Owner, consultant, contact persons, address, and phone number.
4. A list of owned equipment available to be used in the performance of the Project.
5. An outline of the Worker training course and medical surveillance program conducted by the Contractor.
6. A standard operating procedures manual describing Work practices and procedures, equipment, type of decontamination facilities, respiratory program, special removal techniques, etc.
7. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
   a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous lead contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
   b. Any Stop Work Orders issued on Projects within the past 2 years.
   c. Any litigation or arbitration proceedings arising out of performance on past Projects.
   d. Any liquidated damages assessed within the last 2 years.
8. Preliminary Schedule: Provide an estimate of manpower to be utilized and the time required for completion of each major Work Area. Include estimated size and number of crews and work shifts.

B. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below:
   1. Progress Schedule:
      a. Show the complete sequence of lead related activities and the sequencing of Work within each building section.
      b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area or phase.
      c. Show projected percentage of completion for each item, as of the first day of each month.
      d. Show final inspection dates.
   2. Permits: As required by State and local regulations, including arrangements for storage, transportation, and disposal of contaminated material.
   3. Lead Activities Work Plan: Provide plans which clearly indicate the following:
      a. All Work Areas/containment's numbered sequentially.
      b. Locations and types of all decontamination enclosures.
      c. Entrances and exits to the Work Areas/containment's.
      d. Type of lead related activity/technique for each Work Area/containment.
      e. Proposed location and construction of storage facilities and field office.
      f. Location of water and electrical connections to building services.
   4. Equipment: Submit manufacturer's data sheets/product descriptions of all equipment and products including HEPA vacuums, respirators, protective clothing, chemicals, etc. identified in this specification.
   5. Samples: Submit samples of warning notices to be posted, replacement materials, etc.
   6. Worker Training, Medical Surveillance, and Certification:
      a. The Contractor shall submit a list of persons to be employed for the Project.
      b. Present evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926. 62.
      c. Submit documentation that Workers have been fit tested specifically for respirators used on the Project.
      d. Submit copies of Proof of Lead Renovation Remolding certification for each person employed in the disturbance of lead.
   7. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.

8. Material List: A complete materials list of all items proposed to be furnished and used under this Contract.
9. Subcontractor List: List of all subcontractors to be used on the Project (i.e. Waste Hauler).
10. Material Safety Data Sheets (MSDS): Copies of MSDS for each chemical or material used for the Project (paint stripper, surfactant, etc.)
11. Project Supervisor: Resume of the proposed Project Supervisor.
12. Rental Notifications: Notices sent to rental suppliers informing them of the nature of the Work that the Contractor intends to use the equipment for.
13. Worker's Acknowledgments: Statements signed by each employee that the employee has received training in the proper handling of lead containing paint; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
14. Laboratory: Submit the documentation that the laboratory performing the OSHA personnel air samples is recognized as an Environmental Protection Agency National Lead Laboratory Accredited Program (NLLAP) accredited laboratory.
15. HUD Title X: "Guidelines for the Evaluation and Control of Lead Based Paint."

C. Project Close-out Submittals: Submit the following at the closeout of the Project:
1. Copies of all waste disposal manifests, seals, and disposal logs.
2. OSHA compliance air monitoring records conducted during the Work.
3. Daily progress log.
4. Entry and exit log.
5. A list of all EPA Certified Workers used in the performance of the Project, including name, social security number.
6. Required Employee Statements including Medical Examination Statement, Worker's Acknowledgment Statement, and Employee Training Statement.

1.04 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of Workers and shifts.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
    a. Methods of job site preparation and removal methods.
    b. Respiratory protection.
    c. Disposal procedures.
    d. Cleanup procedures.
    e. Fire exits and emergency procedures.
5. Contractor's plan for twenty-four (24) hour project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
6. Temporary utilities.
7. Handling of furniture and other moveable objects.
8. Storage of removed lead containing paint.
9. Waste disposal requirements and procedures.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.05 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
   1. 29 CFR 1910, Occupational Safety and Health Standards
   2. 29 CFR 1926, Safety and Health Regulations for Construction
   3. 40 CFR 148, Hazardous Waste Injection Restrictions
   4. 40 CFR 260, Hazardous Waste Management System: General
   5. 40 CFR 261, Identification and Listing of Hazardous Waste
   6. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
   7. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
   8. 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   9. 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   10. 40 CFR 268, Land Disposal Restrictions
   11. 40 CFR 745, Lead; Identification of Dangerous Levels of Lead; Proposed Rule
   12. 49 CFR 172, Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements
   13. 49 CFR 178, Specifications for Packaging
   14. HUD 0005646, (1990; Rev May 1991) Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing

C. Standards and Guidance Documents:
   1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
   2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
   3. UL 586, (1990) High-Efficiency, Particulate, Air Filter Units
   4. NIOSH OSHA Booklet 3142, Lead in Construction
   5. NFPA 701, (1989) Methods of Fire Test for Flame-Resistant Textiles and Films
   6. EM 385-1-1, (1992) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.06 NOTICES

A. The Contractor shall post and/or provide notification to building occupants 10 days prior to beginning lead activities. The posting shall include the following information:
   1. The locations of the lead Renovation Remolding Project.
   2. The amounts and types of materials being removed and/or disturbed.
   3. The commencement and completion dates of the Project.
   4. The name, address, and certification of the Lead Contractor.
   5. The name and address of the Environmental Consultant and laboratory.

1.07 PROJECT MONITORING AND WIPE SAMPLING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the lead-based paint Project and provide direction as required throughout the entire lead period.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the wipe sampling and project monitoring functions described below. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall provide the following administrative services:
   1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
   2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
   3. Review and approve the Contractor's OSHA compliance testing laboratory.

D. The Consultant shall staff the Project with a trained person(s) to act on the Owner's behalf at the job site. At a minimum the trained person(s) shall be certified as a lead inspector or risk assessor. This individual shall be designated as the Lead Project Monitor (LPM).
   1. The LPM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the LPM is on-site.
   2. The LPM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The LPM shall have the authority to Stop Work when gross work practice deficiencies or unsafe practices are observed.
      a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
      b. Standby time required to resolve the situation shall be at the Contractor's expense.
   3. The LPM shall provide the following services:
      a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
      b. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
      c. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
      d. Monitor, verify, and document all waste load-out operations.
      e. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
   4. The following minimum inspections shall be conducted by the LPM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of work to the next by the Contractor is only permitted with the approval of the LPM.
      a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
      b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any lead containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
      c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the LPM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
      d. Visual Clearance Inspection: The purpose of this inspection is to verify the Contractor's certification that all materials have been removed from the Work Area and the absence of all visible accumulations of debris in the Work Area.
      e. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that work has been completed as contracted and the existing condition of the area prior to its release to the Owner.
   5. The LPM shall perform lead wipe (lead-dust clearance) sampling as follows:
      a. Wipe samples shall be collected from one sill surface and floor area surface where doors have been removed following the lead contractor's final cleaning of the work area. Lead wipe samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.
   6. The LPM shall perform a pilot air monitoring project as follows:
      a. Air samples shall be collected during the first phase of the lead project to determine if lead removal methods are generating airborne lead dust at concentrations exceeding regulatory guideline for locations exterior the Work Area. At least one air sample will be collected at the entrance to the Work Area and at critical barriers.
      b. Should it be established that airborne lead-dust concentrations, exterior to the work area, are within the applicable guidelines, no further air monitoring will be performed.

Should airborne lead-dust concentrations, exterior the work area, be determined to exceed the applicable guideline concentration, additional engineering controls will be implemented and the pilot project repeated. Once affective engineering controls have been established and implemented, no further air monitoring will be performed.

c. Lead air samples shall be analyzed by a NLLAP laboratory. Results shall be available within 24 hours of completing sampling.

1.08 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.62, the Contractor shall be required to perform personal air monitoring to determine that appropriate respiratory protection is being utilized.

B. The Contractor's laboratory analysis of air samples shall be conducted by NLLAP approved laboratory, subject to approval of the Environmental Consultant.

C. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days.

1.09 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall hold Lead certification for the renovation & remolding of lead-based paint.
   2. The Project Supervisor shall have a minimum of one-year experience as a supervisor.
   3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.

B. Prior to the commencement of Work, the Contractor shall submit the proposed Project Supervisor's resume to the Owner and Environmental Consultant for approval.

C. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant.

D. The Project Supervisor shall maintain the Project Log Book required by section 2.03 of the specifications and a Waste Disposal Log.

E. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Lead Project Monitor.

1.10 MEDICAL REQUIREMENTS

A. Employers must make available medical examinations to all employees covered under the medical surveillance program. Medical exams must be performed:
   1. Medical Surveillance should have undergone an initial medical surveillance examination
   2. At least annually when tests within the preceding 12 months indicated a blood lead level at or above 40 µg/dl;
   3. Prior assignment for each employee for the first time to an area in which lead concentrations are above the action level;
   4. As soon as possible when employee has developed signs or symptoms of lead exposure;
   5. For employees medically removed from work area; and
   6. For employees as final medical determination.

B. The medical exam consists of the following:
   1. A detailed work and medical history with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematological, renal, cardiovascular, reproductive and neuralgic problems.

2. Through physical examination with particular attention to tooth, gums, hematological, gastrointestinal, renal cardiovascular, and neurological systems. Pulmonary status must be evaluated if respiratory protection will be used.
3. Blood sample and analysis which determines:
   a. Blood lead level;
   b. Hemoglobin and Hematocrit determinations, red cells indices and examination of peripheral smear Morphology;
   c. Zinc protoporphyrin;
   d. Blood Urea Nitrogen (BUN);
   e. Respirator Health Check;
   f. Pulmonary function testing;
   g. Chest X-ray;
   h. Electrocardiogram.

C. Employees may seek a secondary physician for a second opinion to review initial results, and conduct examination consultations and laboratory tests deemed necessary. If two physicians disagree and are unable to resolve differences a third physician may be contacted (see OSHA Lead Standard 29 CFR 1910.1025(j) for more details).

1.11 TRAINING

A. As required by applicable regulations, prior to assignment to lead Work instruct each employee with regard to the hazards of lead, safety and health precautions, and the use and requirements of protective clothing and equipment.

B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.62. Provide respirator training and fit-testing.

1.12 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.

C. Respiratory protection will be based upon whether Class 1, 2, and 3 tasks are being performed, in accordance with 29 CFR 1926.62.

D. No respirators shall be issued to personnel without such personnel participating in a respiratory training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.62.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the Workday. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour Workday.

I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.13 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.

C. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.

D. Protect materials from unintended contamination.

E. Remove damaged or deteriorated materials from the job site. Materials contaminated with lead shall be disposed of as lead debris as herein specified.

1.14 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the lead Work Areas.

B. Provide temporary 120-280 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the lead Work Area.
   1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
   2. Provide temporary wiring and "weatherproof□receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
   3. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment.
   4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

C. Provide temporary lighting with "weatherproof□fixtures for all Work Areas including decontamination chambers.
   1. The entire Work Area shall be kept illuminated at all times.
   2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet wiping.

E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

2.01 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, headcoverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing lead Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.02 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to lead Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.

1. Provide danger signs in vertical format conforming to 29 CFR 1926. Minimum 20” x 14” displaying the following legend.

DANGER
LEAD WORK AREA
POISON
NO SMOKING OR DRINKING
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA

2. Provide 3” wide yellow barrier tape printed with black lettered, “DANGER LEAD REMOVAL”. Locate barrier tape across all corridors, entrances and access routes to lead Work Area. Install tape 3’ to 4’ AFF.

B. Provide lead danger labels affixed to all lead materials, scrap, waste, debris and other products contaminated with lead.

1. Provide lead danger labels of sufficient size to be clearly legible, displaying the following legend, or equivalent:

DANGER
CONTAINS LEAD
AVOID CREATING DUST
POISON HAZARD

2. Provide the following lead labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport lead contaminated material in accordance with United States Department of Transportation 49 CFR, Part 745.
3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
   a. Generator Name:
   b. Facility Name:
   c. Facility Address:

2.03 PROJECT LOG BOOK

A. Provide a permanently bound Project log book of minimum 8-1/2” x 11” size. Log book shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Lead Contractor; emergency numbers including, but not limited to local Fire/Rescue department.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.

D. The Project Supervisor shall document all Work performed daily and note all inspections.

2.04 SCAFFOLDING AND LADDERS

A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular

welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.05 SURFACTANT (AMENDED WATER)

A. Wet all lead-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

2.06 ENCAPSULANT

A. Following lead scrapping, an encapsulant material shall be applied to the scrapped surfaces and remaining surfaces containing lead-based paint.

B. Approved Manufacturer:
   1. KapsulKote Inc.: KapsulKote II System – PrimerKote and FinishKote
   2. Premier Coatings, Inc.: Lead Block
   3. GLOBAL Encasement, Inc.: LeadLock GE-40
   4. Fiberlock Technologies, Inc.: L-B-C Lead Barrier Compound
   5. Fiberlock Technologies, Inc.: LeadMaster

2.07 DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags. Bags shall also be imprinted with U.S. Department of Transportation required markings.

B. Provide 30 or 55 gallon capacity fiber or metal drums capable of being sealed air and water tight if lead waste has the potential to damage or puncture disposal bags. Affix lead caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled with the names of the waste generator and the location at which the waste was generated.

D. Labeled lead waste containers or bags shall not be used for non-lead waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as lead waste.

2.08 HEPA VACUUM EQUIPMENT

A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

C. Approved Manufacturers:
   1. Hako Minuteman
   2. Micro-Trap Inc.
   3. Control Resource Systems, Inc.

2.09 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb lead material shall be equipped with HEPA filtered local exhaust ventilation.

2.10 POLYETHYLENE SHEETING

A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire-retardant sheeting.

B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire-retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire-retardant plastic sheeting shall be used for the flooring.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should the area beyond the Work Area(s) become contaminated with lead containing materials, immediately stop Work and institute emergency procedures. Contaminated non-Work Areas shall be isolated and decontaminated in accordance with procedures established for lead removal. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. Medical approval, fit test reports, Worker Acknowledgments, and EPA certificates shall be on site prior to admittance of any Contractor's employees to the Work Area.

C. Perform all lead removal Work using wet removal procedures. Mix and apply surfactant in accordance with manufacturers written instructions. Dry removal procedures are not permitted.

D. The following documents shall be posted at the site at an approved location:
   1. Company license.
   2. Daily personal air monitoring results.
   3. Worker's EPA certificates (copies are acceptable provided Workers have original certificates in their possession).
   4. Medical records.
   5. Fit test reports.
   6. Project specifications.
   7. Project drawings.
   8. Notifications.
   9. Applicable regulations.
   10. Material Safety Data Sheets.
   11. Lead Work plan.
   12. List of emergency telephone numbers.
   13. Waste Disposal Log

E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

A. Provide a personnel decontamination enclosure contiguous to the Work Area, unless otherwise specified. The decontamination enclosure shall be attached to the Work Area and not located within it. If the decontamination chamber is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry. Alternately, a remote decontamination enclosure can be situated within 150 feet of the Work Area. Contamination enclosure requirements set forth in this part shall apply with the exception to Section 3.02.B. Access to the Work Area will not be directly through the decontamination enclosure.

B. Access to the Work Area will be from the clean room through an air-lock to the shower, through an air lock to the equipment room then into the Work Area. Each airlock shall be a minimum of three feet from door to door.

C. The decontamination enclosure ceiling and walls shall be covered with two layers of opaque 6 mil fire-retardant polyethylene sheeting. Two layers of 6 mil fire-retardant reinforced polyethylene sheeting shall be used to cover the floor.

D. Establish a triple layer of six mil fire-retardant polyethylene at the decontamination chamber doorways, weighted to insure a tight seal of the enclosure. Prior to establishing doorway seals move all required tools, scaffolding, and equipment into the Work Area.

E. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.

F. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

G. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be collected in a non-corrosive container and disposed of as lead waste according to all applicable laws.

H. The equipment room shall be used for the storage of tools and equipment. A labeled 6 mil plastic waste bag for collection of contaminated clothing shall be located in this room.

I. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Lead Project Monitor.

3.03 WORK AREA ENTRY AND EXIT PROCEDURES

A. Access to and from the Work Area is permitted only through the personnel decontamination enclosure.

B. Workers shall sign the entry/exit log upon every entry and exit.

C. The following procedures shall be followed when entering the Work Area:
   1. Before entering the Work Area, workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators. Two layer of protective clothing shall be required when a remote decontamination enclosure is being utilized.
   2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.

D. The following procedures shall be followed when exiting the Work Area:
   1. Before leaving the Work Area, gross lead contamination will be removed by wet cleaning and HEPA vacuuming. At least two wet cleanings shall be performed with separate cleaning solutions and rinse waters.
   2. In the equipment room, workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room. For remote decontamination enclosures, one layer of protective clothing shall be removed prior to exiting the Work Are air lock.
   3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal. Disposal towels shall be provided as well as a 6 mil plastic disposal bag for the collection of the contaminated towels.
   4. Upon exiting the shower, workers shall don new disposable clothing if work shift is to continue or street clothes to exit area. Under no circumstances shall workers enter public non-Work Areas in disposable protective clothing.

3.04 WORK AREA PREPARATION

A. Danger signs shall be posted at all approaches to the Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs. The Work Area shall be considered to include the entire room in which the window or door being addressed is located and any exterior locations constructed to enable the activities.

B. Shut down and lock out the building heating, ventilating, and air conditioning and electrical systems. Provide temporary electric power and lighting as specified herein.

C. All surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited.

D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.

E. Should a construction barrier be constructed at the window or door opening being addressed, Paragraph 3.05.K will not be required.

F. All non-movable equipment in the Work Area shall be completely covered with 2 layers of fire-retardant polyethylene sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive.

G. Provide enclosure of the Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved Work plan and as specified herein.

H. Seal off all openings including but not limited to windows, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations of the Work Area enclosure, using 2 layers of at least 6 mil fire-retardant polyethylene sheeting to form a critical barrier.

I. Provide temporary framing and sheathing at openings larger than 32 square feet, which form the limits of the Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire-retardant polyethylene sheeting to form an isolation barrier.

J. Isolation barriers shall be installed at all elevator openings in the Work Area. Elevator controls shall be modified so that elevators bypass the Work Area.

K. Provide two layers of 6 mil fire-retardant polyethylene sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two layers (for a total of four layers). Sheeting shall be secured with spray adhesive and then sealed with duct tape. All joints in polyethylene sheeting shall overlap 12” minimum. Note that floor sheeting does not eliminate dust clearance sampling of the floor area below the sheeting and/or sampling of the sheeting floor area. Failure of either type of dust clearance sampling requires additional cleaning of the Work Area by the Contractor at no additional expense to the Owner.

L. Frame out emergency exits. Provide double layer 6 mil fire-retardant polyethylene sheeting and tape seal opening. Post as emergency exits only. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.

3.05 RENOVATION AND REMOLDING OF LEAD-BASED PAINT

A. Renovation and Remolding shall be conducted in accordance with the Contract Documents and the approved Lead Work Plan.

B. If Lead-based Paint surfaces need to be addressed then it should be accomplished with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material if it does not display evidence of saturation.

C. One Worker shall continuously apply amended water while lead based paint is being removed.

D. Removal of lead-based paint shall be accomplished through manual scrapping.

E. Perform cutting, drilling, abrading, or any penetration or disturbance of lead containing material in a manner to minimize the dispersal of lead into the air. Use equipment and methods specifically designed to limit generation of airborne particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

F. Upon removal of lead from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc. Wet and bag the debris as it is removed, using a 6 mil plastic disposable bag.

G. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate or whenever there is enough accumulation to fill a single bag or container. Maintain the surfaces of the Work Area free of accumulation of lead debris.

H. Dust-tight enclosed inclined chutes shall be used for materials dropped from distances greater than 10 ft.

I. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

J. Power or pressure washers will not be allowed to be used for lead-based paint removal or clean-up procedures.

K. All construction and demolition debris determined by the Environmental Consultant to be contaminated with lead shall be handled and disposed of as lead waste.

3.06 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The Work Area persons shall not enter the airlock. Large components may be moved directly to a waste container when a remote decontamination enclosure is being utilized. The component must be decontaminated within the work area and posse no health concerns when removed from the Work Area.

B. The cleaned containers of lead material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.

C. Containers and equipment shall be moved from the work area and into a holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.

D. The cleaned containers of lead material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

E. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

F. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.07 WORK AREA DECONTAMINATION

A. Following completion of gross removal activities and after all accumulations of lead waste materials have been containerized, the following decontamination procedures shall be followed, unless otherwise specified.

B. Daily Cleaning:

1. According to the HUD Guidelines, "A thorough cleanup of the entire area under active abatement should occur daily during the entire abatement process. This daily cleanup should consist of the following:
    a. Large Debris:
        1) Large demolition-type debris (e.g., doors, windows, trim) should be wrapped in 6-mil plastic, sealed with tape, and moved to the area designated for trash storage on the property. Since lead-contaminated debris is a potentially hazardous waste, it should never be stored outside while awaiting removal/disposal. Consequently, an area inside the property must be designated as a temporary trash storage area, unless an approved container is to be located exterior to the building.
    b. Small Debris:
        1) Small debris should be collected by wet mopping or wet sweeping and disposed of properly. However, before any sweeping occurs, the affected surfaces should be sprayed with a fine mist of water, to keep surface dust from becoming airborne and potentially containing other areas of the property and lead workers. Dry sweeping is prohibited. The swept debris should be placed in double 4-mil or

single 6-mil plastic bags, properly sealed, and moved to the designated trash storage area. Care should be taken not to overload trash bags, which otherwise may rupture or puncture during handling and transport.

c. Exterior Cleanup:

1) Using a containment system should protect unabated areas potentially affected by exterior lead activities. Because weather can adversely affect the exterior of the containment, the surface plastic of the containment system should be removed at the end of each workday. On a daily basis, as well as during final cleanup, the immediate area should be examined visually to ensure that no lead debris has escaped containment. Any such debris should be raked or wept swept and placed in single 6-mil or double 4-mil plastic bags, which should then be sealed and stored along with other contaminated debris.

2) At the conclusion of the lead activities, a final cleanup must occur. This is a much more thorough process than the daily cleanup. Failure to perform an adequate final cleanup will result in failure to pass post-lead-dust clearance.

C. Preliminary Final Cleanup:

1. Before final cleanup can begin and before abated surfaces can be painted or sealed, the plastic sheeting used for containment must be removed. This contaminated plastic sheeting must be removed and disposed of very carefully. Removal should start with upper-level plastic, as applicable. The plastic should be sprayed or misted with water to hold down dust, and then folded in upon itself to trap any dust residues inside. Before removal of floor plastic, it should be sprayed and swept as detailed earlier in this chapter. It should be folded carefully from the corners/ends to the middle to trap any remaining lead dust and placed into double 4-mil or single 6-mil plastic bags that are then sealed and removed from the premises. As with daily cleanups, this plastic removal process requires the use of protective equipment, especially appropriate respirators. Plastic sheets used to isolate contaminated rooms from non-contaminated rooms should not be removed at this time. These sheets should remain until after the preliminary final cleanup/final cleanup is complete and satisfactory lead dust clearance results are obtained. Then the plastic sheets used to isolate contaminated rooms from non-contaminated rooms should be carefully removed as described above.
2. After the plastic has been removed from the contaminated area, the entire area should be HEPA-vacuumed as detailed in HUD Guidelines, Section 10.2.1, starting with the rooms farthest from the entrance to avoid retracking dust through the already-cleaned area. In each room, vacuuming should begin with the ceilings and proceed down the walls, making sure every surface is treated, including doors and door trim, windows, window sills, wells, and trim, baseboards, etc
3. The entire affected area should next be washed down with a TSP solution as detailed above and then it should be HEPA-vacuumed again using the steps already outlined. The contractor must not deviate from or skip any step. To do so could mean that hazardous levels of lead dust and residue could be embedded in the new paint and mobilized later when that paint deteriorates or is abraded.
4. Prior to and after isolation and critical barriers are removed, the Lead Project Monitor shall inspect the Work Area for cleanliness. If necessary, additional cleaning shall be performed by the Contractor as directed by the Lead Project Monitor.
5. As a result of any visual inspection by the Lead Project Monitor, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

D. Final Cleanup Procedures

1. The final clean-up procedures is as follows:
   a. Remove the top layer of 6-mil poly and seal in bags or clean 6-mil poly.
   b. Remove bags of poly and store in a secure area.
   c. Vacuum all surfaces with a HEPA-equipped vacuum beginning with the ceiling and working down.

d. Wash all surfaces with TSP (trisodium phosphate) detergent.
e. Vacuum all surfaces a second time.
f. Wash all surfaces a second time.
g. Remove all contaminated equipment and material to secure storage area.
h. Removal final layer of poly, except isolation and critical barriers are to remain. Isolation and critical barriers are to be removed following satisfactory lead wipe clearance results.
i. Vacuum floors with HEPA-equipped vacuums.
j. Wash surfaces again with TSP.
k. Vacuum again.
l. Seal surfaces with paint, polyurethane, or wax.

E. Cleanup Confirmation (Lead Dust Clearance)
1. The LPM will be collection lead wipe samples to confirm the effectiveness of the cleanup activities. Lead-dust results shall be available within 24 hours of completing sampling. Following satisfactory reporting of the results, all isolation and critical barriers shall be removed. Should results indicate lead-dust present at concentrations exceeding the acceptable guideline level, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.
2. The established clearance level for dust-lead for floors is 10 micrograms per square foot (ug/ft2) and for window sills the clearance level is 100 micrograms per square foot (ug/ft2). This level has been established as part of Title 40 of the Code of Federal Regulations Part 745 (40 CFR Part 745). If the contractor should fail the wipe tests for lead dust clearance, the contractor shall pay for additional testing until clearance is obtained

3.08 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

B. Finishes damaged by lead activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment, unless the damaged surfaces are to be replaced during renovation activities.
1. Finishes unable to be restored shall be replaced under this Contract.
2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of lead activities.

PART 4 - DISPOSAL OF LEAD WASTE

4.01 APPLICABLE REGULATIONS

A. All lead waste shall be stored, transported and disposed of in accordance with the following regulation(s) as a minimum:
1. NYS DEC 6 NYCRR.

4.02 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor’s Hauler and Disposal Site shall be approved by the Owner.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal Working hours unless otherwise specified. No waste may be taken from the site unless the Environmental Consultant is present and authorizes the release of the waste as described herein.

C. The Contractor shall have the Hauler provide the estimated date and time of arrival at the Disposal Site.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Hauler’s Permit.

The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Waste Manifests.

F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site lead material. The Hauler must travel directly to the disposal site without unauthorized stops.

4.03 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.), open containers will not be permitted on-site (i.e. open dumpster with canvas cover, etc.).

B. The Environmental Consultant shall verify that the waste storage container tags (license plates) match that listed on the New York State Department of Environmental Conservation permit. Any container not listed on the permit shall be removed from the site immediately.

C. The container shall be plasticized and sealed with a minimum of one (1) layer of 6 mil polyethylene on the sides and two (2) layers of 6 mil polyethylene on the floor.

D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS LED
AVOID CREATING DUST
POISON HAZARD

E. The New York State Department of Environmental Conservation Hauler's Permit number shall be stenciled on both sides and back of the container.

F. Once the container is loaded at the site, the door(s) will be locked at all times.

G. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

H. Before the container is removed from the Project Site for transportation to the Disposal Site the locks shall be removed at the Disposal Site by the operator of the Disposal Facility and returned by the Disposal Facility to the Contractor.

1. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

END OF SECTION

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PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Underslab vapor retarder.

1.02 REFERENCES

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Concrete Construction; 2020.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting; 2020.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 308R - Guide to External Curing of Concrete; 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete; 2019, with Errata (2021).

J. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

K. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2019.

L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

M. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2022.

N. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2022.

O. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

P. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

Q. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2022.

R. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

T. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

V. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory; 2019.

W. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

X. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

Y. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

Z. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2022.

AA. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2022.

BB. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2024.

CC. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

DD. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).

EE. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

FF. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2017).

GG. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

HH. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

II. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.

JJ. ASTM D6817/D6817M - Standard Specification for Rigid Cellular Polystyrene Geofoam; 2017 (Reapproved 2021).

KK. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

LL. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.

MM. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

NN. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 2017.

OO. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).

PP. PS 1 - Structural Plywood; 2009 (Revised 2019).

QQ. ACI 350 - Concrete Sanitary Engineering Structures.

RR. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

1.03 ACTION SUBMITTALS

A. The contractor shall comply with the requirements of Division 01 Specification of the Project Manual, Section 013300 - SUBMITTALS.

B. Product Data: For each type of product indicated.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

2. Submit mix design mixtures for each type of concrete to be used on the Project at least 30 calendar days prior to the first scheduled concrete pour. The Contractor's testing laboratory shall develop concrete mix designs and test all materials and mixes for conformance with ACI 301 and these specifications. The costs associated with development of the design mix and testing of samples shall be included in the bid price.
3. Submit the following:
    a. Name, address, and telephone number of Contractor's laboratory.
    b. Mix proportions.
    c. Source of cement, type, brand, and certified copies of mill reports, including physical and chemical analysis.
    d. Sources of fine aggregates and results of test made in accordance with ASTM C33/C33M and ASTM C40.
    e. Source of coarse aggregates and results of tests made in accordance with ASTM C33/C33M.
    f. Catalog cuts of all admixtures.
    g. Furnish test results of slump, air entrainment and water-cement ratio for each mix design.
4. For each mix proposed, make and cure four (4) standard 6 inch concrete test specimens to the laboratory in accordance with ASTM C192/C192M. Furnish compression test results made in accordance with ASTM C39/C39M. Break two (2) cylinders at seven (7) days and two (2) at 28 days.
5. If the concrete is intended to be pumped, design mix accordingly and submit certification that it has been tested for pumping.
6. If adopted mix fails to produce concrete meeting the requirements for strength and placibility, the Architect may order additional cement or adjustments to mix proportions at no extra cost to the Owner.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, spacing, locations, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement including steel bars and wire fabric.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the state where the project is located; detailing fabrication, assembly, and support of formwork. Shop drawings shall bear the signature and seal of the same licensed Professional Engineer.
    1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal
    2. Shop drawings shall indicate formwork dimensioning, materials and arrangement of joints and ties.
    3. Manufacturer's instructions: Indicate installation procedure and interface required with adjacent work

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    1. Location of construction joints is subject to approval of the Architect, if not shown on the drawings.

G. Samples: For waterstops, vapor retarders, and vapor retarder tape.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, provided by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Adhesives and Vapor retarders.
7. Semi rigid joint filler.
8. Joint-filler strips.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

G. Furnish transit-mix delivery slips to Owner's Representative.

1.05 QUALITY ASSURANCE

A. Comply with Referenced Standards specified in Division 01 Section "References" in addition to ACI 301.

B. Perform testing under the provisions of Division 01 Section "Quality Requirements" and the "FIELD QUALITY CONTROL" Article of Part 3 listed in this specification.

C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
   1. The contractor shall provide an adequately sized, insulated curing box to house concrete cylinders at the discretion of the Architect, for the 48-hour period between concrete pour and sample collection pick-up by the Testing Laboratory (ASTM C31/C31M). As directed by the Architect, the contractor shall cure additional cylinders in the same fashion as the in-place concrete.
   2. Curing box shall be located away from the main construction area and shall be blocked up off the ground.
   3. A log sheet shall be provided in a waterproof sheet protector to log in the placement and removal of the concrete test samples by the testing laboratory.
   4. Minimum information to be logged for each pour date shall include: date of pour, date of pick-up, weather conditions at the time of pour, testing

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. To further insure consistency, coloration, finish and quality; all aggregates, cement, water and other ingredients shall each be secured from the same source for the duration of the project.
   1. The batching plant and raw materials may be subject to inspections and test performed by the Architect.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete", Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
3. ACI 304R - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

I. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Store cement off the ground in a dry, weatherproof, adequately ventilated structure with provisions to prevent the absorption of water.

C. Transport dry concrete batches from the central plant to the site in approved truck mixers conforming to the requirements of the Truck Mixer Manufacturer's Agitating Standards. Each truck shall contain a plate stating the capacity, drum speeds and be provided with a revolution counter.

D. Packaged material shall be delivered and stored in the original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected.

E. Protect all materials from freezing.

1.07 COORDINATION

A. Coordinate work under provisions of Division 01 Specification of this Project Manual.

B. The Contractor shall provide at least five (5) working days advance notice prior to formwork closure to the Architect.

C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Notify Architect a minimum of three (3) working days prior to commencement concrete pours.

1.08 REGULATORY REQUIREMENTS

A. Conform to ACI 304R and all applicable codes for placement of concrete and related work.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when the ambient temperature is below 40 deg. F. or when the concrete temperature exceeds 85 deg. F. Under certain circumstances, the Engineer may approve the placement of concrete under the above conditions, provided that the procedures of ACI 305R and ACI 306R are strictly adhered to.

B. Do not place concrete when the conditions may adversely affect the placing, curing or finishing of concrete, or its strength.

C. Comply with the requirements contained in Section 016500 - PRODUCT DELIVERY, STORAGE AND HANDLING.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Steel forms: Minimum 16 gage thick, stiffened to support weight of concrete with minimum deflection.
   3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. Douglas Fir Species, solid one side grade and sound

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum unless indicated otherwise on the drawings.

C. Form-Release Agent: Commercially formulated, colorless, water based, non-toxic, V.O.C. compliant, environmentally safe material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete; manufactured by DAYTON SUPERIOR or equal. Agent shall not be detrimental to the environment.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   3. For Concrete Tanks: Furnish snap-ties with 1 inch plastic cone and waterseal washer.

2.02 PERMANENT PREFABRICATED EPS FOAM PANEL FORMWORK

A. Manufacturers:
   1. LiteForm Technologies, LLC; LiteDeck WRS: www.liteform.com.
   2. b-foam GEOFOAM-GRADE EPS: PT BETON WORKS: www.b-foam.com/geofoam.
   3. Insulfoam GF (Geofoam)
   4. Engineer approved equivalent.

B. Floor Deck Forms: Pre-engineered expanded polystyrene foam plastic blocks in sizes and shapes required to infill the irregularly shaped areas indicated and verified by the contractor by field measurements. Shop drawings shall be produced based upon field verifications. Forms shall be installed to allow for the installation of a poured reinforced concrete slab as indicated on the drawings. EPS foam shall be Fire-retardant (FR) and shall conform to ASTM D6817/D6817MASTM D6817. EPS foam shall have the following Physical characteristics:

TYPE	EPS 12	EPS 15	EPS19	EPS 22	EPS 29	EPS 39	EPS 46
Density, min. pcf	0.70	0.90	1.15	1.35	1.80	2.40	2.85
Compressive Resistance at 1%, psi	2.2	3.6	5.8	7.3	10.9	15.0	18.6
Compressive Resistance at 5%, psi	5.1	8.0	13.1	16.7	24.7	35.0	43.5
Compressive Resistance at 10%, psi	5.8	10.2	16.0	19.6	29.0	40.0	50.0
Flexural strength min., psi	10.0	25.0	30.0	30.0	50.0	60.0	75.0
Elastic Modulus (min.), psi	220	360	580	730	1090	1500	1860

C. Expanded Polystyrene (EPS) Insulation Board: ASTM C578, Type VIII.
   1. Density: See chart above.
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   4. Oxygen Index, Volume %: 24.0 min.
   5. Dimensional Stability, maximum %: <2%.
   6. Poisson's Ratio: 0.05.
   7. Coefficient of Friction: 0.6
   8. Absorption, volume %: <4.0%

2.03 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 ; ASTM A706/A706M, deformed bars, assembled with clips.

2.04 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. Provide load bearing pad on bottom to prevent vapor barrier puncture.

2.05 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C150/C150M, Type IA, gray. Supplement with the following:
      a. Fly Ash: ASTM C618, Class F or C.
      b. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.
   2. Silica Fume: ASTM C1240, amorphous silica.
   3. Normal-Weight Aggregates: ASTM C33/C33M, No. 57 or 67 crushed stone coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
      a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
      b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
   4. Water: ASTM C94/C94M, clean and not detrimental to concrete.

2.06 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E1745, Class C or polyethylene sheet, ASTM D4397 not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400

b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120
c. Insulation Solutions, Inc.; Viper VaporCheck 10.
d. Meadows, W. R., Inc.; Perminator 10 mil.
e. Reef Industries, Inc.; Griffolyn 10 mil Green.
f. Stego Industries, LLC; Stego Wrap 10 mil Class A.
g. Or approved equal.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33/C33M for fine aggregates.
1. Depth Requirements:
a. Slab on grade: 6 inches (unless otherwise noted in the Geotechnical Report).
b. Footings: 12 inches (unless otherwise indicated in the Geotechnical Report).

2.08 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dayton Superior Corporation; Emery Tuff Non-Slip
b. Lambert Corporation; EMAG-20
c. L&M Construction Chemicals, Inc.; Grip It
d. Metalcrete Industries; Metco Anti-Skid Aggregate

2.09 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 8 oz. /sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet weighing approximately 8 oz. / sq. yd. bonded to prevent separation during use.

C. Membrane curing compound: Moisture Retention complying with ASTM C309. Products: EUCOCURE VOX by Euclid Chemical Company or equal.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
1. Products: Eucocure VOX as manufactured by Euclid Chemical Company or approved equal.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, 1/2" asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: three-component, solvent-free, moisture tolerant, epoxy modified cementitious product.
1. Product: Armatec 110 EpoCem as manufactured by Sika Corporation or specifically approved equal.
2. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Non-Shrink Grout: Premixed compound, free of chlorides, with non-metallic aggregate, cement water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi at 48 hours and 7000 psi at 28 days. Grout shall be suitable for contact with potable water. For

equipment bases and pipe supports, use non-shrink grout by Master Builders, Embeco 636, Unisorb V-1 or equal.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 211.1 and ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   1. Fly Ash: 25 percent.
   2. Combined Fly Ash and Pozzolan: 25 percent.
   3. Ground Granulated Blast-Furnace Slag: 50 percent.
   4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or Pozzolan not exceeding 25 percent.
   5. Silica Fume: 10 percent.
   6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
   7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
   8. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: Pier, Mat and Spread Footings; foundation walls, slab on grade and slab on metal deck: 4000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.50 for all concrete building elements.
   3. Slump Limits (Conventional Mix):
      a. Slabs: 3 inches plus or minus one inch.
      b. Piers, Foundation Walls and Footings: 4 inches plus or minus one inch.
   4. Slump Limits (Pump Mix):
      a. Final slump (Slabs): 6 1/2 inches plus or minus one inch.
      b. Final Slump (Foundation, walls and footings): 7 1/2 inches plus or minus one inch
   5. Air Content:
      a. Piers, Mats and Spread Footings: 5.5 percent, plus or minus 1.0 percent. at the point of delivery.
      b. Slabs: 3 percent, plus or minus 1.0 percent at point of delivery. Do not allow air content of trowel finished concrete floors to exceed 3 percent.
   6. Large Aggregates: 3/4" crushed stone; ASTM C33/C33M, No. 67.
   7. Use Admixtures only when approved by the Engineer.
   8. Mix Grout in accordance with the manufacturer's instructions and specifications.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and measurements before proceeding with formwork. Ensure that dimensions agree with the plans.

B. Inspect the formwork and reinforcing that it has been properly set and secured and that all items to be embedded, built-in or pass through concrete are at their proper locations and elevations.

C. The General Construction Contractor shall verify that all other prime contractors have installed concrete inserts, sleeves, and embedded elements of the project, such as conduit, and their work has been totally completed and inspected by the Architect.

D. Ensure that all points of contact with new grout are free from oil, grease and scale.

3.02 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class B, 1/4 inch for rough-formed finished surfaces.
      a. Hand trim sides and bottom of earth forms and remove loose soil to the satisfaction of the Architect.
      b. Remove water from forms and excavations and divert water flow to avoid washing over, under or though freshly placed concrete.

D. Construct forms tight enough to prevent loss of concrete mortar. Align form joints.

E. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.

F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer: Provide 3/4" inch chamfer on all exterior horizontal and vertical corners and edges of permanently exposed concrete.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not apply form release agent where concrete surfaces are to receive special finishes or applied coatings that may be affected by the agent.

N. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-metallic/ non-shrink grout.

O. Prepare previously placed concrete by cleaning with steel brush and apply a Bonding Agent in accordance with the manufacturer's specifications and instructions.

3.03 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Ensure that all inserts and embedded items are not disturbed during concrete placement.

3.04 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.05 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturers recommended tape.

B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars. Use reinforcing splices at minimum of locations and only at locations of minimum stress. Review locations of splices with Architect. Splice locations shall be approved during shop drawing review phase. Rebar splice overly shall be the minimum length as per ACI 318.
   1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced t minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Take necessary measures to ensure that reinforcement is not disturbed during the placement of concrete.

3.07 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated or at 20' o.c. maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction / Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/16"-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 - JOINT SEALANTS are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Ensure joint fillers and devices are not disturbed during placement of concrete.

G. Install all joint fillers and devices in accordance with the manufacturer's instructions and specifications for floor and wall finish.

H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.

I. Install joint covers in one-piece length when adjacent construction activity is complete.

J. Apply sealants in joint devices in accordance with the manufacturer's specifications and instructions.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
2. Place concrete with the aid of mechanical vibrators which are capable of transmitting to the concrete not less than 3,000 impulses per minute. Maintain at least three (3) vibrators in good working condition, ready for use when concrete placement begins in any one area.
3. Do not interrupt successive placement. Do not permit cold joints to occur.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:
   1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
   3. Maintain records of concrete placement. Record date, locations, quantity, air temperature and test samples taken.
   4. In areas with floor drains, maintain floor elevations at walls; pitch surfaces uniformly to the drains maintaining a 1% slope.
   5. Cure floor surfaces in accordance with ACI 308R.
   6. Apply curing compound in accordance with the manufacturer's specifications and instructions in two (2) coats with the second coat at right angles to the first.

3.09 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch 6 mm in one direction.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E1155/E1155M, for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F (F) 30; and of levelness, F (L) 20; with minimum local values of flatness, F (F) 24; and of levelness, F (L) 15; for suspended slabs.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. This surface shall be used for interior and exterior walking surfaces unless noted otherwise. Finish edges of exterior walkway flags with steel tooled radius edge.
   2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, equipment pads, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lb. /100 sq. ft. of dampened slip-resistive over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aluminum granules.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. All exposed horizontal and vertical wall and slab corners shall have a ¾” wide chamfered edge.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 and ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308R and ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

F. Liquid sealer/hardener to be applied on exposed concrete cured with moisture retentive or absorptive covers. The following materials provide varying levels of protection, sealant and hardness. Review products for project appropriateness.
   1. Euclid: Euco Diamond Hard (Liquid Sealer and Hardener)
   2. L&M Construction Chemicals: Seal Hard (Liquid Sealer and Hardener)
   3. Curecrete Chemical Company: Ashford Formula (Liquid Sealer and Hardener)
   4. Midwest Floor Care: Structure Formula (Liquid Sealer and Hardener)
   5. Or approved equal.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Immediately remove all rust spots that have developed during the construction period as soon as directed by the Architect. Remove all rust spots that have formed by the use of temporary handrails.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor is responsible to notify the Owners representative at least 72 hours prior to the scheduled work that requires inspection / testing. The presence of the Inspector engaged by the Owner does not relieve the contractor of Quality Control Requirements.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Steel reinforcement placement.
   2. Headed bolts and studs.
   3. Steel reinforcement welding.
   4. Concrete placement, including conveying and depositing.

5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. Frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
      b. One (1) additional test cylinder shall be taken during cold weather and be cured under the same conditions as the concrete it represents.
   2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   6. Compression Test Specimens: ASTM C31/C31M.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b. Cast and field cure two Insert number sets of two standard cylinder specimens for each composite sample.
   7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
   10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
   11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
   12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency

may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E1155/E1155M within 72 hours of finishing.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

B. Section 033000 - Cast-In-Place Concrete.

1.02 SCOPE

A. Finishing slabs on grade, elevated slabs and monolithic floor slabs.

B. Finishing exposed concrete interior and exterior walls (Formed Surfaces).

C. Testing for floor flatness.

D. Repair of defective concrete.

E. Surface treatment with concrete hardener and sealer.

1.03 STANDARDS

A. All work of this section shall conform to industry standards, manufacturer's recommendations and the ACI Manual of Concrete Practice.

B. ACI 301 "Specifications for Structural Concrete for Buildings".

C. ACI 302.1R "Guide for Concrete Floor and Slab Construction"

D. ACI 303 "Guide to Cast-In-Place Architectural Concrete Practice".

E. ASTM E1155 "Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers".

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures.

B. Submit pursuant to Section 016100 - Basic Product Requirements.

C. Product Data: Submit manufacturer's product data for each type of concrete sealer, clearly indicating locations each type of sealer will be used.

1.05 QUALITY ASSURANCE

A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer's recommendations, ACI 301 and industry standards.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturer's published instructions.

B. Protect against moisture exposure and damage.

PART 2 PRODUCTS

2.01 CONCRETE SEALER

A. Exterior Concrete
   1. L&M™ AQUAPEL™ from Laticrete International, Inc. or Architect approved equivalent.
   2. Apply to all exterior concrete pavement, slabs, stoops, aprons, sidewalks and patios.
   3. Handle and apply according to manufacturer's recommendations.
   4. Apply sealer to new slabs, ramps, curbs, pads, and other exposed vertical and horizontal concrete surfaces that are a minimum of 28 days old, have been thoroughly moist cured and have been allowed to air dry.

B. Exposed Interior Concrete Slabs and Stair Treads
   1. L&M™ Lion Hard® from Laticrete International, Inc. or Architect approved equivalent.
   2. Seal all exposed interior concrete flat surfaces as indicated on the Room Finish Schedule or elsewhere as shown on the Contract Drawings.

3. Apply two coats in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.01 FINISHING UNFORMED SURFACES (SLABS)

A. Scratched Finish:
   1. After placing, consolidating, and striking-off slabs, level surface to a tolerance not exceeding 1/8 in. in 2 ft when tested with a 2 ft straight edge. Slope surfaces uniformly to drains.
   2. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
   3. A 2' x 2' area of concrete shall be prepared and finished as a sample for the Owner and Architect to approve the finish and roughness.

B. Floated Finish:
   1. After placing, consolidating, and striking-off slabs, level surface to a tolerance not exceeding 1/8 in. in 2 ft when tested with a 2 ft straight-edge. Slope surfaces uniformly to drains. Do not work surface until ready for floating.
   2. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft when tested with a 10 ft straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth, granular texture.
   3. See Paragraph 3.03 for additional tolerance requirements. The more stringent tolerance dictates.

C. Troweled Finish:
   1. After floating, steel-trowel slab surface to a smooth, even, impervious finish free from trowel marks. For exposed to view concrete slabs, give slab surface a second steel troweling to a burnished finish, uniform in texture and appearance. Grind smooth surface defect which would telegraph through applied floor covering system.

D. Slip Broom Finish: (Exterior Concrete)
   1. After placing, consolidating, and striking-off slabs, level surface to a tolerance not exceeding 1/8 in. in 2 ft when tested with a 2 ft straightedge. Slope surfaces uniformly to drain. Do not work surface until ready for floating.
   2. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft when tested with a 10 ft straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth, granular texture.
   3. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom in straight, parallel lines perpendicular to main traffic route. Coordinate required final finish with the Architect before application.

E. Caution: Do not use jitterbugs at any time.

3.02 FINISHING FORMED SURFACES (INTERIOR & EXTERIOR)

A. Exposed to view surfaces: Patch all form tie holes and rub to produce a smooth, uniform finish. Patching material to match concrete in color and texture.

3.03 TOLERANCES (INTERIOR SLABS)

A. An independent testing agency, as specified in Section 014523 - Testing and Inspection Services, will inspect finished slabs for flatness.

B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 72 hours after slab installation.

C. Finish concrete to achieve the following tolerances:

1. Exposed to View and Foot Traffic: F(F) 20 and F(L) 15.
2. Slabs to be Covered with Thin Floor Coverings (i.e., resilient flooring, ceramic flooring): Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.
3. Slabs to be Covered with Wood Flooring: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.
4. Slabs to be Covered with Carpet, Carpet Tile, Rubber Flooring and Other Slabs: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 20; with minimum values of flatness, F(F) 17; and of levelness, F(L) 15.
5. The F(L) values listed above are not applicable to elevated slab on deck. Only F(F) values apply to elevated slabs.

D. Correct the slab surface if tolerances are less than specified.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process. Costs for re-measurement testing will be borne by the Contractor.

3.04 REPAIR OF DEFECTIVE WORK

A. Repair of Unformed Surfaces (Slabs): Test unformed surfaces, such as monolithic slabs, for smoothness and to verify that surface planes conform to tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
   1. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01 in. wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
   2. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 in. clearance all around.
      a. Dampen concrete surfaces in contact with patching concrete and apply specified bonding compound. Place patching concrete after bonding compound has dried. Mix patching of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   3. Repair isolated random cracks and single holes not over 1 in. in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles.
   4. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
   5. Correct low areas in unformed surfaces during, or immediately after completion of, surface finishing operations by cutting out low areas and replacing with fresh concrete if floor is exposed or self-leveling cement-based product approved by the Architect. Self-leveling product used must be compatible with all types of finished flooring being used. Finish repaired areas to blend into adjacent concrete. Use specified bonding or patching compound.

B. Repair of Formed Surfaces (Walls).
   1. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01 in. wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
   2. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to

sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 in. clearance all around.

a. Dampen concrete surfaces in contact with patching concrete and apply specified bonding compound. Place patching concrete after bonding compound has dried. Mix patching of same materials to provide concrete of same type, color and/or class as original concrete. Cure in same manner as adjacent concrete.

3. Repair isolated random cracks and single holes not over 1 in. in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles.

C. Make structural repairs with prior approval of Architect as to method and procedures, using structural patching mortar.

3.05 SEALER APPLICATION

A. Clean concrete of all dirt, laitance, contaminants, oil, existing coatings or membrane curing compounds before application.

B. Install sealers in accordance with manufacturer's written instructions and recommendations.

C. On vertical surfaces, apply sealer evenly and uniformly to avoid streaking. Streaking in sealer coating is not acceptable.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes maintenance of existing unit masonry on all exterior elevations of school buildings, consisting of brick, cast stone, and other masonry surfaces, and cleaning as follows:
   1. Preliminary cleaning, including removing plant growth, dirt, debris, stains, moss, and efforescence.
   2. Cleaning exposed unit masonry surfaces.
   3. Protection of adjoining and nearby non-masonry items.

1.03 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (690 kPa).

B. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

C. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

D. High-Pressure Spray: 800 to 1200 psi (5510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

1.05 INFORMATIONAL SUBMITTALS

A. Cleaning Program.

1.06 QUALITY ASSURANCE

A. Cleaning Specialist Qualifications: Engage an experienced, masonry cleaning firm to perform work of this Section. Firm shall have completed work similar in extent to that indicated for this Project with a record of successful in-service performance.
   1. Field Supervision: Cleaning specialist firms shall maintain experienced full-time supervisors on Project site during times that cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of cleaning specialist firm.
   2. Cleaning Worker Qualifications: Persons who are experienced and specialize in cleaning work of types they will be performing.
   3. Masonry cleaning work shall conform to National Park Service Preservation Briefs #1 and #2.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

C. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
   1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to masonry cleaning including, but not limited to, the following:
      a. Construction schedule. Verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays. Coordinate work areas with school schedule and activities.
      b. Materials, material application, sequencing, tolerances, and required clearances.
      c. Protection of adjacent non-masonry items.
      d. Coordination with masonry replacement control joint installations, repointing and other masonry work in defined areas.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver cleaning materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.09 COORDINATION

A. Coordinate masonry cleaning with public circulation patterns at Project site. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.10 SEQUENCING AND SCHEDULING

A. Order cleaning materials at earliest possible date to avoid delaying completion of the Work.

B. Perform masonry cleaning work in the following sequence:
   1. Remove plant growth.
   2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   3. Remove paint.
   4. Clean masonry surfaces.
   5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
   6. Repair masonry, including replacing existing masonry with new masonry materials.
   7. Rake out mortar from joints to be repointed.
   8. Point mortar and sealant joints.

9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units.

PART 2 - PRODUCTS

2.01 PAINT REMOVERS (IF REQUIRED)

A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.
   1. Products: Subject to compliance with requirements, provide the following:
      a. PROSOCO; Enviro Klean Safety Peel 2.
      b. Architect approved equivalent.

2.02 CLEANING MATERIALS

A. Water: Potable.

B. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate, 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

C. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate, 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

D. Non-acidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9 that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.

E. Non-acidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
   1. Products: Subject to compliance with requirements, provide the following:
      a. PROSOCO; Enviro Klean 2010 All Surface Cleaner.
      b. Architect approved equivalent.

F. Masonry Prewash: Alkaline-based cleaning compound formulated to dissolve and assist in removal of heavy carbon encrustations from calcareous masonry such as Limestone and Sandstone. Use in conjunction with a Limestone Restorer to neutralize surfaces treated with Masonry Prewash.
   1. Prewash Product:
      a. PROSOCO 766 Limestone and Masonry Prewash.
      b. Architect approved equivalent.
   2. Neutralizer Product:
      a. PROSOCO Sure KLean Restoration Cleaner, Limestone & Masonry Afterwash.
      b. PROSOCO Limestone Restorer.
      c. Architect approved equivalent.

2.03 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
   1. Products: Subject to compliance with requirements, provide the following:
      a. PROSOCO; Sure Klean Strippable Masking.
      b. Architect approved equivalent.

B. Sealant Materials:
   1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 - JOINT SEALANTS.
      a. Single-component, non-sag urethane sealant.
   2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.

C. Joint-Sealant Backing:
   1. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where acceptable.

2.04 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being cleaned, building site, plants, and surrounding buildings from harm resulting from masonry cleaning work.
   1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of cleaning work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
   1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
   2. Keep wall wet below area being cleaned to prevent streaking from runoff.
   3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
   4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property at an approved NYSDEC facility.
   5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.02 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being utilized. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
   a. Equip units with pressure gauges.
3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F (60 and 71 deg C) at flow rates indicated.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:
1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (152.4 mm) from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Perform a test panel (4 foot high by 4 foot long) to ensure surfaces will not be harmed or stained by application of undiluted material. Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.03 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, caulking, asphalt, and tar.
1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover.
   a. Comply with requirements in "Paint Removal" Article.
   b. Repeat application up to two times if needed.

3.04 PAINT REMOVAL

A. Paint Removal with Alkaline Paste Paint Remover:
   1. Remove loose and peeling paint using low -pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
   2. Allow paint remover to remain on surface for period recommended by manufacturer.
   3. Rinse with hot water applied by low -pressure spray to remove chemicals and paint residue.
   4. Repeat process if necessary to remove all paint.
   5. Apply acidic cleaner or manufacturer's recommended afterwash to masonry, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended by chemical cleaner or afterwash manufacturer.

3.05 CLEANING BRICKWORK

A. Cold-Water Soak:
   1. Apply cold water by intermittent spraying to keep surface moist.
   2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
   3. Apply water in cycles with at least 30 minutes between cycles.
   4. Continue spraying until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
   5. Continue spraying for 72 hours.
   6. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by low-pressure spray.

C. Detergent Cleaning:
   1. Wet masonry with cold water applied by low-pressure spray.
   2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
   3. Rinse with cold water applied by low -pressure spray to remove detergent solution and soil.
   4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

D. Mold, Mildew, and Algae Removal:
   1. Wet masonry with hot water applied by low-pressure spray.
   2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
   3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
   4. Rinse with cold water applied by medium -pressure spray to remove mold, mildew, and algae remover and soil.
   5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

E. Nonacidic Gel Chemical Cleaning:
   1. Apply non-acidic gel cleaner in 1/8-inch (3-mm) thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.

3.06 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
   1. Do not use metal scrapers or brushes.
   2. Do not use acidic or alkaline cleaners.

B. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

D. Restoration cleaning:
   1. All protective strippable masking, polyethylene sheeting and tape shall be removed.
   2. Window glass or painted or unpainted metal that shows evidence of contamination from chemicals shall be thoroughly washed with clear water.
   3. All debris from this operation shall be removed from the job site, upon completion.

END OF SECTION

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes maintenance, restoration and cleaning of masonry as follows:
   1. The removal of select areas, sections, individual brick that are damaged, stained or otherwise unacceptable in appearance and replacement with salvaged brick to match adjacent brick.

B. RELATED SECTIONS: the following sections contain requirements that relate to the Section.
   1. Section 040120 - Maintenance of Unit Masonry
   2. Section 040343 - Masonry Repointing
   3. Section 040513 - Mortar
   4. Section 040523 - Masonry Accessories
   5. Section 042113 - Brick Masonry
   6. Section 079200 - Sealants

1.03 SUBMITTALS

A. Product Data:
   1. Portland Cement: Brand and Manufacturer's name.
   2. Lime: Brand and Manufacturer's name.
   3. Mortar Pigments: Brand and Manufacturer's name.
   4. Packaged Products: Manufacturer's specifications and application instructions for products specified.
   5. Sand: Location of pit, name of Owner, and previous test data.

B. Samples: Deliver to the Site for comparison with existing masonry.
   1. Mortar for exposed joints and cracks: Each required type, minimum 12 inches long by full thickness, showing finish and color.
   2. Masonry Units: Each required type, full size, showing finish and full color range.

1.04 QUALITY ASSURANCE

A. Material Container Labels: Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number shelf life of product, and mix ratio (if applicable).

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaged Products:
   1. Deliver materials to the site in manufacturer's original, sealed container. Do not deliver materials which have exceeded shelf life limitation set forth by manufacturer.
   2. Comply with manufacturer's printed instructions for storing and protecting materials.

B. Bulk Aggregate: Store in a manner which will keep aggregate clean and protected from the weather elements.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
   1. For factory packaged products, comply with the manufacturer's printed limitations and instructions.
   2. At temperatures below 40° F, maintain mortar temperature between 40° F and 120° F unless otherwise recommended by the material manufacturer. If necessary, heat mixing water and sand to produce the required results.

3. At temperatures between 32° Fand 20° F, provide wind breaks and cover the restored masonry to prevent wetting and freezing. Maintain restored masonry above freezing for not less than 16 hours using auxiliary heat or insulating blankets.
4. At temperatures below 20° F, provide heated enclosures for performing the Work. At the end of the workday, maintain the enclosures and keep the Work from freezing for not less than 24 hours.
5. Do not lower freezing point of mortar by use of antifreeze, calcium chloride, or other additives.
6. Do not use frozen materials or materials coated with ice or frost.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mortar:
   1. Use mortar approved in Section 040513 - Masonry Repointing and 040513 - Mortar.

B. Mortar Color: Match existing adjacent mortar color. Note: Multiple colors or shades of colors may be required.

C. Brick: Use salvaged and/or new brick that closely match adjacent brick around the restoration area, for brick exposed to view.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection: Protect adjacent surfaces not being restored. Protect sills, ledges, and projections from material droppings.

B. Surface Preparation:
   1. Prepare surfaces to be restored in compliance with product manufacturer's printed instructions and as specified.
   2. Remove dirt, dust, and foreign material from surfaces to be restored.
   3. Clean areas to be restored with compressed air or water flushing, except as otherwise recommended by the mortar manufacturer.

C. Materials Preparation:
   1. Dry concrete masonry units and stone that have become wet. Do not wet these masonry units.
   2. Prepare exposed Type N mortar and Modified Type N pointing mortar to match the color and appearance of existing adjoining mortar.

3.02 REPLACING MASONRY UNITS

A. Provide temporary shoring other supports as required to prevent displacement of existing masonry which is to remain. Perform the removal Work with such care as may be required to prevent damage to adjoining masonry which is to remain.

B. Remove the deteriorated and damaged masonry units to their full depth, including the surrounding joint mortar. Wherever possible without damaging masonry, use a rotary power masonry saw for cutting Work. Leave square corners and adjoining masonry which is to remain. Clean joints and cavities by flushing with water or compressed air.

C. Dampen contact surfaces slightly before application of mortar, making sure there is no free water. Install matching masonry units with Type N mortar. Install units to match and align with existing masonry. Maintain bonding and coursing pattern of existing masonry. Use presoaked wood wedges where necessary to properly set the units and maintain uniform matching joints. Backpack and fill joints full of mortar. Finish joints to match existing adjoining joints.

3.03 CLEANING

A. As the Work proceeds and after completion of Work, remove excess mortar, droppings, smears, stains, and other soiling substances resulting from the Work of this Section. Remove misplaced materials from surfaces immediately.

END OF SECTION

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes historic masonry repointing work as follows:
   1. Removing cracked, broken, stained, and/or loose mortar in exterior brick joints.
   2. Raking and cleaning mortar joints.
   3. Installing new mortar to match existing mortar.
   4. Installing joint sealant and backer rod.

1.03 RELATED REQUIREMENTS

A. Section 040120 - Maintenance of Unit Masonry.

B. Section 040121 - Masonry Restoration.

C. Section 040513 - Mortar.

D. Section 042113 - Brick Masonry.

E. Section 079200 - Sealants.

1.04 REFERENCE STANDARDS

A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

B. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

C. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

E. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

G. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.05 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Pointing Mortar: Mortar used to seal joints at the exposed faces of masonry units; may include decorative aggregate or pigments for color and may be tooled in a decorative manner.

C. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

D. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference on masonry repointing at Project Site. Coordinate with all other masonry related pre-installation conferences into one.
   1. Review methods and procedures related to repointing masonry, including, but not limited to, the following:
      a. Masonry repointing specialist’s personnel, equipment, and facilities needed to make progress and avoid delays.
      b. Materials, material application, and sequencing.
      c. Quality-control program.
      d. Fire-protection plan.

e. Repointing program.
f. Coordination with building occupants.

B. Sequence and Scheduling:
1. Order pre-mixed mortar for repointing mortar immediately after approval of Samples based on preconstruction results. Take delivery of and store at Project site a sufficient quantity of pre-mixed mortar to complete Project.
2. Perform masonry repointing work in the following sequence:
a. Remove broken, cracked, stained and/or loose mortar.
b. Rake out joints.
c. Clean mortar joints.
d. Point mortar joints.
e. After repointing has been completed and cured, perform a final cleaning to remove residues from this work.
3. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in mortar joints according to this Section.

1.07 SUBMITTALS

A. Product Data: For each type of product indicated.
1. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings:
1. Include plans, elevations, sections, and locations of masonry repointing on the structure.
2. Show joint details for each type of joint required, including joint width, raking depth, and tooled joint profile.
3. Show provisions for expansion joints or other sealant joints.
4. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples: Before erecting mock-up, submit samples of the following:
1. Each type of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
a. Include with each sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
2. Sealant materials. Provide manufacturer’s printed brochure showing full color range for initial selection. Provide cured physical sealant samples for verification. Provide cured sample with sanded finish if required.
3. Include similar Samples of accessories involving color selection.

D. Qualification Data: For restoration specialists including restoration firm, field supervisors, architectural conservator, and mortar manufacturer.

E. Quality-control Program.

F. Repointing Program.

1.08 QUALITY ASSURANCE

A. Masonry Repointing Specialist Qualifications: The Contractor performing the work of this Section shall be regularly engaged in repointing historic masonry and shall demonstrate to the satisfaction of Owner/Architect that, within the previous 5 years, they have successfully performed and completed in a timely manner, at least 3 projects similar in scope and type to the required work.
1. Foreman: Work of masonry repointing shall be directly supervised by a full-time foreman who has experience equal to or greater than that required of the Masonry Repointing Specialist. The foreman shall read and speak English fluently. The foreman shall be on the site daily for the duration of the work and shall remain on the job throughout the work unless

his performance is deemed unacceptable. The foreman shall hold valid installer certification from each product used where offered or required by the manufacturer.

2. Mechanics: Masonry repointing shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with the materials and methods specified, have a minimum of 3 years' experience with work on buildings similar to that required by this Section, and are familiar with the design requirements. Contractor shall certify that all mechanics employed for masonry repointing work fully understand the requirements of the Project. Each mechanic shall hold valid installer certification from each product used where offered or required by the manufacturer.
    a. Provide one crew of mechanics for the duration of the project. Substitutions and additions of work force shall be permitted with the Architect's consent, so long as there is no adverse effect on quality or performance of work.

B. Mortar Manufacturer Qualifications: A firm regularly engaged in producing masonry mortar for preservation work that has been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no extra cost to Owner.
    1. Acceptable manufacturers include:
        a. Cathedral Stone Products, 7266 Park Circle Drive, Hanover, MD 21076, (800) 684-0901, www.cathedralstone.com
        b. Conproco Corporation, 17 Production Dr., Dover, NH 03820, (800) 258-3500, www.conproco.com
        c. Edison Coatings, 3 Northwest Drive, Plainville, CT 06062, (800) 341-6621, www.edisoncoatings.com
        d. Freedom Cement, 70 East Brookfield Road North Brookfield, MA 01535, (866)254-7277, www.freedomcement.com
        e. Glen-Gery Corporation, 1166 Spring Street, PO Box 7001 Wyomissing, PA 19610, (610) 374-4011, www.glengery.com
        f. Spec Mix, 1230 Eagan Industrial Rd., Suite 160, Eagan, MN 55121, (888) 773-2649, www.specmix.com
        g. U.S. Heritage Group; Heritage Restoration Mortars; 0352 Franklin Ave, Franklin Park, IL 60131, (773)286-2100, www.usheritage.com
        h. WorkRite Cements, 5952 Lincoln Highway West, Thomasville, PA 17364, (717) 792-4700, .workrite-cements.com
        i. Architect approved equivalent

C. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
    1. If mechanical grinders are used to cut joints, include provisions for supervising performance and preventing damage due to worker fatigue.
    2. Include methods for containment of and protection of workers from silica containing dust in compliance with applicable Local, State, and Federal regulations.

D. Repointing Program: For each phase of restoration process, provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials on building and Project site.
    1. Include methods for keeping pointing mortar damp during curing period.
    2. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

E. All work shall conform to the requirements of the Secretary of the Interior's Standards for Rehabilitation 36 CFR 67.

1.09 MOCK-UPS

A. General: Before beginning brick masonry restoration, prepare mock-ups to demonstrate aesthetic effects and qualities of materials and execution and to provide standards for work of this Section. Do not proceed with brick restoration until Architect has approved relevant mock-ups.
   1. Locate mock-ups on existing walls that are representative of the range of as-built conditions to be encountered in the remainder of work in locations as directed by or acceptable to Architect and accessible for review by Owner and Architect.
   2. Provide a minimum of 48 hours' notice to Architect prior to start of each mock-up.
   3. Architect will monitor mock-ups. Mock-ups performed in the absence of Architect will not be accepted.
   4. Mock-ups shall be performed by the same crew who will be executing the work and following requirements of this Section.
   5. Repeat mock-ups as necessary to obtain approval by Architect.
   6. Protect approved mock-ups to ensure that they are without damage, deterioration, or alteration until time of Substantial Completion.
   7. Approved mock-ups in undamaged condition at time of Substantial Completion may be incorporated into the work.
   8. Approved mock-ups will represent the minimum acceptable standard for brick masonry restoration work. Subsequent work that does not meet the standard of approved mock-up will be rejected.

B. Prepare the following mock-ups:
   1. Mortar Removal: In an inconspicuous location, each mechanic scheduled to mechanically cut the joints shall perform a mock-up in the presence of the Architect to demonstrate the ability of the operator to use tools without damaging the masonry. Cut joints and prepare for pointing as specified below. Each mock-up area shall measure approximately 16 square feet (4 by 4 feet) and include both horizontal and vertical joints. Any worker that damages the masonry will not be permitted to cut joints. Only those workers approved by the Architect may use hand-held grinders or other power tools to cut joints.
   2. Repointing: For each type of masonry and joint required, provide a pointing mock-up measuring approximately 16 square feet (4 by 4 feet).

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store mortar mix and other cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.11 FIELD CONDITIONS

A. Materials shall be used only at the manufacturer's recommended temperature tolerances or as indicated below, whichever is more conservative.

B. Cold Weather Requirements: Pointing work may only be performed when temperatures remain above 40 degrees F and are predicted to remain so for at least seven days after completion of work. If in any given 24-hour period the temperature drops or is expected to drop below 40 degrees F at any time, work will not recommence until a constant temperature of 40 degrees F or higher is projected for a minimum of 72 hours. Once stopped for reason of temperature, work will recommence only upon approval of the Architect.
   1. Do not leave joints raked and open when temperatures fall below 40 degrees F. Provide temporary protection of raked joints, such as cylindrical sealant backings (closed-cell foam backer rod), when temperatures fall below 40 degrees F.

C. Hot Weather Requirements: Do not apply mortar to substrates with temperatures of 90 degrees F and above unless otherwise indicated. Protect freshly installed mortar when temperature and humidity conditions produce excessive evaporation of water from mortar. Provide artificial shade

and wind breaks and use cooled materials to minimize evaporation during mortar placement. Protect freshly installed mortar from premature drying or rapid curing by using dampened burlap, plastic sheeting, or periodically misting with water to keep mortar moist for 72 hours following final tooling.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for masonry repointing work from one source with resources to provide materials of consistent quality in appearance and physical properties.

2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; white or gray, or both where required for color matching of mortar.
   1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: Not permitted.

D. Mortar Cement: Not permitted.

E. Mortar Sand: ASTM C144 natural sand blend, rounded to sub-angular in shape, washed, screened, and dried.
   1. Match size, texture, and gradation of existing mortar sand as closely as possible while remaining in compliance with ASTM C144 grading and soundness requirements. Blend several sands if necessary to achieve suitable match.
   2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: Pigments, if required to match original mortar color, shall be non-fading, UV-stable pigments meeting the requirements of ASTM C979/C979M. When blended with other dry components, the pigment proportion shall not to exceed 10 percent by weight of the cementitious or binder materials, except for carbon black, which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

G. Admixtures: Admixtures, including air-entraining agents, anti-freeze additives, latex modifiers, calcium chloride, or otherwise, shall not be used without the express written consent of the Architect and the mortar manufacturer. Calcium chloride is not permitted in any mortar.

H. Water: Potable.

2.03 MORTAR MIXES

A. Match existing mortar mix: For each variation in mortar type or color required, match existing mortar color, texture, materials and mix proportions while complying with the material requirements of this Section and the mix proportion requirements of ASTM C270.

B. Only pre-proportioned, dry-blended mixes packaged under factory-controlled conditions shall be permitted.

2.04 ACCESSORY MATERIALS

A. Masking Tape: Non-staining, non-absorbent material, compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Sealant Materials:
   1. Sealant manufacturer’s standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 079200 - Joint Sealants.
      a. Type: Single-component, nonsag urethane sealant.

b. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.
c. Sanded Joints: Provide mortar sand or ground mortar consisting of existing mortar retrieved from joints ground to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the #100 sieve.
d. Sealant Primer: Use type recommended by sealant manufacturer.

C. Joint-Sealant Backing:
1. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

D. Other Products: Select materials and methods of use based on the following, subject to approval of a mock-up:
1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
b. Leave residue on surfaces.

2.05 EQUIPMENT

A. Use of rotary grinders, power chisels, or any other power tools for cutting and raking joints will be permitted only with prior written approval of tool types, locations, and mechanics by the Architect. If mechanical grinders are approved by the Architect for cutting the horizontal joints, the blade must be diamond-impregnated metal measuring no larger than 4-1/2 inches in diameter, 1/16 inches in thickness.

B. Pneumatic Chisels: Barre Type B, short stroke, such as that manufactured by Trow and Holden (45 South Main St., Barre, VT 05641, Phone: 800-451-4349, Website: www.trowandholden.com) or similar, may be used with the approval of the Architect.

C. Chisels shall be narrower than the joints in which they are used.

D. Special Tools: Provide special knives or special thin cutter blades for use in joints less than 1/8 inch in width.

E. Brushes for cleaning joints shall be stiff, plastic or natural bristle brushes. Wire brushes shall not be used.

F. Trowels for Pointing: Long, thin pointing trowels that are narrower than joints being pointed.
1. Fabricate special trowels for pointing if necessary to provide for proper insertion and compaction of mortar or where required to achieve the desired tooled profile.

G. Pressure Washer: Pressure washers shall be fitted with a 40 degree fan-shaped nozzle, in-line pressure gauge, and pressure regulator. Operating pressure shall not exceed those specified, as measured in-line, and equipment shall be capable of providing the specified flow rate.
1. Spray nozzle shall be kept at minimum 1 foot away from the masonry surface. A dowel may be taped to the wand that projects 1 foot beyond the nozzle to ensure that the nozzle remains at minimum 1 foot way from the surface.

PART 3 EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work, including removals and new infill work.
   1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.
   1. Cover sills, ledges, and projections to protect from mortar droppings.
   2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
   3. Immediately remove mortar in contact with exposed masonry and other surfaces.
   4. Clean mortar splatters from scaffolding at end of each day.

3.02 GENERAL

A. Repointing Appearance Standard: Repointed joints are to have a uniform appearance as viewed from ten (10) feet away by the Architect.

3.03 MORTAR REMOVAL

A. Carefully document existing joint profile and width prior to mortar removal.

B. Rake out and repoint joints to the following extent:
   1. All joints in areas indicated in the Contract Drawings.
   2. Joints at locations of the following defects:
      a. Holes and missing mortar.
      b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
      c. Cracks 1/8 inch or more in width and of any depth.
      d. Hollow-sounding joints when tapped by metal object.
      e. Eroded surfaces 1/4 inch or more deep.
      f. Deterioration to point that mortar can be easily removed by hand without tools.
      g. Joints filled with substances other than mortar.

C. Do not damage the edges of masonry units or widen joints. Any masonry unit damaged by mortar removal shall be removed and replaced in kind at the Contractor’s expense at the direction of the Architect.

D. Remove mortar to provide joints with square backs and to expose masonry for contact with pointing mortars or sealant. Brush, vacuum, or flush joints with water to remove all dirt and loose debris.

E. Removal Depth:
   1. Pointed Joints: Cut joints and rake clean to a depth equal to two and one-half times the joint width (Example: Rake 1/2-inch-wide joints to a depth of 1-1/4 inches), or to sound mortar, whichever is deeper.
      a. Do not remove unsound mortar that extends more than half the depth of the masonry unit; consult Architect for direction.

F. Power-operated saws and grinders will be permitted for use on the joints with the approval of the Architect, only if the Contractor demonstrates the ability of the operators to use tools without damaging the masonry. If damage to the masonry is caused by the use of power tools, only chisels and mallets will be permitted for the remainder of the project.
   1. Center-cut joints: If power operated tools are permitted by the Architect, these tools shall only be used to cut a single kerf in the center of the joints. Hand tools shall be used to remove the remaining mortar from sides of the joints.
   2. Do not use power operated saws and grinders on joints less than 3/16 inch wide and less than 4 inches long, including all brick masonry head joints.

G. Completely remove sealant residues where present in joints indicated to receive repointing with mortar. Do not damage the edges of masonry units or widen joints.

H. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

3.04 MORTAR MIXING

A. Thoroughly mix mortar in quantities needed for immediate use using mechanical batch type mixer in accordance with ASTM C270. Add approximately half the required water and mix mortar for a minimum of five minutes, and then slowly add water as needed to reach the desired working consistency. Do not exceed mix time of ten minutes. A minimum amount of water shall be used to produce a workable consistency for the mortars intended purpose.
   1. Where mortar is required in small batches of less than a cubic yard and the Architect specifically approves, mortar may be mixed in a clean vessel by hand or paddle mixer and electric drill. No plastic particles from mixing in plastic buckets will be permitted in any mortar.

B. After mixing, allow Portland cement mortars to sit for 20 minutes prior to use to allow for initial shrinkage.

C. Mortar for pointing shall be as dry a consistency as will produce a mortar sufficiently plastic to be worked into the joints.

D. Add only clean, potable water at the project site. Do not add sand, cement, lime, bonding agents, color admixtures, set accelerators, plasticizers, air entraining admixtures or other materials unless specifically authorized in writing from the manufacturer and approved by the Architect.

E. Use mortar within 1/2-hour of mixing, after which unused mortar shall be discarded. Do not re-temper mortars which have begun to set.

3.05 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:
   1. All joints in areas indicated.
   2. Joints where mortar is missing or where they contain holes.
   3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
   4. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
   5. Joints where they sound hollow when tapped by metal object.
   6. Joints where they are worn back 1/4 inch or more from surface.
   7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
   8. Joints where they have been filled with substances other than mortar.
   9. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
   1. Remove mortar from joints to depth of 2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, un-weathered mortar.
   2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
   3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
      a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.

b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:
1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing applicaiton so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to feather edge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
   a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
   b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant:
1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces according to Section 079200 - JOINT SEALANTS Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant according to Section 079200 - JOINT SEALANTS and the following:
   a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
   b. Install sealant using only proven installation techniques that will ensure that sealant will be deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
   c. Install sealant as recommended by sealant manufacturer but within the following general limitations, measure at the center (thin) section of the bead:
   d. Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.
   e. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.

f. Do not allow sealant to overflow or spill into adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

4. Cure sealant according to Section 079200 - JOINT SEALANTS.

G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.06 CURING

A. Cure joints after mortar has achieved initial set by maintaining in damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers. Cure using clean, potable water.
2. Increase the frequency of misting in hot and dry weather.
3. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

B. Hairline cracking within the mortar or mortar separation from the edge of masonry units is unacceptable. Remove mortar and repoint.

3.07 INSTALLING SEALANT

A. After raking out mortar, keep joints dry and free of mortar and debris.

B. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.

C. Fill sealant joints with specified joint sealant:

1. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
2. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding masonry and matching the contour of adjoining mortar joints.
3. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:
   a. Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.
4. Tool sealant to form smooth, slightly concave, uniform beads. Remove excess sealant from surfaces adjacent to joint.
5. Sanded Joints: Immediately after first tooling, apply aggregate to sealant, gently pushing aggregate into the surface of sealant. Lightly retool sealant to form smooth, slightly concave, uniform beads. Remove excess sealant and aggregate from surfaces adjacent to joint.
6. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mock-up.

3.08 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloths.

C. Clean debris from roof, roof drains, and associated piping. Rinse off roof and flush out roof drains.

D. Clean debris and any mortar droppings from ledges and horizontal surfaces.

E. Sweep and rake adjacent pavement and grounds to remove debris. Where necessary, pressure wash surfaces at low pressure to remove mortar, dust, dirt, and stains.

F. Remove masking materials, leaving no residues that could trap dirt.

3.09 FIELD QUALITY CONTROL

A. Architect's and Construction Manager's Project Representatives: Architect and Construction Manager will assign Project representatives to help carry out their responsibilities at the site, including observing progress and quality of portion of the work completed. Allow Architect's and Construction Manager's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the work completed.

B. Notify Construction Manager's and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Construction Manager and Architect's Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

END OF SECTION

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PART 1 GENERAL

1.01 RELATED SECTIONS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This Section includes: mortar for all concrete unit masonry, brick masonry and cast stone.
   1. Mortar for all concrete unit masonry, brick masonry and cast stone.
   2. Mortar for repointing joints.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 040121 - Masonry Restoration
   2. Section 040343 - Masonry Repointing
   3. Section 040523 - Masonry Accessories
   4. Section 042113 - Brick Masonry
   5. Section 079200 - Sealants

1.03 STANDARDS

A. All work of this section shall conform to industry standards and/or manufacturer’s recommendation.

B. ASTM C91 "Standard Specifications for Masonry Cement".

C. ASTM C109 "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars".

D. ASTM C144 "Standard Specification for Aggregate for Masonry Mortar".

E. ASTM C150 "Standard Specification for Portland Cement".

F. ASTM C207 "Standard Specifications for Hydrated Lime for Masonry Purposes".

G. ASTM C270 "Standard Specifications for Mortar for Unit Masonry".

H. ASTM C780 "Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry".

I. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete".

J. ASTM C1506 "Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters".

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures.

B. Submit pursuant to Section 016100 - Basic Product Requirements.

C. Submit certificates of compliance and manufacturer's technical data describing: cement, lime, sand and admixture products specified.

D. Submit manufacturer's technical data describing integral coloring specified.

E. Submit small mortar samples depicting integral coloring. Provide manufacturer's entire range of available colors. Plastic samples representing available colors are not acceptable.

F. Mortar mix designs for each type of mortar. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

G. Submit results of tests of field specimens.

1.05 QUALITY ASSURANCE

A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer’s recommendations and/or industry standards.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturer's published instructions.

B. Protect against moisture exposure and damage.

PART 2 PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I or Type II.
   1. Provide white cement for integral coloring where required to obtain desired mortar color.

B. Mortar Sand: ASTM C144
   1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
   2. For pointing mortar, provide sand with rounded edges.
   3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

C. Water: Clean, potable and salt free.

D. Lime: ASTM C207, Type S mortar.

E. Provide all cement products from one manufacturer.

2.02 ADMIXTURES

A. Admixtures containing calcium chlorides are prohibited.

B. Apply at dosage recommended by the manufacturer.

2.03 INTEGRAL COLORING

A. Product: dry mixture of pure, non-fading, alkali-resistant iron-oxide pigments possessing uniform dispersion characteristics specifically intended for mixing into mortar and complying with ASTM C979.

B. Color to match existing adjacent mortar. Color to be approved by Architect.

2.04 MORTAR MIX

A. Prepare mortar mixes pursuant to "Property Specification Requirements" of ASTM C270 for types indicated on Drawings and herein specified. Do not exceed manufacturer's recommended pigment to cement ratio in colored mortar.

B. Exterior Concrete Unit Masonry (above grade)
   1. Mortar:
      a. Type S (minimum average compressive strength at 28 days: 1,800 lb./sq. in.).
      b. Mix: Portland cement/lime/sand.
   2. Admixture:
      a. Coloring pigments, color as selected by Architect.
      b. Must contain admixture for waterproofing
         1) Submittals must specify water repellent agent.
         2) Submit product literature for approval prior to using mortar on any finished area.

C. Exterior Brick Masonry (above grade)
   1. Mortar:
      a. Type N
         1) Proportion Portland cement, Lime and Sand in a 1:1:6 ratio
   2. Admixture:
      a. Coloring pigments, color as selected by Architect.
      b. Submit product literature for approval prior to using mortar on any finished area

D. Interior Concrete Unit Masonry
   1. Mortar:

a. Type S (minimum average compressive strength at 28 days: 1,800 lb./sq. in.).
b. Mix: Portland cement/lime/sand.
c. Color: Standard gray
    1) Standard gray at CMU to be painted.

E. Tests
    1. Prepare mix designs and conduct tests using a recognized laboratory.

PART 3 EXECUTION

3.01 MIXING

A. Mix mortar by methods that will ensure accurate proportioning of all required ingredients to a uniform consistency.

B. Mechanically mix between 3 to 5 min. Hand mixing is prohibited.

C. Select ingredients that are compatible.

D. Do not combine two air entraining materials within same mortar mix.

3.02 RETEMPERING

A. Use mortar within 2-1/2 hours of initial mixing.

B. Discard unused mortar after it has begun to set. Do not re-temper mortar that has begun to set.

3.03 ADMIXTURES

A. Mix admixtures into mortar pursuant to manufacturer's published instructions.

3.04 INTEGRAL COLORING

A. Provide integral coloring to mortar for all exterior walls.

B. Mix into mortar pursuant to manufacturer's published instructions.

3.05 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work area, as needed to perform inspections.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests, inspections and prepare test reports:
    1. Payment for these services will be made by Owner.

C. Mortar Tests: Test each type of mortar in accordance with ASTM 780, testing with same frequency as masonry samples.
    1. Test three samples for each 5,000 square feet of wall area or portion thereof; test one sample at 7 days and two samples at 28 days for each set.

END OF SECTION

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Specifications, apply to work of this Section.

1.02 SUMMARY

A. This Section includes the following masonry related items:
   1. Metal horizontal joint reinforcement for masonry.
   2. Wall weep and ventilation for masonry veneer.
   3. Masonry veneer anchors.
   4. In wall cavity mortar netting with insect barrier.
   5. Thru wall flashing.
   6. Repair and Restoration Anchors.
   7. Masonry Control Joints.
   8. Grout Screen.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 040121 - Masonry Restoration.
   2. Section 040343 - Masonry Repointing.
   3. Section 040513 - Mortar.
   4. Section 042113 - Brick Masonry.

1.03 STANDARDS

A. All work of this section shall conform to industry standards and/or manufacturer’s recommendations.

B. ASTM A82 "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement".

C. ASTM A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".

D. ASTM A641 "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire".

E. ASTM A951 "Standard Specification for Masonry Joint Reinforcing".

F. ASTM D2287 "Standard Specification for Non-rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds".

G. "Building Code Requirements and Specification for Masonry Structures" and Companion Commentaries (latest edition) (ACI-530/530.1; ASCE-5; TMS-402/602).

1.04 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.05 SUBMITTALS

A. Submit pursuant to 013300 - Submittal Procedures.

B. Submit pursuant to 016100 - Basic Product Requirements.

C. Product Data: Provide manufacturer's cut sheets clearly hi-liting or otherwise indicating choices in size, gauge, color, material, etc. for the following products:
   1. Horizontal joint reinforcing.
   2. Veneer anchors.
   3. Masonry anchors to structural steel.
   4. Movement joint products.
   5. Grout screen.
   6. Through-wall flashing, drip edge and termination bar.
   7. Cell vents.

8. Mortar netting.
9. Rigid ties.
10. Expansion and adhesive anchors.

D. Submit certificates of compliance and manufacturer's technical data for but not limited to: horizontal joint reinforcing, movement joints products, anchors, thru-wall flashing, mortar netting, wall ventilation and rigid ties.

1.06 QUALITY ASSURANCE

A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer’s recommendations and/or industry standards.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturer’s published instructions.

B. Protect against moisture exposure and damage.

C. Store masonry accessories to prevent corrosion and accumulation of dirt, oil or any other foreign substances.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hohmann & Barnard, Inc., 150 Motor Parkway, Suite 410, Hauppauge, NY 11788. Phone: (800) 645-0616.

B. Heckmann Building Products, 110 Richards Ave., Norwalk, CT 06854. Phone: (800) 621-4140.

C. WIRE-BOND, 400 Roundtree Road, Charlotte, NC 28217. Phone: (800) 849-6722.

D. Architect approved equivalent.

2.02 HORIZONTAL JOINT REINFORCEMENT WITH TIES OR ANCHORS

A. Description: Two or more parallel longitudinal deformed rods, weld connected with transverse cross rods which forms a ladder design.

B. Provide with out-to-out longitudinal rod spacing two inches less than out-to-out of CMU wythe width.

C. Exterior Application:
1. Side Rods: Two rods, 3/16-inch diameter.
2. Cross Rods: 9 gauge.
3. Finish: hot dip galvanized 1.5 oz. per sq. ft., ASTM A153, Class B-2.
4. Pintle: super-heavy-duty eyelets, pintles are flattened and serrated.
    a. Embed pintles (hooks) in the mortar joint and extend into the veneer a minimum of 1 ½”, with at least 1" cover to the outside face.

D. Products: #270 ML Adjustable Eye-Wire by Hohmann & Barnard, Inc., (www.h-b.com) Basis of Specification or Architect approved equivalent.

2.03 HORIZONTAL JOINT REINFORCEMENT WITHOUT TIES OR ANCHORS

A. Description: two or more parallel longitudinal deformed rods weld connected to a continuous diagonally oriented cross rod which forms a "ladder" design.

B. Provide with out-to-out side rod spacing two in. less than out-to-out total wall system width.
1. Lap side rods minimum of 6" at splices u.o.n.

C. Exterior Application:
1. Side Rods: 2 min., 3/16-inch diameter.
2. Cross Rods: 9 gauge.
3. Finish: hot dip galvanized 1.5 oz. Per sq. ft., ASTM A153, Class B-2.

D. Interior Application:

1. Side Rods: 2 min., 3/16-inch diameter.
2. Cross Rods: 9 gauge.
3. Finish: mill galvanized minimum of .10 oz. psf.

E. Products: #220 Ladder Mesh by Hohmann & Barnard, Inc. (www.h-b.com), Basis of Specification or Architect approved equivalent.

2.04 VENEER ANCHORING SYSTEM (HB-DW-10HS)

A. Description: vertically adjustable mechanical anchoring system for anchoring masonry veneer to existing wall construction.

B. Provide 12-gauge HB-DW-10HS with 3/16-inch diameter Vee Byna-Tie as manufactured by Hohmann & Barnard, Inc. or Architect approved equivalent.
1. Embed Vee Byna-Tie in the veneer mortar joint a minimum of 2”, with at least 1” cover to the outside face.

C. Finish: hot dip galvanized.

2.05 MASONRY RESTORATION ANCHORING SYSTEM TO EXISTING BUILDING CMU

A. Description: Masonry Fastener assembly for refacing a brick veneer to existing masonry construction with a minimum 3/4" cavity.

B. Product: Spira-Lok® Repair and Restoration Anchors by Hohmann & Barnard, Inc. or Architect approved equivalent.
1. Finish: Stainless Steel Type 304.
2. Diameter: 8mm.

2.06 GROUT SCREEN

A. Hohmann & Barnard or Architect approved equivalent.
1. MGS Mortar/Grout Screen based on CMU thickness.
2. Use where required to maintain grout in filled cells.

2.07 THROUGH-WALL FLASHING (BASE FLASHING, THRU-WALL FLASHING)

A. Flexible Flashing: For flashing not exposed to the exterior, use the following self adhesive (clear), non-asphalt composite membrane with a minimum thickness of 40 mils, unless otherwise indicated:
1. Textroflash™ Flashing by Hohmann & Barnard, Inc.
2. Flex-Flash® Flashing by Hohmann & Barnard, Inc.
3. Mas-N-Flash by WIRE-BOND.
4. CCW-705-TWF by Carlisle Coatings & Waterproofing Inc.
5. Architect approved equivalent guaranteed not to "drool" when exposed to UV or heat.

B. Flashing Primer: Use water-based self-adhering flashing primer as recommended by flashing manufacturer.

C. Stainless Steel Drip Edge (Drip Plate):
1. 26-gauge Type 304 stainless steel drip plate, 2-1/2” wide with a 3/16” hemmed drip.
2. Provide factory formed inside and outside corners.

D. Termination Bar (top):
1. 26 gauge x 1-1/2”, 304 stainless steel with 3/8" flange on top to receive field applied sealant.

2.08 WALL DRAINAGE AND VENTILATION

A. Manufacturers:
1. Quadro Vent™ by Hohmann & Barnard, Inc.
2. #3601 Cell Vent by WIRE-BOND.
3. #85 Cell Vent by Heckmann Building Products.
4. CavClear® Weep Vents by CavClear.
5. Architect approved equivalent.

B. Application:
   1. Install directly on top of through wall flashings **and** at highest point in cavity at 24" o.c. in brick veneer conditions and 32" o.c. in cast stone and ACMU veneer. Install at window sills & heads, door heads louvers and other locations as shown on the Contract Drawings.
   2. Color: to be selected by Architect.
   3. If cell vent appears in profiled unit (Bullnose, chamfered, etc.) trim cell vent to profile shape.

2.09 IN WALL CAVITY MORTAR NETTING

A. Description: 90% open polymeric mesh with insect barrier to allow unobstructed passage of air and water as base of wall cavity.

B. Manufacturer:
   1. Mortar Net Solutions™, 6575 Daniel Burnham Drive Suite G, Portage, Indiana 46368. Phone: (800) 664-6638. Basis of Specification.
   2. MASONPRO, Inc., 43300 Seven Mile Road, Northville, MI 48167. Phone: (800) 659-4731.
   3. Hohmann & Barnard, Inc., 150 Motor Parkway, Suite 410, Hauppauge, NY 11788. Phone: (800) 645-0616. Mortar Trap™.
   4. Architect approved equivalent.

C. Product: Mortar Net® with Insect Barrier, by Mortar Net Solutions™, 10" high by thickness required.

D. Match product size to cavity size. Cavity should be no more than ¼" wider than 1" thick material and 2" thick material, and 0.4" thick material should touch both the outer wythe and the inner wall. For cavities larger than 2", place rigid insulation of sufficient height to extend at least 6" above the top of the Mortar Net® with Insect Barrier against the outside of the inner wythe and of appropriate thickness to reduce the cavity to the appropriate size or add additional layers of Mortar Net® to fill width of cavity.

2.10 COMPRESSIBLE FILLER

A. Premolded filler strips complying with ASTM D1056, Grade 2A 1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Products:
   1. NS Closed Cell Neoprene Sponge as manufactured by Hohmann & Barnard, Inc.
   2. #3300 Expansion Joint as manufactured by Wire-Bond.
   3. Architect approved equivalent.

2.11 EXPANSION BOLTS (ATTACHING STEEL MEMBERS TO MASONRY WALLS)

A. Description: Stud type with a single piece three section wedge and zinc plated in accordance with ASTM B633 or where specified, type 304 or type 316 stainless steel. See Contract Drawings for locations where stainless steel is required. Anchors shall be installed in drilled holes per manufacturer's recommendations.

B. Product: Hilti Kwik Bolts, diameter as specified, by Hilti Corp. or Architect approved equivalent.

2.12 ADHESIVE ANCHOR BOLTS (ATTACHING STEEL MEMBERS TO MASONRY ELEMENTS)

A. Description: Threaded anchor rods, nut and washer, a cylindrical mesh screen tube and an injectable adhesive (components A and B) material. Screen tube and anchors shall be installed in drilled holes and per manufacturer's recommendations. Anchor rods supplied in accordance with ASTM A 36, or if required: ASTM F 593 (AISI 304 stainless steel). Nuts shall be furnished to meet the requirements of the above anchor rod specifications. Anchors rods (non-stainless steel), nuts and washers to be zinc plated in accordance with ASTM A 153.

B. Product: Hilti HIT-HY 10 PLUS, diameter as specified, by Hilti Corp. or Architect approved equivalent.

PART 3 EXECUTION

3.01 GENERAL

A. If more than one value or requirement is specified, see Contract Drawings for location.

3.02 HORIZONTAL JOINT REINFORCEMENT

A. Place horizontal joint reinforcing as follows:
   1. In solid wall panels, for interior and exterior walls, place at a vertical spacing of 16 in. on center vertically.
   2. In exterior parapets, place at a vertical spacing of 8 in. on center vertically.

B. Place horizontal joint reinforcement in:
   1. All concrete unit masonry walls.

C. Place horizontal joint reinforcing in the two (2) bed joints above and below window, louver, door wall openings, and training openings extending a minimum of 24" beyond the opening (except at vertical control joints). At other special conditions, place horizontal joint reinforcement as described in manufacturer's published instructions and as illustrated on Contract Drawings.

D. Lap side rods at each end joint a minimum of 6 in. for normal shrinkage stresses.

E. Install prefabricated corner and tee assemblies at each wall corner and intersection.

F. Miter and butt end joints are prohibited.

G. Place horizontal joint reinforcement in approximate center of out-to-out wall assembly and assuring a 5/8 in., minimum, mortar coverage on exterior face.

H. Install horizontal joint reinforcement continuous, terminating only at vertical control joints.

I. Cut, form and seal all inside and outside corners.

3.03 THROUGH-WALL FLASHING INSTALLATION

A. Install flashing, drip edge, and termination bar in accordance with manufacturer’s printed instructions at all exterior conditions.
   1. Use primer as recommended by flashing manufacturer.
   2. Install flashing in sections of 8' or less into primed surfaces.
   3. Use a roller to firmly press flashing onto surface without air pockets.
   4. Seal all non water shedding edges as recommended by flashing manufacturer.
   5. Do not leave flashing exposed to UV light for more than 60 days.

B. Mortar shall be bedded above and below the flashing.

C. Flash all shelf angles including but not limited to lintels, bond beams, sills, wall bases and any other obstructions to natural flow of water within the wall cavity.

D. Install end dams a minimum of 2” high U.N.O. at all shelf angles, sills and other ends.

E. Lap all flashing joints a minimum of 3” and seal with manufacturers approved mastic. Lap all drip edge a minimum of 3" with sealant beads as recommended by manufacturer.

F. Any penetration of the flashing must be sealed.

G. All thru wall flashings to rise a minimum of 12” to the interiors. Use termination bar and sealant at exterior sheathing and CMU.

H. Fasten termination bar to stud wall construction at 16" o.c. maximum and at 8" o.c. maximum for CMU back-up wall construction.

I. At base of masonry walls where exterior finish grade changes, follow grade changes by lowering or raising base flashing as required in 8" steps to follow the exterior grade.

3.04 MORTAR NET

A. Install as per manufacturer’s instructions.

B. Install continuous length of mortar net immediately above all through-wall flashings in masonry veneer applications.

3.05 EXPANSION/CONTROL JOINTS IN MASONRY VENEER

A. Install Joint Stabilization Anchors at 2’-0” o.c. vertically in veneer expansion/control joints. Field bend joint stabilization anchors where CJ/EJs occur at perpendicular veneer. Provide NSTA - Closed Cell Neoprene Sponge in veneer control joints.

END OF SECTION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Drawings and general provisions of the Agreement, including General Conditions and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Brick Masonry
      a. For the infilling of existing exterior walls where brick in-fills are required.
      b. For replacing existing brick that is either missing or severely damaged as identified on the Contract Drawings.
      c. Exterior brick exposed to view: Use salvaged brick if available. Otherwse use new matching brick. Back-up brick in exterior wall reconstruction: Use new brick.

B. Related Sections: The following Sections contain requirements that relate to the Section.
   1. Section 040120 - Maintenance of Unit Masonry
   2. Section 040121 - Masonry Restoration
   3. Section 040343 - Masonry Repointing
   4. Section 040513 – Mortar
   5. Section 040523 – Masonry Accessories
   6. Section 079200 – Sealants

1.03 STANDARDS

A. ASTM C62 "Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)".

B. ASTM C67 "Standard Test Methods of Sampling and Testing Brick and Structural Clay Tile".

C. ASTM C216 "Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)".

D. BIA Technical Notes on Brick and Tile Construction.

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 – Submittal Procedures

B. Product Data:
   1. Submit product data including test results on each type of new brick required.
   2. Submit product data for proposed cleaning product including instruction for proper application and use.

C. Samples for Verification & Approval
   1. 5 brick strap for each type or color of brick specified showing extremes of variation in color and texture.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with Technical Notes on Brick and Tile Construction, by Brick Institute of America (BIA), except as more stringently required in the Contract Documents.

1.06 STORAGE AND PROTECTION

A. Store new brick and salvaged brick off ground, under cover, to prevent wetting and contamination by weather, mud, dust and materials likely to cause staining.

1.07 PROJECT/SITE CONDITIONS

A. At end of day, or during a shutdown, protect top surface of all masonry to prevent rain from entering the masonry. Install protection, adequately anchored, to prevent water intrusion to cover top surface and extend a minimum of 2 ft down all sides of masonry.

B. Brace walls according to NCMA and ANSI.

C. Prevent and remove immediately any mortar, grout and soil droppings that come in contact with masonry.

D. Protect base of walls from rain-splashed mud and mortar by means of coverings on ground and over wall surface.

E. Cold Weather Requirements: Comply with National Concrete Masonry Association (NCMA) TEK Spec #3-1C “All Weather Concrete Masonry Construction.”.

PART 2 PRODUCTS

2.01 FACING BRICK

A. Face Brick: Provide face brick, including specially molded, round, cut, or sawed shapes wehre required to complete masonry restoration work matching existing masonry.
   1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork.
      a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
   2. Special Shapes:
      a. Provide specially molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
      b. Provide specially ground units, shaped to match patterns, for arches and where indicated.
      c. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.
   3. Tolerances as Fabricated: Comply with tolerance requirements in ASTM C216, Type FBS or to match existing brick masonry tolerances.

B. Salvaged Brick: When available use salvaged brick that are whole and in good condition.

2.02 BRICK CLEANER

A. Non-Acidic cleaner specific for cleaning brick and removing efflorescence as recommended by brick manufacturer for brick being supplied.

B. See Specification Section 040120 - Maintenance of Unit Masonry.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine other construction, which supports or connects with masonry work. Where such construction as footings and shelves are not sound or level, where anchorage devices have not been installed, where interferences exist, or where there are other conditions unsuitable for proper installation or performance of the masonry, do not start masonry work until defective earlier construction has been completed or corrected.

3.02 CONDITIONING BRICK

A. Wet brick with absorption rate greater than 20 grams/min/30 sq. in., as determined by ASTM C67, so that rate of absorption when laid does not exceed this amount.

B. Do not dip individual brick in water before laying. Instead, play a hose on piled brick until water runs from brick. Wet down 1 day before brick are to be used. In hot weather, wet down 2 to 4 hours before brick are to be used.

3.03 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
   1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that sourounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole bricks as possible.
   1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
   2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
   3. Store brick for reuse. Store off ground, on skids, and protected from weather.
   4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
   1. Maintain joint width for replacement units to match existing joints.
   2. Use setting buttons or shims to set units accurately spaced with uniform joints.

H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67/C67M initial rates of absorption (suction) of more than 30 gr/30 sq. in. per min. (30 g/194 sq. cm. per min.). Use wetting methods that ensure that units are nearly saturated, but surface is dry when laid.
   1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
   2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
   3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.04 REANCHORING VENEERS

A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16 inches o.c. vertically and 32 inches o.c. horizontally unless otherwise indicated. Install atlocations to avoid penetrating flashing.

B. Recess anchors at least 5/8 inch from surface of mortar joint and fill recess with pointing mortar.

3.05 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where the Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:
   1. Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning", as applicable to meet paint manufacturer's recommended preparation.
   2. Immediately paint exposed steel with two coats of anti-rust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.06 COURSING AND BOND

A. Course brick to match existing brick coursing.

B. Layup brick with approximately 3/8 in. bed joints, uniformly adjusted to produce the specified coursing. Make head joints the same width as bed joints.

C. Layup brick in stretcher, header, rowlock, bull header (stretcher rowlock), soldier, or sailor position with only good faces and good ends showing. Cut brick to make headers in veneer and show good end only.

D. Shapes: Provide shapes as indicated on Drawings, with finished faces at all locations where they will be visible in the Work. Do not cut brick to make shapes.

E. Finish visible brick joints using nonrusting tools to form hard impervious surface by hard tooling to a concave profile "U" joint.

F. Compress joints and cut flush in unexposed work except at joints below grade. Hard tool joints below grade to a concave profile.

3.07 INSTALLATION

A. At brick infills, select brick from salvaged brick that closely matches existing, adjacent brick. Salvaged brick to only be used for brick appearing in exterior face of in-fill.

B. Lay brick plumb and true to lines, with level courses. Line up head joints vertically. Use no more than one cut closure in any length of wall. Line up closures vertically.

C. Layup brick with completely filled mortar joints. Do not furrow bed joints. Butter end of brick with sufficient mortar to fill head joint, then shove in place. Rock closures in place with head joints thrown against two adjoining brick in place.

D. Tap each unit to line and level as it is placed. Do not disturb any unit once in place except to completely remove and set in a fresh bed of mortar.

E. Do not pound corners and jambs to fit stretcher units after they have been set in position. Where an adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.

F. Make all cuts with power masonry saw. Do not use Sawcut faces in exposed work.

G. Lay up only brick, which have no chipped, cracked or discolored exposed faces. Layup with good face showing, lip (if any) always down, frog (if any) always up. Where flat side is shown, provide a brick with flat un-torn side matching other brick faces, without frog, or core holes.

H. Tool joints when thumbprint hard, compressing mortar tightly against both sides of joint. Make head joints match profile of bed joints.

3.08 FLEXIBLE IN WALL FLASHING

A. Place wall flashing over a thin bed of mortar, always sloping flashing slightly to exterior. Place mortar over flashing to bed brick course above it.

B. Turn wall flashing at least 8 in. up behind brick and anchor top edge as per detail shown in drawings.

C. Tape, or seal with asphalt cement, all penetrations in wall flashing. Extend wall flashing around outside of structural columns. Extend wall flashing at least 4 in. beyond lintels and sills and turn up ends to form a pan, which directs moisture to exterior. Lap wall flashing joints at least 4 in. Extend wall flashing to within 1/4 in. of exterior of mortar joint.

3.09 OTHER WORK

A. Build in lintels, door frames, windows, flashing, insulation, reglets, inserts, anchors, blocking, sleeves, boxes, cabinets, piping, conduit, and other items whether provided as part of masonry work, as preparation for other work, or furnished by other trades.

B. Fill steel door frames in masonry walls with grout.

C. Provide passage for electrical and mechanical lines. Allow and aid placement in walls where lines would be exposed. Cut neat holes for in wall switches and cabinets. Make provisions for passage of lines, and other chases and openings, during laying up of masonry so that later cutting is not necessary. Fill holes after lines and boxes are in place.

D. Maintain sealant clearances at door, window, and other openings.

E. Provide lintels at all openings in masonry work, as needed to form openings for windows, louvers, frames, in-wall equipment, through wall ducts and piping, and as otherwise needed to support heads of all openings over 8 in. wide.

3.10 CONTROL OF MOVEMENT

A. For expansion joints, leave full width of joint free of masonry, mortar and reinforcement, ready for backup material and sealant.

B. For control joints, insert control joint material and leave joint free of masonry and reinforcement.

C. If control joints are not shown, place them vertically not more than 24 ft on center, within 2 ft of building corners, and at lines of weakness such as at steel columns, changes in building height, and at each side of openings over 8 ft high.

D. Do not butter masonry units to steel members, except where masonry bears on steel. Maintain 1/2 in. clearance. Fill vertical clearances with 1/2 in. semi-rigid fiberglass or other sort, incombustible board material.

E. Build nonbearing partitions to a distance 3/8 to 3/4 in. from structural soffit above. When structure above has deflected from building loads placed upon it, wedge partition to structural soffit with metal or slate wedges and fill top joint with mortar.

F. Straighten and position anchors and protruding reinforcement, which were placed in, reinforced brick lintel concrete to bond fine grout to concrete beam.

3.11 PROTECTION

A. Wall covering:
   1. Cover tops of partially completed walls with strong, non-staining, waterproof membrane, securely held in place, extending at least 24 in. down both sides of wall at start of rain, and at end of each day's work on wall.
   2. Clamp protective membrane in place using spring wire clamps.

B. Load application:
   1. Do not apply dead, live floor, or roof loading for at least 24 (twenty-four) hours after building masonry columns or walls.
   2. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.

C. Staining:
   1. Prevent mortar, grout, and cleaning agents from adhering to, staining or deteriorating masonry and other surfaces to be left exposed or painted.
   2. Remove mortar, grout, and cleaning agents from masonry and other surfaces daily. Remove them from sensitive surfaces such as aluminum and glass immediately.
   3. Protect sills, ledges, and projections from mortar droppings by means of taped paper guards or a layer of sand.
   4. Protect door and window frames during masonry construction. Maintain in plumb, square, true position.

3.12 REPAIR OF DEFECTIVE WORK

A. Remove stained and damaged brick and replace with new units in fresh mortar bed, of color and tooling matching surrounding work. Repair voids and other defects in mortar joints.

3.13 CLEANING BRICK

A. Start cleaning late in the work, after mortar is thoroughly cured.

B. Dry clean walls before wetting. Remove large particles of mortar with wood paddles and scrapers. Use chisel or wire brush only when wood implements do not work.

C. Soak wall with copious amounts of clean water from hose, flushing off loose mortar and dirt in the process.

D. Scrub walls with detergent cleaning agent, using stiff fiber brush.

E. Rinse off all detergent, dirt, and mortar crumbs using clean water from hose.

F. Do not use any acid or acid compounds in cleaning brick masonry.

G. No air blast or sand blast cleaning of masonry shall be allowed.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Grout.
   3. Base Plates.

B. Related Requirements:
   1. Division 01 - "Quality Requirements" for independent testing agency procedures and administrative requirements.
   2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and for surface-preparation and priming requirements.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches (38 mm).
   2. Welded built-up members with plates thicker than 2 inches (50 mm).
   3. Column base plates thicker than 2 inches (50 mm).

1.04 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Shop drawings and required calculations shall bear the seal and signature of a registered Professional Engineer licensed in the state in which the project is located. Structural steel shop drawings will not be reviewed without said seal and signature.
      a. A full set of engineered calculations for all beam to column moment connections shall be submitted to the engineer of record for approval. The steel fabricator drawings shall not be reviewed without said engineering calculations affixed with a seal and signature of a professional engineer licensed in the state in which the project is located.
   2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   3. Include embedment Drawings.

4. Indicate profiles, sizes, spacing and locations of structural members, openings, attachments, fasteners, connections, cambers, holes and other pertinent data. Include locations of structural members, openings, attachments and loads.
5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
7. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer / fabricator.

B. Welding certificates: Submit certificates certifying that welders employed in the work have met AWS qualifications within in the previous 12 months.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties. Indicate structural strength, destructive and non-destructive test analysis.

E. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Non-shrink grout.

1.08 QUALITY ASSURANCE

A. Fabricator shall have a minimum of five (5) years documented experience with performing the work of this section.

B. Installer Qualifications: A qualified installer specializing in performing the work of this section with a minimum of three (3) years of documented experience.

C. Delegated Connection Designer: Connections not fully detailed on the contract drawings shall be designed under the direct supervision of a professional structural engineer experienced in the design of this work and licensed in the state in which the work is located. The shop drawings shall bear the seal and signature of same professional engineer.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
1. AISC Code of Standard Practice for Steel Buildings and Bridges - AISC 303.
2. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products to/at the site under the supervision of Division 01 of this Project Manual.

B. Schedule deliveries of materials to the site at intervals which will ensure uninterrupted progress of the work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and experience. who bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

A. Coordinate the work under Division 01 specification of this Project Manual.

B. Coordinate the selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions and directions for installation.

D. Coordinate the work of this section with utility installations and all other adjacent work.

E. Coordinate the work of this section such that general progress of the Work in not interrupted.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on the plans and approved shop drawings.

B. The contractor is responsible for the proper location and elevations of the work.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated where beam end reactions are not shown on drawings. Connection designer shall design shear connections to resist the reaction resulting from the maximum allowable uniform load of the beam found in the AISC Specification being applied along its full length.
   1. Select and complete connections using AISC 360.
   2. Use Load and Resistance Factor Design; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained. Provide design and details of moment connections to resist forces shown on the contract drawings.

C. Construction: Moment frame and Braced frame.

2.02 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels, Angles, M-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M.

E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C, seamless structural tubing.

F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
   1. Weight Class: as indicated on the contract documents.
   2. Finish: Black except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers with plain finish.
   1. Direct-Tension Indicators: ASTM F959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

E. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Anchor Bolts: ASTM F1554, 36 and 55 ksi yield strength for moment resisting anchor rods.
   1. Nuts: ASTM A563 heavy-hex carbon steel.
   2. Plate Washers: ASTM A36/A36M carbon steel.
   3. Washers: ASTM F436/F436M, Type 1, hardened carbon steel.
   4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Threaded Rods: ASTM A 36/A 36M.
   1. Nuts: ASTM A563 ASTM A563M heavy-hex carbon steel.
   2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   3. Finish: Plain.

H. Clevises: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.

J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

2.04 PRIMER

A. Primer: Comply with Division 09

B. Primer: SSPC-Paint 15, Type I, red oxide.

C. Ensure primer is compatible with required topcoat.

D. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.05 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

B. Grout shall consist of a premixed compound with cement, water reducing and plasticizing additives capable of developing a minimum compressive strength of 7000 psi at 28 days.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. All wide flange structural steel members shall be fabricated in accordance with ASTM A992/A992M. All miscellaneous steel members including channels, angles, S, HP, and M shapes shall be fabricated in accordance with ASTM A36/A36M.
   6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
   7. All shop connections shall be welded or high strength bolted.
   8. Bearing surfaces shall be planed true to provide full bearing over the entire surface.
   9. Continuously seal joined members by intermittent welds and plastic filler. Grind welds smooth where exposed or where interference with other building materials is encountered,
   10. Splicing is not permitted unless indicated on the Contract Documents or accepted on the final approved Shop Drawings.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Mechanically thermal cut bolt holes shall not be permitted unless prior approval by the Architect is obtained in writing.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning." or SSPC-SP 3, "Power Tool Cleaning." unless a more stringent cleaning method is required for selected primers and / or other coatings.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Shop prime non-exposed steel members after fabrication in accordance with SSPC- PA. Do not prime surfaces that will be fireproofed, field welded or are in contact with concrete or high strength bolts.

H. Paint exposed structural steel members in accordance with the applicable Division 09 Specification section.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning unless approved by the Architect in writing.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened unless otherwise shown on the contract documents or required by the connection designer.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.09 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
   1. Inspection and Tests will not relieve the contractor of responsibility for providing materials, fabrication and erection procedures in compliance with the specified requirements. The contractor shall verify that all materials meet or exceed the requirements specified in these specifications, Contract drawings and related references. Materials not in compliance with the specified requirements will be rejected and required to be removed from the site.

C. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M , Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M type required for materials being welded and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E165/E165M.
   2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E164.
   4. Radiographic Inspection: ASTM E94.

E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other drawings for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other drawings showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
   2. Clean bearing surfaces and other surfaces which will be in permanent contact with the work.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Proceed with the installation only after unsatisfactory conditions have been corrected. Commencement of installation will indicate that the erector accepts the conditions which exist.

C. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates.

E. Erect all components in accordance with the approved shop drawings.

F. Field weld components and shear studs as indicated on approved shop drawings and in accordance with AWS D1.1/D1.1M.

G. Do not field cut or alter structural members without written approval of the Engineer.

H. Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
   5. Coordinate placement of anchors in concrete or masonry construction for securing base plates.

I. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

J. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

K. Splice members only where indicated.

L. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

M. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

N. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

O. Erect all components in accordance with approved shop drawings. After erection, prime welds, abrasions and surfaces not shop primed or galvanized as required, except surfaces to be in contact with concrete.

P. Field weld components and shear studs as indicated on the approved shop drawings and in accordance with AWS D1.1/D1.1M.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened Pretensioned unless specifically identified as pretensioned or slip-critical on the. contract documents or calculations by the Delegated Connection designer.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
4. Connections and abrasions shall be cleaned, prepared and finished in the same manner and with the same materials used in shop finishing.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test high strength bolted connections according to RCSC's "Specification for Structural Joints Using ASTM F3125/F3125M, Grade A325 or Grade A490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E165/E165M.
      b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E164.
      d. Radiographic Inspection: ASTM E94.

E. Post Installed Mechanical Anchors, Adhesive Anchors and Screw Anchors: Comply with 2020 New York State Building Code Table 1705.3.
   1. The special inspection shall include the verification of compliance with approved construction documents and standards established by the Commissioner pursuant to Section 28-113.2.2 of the Administrative Code.

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.06 TOLERANCES

A. All members shall be installed within AISC tolerances and as follows:
   1. Maximum variation from plumb: 1/4" (6mm) per story, non-cumulative.
   2. Maximum offset from true alignment: 1/4" (6mm).

3.07 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Touchup Priming: Cleaning and touchup priming as specified in Division 9 "High-Performance Coatings" or compatible primer established at the fabricators shop to be compatible with the final finish.

3.08 ADJUSTING

A. All misfits due to errors in location, fabrication, inaccuracies in the setting of anchor bolts or other items of attachment or support shall be immediately reported to the Engineer and corrected in a manner subject to the approval of the Engineer.

B. Submit method of correction to the Architect under Division 01 Specification provisions.

C. Proceed with corrective work only after receiving written approval from the Architect.

D. All corrections shall be made at no additional cost to the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Treated Wood Members.
   2. Fasteners.
   3. Wood blocking, cants, and nailers.
   4. Wood furring and grounds.

1.03 REFERENCES:

A. AITC - American Institute of Timber Construction.

B. APA PRP-108 - Performance Standards and Qualification Policy for Wood Structural Panels (Form E445); 2021.

C. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2024).

D. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products; 2024.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   1. Currently: 2025 NYS Building Code Series.

G. PS 1 - Structural Plywood; 2009 (Revised 2019).

H. PS 2 - Performance Standard for Wood Structural Panels; 2018.

1.04 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. SPIB: The Southern Pine Inspection Bureau.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Plywood.
4. Shear panels.
5. Power-driven fasteners.
6. Powder-actuated fasteners.
7. Expansion anchors.
8. Metal framing anchors.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle, Transport and Store Plywood Panels in accordance with the APA Storage and Handling recommendations.

B. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:
1. Dimension lumber framing.
2. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness 15 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; UC2 (Interior Construction - Above Ground - Damp) for interior construction not in contact with the ground, Use Category UC3B (Above Ground Exposed) for exterior construction not in contact with the ground, and UC4B (Ground Contact or Fresh Water - Heavy Duty) for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
   3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency. Mark panels on surfaces that will not be exposed in the final construction.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
   1. Concealed blocking.
   2. Framing for non-load-bearing exterior walls.
   3. Roof construction.

2.04 DIMENSION LUMBER FRAMING

A. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
   1. Species and Grade: Southern pine; No. 1 grade; SPIB.
   2. Species and Grade: Douglas fir-south; No. 1 grade; WWPA.
   3. Species and Grade: Hem-fir; No. 1 grade; WCLIB or WWPA.

2.05 CONSTRUCTION MOUNTING PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, APA rated A-D faced plywood or MDF; 3/4 inch thick; flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.06 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
   1. Hem-fir (north); NLGA.
   2. Mixed southern pine; SPIB.
   3. Hem-fir; WCLIB or WWPA.
   4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
   2. Eastern softwoods; No. 2 Common grade; NeLMA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.

B. Power-Driven Fasteners: NES NER-272.

C. Wood Screws: ASME B16.1.

D. Lag Bolts: ASME B18.2.1.

E. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency.
   1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.08 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

A. Surfaces to receive new wood members shall be free of all dirt, debris, and loose materials. Exposed surfaces shall be mechanically scraped if necessary, to remove projections.

B. Surfaces shall have no free water present in any form (rain, dew, frost, snow or ice).

C. Contractor is responsible to inspect all exposed surfaces to see that conditions are satisfactory for installation of new work.

3.02 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Place horizontal members flat, crown side up.

C. Coordinate installation of adjacent construction.

D. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.10.1, "Fastening Schedule," in ICC's "International Building Code" and the 2025 Building Code of New York State".

3.03 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.04 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:
   1. Synthetic rubber waterproofing.
   2. Polyurethane waterproofing.
   3. Cold-applied modified-polymer elastomeric waterproofing.
   4. Cold-applied fiberglass reinforced vapor permeable waterproofing.

1.02 ABBREVIATIONS

A. CSPE - Chlorosulfonated Polyethylene.

B. HDPE - High-Density Polyethylene.

C. NRCA - National Roofing Contractors Association.

D. SBS - Styrene-Butadiene-Styrene.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

C. ASTM C1306 - Standard Test Method for Hydrostatic Pressure Resistance of a Liquid-Applied Waterproofing Membrane; 2008.

D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

E. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).

F. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2020.

G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

H. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2022.

I. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 2020.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

K. ICC-ES AC29 - Acceptance Criteria for Cold, Liquid-Applied, Below-Grade, Exterior Dampproofing and Waterproofing Materials; 2011, with Editorial Revision (2014).

L. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

A. See Section {\id\#1000094} - {\t\#1000094}, for submittal procedures.

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.

F. Warranty:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's certification that installation complies with warranty conditions for the waterproofing membrane.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in installation of fluid-applied waterproofing with minimum five years experience.

C. Single Source Responsibility for Waterproofing: Provide and install products from single source.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until cured.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no cost to Owner.

C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polyurethane Waterproofing:
   1. AVM Industries, Inc; Aussie Membrane 520: www.avmindustries.com/sle.
   2. Carlisle Coatings & Waterproofing, Inc; MiraSEAL TDS: www.carlisleccw.com/sle.
   3. BASF Corporation; MasterSeal HLM5000: www.basf.com

2.02 MEMBRANE AND FLASHING MATERIALS

A. Polyurethane Waterproofing: Cold-applied one or two component polyurethane, complying with ASTM C836/C836M.
   1. Cured Thickness: 60 mils (1.5 mm), minimum.
   2. Suitable for installation over concrete substrates.
   3. VOC Content: None.
   4. Tensile Strength: 400 psi (2.758 MPa), measured in accordance with ASTM D412.
   5. Ultimate Elongation: 180 percent, measured in accordance with ASTM D412.
   6. Hardness: 30, measured in accordance with ASTM D2240, using Type A durometer.
   7. Permeance: 0.073 perms (4 ng/(Pa s sq m)), measured in accordance with ASTM E96/E96M.
   8. Permeability: 0.01 perm inch (0.8 ng/ (Pa s m)), measured in accordance with ASTM E96/E96M.
   9. Adhesion: greater than 150 psi (1.03 MPa), measured in accordance with ASTM D4541.
   10. Brittleness Temperature: minus 50 degrees F (minus 44 degrees C), measured in accordance with ASTM D746.
   11. Products:
      a. Carlisle Coatings & Waterproofing, Inc; CCW 703 Liquiseal: www.carlisleccw.com/sle.

b. BASF Corporation; MasterSeal HLM 5000 - High Build System.

B. Flexible Flashings: Type recommended by membrane manufacturer.

C. Joint Cover Sheet: 1 inch (25.4 mm) thick elastic sheet material designated for and compatible with membrane.

2.03 ACCESSORIES

A. Surface Conditioner: cementitous type, compatible with membrane compound; as recommended by membrane manufacturer.

B. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.

C. Protection Board: Drainage type rigid insulation specified in Section 072100.

D. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
1. Composition: Dimpled polystyrene core; polypropylene filter fabric.
2. Products:
a. CCW Mira-Drain 6000.

E. Cant Strips: Provide cant strips in size and material recommended by the waterproofing system manufacturer

F. Counterflashings: Two-piece counterflashing as specified in Section 076200.

G. Counterflashings: As recommended by membrane and protection board manufacturer.

H. Reglet Strip Devices: Compatible and matching counterflashing material configured as detailed on the drawings or approved by the architect..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.

D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.

E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

F. Prepare building expansion joints at locations as indicated on drawings.

G. Install cant strips at inside corners.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

C. At joints and cracks less than 1/2 inch (13 mm) in width including joints between horizontal and vertical surfaces, apply 12 inch (300 mm) wide strip of joint cover sheet.

D. At joints from 1/2 inch to 1 inch (12.7 mm to 25.4 mm) in width, loop joint cover sheet down into joint between 1-1/4 inch to 1-3/4 inch (31.8 mm to 44.5 mm), and extend sheet at least 6 inches (152 mm) on either side of expansion joint.

E. Center joint cover sheet over joints, roll sheet into 1/8 inch (3.2 mm) thick coating of waterproofing material and apply second coat over sheet extending at least 6 inches (152 mm) beyond sheet edges.

F. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches (150 mm) above horizontal surface for first ply and ____ inches (____ mm) at subsequent plies laid in shingle fashion.

G. Apply extra thickness of waterproofing material at corners, intersections, and angles.

H. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

I. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Immediately after curing, dust membrane with tack-reducing surfacing at rate of approximately 10 lbs/100 sq ft (4 kg/10 sq m).

B. After membrane has cured, but before it becomes dusty, apply separation sheet. Lap joints to ensure complete coverage.

C. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward, and scribe and cut boards around projections, penetrations, and interruptions.

D. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

E. Adhere drainage panel to substrate with compatible adhesive.

3.05 FIELD QUALITY CONTROL

A. Owner will provide testing services in accordance with Section 014500 - QUALITY CONTROL. Contractor shall provide temporary construction and materials for testing.

B. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.

C. Flood to minimum depth of 1 inch (25 mm) with clean water, and after 48 hours inspect for leaks.

D. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect/Engineer; repeat flood test, and repair damage to building.

E. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Polyisocyanurate foam insulation with foil facers
   2. Extruded Polystyrene foam board insulation.
   3. Mineral-wool blanket insulation.
   4. Vapor retarders.

1.03 ACTION SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: For each type of product indicated.

C. Manufacturer's Certificate: Certify panels will conform to specified performance requirements.

1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.06 PRE-INSTALLATION MEETING

A. Pre-Installation Meeting: Convene minimum one week prior to commencing Work of this section. Review installation procedures and coordination required with Related Work and include the following:
   1. Participants: Authorized representatives of the Contractor, Architect, Installer, and Manufacturer.
   2. Review wall assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
   3. Review continuous insulation wall panels installation methods and procedures related to application, including manufacturer’s installation guidelines.
   4. Review firestopping requirements and weather resistive membrane requirements and placement locations.
   5. Review field quality control procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 POLYISOCYANURATE BOARD INSULATION

A. Acceptable Manufacturer: Insulating panels shall be XCI products produced by Hunter Panels, 15 Franklin Street, Portland, Maine 04101. Phone: (207) 761-5678 or (888) 746-1114. Fax: (877) 115-1769. E-mail: info@hpanels.com.
   1. Architect approved equivalent.

B. Board Insulation with Foil Facers: Hunter Panels Xci Foil (Class A) complies with ASTM C1289 and ASTM E84 Class A (25 or less) Panels are a high thermal resistive rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded on both sides to reinforced foil facers.
   1. Type: ASTM C1289, Type I (Foil-facers on each side of foam core)
      a. Grade 3 (25 psi).
      b. Panel Size:
         1) 4 feet by 8 feet (1220 mm by 2440 mm) and 4 feet by 4 feet (1220 mm by 1220 mm)
      c. R Value: ASTM C518 at 75 degrees F (23.9 degrees C). Provide thickness requirements indicated on the drawings
         1) 2.0 inches (51 mm) / R Value 13.0 and 4.0 inches (100 mm) / R Value 25.2

C. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.

D. Panel fasteners shall be corrosion resistant type as approved by the panel manufacturer. Length of fasteners shall be as recommended by the panel manufacturer

2.02 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84, Class A.
   1. Products:
      a. DuPont de Nemours, Inc. Chemical Company; STYROFOAM HIGHLOAD 100: www.DuPont.com/#sle.
      b. Owens Corning Corporation: FOAMULAR NGX 1000(100 psi compressive strength): www.ocbuildingspec.com/#sle.
      c. Substitutions: See Section 016100 - Product Requirements and Section 012500 - Substitution Procedures.
   2. Type V: 100.0 psi (Compressive strength), 3.00 pcf (Density) minimum.
   3. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   4. Type and Thermal Resistance, R-value: Type V, 5.0, (0.88) per 1 inch thickness at 75 degrees F mean temperature.

B. Phenolic Foam Core Board Insulation: Phenolic foam core insulation boards with a glass-tissue-based facing on the back surface and a composite foil facer on the exterior surface. Provide type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Kingspan Kooltherm K12 Framing Board.
      b. Architect approved equivalent.

2. Compressive Strength: Minimum ASTM D1621. Compressive strength at 10% compression:100 kPa (14.5 psi) min.

C. Rigid Vacuum-sealed Insulation Panel encased and sealed in a thin gas-tight envelope providing high thermal resistance with reduced panel thickness requirements. System shall incorporate compatible rigid insulation panels for areas requiring panel modifications and/or penetrations to complete the thermal envelope. The installation shall be coordinated with the manufacturer's design support team to enable optimal and efficient use of the VIP panel systems.
   1. Panels shall be manufactured under a management system certifies the following:
      a. ISO 9001:2015 (Quality Management Systems, Requirements).
      b. ISO 14001:2015 (Environmental Management Systems, Requirements).
      c. ISO 45001:2018 (Occupational Health and Safety Management Systems, Requirements).
      d. ISO 50001:2018 (Energy Management Systems, Requirements).
   2. Panels shall meet the following ASTM standards:
      a. ASTM C1667
      b. ASTM C165
      c. ASTM D2126
   3. Physical Characteristics:

Property	Test Method	Result
Nominal Thickness		0.94 inches (24 mm)
Dimensions: Width Length		 22.4 inches (570 mm) 24.0 inches (570 mm) or 48.0 inches (1220 mm)
Nominal Panel Mass 20 mm thickness 25 mm thickness 30 mm thickness 35 mm thickness 40 mm thickness		 0.82 p.s.f. / 4 kg/sq.m. 1.02 p.s.f. / 5 kg/sq.m. 1.25 p.s.f. / 6 kg/sq.m. 1.43 p.s.f. / 7 kg/sq.m. 1.64 p.s.f. / 8 kg/sq.m.
Compressive Strength, Min. (psi) @ 25% deformation	ASTM C165	34.6 psi (Panasonic)
Dimensional Stability 20 mm (0.79 in.)-50 mm (1.97 in) Length max. Width max.	ASTM D2126	 0.5% 0.6%
Density	BS EN 1602	10.6-13.10 pcf / 170-210 kg/cm (Kingspan)
Density	ASTM C1667	18.08 pcf (Panasonic)
Thermal Resistance (Kingspan) 0.79 in. / 20 mm 0.98 in. / 25 mm 1.18 in. / 30 mm 1.57 in. / 40 mm	ASTM C1667	R - value (Avg. based on panel size) 22 28 33 46

1.97 in. / 50 mm		57
Thermal Resistance (Panasonic) 0.94 inches (24 mm)	ASTM C1667	R-values 66 (COP) / 34.74 (Average)
Flame Spread Index	ASTM E84	Class A (25)
Smoke Development Index	ASTM E84	Clas A (10)

4. Manufacturer / Product: Panasonic / ADVANC-R and Kingspan / OPTIM-R or Architect approved equivalent.
5. Adhesive: See Roofing manufacturer's recommended adhesive for the Total Roof System warranty specified.

D. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

E. Tape joints in rigid insulation with Henry Blueskin SA or equivalent material as recommended by the approved insulation manufacturer.

2.03 MINERAL-WOOL BLANKET INSULATION

A. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Products:
   a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
   b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
   c. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.
   d. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.
   e. Owens Corning.- Thermafiber® RainBarrier HD (R-4.3 per inch, 6.0 pcf.)
4. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.

B. Mineral-Wool Blanket Cavity Insulation: CAVITYROCK Black; ASTM C612 Type IVB, Class A (faced surface with a flame-spread index of 25 or less per ASTM E84);
1. Complies with NFPA 285 requirements for wall assemblies.
2. Size: 24 inches wide as indicated on the drawings x 48 inch lengths.
3. Thickness: 3 inches (76 mm) or as indicated on the drawings.
4. Edges: Square
5. Density:
   a. Outer layer: 6.2 pcf, ASTM C612.
   b. Inner layer: 3.8 pcf, ASTM C612.
6. R value: 4.3 per inch (1 and 2 inch thick products) and 4.3 per inch for 2.5 to 6 inch thicknesses.
7. Fungi Resistance: Zero mold growth when tested in accordance with ASTM C1338.
8. Moisture Resistance: Absorption of less than 0.03 percent by volume.
9. Water Vapor Permeance: 27 perm (1555 ng/(Pa s sq m)), maximum, at 1 inch (25 mm) thick when tested in accordance with ASTM E96/E96M, desiccant method.
10. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
11. Melting Point: 2,150 degrees F (1177 degrees C), minimum.
12. Note: Provide CAVITYROCK BLACK where indicated on the drawings and at all Rainscreen applications.

2.04 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84. Install where noted on the drawings.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Corporation.
      b. Gaco Western Inc.
      c. SWD Urethane Company.
   2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.05 THERMAL BARRIER

A. Intumescent Coating for SPF Insulation: DC315 Low VOC intumescent coating providing a 20 minute thermal barrier over SPF insulation in accordance with NFPA 286 and UL1715; AC456 compliant to meet IBC and IRC requirements; ASTM E84 - Flame spread 0 Smoke Developed 10.; ASTM E2768 - 30 minute ignition resistant material. Material shall cure by coalescence and be Spray applied at 24 mils (WFT), 67 % solids, Flat finish. Color: White.
   1. Manufacturer: International Fireproof Technology Inc. Tel.: (949)975-8588 or approved equal

2.06 VAPOR RETARDERS - LOW PERMEANCE

A. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Raven Industries Inc.; DURA-SKRIM 6WW.
      b. Reef Industries, Inc.; Griffolyn T-65.
      c. Stego Industries, LLC StegoWrap 15 mil
      d. or approved equal.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

D. Single-Component Nonsag Urethane Sealant: ASTM C920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

F. Foil Type Wall Vapor Barriers: Foil faced, scrim-reinforced kraft Vapor Barrier material, ASTM C1136, Type II, IV; with 0.0003 inch Aluminum Foil face, 0.0001 inch Elastomeric Polymer Barrier Coating, Tri-directional fiberglass reinforcing, flame resistant adhesive and 0.01 lb. / sq. ft. Natural Kraft backing. Product shall be R-3035 Foil Scrim / Kraft as manufactured by Lamtec® Corporation or approved equal.

2.07 VAPOR RETARDER - VARIABLE PERMEANCE

A. Sheet Retarder: Certainteed MemBrain, The SMART Vapor Retarder. Polyimide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to greater than 10 perms using the wet cup method.
   1. Water Vapor Permeance:
      a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
      b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).
   2. Fire Hazard Classification: ASTM E 84:

a. Maximum Flame Spread Index; 20.
b. Maximum Smoke Developed Index; 55.

2.08 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
   1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
   1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
      a. Ceiling plenums.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.

D. Insulation Fasteners: Lengths of galvanized, 13 gauge, 0.072 inch (1.83 mm) high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.

E. Insulation Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

F. Wire Mesh: Galvanized steel, hexagonal wire mesh.

G. Adhesive: Gun grade, interior and exterior, and compatible with insulation and substrates; complies with ASTM C557.
   1. Application Temperature: 40 to 100 degrees F (5 to 38 degrees C) at contact surfaces.
   2. Volatile Organic Content (VOC): Less than 7 percent by weight.

H. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

2.09 AT GRADE INSULATION PROTECTION / FLASHING

A. At Grade Insulation Flashing/ Protection: EnergyFlash by EnergyEdge, non-corrosive PVC protection for exposed Rigid insulation materials where below grade insulation extends to meet wall construction above grade. Material is solid core, UV protected exterior grade PVC. Color is Grey. Finish as indicated on the drawings. Material shall comply with ASTM D635, ASTM D696, ASTM E84 and ASTM D1929.
   1. Model: ES217 (13 3/4 inches high with 2 3/16 inch top return and a 3 inch vertical nailing flange)Provide Pre-fabricated Corners and matching fasteners
   2. Provide Pre-fabricated Corners and Matching fasteners.
   3. Install in accordance with manufacturer's specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.

3.04 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
   1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04

3.05 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
      a. Exterior Walls: Set units with facing placed toward interior of construction.
      b. Interior Walls: Set units with facing placed toward areas of high humidity.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.06 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.07 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
   2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
   3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
   4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.08 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
   1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
   2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.09 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.10 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section 011400 - WORK RESTRICTIONS and 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 017423 - CLEANING.

C. Waste Management:
   1. Coordinate recycling of waste materials with Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

3.11 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Base and Counter flashing.
   2. Through Wall flashing.

1.03 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 REFERENCES:

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

B. ASTM B32 - Standard Specification for Solder Metal; 2020.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.
   1. Detail fabrication and installation layouts, details. Distinguish between shop- and field-assembled work.
   2. Include identification of material, thickness, weight, and finish for each item and location in Project.
   3. Include details for forming, including profiles, shapes, seams, and dimensions.
   4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   5. Include details of termination points and assemblies.
   6. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
   7. Include details of roof-penetration flashing.
   8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
   9. Include details of special conditions.
   10. Include details of through wall scuppers including section details, dimensions of scupper openings and height above finished roof surface, edge sealing details, interface and sealing with roof membrane system, counterflashing and exposed exterior fascia conditions.
   11. Include details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping, scupper, roof edge and flashing required to complete the roofing system. All sheet metal shall be SPRI ES-1 tested and FM approved for this project.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

D. Perform work in accordance with SMACNA (ASMM), CDA A4050, and approved manufacturer's requirements and standard details, except as otherwise indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

B. Gravel Stops, roof edges, counterflashing, and other components incorporated or in contact with the Roofing System shall be pre-approved by and made integral to the 20-year Total Roofing System warranty specified in Division 07. Shop drawings and components shall be reviewed and approved by the Roofing manufacturer prior to submittal to the architect for approval. Submit a letter signed by a current representative of the manufacturer on Roofing manufacturer letterhead, attesting to this approval and warranty acceptability. Submit this certification letter as part of the Shop Drawing submittals for this section.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated or required by the approved roofing manufacturer responsible for providing the Total System Warranty for the roof system.

C. FM Approvals Listing: Manufacture and install copings, roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120 Identify materials with name of fabricator and design approved by FM Approvals.

D. SPRI Wind Design Standard: Manufacture and install Gravel Stops, Scuppers, Roof edges, Counterflashing, and other components of roof metal work tested according to SPRI ES-1 and capable of resisting the required design pressure.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Thickness: 0.050 inch as indicated on the drawings.
   2. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   3. Color: As selected by the Architect from the manufacturer's full range of color offerings.
   4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel: ASTM A666/A666M, Type 304, soft temper, 26 gage thick; smooth No. 4 finish.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.04 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.05 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
   1. Gutter Profile: Half round according to cited sheet metal standard and as detailed on the architectural drawings.
   2. Expansion Joints: Butt type with cover plate.
   3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
   4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
      a. Aluminum: 0.050 inch thick.

B. Downspouts: Fabricate round downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors .Shop fabricate elbows.

1. Fabricated Hanger Style: Fig 1-35D according to SMACNA's "Architectural Sheet Metal Manual-Third Edition"
2. Fabricate from the following material(s):
   a. Aluminum: 0.050 inch thick.

2.06 GENERAL FINISH REQUIREMENTS

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 - {\t\#1000090}.

3.03 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04.

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 6 inches beyond wall openings.

3.04 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.05 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Soldering operations: Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. Upon completion of sheet metal flashing and trim installations, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Polyurethane joint sealants.
   3. Latex joint sealants.
   4. Preformed joint sealants.
   5. Acoustical joint sealants.

1.03 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Samples for Verification: For each type of sealant submit a color sample board and one sample joint, 1/2 inch wide by 6 inches long including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 ACTION SUBMITTALS

A. See Section 013300 - SUBMITTALS, for Submittal Procedures.

B. Product Data: For each joint-sealant product indicated.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Warranties: Sample of special warranties.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project with a minimum of three (3) years experience in the installation of the work of this section.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.07 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two (2) years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L

C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full color range.

G. Sealant Abbreviations:

Use (related to application)
1. NT = Non-Traffic
2. T = Traffic

Type
1. S = Single Component
2. M = Multi-component
3. LM = Low Modulus
4. C = Clear
5. OP = Opaque

Grade
1. NS = Non-Sag
2. NF = Non-Flexible
3. P = Pourable
4. SL = Self-Leveling

Use (related to Contact Material)
1. M = Mortar Contact
2. G = Glass Contact
3. A = Aluminum Contact
4. O = Other Materials
5. I = Immersible

2.02 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use (application) T; Use (for materials) M and O.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; DOWSIL 790.
      b. GE Advanced Materials - Silicones; SCS2000 SilPruf LM.
      c. Pecora Corporation; 301 NS

d. Sika Corporation, Construction Products Division; SikaSil-WS 290
e. Tremco Incorporated; Spectrem 1.

B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use (application) T; Use (for materials) M and O
1. Products: Subject to compliance with requirements, provide the following:
a. Pecora Corporation; 311 NS.
b. Sika Corporation, Construction Products Division; SilkaSil-728 NS.
c. Tremco Incorporated; Spectrem 800.

C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use (application) T; Use (for materials) M
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 890-SL.
b. Pecora Corporation; 310 SL.
c. Sika Corporation, Construction Products Division; SilkaSil-728 SL.
d. Tremco Incorporated; Spectrem 900 SL.

D. Mildew-Resistant, Single-Component, Nonsag, Non-staining, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use (application) NT; Use (for materials) M, G, A, and O
1. Products: Subject to compliance with requirements, provide one of the following:
a. Tremco Incorporated: Tremsil 200.
b. Pecora Corporation; 898 NST.
c. GE Advanced Materials; SCS1700 Sanitary.

2.03 POLYURETHANE JOINT SEALANTS

A. Single-Component, Non-sag, non-staining, non-yellowing, moisture curing, paintable, Low VOC, Hybrid Polyurethane (STPU), Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT; Use (for materials) M, G, A, and O
1. Products: Subject to compliance with requirements, provide one of the following:
a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Pecora Corporation; Dynatrol I-XL.
c. Tremco Incorporated; Dymonic 100.

B. Single-Component, nonsag, traffic-grade, moisture cured, paintable, fire resistant, Polyurethane Joint Sealant: ASTM C920. Type S Grade NS, Class 35, for Use (application) NT; Use (for materials) M, A, O, and I
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF; Masterseal NP1.
b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
c. Tremco Incorporated; Dymonic 100.

C. Single-Component, Pourable, Traffic-Grade, moisture cured, Polyurethane Joint Sealant: ASTM C920, Type S, Grade P, Class 35, for Use (application) T; Use (for materials) M, A, and O
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. BASF; MasterSeal SL 1.
b. Pecora Corporation; Urexpan NR-201.
c. Sherwin-Williams Company, Loxon SL1 Self-Leveling.
d. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
e. Tremco Incorporated; Vulkem 45 SSL.

D. Immersible Multicomponent, Nonsag, Traffic-Grade, Chemically curing, Polyurethane Joint Sealant: ASTM C920, and meets ASTM C1247 test requirements, Type M, Grade NS and SL, Class 25, for Use (application) T; Use (for materials) M, A, O, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Sika Corporation, Construction Products Division, Sikaflex - 2c NS EZ
   b. Master Builders Solutions; MasterSeal NP 2.
   c. Pecora Corporation; Dynatred.
   d. Tremco Incorporated; Dymeric 240 FC.

2.04 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF; MasterSeal NP 520.
      b. GE Advanced Materials; Ultra Seal.
      c. Pecora Corporation; AC-20+.
      d. Tremco Incorporated; Tremflex 834.
      e. Sherwin Williams Company (SherMax Urethanized Elastomeric Sealant).

2.05 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from Polyurethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Tremco Incorporated; Spectrum SimpleSeal.
      b. Tremco Incorporated; Illmod 600
      c. Emseal Joint Systems, Ltd.; 25V.
      d. Schul International Company; Sealtite Standard.

2.06 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, fire resistant, paintable, non-staining acrylic latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pecora Corporation; AC-20 FTR.
      b. Sherwin-Williams Company, Sher-Max Urethanized Elastomeric Sealant
      c. Tremco Incorporated; Tremflex 834, Acoustical/Curtain Wall Sealant
      d. USG Corporation; SHEETROCK Acoustical Sealant.

2.07 BUTYL SEALANTS

A. Butyl Sealant: Manufacturer's non-skinning, non-hardening, non-bleeding permanently flexible gun grade compound to limit sound transmission, seal painted and aluminized metal panels and to act as a vapor barrier for polyethylene barrier films complying with ASTM C919, Use (application) NT; Use (for materials) M, G, A, and O.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pecora Corporation; BA-98.
      b. DOWSIL 335 Butyl Sealant

B. Butyl Sealant: Manufacturer's one-part gun grade compound formulated from virgin butyl rubber for use as a sealing and glazing compound complying with ASTM C1311, Type S, for Use (application) NT; Use (for materials) M, G, A, and O.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; BC-158.
   b. Tremco; Tremco Butyl Sealant

2.08 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.09 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
    1. Place sealants so they directly contact and fully wet joint substrates.
    2. Completely fill recesses in each joint configuration.
    3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
    1. Remove excess sealant from surfaces adjacent to joints.
    2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
    3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
    4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
    5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
        a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations and at perimeters of acoustical Panel edge channels of Acoustical Panel Ceiling systems. with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at

perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations.

3.04 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 1 test for each 500 feet of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in paver and pavement installations.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Tile control and expansion joints.
   2. Sealant Types:
      a. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
      b. Polyurethane Joint Sealant: Single component, pourable, traffic grade.
      c. Preformed Joint Sealant: Preformed foam sealant.

3. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
   1. Joint Locations:
      a. Joints in pedestrian plazas.
   2. Sealant Types:
      a. Polyurethane Joint Sealant: Immersible, multicomponent, non-sag, traffic grade.
   3. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in dimension stone cladding.
      d. Joints between metal panels.
      e. Joints between different materials listed above.
      f. Perimeter joints between materials listed above and frames of doors windows and louvers.
      g. Control and expansion joints in ceilings and other overhead surfaces.
   2. Sealant Types:
      a. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
      b. Polyurethane Joint Sealant: Single component, non-sag, Class 100/50.
   3. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
   2. Sealant Type:
      a. Polyurethane Joint Sealant: Single component, non-sag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Perimeter joints of exterior openings where indicated.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
   2. Sealant Type:
      a. Latex Acrylic based Joint Sealant.
   3. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
   2. Sealant Type:
      a. Silicone Joint Sealant: Mildew resistant, single component, non-sag, neutral curing.
   3. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Location:
      a. Acoustical joints where indicated.

b. Other joints as indicated.

2. Joint Sealant: Acoustical joint sealant.

3.08 SEALANT INSTALLATION LOG

A. A tabular log of all sealant installations on the project shall be be keep and submitted with the O & M manuals at the completion of the project.

B. Tabular log shall have columns for:
   1. Sealant type
   2. Sealant installation location
   3. Temperature during installation
   4. Date of Installation
   5. Manufacturer
   6. Sealant color installed.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. Extent and location of each type of flush wood door is indicated on Construction Documents and in schedules.

B. Types of doors required include the following:
   1. Solid core flush wood doors with wood veneer faces.
   2. Fire-rated flush wood doors with wood veneer faces.

C. Factory-finishing of flush wood doors is included in this Section.

D. Factory pre-fitting to frames and factory pre-machining for hardware for wood doors is included in this Section.

E. Louvers for flush wood doors, including furnishing and installation, are specified under this Section.

F. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 088000 - Glazing
   2. Section 099123 - Painting

1.03 STANDARDS

A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

B. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).

C. AWI Quality Standard: "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

D. NFPA 80 "Standard for Fire Doors and Other Opening Protectives".

E. ASTM E90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".

F. ASTM E152 "Standard Methods of Fire Tests of Door Assemblies".

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures.

B. Submit pursuant to Section 016100 - Basic Product Requirements.

C. Product Data
   1. For each type of door, include grade of door information, core and edge construction, louver information and trim for openings.
   2. Factory finishing specifications.
   3. Fire rated doors showing conformance with NFPA 80.

D. Shop Drawings
   1. Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, STC rating, undercuts, requirements for factory finishing, requirements for veneer matching and other pertinent data.
      a. Include details of electrical raceway and preparation for electrified hardware, access control systems, and security systems if applicable.

2. For factory pre-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

E. Samples
1. Factory finishes applied to actual door veneer materials, approximately 8" x 10". Provide three (3) samples of each available stain.
2. Glazing stops: Two (2) 6" long samples for each available glazing stop if requested by Architect.

F. Warranty
1. Sample Warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain-of-custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.

B. Provide wood flush doors complying with:
1. ANSI/WDMA: Industry Standard I.S.1-A-13 Series.
2. Duty Level: Heavy Duty.
3. Match between Veneer Leaves: Book Match.
4. Double doors and sliding doors shall be pair and set matched.
5. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
6. Fire-Rated Doors: In addition to complying with I.S.1 Series standards, provide flush wood doors identical in materials and construction to units tested in frame and door assemblies pursuant ASTM E 152 and which are labeled and listed for ratings indicated by Underwriters Laboratories, Factory Mutual, or other testing and inspection agency acceptable to authorities having jurisdiction.

C. Obtain doors from a single manufacturer, unless otherwise indicated.
1. Mark each door with stamp indicating conformance with WDMA Wood Flush Door Certification Hallmark.
2. Mark each door manufactured with Type I (exterior) adhesives with permanent Type I glue bond mark.

D. Experienced workers familiar with the work and according to manufacturer’s recommendations and/or industry standards shall perform all work of this section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Package, deliver, store, and handle doors pursuant to WDMA standards and appendix plus manufacturer's published instructions.

B. Store doors flat on a level surface in a dry, well-ventilated building. Do not put doors in direct contact with water and keep them at least four inches off the floor to avoid contact with condensation.

C. Use cross supports under door panels and place protective coverings under the bottom door and over the top. Select a covering material that will protect doors from contact with dirt, water and abuse, while allowing air to circulate under and around the stack.

D. Avoid placing doors in areas with direct sunlight. Certain varieties of wood, such as cherry, mahogany, walnut and teak, are susceptible to discoloration when exposed to sunlight or even some forms of artificial light, particularly when they are not factory-finished.

E. Do not store doors in buildings with uncontrolled temperature or humidity. The optimal climate-controlled condition for storing wood doors are storage facilities that can maintain 25% to 55% relative humidity and temperature of 50 degrees to 90 degrees Fahrenheit.

F. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete and dry, and HVAC System is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.08 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
   1. Warranty shall include reinstallation that may be repaired due to repair or replacement of defective doors where defect was not apparent prior to hanging.
   2. Warranty shall be in effect during following period of time after date of Substantial Completion.
   3. Solid Core Interior Doors:
      a. Life of installation

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors which may be incorporated in the Work include, but are not limited to, the following:
   1. Solid Core Doors with Wood Veneer Faces and Fire Rated Flush Wood Doors.
      a. Haley Brothers, Inc., SCL Series
      b. Masonite International Corporation, Aspiro™ Series
      c. Oshkosh Architectural Door Company
      d. VT Industries, Inc., Heritage Collection

2.02 FLUSH WOOD DOORS, GENERAL

A. Fabricate doors pursuant to WDMA Industry Standard I.S.1 Series.

B. WDMA I.S.1A-13 Performance Grade: Heavy Duty

C. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

2.03 INTERIOR DOORS - SOLID CORE - 1 3/4" THICK (UNLESS NOTED OTHERWISE).

A. Face:
   1. Species: birch, rotary cut, natural, select white veneer, Custom Grade .
   2. Factory finished: transparent manufacturer's standard stain color selection by Architect.
      a. Minimum of eight standard stain colors are required, match stain finish of adjacent doors.

B. Core Construction:
   1. Core Duty: Heavy Duty, Extra Heavy Duty for STC Fire-rated doors.
   2. Structural Composite Lumber Core (SCLC) Non-Rated and Twenty minute rated doors.
      a. Structural Composite Lumber: Engineered hardwood composite wood products tested in accordance with WDMA I.S.1A, Testing Cellulosic Composite Materials for use in Fenestration Products containing no added urea formaldehyde.
      b. Provide top rail blocking for doors specified to have a closer.
   3. Fire doors shall be constructed with manufacturer's label permanently attached to the hinge side stile indicating the testing agency's approval for the rating classification required.

4. Mineral-core fire doors shall be constructed with manufacturer's incombustible mineral core of a single or tightly fitted sections. Core may not contain any asbestos. Stiles and rails bonded to core: 45, 60, and 90 minute rated doors.
    a. Provide top rail and lockset rated blocking.

C. Hardware Preparation:
1. Factory machine doors for hardware that is not surface applied. Coordinate with existing hardware to be re-used.
2. Electrical Raceways: Provide wood doors receiving electrified hardware with concealed pathway for wiring harness with plug connectors on both ends. Coordinate with hardware supplier if wiring harness is to be factory installed in wood door.
3. Blocking: Provide blocking (rated where required) in all doors to allow for secure application of all hardware.

D. Edge Bands:
1. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA Section P-1, Performance Standards for Architectural Wood Flush Doors.
2. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA Section P-1, Performance Standards for Architectural Wood Flush Doors.

E. Doors for fire rated openings:
1. Provide construction and fire resistive composite core containing no asbestos as needed to provide fire ratings indicated.
2. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60 and 90 minute rated doors. Comply with specified requirements for exposed edges.
3. Category B Edge Construction: Provide 20 minute fire rated doors at Category B, with smoke and fire seals applied to frame for 20 minute openings.
4. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
    b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel in color as selected by the Architect.

F. Finishes
1. Doors shall receive factory finishing.
2. Factory Finishing: WDMA System TR-6, catalyzed polyurethane, premium grade.
    a. Stain Coat
    b. Sealer: 3 coats
    c. Sanding: Sand
    d. Topcoat: 2 coats

2.04 LOUVERS AND LIGHT FRAMES

A. Metal Louvers: Size, type and profile shown on the Contract Drawings and fabricated from the following:
1. Steel: 20-gage, galvanized and factory primed for paint finish.
    a. Color: To be selected by Architect from the manufacturer's full range of colors.
2. Provide fusible link, self-closing louvers in fire rated doors.

B. Metal Frames for Lite Openings in Fire Rated Doors: Manufacturer's standard frame formed of 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated.

C. Wood Frames for Lite Openings in Non-Rated Doors: Manufacturer's standard wood frame in same species as door faces, factory stained to match face of doors.

PART 3 EXECUTION

3.01 EXAMINATION AND INSTALLATION

A. Inspect openings to verify that frames are plumb and level and comply with tolerance requirements of WDMA Industry Standard I.S.1 Series and Appendix.
   1. Bring frames into compliance with WDMA Industry Standard I.S.1 Series and Appendix prior to installation of doors.

B. Hardware: Re-install salvaged hardware.

C. Install doors pursuant to door manufacturer's published instructions and WDMA Industry Standard I.S.1 Series and Appendix.
   1. Install fire-rated doors pursuant to requirements of NFPA 80 and WDMA Standards and Instructions.
   2. Seal cut in prefinished doors pursuant to door manufacturer's published instructions.
   3. Putty all nail/staple holes in wood glass trim. Putty shall match wood door color.

D. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Clearances: Provide 1/8-inch at heads, jambs, and between pairs of doors. Provide 1/8-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide ¼-inch from bottom of door to top of threshold.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8-inch in 2-inches at lock and hinge edges.
   3. Bevel fire-rated doors 1/8-inch in 2-inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project Site.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

3.03 CLEANING

A. Clean doors pursuant to door manufacturer's published instructions.

3.04 PROTECTION

A. Protect doors, as recommended by door manufacturer, to ensure that wood doors will be without damage and/or deterioration at time of Substantial Completion.

END OF SECTION

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Vision Lites.
   2. Exterior Doors, Transoms and Side Lites.
   3. Interior Doors, Transoms and Side Lites.
   4. Aluminum Framed Window System.
   5. Aluminum Framed Entrances and Storefronts.
   6. Insulated Glazing Infill Panels.
   7. Casework Cabinet Door Glazing.
   8. Escape Labeling for Glazed Windows.

1.03 REFERENCES

A. Referenced Standards: These standards (latest edition or edition in force by AHJ) form part of this specification only to the extent they are referenced as a specification requirement. Refer to the below referenced publications (latest edition) for glazing terms not otherwise defined in this section.

B. AAMA A804.1 "Voluntary Specification for Ductile Back-Bedding Compound" (mandatory).

C. AAMA A807.1 "Voluntary Specification for Oil-Extended Cured Rubber Back-Bedding Glazing Tapes" (mandatory).

D. AAMA 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings On Aluminum Extrusions and Panels".

E. ANSI Z97.1 “American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test”.

F. ASCE/SEI 7-16 "Minimum Design Loads and Associated Criteria for Buildings and Other Structures".

G. ASTM C162 "Standard Terminology of Glass and Glass Products".

H. ASTM C509 "Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material".

I. ASTM C864 "Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers".

J. ASTM C920 "Standard Specification for Elastomeric Joint Sealants".

K. ASTM C1036 "Standard Specification for Flat Glass".

L. ASTM C1048 "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass".

M. ASTM C1172 "Standard Specification for Laminated Architectural Flat Glass".

N. ASTM D523 "Standard Test Method for Specular Gloss".

O. ASTM E119 "Standard Test Methods for Fire Tests of Building Construction and Materials".

P. ASTM E1300 “Standard Practice for Determining Load Resistance of Glass in Buildings”.

Q. ASTM E2190 "Standard Specification for Insulating Glass Unit Performance and Evaluation".

R. CPSC "16CFR1201, Safety Standard for Architectural Glazing Materials".

S. FGIA (Fenestration and Glazing Industry Alliance) IGMA TM-300 "North American Glazing Guidelines for Sealed Insulated Glass Units for Commercial and Residential Use".

T. AAMA Recommendations and Guidelines.

U. NFRC (National Fenestration Rating Council) 100 "Procedure for Determining Fenestration Product U-Factors"

V. NFRC 200 "Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence".

W. NFRC 300 "Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems".

1.04 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thickness: Indicated by thickness designations in inches (millimeters) according to ASTM C1036.

C. Interspace: Space between lites of an insulating-glass unit.

D. Sealed Insulating Glass Unit Surface Designations:
   1. Surface #1 - Exterior surface of the outer glass lite.
   2. Surface #2 - Interspace surface of the outer glass lite.
   3. Surface #3 - Interspace surface of the inner glass lite.
   4. Surface #4 - Interior surface of the inner glass lite or the interlayer surface of the first layer of laminated glass.
   5. Surface #5 - Interlayer surface of the second layer of laminated glass.
   6. Surface #6 - Interior surface of the second layer of laminated glass.

E. Solar Heat Gain Coefficient (SHGC): The amount of solar radiation that enters a building as heat. The lower the number, the better the glazing is at preventing solar gain.

F. Fading Transmission: The UV Transmittance is determined as an average for wavelengths 300 -380 nm. ISO is the weighted average for wavelengths 300 – 700 nm (based on CIE 89/3). This region includes all of the ultraviolet energy and part of the visible spectrum and will give the best representation of relative fading rates. The lower the number, the better the glass is for reducing fading potential of carpets and interior furnishings.

G. U-Factor: This represents the heat flow rate through a window expressed in IP (BTU/hr·ft²·°F) and SI (W/m2K), using winter night weather conditions of 0°F outside and 70°F inside. The smaller the number, the better the window system is at reducing heat loss.

H. Glazing Gasket: A pre-formed elastomeric or plastic material applied between the face of the glass or panel and the framing to provide resilient support between the glass or panel and the framing, and to prevent the passage of air and water.

1.05 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E1300 by a qualified professional engineer licensed in the State of the project, using the following design criteria:
   1. Design Wind Pressure: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Contract Drawings.
      a. Wind Design Data: As indicated on Contract Drawings.
      b. Basic Wind Speed : 120 mph.

c. Risk Category: III.
d. Seismic Zone: As indicated on Contract Drawings.

2. Design Snow Loads: As indicated on Contract Drawings.
3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or one (1) inch, whichever is less.
4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure, based on glass type factors for short duration load.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 degree F, ambient; 180 degree F, material surfaces.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

1.06 SUBMITTALS

A. Pursuant to Section 013300 - Submittal Procedures.

B. Pursuant to Section 016100 - Basic Product Requirements

C. Product data: Description of each type of glass, glazing product, and accessory product.

D. Glazing Schedule: List glass types, thicknesses, tints (if any) for each opening and location. Use same designations as indicated on Contract Drawings.
1. Include glazing in-fill panels and spandrel panels if applicable.

E. Shop Drawings:
1. Submit shop drawings indicating project layout and elevations, fastening and anchoring methods, dimensions of individual components, detail of joints, sealants and gaskets, and accessories.

F. Samples:
1. Provide 12” x 12” samples of all tinted glass. Other glass only if requested by Architect.
2. Provide 6" x 6" samples of glazing in-fills panels in the finish and thickness specified.

G. Closeout Documents:
1. Product Certificates:
a. Statement that fire rated glass provided for fire rated doors meets labeling or certification requirements of public authorities.
b. Statement that the extent of tempered glass meets requirements of public authorities.
c. Installing Contractor shall submit on company letterhead, certification that insulated glass installed meets all the specified performance values required in this specification. The certification shall list all the performance values. This certification must be signed by an officer of the company and notarized.
2. Maintenance data for glass and other glazing materials to be included in Operating and Maintenance Manual specified in Division 01.
3. Executed Warranties as specified below.

1.07 QUALITY ASSURANCE

A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturer’s recommendations and/or industry standards.

B. Qualifications of Installer: Provide glazing work by an installer who has installed the specified products for at least 2 years.

C. Single-Source Responsibility for Glass and Glazing Accessories: Obtain glass and accessories from one source for each product indicated.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Associated Laboratories, Inc. (ALI).
   3. National Certified Testing Laboratories (NCTL).

E. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

F. Fire-Protection Rated Glazing Labeling: Permanently mark fire-protection rated glazing with certification label of testing agency acceptable to authorities having jurisdiction. Label shall indicate the following:
   1. Manufacturer.
   2. Test Standard.
   3. Whether glazing is for use in fire doors.
   4. Hose-stream test.
   5. Temperature rise rating.
   6. Fire -resistance rating in minutes.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturers published instructions.

B. Protect against moisture exposure and damage.

C. Package, handle, and store glass so that water does not touch or condense on glass surfaces.

D. Protect glass edges against chipping and other damage. Protect coated glass surfaces from abrasion and scratching.

E. Store glass and glazing products in controlled environment, out of sunlight, so that temperature does not go above 80º F. Bring glazing materials to at least 40º F, or higher temperature if recommended by producer, before installing.

F. Furnish labels identifying each type of glass. Keep labels in place until glass is installed.

1.09 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer’s Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in “Definitions” article f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer’s published instructions.
   1. Warranty Period: Manufacturer’s standard, but not less than ten (10) years after date of Substantial Completion.

C. Manufacturer’s Warranty on Coated Glass Products: Submit written warranty signed by manufacturer of coated glass agreeing to furnish replacements for those coated glass units that deteriorate as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating. Warranty covers only

deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard, but not less than ten (10) years after date of Substantial Completion.

D. Manufacturer's Warranty on Laminated Glass: Submit written warranty signed by manufacturer of laminated glass agreeing to furnish replacements for those laminated glass units that deteriorate within specified warranty period. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard, but not less than ten (10) years after date of Substantial Completion.

PART 2 PRODUCTS

2.01 GLAZING PERFORMANCE REQUIREMENTS

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with Performance Requirements. Where fully tempered glass is indicated or required, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.8 computer program, expressed in Btu/sq.ft. x h x deg F (W/sq. m x K).
5. Solar Heat Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7.8 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C1048; Type 1; Quality-Q3; Class 1 (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

B. Interior Casework Doors Glazing

1. 3/16" Tempered clear flat glass.
2. Color: Clear.

2.03 LAMINATED GLASS

A. Laminated Glass: ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category 11 materials, and with other requirements specified. Use materials that have proven

record of no tendency to bubble, discolor, or loose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.04 INSULATING GLASS

A. Insulating-Glass Units: Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.

1. Provide a triple silver coating.
2. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
3. Spacer: Manufacturer's standard aluminum spacer material and construction.
4. Desiccant: Molecular sieve or silica gel, or blend of both.
5. Interspace Content: Argon.
6. Performance Requirements (1" Glass Units):
   a. **Visible Light Transmittance: 65%.**
   b. **External Reflectance: 11%.**
   c. **Internal Reflectance: 12%.**
   d. **Solar Height Gain Coefficient (SHGC): 0.27.**
   e. **Center of Glass U-Factor: 0.24 IP (Argon Fill).**
   f. **Fade Transmission UV: 5%.**
   g. **Fade Transmission ISO: 43%.**
7. Product: Cardinal LoE³-366 or Architect approved equivalent meeting or exceeding all of the above performance requirements.

2.05 FIRE-PROTECTION-RATED GLAZING

A. Multi-laminate Fire-Rated (45 to 120 minutes), Impact Safety-Rated Fireglass multi-laminate glass with clear intumescent layers, interior and exterior use, meets CPSC 16 CFR 1201 (Cat. I and II) and ANZI Z97.1. Provide protection against radiant and conductive heat transfer per ASTM E119 and UL 263, withstands thermal shock. Five (5) year limited warranty.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire rated glass products that may be incorporated in the Work include, but are not limited to the following:

1. SAFTI FIRST, 100 N. Hill Dr., Suite 12, Brisbane, CA 94005. Phone: 888-653-3333 (Basis of Specification).
2. Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 Phone: 800-426-0279.
3. Pilkington North America, 811 Madison Ave., Toledo, OH 43604 Phone: (800) 221 0444.
4. Architect Approved Equivalent.

C. Material:

1. SuperClear 45-HS-LI 45 minute fire and safety rated glazing by SAFTIFIRST.
2. GP Firelite Plus® by Technical Glass Products.
3. Pilkington Pyrostop®: 45-200; 45 minute, 3/4" thick, STC 40; U-Value 0.86

D. Design Requirements:

1. Thickness: ¾” standard or manufacturer's standard thickness required to meet the rating.

2. Sound Transmission Rating: Must meet 38 STC/35 OITC in standard hollow metal frames. Glass and frame must be tested as an assembly. Glass only STC/OITC values are not acceptable.
3. Appearance: clear, wireless and tint-free.
4. Visual Light Transmission: Must meet minimum 85% VLT for low-iron.
5. Fire Rating: 45 minutes with hose stream.
6. Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Category I and II, ANSI Z91.1 Class A and B and CAN/CGSB 12.1 Class A and B.

E. Manufacturer's Fire Rated Glazing Material:
1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
2. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:
a. CPSC 16 CFR 1201, Cat. I or II.

2.06 GLAZING INFILL PANELS

A. Manufacturer:
1. Citadel Architectural Products, Inc.; 3131-A North Franklin Road, Indianapolis, IN 46226. Phone: 800-446-8828.
2. Architect Approved Equivalent.

B. Panel:
1. GlazeGuard 1000 WR Plus
a. Composition:
1) Face: 0.010" (min) prefinished textured aluminum.
2) Stabilizer: 3 mm high density polypropylene.
3) Core: 11/16" polyisocyanurate (ISO) foam.
4) Stabilizer: 3 mm high density polypropylene.
5) Back: 0.010" (min) prefinished textured aluminum.
b. Thickness: 1" (nominal).
c. Performance:
1) Surface Burning Characteristics: Panel shall have a Flame Spread Matrix Index less than 25, and a Smoke Developed Index less than 450. Testing shall be in accordance with ASTM E84.
d. Finish:
1) Anodized: To match storefront or curtain wall finish, U.N.O.
e. Installation Method: On setting blocks and sealed with gaskets matching glazing gaskets.

2.07 DECALS

A. All transparent doors and fixed adjacent transparent glass sidelights shall be marked in two areas on the glass surface thereof. One such area shall be located at least 30 inches, but not more than 36 inches and the other at least 60 inches, but not more than 66 inches above the finished floor below the door or sidelight.
1. Decal shall be of such design as to be readily discernible to any person approaching the doors and sidelights from any direction.

B. Description: Self-adhering acrylic or polyester sheet material in one-color design. Provide decals on each side of glazing, aligned back to back.
1. Size: Circular, 5 inches in diameter.
2. Color: Red
3. Refer to the Code for alternative marking methods.

C. Emergency Escape Window Labeling:

1. Provide vinyl window decal 5"x3" minimum dimension.
2. Colors: Red and White.
3. May be required on new and existing windows.

2.08 GLAZING MATERIALS

A. Description: Provide glazing materials that are compatible with one another and with materials of glazing channel as well as with any sealants or interlayers in the glass units.
   1. Product quality assurance: Confirm compatibility of all products used or encountered in executing the work of this Section. Test as necessary to assure short and long term performance of frames, glazing materials, and glass without loss of seal, gassing, staining, discoloration, softening, deterioration, racking, breaking, or leaking.
   2. Color: Provide glazing materials, which match color of glazing channel. If color match is not available, submit color samples to Architect for color selection.

2.09 GLAZING TAPES

A. Description: 100% solids, extruded, non-staining butyl-isobutylene tape. Provide hard spacer rod for use in lights over 80 united in.

B. Standards:
   1. AAMA A804.1, for normal use.
   2. AAMA A807.1, for use where much thermal movement is anticipated.

2.10 GLAZING GASKETS

A. Description: Chloroprene (neoprene), EPDM, or Silicone compression gaskets in a soft and a dense formulation for the two sides of the glass. Select soft gasket to compress 25 to 40% when glass and dense gasket are in place.
   1. Where small lites (as in doors) can be glazed with a continuous preformed elastomeric glazing extrusion, use a gasket of the dense formulation, compressed to watertightness outside and inside, with either a bent joint or a tightly compressed cut joint at corners.

B. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C864.
   2. EPDM complying with ASTM C864.
   3. Silicone complying with ASTM C1115.
   4. Thermoplastic polyolefin rubber complying with ASTM C1115.

C. Soft Compression Gaskets: Extruded or molded, closed cell, integral-skinned neoprene EPDM gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.11 GLAZING ACCESSORIES

A. Setting blocks, edge blocks, spacers, and gaskets: Chloroprene (neoprene), EPDM, or silicone: ASTM C864.
   1. Hardness of setting blocks: Sufficient to compress no more than 20% under weight of glass.

B. Cleaners, solvents: As recommended by glazing material producer for each type of glass, glazing material, and substrate.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine frames and other construction, which supports or underlies glazing work. Where frames are out of square, out of plane, subject to excessive deflection, or where substrates contain bond breaking substances, moisture, unsound material, or where there are other conditions unsuitable

for proper installation or performance of the glazing work, do not start glazing work until defective earlier construction has been completed or corrected.

B. For exterior glazing, do not start glazing until each lite is provided with 2 or more weepholes, not more than 3 ft o.c.

C. Remove dust and other bond breaking substances from surfaces to be glazed. Do not glaze wet, damp, or uncured surfaces.

3.02 INSTALLATION

A. Installation includes such work as surface preparation, priming, cleaning, protecting, and repairing or replacing defective and damaged work.

B. Provide safety glass in lites where required by 16CFR1201 and public authorities, and at other locations as specified herein.

C. Install glazing according to FGMA Glazing Manual.

D. Orient glass so that wave and other distortions run horizontally.

E. Install glass and glazing materials only when the temperatures of air, materials, and substrate are above 40 F. If air temperature is below 40 F, protect them and bring glazing materials to temperature recommended by producer.

F. Install fire-protection-rated glass in fire rated door vision lites and fire rated windows using sealant approved by the fire rating agency for use with the tested assembly. In existing frames, modify or replace glazing stops to:
   1. Accommodate new glass thickness.
   2. Glazing stop heights must be 3/4" in height.

G. At transparent glass doors, fixed adjacent glass sidelights, and other glazed openings that extend to within 18 inches of the floor, provide decals in locations outlined in Part 2.

H. Install glazing infill panels in accordance with manufacturer's written instructions.

3.03 PROTECTION

A. Temporarily during construction, identify glazed areas by hanging narrow streamers from walls and mullions. Do not mark glass nor affix decals to glass except for permanent decals as required by Code.

B. Clean installed glass and infill panels (if applicable) frequently during construction. Do not place other materials in contact with glass nor in such a way as to create a heat trap.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

D. Wash glass on both faces in each area of project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.
   1. Install permanent decals required by Code after final cleaning of glazing.

3.04 GLAZING SCHEDULE EXTERIOR

A. Aluminum Entrance Doors
   1. 1” LoĒ³-366 insulated glass.
   2. Temper: all lites.
   3. Color:
      a. Interior Glazing: Clear.
      b. Exterior Glazing: Clear.
   4. Type: Plain.
   5. Glazing method: Gasket.

B. Exterior Transoms and/or Sidelites
   1. 1” LoĒ³-366 insulated glass.

2. Temper: All lites within 18” of doors or floor.
3. Color:
   a. Interior Glazing: Clear.
   b. Exterior Glazing: Clear.
4. Type: Plain.
5. Glazing method: Gasket.

C. Aluminum Window Systems
1. 1” LoĒ³-366 insulated glass.
2. 1" Insulated Glazing Infill Panels (in locations shown on Contract Drawings).
3. Temper: all lites within 18” of doors or floor.
4. Color:
   a. Interior Glazing: Clear.
   b. Exterior Glazing: Clear.
5. Type: Plain.
6. Glazing method: Gasket.

D. Aluminum Curtain Walls or Storefront Walls
1. 1” LoĒ³-366 insulated glass.
2. 1" Insulated Glazing Infill Panels (in locations shown on Contract Drawings).
3. Temper: all lites within 18” of doors or floor.
4. Color:
   a. Interior Glazing: Clear.
   b. Exterior Glazing: Clear.
5. Type: Plain.
6. Glazing method: Gasket.

E. Hollow Metal and/or Fiberglass Entrance Doors
1. 1" LoĒ³-366 insulated glass or fire protection-rated glass if exterior door is fire rated.
2. Temper: all lites.
3. Color:
   a. Interior Glazing: Clear.
   b. Exterior Glazing: Clear.
4. Type: Plain.
5. Glazing method: Tape or gasket for lites smaller than 5 sq. ft.

3.05 GLAZING SCHEDULE INTERIOR

A. Interior Transoms and/or Sidelites
1. Thickness: ¼”.
2. Temper: All lites within 18” of doors or floor.
3. Color: Clear.
4. Type: Plain.
5. Glazing method: Gasket.

B. Fixed Steel Windows and Vision Panels:
1. Thickness: ¼”.
2. Color: Clear.
3. Type:
   a. Fire Rated Openings: Fire-Protection-Rated Glass.
   b. Temper: All lites within 18” of doors or floor.
   c. Plain: All other glazing.
4. Glazing method: Tape or gasket perimeters.

C. Fire Rated Doors
1. Thickness: 3/4”.

2. Color: Clear.
3. Type: Fire-Protection-Rated Glass.
4. Glazing Method: Fire rated gasket.

D. Other Interior Doors
1. Thickness: ¼”.
2. Color: Clear.
3. Type: Temper all lites.
4. Glazing Method: Tape or gasket perimeters.

E. Cabinet Doors
1. Thickness: 3/16".
2. Color: Clear.
3. Type: Tempered.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Safety and security window film.

B. Anti-graffiti window film.

C. Film attachment systems.

1.02 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.

B. ASTM International (ASTM):
1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
3. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
4. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
5. ASTM D1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
6. ASTM D2240 - Standard Method for Rubber Property - Durometer Hardness.
7. ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
8. ASTM D5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
9. ASTM D4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.
10. ASTM E84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
11. ASTM E903 - Standard Methods of Test for Solar Absorbence, Reflectance and Transmittance of Materials Using Integrating Spheres.
12. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
13. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
14. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings.
15. ASTM F2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings.

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

D. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

E. GSA-TS01-2003 -- Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

F. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

G. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.03 PERFORMANCE REQUIREMENTS

A. Safety Glazing Impact Performance:

1. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass.
2. Impact Resistance after Aging: 400 ft-lbs, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film applied on 1/8 inch annealed glass.
3. 400 ft-lbs impact resistance, meeting 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass.
4. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/4 inch annealed glass
5. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) or 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass
6. 150 ft-lbs impact resistance, meeting ANSI Z97.1 (Class B, Unlimited) and 16 CFR 1201 (Category 1) impact requirements with film applied on 1/4 inch annealed glass
7. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) and 16 CFR 1201 (Category 2) impact requirements with film is applied on 1/4 inch annealed glass

B. Impact Resistance and Pressure Cycling:
1. ASTM E1996 / ASTM E1886: Small Missile "A", +/- 80 psf Design Pressure.
2. ASTM E1996 / ASTM E1886: Large Missile "C", +/- 75 psf Design Pressure
3. ASTM E1996 / ASTM E1886: Small Missile "A", +/- 70 psf Design Pressure
4. ASTM E1996 / ASTM E1886: Small Missile "A", +/- 60 psf Design Pressure
5. ASTM E1996 / ASTM E1886: Large Missile "C", +/- 60 psf Design Pressure

C. Tear Resistance:
1. Minimum Graves Area Tear Strength of 1,000 lbs% as measured on coated film product, without liner, per ASTM D1004.
2. Minimum Graves Area Tear Strength of 1,200 lbs% as measured on coated film product, without liner, per ASTM D1004.
3. Minimum Graves Area Tear Strength of 1,100 lbs% as measured on coated film product, without liner, per ASTM D1004.

D. Adhesion to Glass:
1. Minimum 8 lbs/in peel strength per ASTM D3330 (Method A).
2. Minimum 6 lbs/in peel strength per ASTM D3330 (Method A).
3. Nominal 4 lbs/in peel strength per ASTM D3330 (Method A).
4. Minimum 3 lbs/in peel strength per ASTM D3330 (Method A).
5. Minimum 2 lbs/in peel strength per ASTM D3330 (Method A).

E. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
1. Flame Spread Index: no greater than 25.
2. Smoke Developed Index: no greater than 55.

F. Abrasion Resistance:
1. Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
2. Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
3. Film shall have a surface coating that is resistant to abrasion such that less than 5 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
4. Film shall have a surface coating that is resistant to abrasion such that a nominal 5 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

5. Film shall have a surface coating that is resistant to abrasion such that a nominal 3 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
6. Film shall have a surface coating that is resistant to abrasion such that less than 2 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

G. UV Light Rejection:
1. Minimum of 99.9% UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300 - Administrative Requirements.

B. Product Data: Manufacturer's current technical literature on each product to be used, including:
1. Manufacturer's Data Sheets.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.
1. Flammability Testing, ASTM E84.
2. Film Properties Testing, ASTM D882.
3. Abrasion Resistance Testing, ASTM D1044.
4. Peel Strength Testing, ASTM D3330.
5. Tear Resistance Testing, ASTM D1004.
6. Puncture Strength Testing, ASTM D4830.
7. Safety Glazing Impact Testing, ANSI Z97.1 and/or 16 CFR 1201.
8. Burglary Resistance Glazing, UL 972
9. Safety Glazing Impact Testing, ANSI Z97.1 and 16 CFR 1201.
10. Impact Resistance and Pressure Cycling, ASTM E1886 and ASTM E1996.
11. Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003.

D. Other Product Submittals:
1. Manufacturer's summary of 3rd Party Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003h
2. 3rd Party test reports from Forced Entry Resistance evaluations.

E. Verification Samples: For each film specified, two samples representing actual film color and pattern.

F. Performance Submittals: Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
1. Provide documentation that the adhesive used on the specified film is a Pressure Sensitive Adhesive (PSA).

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
   a. Name of building.
   b. The name and telephone number of a management contact.
   c. Type of glass.
   d. Type of film and/or film attachment system.
   e. Amount of film and/or film attachment system installed.
   f. Date of completion.
3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
4. Provide an EFilm application analysis to determine available energy cost reduction and savings.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Follow Manufacturer's instructions for storage and handling.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of any hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

A. At project closeout, provide to Owner's Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

B. In order to validate warranty, installation must be performed by an Authorized 3M dealer. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241; Email: request info (tdjohnson3@mmm.com).|
1. Area authorized 3M Dealer: Layr: Tel: 888-888-8000; Email: info@layr.com; Web: www.layr.com

2.02 CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM

A. 3M Scotchshield Ultra S600 Safety and Security Window Film. Optically clear microlayered polyester film, nominally 6 mils (0.006 inch) thick, with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is clear and does not contain dyed polyester. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film is microlayered with both plastic and ductile polyester layers for tear resistance.

1. Physical / Mechanical Performance Properties (nominal):
   a. Film Color: Clear.
   b. Film Thickness (excluding coatings or adhesive liner): Nominal 6 mils
   c. Tensile Strength (ASTM D882):
      1) Base Film: 32,000 psi (MD) / 32,000 psi (TD).
      2) Coated Film: 32,000 psi (MD) / 32,000 psi (TD).
   d. Break Strength (ASTM D882):
      1) Base Film: 190 lb/in (MD) / 190 lb/in (TD).
      2) Coated Film: 210 lb/in (MD) / 210 lb/in (TD).
   e. Percent Elongation at Break (ASTM D882):
      1) Base Film: 110 % (MD) / 100 % (TD).
      2) Coated Film: 136 % (MD) / 115 % (TD).
   f. Yield Strength:
      1) Base Film: 12,000 psi (MD).
      2) Coated Film: 15,000 psi (MD).
   g. Percent Elongation at Yield (ASTM D882):
      1) Base Film: 7% (MD).
      2) Coated Film: 9% (MD).
   h. Graves Tear Resistance (ASTM D1004):
      1) Maximum Force (lbs):
         (a) Base Film: 28 (MD) / 28 (TD).
         (b) Coated Film: 28 (MD) / 28 (TD).
      2) Maximum Extension (in):
         (a) Base Film: 0.45 (MD) / 0.65 (TD).
         (b) Coated Film: 0.55 (MD) / 0.55 (TD).
      3) Graves Area Tear Resistance (lbs%):
         (a) Base Film: 900 (MD) / 1,200 (TD).
         (b) Coated Film: 900 (MD) / 1,100 (TD).
   i. Puncture Propagation Tear Resistance (ASTM D2582):
      1) Coated Film: 6 lbf (MD) / 7 lbf (TD).
   j. Puncture Strength (ASTM D4830):
      1) Coated Film: 140 lbf.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass.
   a. Visible Light Transmission (ASTM E 903): 87 percent.
   b. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
   b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.
7. Impact Resistance and Pressure Cycling: Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTM E 1996 and ASTM E1886E 1886) at +/ 80 psf Design Pressure with use of 3M Impact Protection Adhesive. Film applied to 3/16 inch (4.8 mm) tempered glass.
8. Blast Hazard Mitigation:
9. Independent testing with results from high explosive arena blast or shock tube testing:
   a. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 44 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Profile Attachment system.

b. GSA Rating of "2"/ ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Profile Attachment system
c. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Adhesive Attachment system
d. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Adhesive Attachment system
e. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass and 3M Impact Protection Profile Attachment system
f. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 8 psi and 60 psi*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass and 3M Impact Protection Adhesive Attachment system
g. GSA Rating of "3B" / ASTM F1642 "Very Low Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass, daylight applied film (no attachment)
h. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 7 psi and 43 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass, daylight applied film (no attachment)
i. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on 1 inch (25.4 mm) annealed double pane glass, daylight applied film (no attachment)
j. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 12 psi and 70 psi*msec blast impulse, on 1 inch (25.4 mm) tempered double pane glass, daylight applied film (no attachment)

10. Forced Entry Resistance: Product shall have been evaluated for time to resist complete body passage by a qualified 3rd Party test lab.

B. 3M Scotchshield Ultra S800 Safety and Security Window Film. Optically clear microlayered polyester film, nominally 8 mils (0.008 inch) thick, with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is clear and does not contain dyed polyester. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film is microlayered with both plastic and ductile polyester layers for tear resistance.

1. Physical / Mechanical Performance Properties (nominal):
   a. Film Color: Clear.
   b. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils
   c. Tensile Strength (ASTM D882):
      1) Base Film: 32,000 psi (MD) / 32,000 psi (TD).
      2) Coated Film: 32,000 psi (MD) / 32,000 psi (TD).
   d. Break Strength (ASTM D882):
      1) Base Film: 250 lb/in (MD) / 250 lb/in (TD).
      2) Coated Film: 245 lb/in (MD) / 265 lb/in (TD).
   e. Percent Elongation at Break (ASTM D882):
      1) Base Film: 115 % (MD) / 115 % (TD).
      2) Coated Film: 132 % (MD) / 130 % (TD).
   f. Yield Strength:
      1) Base Film: 12,000 psi (MD).
      2) Coated Film: 15,000 psi (MD).
   g. Percent Elongation at Yield (ASTM D882):
      1) Base Film: 7% (MD).

2) Coated Film: 9% (MD).

h. Graves Tear Resistance (ASTM D1004):
1) Maximum Force (lbs):
(a) Base Film: 40 (MD) / 40 (TD).
(b) Coated Film: 40 (MD) / 40 (TD).
2) Maximum Extension (in):
(a) Base Film: 0.45 (MD) / 0.65 (TD).
(b) Coated Film: 0.50 (MD) / 0.57 (TD).
3) Graves Area Tear Resistance (lbs%):
(a) Base Film: 1,100 (MD) / 1,300 (TD).
(b) Coated Film: 1,100 (MD) / 1,300 (TD).

i. Puncture Propagation Tear Resistance (ASTM D2582):
1) Coated Film: 9 lbf (MD) / 10 lbf (TD).

j. Puncture Strength (ASTM D4830):
1) Material Properties (as supplied).
2) Coated Film: 185 lbf.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass.
a. Visible Light Transmission (ASTM E 903): 87 percent.
b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.79
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.
7. Impact Resistance and Pressure Cycling: Film shall pass impact of Large Missile "C" and withstand subsequent pressure cycling (per ASTM E1996 and ASTM E1886) at +/ 75 psf Design Pressure with use of 3M Impact Protection Adhesive. Film applied to 1/4-inch tempered glass.
8. Blast Hazard Mitigation:
a. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 44 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Profile Attachment system
b. GSA Rating of "2"/ ASTM F1642 "Minimal Hazard" with blast pressure of 7 psi and 43 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Profile Attachment system
c. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 9 psi and 62 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Adhesive Attachment system
d. GSA Rating of "2" / ASTM F1642 "No Hazard" with blast pressure of 9 psi and 63 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Adhesive Attachment system
e. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 9 psi and 60 psi*msec blast impulse, on 1 inch (25 mm) annealed double pane glass and 3M Impact Protection Profile Attachment system
f. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 10 psi and 89 psi*msec blast impulse, on 1 inch (25 mm) annealed double pane glass and 3M Impact Protection Adhesive Attachment system

g. GSA Rating of "3B" / ASTM F1642 "Very Low Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass, daylight applied film (no attachment)
h. GSA Rating of "3B" / ASTM F1642 "Very Low Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass, daylight applied film (no attachment)
i. GSA Rating of "3B" / ASTM F1642 "Low Hazard" with blast pressure of 7 psi and 42 psi*msec blast impulse, on 1 inch (25 mm) annealed double pane glass, daylight applied film (no attachment)

9. Forced Entry Resistance: Product shall have been evaluated for time to resist complete body passage by a qualified 3rd Party test lab.

2.03 MICROLAYERED SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL

A. 3M Scotchshield Ultra Prestige S70: Optically clear micro-layered polyester, laminated to an optically clear multi-layered polyester film containing at least 220 layers with a pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. Films contain no metals, but so contain infrared-absorbing carbon, metal oxide particles, or both.

1. Physical / Mechanical Performance Properties:
   a. Film Color: Virtually clear with at least 220 layers.
   b. Thickness: Nominal 8.0 mils
   c. Tensile Strength (ASTM D 882): 24,000 psi (MD) / 26,000 psi (TD)
   d. Break Strength (ASTM D 882): 200 lbs/in (MD) / 215 lbs/in (TD)
   e. Percent Elongation at Break (ASTM D882): 104% (MD) / 118% (TD)
   f. Yield Strength (ASTM D882): 16,000 psi (MD)
   g. Percent Elongation at Yield (ASTM D882): 8% (MD)
   h. Graves Tear Resistance (AASTM D1004):
      1) Maximum Force: 35 lbs (MD) / 36 lbs (TD)
      2) Maximum Strain: 56% (MD) / 50% (TD)
      3) Graves Area Tear Resistance: 1,100 lbs% (MD) / 1,100 lbs% (TD)
   i. Puncture Propagation Tear (ASTM D 2582): 10 lbf
2. Solar Performance Properties: Film applied to 1/4 Inch thick clear glass.
   a. Visible Light Transmission (ASTM E 903): 68 percent.
   b. Visible Reflection (ASTM E 903): Not more than 10 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.51
   e. Total Solar Energy Rejected: 50%
3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
7. Impact Resistance and Pressure Cycling:
   a. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTM E 1996 and E 1886) at +/- 80 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
8. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 6 psi and 45 psi*msec, on 1/4 inch (6 mm) single pane tempered glass and 3M Impact Protection Adhesive film attachment system.
b. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 9 psi and 60 psi*msec, on 1 inch (25 mm) double pane tempered glass and 3M Impact Protection Adhesive film attachment system.

B. 3M Scotchshield Ultra Prestige S50: Optically clear micro-layered polyester, laminated to an optically clear multi-layered polyester film containing at least 220 layers with a pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. Films contain no metals, but so contain infrared-absorbing carbon, metal oxide particles, or both.
1. Physical / Mechanical Performance Properties:
a. Film Color: Lightly tinted with at least 220 layers.
b. Thickness: Nominal 8.0 mils
c. Tensile Strength (ASTM D 882): 25,000 psi (MD) / 26,000 psi (TD)
d. Break Strength (ASTM D 882): 210 lbs/in (MD) / 220 lbs/in (TD)
e. Percent Elongation at Break (ASTM D882): 111% (MD) / 102% (TD)
f. Yield Strength (ASTM D882): 16,000 psi (MD)
g. Percent Elongation at Yield (ASTM D882): 8% (MD)
h. Graves Tear Resistance (ASTM D1004):
1) Maximum Force: 36 lbs (MD) / 36 lbs (TD)
2) Maximum Strain: 50% (MD) / 50% (TD)
3) Graves Area Tear Resistance: 1,100 lbs% (MD) / 1,100 lbs% (TD)
i. Puncture Propagation Tear (ASTM D 2582): 10 lbf
2. Solar Performance Properties: Film applied to 1/4 Inch thick clear glass.
a. Visible Light Transmission (ASTM E 903): 48 percent.
b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.44
e. Total Solar Energy Rejected: 56%
3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
7. Impact Resistance and Pressure Cycling:
a. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTM E 1996 and E 1886) at +/- 80 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
8. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
a. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 6 psi and 45 psi*msec, on 1/4 inch (6 mm) single pane tempered glass and 3M Impact Protection Adhesive film attachment system.
b. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 9 psi and 60 psi*msec, on 1 inch (25 mm) double pane tempered glass and 3M Impact Protection Adhesive film attachment system.

C. 3M Scotchshield Ultra Night Vision S25: Optically clear polyester film comprised of co-extruded micro-layers, laminated to a metalized polyester film. Additional film layer is added for color and

performance, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film color is derived from the metal coating and the product will not contain dyed polyester.

1. Physical / Mechanical Performance Properties:
    a. Film Color: Moderately tinted.
    b. Thickness: Nominal 8.0 mils
    c. Tensile Strength (ASTM D 882): 28,000 psi (MD) / 27,000 psi (TD)
    d. Break Strength (ASTM D 882): 235 lbs/in (MD) / 230 lbs/in (TD)
    e. Percent Elongation at Break (ASTM D882): 120% (MD) / 85% (TD)
    f. Yield Strength (ASTM D882): 17,000 psi (MD)
    g. Percent Elongation at Yield (ASTM D882): 8% (MD)
    h. Graves Tear Resistance (ASTM D1004):
        1) Maximum Force: 37 lbs (MD) / 38 lbs (TD)
        2) Maximum Strain: 49% (MD) / 46% (TD)
        3) Graves Area Tear Resistance: 1,100 lbs% (MD) / 900 lbs% TD)
    i. Puncture Propagation Tear (ASTM D 2582): 10 lbf
2. Solar Performance Properties: Film applied to 1/4 Inch thick clear glass.
    a. Visible Light Transmission (ASTM E 903): 24 percent.
    b. Visible Reflection (ASTM E 903): Not more than 20 percent exterior / 7% interior.
    c. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
    d. Solar Heat Gain Coefficient (ASTM E 903): 0.40
    e. Total Solar Energy Rejected: 60%
3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
    a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.
7. Impact and Pressure Cycling:
    a. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTM E 1996 and E 1886) at +/- 80 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
8. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
    a. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 6 psi and 43 psi*msec, on 1/4 inch (6 mm) single pane annealed glass and 3M Impact Protection Adhesive film attachment system.
    b. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 6 psi and 45 psi*msec, on 1/4 inch (6 mm) single pane tempered glass and 3M Impact Protection Adhesive film attachment system.
    c. GSA Rating of "3B" / ASTM F1642 "Minimal Hazard" with minimum blast load of 5 psi and 32 psi*msec, on 1/4 inch (6 mm) single pane tempered glass and 3M Impact Protection Profile film attachment system.
    d. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 5 psi and 35 psi*msec, on 1 inch (25 mm) double pane annealed glass and 3M Impact Protection Profile film attachment system
    e. GSA Rating of "2" / ASTM F1642 "No Hazard" with minimum blast load of 9 psi and 61 psi*msec, on 1 inch (25 mm) double pane tempered glass and 3M Impact Protection Adhesive film attachment system

2.04 CLEAR SAFETY AND SECURITY WINDOW FILM

A. 3M Safety S40 (SH4CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 4.0 mils
      c. Tensile Strength (ASTM D 882): 25,000 psi.
      d. Elongation: 130 percent.
      e. Break Strength (ASTM D 882): 100 lbs/in
   2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   4. Identification: Labeled as to Manufacturer as listed in this Section.
   5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
      a. Visible Light Transmission (ASTM E 903): 87 percent.
      b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
      a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).
      b. Safety Rating (ANSI Z97.1): Class B, Unlimited Size.

B. 3M Safety S70 (SH7CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 7.0 mils
      c. Tensile Strength (ASTM D 882): 25,000 psi.
      d. Break Strength (ASTM D 882): 175 lbs/in.
   2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   4. Identification: Labeled as to Manufacturer as listed in this Section.
   5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
      a. Visible Light Transmission (ASTM E 903): 87 percent.
      b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
      a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).
   7. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
      a. GSA Rating of "3B" with minimum blast load of 4 psi and 28 psi*msec, on 1/4 inch single pane annealed glass and 3M Impact Protection Adhesive film attachment system.
      b. GSA Rating of "3B" with minimum blast load of 10 psi and 89 psi*msec, on 1 inch (25 mm) double pane annealed glass and 3M Impact Protection Adhesive film attachment system.

C. 3M Safety S80 (SH8CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:
    a. Film Color: Clear.
    b. Thickness: Nominal 8 mils.
    c. Tensile Strength (ASTM D 882): 25,000 psi.
    d. Break Strength (ASTM D 882): 200 lbs/in
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
    a. Visible Light Transmission (ASTM E 903): 87 percent.
    b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
    a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.
7. Blast Hazard Mitigation:
    a. GSA Rating of "3B" / ASTM F1642 "Minimal Hazard" with minimum blast load of 6 psi and 41 psi*msec, on 1/4 inch (6 mm) single pane annealed glass and 3M Impact Protection Adhesive film attachment system.
    b. GSA Rating of "3B" with minimum blast load of 7 psi and 41 psi*msec, on 1/4 inch single pane annealed glass and 3M Impact Protection Profile film attachment system.
    c. GSA Rating of "3B" with minimum blast load of 4 psi and 29 psi*msec, on 1/4 inch single pane annealed or tempered glass without use of film attachment system.
    d. GSA Rating of "2" with minimum blast load of 12 psi and 66 psi*msec, on 1 inch double pane annealed glass and 3M Impact Protection Adhesive film attachment system.
    e. GSA Rating of "3B" with minimum blast load of 14 psi and 63 psi*msec, on 1 inch double pane annealed glass and 3M Impact Protection Profile film attachment system.

D. 3M Safety S140 (SH14CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
    1. Physical / Mechanical Performance Properties:
        a. Film Color: Clear.
        b. Thickness: Nominal 14 mils
        c. Tensile Strength (ASTM D 882): 25,000 psi.
        d. Break Strength (ASTM D 882) (Per Inch Width): 350 lbs.
    2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
    3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
    4. Identification: Labeled as to Manufacturer as listed in this Section.
    5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
        a. Visible Light Transmission (ASTM E 903): 85 percent.
        b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
    6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
        a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    7. Impact Resistance and Pressure Cycling:
        a. Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTM E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

8. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
    a. GSA Rating of "3B" with minimum blast load of 8 psi and 44 psi*msec, on 1/4 inch single pane annealed glass and 3M Impact Protection Profile film attachment system.
    b. GSA level 3B rating with minimum blast load of 15 psi overpressure and 58 psi*msec blast impulse on 1 inch double pane annealed glass without use of film attachment system.
9. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).
    a. Annealed Glass (1/4 inch) - Pass
    b. Tempered Glass (1/4 inch) - Pass

E. 3M Safety Exterior S20: Optically clear polyester film with an exterior durable abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
1. Physical / Mechanical Performance Properties:
    a. Film Color: Clear.
    b. Thickness: Nominal 2 mils
    c. Tensile Strength (ASTM D 882): 25,000 psi.
    d. Elongation: 88 percent.
    e. Break Strength (ASTM D 882): 50 lbs/in
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
    a. Visible Light Transmission (ASTM E 903): 88 percent.
    b. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
    a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class B, Unlimited Size.

F. 3M Safety Exterior S40. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
1. Physical / Mechanical Performance Properties:
    a. Film Color: Clear.
    b. Thickness: Nominal 4 mils
    c. Tensile Strength (ASTM D 882): 25,000 psi.
    d. Break Strength (ASTM D 882): 100 lbs/in.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
    a. Visible Light Transmission (ASTM E 903): 89 percent.
    b. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
    a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

G. 3M Safety Exterior S70. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other.
1. Physical / Mechanical Performance Properties:
    a. Film Color: Clear.

b. Thickness: Nominal 7 mils
c. Tensile Strength (ASTM D 882): 25,000 psi.
d. Break Strength (ASTM D 882): 140 lbs/in.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
   a. Visible Light Transmission (ASTM E 903): 88 percent.
   b. Ultraviolet Transmission (ASTM E 903): Less than 0.5 percent.
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

2.05 SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL

A. 3M Safety Neutral S35. Dual reflective polyester film, nominally 8 mils (0.008") thick, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is comprised of an optically clear safety film laminated to a metalized film layer for reflective and sun control properties. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
   1. Physical / Mechanical Performance Properties (nominal):
      a. Film Color: Neutral
      b. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils
      c. Tensile Strength 33,000 psi (MD) / 23,000 psi (TD)
      d. Break Strength: 170 lb/in (MD) / 280 lb/in (TD)
      e. Percent Elongation at Break: 100 % (MD) / 80 % (TD)
      f. Yield Strength: 23,000 psi
      g. Percent Elongation at Yield: 80%
   2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   3. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
   4. Identification: Labeled as to Manufacturer as listed in this Section.
   5. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass (NFRC 100/200).
      a. Visible Light Transmission: 39%
      b. Visible Reflection: 23% exterior / 13% interior
      c. Ultraviolet Transmission: Not more than 1%.
      d. Solar Heat Gain Coefficient: 0.43
   6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
      a. Safety Rating (CPSC 16 CFR, Part 1201): Category 2 (400 ft.-lbs).
      b. Safety Rating (ANSI Z97.1): Class A, Unlimited (400 ft.-lbs).
   7. Impact Resistance and Pressure Cycling
      a. Film shall pass impact of Large Missile "C" and withstand subsequent pressure cycling (per ASTM E1996 and ASTM E1886) at +/- 60 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system. Tested on 1/4 inch (6 mm) tempered glass.
   8. Blast Hazard Mitigation:
      a. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Profile Attachment system

b. GSA Rating of "2"/ ASTM F1642 "Minimal Hazard" with blast pressure of 6 psi and 42 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Adhesive Attachment system
c. GSA Rating of "2" / ASTM F1642 "No Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Adhesive Attachment system
d. GSA Rating of "2" / ASTM F1642 "No Hazard" with blast pressure of 6 psi and 42 psi*msec blast impulse, on 1 inch (25 mm) double pane tempered glass and 3M Impact Protection Adhesive Attachment system

B. 3M Safety Silver S20. Highly reflective polyester film, nominally 8 mils (0.008") thick, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is comprised of an optically clear safety film laminated to a metalized film layer for reflective and sun control properties. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass.
1. Physical / Mechanical Performance Properties (nominal):
a. Film Color: Silver reflective
b. Film Thickness (excluding coatings or adhesive liner): Nominal 8 mils
c. Tensile Strength: 20,000 psi (MD) / 30,000 psi (TD)
d. Break Strength: 160 lb/in (MD) / 247 lb/in (TD)
e. Percent Elongation at Break: 95 % (MD) / 76 % (TD)
f. Yield Strength: 15,000 psi
g. Percent Elongation at Yield: 7%
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Solar Performance Properties: Film applied to 1/4 inch (6 mm) thick clear glass (NFRC 100/200).
a. Visible Light Transmission: 18%
b. Visible Reflection: 61%
c. Ultraviolet Transmission: Not more than 1%.
d. Solar Heat Gain Coefficient: 0.25
6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
a. Safety Rating (CPSC 16 CFR, Part 1201): Category 2 (400 ft-lbs).
b. Safety Rating (ANSI Z97.1): Class A, Unlimited (400 ft-lbs).
7. Impact Resistance and Pressure Cycling
a. Film shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTM E1996 and ASTM E1886) at +/- 60 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system. Tested on 1/4 inch (6 mm) tempered glass.
8. Blast Hazard Mitigation:
a. GSA Rating of "2" / ASTM F1642 "Minimal Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Profile Attachment system
b. GSA Rating of "2"/ ASTM F1642 "Minimal Hazard" with blast pressure of 6 psi and 42 psi*msec blast impulse, on 1/4 inch (6 mm) annealed single pane glass and 3M Impact Protection Adhesive Attachment system
c. GSA Rating of "2" / ASTM F1642 "No Hazard" with blast pressure of 4 psi and 28 psi*msec blast impulse, on 1/4 inch (6 mm) tempered single pane glass and 3M Impact Protection Adhesive Attachment system

d. GSA Rating of "2" / ASTM F1642 "No Hazard" with blast pressure of 6 psi and 42 psi*msec blast impulse, on 1 inch (25 mm) double pane tempered glass and 3M Impact Protection Adhesive Attachment system

2.06 ANTI-GRAFFITI WINDOW FILM

A. 3M Anti-Graffiti 4 (AG-4): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 4.0 mils
      c. Tensile Strength (ASTM D 882): 25,000 psi.
      d. Break Strength (ASTM D 882) (Per Inch Width): 136 lbs.
      e. Elongation at Break (ASTM D 882): > 100 percent.
      f. Peel Strength: 1 lb/inch.
      g. Puncture Strength (ASTM D 4830): 90 lbs.
      h. Abrasion Resistance (ASTM D1044): < 2 percent increase in haze.
   2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   4. Identification: Labeled as to Manufacturer as listed in this Section.
   5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
      a. Visible Light Transmission (ASTM E 903): 81 percent.
      b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

B. 3M Anti-Graffiti 6 (AG-6): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.
   1. Physical / Mechanical Performance Properties:
      a. Film Color: Clear.
      b. Thickness: Nominal 6.0 mils
      c. Tensile Strength (ASTM D 882): 25,000 psi.
      d. Break Strength (ASTM D 882): 150 lbs/in
      e. Elongation at Break (ASTM D 882): > 100 percent.
      f. Peel Strength: 1 lb/inch.
      g. Puncture Strength (ASTM D 4830): 125 lbs.
      h. Abrasion Resistance (ASTM D 1044): < 2 percent increase in haze.
   2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   4. Identification: Labeled as to Manufacturer as listed in this Section.
   5. Solar Performance Properties: Film applied to 1/4 Inch (6 mm) thick clear glass.
      a. Visible Light Transmission (ASTM E 903): 87 percent.
      b. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.

2.07 3M IMPACT PROTECTION FILM ATTACHMENT SYSTEMS

A. 3M Impact Protection Adhesive (IPA): Weatherable, UV-resistant, moisture curable structural sealant wet glaze.
   1. Color:
      a. Black.
      b. White.

2. Material Properties (as supplied):
    a. Typical Cure Time: 3 - 7 days (25 degrees C, 50% RH)
    b. Full Adhesion: 7 - 14 days
    c. Tack-Free Time (ASTM D 5895): 21 minutes (25 degrees C, 50% RH)
    d. Flow, Sag or Slump (ASTM D 2202): 0 inches
    e. Specific Gravity: 1.4
    f. Working Time: 10 - 20 minutes (25 degrees C, 50% RH)
    g. VOC Content: 16 g/L
3. Material Properties (as cured - 21 days at 25 degrees C, 50% RH):
    a. Ultimate Tensile Strength (ASTM D412): 380 psi (2.62 MPa)
    b. Ultimate Elongation (ASTM D412): 640 psi
    c. Durometer Hardness, Shore A (ASTM D2240): 38-39 points
    d. Tear Strength, Die B (ASTM D624): 72 ppi
4. Uniformity: Product shall have uniform consistency and appearance, with no clumping.
5. Impact Resistance and Pressure Cycling:
    a. As part of a filmed glass system, film attachment shall demonstrate ability to withstand Medium Large Missile C and Small Missile A impact, with subsequent pressure cycling (per ASTM E 1996 and ASTM E 1886) at +/- 75 psf design pressure.
    b. As part of a filmed glass system, film attachment shall demonstrate ability withstand structural load requirements of ASTM E330 when tested at +/ 100 psf design pressure.
6. Blast Hazard Mitigation:
    a. GSA level "2" rating (minimal hazard) of "2" with minimum blast load of 11 psi overpressure and 55 psi*msec blast impulse.
    b. GSA level "3B" rating (low hazard) with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.
    c. ASTM F1642 rating of "Low Hazard" with minimum blast load of 8 psi overpressure and 42 psi*msec blast impulse.

B. 3M Impact Protection Profile (IPP): Weatherable, flexible-mechanical style film attachment made of extruded rubber profile with two strips of double coated foam tape: one strip for bonding to applied film and the other strip for bonding to the window frame.
1. 3M Impact Protection Profile, BP-700.
    a. Total width: 1.0 inches.
    b. Tape width: 0.5 inches.
2. 3M Impact Protection Profile, BP-950.
    a. Total width: 1.3 inches.
    b. Tape width: 0.625 inches.
3. 3M Impact Protection Profile, BP-950 XL.
    a. Total width: 1.3 inches.
    b. Tape width: 0.38 inches.
4. Material Properties:
    a. Full Adhesion: 1 - 2 days (25 degrees C, 50% RH)
    b. Ultimate Tensile Strength (AASTM D412): > 20,500 psi
    c. Ultimate Elongation (ASTM D412): 400%
    d. Break Strength, Die B (ASTM D624): > 71 ppi
    e. Durometer Hardness, Shore A: (ASTM D2240): 70 pts
5. Uniformity: Product shall have uniform consistency and appearance.
6. Impact Resistance and Pressure Cycling:
    a. As part of a filmed glass system, film attachment shall demonstrate ability to withstand Small Missile A impact, with subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf design pressure.
7. Blast Hazard Mitigation:

a. GSA level "2" rating (minimal hazard) with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.
b. GSA level "3B" rating (low hazard) with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.
c. ASTM F1642 rating of "Low Hazard" with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.

PART 3 EXECUTION

3.01 EXAMINATION

A. Film Examination:
1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
2. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
3. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
4. Commencement of installation constitutes acceptance of conditions.

B. Impact Protection Adhesive Examination:
1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.
2. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
3. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
4. Conduct an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long bead, approximately 0.5 - 1 inch in width, masking one side of the frame surface underneath the strip with tape. Allow the Impact Protection Adhesive to cure for 7 days and test adhesion by pulling up on the masked end and a 90 degree angle. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is not recommended.

C. Impact Protection Profile Examination:
1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.
2. Windows and frames must be examined to ensure that they are fit to receive the Impact Protection Profile in a manner such that the two profile adhesive strips will be perpendicularly opposed to each other and that they will not contact glazing stops or frame gaskets without stretching the profile.
3. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
4. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.

5. Conduct an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long strip on the frame surface, using the sufficient pressure to achieve good adhesive wet-out. Allow the Impact Protection Profile to cure for 1-2 days and test adhesion by removing the test strip. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is either not recommended, or an adhesion promoter, such as 3M Primer 94, must be used.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.03 INSTALLATION

A. Film Installation:
   1. Install in accordance with manufacturer's instructions.
   2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
   3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
   4. Apply film to glass and lightly spray film with slip solution.
   5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
   6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
   7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

B. Impact Protection Adhesive Installation:
   1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.
      a. For blast hazard mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
      b. For impact resistance and building envelope protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
   2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.
   3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.
   4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.
   5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.
   6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.

C. Impact Protection Profile Installation:

1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator trained to install 3M Impact Protection Profile. Refer to 3M publication, 3M Impact Protection Profile Installation Systems Instructions.
2. Each profile piece must span continuously to both sides of the window, within 1/8 inch to the frame edge. Splicing the profile between frame edges is prohibited.
3. Profile must be aligned and applied by 3M recommended or approved methods and tools to ensure a quality installation.
4. Corner joints must be fabricated by 3M recommended and approved methods. No part of the profile adhesive shall make contact with an adjacent profile.
5. Sufficient pressure must be evenly applied along the entire length of the profile to ensure full adhesion from both adhesive strips. A roller tool is required to minimize entrapment of air in the adhesive.

3.04 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Gypsum plastering on expanded-metal lath.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

1.04 QUALITY ASSURANCE

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockups for each substrate and finish texture indicated for gypsum plastering, including accessories.
      a. Size: 100 sq. ft. (9 sq. m) in surface area.
   2. Simulate finished lighting conditions for review of mockups.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, contamination, corrosion, construction traffic, and other causes.

1.06 FIELD CONDITIONS

A. Comply with ASTM C842 requirements or gypsum plaster manufacturer's written recommendations, whichever are more stringent.

B. Room Temperatures: Maintain temperatures at not less than 55 degrees F (13 degrees C) or greater than 80 degrees F (27 degrees C) for at least seven days before application of gypsum plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.

C. Avoid conditions that result in gypsum plaster drying out too quickly.
   1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
   2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
   3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.01 EXPANDED-METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. ClarkDietrich Building Systems.
b. MarinoWARE.

3. Flat-Rib Lath: Rib depth of not more than 1/8 inch (3 mm), 3.4 lb/sq. yd. (1.8 kg/sq. m).

2.02 ACCESSORIES

A. General: Comply with ASTM C841, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. ClarkDietrich Building Systems.
b. MarinoWARE.
2. Cornerite: Fabricated from expanded-metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
3. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
4. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.
5. Control Joints: Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
6. Two-Piece Expansion Joints: Fabricated from zinc; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch (6 to 16 mm) wide; with perforated flanges.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Fry Reglet Corporation.
b. Gordon, Inc.
c. MM Systems Corporation.
d. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
3. Finish: Insert requirements for anodic or other factory-applied coatings.

2.03 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compound: ASTM C631.

C. Fasteners for Attaching Metal Lath to Substrates: ASTM C841.

D. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.

E. Mix Additives: Use gypsum plaster accelerators and retarders from plaster manufacturer if required by Project conditions. Use only additives that manufacturer recommends in writing for use with plaster to which it is added.

2.04 BASE-COAT PLASTER MATERIALS

A. Recycled Content of Gypsum Plaster: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

B. High-Strength Gypsum Neat Plaster: ASTM C28/C28M, with a minimum, average, dry compressive strength of 2800 psi (19 MPa) according to ASTM C472 for a mix of 100 lb (45 kg) of plaster and 2 cu. ft. (0.06 cu. m) of sand.
1. Products: Subject to compliance with requirements, provide the following:

a. USG Corporation; Structo-Base.

C. Aggregates for Base-Coat Plasters: ASTM C35, sand.

2.05 FINISH-COAT PLASTER MATERIALS

A. Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gaged, interior finish.
1. Products: Subject to compliance with requirements, provide one of the following:
a. USG Corporation; Imperial Veneer Finish Plaster.
b. Or approved equal.

2.06 PLASTER MIXES

A. Mixing: Comply with ASTM C842 and manufacturer's written instructions for applications indicated.

B. Mix Additives: Use accelerators and retarders, if required by Project conditions, according to manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.03 INSTALLATION, GENERAL

A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

B. STC-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.04 INSTALLING EXPANDED-METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C841.

3.05 INSTALLING ACCESSORIES

A. General: Install according to ASTM C841.

B. Cornerbeads: Install at external corners.

C. Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.

D. Control Joints: Locate as approved by Architect for visual effect, with spacing between joints in either direction not exceeding the following:
1. Partitions: 30 feet (9 m).
2. Ceilings: 30 feet (9 m).

E. Aluminum Trim: Install according to manufacturer's written instructions.

3.06 PLASTER APPLICATION

A. General: Comply with ASTM C842.
1. Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.

2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on substrates for direct application of plaster.

C. Base-Coat Plaster:
1. Over Expanded-Metal Lath:
   a. Scratch Coat: High-strength gypsum neat plaster with job-mixed sand.
   b. Brown Coat: High-strength gypsum neat plaster with job-mixed sand.
2. Over Unit Masonry: Gypsum neat plaster with job-mixed sand.
3. Over Monolithic Concrete: Gypsum neat plaster with job-mixed sand.

D. Finish Coats:
1. Smooth-Troweled Finishes:
   a. Materials: High-strength gypsum gaging plaster and lime putty.
   b. Locations: Provide smooth-troweled finish unless otherwise indicated.

E. Concealed Plaster:
1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
3. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.07 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.08 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes wood athletic flooring.

1.03 COORDINATION

A. Concrete slabs on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on earth side of below grade walls by general contractor in accordance with Division 03. See Moisture content Testing requirements in Part 3 EXAMINATION Article in this Section.

B. Thresholds: See Division 08 - Hardware.

1.04 REFERENCES

A. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

C. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2011 (Reapproved 2019).

D. ISO 14040 - Environmental Management - Life Cycle Assessment - Principles and Framework; 2006, with Amendment (2020).

E. ISO 14044 - Environmental Management - Life Cycle Assessment - Requirements and Guidelines; 2006, with Amendment (2020).

F. MFMA (PUR) - Performance and Uniformity Rating Sport Specific Standards; current edition.

G. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems; current edition.

H. MFMA – Maple Flooring Manufactures Association

I. FIBA – International Basketball Federation

J. FSC – Forest Stewardship Council

K. FloorScore – Certified product by CDPH 01350

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.

B. Shop Drawings: For each type of floor assembly, include the following:
   1. Plans, sections, and attachment details.
   2. Details of concrete-slab depressions.
   3. Locations of different grades of wood flooring.
   4. Expansion provisions and trim details.
   5. Layout, colors, widths, and dimensions of game lines and markers.

C. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work.

D. Maintenance literature: Submit one copy of manufacturer's maintenance instructions for review prior to approval. A second copy shall be submitted with the Close-out manual / paperwork for the owner's maintenance personnel.

1.06 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain-of-custody certification by an FSC-accredited certification body.

B. Manufacturer shall be a MFMA Mill Member, an established firm experienced in the field and have been in business a minimum of ten (10) years; Connor Sports Surface Solutions or an Architect approved equivalent.

C. Floor system manufacturer and flooring shall be independently verified by the guidelines of the ISO 14064-1:2006 World Resource Institutes Greenhouse Gas Protocol, Scope 1, 2 and 3.

D. Manufacturer and flooring shall be independently verified by the guidelines of the ISO 14040 and ISO 14044 Life Cycle Assessment (LCA), confirming a negative carbon footprint.

E. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

F. Floor system manufacturer must provide a Life Cycle Assessment and an Environmental Product Declaration (EPD) in accordance with the Product Category Rule Version 2.2014.

G. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.
   1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
   2. Installer must a firm experienced in MFMA wood flooring and be approved by the manufacturer of the approved flooring system.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver floor assembly materials in unopened cartons or bundles.

B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry and all overhead mechanical work, lighting, backstops, scoreboards are installed.

C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained.

D. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F2170 In-Slab Relative Humidity test.

1.10 FIELD CONDITIONS

A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
   1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
   2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
      a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.

b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. The wood flooring shall not be installed until all masonry, plastering, tile, marble and terrazzo work is completed, and overhead mechanical trades and painters have finished in wood floor area. The building must be reasonably dry; all openings must be closed in; permanent heating and air conditioning installed and operating.

1.11 WARRANTY

A. The Manufacturer shall warrant the material shipped to the site to be free from defects in materials and workmanship for a period of one year and the flooring installer shall warrant the installation of the flooring to be free of defects in materials and workmanship for a period of one year. The exclusive remedy under this warranty shall be replacement of defective material supplied by the manufacturer or correction of defective installation by the flooring installer. All implied warranties of merchantability or fitness for intended use are limited to the period of this warranty. This warranty excludes consequential damages.

B. During the warranty period, the floor cannot be coated without the permission of the floor contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Conner Sports Surface Solutions NeoShok
2. Robbins Sports Surfaces: BioCushion Classic
3. Architect Approved Equivalent.

2.02 SYSTEM DESCRIPTION

A. System Type: Floating Resilient Wood Athletic Flooring System.

B. Overall System Height: 2 1/2 inch with 25/32 Maple Flooring surface.(NeoShok)

2.03 PERFORMANCE REQUIREMENTS

A. FloorScore Certification: Wood athletic flooring shall be certified under the RFCI FloorScore program.
1. Floor finishes must comply with requirements of SCAQMD Rule 1113, "Architectural Coatings."

B. Composite Wood Products: Shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Certified Wood: Wood shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

2.04 FLOORING MATERIALS

A. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

B. Strip Flooring:
1. Grade: MFMA Second & Better (TGEM)
a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.
2. Length: Random Length (RL) tongue and groove and end matched..

3. Cut: Flat.
4. Thickness: 25/32 inch (19.84 mm).
5. Face Width: 2-1/4 inches (57 mm).
6. Finish Treatment: Factory -Sanded

2.05 SUBFLOOR MATERIALS

A. Vapor Retarder: 10 mil reinforced polyethylene (Griffolyn or equal) minimum.

B. Plywood Underlayment: 4' x 8' panels, APA, exposure 1, rated sheathing, 32/16 span rating, C-D plugged, exterior glue, tongue and groove, 15/32 inch thick. Apply in two staggered two layers.
   1. Bonding adhesive contains no urea formaldehyde.

C. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
   1. Type: 2 1/4 inch wide by 3 inch long PVC resilient pads with six fully enclosed air channels.
   2. Material: Neoprene.
   3. Thickness: 3/4 inch (Connor NeoShok)

2.06 FINISHES

A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
   1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
      a. Manufacturer: Bona SuperSport DTS (Deep Tone Sealer) Seal. Greengard certified
   2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
      a. Type: MFMA Group 5, Water-Based Finishes.
      b. Manufacturer: BONA SuperSport finish.
   3. VOC Content:
      a. Floor Sealers and Finish Coats: VOC content of not more than 350 g/L.
      b. Game-Line and Marker Paint: VOC content of not more than 150 g/L.

2.07 ACCESSORIES

A. Vapor Retarder: ASTM D4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.

B. Resilient Wall Base: Molded, vented, rubber cove base; 3 inch by 4 inch by 48 inches; with premolded outside corners.
   1. Color: Black.

C. Thresholds: Re-install existing thresholds, U.N.O.

D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
   1. Subfloor fasteners: 1 inch length, 7/16 inch crown, coated staples or equivalent.
   2. Flooring fasteners shall be 2" (50mm) 15 gauge flooring cleats.

E. Construction Adhesive: Manufacturer's standard for application indicated.
   1. Wood Flooring adhesive shall be single component elastomeric polyurethane or PVA adhesive when suitable, for use with parquet.
   2. VOC Content: 20 g/L or less.
   3. Manufacturer: Bona or W. W. Henry Company or as approved by the Flooring Manufacturer.

F. Protective Floor Cover:
   1. Manufacturer cover system (Action AirRide) with patented air blower system. System includes Phthalate-free, seamless 10’-0” wide, 20.5 ounce vinyl covers and A-frame rack.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
   1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
      c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Concrete Slabs:
   1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
   2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
   3. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.

B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.

B. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
   1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.

C. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches (150 mm) and sealed. Turn up 4 inches at walls.

D. Cush pads shall be attached to the underside of the first layer of sheathing 12” (300mm) on center or as per manufacturer's recommendations.

E. Subfloor:
   1. Install the lower subfloor perpendicular to the intended finish flooring direction. All joints shall be staggered 4’ and spaced ¼” (6mm) apart.
   2. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
   3. Install the upper subfloor diagonal to the lower subfloor panels staggering joints 4’ and spacing ¼” (6mm) apart. Secure these panels using adhesive(Box X pattern) and 1”

(25mm) staples placed 6” (150mm) On Center (O.C.) at panel perimeter and 12” (300mm) O.C. throughout interior.

F. Maple Flooring
   1. Machine nail maple finish flooring 10” to 12” (250mm to 300mm) on center with end joints properly driven up and proper spacing provided for humidity conditions in specific regions. Consult with manufacturer's “Certified” installation contractor.
   2. Provide 1 inch (25 mm) expansion voids at the perimeter and at all vertical obstructions.
   3. Expansion rows will be evenly distributed with each row of flooring, with each space not exceeding 1/64” (0.4mm).

G. Installation Tolerances: 1/8 inch in 10 feet (3 mm in 3 m) of variance from level.

3.04 SANDING AND FINISHING

A. Allow installed flooring to acclimate to ambient conditions before sanding.

B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."

C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups.

D. After sanding, buff entire floor using 100-grit screen or equal grit sandpaper, with a heavy-duty buffing machine.

E. Remove sanding dust by tack or vacuum prior to the first coat of finish.

F. Floor shall present a smooth surface without drum stop marks, gouges, streaks or shiners.

G. Inspect entire area of floor to ensure that the surface is acceptable for finishing, completely free of sanding dust and perfectly clean.

H. Finish: Apply two seal coats and two finish coats system in accordance with the finish manufacturer's written instructions. Buff and vacuum or tack between each coat after it dries. <>
   1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.

3.05 BASE INSTALLATION

A. Affix rubber base to wall with recommended adhesive or screws. Miter all corners carefully. Use premolded outside corners. Install aluminum thresholds as required, anchoring firmly in concrete floor beyond limits of wood flooring.

3.06 CLEAN UP

A. Clean up all unused materials and debris and remove from premises, properly dispose of all waste materials.

3.07 PROTECTION

A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
   1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
   2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

3.08 MAINTENANCE

A. Upon completion of floor installation, the flooring installation contractor / manufacturer shall provide literature and instruction for the care and maintenance instructions to the owners maintenance personnel in charge and responsible for the upkeep of the building to insure that the care and maintenance instructions of the MFMA are followed.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative Chip System Epoxy floor coating system with a 3/16 inch thick body coat and decorative chip broadcast with integral cove base.

B. Surface preparation.

1.02 REFERENCES

A. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser; 2019.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

D. ASTM D3363 - Hardness Testing.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

B. Manufacturer's Installation Instruction: Indicate special procedures and perimeter conditions requiring special attention.

C. Manufacturer’s Safety Data Sheet (SDS) for each product being used.

D. Provide four (4) 3 inch x 3 inch samples of each color chosen demonstrating floor color, texture and thickness and a six inch long cove base sample of the approved product selection.

1.04 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of Ten (10) years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.

B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.

C. A pre-installation conference shall be held between Applicator, General Contractor, Architect and the Owner's Representative to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

D. Manufacturer of Approved System shall be single source and made in the USA.

E. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.

1.05 DELIVERY, STORAGE AND HANDLING

A. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

D. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Owner's Representative or other personnel working with or around the material.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature required by manufacturer three days prior to, during and 24 hours after installation of materials.

1.07 WARRANTY

A. Sherwin-Williams warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Sherwin-Williams published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

B. Sherwin-Williams' liability with respect to this warranty is strictly limited to the value of material purchase.

1.08 MAINTENANCE DATA

A. Submit maintenance data.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface and suggested schedule for cleaning.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hybri - Flex AC., seamless 3/16" decorative micro-chip epoxy flooring system by Sherwin-Williams High Performance Flooring. Phone: (866) 540-1299.

B. Manufacturer of Approved System shall be single source and made in the USA.

C. Architect approved equivalent.

2.02 MATERIALS

A. Topping: Poly-Crete SL.

1	Percent Solids	100%
2	VOC	0 g/L
3	Bond Strength to Concrete, ASTM D4541	400 psi, substrates fails
4	Compressive Strength, ASTM C 579	9,000 psi
5	Tensile Strength, ASTM D 638	2,175 psi
6	Flexural Strength, ASTM D 790	5,076 psi
7	Impact Resistance @ 125 mil, MIL D-3134, No visible damage or deterioration	160 inch lbs

B. Broadcast and Grout Floor Coating: 100% solids epoxy resin.

1	VOC	3.8 g/L
2	Compressive Strength, ASTM D 695	11,200 psi
3	Tensile Strength, ASTM D 638	2,100 psi
4	Flexural Strength, ASTM D 790	5,100 psi
5	Abrasion Resistance, ASTM D 4060 C-10 Wheel, 1,000 gm load, 1,000 cycles	29 mg loss
6	Flame Spread/NFPA-101, ASTM E 84	Class A
7	Impact Resistance, ASTM D2794	greater than 160
8	Water Absorption. ASTM D570	0.04%
9	Pot life @ 70 F	20 minutes

C. Topcoat - Accelera.

1	Percent Solids	100 %
2	VOC	0 g/L
3	Tensile Strength, ASTM D 638	2,600 psi
4	Compressive Strength, ASTM C-579	18,000 psi

5	Adhesion, ASTM 4541	Substrate Failure
6	Hardness, Shore D ASTM D 2240	70
7	Gloss ASTM D 523 60 Degree	90
8	Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	27 mg
9	Pot Life, 70 F, 50% RH	7 - 10 minutes

D. Aggregate: Acrylic color chips. Colors and Chip Sizes (Macro and Micro) to be selected by the Architect from the manufacturer's full color offering. Chip size shall be as selected by the Architect.

E. Primer: As recommended by floor covering manufacturer.

F. Patch Materials
   1. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze # 4 Cove-Rez.
   2. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete SL

G. Epoxy Cove Base
   1. 4" high, unless noted otherwise.
   2. Speed Cove™ Precast Cove Base systems or Architect approved equivalent.

2.03 ACCESSORIES

A. Primers and Fillers: Waterproof; types recommended by flooring manufacturer.

B. Expansion Joints/Joint Fillers: Types recommended by flooring manufacturer for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas and conditions with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Verify that surfaces are smooth and flat with maximum variation of 1/4 inch in 10 feet and are ready to receive work.

C. Verify concrete floors have cured a minimum of 28 days, are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization or dusting.

3.02 PREPARATION

A. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.

B. Moisture Testing: Perform tests recommended by manufacturer and as follows.
   1. Perform anhydrous calcium chloride test ASTM F1869. Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 20 lbs/1,000 sf/24 hrs.
   2. Perform relative humidity test using is situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
   3. If the relative humidity exceeds 75% then Dur-A-Flex, Inc Dur-A-Glaze MVP Primer moisture mitigation system must be installed prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.

C. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.

D. Mechanical surface preparation
   1. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings

hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-4as described by the International Concrete Repair Institute.

2. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
3. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
4. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.

E. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

F. Vacuum clean substrate.

G. Apply primer as per manufacturer's recommendations.

3.03 INSTALLATION FLOORING

A. Apply floor coating system in accordance with manufacturer's instructions. Form integral ¼ inch radius cove base four (4)inches high with same materials as floor coating. Apply four finish coats minimum and spread aggregate uniformly in accordance with the manufacturer's instructions.

B. The system shall be applied in four distinct steps as listed below:
   1. Substrate preparation
   2. Topping/overlay application with colored chip broadcast.
   3. Resin application with colored chip broadcast.
   4. Topcoat application.
      a. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
      b. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
      c. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
      d. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

C. Topping
   1. The topping shall be applied as a self-leveling system as specified by the Architect. the topping shall be applied in one lift with a nominal thickness of 1/8 inch.
   2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
   3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
   4. The topping shall be applied over horizontal surfaces using 1/2 inch "v" notched squeegee, trowels or other systems approved by the Manufacturer.
   5. Immediately upon placing, the topping shall be degassed with a loop roller.
   6. Colored chips shall be broadcast to excess into the wet material, Microchips at the rate of 0.15 lbs/sf.
   7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Broadcast Coat
   1. The 2nd broadcast coat shall be applied as specified by the Architect.

2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The broadcast coat shall be applied over horizontal surfaces using squeegee and back rolled at the rate of 100 sf/gal.
5. Colored chips shall be broadcast to excess into the wet material, Microchips at the rate of 0.15 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

E. Topcoat
1. The grout coat shall be comprised of ACCELERA resin and hardener mixed per the manufacturer's instructions.
2. The grout coat shall be applied using a squeegee and cross rolled with a 3/8 inch nap roller at the rate of 65 sq ft/kit.
3. Apply a second ACCELERA topcoat using a squeegee and cross roll with a 3/8 inch nap roller at the rate of 200 sq ft/kit (for smooth finish).
4. The finished floor will have a nominal thickness of 3/16 inch.

3.04 FIELD QUALITY CONTROL

A. Tests, Inspection
1. The following tests shall be conducted by the Applicator:
a. Temperature
1) Air, substrate temperatures and, if applicable, dew point.
b. Coverage Rates
1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.05 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Epoxy Matrix Wall Finish System

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: Provide data indicating matrix materials and physical and performance characteristics.

C. Samples: Submit two samples, 3 inches by 3 inches (76.2mm by 76.2mm) in size illustrating color of matrix, color of aggregate, and clear protective sealcoat.

D. Certificates: Manufacturer's certificate that products meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance and cleaning requirements for coatings, stain and graffiti removal, rejuvenation of top coat, repair and patching techniques.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016100 - BASIC PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Matrix Material: 1 gallon (4 liters) of each color specified.
   3. Extra Aggregate Material: 5 gallons (20 liters) of each type, size, and color specified.
   4. Label each container with manufacturer's name, product number, color number, and areas where used.

1.04 QUALITY ASSURANCE

A. Products Requiring Flame/Smoke Ratings: ASTM E84 and classified and listed by UL.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years of documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum ten (10) years of documented experience listing a minimum of five projects of similar scope accomplished in the last two years.
   2. Approved by manufacturer.

D. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1.05 MOCK-UP

A. Provide mock-up, 2 feet (0.61 m) long by 4 feet (1.22 m) height minimum or full height of wall, illustrating matrix and aggregate in selected colors.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install matrix materials when substrate and ambient temperature is below 50 degrees F (10 degrees C) or above 90 degrees F (32 degrees C) unless permitted otherwise in writing by the manufacturer

B. Substrate temperature must be at least 5 degrees F above the dew point.

C. Material shall not be applied in direct sunlight.

D. Maintain this temperature range, 24 hours before, during, and 48 hours after installation of work.

E. Provide temporary enclosures, heat, and ventilation in areas where work is being performed, to allow work to cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Aggregate Wall Surfacing:
   1. ResuWall Deco Flake by The Sherwin-Willams Company.
   2. Architect approved equivalent.
   3. Substitutions: See Section 016100 - BASIC PRODUCT REQUIREMENTS and Section 012500 - PRODUCT SUBSTITUTION REQUESTS.

2.02 MATERIALS

A. ResuWall Deco Flake
   1. Primer: Resuflor Aqua 3462 at 250-400 sq. ft. per gallon.
   2. Broadcast: 6750D/6755D to excess.
   3. Bonding Coat: Resuflor Aqua 3461 at 250-400 sq. ft. gallon.
   4. Second Broadcast: 6750D/6755D to excess.
   5. Grout Coat: Resuflor Aqua 3461 at 250-400 sq. ft. per gallon.
   6. Seal Coat: Resutile Aqua 4410 at 300-450 sq. ft. per gallon.

B. VOC Content of Resinous Wall and Ceiling Coating: Provide resinous wall and ceiling systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
   1. Resinous Flooring: 100 g/L.

2.03 HIGH-PERFORMANCE RESINOUS WALL AND CEILING COATING SYSTEM

A. Resinous Wall and Ceiling Coating: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor.

B. System Characteristics:
   1. Slip Resistance: Provide smooth, orange peel finish unless otherwise specified.
   2. Color and Pattern: As selected by the Architect form the manufacturers full offering of colors and patterns.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work of this section, as instructed by the coating manufacturer. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces. Test and report for moisture level in substrate to verify compliance with manufacturer’s requirements. Do not proceed unless acceptable test results are achieved.

B. Only installers approved in writing by the manufacturer shall perform installation of the approved material as specified in this section.

C. Verify maximum variation from flat surface of substrate is 1/8 inch (3 mm).

3.02 PREPARATION

A. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces. Clean surfaces of loose foreign matter.

B. Protect adjacent construction from damage and deterioration due to this work.

C. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:

1. CONCRETE SURFACE PROFILE (CSP)
    a. Thin film, to 10 mils CSP-1 to CSP-3
    b. Thin and medium films, 10 to 40 mils CSP-3 to CSP-5
    c. Self-leveling mortars, to 3/16” CSP-4 to CSP-6
    d. Mortars and laminates, to 1/4” or more CSP-5 to CSP-10

D. Surfaces to receive the bonded polymer system shall be inspected by a manufacturers representative after the surface has been prepared to insure that the substrate is sound and structurally durable. Areas found that do not meet the required surface conditions shall be removed and replaced or re-prepared until acceptable conditions are provided. Do not proceed with the wall system application until surface preparation is found acceptable to the manufacturers representative.

E. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Moisture Testing: Perform tests indicated below.
    a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours. Perform tests so that each test area does not exceed 1000 sq. ft. and perform 3 tests for the first 1000 sq. ft. and one additional test for every additional 1000 sq ft.
    b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.

F. Surfaces shall be cleaned and vacuumed to provide a clean and dust-free surface.

G. Mask and protect adjacent surfaces and materials not receiving surfacing from material installation; repair all staining or damage to restore original conditions.

H. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through wall system according to manufacturer's written instructions.

3.03 ENVIRONMENTAL CONDITIONS

A. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers’ installation instructions shall be implicitly instructions shall be implicitly followed.

B. Repair damaged and deteriorated concrete according to resinous wall and ceiling manufacturer's written instructions.

C. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

D. Resinous Materials: Mix components and prepare materials according to resinous wall and ceiling manufacturer's written instructions.

E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous wall and ceiling according to manufacturer's written instructions.

3.04 APPLICATIONS

A. Install resinous wall and ceiling coating system over properly prepared concrete surface in strict accordance with the manufacturer's directions.
   1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.
   2. Install topcoat over wall and ceiling coating system after excess aggregate or sand dust has been removed.
   3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying wall and ceiling coatings, or as instructed by manufacturer.

B. Apply components of resinous wall and ceiling system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous wall and ceiling system to substrate, and optimum intercoat adhesion.
   2. Cure resinous wall and ceiling components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, comply with resinous wall and ceiling manufacturer's written instructions.

C. Sealant: Saw cut resinous wall and ceiling topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer’s written recommendations.

D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

E. Sand between coats and remove sand dust prior to next coat.

F. Apply topcoats in number indicated for wall and ceiling system and at spreading rates recommended in writing by manufacturer.

3.05 INSTALLATION

A. Consult SDS sheets prior to use of these materials and follow all safety guidelines during the handling, installation and curing operations.

B. Install resinous wall and ceiling coating system over properly prepared concrete surface in strict accordance with the manufacturer's directions.
   1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.
   2. Install topcoat over wall and ceiling coating system after excess aggregate or sand dust has been removed.
   3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying wall and ceiling coatings, or as instructed by manufacturer.

C. Apply components of resinous wall and ceiling system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous wall and ceiling system to substrate, and optimum intercoat adhesion.

2. Cure resinous wall and ceiling components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, comply with resinous wall and ceiling manufacturer's written instructions.

D. Wall Surfacing: Mix components, prepare and apply primer, bondcoats with matrix, grout coat and sealcoat in strict accordance with manufacturer's instructions.

E. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

F. Sand between coats and remove sand dust prior to next coat.

G. Apply topcoats in number indicated for wall and ceiling system and at spreading rates recommended in writing by manufacturer.

H. Sealant: Saw cut resinous wall and ceiling topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.

I. Allow materials to cure 48 hours before exposure to water and a full seven days to achieve full chemical resistance.

J. Wash any developed surface films with soap and water as recommended by the manufacturer.

3.06 CLEANING

A. Clean surfaces of overspray, splatter, excess material, and staining of adjacent surfaces.

B. Consult manufacturers specifications for cleaning mixing and application equipment being mindful to observe all fire and health precautions when handling cleaning solvents.

C. Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all spattering and drippings, and all resulting stains.

3.07 PROTECTION

A. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber reinforced plastic panels.

B. Glass fiber reinforced plastic ceiling suspension system.

C. Trim.

1.02 REFERENCE STANDARDS

A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

C. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2025.

D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

E. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

G. FM 4880 - Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials; 2017.

H. ISO 846 - Plastics - Evaluation of the Action of Microorganisms; 2019.

I. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water; 2017.

1.03 SUBMITTALS

A. See Section 013300 - SUBMITTALS, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 3 by 3 inch (76 by 76 mm) in size illustrating material and surface design of panels.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016100 - FIBER CEMENT SIDING (HARDIE), for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fiber Reinforced Plastic Panels:
   1. Marlite: Standard FRP www.marlite.com.
   2. Nudo; FiberLite FRP Wall Panels: www.nudo.com.
   3. Or approved equal.

B. Glass Fiber Reinforced Plastic Ceiling Suspension System:

2.02 PANEL SYSTEMS

A. Wall Panels:

1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
2. Panel Thickness: 0.09 inch (2.3 mm).
3. Surface Design: Embossed
4. Color: As selected by Architect.
5. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.
6. Trim Material: Extruded Aluminum Designer Trim in color as selected by the Architect.

B. Ceiling:
1. Panel Size: 23-3/4 by 23-3/4 inch (603 by 603 mm).
2. Panel Thickness: 0.09 inch (2.3 mm).
3. Surface Design: Embossed.
4. Color: White.
5. Suspension System: Glass fiber reinforced plastic (FRP) grid.

2.03 MATERIALS

A. Panels: Glass fiber reinforced plastic (FRP), complying with ASTM D5319.
1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
2. Class 1 fire rated when tested in accordance with FM 4880.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
4. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
5. Impact Strength: Greater than 6 ft lb force per inch (320 J per m), when tested in accordance with ASTM D256.
6. Sanitation and Cleanability: Comply with 9 CFR 416.2.
7. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
8. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

B. Ceiling Suspension System: Glass fiber reinforced plastic (FRP) lay-in grid.
1. Profile: Tee; 1-3/8 inch (35 mm) or 1-1/2 inch (38 mm) wide face.
2. Support Channels and Hangers: Galvanized or stainless steel, size and type to suit application.
3. Plastic hold-down clips.

C. Trim: Vinyl; color coordinating with panel.

D. Fasteners: Nylon rivets.

E. Adhesive: Type recommended by panel manufacturer.

F. Sealant: ; color matching panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness, plumb, smoothness, uniformity and other conditions which could affect proper panel installation prior to starting work.

B. Verify that substrate conditions have been are corrected and are ready to receive the work of this section.

C. Verify that layout of hangers will not interfere with other work; make adjustments in layout as necessary.

D. Do not begin ceiling installation until services above ceiling are complete except for final trim

3.02 INSTALLATION - WALLS

A. Remove packaging and allow panels to acclimate to room temperature and humidity for a minimum of 48 hours.

B. Install panels in accordance with manufacturer's instructions.

C. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

D. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener, spaced as indicated by panel manufacturer.

E. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

F. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

G. Install panels with manufacturer's recommended gap for panel field and corner joints.

H. Drive fasteners to provide snug fit, and do not over-tighten.

I. Place trim on panel before fastening edges, as required.

J. Fill channels in trim with sealant before attaching to panel.

K. Install trim with adhesive and screws or nails, as required.

L. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

M. Remove excess sealant after paneling is installed and prior to curing.

3.03 INSTALLATION - CEILINGS

A. Install suspension system in accordance with manufacturer's instructions.

B. Space hangers not more than 48 inches (1220 mm) on center.

C. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance

E. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently. Do not eccentrically load system or induce rotation of runners.

F. Install ceiling panels using hold down clips.

3.04 CLEANING

A. Clean panel surfaces in compliance with manufacturer’s recommendations.
   1. Use a clean, damp, nonabrasive cotton cloth and a mild liquid detergent or household cleaner.
   2. Rinse with clean water using a clean, nonabrasive cotton cloth.
   3. Dry panels with a soft, clean nonabrasive cotton cloth.
   4. Do not use cleaners containing acid, alkali or sodium hypochlorite.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.
   1. Concrete.
   2. Concrete Masonry Units.
   3. Steel.
   4. Galvanized metal.
   5. Gypsum board.
   6. Wood.
   7. Aluminum.

1.03 DEFINITIONS

A. Flat: Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Matte: Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Eggshell: Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. Satin: Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. Semi-Gloss: Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. Gloss: Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. High Gloss: Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.
   1. Product List: For each product indicated, include the following:
   2. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   3. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
   4. VOC content.

1.05 CLOSEOUT SUBMITTALS

A. Coating Maintenance manual: Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

B. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.07 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer’s label with the following information:
   1. Product name and type (description).
   2. Batch date.
   3. Color number.
   4. VOC content.
   5. Environmental handling requirements.
   6. Surface preparation requirements.
   7. Application instructions.

1.09 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work. If Lead paint is encountered, refer to OSHA "Lead In Construction Standard". Additional regulations may apply if the project is considered EPA defined Target Housing or Child Occupied Facility.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company.

2.02 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anti-corrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Colors: As selected by Architect from manufacturer's full range.
1. 30 percent of surface area will be painted with deep tones.

2.03 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.
1. Benjamin Moore - Super Spec - Int/Ext High-Build Block Filler - 206/K206 (75-100 sq. ft. / gal - 4.2 mdf per coat), VOC 55 g/l, CHPS (E3)
2. Sherwin-Williams - PrepRite Int/Ext Block Filler, B25W25, at 75-125 sq. ft. per gal. (E3)
3. Or approved equal.

2.04 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.
1. Benjamin Moore - Ultra Spec 500 Latex Primer N534 (0 g/l), 50 X-Green (E3)
2. Sherwin-Williams - Pro Mar 200 Zero - Interior Latex Primer - B28W02600/B28WQ2600 (E3)
3. PPG - Speedhide Interior Latex - Quick-Drying #6-2 (E3)

B. Primer Sealer MPI #60.
1. Benjamin-Moore - (E3) Insul-X Tough Shield Floor and Patio TS-3 (<200 g/l)
2. Sherwin-Williams - Protective & Marine - Armorseal Tread-Plex - B90W111 (E3)
3. Or approved equal.

C. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.
1. Benjamin Moore - Ultra Spec 500 Latex Primer N534 +(0 g/l), MPI 149 X-Green (E3)
2. Sherwin-Williams - ProMar 200 Zero - Interior Latex Primer - B28W02600/B28WQ2600 (E3)
3. PPG - Speehide Zero Interior Zero VOC - #6-4900XI -(E3)

D. Primer, Latex, for Interior Wood: MPI #39.
1. Benjamin Moore - Fresh Start N023 Primer, CHPS Certified (E3)

2. Sherwin-Williams - PrepRite ProBlock Primer Sealer - B51-620 Series, at 4.0 mils wet, 1.4 mils dry. (E3)
3. Or approved equal.

E. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.
1. Benjamin Moore - Super Spec Alkyd Metal Primer P06, 1.9 mdf, VOC - 313 (E2)
2. Sherwin-Williams - Protective & Marine - Kem Bond HS - B50WZ4 (E2)
3. Rustoleum - High Performance - 7400 System - #2082402 (E2)
4. Or approved equal

F. Primer, Alkyd, Quick Dry, for Metal: MPI #76.
1. Benjamin Moore -Corotech Universal Metal Primer V131, 2.1 mdf, 333 g/l.
2. Sherwin-Williams - Protective & Marine - Kem Bond HS Universal Alkyd Primer - B50WZ0004 (E3)
3. Or approved equal.

G. Primer, Galvanized, Water Based: MPI #134.
1. Benjamin Moore Super Spec HP Acrylic Metal Primer P04/KP04.
2. Sherwin Williams - Pro Industrial - Pro-Cryl Universal Primer - B66W310 (E2)
3. Or approved equal.

2.05 WATER-BASED PAINTS

A. Latex, Interior, Flat, (Gloss Level 1): MPI #53.
1. Benjamin Moore - Eco Spec WB Interior Latex Flat Finish N373/F373 (E3)
2. Sherwin-Williams - Solo - Interior/Exterior 100% Acrylic Flat - A74W00051 (E3)
3. PPG - Speedhide - Interior Flat Latex - #6-70 (E3).
4. Or approved equal.

B. Latex, Interior, (Gloss Level 4): MPI #43 (Pearl / Satin / Low Lustre)
1. Benjamin Moore - Ultra Spec 500 Latex Semi Gloss N539 (0 g/l), 43 X-Green (E3).
2. Sherwin-Williams - ProMar 200 Zero VOC - Interior Latex Semi-Gloss, B31-2600 Series - (E3).
3. Or approved equal.

C. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.
1. Benjamin Moore - Ultra Spec 500 Latex Eggshell N538 (0 g/l), MPI #143 X-Green, CHPS Certified (E3).
2. Sherwin-Williams - Harmony - Interior Acrylic Latex Flat - B05W01051 (E3)
3. Or approved Equal.

D. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145
1. Benjamin Moore - Ultra Spec500 Latex Eggshell N538 (0 g/l), MPI # 145 X-Green, CHPS Certified (E3).
2. Sherwin Williams Promar 200 Zero VOC - Interior Latex Flat - #B30WO2651/B30WQ2651 (E3).
3. PPG Speedhide Zero - Interior Zero VOC Latex Flat - #6-4110XI (E3).

E. Latex, Interior, High Performance Architectural, (Gloss Level 2): MPI #138.
1. Benjamin Moore Regal Select Waterborne Interior Paint - Eggshell Finish 549, 1.5 mdf, (0 g/l), MPI #138 X-Green, CHPS Certified.
2. Sherwin-Williams - SuperPaint - Interior Latex Satin - A87W001151/A87WQ1151 (E3)
3. Or approved equal.

2.06 SOLVENT-BASED PAINTS

A. Epoxy Primer MPI #212
1. Sherwin-Williams - Protective & Marine - ArmorSeal 33 Epoxy Primer - B58AQ33/B60VQ33 (E3)

2. Or approved Equal

B. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81.
   1. Corotech Alkyd Enamel Semi-Gloss V231, 2.0 - 2.5 mdf, 389 g/l.
   2. Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
   1. Report in writing conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:
   1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      a. Concrete: 12 percent.
      b. Masonry (Clay and CMU): 12 percent.
      c. Wood: 15 percent.
      d. Gypsum Board: 12 percent.
   2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
   1. Concrete Floors: Remove oil, dust, grease, dirt and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
   1. SSPC-SP 3, "Power Tool Cleaning."

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop primed surfaces.

H. Galvanized Metal Surfaces: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
1. Scrape and clean knots and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt and other foreign material that might impair the bond of paints to substrates.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Unless otherwise specified or noted, paint all “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and texture to match adjacent surfaces, in the following areas:
a. where exposed-to-view in all exterior and interior areas.
b. in all interior high humidity interior areas.
c. in all boiler room, mechanical and electrical rooms.
2. In unfinished areas leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

3. Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
4. Do not paint over nameplates.
5. Paint the inside of all ductwork where visible behind louvers, grilles and diffusers for a minimum of 460 mm (18”) or beyond sight line, whichever is greater, with primer and one coat of matt black (non-reflecting) paint.
6. Paint the inside of light valances gloss white.
7. Paint disconnect switches for fire alarm system and exit light systems in red enamel.
8. Paint red or band all fire protection piping and sprinkler lines in accordance with mechanical specification requirements and the AHJ. Keep sprinkler heads free of paint.
9. Paint yellow or band all natural gas piping in accordance with mechanical specification requirements and the AHJ.
10. Backprime and paint face and edges of plywood service panels for telephone and electrical equipment before installation to match adjacent wall surface. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
    a. Uninsulated plastic piping.
    b. Pipe hangers and supports.
    c. Metal conduit.
    d. Plastic conduit.
    e. Tanks that do not have factory-applied final finishes.
    f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material. Coordinate the installation of required piping labels with the installing contractor in order to schedule painting prior to application of labels.
11. Paint the following work where exposed in occupied spaces:
    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    h. Other items as directed by Architect.
12. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
    1. Contractor shall touch up and restore painted surfaces damaged by testing.
    2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 PROTECTION

A. Protect all exterior surfaces and areas, including landscaping, walks, drives, all adjacent building surfaces (including glass, aluminum surfaces, etc.) and equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

B. Protect all interior surfaces and areas, including glass, aluminum surfaces, etc. and equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

C. Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.06 CLEANING

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site. Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.07 INTERIOR PAINTING SCHEDULE

A. Concrete and Clay Masonry Substrates, Non-traffic Surfaces:
   1. Institutional Low-Odor/VOC Latex System: (MPI INT 3.1M).
      a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149. Benjamin Moore - Ultra Spec 500 Latex Premier N534 (0 g/l), MPI #50 X-Green (E3)
      b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat
      c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145 X-Green. Benjamin Moore - Ultra spec 500 Latex Egg shell, N 538 (0 g/l).

B. Concrete Substrates, Traffic Surfaces:
   1. Latex Floor Enamel System: (MPI INT 3.2A)
      a. Prime Coat: Floor paint, latex, slip-resistant, matching topcoat.
      b. Topcoat: Floor paint, latex slip-resistant, low gloss (maximum Gloss Level 3), MPI #60: Benjamin Moore - Insl-X Tough Shield Floor and Patio TS-3 (<200 g/l).
   2. Clear Acrylic System, Gloss Finish: (MPI INT 3.2F)
      a. First Coat: MPI #99 - Sherwin -Williams - H&C Concrete Sealer Wet Look Water Base, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
      b. Second Coat: MPI #99 - Sherwin-Williams - H&C Concrete Sealer Wet Look Water Base, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
   3. Concrete Stain System (Water-based): (MPI INT 3.2E)
      a. First Coat: Benjamin Moore - Insl-X Tuffcrete Waterborne Acrylic Concrete Stain CST-2xxx, 450-500 sq. ft. / gal., 153 g/l, MPI #58.
      b. Second coat: Benjamin Moore - Insl-X Tuffcrete Waterborne Acrylic Concrete Stain CST-2xxx, 450-500 sq. ft. / gal., 153 g/l, MPI #58.
   4. Concrete Substrates, Non-Slip - High Performance Traffic Surfaces: (MPI INT 3.2L)
      a. Pigmented Polyurethane over Epoxy Slip-Resistant Deck Coating System:
         1) Prime Coat: Epoxy, gloss , (Gloss Level 6), MPI #212: S-W Armorseal 1000 HS, B67W2001 Series, at 2.5 to 4.0 mils dry, per coat.
         2) Intermediate: Polyurethane, gloss matching topcoat.
         3) Topcoat: Polyurethane, two-component, pigmented, gloss, (Gloss Level 6), MPI #212: S-W Armorseal HS Polyurethane, B65W220 Series, at 2.0 to 3.0 mils dry, per coat, with manufacturer's recommended slip-resistant aggregate.

C. CMU Substrates
   1. High-Performance Epoxy Paint System: (MPI INT 4.2G)

a. Block Filler: Block filler, epoxy, MPI #116: S-W Kem Cati-Coat HS Epoxy Filler/Sealer, at 10 to 20 mils dry, per coat.
b. Intermediate Coat: Epoxy, high-build, low gloss, MPI #108: S-W Macropoxy 646 Fast Cure Epoxy, B58 Series, at 5 to 10 mils dry, per coat.
c. Topcoat: Polyurethane, two-component, pigmented, semi-gloss, (Gloss Level 5), MPI #72: S-W Acrolon 218 HS Acrylic Polyurethane, B65-650 Series, at 3.0 to 6.0 mils dry, per coat.

2. Water-Based Light Industrial Coating System: (MPI INT 4.2K)
   a. Block Filler: Benjamin Moore Super Spec Masonry Int/Ext High Build Block Filler 206, 75-100 sq. ft. /gal., 8.5-11.4 mdf, 45 g/l, MPI#4, CHPS Certified.
   b. Intermediate Coat: Light industrial coating, interior, water-based, matching Topcoat.
   c. Topcoat: Light Industrial coating, interior, water-based, eggshell, (Gloss Level 5), MPI #153 X-Green: Benjamin Moore Ultra Spec HP DTM Acrylic Enamel Semi-Gloss HP29, 2.3 mdf, VOC-45.
3. Latex System: (MPI INT 4.2A)
   a. Block Filler: Latex Block Filler, MPI #4 X-Green: Benjamin Moore Super spec Masonry Int/Ext High Build Block Filler 206, 75-100 sq. ft. / gal., 8.5-11.4 mdf
   b. Intermediate coat: Latex interior, matching topcoat.
   c. Topcoat: Latex, interior flat (Gloss Level 2), MPI #44 X-Green / #144 X-Green: Benjamin Moore - Ultra Spec 500 Interior Low Sheen Finish N537, 1.8 mdf, (0 g/l), CHPS Certified.

D. Metal Substrates:
1. Latex System: (MPI INT 5.1Q)
   a. Prime Coat: Primer, rust-inhibitive, water-based, MPI #107: Benjamin Moore Super Spec Acrylic Metal Primer P04, 2.0 mdf, VOC-47, CHPS Certified.
   b. Intermediate Coat: Water-based acrylic interior, matching Topcoat.
   c. Topcoat: Water based acrylic, gloss (Gloss Level 5), MPI #147 X-Green: Benjamin Moore Ultra Spec 500 Interior Gloss finish N540, 1.8 mdf, (0 g/l), CHPS Certified.
2. Water-Based Dry-Fall System: (MPI INT 5.1C)
   a. Two Top Coats: Dry-fall latex, flat, MPI #118: Benjamin Moore - Coronado Super Kote Flat Latex dry Fall N110, 1.1-1.7 mdf, 375-475 sq. ft. / gal., (46 g/l), CHPS Certified.
3. Pigmented Polyurethane over Epoxy System: (MPI INT 5.1H)
   a. Prime Coat: Epoxy, high-build, low gloss, MPI #108: Benjamin Moore - Corotech Polyamide Epoxy Semi-Gloss Coating V400, 2.5-3.0 mdf, (326 g/l).
   b. Intermediate Coat: Polyurethane, two-component, pigmented, matching topcoat.
   c. Topcoat: Polyurethane, two-component, pigmented, semi-gloss, (Gloss Level 5), MPI #72: Benjamin Moore - Corotech, Alphatic Acrylic Urethane Gloss, V500, 2.5-3.6 mdf, (229 g/l).
4. Epoxy-Modified Latex System: (MPI INT 5.1K)
   a. Prime Coat: Primer, rust-inhibitive, water based, MPI #107: Benjamin Moore - Corotech Acrylic Metal Primer, V110.
   b. Intermediate Coat: Epoxy-modified latex, interior, gloss matching topcoat.
   c. Topcoat: Epoxy-modified latex, interior, gloss, (Gloss Level 6), MPI #115: Benjamin Moore - Corotech, Acrylic Epoxy Gloss, V450-90, 1.5 - 2.0 mdf, (168 g/l),
5. Acrylic/Alkyd System:
   a. Prime Coat, MPI #107: Benjamin Moore - Corotech Acrylic Metal Primer, V110,
   b. Intermediate Coat: Water-based acrylic-alkyd, interior, matching topcoat.
   c. Topcoat: Water-based acrylic-alkyd, semi-gloss, interior: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss N793, CHPS Certified.

E. Galvanized-Metal Substrates:
1. Pigmented Polyurethane System: (MPI INT 5.4C)

a. Prime Coat, MPI #105: Benjamin Moore - Corotech Acrylic Metal Primer V110, 1.5 - 2.0 mdf, (VOC ,<200)
b. Intermediate Coat: Polyurethane, two-component, pigmented, matching topcoat.
c. Topcoat: Polyurethane, two-component, pigmented, gloss, MPI #105: Benjamin Moore - Corotech Urethane Waterborne Urethane Gloss, V540, 470-530 sq. ft. / gal., 1.6-1.8 mdf, (19 g/l).

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:
1. Pigmented Polyurethane System:
a. Prime Coat: Primer, vinyl wash: Benjamin Moore - Corotech Waterborne Bonding Primer, V175, 1.6 mdf, (84 g/l).
b. Intermediate Coat: Polyurethane, two-component, pigmented, matching topcoat.
c. Topcoat: Polyurethane, two-component, pigmented, gloss: Benjamin Moore - Corotech Waterborne Urethane Gloss, V540, 470-530 sq. ft. / gal., (19 g/l).

G. Wood Substrates:
1. Water-Based Light Industrial Coating System:
a. Prime Coat: Primer sealer, latex, interior, MPI #39: Benjamin Moore - Fresh Start N023 Primer, 1.2 mdf, (44 g/l)(E3)
b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
c. Topcoat: Light industrial coating, interior, water based, eggshell, (Gloss Level 3), MPI #151: Benjamin Moore - Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, V342, 1.5-2.0 mdf, (VOC- 72). (E1)

H. Gypsum Board Substrates:
1. Latex System: (INT 9.2A)
a. Prime Coat: Primer, latex, interior, MPI #149 X-Green: Benjamin Moore - Ultra Spec 500 Latex Primer, N534 (0 g/l),
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat (Gloss Level 1), MPI #53 X-Green/#143 X-Green: Benjamin Moore - Ultra Spec 500 Latex Flat N536, (0 g/l), CHPS Certified.
2. Institutional Low-Odor/VOC Latex System: (MPI INT 9.2M)
a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149 X- Green. Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143: Benjamin Moore - Ultra-Spec 500 Latex Flat, N536, (0 g/l), CHPS Certified.
3. High-Performance Architectural Latex System: (INT 9.2B)
a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green. Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l),
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 3), MPI #139: Benjamin Moore Ultra spec 500 Latex Eggshell, N538, (0 g/l), CHPS certified.
4. Water-Based Light Industrial Coating System:
a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green: Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
c. Topcoat: Light industrial coating, interior, water based, eggshell, (Gloss Level 3), MPI #151: Benjamin Moore - Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, v342, 1.5- 2.0 mdf, (VOC-72).
5. Epoxy-Modified Latex System: (MPI INT 9.2F)
a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green:Benjamin Moore - Ultra Spec 500 Latex Primer, N534, (0 g/l).
b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.

c. Topcoat: Epoxy-modified latex, interior, eggshell, (Gloss Level 3), MPI #115: Benjamin Moore - Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, V342, 1.5 - 2.0 mdf, (VOC-72).

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Solid-polymer toilet compartments configured as toilet compartment enclosures and urinal screens.
   2. Partition Style:
      a. Floor Anchored / Overhead Braced.

1.03 REFERENCES

A. ASTM A351/A351M - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts; 2024, with Editorial Revision (2025).

B. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ICC A117.1-2009 - Accessible and Usable Buildings and Facilities; 2009.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2019.

F. All work of this section shall conform to industry standards and/or manufacturer’s recommendations.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

D. Manufacturer's Warranty: Manufacturer's standard 15 -year limited warranty for panels, doors and stiles against breakage, corrosion, delamination and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

C. Material Fire Ratings:
   1. National Fire Protection Association - NFPA 286: Pass.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC A117.1 for toilet compartments designated as accessible.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.09 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials:
   1. Panels and pilasters shall be 1" thick solid HDPE resin; water resistant; non-absorbent; self-lubricating surface; covered with protective masking. Color and material - homogeneous throughout.
   2. Fire Rating:
      a. Fire-resistance Rating: NFPA 286.
   3. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.
   4. Stainless Steel Castings: ASTM A351/A351M, Type 304.
   5. Edges: Radius.

2.02 SOLID-POLYMER UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Scranton Products.
   2. Approved Equivalent

B. Toilet Enclosure Style: Floor Anchored/Overhead Braced.

C. Entrance-Screen Style: Floor Anchored/Overhead Braced.

D. Urinal-Screen Style: Wall Hung. Urinal Screen size(s) shall be as indicated on the drawings.

E. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE)or panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, <>, and with homogenous color and pattern throughout thickness of material.
   1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
   2. Color, Texture and Patterns: Colors, Textures and Patterns in each room as selected by Architect from manufacturer's full range.

F. Pilaster Shoes and Sleeves (Caps):
   1. Three Inch high manufacturer's standard design; 18 gauge, Type 304 stainless steel secured to pilaster with stainless steel tamper-resistant Torx head sex bolt.
   2. Three inch high manufacturer's standard design Polymer Color and Pattern: Matching or Contrasting with pilaster, as selected by Architect from manufacturer's full range.

G. Urinal-Screen Post: Manufacturer's standard 1 3/4inch heavy-duty aluminum post with chrome-plated escutcheons and caps.

H. Brackets (Fittings):
   1. Full-Height (Continuous) U-Type
      a. Extruded heavy-duty aluminum 6463-T5 alloy as indicated on the drawings.
      b. Stainless steel, Type 304 as indicated on the drawings.
   2. The brackets are fastened to the pilaster with stainless steel tamper resistant Torx head screws and fastened to the panels with stainless steel tamper resistant Torx head sex bolts.

I. Door Hardware:
   1. Wrap-Around Hinges: Hinges shall be 8 inches (203 mm) and fabricated from heavy-duty extruded aluminum wrap-around hinges through-bolted to pilasters and doors with stainless steel tamper resistant Torx head sex bolts. Hinges operate with field adjustable nylon cams. Cams can be field set in 30, 60 or 90-degree increments.
   2. Latches:
      a. Aluminum Slide Bolt Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing shall have a bright dip anodized finish, and the slide bolt and button shall have a black anodized finish.
      b. Stainless Steel Slide Bolt Latch and housing shall be made of heavy-duty stainless steel type 304. The latch housing shall have a bright finish, and the slide bolt and button shall have a black anodized finish.
      c. Provide occupancy indicator.
   3. Door strike/keeper shall be made of heavy-duty extruded aluminum (6436-T5 alloy) with a bright dip anodized finish and secured to the pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper shall be made of extruded black vinyl.
      a. Style: 3 inches (76 mm) stainless steel emergency access.
   4. Each door shall be supplied with one coat hook/bumper and door pull made of chrome plated Zamac.
   5. Equip outswing handicapped doors with second door pull and door stop.
   6. Emergency access required by lifting door upwards and allowing latch to disengage.

2.03 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   1. Material: Clear anodized aluminum.
   2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees. Note: Door hardware shall enable emergency access form the exterior of the toilet stall unit for emergency access purposes.
   3. Latch and Keeper: Manufacturer's standard latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
   4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
   5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.
   6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, heavy-duty extruded aluminum (6463-T5 alloy) head rail with anti-grip profile and in manufacturer's standard finish shall be fastened to the headrail bracket by a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
   1. Headrail brackets shall be heavy-duty extruded aluminum with a satin finish and secured to the wall with a stainless steel tamper resistant Torx head screws.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.04 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch (610-mm) wide, in-swinging doors for standard toilet compartments and 36-inch (914-mm) wide, out-swinging doors with a minimum 32-inch (813-mm) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.02 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 3/8 inch (9.5 mm).
      b. Panels and Walls: 1 inch (25 mm).
   2. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
   3. Finished surfaces shall be cleaned after installation and be left free of imperfections.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors in closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Replace all damaged products including adjacent finish surfaces before Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Washroom accessories.
   2. Miscellaneous Bathroom Accessories
   3. Underlavatory guards.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty requirements listed under this section.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals. Manufacturer's service and parts manual shall be provided to the owner upon completion of project.

B. All keyed toilet accessories shall be keyed alike. Six keys shall be provided to the Owner.

1.06 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts, and anchoring devices set into back-up construction as required to prevent delaying the Work.

1.07 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: five (5) years from date of Substantial Completion for Toilet Accessories and Hand Dryer units. Mirror reflective surfaces shall be warranted for a period of fifteen (15) years against silver spoilage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A666/A666M, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated. 65-70% post-recycled content.

B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Mirrors: ASTM C1048, Tempered Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.02 WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Bradley Corporation
   2. Approved Equivalent

B. Toilet Tissue (Roll) Dispensers:
   1. Basis-of-Design Product: Bradley Model 5402 - Surface Mounted.

C. Towel Dispenser :
   1. Basis-of-Design Product: Bradley Model 250-15 - Surface Mounted.

D. Liquid-Soap Dispensers:
   1. Basis-of-Design Product: Bradley Model 6A01-11 - Surface Mounted Foam

E. Grab Bars:
   1. Basis-of-Design Product: Bobrick Model B-6806-Series.
      a. Mounting: Flanges with concealed vandal resistant fasteners.
      b. Material: 18-8, Type 304, 18 gauge stainless steel, 0.05 inch thick.
      c. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant, satin-finish texture in grip area.
      d. Outside Diameter: 1-1/2 inches (38 mm).
      e. Configurations and Lengths: As indicated on Drawings. Bar ends are heliarc welded to concealed mounting flanges shall be 1/8 inch thick 18-8 Type 304, 11 gauge stainless steel plate, 2 inches x 3-1/8 inches, and equipped with two screw holes for attachment to wall. Intermediate Flanges are 18-8, Type 304, 22 gauge, 2 5/8 inches x 3 1/8 inches wide by 3 1/8 inches in diameter. Flange covers shall be 22 gauge, 3-1/4 inches diameter x 1/2 inch deep drawn stainless steel with satin finish, and shall snap over mounting flange to conceal mounting screws and/or WingIt (TM) fasteners as required by wall construction. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Clearance between the grab bar and wall shall be 1-1/2 inches.
      f. Grab bars shall comply with barrier-free accessibility guidelines (including ADAAG and ICC A117.1) for structural strength and configurations.

F. Mirror Units:
   1. Basis-of-Design Product: Bradley Model 781-1830

G. Tilt Mirror Units :
   1. Basis-of-Design Product: Bradley Model 740-018300

2.03 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Truebro by IPS Corporation.
   2. Or Architect approved equivalent.

B. Underlavatory Guards Supplied by Plumbing Contractor - Installed by General Contractor):<>
   1. Basis-of-Design Product: TrueBro Lav-Shield.
      a. Description: Durable single piece enclosure conceals piping and valves under the lavatory, preventing direct contact with and burns from piping. Removable to allow service access.

b. Material and Finish: Antimicrobial, molded plastic, white.

2.04 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to the Owner's Construction Representative with a transmittal copy to the Architect.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.02 TOLERANCES

A. Maximum Variation from Position: 1/8 inch (3 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm) over length of unit.

C. Maximum Variation from Plumb: 1/16 inch (1.5 mm) over height of unit.

3.03 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to Work of this Section.

1.02 SECTION INCLUDES

A. Design, fabrication, finishing, and delivery of pre-engineered, factory, fabricated site shelter.

B. Pre-manufactured Steel Exterior Shelters.

1.03 REFERENCES

A. AISC - American Institute of Steel Construction Manual of Steel Construction.

B. ASTM - American Society for Testing and Materials.
   1. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated.
   2. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   3. ASTM A563 - Standard Specification for Carbons and Alloy Steel Nuts.
   4. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
   5. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

C. AWS - American Welding Society.

D. OSHA – Occupational Safety and Health Administration Steel Erection Standard 29 CFR 1926 Subpart R-Steel Erection.

E. PCI - Powder Coating Institute.

F. SSPC - Steel Structures Painting Council.
   1. SSPC-SP10 - Near-White Blast Cleaning.

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures.

B. Submit pursuant to Section 016000 - Product Requirements.

C. Submit drawings and calculations signed and sealed by a Professional Engineer licensed in the State of New York.
   1. Calculation submittal shall include:
      a. References to building codes and design manuals used for calculations.
      b. Identification of lateral force resisting system.
      c. Formulas used for determining snow, wind, and seismic loads to specific project location.
      d. Three dimensional modeling input, model geometry, and analysis results.
      e. Member design results and controlling load combinations.
      f. Connection design for structural bolts, welds, plate thicknesses, and anchorage to the foundation.
      g. Foundation designs must include the required combinations of gravity and lateral loads.

D. Shelter structure shall be designed in accordance with the Building Code of the State of New York with the following design parameters:
   1. See Contract Drawings for structural design criteria including but not limited to ground snow load, basic wind speed and seismic design.

E. Drawing submissions shall include:
   1. Anchor bolt layout.
   2. Foundation design.
   3. Three dimensional views of frame.

4. Member sizes and locations.
5. Structural connection details, including bolt sizes and plate thicknesses.
6. Roof trim and connection details.

1.05 QUALITY ASSURANCE

A. Manufacturer shall meet the following requirements:
1. Minimum of 10 years in the shelter construction industry.
2. Full time on-staff Quality Assurance Manager.
3. All welders AWS Certified.
4. Annual audit of Quality System by Third Party Agency.
5. Annual audit of powder coat finish system by Third Party Agency (PCI).

1.06 STORAGE AND HANDLING

A. Installer shall store product in a dry place or covered if out in the weather and keep product out of direct sun.

B. Installer shall store product elevated from soils to allow air circulation and to not introduce mold, fungi decay or insects to the product.

C. Product must be handled with protective straps or padded forks if lifting with mechanical equipment. Use of chain or cable to lift product into place will not be accepted.

1.07 FIELD OR SITE CONDITIONS

A. Foundations shall be at the same elevation unless specifically noted otherwise on the drawings.

1.08 WARRANTIES

A. Shelter: 10-year limited warranty on steel frame members

B. Shelter: 10-year limited warranty on the paint system.

C. Metal Roofing: 20-year Metal Roof Kynar finish warranty and standard Metal Roof manufacturers material warranty shall be provided.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. Approved Manufacturer: RCP Shelters, Inc. 2100 SE Rays Way, Stuart, FL 34994. Phone: (800) 525-0207.

B. The product shall be designed, produced, and finished at a facility owned and directly supervised by the supplier who has a minimum of ten years under same ownership making pre-manufactured shelters.

C. Architect approved equivalent.

2.02 DESCRIPTION

A. Model: Custom TS-SS.

B. Size and Dimensions:
1. Shape: See Contract Drawings.
2. Dimensions: See Contract Drawings.
3. Roof Style: See Contract Drawings.
4. Roof Pitch: See Contract Drawings.
5. Eave Height: See Contract Drawings..

2.03 STEEL STRUCTURAL COMPONENTS

A. Structural Framing: Fabricated for field assembly using bolted connections with no welding required or permitted; cold-formed shapes prohibited.
1. Columns & Beams: ASTM A500 Grade C structural steel tube. the following shapes are prohibited: I-beams, wide-flange beams, C-channels, Z-shapes.

2. Plates: ASTM A572 Grade 50.
3. Compression Ring: Steel plate, ASTM A572 Grade 50.
4. Fasteners.
   a. Bolts: ASTM A325 high strength bolts.
   b. Nuts: ASTM A563 high strength nuts.
5. Column Anchors: ASTM F1554 Grade 36, provided by Contractor or Owner, attached to top of foundation, recessed below slab on grade.
6. Cap plates: Factory bent and field installed with hidden fasteners on hip and ridge beams not normal to roof so that metal roof deck does not bear structurally on beam corner only.
7. Finish: Powder Coat.
   a. Pre-blast inspection to catch and remove oil, grease, and other coatings impeding contaminates.
   b. Steel grit blasted to near white condition in accordance with SSPC-SP10, removing all oil residue, mil scale, weld spatter, and slag.
   c. Five stage phosphate wash (includes detergent, phosphate, rust protectant sealant).
   d. Epoxy powder coat primer
   e. Topcoat of TGIC polyester powder coat; color to be Black.
   f. All materials inspected to meet 100% coating, proper cure, film thickness, and impact resistance.
   g. Wet-coat alternatives shall not be acceptable.

B. Roof System: Galvalume® structural metal roof panels with exposed fasteners.
1. Acceptable Panel Profiles:
   a. Galvalume® panels with 1-1/2" high ribs, 7.2" on center.
2. Panel Gauge: Minimum 24-gauge.
3. Panel Width: 3'-0".
4. Panel Length: Precut to the length from the eave to the ridge; angles factory precut.
5. Panel Orientation: Ribs shall run with the pitch of the roof for proper drainage.
6. Trim: Provide matching roof trim and fasteners.
7. Finish: Factory pre-finished with Kynar 500® paint system; color to be Charcoal.

2.04 PRODUCT MATERIALS:

A. General Description: The pre-engineered package shall be pre-cut unless otherwise noted and pre-fabricated which will include all parts necessary to field construct the shelter. The shelter shall be shipped knocked down to minimize shipping expenses. Field labor will be kept to a minimum by pre-manufactured parts. Onsite welding will not be required.

B. Reinforced Concrete:
1. See Section 033000 - CAST-IN-PLACE CONCRETE.

PART 3 - EXECUTION

3.01 ERECTION

A. Install the building foundation as indicated on the approved engineered shop drawings. Allow concrete to cure and achieve required strength prior to structure placement.

B. Tolerances on steel structural members, including factory fabrication, shall be in accordance with to AISC construction practices. Field modifications, field slotting or opening of holes will not be permitted. Tolerances specified on the installation drawings for anchor bolt or column layout details shall be required.

C. OSHA Compliance: Comply with Steel Erection Standard 29 CFR 1926 Subpart R-Steel Erection.

3.02 REPAIR

A. Required field repairs shall be coordinated and verified with manufacturer prior to execution.

3.03 FIELD OR SITE QUALITY CONTROL

A. Field or Site Tests and Inspections shall be completed as required by the Building Code and AHJ.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This section includes, but not limited to, the following:
   1. Vanity aprons and end panels.
   2. Cabinet Shelving.
   3. Countertop Support Brackets.
   4. Standards and Brackets.
   5. Shelving.
   6. Window Sills.
   7. Horizontal In-fills behind Base Cabinets.
   8. Wall and Base Cabinets.
   9. Closet Rod with Shelf.
   10. Cabinet Door and Drawer Locking Devices.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 061000 - Rough Carpentry for blocking within walls to adequately support casework.
   2. Section 079200 - Sealants for caulking of casework and/or countertops to abutting walls.
   3. Section 088000 - Glazing for cabinet door glass.
   4. Section 092116 - Gypsum Board Assemblies.
   5. Section 096513 - Resilient Base and Accessories for application of rubber base to casework.
   6. Section 123653 - Laboratory Work Surfaces.
   7. Section 123661 - Quartz Surfacing Countertops.
   8. Division 22 Plumbing - Furnishing, installation, and hook-up of sinks, fixtures, outlets, strainers, tailpieces, traps, vacuum breakers, stops, etc., shall be performed by the Plumbing Contractor in accordance with IPC of New York State and local building codes. In all cases, sink cutouts shall be by the Casework Contractor and coordinated with the Plumbing Contractor.
   9. Division 26 Electrical - Furnishing, installation, and final connections of wiring, conduit, and/or electrical items within the casework.

1.03 STANDARDS

A. All work of this section shall conform to industry standards and/or manufacturer’s recommendations.

B. Architectural Woodwork Institute (AWI) Quality Standard: "Architectural Woodwork Quality Standards".

C. AWI Custom grade.

D. ANSI/KCMA A161.1 "Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets".

E. ANSI 161.2 "Performance Standards for Fabricated High Pressure Decorative Laminate Countertops".

1.04 SUBMITTALS

A. Submit pursuant to Section 013300 - Submittal Procedures.

B. Submit pursuant to Section 016100 - Basic Product Requirements.

C. Product Data: Submit manufacturer's technical product data indicating materials, hardware, and finishes used in fabrication of cabinets, as required to show compliance with specifications.

D. Shop Drawings: Submit shop drawings indicating location and size of each type of cabinet and countertops, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to countertop and to walls.
   1. Shop Drawings must be based on actual field measurements including field measurements of all utility's sizes and locations.
   2. Casework Shop Drawings shall include coordination for both new and existing utilities. Any required holes in rear or side panels should receive satin chrome escutcheon plates.
   3. Show any modifications required in casework to accommodate all utilities.

E. Installation Instructions: Submit manufacturer's written installation instructions where available. Install fabricated items in accordance with Architect approved shop drawings.

1.05 QUALITY ASSURANCE

A. All work of this section shall be performed by experienced workers familiar with the work and according to manufacturers' recommendations and/or industry standards.

B. Source limitations for cabinets: Obtain cabinets and vanity supports through one source from a single manufacturer/fabricator.

C. Verify casework dimensions to field measurements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturer’s published instructions.

B. Protect against moisture exposure and damage.

C. Protect cabinets during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

D. Do not deliver cabinets until painting, wet work, grinding and similar operations, which could be performed before installation of cabinets, have been completed in installation areas.

1.07 JOB CONDITIONS

A. Do not deliver or install any items of this specification until spaces are enclosed and weather tight. Comply with cabinet manufacturer's recommendations for temperature and humidity requirements in cabinet installation areas. Do not install cabinets and countertops until required temperature and relative humidity have been stabilized and will be maintained in installed areas.

B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed cabinet work within a tolerance range of the optimum moisture content acceptable to cabinet manufacturer, from date of installation through remainder of construction period.

PART 2 PRODUCTS

2.01 MATERIALS

A. Plastic Laminate Manufacturers:
   1. Formica
   2. Nevamar
   3. Wilsonart
   4. Architect approved equivalent.

B. Plastic Laminates:
   1. Sheet Thickness: 0.048 inches for countertops, edge boards and backsplash.
   2. Countertops shall have white melamine laminated backer sheets at underside.
   3. Colors to be selected by Architect from manufacturer's standard colors.

C. Particle Board (If required)
   1. Three-layer, Grade A, 45 Lb. minimum.
   2. Thickness: As shown on Contract Drawings or as required to produce the finish product shown on Contract Drawings.

D. Plywood
   1. 3/4" Grade A Plywood, u.n.o.
   2. Thickness: As shown on Contract Drawings or as required to produce the finish product shown on Contract Drawings.

E. Hardwood
   1. 1" minimum thickness maple.

2.02 METAL SHELF BRACKETS AND SUPPORTS

A. Countertop Bracket Manufacturers:
   1. A & M Hardware, Inc., 400 W. Gramby Street, Manheim, PA 17545, Phone (888) 647-0200 (Basis of Specification).
   2. Richelieu, www.richelieu.com; Phone (800) 619-5446.
   3. Architect approved equivalent.

B. Closet Rod with Shelf
   1. U-Line Model H-2515 wall mounted coat rack.
   2. Provide multiple units of various lengths to fill entire wall.
   3. Finish: Satin aluminum.

2.03 COMPONENTS

A. Wall Cabinets
   1. Bottoms, Side Panels and Backs: 3/4” Grade A Plywood with high pressure laminate on all surfaces exposed to view.
   2. Doors: 3/4” Grade A Plywood with high pressure laminate on all surfaces, unless noted otherwise.
   3. Doors over 4'-0" in height: 1" minimum thickness hardwood maple with plastic laminate finish on all surfaces.
   4. Doors with glass: Provide glazing as specified in Section 088000.
   5. Unexposed Sides and Tops: 3/4” Grade A Plywood with high pressure laminate. If there is to be no soffit above the wall cabinets, entire cabinet top area must be solid, allowing no chance for items to fall into or past cabinet from above.

B. Drawers
   1. Boxes: Constructed of 1/2” pre-finished birch hardwood components joined with blind rabbeted corners and galvanized brads with square drive, flat head and self-countersinking heads (Equality Screw Co. #7650).
   2. Bottoms: 1/2” pre-finished birch hardwood (trapped in grooves at all four sides).
   3. Horizontal Frame Rails (If applicable): Between drawers to be 3/4” x 3 1/2” Grade A Plywood with high pressure plastic laminate all exposed sides.

C. Shelves
   1. Adjustable Shelves Less than 32” in length: 3/4” Grade A Plywood with plastic laminate finish; leading edge of shelf to be finished with high pressure laminate.
   2. Adjustable Shelves Greater than 32” in length: 3/4” Grade A Plywood with plastic laminate finish with 2” x 3/4” apron at front edge; leading edge of shelf to be finished with high pressure laminate.

D. Base Cabinets
   1. Tops, Bottoms, Side Panels and Backs: 3/4” Grade A Plywood with plastic laminate finish. Finish interior with high pressure laminate.
      a. Reinforce interior top edges of base cabinet front, side, and rear panels to provide additional support area and attachment area for countertops.
   2. Doors and Drawer Faces: 3/4” Grade A plywood with plastic laminate finish. Interior with high pressure laminate.
   3. Kick Bases: Fabricated with 3/4” white melamine balanced material (to receive base by GC).

E. Countertops (Work Surfaces) (only if specifically called out on Contract Drawings), and Window Sills, Horizontal Fillers Behind Base Cabinets
   1. Plastic Laminate Counters: Fabricated with Grade A Plywood thickness as shown (build down to 1½" thickness) and (GP-50) plastic laminate edge banding, top surface and backsplash; all tops to have white melamine laminated backer sheet at underside.
   2. Plastic Laminate Backsplash: Fabricated with 3/4" white melamine balanced material and to be attached with #8 x 2" screws (Equality Screw Co. #7650) and sealed with adhesive caulk at all locations.
   3. Where counter tops are not supported by base cabinets, provide 1-1/2" x 1-1/2" x 1/4" (unless noted otherwise) aluminum ledger angle continuous along wall.
   4. Where counter tops terminate unsupported by a base cabinet or end panel, provide countertop support bracket.
   5. Where horizontal plastic laminate covered fillers are required behind casework, provide 1-1/2" x 1-1/2" x 1/4" aluminum angle along rear of backsplash and along wall for filler support.

F. Casework Ventilation
   1. Manufacturers:
      a. REGGIO Registers, Jytek Rd., Leominster, MA 01453. Phone: (800) 880-3090.
      b. Architect Approved Equivalent.
   2. Styles:
      a. Royal Toe Kick Vent Cover
         1) Thickness: 3/16".
         2) Material: Steel.
         3) Edge: Beveled.
         4) Size: Outside 3.5" x 12", 14", 16", 20" or 26", depending on cabinet dimensions.
      b. Surface Grilles:
         1) Thickens: 1/8".
         2) Material: Aluminum.
         3) Edge: Straight with mounting holes.
         4) Size: Outside 3.5" or 5.5" x available length to suit field conditions.

2.04 HARDWARE

A. Hinges: Blum, 110-degree, self-closing, full overlay.
   1. Provide two (2) hinges on doors up to 3'-6" in height.
   2. Provide three (3) hinges on doors 3'-7" to 4'-6" in height.
   3. Provide four (4) hinges on doors 4'-7" to 7'-0" in height.

B. Hinge Mounting Plates: Blum Steel Wing Plate (Blum #17318100); installed into door with Nylon expansion inserts (per Blum specifications).

C. Drawer Slides: Accuride #3832; full extension attached to cabinet.

D. System Screws: Blum 5mm x 10mm zinc plated (Blum #661.1000) attached to drawer box with: flat head zinc screws #6 x ½" (Blum #6062).

E. Cabinet Handles:
   1. 3½" clear anodized satin-finished aluminum bent pulls (Hafele #116.39.446).
   2. Semi-recessed pull handle: Hafele 151.00.311 inset handle.

F. Shelf Support System: Polished galvanized 5mm seismic shelf supports.

G. Door and Drawer Face Bumpers: Blum 4mm x 1.5mm resilient plastic bumper (Blum ETP1950).

H. Cabinet Door and Drawer Locks:
   1. Provide electronic cabinet door and/or cabinet drawer locks where called for on the Contract Drawings.
   2. Electronic cabinet lock:

a. KITLOCK Codelocks KL1006 Standard Electronic Cabinet Lock or Architect approved equivalent.
b. 10 button keypad.
c. Battery powered.
d. Provide emergency opening capabilities.
e. Provide left, right, vertical versions as required.

I. Escutcheons:
1. Chrome Plated Steel, low profile escutcheon plates, sized to penetrating pipe or conduit. Overall size must conceal drilled hole in casework.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect substrate and conditions under which cabinets are to be installed.

3.02 BLOCKING

A. Contractor shall provide blocking in walls for casework support.

3.03 CASEWORK INSTALLATION

A. Install casework (cabinets, shelving and other plastic laminate covered woodwork) plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips and molding as indicated or required, and in finish to match.

B. Anchor cabinets securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions for support of units.

C. Complete hardware installation and adjust doors and drawers for proper operation. Doors and drawers shall be centered.

3.04 COUNTERTOP (WORK SURFACES) INSTALLATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturers requirements.

B. Install countertops level, true and straight in longest lengths possible with no distortions. Shim as required using concealed shims.

C. Scribe countertops to abutting finishes for accurate fit.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Anchor countertops to base cabinets and/or countertop supports.

F. The party responsible for provision of countertops is also responsible for provision of penetrations through countertop; penetrations include but are not limited to cutouts for sinks, faucets, grommets and soap dispensers.

G. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.05 WINDOW SILL AND WINDOW SURROUND INSTALLATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturers requirements.

B. Install window sills and window surrounds, if any, plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where sills and/or surrounds abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips and molding as indicated or required, and in finish to match.

C. Anchor sills and surrounds securely in place with concealed fasteners, anchored into structural support members of wall construction.

3.06 CLOSET ROD AND SHELF INSTALLATION

A. Provide solid blocking in wall at all attachment points of wall mounted coat rack with shelf.

B. Contractor's Option: In lieu of solid wood blocking concealed in wall, provide two (2) layers of 3/4" plywood, 10" high x full width of room, finished with plastic laminate on all exposed surfaces. Secure to wall studs with two (2) decorative fasteners at each stud. Attach coat rack to plastic laminate ledger.

3.07 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean exposed and semi-exposed surfaces, touch-up as required. Use only cleaning products approved by the manufacturer of the surfaces being cleaned.

C. Remove and refinish damaged or soiled areas.

D. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive side play.

E. Protection: Provide 10-mil plastic or other suitable water-resistant covering over countertop and work surfaces. Tape to underside or countertop/work surface to securely hold protection material in place. Remove protection material and all tape at Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 01 of the Project Manual, apply to work of this Section.

1.02 SUMMARY

A. This Section includes, but is not limited to, quartz surfacing the following:
   1. Lavatory countertops including sinks if they are integral, backsplashes, side splashes and aprons.
   2. Kitchen countertops, backsplashes and side splashes.
   3. Casework countertops unless noted otherwise.
   4. Work surface countertops unless noted otherwise.
   5. Other countertops as shown on Contract Drawings.
   6. Quartz Countertop Accessories including but not limited to ledger angles, shelf type brackets, concealed countertop brackets.

1.03 STANDARDS

A. All work of this section shall conform to industry standards and/or manufacturer's recommendations.

B. ANSI/NSF 51 – "Food Equipment Materials".

C. ASTM C97 – "Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone".

D. ASTM C99 – "Standard Test Method for Modulus of Rupture of Dimension Stone".

E. ASTM C170 – "Standard Test Method for Compressive Strength of Dimension Stone".

F. ASTM C482 – "Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste".

G. ASTM C484 – "Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile".

H. ASTM C531 – "Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes".

I. ASTM C650 – "Standard Test Method for Resistance of Ceramic Tile to Chemical Substances".

J. ASTM E84 – "Standard Test Method for Surface Burning Characteristics of Building Materials".

1.04 SUBMITTALS

A. Pursuant to Section 013300 - Submittal Procedures.

B. Pursuant to Section 016100 - Basic Product Requirements.

C. Sustainable Design Reporting:
   1. Provide documentation from manufacturer of the amounts of pre-consumer and/or post-consumer recycled content for products.
   2. Provide documentation from manufacturer showing manufacturing locations for products manufactured and sourced within 500 miles of project site.

D. Manufacturer certifications:
   1. Signed by manufacturer certifying that they comply with the following requirements:
      a. NSF/ANSI Standard 51: Food Contact
      b. UL 723 (ASTM E84): Surface Burning Characteristics

E. Product Data:
   1. Submit the following:
      a. Product specification sheet(s).
      b. Manufacturer's written installation instructions.
      c. Manufacturer's warranty.

F. Shop Drawings:
   1. Show location of each item; provide complete detailed and dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show the following:
         1) Full-size details, edge details, attachments, backsplashes, side splashes, aprons, etc.
         2) Locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
         3) Fabrication details for brackets or manufacturer's bracket product data sheet(s).
         4) Details of anchorage to cabinets and to walls.
         5) Locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in quartz surface.
         6) Locations and sizes of cutouts for sink installation and lavatory installation.
         7) Type of sealant.
         8) Type of adhesive.
         9) Seam locations.
         10) Show direction of directional pattern, if any.

G. Samples:
   1. 2” x 2” sample for each of Manufacturer’s full line of colors, pattern, and finishes for initial selection.
   2. Two (2) 6" x 6" samples of each color selected.
   3. Two (2) 4” long samples of selected edging.

H. Maintenance Data:
   1. Submit manufacturer’s care and maintenance data, including repair and cleaning instructions.
   2. Include in project closeout documents.

1.05 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications:
   1. Work of this Section shall be performed by a fabricator/installer approved by the quartz surfacing manufacturer.
   2. Use of digital templating equipment and slab layout technology prior to fabrication and installation of all products.
      a. Slabsmith.
   3. Minimum of five (5) years of documented experience with commercial fabrication/installation of quartz surfaces.

B. Applicable Standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class 1) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less
         2) Smoke Developed Index: 450 or less

C. Verify all dimensions in field.

D. Allowable Tolerances:
   1. +/- 1/8” in component size over a 10 foot length.
   2. +/- 1/8” in location of openings from indicated location.

3. Minimum of 1/16 inch and a maximum of 1/8 inch clearance between quartz surfaces and each wall.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pursuant to manufacturers published instructions.

B. Protect countertops during transit, delivery, storage and handling to prevent moisture exposure, damage, soiling and deterioration.

C. Store components indoors in clean and dry area prior to installation.

D. Do not deliver until painting, wet work, grinding and similar operations, which could be performed before installation of casework, have been completed in installation areas.

1.07 WARRANTY

A. Provide manufacturer's minimum 10-year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Warranty shall begin at date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
1. Silestone by Cosentino SA, Apdo No. 1 Macael 04867, Almeria, Spain. (Basis of Physical Characteristics)
2. Cambria USA, 11000 West 78th Street, Suite 220, Eden Prairie, MN 55344 Phone: 866-226-2742.
3. Corian® Design, Corian® Quartz (formerly known as Zodiaq®), Chestnut Run Plaza, 974 Centre Road, P.O. Box 2915, Wilmington, DE 19805, Phone: 800-426-7426.
4. Architect approved equivalent.

2.02 COUNTERTOP MATERIALS

A. Engineered Stone Countertops
1. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs.
2. Physical Characteristics:
   a. Water absorption: Maximum 0.04 percent, tested per ASTM C 97
   b. Bond strength: Average of 211 PSI (1.4 MPa), tested per ASTM C482
   c. Modulus of rupture: Average of 6200 PSI (5.11 MPa), tested per ASTM C99
   d. Flexural strength: 5620 PSI (50.3 MPa), tested per ASTM C 880
   e. Abrasion index: Minimum 62, tested per ASTM C 241
   f. Thermal shock: Pass 5 cycles, tested per ASTM C 484
   g. Thermal expansion: 1.747 x 10-5, tested per ASTM C 531
   h. Flame spread: Class 1 (FS-25 or less), tested per ASTM E84
   i. Mohs hardness: 6 to 6.5
   j. Stain resistance: Stains completely removed, tested per ASTM C 650, excluding hydroxide.
3. Thickness: 1-1/4" (3 cm).
4. Edge detail: Bullnose (Full Bullnose or Volcanic Edge).
5. Color: To be selected from manufacturer's colors in ALL price groups.
6. Surface finish: Polished.
7. Provide ¾" x 4" backsplash with profiled edges on all countertops unless noted otherwise. Provide ¾" x 4" side splashes with profiled edges where shown on the Contract Drawings.

2.03 SETTING MATERIALS

A. Adhesive: 50-year, 100% silicone or epoxy adhesive approved by quartz surfacing manufacturer.

B. Adhesive which is visible in finished work shall be tinted to match quartz surface.

2.04 ACCESSORIES

A. Epoxy Adhesive: K-bond epoxy type provided by countertop manufacturer.

B. Joint Sealant: Single component silicone sanitary sealant and backing materials; specified in Section 079200 - Sealants.

C. Vanity Counter Center Support Bracket: A & M Hardware, Inc., standard workstation and countertop bracket or Architect approved equivalent, 1/4" x 18" x 18" aluminum, color as selected by Architect.

D. Countertop and vanity top rear and side (at fixed wall) ledger angles: 1/4" x 2" x 2" aluminum angle.

2.05 FABRICATION

A. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.

B. Utilize digital images for seam coordination, product flow, and bookmatch material.

C. Form joints between components using manufacturer’s standard joint adhesive.
   1. Reinforce as required.
   2. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
   3. Rout and finish component edges with clean, sharp returns.
   4. Rout cutouts, radii and contours to template.

D. Smooth edges.

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Conditioning: Comply with manufacturer's recommendations for temperature and humidity requirements in installation areas. Do not install countertops until required temperature and relative humidity have been stabilized and will be maintained in installed areas.

B. Do not install countertops until walls and ceilings of the spaces to receive the Work have been finished.

3.02 INSTALLATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturers requirements.

B. Install in accordance with manufacturer’s instructions.

C. Provide factory cutouts for plumbing fittings and accessories.

D. Provide surfaces with a uniform finish.

E. Install countertop plumb, level, true and straight with no distortions. Shim as required using concealed shims.
   1. Tops:
      a. Flat and true to within 1/8 inch of a flat surface over a 10-foot length.
      b. Allow a minimum of 1/16 inch to a maximum of 1/8 inch clearance between surface and each wall.
      c. Form field joints using manufacturer’s recommended adhesive, with joint widths no greater than 1/16 inch in finished work.
      d. Keep components and hands clean when making joints.

F. Where countertop abuts other finished work, scribe and cut for accurate fit.

G. The party responsible for provision of countertops is also responsible for provision of penetrations through countertop; penetrations include but are not limited to cutouts for sinks, faucets, and soap dispenser.

H. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Reinforce joints as required.

I. Adhere sinks to tops using manufacturer's recommended sealant, adhesive and mounting hardware.

J. Anchor countertop securely in place with concealed fasteners and adhesives as recommended by manufacturer.

K. Provide backsplashes and side splashes as indicated on the Contract Drawings.
   1. Adhere to countertops using silicone sealant.

L. Where quartz surfacing vanity top abuts a toilet partition or urinal screen, provide a vanity counter support bracket or plastic laminate end support panel. Do not attach countertop to toilet partition or urinal screen.

M. Secure support brackets and ledger angles to solid, fire-retardant wood blocking concealed within the stud wall cavity.
   1. Provide solid wood, fire-retardant blocking vertically along full width of metal wall studs to secure concealed shelf support brackets. Provide wall stud with wood blocking at each concealed shelf support location.

3.03 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Do NOT allow harsh chemicals, such as lacquer thinner, turpentine, nail polish remover (acetone) or stove and drain cleaners, to REMAIN in contact with the surface. Hot pans and heat-producing appliances should be placed on heat shields or hot pads.

C. Clean exposed and semi-exposed surfaces, touch-up as required. Remove and refinish damaged or soiled areas.

D. Apply heavy kraft paper or other heavy protective coating masked in place to prevent surface damage. Remove kraft paper at building turn over to Owner and clean countertops.

END OF SECTION

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PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Coordination
   2. Interpretation of Plans
   3. Coordination Drawings.
   4. Cost Breakdown
   5. Substitutions and Prior Approval Requests
   6. Record Documents
   7. Maintenance Manuals
   8. Fire Safety Precautions
   9. Personal Safety Requirements
   10. Testing, Adjusting and Balancing
   11. Equipment Rebates
   12. Temporary Equipment Operation
   13. Piping materials and installation instructions common to most piping systems.
   14. Equipment installation requirements common to equipment sections.
   15. Painting and finishing.
   16. Concrete bases.
   17. Supports and anchorages.

1.03 GENERAL

A. This Section includes mechanical items common to all of this division specification sections.

B. Provide services, skilled and common labor, and all apparatus and materials required for the complete installation as shown and within the intent of the contract documents, field conditions, and code requirements.

C. The intention of these Contract Documents is to call for finished work, fully tested and ready for operation. Any components or labor not mentioned in the Contract Documents but required for functioning systems shall be provided. Should there appear to be any discrepancies or questions of intent, the Contractor shall refer the matter to the Architect/Engineer for decision before start of any related work.

D. The drawings show the general arrangement of systems and equipment but do not show all required fittings and offsets that may be necessary to connect pipes and ductwork to equipment, and to coordinate with other trades. Provide all necessary fittings, offsets and runs based on field measurements and at no additional cost. Coordinate with other trades for space available and relative location of equipment and accessories. Pipe and duct location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.

1.04 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. ABS: Acrylonitrile-butadiene-styrene plastic.
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. PE: Polyethylene plastic.
   4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.05 WARRANTY

A. Provide guarantee and maintain the stability of workmanship and materials used and keep same in good operating condition for a period of minimum or one year after final completion of the work (unless specified otherwise) as evidenced by the issuance of the final certificate by the Architect.

B. Correct any deficiencies/defects of any kind immediately and; at the Contractors expense due to faulty workmanship or materials that arise during the above mentioned period of time. Corrections shall be done to the satisfaction of the Engineer/Architect. Such reconstruction and/or repairs shall include damages to the finishes or the building resulting from the original defect.

1.06 COORDINATION

A. Coordinate mechanical work with that of other trades in order to:
   1. Avoid interferences between general construction, mechanical, electrical, structural and other specialty trades.
   2. Maintain clearances and advise other trades of clearance requirements for operation, repair, removal and testing of mechanical equipment.
   3. Indicate aisle-ways and access-ways required on coordinated shop drawings for roof equipment area, mechanical equipment rooms, data and telecomm rooms, corridors, ceiling spaces, shafts, corridors, ceiling space, laboratories, etc.

B. Understanding of Work:
   1. Study, examine, and compare of the contract documents, including drawings and specifications. The Subcontractor shall have a full understanding of how the work in this part is scheduled, phased, and installed with work of other trades.
   2. Include in this installation piping, ductwork, devices, and equipment that are necessary for complete and operating systems as specified and as required.
   3. Connect piping and ductwork from fixtures, outlets, and devices full size to the nearest suitable main or riser.
   4. Certain installations may be presented as typical, and full details are not repeated for each case. Subcontractor shall provide complete installation as if full details apply to each and every case, and make adjustments to typical details to suit each specific installation as part of the basic work.
   5. Installation of work presented on the diagrams are applicable to the plans, and work depicted on the plans are applicable to the diagrams.
   6. If there is a discrepancy in the drawings or specifications, the contractor shall figure the work based on the most stringent requirements to complete the installation and obtain clarification from the Architect before installation.

C. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in- place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible. Work shall be above ceilings or ceiling line.
7. Coordinate installation and connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Coordinate with individual system requirements.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as is practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
12. Coordinate with the locations of electrical panels and avoid installing piping and ductwork over them. Electrical panels are purposely located and have priority for location. The contractor is responsible for required piping and ductwork offsets to insure that the panels are located as designed and for other conditions.
13. Perform system modification recommended by Test and Balance Agency after recommendations are accepted by the Engineer

1.07 INTERPRETATION OF PLANS

A. In general, the Drawings are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements.

B. Drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail of construction. All work shall be constructed from field measurements taken at the site. This shall include all rises, drops, elbows, offsets, etc as necessary to avoid structural members or equipment and materials installed by other trades. The contractor shall coordinate the ductwork and piping layout before construction. No additional costs will be allowed for piping and ductwork fabrications without field verification of available space. If it is found, before installation, that a more convenient, suitable or workable arrangement of any or all phases of construction would result by altering the arrangement indicated on the Drawings, the architect/engineer may require the contractor to change the arrangement of his work without additional cost to the owner.

C. The drawings and specifications are intended to supplement each other. Any items shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed the same as if mentioned and shown.

D. The greatest quantity or more expensive work shall govern where there is a conflict noted anywhere on the drawings and/or specifications.

1.08 COORDINATION DRAWINGS

A. Review contract documents and prepare coordination model drawings as an informational supplemental submittal in accordance with Division 1, 21, 22, and 23 requirements. Provide drawings of all areas of the project. Architectural models of the building will be made available upon request. Detailed mechanical models will not be made available. Facilitate coordination meetings and revise drawings as required to resolve work conflicts.

B. All contractors (including steel, precast concrete, fire protection, lighting, plumbing, piping, and building sound systems) are required to attend a minimum of (3) three coordination meetings on site to resolve any coordination issues prior to start of construction.

C. If the coordination drawings are not complete and/or coordinated prior to the work being started no extra cost shall be incurred by the owner due to coordination issue and it shall be the responsibility of the contractors to make the necessary modifications to the system to meet the requirements. All modifications shall be approved by the engineer/architect but at the cost to the contractor.

D. The composite model drawings of all trades shall detail all structural building elements, mechanical equipment, and work of other trades. Indicate locations where space is limited for installation, access for service, and where sequencing and coordination of installations are of importance to the efficient flow of work. The composite drawings shall include at a minimum the following. Where required for clarity multiple composite drawings may have to be submitted for each area.
   1. Clearances for maintaining ceiling heights.
   2. Clearances for installation of material and equipment for all trades.
   3. Clearances for installing and maintaining insulation.
   4. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
   5. Equipment connections and support details.
   6. Penetrations thru block walls and Pre-cast walls.
   7. Exterior wall and foundation penetrations.
   8. Fire-rated wall and floor penetrations.
   9. Sizes and locations of required concrete pads and bases.
   10. Valve stem movement.
   11. Dimensional locations of pipe sleeves passing through floor/roof slabs.
   12. Locations of wall and ceiling access panels where required for access to mechanical equipment.
   13. Reflected ceiling plans to integrate installations of light fixtures, grilles, registers, and diffusers, sprinklers, communication systems, and other ceiling mounted components.
   14. Both new and existing structural elements.

1.09 COST BREAKDOWN

A. Submit a cost breakdown for each claim according to General Conditions of the Contract. Include project name, location, Architect/Engineer, Contractor and date.
   1. List the cost breakdown for labor and material separately and include a total.
   2. Breakout and detail the cost according to specification sections.

1.10 SUBSTITUTIONS AND PRIOR APPROVAL REQUESTS

A. Equipment manufacturers where indicated on the drawings are the basis of design. The contractor accepts responsibility for all design implications when providing approved equipment other than the design basis.

B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics than the basis of design may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at the cost of the contractor. If minimum energy rating or efficiencies are specified, equipment shall comply with those requirements. Cost implications to other trades are the responsibility of the contractor.

C. Dimensional and Wight Changes: Substituted equipment with dimensions or weight different than the basis of design may be furnished provided such proposed equipment is approved in writing. The contractor is responsible for verifying and coordinating proposed equipment such that it maintains the design intent for access and serviceability and reserves space for future equipment where required. Cost implications to other trades are the responsibility of the contractor.

D. Bids shall be based on the exact materials specified, those listed scheduled on the drawings, or on materials which have been accepted as equivalent. The specified/scheduled products have been used in the design of the project and the preparation of the drawings and specifications as such establish minimum standards of function, dimension, appearance and quality necessary and requisite for this project, which substitutes must meet to be considered acceptable. The burden of proof of equality rests with the party making the request.

E. Requests for substitution shall be in writing and shall be received by the Engineer not later than 10 days before bid opening date. Materials not specified or accepted as equivalent shall not be acceptable for installation.

F. Each prior approval request for substitution shall include and meet the following requirements:
   1. The name and model of the material or equipment for which an equivalent is being proposed and a complete description of the proposed equivalent including drawings, cuts sheets, equipment performance capacity and test data, equipment weights, electrical and any other information necessary for a complete evaluation.
   2. A written comparison listing any deviations from the scheduled equipment and/or the specification requirements must also be provided prior to any proposed substitution will be evaluated.
   3. A written statement setting forth any changes in other materials, equipment, electrical, structural and/or other Work in which incorporation of the equivalent may be required shall be included.
   4. Material and/or equipment requests which do not meet the above requirements will not be evaluated or approved.
   5. The burden of proof of the merit of the proposed equivalent is upon the proposer. Any and all extra costs associated with the equipment change and affecting architectural, structural, mechanical, plumbing or electrical work shall be responsibility of the entity requesting the substitution.
   6. The Engineer’s decision of approval or disapproval of a proposed equivalent is final.

G. Final approval of all equipment shall be contingent on shop drawing acceptance, compliance with the specifications and performance criteria as scheduled and acceptable installation. General approval to bid a product does not relieve the Supplier or Contractor of meeting specific specification requirements.

H. The Mechanical Contractor shall pay, provide, install and be responsible for extra materials required or any other trade due to this use of alternate accepted equipment which has installation requirements different than the specified equipment. The Mechanical Contractor shall pay other trades for any extra work they are involved in due to this substitution of equipment.

I. If substitutions of controls or equipment require any changes in the architectural, structural, mechanical, plumbing or electrical work from that shown on the drawings, the extra cost of the equipment or architectural, structural, mechanical, plumbing or electrical work shall be responsibility of the Contractor requesting the substitution. All substitutions shall be prior approved by the Architect or Engineer before purchase by the contractor.

J. Where any redesign of electrical, mechanical or other work is required due to substitution, arrangement or equipment layout other than herein specified or shown:
   1. Arrange for required redesign by Architect and Engineer.
   2. Pay all costs for such redesign.

1.11 SUBMITTALS

A. Refer to individual product and equipment specification sections for detailed submittal requirements.

B. The mechanical and electrical contractor shall have an onsite meeting prior to installation to review all shop drawings and verify all electrical requirements with the electrical contractor. The mechanical contractor shall be responsible for coordinating and setting up meeting and sharing of mechanical equipment electrical requirements with electrical contractor prior to when construction is set to begin and equipment is to be ordered.

C. The electrical contractor shall sign off on all mechanical shop drawings for electrical requirements prior to ordering equipment.

1.12 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "Project Record Documents." In addition to the requirements specified in Division 1, at a minimum the contractors shall:
   1. Maintain an on-site set of drawings to record actual revisions to the work being performed on site. Revisions shall be shown on the documents legibly to reflect actual on-site changes to the documents.
   2. Revisions shall be show on the documents in a contrasting color (red).
   3. Revisions shall be updated to the on-site plan daily.
   4. Ensure all revisions and documentation is complete and accurate, enabling future reference by Owner.

B. Refer to specific sections for additional record documentation.

1.13 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "Operating, Maintenance, and Warranty Data". Submit copies for review by Architect/Engineer. In addition to the requirements specified in Division 1, include the following information:
   1. Descriptive summary of function, normal system operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.
   5. Warranty information for all mechanical items shall be included in one tabbed section.

1.14 FIRE SAFETY PRECAUTIONS

A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient fire fighting devices,
   1. watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phases of work.

B. At all times, access shall be maintained for fire department trucks to the building.

C. All welding brazing, cutting and sweating operations performed in vicinity of or accessible to combustible materials shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.

D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.

E. When necessary to do cutting, welding, brazing, sweating and similar work in vicinity of wood, in shafts, or vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire resistant blankets or similar approved coverings. In addition, a helper shall be stationed nearby with proper fire extinguishers (provided by the Contractor performing the work) to guard against sparks and fire.

F. Whenever combustible materials have been exposed to sparks, molten metal, hot slag or splatter, a person shall be kept at the place of work to make sure the smoldering fires have not been started. Whenever cutting or welding operations are carried on in a vertical pipe shaft, a person to act as a fireguard shall be employed to examine all floors below the point of cutting or welding. This fireguard shall be kept on duty after completion of work to guard against fires and shall examine each level after this time, prior to leaving. There shall be no exceptions to this requirement and failure to comply will be construed as negligence.

1.15 EQUIPMENT REBATES

A. The contractor shall be responsible for applying for and leading the rebate application process for all eligible equipment / systems within the project on behalf of the owner.

B. The contractor shall provide all receipts, invoicing, counts, site data, etc as required to procure equipment rebates

C. The contractor shall forward the filled out application and all necessary rebate “back-up” requirements to the owner at the completion of the project.

1.16 PERSONAL SAFETY REQUIREMENTS

A. A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions required in connection with his work, including regulations of the Occupational Safety and Health Administration (OSHA) and other governing agencies.

1.17 TESTING, ADJUSTING AND BALANCING

A. All domestic hot water circulation systems will be balanced by an independent test and balance agency hired by the mechanical contractor. The scope of the testing and balancing work includes functional performance testing of all mechanical systems. Deficiency reports will be distributed directly to the contractor on an ongoing basis. Exceptions taken to specific direction issued by the testing agency shall be brought to the attention of the engineer by the installing contractor.

B. The Contractor shall be certain that all systems are ready for proper operation prior to balancing and adjusting with clean filter and other system elements, e.g., coils. Temperature control calibration, electrical interface, etc., shall also be complete prior to balancing and adjusting. All equipment shall be freshly oiled. The Contractor shall instruct his employees and subcontractors to leave all balancing devices in a wide open position and free all operating arms and adjustments so that they

1. can be easily operated. The contractor shall write a letter to the testing agency indicating that each of the areas defined by the construction schedule is complete and ready for balancing.

C. The Contractor shall provide and coordinate the services of qualified, responsible subcontractors, suppliers and personnel as required to correct, repair, and/or replace any and all deficient items or conditions found during the course of this project, including the testing, adjusting, and balancing period.

D. In order that all systems may be properly tested, balanced, and adjusted as required herein by these Specifications, the Contractor shall operate the systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB.

E. Project Contract completion schedules shall allow for sufficient time to permit the completion of TAB services prior to Owner occupancy. The Contractor shall allow adequate time for the testing

and balancing activities of the Owner provided services, during the construction period, and prior to Substantial Completion as defined in the Uniform General Conditions of this Construction Document.

F. The Drawings and Specifications indicate valves, dampers, and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Contractor to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the Contractor shall provide access as requested by the TAB Firm. Also, any malfunction encountered by TAB personnel and reported to the Contractor shall be corrected by the Contractor immediately so that the balancing work can proceed with the minimum of delays.

1.18 TEMPORARY HEAT/EQUIPMENT OPERATION

A. Provide temporary gas meter and connections to equipment provided by the General Contractor as required for temporary heat.

B. Warranties:
   1. The Contractor shall provide extended warranties for all equipment and mechanical system components operated prior to the date of substantial completion. The Contractor shall obtain in writing from the manufacturer extended warranties for all equipment such that the Owner's warranty starts at the date of substantial completion in accordance with the General Division 1 requirements. Any additional costs shall be the burden of the Contractor.

PART 2: PRODUCTS

2.01 SUBMITTALS

A. Submit product data for the following in accordance with requirements of Division 1 Specification Section 01300, “Submittals.”
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

B. Welding certificates.

2.02 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

2.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

C. Storage of materials and equipment shall not impede the work of other contracts.

D. Handling of equipment and products shall be according to manufacturers instructions and in compliance with the articles of their warranty.

E. Protect products from weather, unless product is slated for exterior installation. If outdoor storage is necessary, support products off the ground or pavement in watertight enclosures.

2.04 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

2.05 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.06 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.07 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Plastic-to-Metal Transition Fittings: One-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107, four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.08 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint,
   1. plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.09 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Stainless steel. Include two for each sealing element.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.11 ESCUTCHEONS

A. A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening. Provide with polished chrome plated finish.

2.12 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3: EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors:

M. Sleeves are not required for core-drilled holes.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
      b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free
   1. solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
   3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.05 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section.

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.08 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.09 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 22 05 00

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves

1.02 ABBREVIATIONS

A. IBBM: Iron body, bronze mounted.

B. OS&Y: Outside screw and yoke.

C. WOG: Water, oil, gas.

D. WSP: Working steam pressure.

1.03 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets and specifications for each valve type.

B. Valve Schedule: List type of valve, manufacturer's model number, and size for each service application.

1.04 MAINTENANCE

A. Special Tools:
   1. One wrench for each type and size wrench operated plug valve.

PART 2 PRODUCTS

2.01 VALVES - GENERAL

A. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one manufacturer.

B. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.

C. Valve parts of same manufacturer, size and type shall be interchangeable.

D. Manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified.

E. Valves which use packing, shall be capable of being packed when wide open and under full working pressure.

F. Size valves the same size as the piping in which they are installed, unless specified otherwise.

2.02 BALL VALVES

A. Type BV: 150 psig WSP, 600 psig WOG, 2 piece bronze body, solid blow-out proof stem, teflon seats, chrome plated brass ball, teflon seals, corrosion resistant steel lever handles with vinyl grips, balancing stop, and threaded or solder ends. Acceptable Manufacturers: Conbraco, Hammond, Milwaukee, Nibco, and Watts.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install valves at locations noted on the drawings or specified.

3.02 VALVE APPLICATION SCHEDULE

A. Schedule of valve applications for the different services is as follows:
   1. Cold Water In Buildings and Tunnels (CW) 125 psig and Less:
      a. 3 inch and Less: A or D gates or BV balls, O globes or angles, and S or U checks; or C gates, K globes or angles, and V checks, with solder joint companion flanges.
      b. 4 inch and Up: C gates or BF butterflys, K globes or angles, and V checks.
   2. Compressed Air (A) 125 psig and less:
      a. 2 inches and Less: A gates, J globe or angles, and W checks.

b. 2-1/2 inches and Up: C gates, K globe or angles, and W checks.

3. Domestic Hot Water and Circulating (DHW & DHWC) 125 psig and Less:
   a. 3 inch and Less: A or D gates or BV balls, J or O globes or angles, and S or U checks.
   b. 4 inch and Up: C gates or BF butterflys, K globes or angles, and V checks.
4. Gas - Natural, Manufactured or Mixed Fuel (G) 125 psig and Less:
   a. 2 inch and Less: AB plug valves.
   b. 2-1/2 inch and Up: AA plug valves.
5. Gas, Bottled Liquified Petroleum (BG): A gates, and J globes or angles, with flared or ferrule copper tubing adapters.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General support requirements for plumbing piping

B. Pipe hangers and supports

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Piping Insulation: Section 220700.

1.04 SUBMITTALS

A. Shop Drawings:
   1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.
   2. Details of pipe anchors.

B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the applicable requirements of the ASME B31 Piping Codes.
   2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.
   1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
Up to 2-1/2	4	16	6	10
3 to 6	4	14	6	10
8 to 14	10	12	12	16
16 and up	10	10	12	16

B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE
Up to 2-1/2	8	18

3 to 8	10	16
10 to 14	12	12
16 and up	18	10

C. Pipe Covering Protection Saddles: 3/16 inch thick steel, of sufficient depth for the insulation thickness specified, notched so that saddle contact with the pipe is approximately 50 percent of the total axial cross section. Saddles for pipe 12 inches in size and larger shall have a center support.

D. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut.
   1. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping 10 inches in size and larger.

E. Adjustable Floor Rests and Base Flanges: Steel.

F. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two nuts at each end for positioning rod and hanger, and locking each in place.

G. Riser Clamps: Malleable iron or steel.

H. Rollers: Cast Iron.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not hang or support one pipe from another or from ductwork.
   1. Do not bend threaded rod.

B. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.

C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.
   1. For Steel, and Threaded Brass Pipe:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1 and under	8
1-1/4 and 1-1/2	9
2	10
2-1/2 and up	12

   1. For Grooved End Steel Pipe:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1-1/2 and under	7
2 through 4	10
5 and over	12

   1. No pipe length shall be left unsupported between any two coupling joints.
   2. For Copper Pipe and Copper Tubing:

PIPE OR TUBING SIZE (Inches)	MAXIMUM SPACING (Feet)
1-1/2 and under	6
2 and over	10

   1. For Glass Pipe, and Aluminum Tubing:

Glass Pipe	8	8	8
Plastic Tubing	3	5	7
Aluminum Tubing	3	5	7

1. For Plastic Tubing:

PIPE OR TUBING SIZE (Inches)	MAXIMUM SPACING (Feet)
Under 2 inch	3
2 inch and over	4

1. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
2. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
3. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
4. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.
5. Support floor drain traps from the overhead construction, with hangers of type and design as required and approved. Overhead supports are not required for floor drain traps installed directly below earth supported concrete floors.

D. Size hanger rods in accordance with the following:

	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8
6	3/4	1/2	5/8	1/2
8, 10 and 12	7/8	5/8	3/4	5/8

1. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.
2. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each rod, two at upper hanger attachment and two at hanger.

E. Vertical Piping:
1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.

F. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

G. Underground Pipe Supports: Firmly bed pipe laid underground, on solid ground along bottom of pipe. Install masonry piers for pipe laid in disturbed or excavated soil or where suitable bearing cannot be obtained. Support pipe, laid proximate to building walls in disturbed or excavated soil, or where suitable bearing cannot be obtained, by means of wall brackets or hold-fasts secured to walls in an approved manner.

3.02 UPPER HANGER ATTACHMENTS

A. General:
   1. Do not use flat bars or bent rods as upper hanger attachments.

3.03 PIPING IN TUNNELS

A. Support piping in tunnels on adjustable stanchions, fabricated in accordance with the details on the Drawings, unless otherwise indicated. Install, secure and be responsible for the proper locations of all cast-in-place inserts and stanchion supports, in ample time so as not to delay construction Work. Secure tops of stanchions to overhead construction, as required and approved.

3.04 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.05 PIPE INSULATION SHIELDS

A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

3.06 PIPE COVERING PROTECTION SADDLES

A. Install pipe covering protection saddles at all points of support, for steel piping 6 inches in size and larger, insulated with hot service insulation. Weld saddles to piping to insure movement with pipe.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe hangers for various installed pipe systems.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300

1.03 REFERENCES

A. Underwriters Laboratories - UL Listing.

B. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

C. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

D. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process

E. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)

F. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture

G. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application

H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices

1.04 QUALITY ASSURANCE

A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturers name, part number, and applicable size stamped in the part itself for identification.

C. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Anvil International (Grinnell)

B. Cooper B-Line, Inc.

C. Carpenter and Patterson

D. Fee and Mason

E. Hilti

F. Elcen

G. Piping Technology and Products, Inc.

H. Or Approved Equal

2.02 MATERIALS

A. Pipe Hangers & Supports:

1. All pipe hangers and supports for stainless steel piping systems shall be of stainless steel construction.
2. All pipe hangers and supports for copper tubing piping systems shall be of stainless steel construction. Provide dielectric/isolation wrapping or pipe insulation where dissimilar metals meet.

3. All pipe hangers and supports for black iron piping systems shall be of stainless steel construction. Provide dielectric/isolation wrapping where dissimilar metals meet.
4. All pipe hangers and supports for PVC piping systems shall be of galvanized steel construction, except where piping is used for chemical treatment.
5. All pipe hangers and supports for chemical lines including [sodium] [calcium] hypochlorite and caustic soda shall be of stainless steel construction.
6. All pipe hangers and supports for chemical lines including brine solution and regenerate piping shall be of stainless steel construction.
7. All pipe hangers and supports for Rigid galvanized piping systems shall be of galvanized steel construction.

B. Trapeze Hangers: Where three or more non-chemical lines of pipe run parallel, support them with galvanized trapeze hangers, Grinnell Figure 46. Trapeze to be supported by a minimum of two galvanized rods with Figure 60 washer plates. For top loading only.

C. Concrete Inserts: Anvil International Figure 282, MSS SP-58 (Type 18), galvanized, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.

D. C-Clamps: Anvil International Figure 86, MSS SP-58 (Type 23) galvanized with set screw and lock nut. Use these for attaching hangers to steel beams. Welding hanger rods to steel members is not permitted. Provide retaining clip for C-Clamps.

E. Malleable Beam Clamps: Anvil International Figure 218, MSS SP-58 (Type 30), galvanized. Use these for attaching hangers to bar joists. Provide retaining clip for all beam clamps.

F. Clevis Hangar (4" diameter Piping or Less): Anvil International Figure 67, MSS SP-58 (Type 5), galvanized. Use these for attaching hangers to bar joists, column or wall.

G. Clevis Hanger (4" diameter or Greater D.I. Piping): Anvil International Figure 590, MSS SP-58 (Type 1), galvanized.

H. Pipe saddle support: Pipe saddle with U-bolt and threaded pipe adjuster. Cooper B-Line Figure 318A, MSS SP-69 (Type 37), stainless steel. Pipe stand: Cooper B-Line Figure 316T, stainless steel.

I. All hangers and supports shall be UL Listed. Cooper B-Line Figure 318A & 316T,

J. Provide threaded rod in accordance with manufacturer instruction.

2.03 FINISHES

A. Indoor Finishes
1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited epoxy finish.
3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish.

B. Outdoor and Corrosive Area Finishes (Chemical Room)
1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
2. Hangers, strut, and clamps located in corrosive areas shall be type [304] [316] stainless steel with stainless steel hardware.
3. Provide dielectric/isolation wrapping in systems of dissimilar metals.

PART 3 - EXECUTION

3.01 SCHEDULES - HANGER SPACING

A. PVC Pipe

1. 1/2 to 1-inch - 4'-0" o.c.
2. 1 1/4 to 8-inches - 5'-0" o.c.

3.02 INSTALLATION

A. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight of pipe.

B. Do not use perforated metal, strap iron, or band iron.

C. Do not make offsets in hangers.

D. Maximum allowable spacing of pipe hangers for horizontal piping is listed above. Space hangers and brackets at close intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging.

E. Place hangers within 12 inches of each horizontal elbow.

F. Use hangers with 1-1/2 inch minimum vertical adjustment.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Hangers for insulated pipes shall be sized to accommodate insulation thickness.

I. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.

J. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.

K. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

L. All hangers and supports that are not galvanized shall be painted or shop primed.

M. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

N. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

O. Support Provide neoprene protection where dissimilar metals come into contact.

P. Maximum allowable spacing of pipe supports for vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

Q. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in section 3.01B.

R. Do not support piping from other pipes, ductwork or other equipment that is not building structure.
   1. Where horizontal piping movements are greater than 1/2 inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, the hanger pie and structural attachments shall be offset in such a manner that the rod is vertical in the hot position.

S. In the part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams.

T. In the parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Stencils

B. Pipe markers

C. Tags

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit list of wording, symbols, letter size and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures and installation.

PART 2 - PRODUCTS

2.01 STENCILS

A. Manufacturers:
   1. SETON NAMEPLATE CO., New Haven, CT, Model SPS.

B. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
   2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
   3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
   4. 8 to 16 inch (200-250 mm) Outside Diameter of Insulation or Pipe: 24 inch (600 mm) long color field, 2-1/2 inch (65 mm) high letters.
   5. Equipment: 2-1/2 inch (65 mm) high letters.

C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.02 PIPE MARKERS

A. Manufacturers:
   1. SETON NAMEPLATE CO., New Haven, CT., Set Mark Pipe Markers.
   2. BUNTING, Pittsburgh, PA, Wrap-Mark.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed. For the following piping systems:
   1. Raw water - pre-treatment
   2. Raw Water - post- treatment
   3. Water Service
   4. Sample Lines
   5. Hypochlorite injection lines

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mils (0.10 mm) thick, manufactured for direct burial service.

2.03 TAGS

A. Manufacturers
   1. SETON NAMEPLATE CO., New Haven, CT.
   2. Metal Tags: Brass with stamped letters.
   3. Tag Size Minimum: 1-1/2 inch diameter.
   4. Chart: Typewritten letter size.

B. Signage: Factory fabricated, flexible, semi-rigid plastic; minimum information indicating PID identification, contents, volume, installation date and right to know information, for the following piping systems:
   1. Chemical Injection:
      a. Right-to-know signage
   2. Hypochlorite Tank (1)

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with paint manufacturers recommendations.

3.02 INSTALLATION

A. Apply stencil painting in accordance with paint manufacturer’s application instructions.

B. Install plastic pipe markers in accordance with manufacturer's instructions at intervals of 8’-0” on center, or after any change in direction. Minimum of one marker per pipe section.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

E. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Install tags with stainless steel/brass S hooks on corrosion resistant chain.

G. Identify valves in main and branch piping with tags.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleanout plug

B. Cleanout

1.02 REFERENCES

A. Comply with the applicable requirements of ASME A112.36.2M - Cleanouts, and ASME A112.1.2 - Drainage Funnels and Air Gaps.

1.03 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified except fasteners.

1.04 MAINTENANCE

A. Special Tools: Deliver the following to the Owner's Representative:
   1. Tools for Vandal Resistant Fasteners: One for each type and size.
   2. T-Handle Wrench for Cleanout Plugs: One for each type and size.

PART 2 PRODUCTS

2.01 CLEANOUT PLUG

A. Cast brass or bronze, with threaded end, and raised or countersunk head.
   1. Tapped head for attachment of cleanout wall or deck plate covers where required.

B. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Broadview, IL; Molycote 1000 by Dow Corning Corp, Midland, MI; Anti-Seize Lubricant by Loctite Corp, Newington, CT.

2.02 CLEANOUT

A. Threaded pipe fitting or cast iron ferrule with gas tight cleanout plug.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.

C. Grease Trap: Set flow control as recommended by the manufacturer's instructions.

D. Secure external components in place with vandal resistant fasteners or devices which cannot be removed without special tools.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Through Penetration Firestops: Section 078400.

B. Painting: Section 099103.

C. Pipe Hangers and Supports: Section 220529.

1.03 ABBREVIATIONS

A. FS: Federal Specification.

B. K: Thermal Conductivity, i.e., maximum Btu per inch thickness per hour per square foot.

C. pcf: Pounds per cubic foot.

D. PVC: Polyvinylchloride.

1.04 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications and installation instructions for the following:
   1. Insulation Materials.
   2. Jacket Materials.

B. Quality Control Submittals:
   1. Installers Qualification Data:
      a. Name of each person who will be performing the Work, and their employer's name, business address and telephone number.
      b. Furnish names and addresses of the required number of similar projects that each person has worked on which meet the qualifications.

1.05 QUALITY ASSURANCE

A. Qualifications: The persons installing the Work of this Section and their Supervisor shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of 5 years.

B. Regulatory Requirements:
   1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

PART 2 PRODUCTS

2.01 PIPING INSULATION

A. Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.
   1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547:
      a. Class 1 (Suitable for Temperatures Up to 450 degrees F): K of 0.26 at 75 degrees F.
   2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75 degrees F; ASTM C 547, Class 1.
   3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75 degrees F; ASTM C 553, Type III.
      a. Suitable for temperatures up to 450 degrees F.

B. Flexible Elastomeric Foam Insulation:
   1. FM tested and approved, meeting the following:

a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
b. K of 0.27 at 75 degrees F based on ASTM C 518 or C 177.
c. Fire Spread/Smoke Developed Rating: 25/50 or less based on ASTM E 84.

2. Pipe Insulation: ASTM C 534, Type I.
3. Polyethylene and polyolefin insulation is not acceptable.

C. High Density Jacketed Insulation Inserts for Hangers and Supports:
1. For Use with Fibrous Glass Insulation:
a. Cold Service Piping:
1) Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75 degrees F, minimum compressive strength of 125 psi.
b. Hot Service Piping:
1) Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300 degrees F; ASTM C 533.
2) Perlite: Minimum density 12 pcf, K of 0.60 at 300 degrees F; ASTM C 610.
2. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

D. Cements:
1. Fibrous Glass Thermal Insulating Cement: Asbestos free; ASTM C 195.
2. Fibrous Glass Hydraulic Setting Thermal Insulating and Finishing Cement: ASTM C 449/C 449M.

PART 3 EXECUTION

3.01 PREPARATION

A. Perform the following before starting insulation Work:
1. Install hangers, supports and appurtenances in their permanent locations.
2. Complete testing of piping.
3. Clean and dry surfaces to be insulated.

3.02 INSTALLATION, GENERAL

A. Install the Work of this Section in accordance with the manufacturer’s printed installation instructions unless otherwise specified.

B. Provide continuous piping insulation and jacketing when passing thru interior wall, floor, and ceiling construction.
1. At Through Penetration Firestops: Coordinate insulation densities with the requirements of approved firestop system being installed. See Section 078400.
a. Insulation densities required by approved firestop system may vary with the densities specified in this Section. When this occurs use the higher density insulation.

C. Do not intermix different insulation materials on individual runs of piping.

D. All water, soil, and waste piping exposed to freezing temperatures shall be protected from freezing by insulation, heat, or both. This included piping in unheated garages, building overhangs, and exposed storm piping.

3.03 INSTALLATION AT HANGERS AND SUPPORTS

A. Reset and realign hangers and supports if they are displaced while installing insulation.

B. Install high density jacketed insulation inserts at hangers and supports for insulated piping.

C. Insulation Inserts For Use with Fibrous Glass Insulation:
1. Where clevis hangers are used, install insulation shields and high density jacketed insulation inserts between shield and pipe.

a. Where insulation is subject to compression at points over 180 degrees apart, e.g. riser clamps, U-bolts, trapezes, etc.; fully encircle pipe with 2 protection shields and 2 high density jacketed fibrous glass insulation inserts within supporting members.
   1) Exception: Locations where pipe covering protection saddles are specified for hot service piping, 6 inch and larger.

D. Insulation Inserts For Use with Flexible Elastomeric Foam Insulation:
1. Where clevis hangers are used, install insulation shields with hardwood filler pieces, same thickness as adjoining insulation, inserted in undersized die cut or slotted holes in insulation at support points.
2. Contour hardwood blocks to match the curvature of pipe, and shield.
3. Coat dowels and blocks with insulation adhesive, and insert while still wet.
4. Vapor seal outer surfaces of dowels and blocks with adhesive after insertion.
5. Install filler pieces as follows:

PIPE/TUBING SIZE	FILLER PIECES	POSITION
Thru 1-1/2”	2 dowel plugs	6 o’clock; in tandem
2” thru 4”	1 block, 2 dowel plugs	6 o’clock, and 4 & 8 o’clock respectively
6” thru 8”	2 blocks, 4 dowel plugs	6 o’clock; in tandem and 4 & 8 o’clock; in tandem

3.04 INSTALLATION OF FIBROUS GLASS COLD SERVICE INSULATION

A. Install insulation materials with a field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket, unless otherwise specified.

B. Piping:
1. Butt insulation joints together, continuously seal minimum 1-1/2 inch wide self-sealing longitudinal jacket laps and 3-inch wide butt adhesive backed strips.
   a. Substitution: 3 inch wide pressure sensitive sealing tape, of same material as jacket, may be used in lieu of butt strips.
2. Bed insulation in a 2-inch wide band of vapor barrier mastic, and vapor seal exposed ends of insulation with vapor barrier mastic at each butt joint between pipe insulation and equipment, fittings or flanges at the following intervals:
   a. Horizontal Pipe Runs: 21 ft.
   b. Vertical Pipe Runs: 9 ft.

C. Fittings, Valves, Flanges and Irregular Surfaces:
1. Insulate with mitre cut or premolded fitting insulation of same material and thickness as pipe insulation.
2. Secure insulation in place with 16-gage wire, with ends twisted and turned down into insulation.
3. Butt insulation against pipe insulation and bond with joint sealer.
4. Insulate valves up to and including bonnets, without interfering with packing nuts.
5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
6. When insulating cement has dried, seal fitting, valve and flange insulation, by imbedding a layer of reinforcing membrane or 4 oz. canvas jacket between 2 flood coats of vapor barrier mastic, each 1/8 inch thick wet.
7. Lap reinforcing membrane or canvas on itself and adjoining pipe insulation at least 2 inches.
8. Trowel, brush or rubber glove outside coat over entire insulated surface.
9. Exceptions:
   a. Type C and D Piping Systems: Valves, fittings and flanges may be insulated with premolded PVC fitting jackets, with fibrous glass insulation inserts.

1) Additional insulation inserts are required for services with operating temperatures under 45 degrees F or where insulation thickness exceeds 1-1/2 inches. The surface temperature of PVC fitting jacket must not go below 45 degrees F.

3.05 INSTALLATION OF FIBROUS GLASS HOT SERVICE INSULATION

A. Install insulation materials with field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket unless otherwise specified.

B. Canvas Jackets on Piping, Fittings, Valves, Flanges, Unions, and Irregular Surfaces:
   1. For Piping 2 inch Size and Smaller: 4 oz per sq yd unless otherwise specified.
   2. For Piping Over 2 inch Size: 6 oz per sq yd unless otherwise specified.

C. Piping:
   1. Butt insulation joints together, continuously seal minimum 1-1/2 inch wide self-sealing longitudinal jacket laps and 3-inch wide adhesive backed butt strips.
      a. Substitution: 3 inch wide pressure sensitive sealing tape, of same material as the jacket, may be used in lieu of butt strips.
   2. Fill voids in insulation at hanger with insulating cement.
   3. Exceptions:
      a. Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Spaces and Concealed Piping: Butt insulation joints together and secure minimum 1-1/2 inch wide longitudinal jacket laps and 3 inch wide butt strips of same material as jacket, with outward clinching staples on maximum 4 inch centers. Fill voids in insulation at hangers with insulating cement.

D. Fittings, Valves, Flanges and Irregular Surfaces:
   1. Insulate with mitre cut or premolded fitting insulation of same material and thickness as insulation.
   2. Secure in place with 16-gage wire, with ends twisted and turned down into insulation.
   3. Butt fitting, valve and flange insulation against pipe insulation, and fill voids with insulating cement.
   4. Insulate valves up to and including bonnets, without interfering with packing nuts.
   5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
   6. After insulating cement has dried, coat insulated surface with lagging adhesive, and apply 4 oz or 6 oz canvas jacket as required by pipe size.
      a. Lap canvas jacket on itself and adjoining pipe insulation at least 2 inches.
      b. Size entire canvas jacket with lagging adhesive.
   7. Exceptions:
      a. In Types E, and F Service Piping Systems: Valves, fittings and flanges may be insulated with premolded PVC fitting jackets, with fibrous glass insulation inserts.
         1) Additional insulation inserts are required for services with operating temperatures over 250 degrees F or where insulation thickness exceeds 1-1/2 inches. The surface temperature of PVC fitting jacket must not exceed 150 degrees F.
      b. In Types E, and F Service Piping Systems: Insulate fittings, valves, and irregular surfaces 3 inch size and smaller with insulating cement covered with 4 oz or 6 oz canvas jacket as required by pipe size.
         1) Terminate pipe insulation adjacent to flanges and unions with insulating cement, trowelled down to pipe on a bevel.
      c. Fittings, Valves, Flanges, and Irregular Surfaces In Concealed Piping, Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Rooms, Unfinished Spaces, and Tunnels: Sizing of canvas surface is not required.

3.06 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive.
   1. Where the slip-on technique is not possible, slit the insulation and install.

2. Re-seal with adhesive, making sure the mating surfaces are completely joined.

B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.
1. Insulate threaded fittings and valves with sleeved fitting covers. Over lap and seal the covers to the adjoining pipe insulation with adhesive.

C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

D. Piping Exposed Exterior to a Building, Totally Exposed to the Elements:
1. Apply flexible elastomeric foam insulation to piping with adhesive.
2. Apply reinforcing membrane around piping insulation with adhesive or mastic.
3. Adhesive Applied System: Apply 2 coats of finish. See Section 099103.
4. Mastic Applied System: Apply another coat of mastic over reinforcing membrane.

3.07 INSTALLATION OF SHEET METAL JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum snap straps and stainless steel strapping installed with special banding wrench.

B. Jacket exposed insulated fittings, valves and flanges with mitred sections of aluminum jacketing.
1. Seal joints with sealant and secure with preformed aluminum bands.

3.08 FIELD QUALITY CONTROL

A. Field Samples: The Owner's Representative, may at their discretion, take field samples of installed insulation for the purpose of checking materials and application. Reinsulate sample cut areas.

3.09 PIPING INSULATION SCHEDULE

A. Insulate all cold service and hot service piping, and appurtenances except where otherwise specified.

B. Schedule of Items Not to be Insulated:
1. Chrome plated piping, unless otherwise specified.
2. Exposed piping in finished spaces, serving one fixture, or piece of equipment, and which connection from the main, branch, or riser, is 24 inches or less in length.
3. Water heater blow-off piping.
4. Air vents, pressure reducing valves, pilot lines, safety valves, relief valves.
5. Water meters.
6. Piping buried in the ground, unless otherwise specified herein.
7. Items installed by others, unless otherwise specified herein.
8. Sanitary drainage piping, unless otherwise specified herein.
9. Mechanical equipment with factory applied steel jacket.
10. Hot service piping 81 degrees F to 104 degrees F.
11. Flanges and unions in Type E, F, and G service piping systems.
12. Sprinkler and standpipe piping, unless otherwise specified.

3.10 COLD SERVICE INSULATION MATERIAL SCHEDULE

TYPE	SERVICE AND TEMPERATURES	INSULATION MATERIAL	PIPE SIZES (INCHES)	MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES)
C	Fluids (except domestic cold water) 40 F to 80 F.	Flex. Elastomeric Foam or Fibrous Glass	1-1/2 & less	1

			Over 1-1/2	1-1/2
D	Domestic cold water, and as specified. 33 F to 80 F.	Flex. Elastomeric Foam or Fibrous Glass	All Sizes	1/2

A. NOTES:
1. Sprinkler and Standpipe Piping (First 10 feet connected to domestic water main within building): Insulate with same materials and thicknesses specified for domestic cold water.
2. Roof Drain Bodies Below Roof, Horizontal Conductor Piping Including Drops, and First Fitting on Vertical conductor: Insulate with same materials and thicknesses specified for domestic cold water.
3. Piping Serving Handicapped Accessible Lavatories:
   a. Insulate exposed hot and cold water supply, and waste piping with under lav piping protection cover. Install fasteners thru each pair of holes in insulated safety wrap.

3.11 HOT SERVICE INSULATION MATERIAL SCHEDULE

	SERVICE AND TEMPERATURES	INSULATION MATERIAL	PIPE SIZES (INCHES)	MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES)
E	Water and other fluids 105 F to140 F.	Flex. Elastomeric Foam or Fibrous Glass	1-1/2 & Less Over 1-1/2	1 2
F	Water and other fluids 141 F to 250 F.	Fibrous Glass	6 & Less 8 & Up	2 2-1/2

3.12 SCHEDULE OF METAL JACKETING FOR INSULATED PIPE

A. Piping Exterior to Building: Jacket insulated piping with circumferentially corrugated aluminum jacketing.
1. Lap longitudinal and circumferential joints a minimum of 2 inches.
2. Secure jacketing in place with 1/2 inch x 0.020 inch thick aluminum bands secured with aluminum wing type seals, on maximum 12 inch centers.
3. Cover insulated fittings, valves, and offsets with mitered sections of jacketing. Seal joints with metal pipe jacket sealant, and secure with aluminum strapping and wing seals.
4. Factory fabricated, preformed fitting covers of same material as jacketing may be used instead of mitered jacketing.
5. Install jacketing so as to avoid trapping condensation and precipitation.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe insulation.

B. Insulate piping as indicated on contract drawings.

1.02 REFERENCES

A. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

B. ASTM C533 - Specification for Calcium Silicate Block and Pipe Thermal Insulation.

C. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

D. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

E. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E96 - Test Method for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Submit the following in accordance with the requirements contained in Section 013300:
   1. Product Data: Provide product description, list of materials and thickness for each
   2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable workmanship and installation standards will be achieved.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements contained in Section 016500.

B. Deliver, store and protect products in accordance with manufacturer's instructions.

C. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Store insulation in original wrapping and protect from weather and construction activities.

E. Protect insulation against dirt, water, chemical, and mechanical damage.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.06 QUALITY ASSURANCE

A. Work of this Section shall be performed by persons experienced in the installation of the specified system.

B. If requested by the Engineer, submit documentation relative to the installer's qualifications. The Owner and Engineer may elect to visit the installer's previous work.

C. Submit at least three references who may be contacted regarding the installer's qualifications.

PART 2 - PRODUCTS

2.01 ELASTOMERIC INSULATION - PIPING 4-INCHES AND GREATER

A. Manufacturers: Armacell Engineered Foams, ArmaTuff White or equal.

B. Insulation:
   1. Flexible elastomeric, closed cell insulation with laminated painted composite exterior.
   2. Sheet Thickness: 1-1/2” (non self-adhering).
   3. Minimum Service Temperature: -297° F.

4. Maximum Service Temperature: 180° F.
5. Maximum Moisture Absorption: 0.2% by volume.

C. Insulation Adehsive:
1. Armaflex 520 or equal (adhere butt joints and seams only).

D. Insulation Tape:
1. ArmaTuff Seal Tape or equal.

E. Fire and Smoke Hazard Ratings: Class 1 and 2 jacketing materials, mastics, sealants and adhesives shall have a maximum flamespread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.

2.02 ELASTOMERIC INSULATION - PIPING LESS THAN 4-INCHES

A. Manufacturers: Armacell Engineered Foams, AP/Armaflex Black LapSeal or equal.

B. Insulation:
1. Flexible elastomeric, closed cell insulation with a self-seal system reinforced with lap seal tape.
2. Sheet Thickness: 1” (non self-adhering).
3. Minimum Service Temperature: -297° F.
4. Maximum Service Temperature: 220° F.
5. Maximum Moisture Absorption: 0.2% by volume.

C. Fire and Smoke Hazard Ratings: Insulation system shall have a maximum flamespread rating of 25 and a maximum fuel contributed and smoke developed rating of 50 or less, when tested in accordance with ASTM E84 and UL723.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed and dry.

C. Paint piping before insulation is installed. Painting shall be work of Section 099744.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Minimum pipe insulation thickness shall be in accordance with New York State Energy Conservation Construction Code requirements

C. Inserts and Shields:
1. Application: All piping regardless of size.
2. Shields: 304L Stainless steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping, and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Cork or other heavy density insulating material suitable for the planned temperature range.
6. Neatly finish insulation at supports, protrusions, and interruptions.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. Quality Control Submittals
   1. Test Reports (Field Tests): Submit data for each system tested, and/or disinfected; include date performed, description, and test results for each system.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.
   2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.03 PROJECT CONDITIONS

A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gages for field testing of systems.

1.04 SEQUENCING AND SCHEDULING

A. Transmit written notification of proposed date and time of operational tests to the Owner's Representative at least 5 days in advance of such tests.

B. Perform cleaning and testing Work in the presence of the Owner's Representative.

C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems, or temporary valves or caps as required to perform the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Test Equipment and Instruments: Type and kind as required for the particular system under test.

B. Test Media (air, vacuum, water): As specified for the particular piping or system under test.

C. Cleaning Agent (water): As specified for the particular piping, apparatus or system being cleaned.

PART 3 EXECUTION

3.01 PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

3.02 PRESSURE TESTS - PIPING

A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.

B. Water Systems:
   1. Domestic water (potable cold, domestic hot and recirculation) inside buildings:
      a. Before fixtures, faucets, trim and accessories are connected, perform hydrostatic test at 125 psig minimum for 4 hours.
      b. After fixtures, faucets, trim and accessories are connected, perform hydrostatic retest at 75 psig for 4 hours.

C. Gas Piping: Before backfilling or concealment perform air test of duration and pressure as required by the local gas company. However, for gas piping designed for pressures of from 4 inches to 6 inches water column, air test at 15 inches Hg for one hour, without drop in pressure. Test gas piping with air only. Check joints for leaks with soap suds.

D. Air Piping:
   1. Compressed Air: Test with air at 150 psig for one hour.
   2. Check joints for leaks with soap suds.

E. Vacuum Piping: Perform air test at 150 psig for one hour, followed by a vacuum test of 25 inches Hg for one hour, during which time the mercury shall remain stationary for the last 30 minutes of test.

F. Gasoline Piping: As Specified under the Section entitled “Fuel Dispensing System”.

G. Drainage, Vent, Conductor and Roof Drain Piping (Inside Buildings): Perform tests before fixtures are installed. Test by filling the entire system with water, and allowing to stand for 3 hours, with no noticeable loss of water. Test joints under a minimum head of 10 feet of water, except the uppermost section. Test the uppermost section to overflowing.

3.03 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.04 DISINFECTION OF POTABLE WATER SYSTEMS

A. Disinfect potable water pipe and equipment installed in the Work of this Contract.
   1. Completely fill the piping, including water storage equipment if installed, with a water solution containing 50 mg/L available chlorine, and allow stand for 24 hours. Operate all valves during this period to assure their proper disinfection.
   2. After the retention period, discharge the solution to an approved waste and flush the system thoroughly with water until substantially all traces of chlorine are removed. Drain and flush water storage equipment if installed.

B. Connect plumbing fixtures and equipment and place the system into service. Prevent recontamination of the piping during this phase of the Work.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Domestic water piping and fittings

B. Sanitary and storm piping and fittings

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Through Penetration Firestops: Section 078400.

B. Sealants: Section 079200.

1.03 SUBMITTALS

A. Product Data:
   1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
   2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

B. Quality Control Submittals
   1. Copy of hydraulic press fitting manufacturer's printed field inspection procedures for hydraulic press joints in domestic tubing.

PART 2 PRODUCTS

2.01 STEEL PIPE AND FITTINGS

A. Steel Pipe for Threading: Standard weight, Schedule 40, black or galvanized; ASTM A 53 or ASTM A 135.

B. Cast Iron Fittings:
   1. Drainage Pattern, Threaded: ASME B16.12.

2.02 COPPER AND BRASS PIPE, TUBING AND FITTINGS

A. Copper Tube, Types K, L, and M: ASTM B 88.

B. Wrot Copper Tube Fittings, Solder Joint: ASME B16.22.

C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.

D. Drainage Tube, Type DWV: ASTM B 306.

E. Wrot Copper Drainage Tube Fittings, Solder Joint: ASME B16.29.

F. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23.

G. Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solder joint.

H. Plumber's Tube: Seamless, semi-annealed, minimum 65 percent copper, No. 18 B & S Gage.

I. Flared Tube Fittings:
   1. Water Tube Type: ASME B16.26.

J. Flanges: Conform to the Standards for fittings used in systems.
   1. Brazing Flanges: ASME B16.24, hubs modified for brazing ends.

2.03 HYDRAULIC PRESS FITTINGS FOR COPPER TUBING

A. Acceptable Fittings:
   1. ProPress by Viega, 301 N. Main, Wichita, KS 67202, (877) 843-4262, www.viega.com.
   2. Operating Conditions:
      a. Maximum Operating Pressure: 200 psi.
      b. Operating Temperature Range: 0-250 degrees F.
      c. Maximum Test Pressure: 600 psi.

d. Maximum Vacuum: 29.2 inches hg @ 68 degrees F.

3. Features:
   a. Fittings: Copper and copper alloy conforming to material requirements of ASME B16.18 or ASME B16.22.
      1) Stainless Steel Grip Ring: Adds strength to the joint without collapsing the interior passageway
   b. No flame for soldering required for installation of fittings and valves.
   c. Unpressed connections identified during pressure testing when water flows past sealing element.
   d. Sealing Elements: Factory installed, EPDM.
   e. Fittings that have been pressed can be rotated. If rotated more than 5 degrees, the fitting must be repressed to restore its resistance to rotational movement.
   f. Extended fitting end lead allows for twice the retention grip surface, and assists with proper tube alignment.
   g. Soldered adapter fittings are not allowed.

2.04 CAST IRON PIPE AND FITTINGS

A. Bell and Spigot Soil Pipe: Service Weight, Bitumin coated; ASTM A 74.

B. Bell and Spigot Soil Pipe Fittings: Service Weight, Bitumin coated; ASTM A 74.

C. Hubless Pipe: Bitumin coated; Cast Iron Soil Pipe Institute Standard No. 301.

D. Hubless Pipe Fittings: Drainage Pattern, Bitumin coated; Cast Iron Soil Pipe Institute Standard No. 301.

E. Hubless Joint Couplings: Stainless steel shield and clamp assembly, and elastomer sealing sleeve; CISPI-310.

F. Water Pipe Fittings: Bitumin coated, cement-mortar lined; AWWA C110.

2.05 DUCTILE IRON PIPE AND FITTINGS

A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.
   1. 3 and 4 Inch Sizes: Class 51.
   2. 6 inch Size and Over: Class 50.

B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

2.06 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

A. Couplings: Grinnell Corp.'s Rigidlok Fig. 7401, or Victaulic Co.'s Style 107, having minimum pressure rating of:
   1. 750 psi from 1-1/2 inch to 4 inch.
   2. 700 psi for 6 inch.
   3. 600 psi for 8 inch.
   4. Couplings: Gustin-Bacon Inc.'s No. 100 Gruvagrips, or Victaulic Co.'s Style 77, having pressure rating of:
      a. 1000 psi for 3/4 inch to 6 inch.
      b. 800 psi for 8 inch to 12 inch.
      c. 300 psi for 14 inch to 24 inch.
   5. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:
      a. Steel: ASTM A 53 or A 106, Grade B.
      b. Malleable Iron: ASTM A 47.
      c. Ductile Iron: ASTM A 536.

2.07 JOINING AND SEALANT MATERIALS

A. Thread Sealant:
   1. LA-CO Industries', Slic-Tite Paste with Teflon.

2. Loctite Corp.'s No. 565 Thread Sealant.
3. Thread sealants for potable water shall be NSF approved.

B. Solder: Solid wire type conforming to the following:
1. Type 3: Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB); Engelhard Corp.'s Silvabrite 100, Federated Fry Metals' Aqua Clean, or J.W. Harris Co. Inc.'s Stay-Safe Bridgit.

C. Soldering Flux for Soldered Joints: All-State Welding Products Inc.'s Duzall, Engelhard Corp.'s General Purpose Liquid or Paste, Federated Fry Metals' Water Flow 2000, or J.W. Harris Co. Inc.'s Stay-Clean.

D. Lead for Calking Joints in Cast Iron Soil Pipe: ASTM B 29 for pig lead.

E. Joint Packing:
1. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504) 466-1484.
2. Acid Resistant Joint Packing: Sealite Inc.'s Red Stripe, Asbestos-Free Acid-Resistant White Oakum, No. 312.

F. Gaskets For Use With Ductile Iron Water Pipe and Cast Iron Drainage Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.

G. Flange Gasket Material:
1. For Use with Cold Water: 1/16 inch thick rubber.
2. For Use with Hot Water, or Air : Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.

H. Gaskets For Use With Grooved End Pipes and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

2.08 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504)466-1484.

2.09 DIELECTRIC CONNECTORS

A. Dielectric Fitting: Bronze ball valve with end connections and pressure rating to match associated piping.
1. Nipples with inert non-corrosive thermoplastic linings are not acceptable.
2. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.
a. Rated 150 psi at 250 degrees F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and mylar sleeves; Model 150 by APS, Lafayette, LA 70596, (337) 233-6116.

2.10 PIPE SLEEVES

A. Type A: Schedule 40 steel pipe.

B. Type B: No. 16 gage galvanized sheet steel.

C. Type C: Schedule 40 steel pipe with 1/4 inch steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

D. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

2.11 FLOOR, WALL AND CEILING PLATES

A. Cast Brass: Solid type with polished chrome plated finish, and set screw.
   1. Series Z89 by Zurn, 929 Riverside Drive, Grosvenordale, CT 06255, (800) 243-1830.
   2. Model 127XXXX by Maguire Mfg., Cheshire CT 06410, (203) 699-1801.
   3. Stamped Steel: Split type, polished chrome plated finish, with set screw.
      a. Figures 2 and 13 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
   4. Cast Iron or Malleable Iron: Solid type, galvanized finish, with set screw:
      a. Model 395 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
      b. Model 900-016XX by Landsdale International, Westville, NJ 08093, (800) 908-0523.

2.12 FLEXIBLE CONNECTIONS

A. Underground Application:
   1. Acceptable Companies:
      a. Titeflex Inc., Springfield, MA.
      b. Flex-ing, Sherman, TX.
   2. Features:
      a. Construction: Stainless steel innercore covered with braided Type 304 stainless steel outer jacket.
      b. UL listed for underground fuel storage tank systems.
      c. Permanently crimped stainless steel collars with one threaded end and one threaded swivel end.

B. Underground or Above Ground Application:
   1. Acceptable Companies:
      a. Titeflex Inc., Springfield, MA.
      b. Flex-ing, Sherman, TX.
   2. Features:
      a. Construction: Convoluted, Type 321 stainless steel inner core, minimum .012 inch wall thickness covered with braided Type 304 stainless steel outer jacket.
      b. UL listed for above ground and underground use.
      c. Factory installed male swivel on one end.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping at approximate locations indicated, and at maximum height.

B. Install piping clear of door swings, and above sash heads.

C. Make allowances for expansion and contraction.

D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.

E. Install horizontal piping with a constant pitch, and without sags or humps.
   1. Water Piping: Pitch 1/4 inch per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch, establish a new low point and continue. At the low point, provide a 1/2 inch drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.
   2. Drainage Piping: Pitch 1/4 inch per foot downward, in direction of flow, unless otherwise noted.
   3. Vent Piping: Pitch 1/4 inch per foot upward, unless otherwise noted.

F. Install vertical piping plumb.

G. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube.

H. Cut pipe and tubing ends square; ream before joining.

3.02 DRAINAGE SYSTEMS

A. Fittings:
   1. Use long turn drainage pattern fittings, unless space conditions prohibit their use; in such cases, short turn pattern fittings may be used.
   2. Vertical Offsets: Make vertical offsets with 45 degree elbows, or 1/8 bends.
   3. Tucker Fittings: Tucker fittings may only be installed in vertical piping.

B. Cleanouts:
   1. Install cleanouts with sufficient side and end clearance to allow for the removal of the cleanout plug, and the use of cleaning tools.
   2. Lubricate cleanout plugs with anti-seize lubricant.

3.03 DOMESTIC WATER PIPING SYSTEM

A. Connect runouts to the upper quadrant of the main, and run upward at not less than 45 degrees before extending laterally.

B. Make final connections to plumbing fixtures and equipment with unions, or flanges:
   1. Do not use unions in ferrous piping larger than 3 inches.
   2. Do not use unions in brass or copper piping larger than 2 inches.

3.04 PIPE JOINT MAKE-UP

A. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type solder specified. Remove residue.

B. Flanged Pipe Joint:
   1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
   2. Provide a gasket for each joint.
      a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.
      b. Air Pipe Gasket: Coat with a thin film of oil before making up joint.
   3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

C. Calked Joint: Pack hub with joint packing specified, and calk. Run 12 ounces molten lead for each inch of pipe diameter. Calk cooled lead ring and face off smoothly.

D. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.

E. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.
   1. Cut grooved end piping is not acceptable.

F. Hubless CI Pipe Joint: Make up joint with hubless fitting and couplings, in conformance with the manufacturer's printed installation instructions.

G. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.

H. Polyethylene Containment Pipe Joint: Follow manufacturer's printed installation instructions.

I. High Density Polyethylene Pipe Joint (HDPE): Follow manufacturer's printed installation instructions.

J. Hydraulic Pressed Joint: Follow manufacturer's printed installation instructions.

K. Dissimilar Pipe Joint:
   1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and calk into the cast iron bell.
   2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.

3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
4. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.
5. Joining FRP and Threaded Pipe: Make up connection with adapters as recommended by manufacturers of piping being joined.

3.05 PIPING PENETRATIONS

A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

CONSTRUCTION	SLEEVE TYPE
Frame construction	None Required
Foundation walls	A*
Non-waterproof interior walls	B*
Non-waterproof interior floors on metal decks.	D*
Non-waterproof interior floors not on metal decks	B*
Floors not on grade having a floor drain	A
Floors over mechanical equipment, steam service, machine, and boiler rooms	A
Floors finished or to be finished with latex composition or terrazzo, and on metal decks	D*
Floors finished or to be finished with latex composition or terrazzo, and not on metal decks	A
Earth supported concrete floors	None Required
Exterior concrete slabs on grade	A
Fixtures with floor outlet waste piping	None Required
Metal roof decks	C
Non-metal roof decks	A
Waterproof floors on metal decks	D
Waterproof floors not on metal decks	A
Waterproof walls	A
*Core drilling is permissible in lieu of sleeves where marked with asterisks.	

B. Diameter of Sleeves and Core Drilled Holes:
1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.
2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
   a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
   b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.
   c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.
3. Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13.

C. Length of Sleeves (except as shown otherwise on Drawings):
   1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.
   2. Floors with Finish: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:
      a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.
   3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.
   4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

D. Packing of Sleeves and Core Drilled Holes:
   1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.
   2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
      a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.
   3. Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top of sleeve and finish the remainder with sealant. See Section 079200.
      a. Sealant Types:
         1) Piping Conveying Materials up to 140 degrees F other than Motor Fuel Dispensing System Piping: Type 1C (one part).
      b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.

E. Weld metal collars of Type C and D sleeves to the upper surface of the metal deck. Seal voids under the metal collar as recommended by the manufacturer of the metal deck.

3.06 FLOOR, WALL AND CEILING PLATES

A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:
   1. In Finished Spaces:
      a. Piping 4 Inch Size and Smaller: Solid or split, chrome plated cast brass.
      b. Piping Over 4 Inch Size: Split, chrome plated cast brass.
      c. Unfinished Spaces (Including Exterior Concrete Slabs): Solid, unplated cast iron.
      d. Fasten plates with set screws.
      e. Plates are not required in pipe shafts or furred spaces.

3.07 PIPE AND FITTING SCHEDULE

A. Where options are given, choose only one option for each piping service. No deviations from the selected option will be allowed.

B. Domestic Water (Above Ground):
   1. 3 inch and Under: Type L hard drawn copper tube, with cast copper alloy or wrot copper solder type fittings, and joints made up with Type 3 solder, or hydraulic press joints.
   2. 4 inch and Over: Coated ductile iron water pipe and fittings, with mechanical or push-on joints installed as per manufacturer’s instructions.

C. Domestic Water (Below Ground):
   1. 2-1/2 inches and Under: Type K soft annealed copper tube with water tube type flared fittings.
   2. 3 inches and Over: Coated ductile iron water pipe and fittings, with mechanical or push-on joints.

D. Drainage (Sanitary) Above Ground:
   1. Service weight, coated, cast iron bell and spigot pipe and fittings with calked joints.

2. Service weight, coated, cast iron bell and spigot pipe and fittings with rubber ring push-on joints.
3. Hubless, coated, cast iron pipe, fittings, and joint couplings.
4. DWV copper tubing, with cast brass or wrot copper drainage pattern fittings, and joints made with Type 3 solder.

E. Drainage (Storm) Above Ground:
1. Service weight, coated, cast iron bell and spigot pipe and fittings, with calked joints.
2. Service weight, coated, cast iron bell and spigot pipe and fittings, with rubber ring push-on joints.
3. Hubless, coated, cast iron pipe, fittings and joint couplings.
4. DWV copper drainage tube, with cast copper alloy or wrot copper drainage pattern fittings, and joints made up with Type 3 solder.

F. Drainage Piping (Below Ground):
1. Option No. 1: Extra heavy weight, coated, cast iron bell and spigot pipe and fittings, with calked joints.
2. Option No. 2: Extra heavy weight, coated, cast iron bell and spigot pipe and fittings, with rubber ring push-on joints.

G. Vent Piping: Same materials that are used for piping system to which vent is connected.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Copper piping, valves and accessories

B. PVC piping, valves and accessories

C. Reinforced flexible tubing and accessories

D. Stainless steel piping, valves and accessories

1.02 RELATION SECTIONS

A. Section 220529 - Hangers and Supports for Piping

B. Section 220553 - Identification for Mechanical Piping and Equipment

C. Section 331140 - Disinfection of Water Facilities

1.03 REFERENCES

A. ASME B16.3 - Malleable Iron Threaded Fittings

B. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings

C. ASME B31.3 - Process Piping

D. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

E. ASTM A120 - Pipe, steel, black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses

F. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service

G. ASTM A403 - Wrought Austenitic Stainless Steel Fittings

H. ASTM B42 - Seamless Copper Pipe

I. ASTM B88 - Seamless Copper Tube

J. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications

K. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

L. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120

M. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

N. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

O. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)

P. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

Q. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing

R. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

S. AWWA C800 - Underground Service Line Valves and Fittings

T. AWWA C901 - Polyethylene Pressure Pipe and Tubing, 1/3" to 3", for Water Service

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, hydrants and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with the local water utility company requirements.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016500.

B. Deliver and store items in shipping containers with labeling in place.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual locations of piping mains, valves, connections and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Provide manufacturer's standard warranty for all applicable items under provisions of Section 017800.

PART 2 - PRODUCTS

2.01 COPPER PIPING, VALVES AND ACCESSORIES

A. All exposed small copper piping shall be Type "K" hard drawn copper tubing. All underground piping shall be soft annealed Type "K" copper tubing with compression fittings.

B. All brass valves and fittings installed on potable water supply piping shall be made of "low-lead" materials (UNS Copper Alloy C89833 or C89520) and have a maximum lead content of 0.25 percent by weight. All low lead brass fittings shall be stamped or embossed with a mark indicating that the product is manufactured from low-lead alloys.

C. Ball valves for copper piping/tubing and galvanized piping shall be renewable reinforced Teflon seats, adjustable packing gland, non-blowout stem with run port opening. Ball valves shall be STOCKHAM Figure T or S-285 (threaded or soldered ends).

2.02 PVC PIPING, VALVES AND ACCESSORIES

A. PVC piping for all interior and exterior applications shall be polyvinyl chloride, Class 1245-B, Schedule 80, and shall conform to ASTM Specifications D2267, D2241, D1784 and D1785. All PVC piping shall conform to NSF-61 and be approved for potable water applications. Pipe shall be as manufactured by SPEARS or approved equal. Fittings for PVC piping shall conform to ASTM D2467 and be slip type and shall be of the same schedule approved for use by the pipe manufacturer. Pipe shall bear the trademark of the manufacturer.

B. Transitions from PVC to poly-tubing shall be made with barbed fittings and stainless clamps, or approved equal.

C. Ball valves shall be double union/double block with PVC body, ball, insert and stainless steel rod and stem with Teflon seats, SPEARS or approved equal.

D. Check valves shall be of the true union ball check type with a PVC body construction. The valves shall be rated at 150 psi. The valves shall be manufactured by SPEARS or approved equal.

E. Unions shall be UL listed, Oring unions with Teflon gaskets by SPEAR or approved equal.

F. Threads and dimensions: ANSI B1.1 and B18.2.

G. All wetted parts of PVC piping, valves and accessories shall be compatible with treatment chemicals.

H. Thread lubricant: Crane "Formula 425", or equal. (NOTE: Approved Teflon tape may be used).

I. Gaskets: Full face, 1/8-inch thick neoprene rubber.

J. Solvent welded joints for chemical piping shall be made using solvent cement that meets or exceeds ASTM F493, compatible with PVC pipe and fittings. Solvent cement shall be Low

V.O.C., Heavy Duty Gray Industrial solvent cement by Oatey; Model EP42 or specifically approved equal.

K. Pressure connections to pressure switches, recorders, and indicating gauges shall be equipped with a snubber.

2.03 REINFORCED FLEXIBLE TUBING

A. HDPE translucent tubing, compatible with chemical transported, minimum 190 psi working pressure at 70F for 1/2" to 3/4" O.D. Install high pressure PVC compression fittings all connections to tubing.

2.04 STAINLESS STEEL PIPING AND ACCESSORIES

A. Standard weight, Schedule 40, two-ferrule type tube fitting connections, conforming to ASTM A269. All tubing, fittings, and valves shall be 316 stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Clean inside of piping and tubing before installation. Keep installed piping clean and protect ends from foreign matter by capping or plugging.

B. Install piping and tubing so that it does not interfere with opening of doors or apparatus, access to equipment or any portion of electrical equipment.

C. Run piping and tubing in straight lines and square with building. Install rise plumb. Make offsets only where indicated and where necessary.

D. Install pipes so that expansion and contraction will not cause undue stress or strain to pipes or equipment. Provide offsets and expansion joints as shown on drawings.

E. Provide flanges and unions throughout the piping systems to make installation and removal of piping and equipment convenient. Make provisions for servicing and removal of equipment without dismantling piping.

F. Support pipe in accordance with provisions of Section 220529.

G. Install non-conducting dielectric connections wherever joining dissimilar metals.

H. Install valves with stems upright or horizontal.

I. Install water service lines in accordance with water utility standards.

J. All copper piping shall be cut square, burrs removed and reamed after cutting. Fitting sockets and tube ends shall be thoroughly cleaned to a bright finish. All solder joints shall be fluxed and soldered using 95-5 tin and antimony solder and water soluble flux.

K. All copper tubing connections shall be compression type.

L. Joints between PVC and Black Iron/Galvanized Pipe (wherever necessary), shall be made with screwed fittings or screwed companion flanges.

M. PVC piping and fittings connections to treatment equipment and at ends of runs shall have screw type joints. In all other locations, solvent welded slip type joints shall be used.

N. Solvent welded joints shall be made using solvent cement that meets or exceeds ASTM F493, compatible with PVC pipe and fittings. Solvent cement shall be Heavy Duty Industrial orange solvent cement by Oatey, or specifically approved equal.

O. Install PVC pipe in such a manner that it is not forced out of line by pipe supports, hangers or other supporting members. Pipe hangers shall be clevis or strap type.

P. Threaded joints where specified shall be made using standard hand or machine pipe threading tools. Dies must be sharp and in good condition to assure a clean and smooth threading operation from start to finish. Threads shall be full cut and perfect. Protective pads of leather, rubber or felt shall be employed to prevent damage to pipe walls by chuck and/or vise jaws. A

slightly tapered wood plug shall be tapped snugly into the pipe for the length of thread to prevent distortion of the pipe wall by the die.

Q. Threaded pipe joints shall be made up using Teflon base compounds placed on the pipe threads. Do not place compound on threads of fittings. NO WICKING WILL BE PERMITTED.

R. All fittings, except couplings, shall be supported and valves shall be braced to resist torque during valve manipulation.

S. All piping shall be free of traps and graded to permit complete drainage.

T. Connect reinforced flexible tubing to transition couplings with stainless steel clamps and/or compression fittings in accordance with tubing manufacturer's installation instructions.

3.02 FIELD QUALITY CONTROL

A. Flush piping prior to conducting pressure testing.

B. Piping shall be pressure tested with air before piping is concealed. All joints shall be checked for leakage while under air pressure by swabbing, utilizing a soap and water solution, and leaks found shall be repaired and rechecked. Pressure of air during testing shall be at least 50 percent higher than normal working pressure. Piping shall be tested for pressure and leakage in accordance with Section 017500.

C. Before piping and valves are concealed, recheck it for leaks.

D. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Peening, caulking and doping are not permitted.

E. The Contractor shall furnish all labor, materials and equipment necessary to accomplish all testing and repairs.

3.03 VALVE ACCESS

A. Locate shutoff and control valves for easy access and operation. Where valves are located in enclosed spaces provide and install access doors.

3.04 TESTING

A. All small piping shall be tested for pressure and leakage, in accordance with AWWA Specification C600.

3.05 EXTRAS

A. Provide District with three (3) 100-foot sections of poly-tubing (one for each chemical treatment system). Size appropriately, as indicated on the drawings.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hydro pneumatic water tank & accessories

1.02 RELATED SECTIONS

A. Section 099870 - Steel Tank Coating System

B. Section 221113 - Facility Piping

C. Section 331140 - Disinfection of Water Facilities

1.03 QUALITY ASSURANCE

A. Governing Standards:
   1. ASTM Specification A36 - Structural Steel
   2. STI - Steel Tank Institute for Fabrication of Steel Water Storage Tanks.
   3. ASME Boiler & Pressure Vessel Code Section VIII, Division 1, Rules for Construction of Pressure Vessel
   4. ANSI/AWWA C509 - Disinfection of Water Storage Facilities
   5. ANSI/AWWA D100 - Welded Carbon Steel Tank for Water Storage
   6. ANSI/AWWA D102 - Coating Steel Water Storage Tanks
   7. ANSI/NSF Standard 61

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Drawings shall include all critical dimensions and show locations of all fittings and accessories, such as saddles and couplings. Materials of construction shall be in accordance with Section 1.03 of this specification.

C. Catalog Data: Manufacturer's literature on tank and air charge system.

D. Installation Instructions: Submit copy of manufacturer's latest installation instructions.

E. Certificates of Conformance: Submit written certification from the tank manufacturer that tank conforms to the requirements of this specification section.

PART 2 - PRODUCTS

2.01 HYDRO-PNEUMATIC TANK

A. The tank shall be constructed of welded steel construction and shall be designed, fabricated, tested and stamped according to ASME standards.

B. Horizontal hydro-pneumatic tank shall be approximately 27’-3” in length by 6'-0" diameter. Tank shall have a 5000 gallon capacity with a design pressure of 100 pounds per square inch.

C. Manufacturer:
   1. Highland Tank
   2. Specifically approved equal.

D. Tanks shall rest on saddles as fabricated by the tank manufacturer. Quality and spacing of saddles shall comply with the manufacturer’s recommendations. Supports shall be fully capable of supporting tank when filled with water.

E. The face of the tank shall be fitted with one (1) 12” x 16” elliptical manhole, completely welded to the tank with a bolted and gasketed plate cover.

F. The face of the tank shall be fitted with two (2) 2-inch diameter, 150 pound flanges for influent and effluent piping. Flanges shall be completely welded to the tank and shall be installed to facilitate a horizontal connection to water piping. Extend flanges 4-inches from face of tank.

G. The face of the tank shall be fitted with couplings and half couplings completely welded to the tank, located as shown on the contract drawings with accessories as mentioned below:

1. One (1) 1-inch coupling for air inlet.
2. One (1) 2-inch coupling for pressure gauge and switch.
3. One (1) 2-inch coupling for sight tube.

H. The tank shall be labeled with a metallic, engraved plate permanently affixed to the tank. Plate shall contain year of manufacture of the tank, manufacturer's name, ASME identification number, tank model number, capacity and dimensions, design ratings and manufacturer's identification number. A second plate as above, but also containing the date of tank installation, shall be permanently affixed adjacent to the first. Protect plates during painting.

I. The interior of the tank shall be painted with an NSF approved epoxy coating in accordance wit Section 099870. Coating system shall be such as to be compatible with the specified tank warranty.

J. The exterior of the tank shall be painted white in accordance with Section 099870. Coating system shall be such as to be compatible with the specified tank warranty.

2.02 ACCESORIES

A. Air Charging System:
1. The air charging system shall be Air Rite Control Model Number D610 as manufactured by Whitewater Manufacturing Co.
2. The unit shall be a completely self contained air charging system with three basic components including an oil-less air compressor, an encapsulated solid state liquid level switch (with isolated electrode circuit and time delay), and a pressure switch. Vibration damper and ambient temperature thermostat are also included. All components shall be enclosed in a fiberglass cover, rendering the entire unit weather proof.
3. Unit shall be mounted as indicated on plans.
4. Liquid level switch and pressure switch shall control the air compressor.
5. Pressure switch settings shall be adjusted in field.
6. Power requirements: 50 Amps, 115/230 Volt, single phase.

B. Level Gauge
1. Controler: Warrick Conductivity Sensor Model 3N.
2. Electrodes: Warrick 3R rigid electrodes

PART 3 - EXECUTION

3.01 PREPARATION

A. Pipe connections shall be covered for protection and to prevent entrance of foreign matter during shipment and while awaiting installation.

B. Prior to shipment, verify location and sizes of all openings in hydro-pneumatic tank.

3.02 INSTALLATION

A. The hydro-pneumatic tank, air charging system, and accessories shall be installed, filled and pressurized in strict accordance to the respective manufacturer’s written instructions and the requirements of the Steel Tank Institute (STI).

B. Equipment to lift the tank shall be of adequate size to lift and lower the tank without dragging and dropping to ensure no damage to the tank or the coating.

C. The tank shall be carefully lifted and lowered by use of cables or chains of adequate length (not less than 45° included angle) attached to the lifting lugs provided. A spreader bar should be used where necessary. Under no circumstances use chain or slings around the tank shell.

D. The tank shall be supported on saddles provided by the tank manufacturer.

E. Backfill as required.

3.03 WARRANTY

A. Hydro-pneumatic tank shall be provided with standard manufacturer's warranty against leakage from corrosion. Warranty shall meet the standards of STI and copies of the STI warranty and supporting documents shall be delivered to the Owner prior to final payment on the project. The serial number of the tank and corresponding warranty shall be registered with STI.

B. Air charging system shall be provided with standard manufacturer’s warranty on all parts and workmanship.

3.04 TESTING AND STARTUP

A. The tank and piping systems shall receive a final precision tank test as performed by a certified tank tester. Written copies of all tests shall be delivered to the Owner.

B. The air charging system shall be tested in strict accordance with manufacturer’s instruction and demonstrate performance requirements.

C. The Contractor shall provide all materials and labor to startup and shall instruct Owner in their use.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lavatory

B. Supports and supporting devices for wall-mounted lavatories, sinks, and equipment

C. Countertop sink

D. Vitreous china water closets

E. Vitreous china urinals

F. Urinal carrier

G. Flush valves

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Sealants: Section 079200.

1.03 SUBMITTALS

A. Product Data: Catalog sheets, specifications, roughing dimensions, and installation instructions for each item specified except fasteners.
   1. Deliver cut out data for countertop fixtures to the Owner's Representative.

B. Samples:
   1. Water Closet Seat: One seat if other than product specified. Sample will be returned and if approved, may be installed on the Project.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with applicable requirements of FS WW-P-541, and the following standards:
      a. ANSI/ASME A112.6.1M - Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
      b. ANSI/ASME A112.18.1M - Plumbing Fixture Fittings.
      c. ANSI/ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
      d. ANSI/ASME A112.19.2M - Vitreous China Plumbing Fixtures.
      e. ANSI/ASME A112.19.6 - Hydraulic Requirements for Water Closets and Urinals.
   2. Materials and installations designated as handicapped accessible shall conform with the following:
      a. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
      b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).
      c. The Uniform Federal Accessibility Standards (UFAS), (Appendix A to 41 CFR Part 101-19.6).
   3. Each fixture carrier support shall be listed by model number in the fixture support manufacturer's Fixture Support Selection Guide as being recommended for support of the appropriate fixture.

B. Plainly and permanently mark each fixture and fitting with the manufacturer's name or trade mark.

C. Acid resistant surfaces shall be plainly and permanently marked with the manufacturer's label or symbol indicating acid resistance.

1.05 MAINTENANCE

A. Special Tools: Deliver to the Owner's Representative.
   1. Furnish the following tools labeled with names and locations where used.
      a. Keys for stops (furnished with stops).
      b. Tools for Vandal Resistant Fasteners: Two for each type and size.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Vitreous China: First quality, smooth, uniform color and texture, with fused on glaze covering surfaces exposed to view.
   1. Surfaces shall be free of chips, craze, warpage, cracks and discolorations. Surfaces in contact with walls or floors shall be flat, with warpage not to exceed 1/16 inch per foot.
   2. Color: White.

B. Porcelain Enameled Cast Iron: Smooth, uniform color and texture, having fused on glaze covering surfaces exposed to view.
   1. Material shall show no cracks, chips, craze or discolorations.
   2. Enameled surfaces shall be acid resistant unless otherwise specified.
   3. Color: White.

C. Fixture Trim: Brass, bronze, or stainless steel construction; consisting of supply and waste fittings, faucets, traps, stop valves, escutcheons, sink strainers, nipples, supplies, and metal trim.
   1. Brass piping: Ips standard weight, with standard weight, 125 lb cast brass fittings.
   2. Brass tubing: 18 B & S gage.
   3. Stainless steel: 18-8 Type 302 or 304 unless otherwise specified.

D. Fixture Trim Finishes:
   1. Brass or Bronze: Polished or satin finished chrome plating, 0.02 mil chromium over 0.2 mil nickel plating.
   2. Stainless Steel: Invisible welds and seams, and unless otherwise specified, polished to No. 4 commercial finish.

E. Fixture Hold-down Bolts: Steel, plated for corrosion resistance.
   1. Cap nuts: Metal, polished and chrome plated.

F. Combination Faucets: Faucets shall turn counter to each other for the on and off positions.

G. For Vandal Resistant Fixtures - Fasteners: Torx head with center pin.

2.02 LAVATORY

A. Fixture: See plans for make and model.

B. Supply Fitting: See plans for make and model.
   1. Maximum Flow: 0.5 gpm at 80 psi.
      a. Exception: Metering faucets shall have a maximum flow of 0.25 gallons per cycle.
   2. Over rim spout with aerator.
   3. Renewable operating units.
   4. Vandal resistant assembly.
   5. 1/2 inch inlet lock nut and coupling nut.
   6. Operators:
      a. Standard Fixtures: Metal four arm indexed handles, with either integral splines, or ceramic spline inserts. Plastic spline inserts will not be accepted.
      b. Handicapped Accessible Fixtures: Metal 4 inch minimum indexed blade handles set, with either integral splines, or ceramic spline inserts. Plastic spline inserts will not be accepted.
         1) Maximum Activation Force: 5 lbf.

C. Waste Fitting: Grid Strainer.
   1. Metal grid strainer to match fixture finish.
   2. Cast escutcheon.
   3. 1-1/4 inch tailpiece.
   4. Vandal resistant assembly.

D. Trap: Cast brass, non-adjustable P trap, 1-1/4 inch tubing inlet, 1-1/2 inch ips outlet.

1. Bottom cleanout plug.
2. Ips brass nipple with solid cast brass escutcheon.

E. Supplies: 3/8 inch ips brass with operated stops and solid cast brass escutcheons.
1. Wall Supplies: Angle stops.

F. Faucet Hole Cover: Cast brass, rounded top, and threaded shank, with backing plate, lock washer and nut.

2.03 FIXTURE SUPPORTS AND SUPPORTING DEVICES FOR LAVATORIES, SINKS, AND EQUIPMENT

A. General: Ferrous metal members of carriers and supporting devices with the exception of chrome plated or porcelain enameled cast iron, shall be factory painted for corrosion resistance.

B. Floor Mounted Carrier Supports: Steel pipe uprights, 1-1/4 inch ips minimum diameter, or 1 inch x 3 inch steel tubing uprights, with cast iron or welded steel feet, drilled for bolting to the floor construction. Each carrier shall be provided with the appropriate fixture supporting devices specified, or recommended by the carrier manufacturer's Fixture Support Selection Guide.
1. Concealed Arms: Steel, with fixture locking lugs, leveling screws and a means of attaching, positioning and securing the fixture to the carrier.
a. Trim: Polished, chrome plated metal escutcheon to space fixture two inches from the wall.
b. Vandal Resistant Trim: Polished, chrome plated metal cap nuts and washers retained with vandal resistant set screws or other approved means of securing trim.

C. Wood Stud Filler Piece: 2 inch x 8 inch wood planking cut to fit between wood studding. Fasten with four 3/8 inch x 2-1/2 inch lag bolts with washers.

2.04 COUNTERTOP SINK

A. Material: See plans for make and model.
1. Features: Self-rimming, extended back ledge, with faucet and spray hose punchings spaced on 4 inch centers. Cove corners 1-3/4 inch minimum radius; fully coat underside with sound deadening and condensation barrier.
2. Finish: Satin finish exposed surfaces.

B. Supply Fitting: See plans for make and model.
1. Maximum Flow: 2.5 gpm at 80 psi.
2. 8 inch swing spout.
3. 1/2 inch inlets on 8 inch centers.
4. Renewable units.
5. Supplies: 1/2 inch ips brass, with angle stops, and cast brass escutcheons.

C. Drain Assembly:
1. Stainless steel removable strainer basket with neoprene stopper and 1-1/2 inch tubing tailpiece.

D. Fastening Devices: Stainless steel spring clip assemblies or clamping devices for securing sink to the countertop.

2.05 VITREOUS CHINA WATER CLOSETS

A. Fixtures: See plans for make and model.

B. Vitreous china, full size, elongated bowl with integral flushing rim and jet; trapway at the rear and the outlet centered between a pair of hold down bolt holes.
1. Trapway size: Pass minimum ball of 2 inches.
2. Trap seal: 2 inches minimum.
3. Water surface area: 12 inches x 10 inches minimum.
4. Provisions for flushing:
a. 1-1/2 inch spud for flush valve operation.

5. Floor Supported Fixture Heights:
   a. Standard Fixture: 14 to 15 inches from finished floor to rim.
   b. Handicapped Accessible Fixture: 17 to 19 inches from finished floor to top of seat (15-13/16 to 17-13/16 inches from finished floor to top of rim based on 1-3/16 inch seat height).

C. Operation: Fixture shall flush satisfactorily without extraordinary rise of water level in the bowl.
   1. Maximum gallons of water per flush: 1.28 gallons.

D. TYPE F WATER CLOSET: Flush Tank: Vitreous china secured to and supported by the closet bowl and separate lift off cover with provisions for locking.
   1. Float valve with nylon seat and vacuum breaker.
   2. Flushing valve.
   3. Metal trip lever.
   4. Supply: 1/2 inch ips brass pipe with a key operated stop and solid cast brass escutcheon.

E. TYPE A, C, F WATER CLOSETS: Water Closet Floor Flange:
   1. For Use with DWV Copper Tubing: Cast brass, 48 ounce minimum weight.
   2. For Use with Cast Iron Soil Pipe: Cast iron, 90 ounce minimum weight.

F. Closet Seat: Extra heavy duty, commercial design; Model 1655-C by Bemis Mfg. Co., Model No. 527-CH by Beneke Corp., or Model No. 9500C by Church Seat Co.
   1. Material and Construction: Solid plastic, open front, less cover, molded in one piece with no joints, seams or crevices.
   2. The manufacturer's name shall be molded into the seat.
   3. Metal check hinges shall be integrally molded into the seat. Hinges, inserts, bearings and posts shall be of brass or stainless steel. Cover upper post and metal exposed above fixture rim with plastic to match seat.
   4. Surface shall be hard, polished, impervious to moisture, and not affected by the action of uric acid.
   5. Color: White.

G. Water Closet Types:
   1. Type A Water Closet: Floor supported, floor outlet, top spud inlet, siphon jet action, activated by an exposed flush valve.
   2. Type C Water Closet: Floor supported, floor outlet, top spud inlet integral seat, siphon jet action, operated by means of an exposed flush valve.
   3. Type E Water Closet: Wall hung, back outlet, back spud inlet, siphon jet action, activated by means of a concealed flush valve.
   4. Type E-1 Water Closet: Wall hung, back outlet, top spud inlet, siphon jet action, activated by means of an exposed flush valve.
   5. Type E-2 Water Closet: Wall hung, back outlet, back spud inlet, integral seat, siphon jet action, operated by means of a concealed flush valve.
   6. Type F Water Closet: Floor supported, close coupled fixture-tank combination, floor outlet, siphon jet action, flush tank operated.

2.06 VITREOUS CHINA URINALS

A. Wall Supported Fixture: Vitreous china, with elongated rim, integral trap and extended side shields.
   1. Dimensions (approx.): 28 inches high, 18 inches wide, 12 inches front to back.
   2. Method of Support: Wall hangers and lugs for bearing plate bolting.

B. Operation: Fixture shall flush satisfactorily with a maximum of 0.5 gallons of water and be accomplished without extraordinary rise in water level in the bowl.

C. Fixture Types:
   1. Type A Urinal: Floor supported, siphon jet action, with a bottom outlet and a 1-1/4 inch top spud inlet for an exposed flush valve connection.

2. Type B Urinal: Wall supported, blowout action, back outlet and a 1-1/4 inch back spud inlet for a concealed flush valve connection.
3. Type B-1 Urinal: Wall supported, blowout action, back outlet and a 1-1/4 inch top spud inlet for an exposed flush valve connection.
4. Type C Urinal: Wall supported, washout action, back outlet, and a 3/4 inch back spud inlet for a concealed flush valve connection.
5. Type C-1 Urinal: Wall supported, washout action, back outlet, and a 3/4 inch top spud inlet for an exposed flush valve connection.

2.07 URINAL CARRIER

A. Floor Mounted Carrier Support (For Wall Hung Urinals): 1-1/4 inch ips steel pipe upright supports with block feet arranged with provisions for bolting to the floor slab, and with the following:
1. Hanger Plate: Steel, height adjustable with provisions for mounting and positioning the fixture hanger.
2. Bearing Plate: Steel, adjustable, with bearing studs, nuts and washers.
3. Studs, Nuts and Washers: Steel, treated for corrosion resistance.
4. Fixture Washers: Plastic.
5. Stud thread protectors.
6. Factory Painted.
7. Trim: Polished chrome plated metal cap nuts and washers.
8. Vandal Resistant Trim: Polished chrome plated metal cap nuts and washers retained with vandal resistant set screws.

B. Ferrous metal members of carriers and supporting devices with the exception of chrome plated or porcelain enameled cast iron, shall be factory painted for corrosion resistance.

2.08 FLUSH VALVES

A. Control Mechanism: Diaphragm or piston operated; do not intermix types. See plans for make and model.

B. Maximum Flow Per Flush:
1. Water Closet: 1.28 gallons.
2. Urinal: 0.5 gallons.

C. Flush Valve Assemblies: Flush valve, stop-check, tailpiece, vacuum breaker, and fixture spud coupling, including wall and spud flanges.

D. Valve Materials:
1. Valve Body: Brass or bronze.
2. Valve Internal Parts: Corrosion resistant materials that will not be affected by the action of or contact with water.

E. Operating Features:
1. Valve operators shall employ the non hold-open feature.
2. Piston type valves shall be field adjustable.

F. Valve Operators:
1. Oscillating Handle: 4 inch brass spring loaded self return handle.
2. Oscillating Disc: 3 inch diameter, cast brass, spring loaded and self returning.
a. Concealed Installations: Furnish wall escutcheon with operators.
3. Push Button Operator: 1 inch cast brass spring loaded push button, wall escutcheon, sleeve with guides and brass push rod; vandal resistant assembly.
4. Maximum Activation Force (Handicapped Accessible Operators): 5 lbf.

G. Assembly Components:
1. Flush Pipe: Seamless brass tubing with integral vacuum breaker, No. 18 B & S gage.
2. Fitting: Cast brass.

3. Stop-Check: Brass or bronze body, non rising stem stop valve with a built-in automatic check.
   a. Exposed Stop-Check: Screwdriver operated with protective cap.
   b. Concealed Stop-Check: Wheel handle operated.
4. Spud Coupling and Wall Flanges: Cast brass.

PART 3 EXECUTION

3.01 FIXTURE SUPPORT AND SUPPORTING DEVICE INSTALLATION

A. Install heavy duty floor mounted carrier supports with specified fixture supporting devices for wall type plumbing fixtures.
   1. Secure to building construction with lag bolts and metal expansion shields, or other appropriate means as required by the construction encountered.

B. Wall Mounted Carrier Supports: Install the following fixtures on wall mounted carrier supports:

C. Fixture Supporting Devices: Attach fixtures by means of the following fixture supporting devices attached to carrier supports.

FIXTURE	SUPPORTING DEVICE
Clinical Service Sink	Fixture hangers & bearing
Lavatory, Vitreous China, with back	Concealed arms.
Lavatory, Vitreous China, slab type	Concealed arms.
Lavatory, Type D	Concealed arms.
Lavatory, Type E	Through bolt.
Water Closet	Bolt to comb. carrier and drainage fitting.
Urinal	Fixture hanger and bearing plate.
Drinking Fountain	Fixture hanger.
Water Cooler (wall mounted)	Fixture hanger.
Water Cooler (Recessed)	Mounting frame.

D. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

3.02 FIXTURE INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.

B. Install fixtures level and at proper height, tighten connections, and install hold-down bolts, cap nuts and cover plates, where required.

C. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

D. Bathtubs:
   1. Residential Type:
      a. Caulk joint between fixture wall and floor with Type 1D sealant; strike a neat joint.

E. Mop Service Sinks:
   1. Set receptor leveled in bed of mortar laid on clean roughened surface. Remove excess mortar and strike a neat joint.
   2. Make connection from drainage pipe to receptor drain.
   3. Caulk joints between receptor and wall or floor with Type 1D sealant; strike a neat joint.
   4. Install service fittings.

F. Lavatories:
   1. Mount lavatories 31 inches from finished floor to rim unless otherwise specified.

2. Mount handicapped accessible fixtures 34 inches from finished floor to rim. Refer to Standard Drawing No. 93/S3013 bound herein, for special clearances required for handicapped accessible fixtures.
3. Caulk joint between fixture back and wall with Type 1D sealant; strike a neat joint.

G. Countertop Fixtures:
1. Install fixture with securing devices supplied.
2. Set fixture on bedding of sealant, tighten securing devices and remove excess sealant.

H. Water Closets:
1. Wall Hung Fixtures:
   a. Standard Fixtures: Install wall hung fixtures 15 inches from finished floor to rim unless otherwise specified.
   b. Handicapped Accessible Fixtures: Install fixtures 18 inches from finished floor to top of seat (16-13/16 inches floor to rim based on 1-3/16 inches seat height).
   c. Set bearing nuts to position fixture 1/16 inch clear of finished wall.
   d. Caulk the joint between fixture back and wall with Type 1D sealant; strike a neat joint.
2. Floor Supported Fixtures:
   a. Set fixture in bed of setting compound; remove excess.
   b. Caulk base perimeter with Type 1D sealant; strike a neat joint.
3. After connections are tightened, install cap nuts and washers.
4. Install water closet seats when directed.

I. Urinals:
1. Wall Hung Fixtures:
   a. Standard Fixtures: Install wall hung fixtures 24 inches from finished floor to rim.
   b. Handicapped Accessible Fixtures: Install wall hung handicapped accessible fixtures 14 inches (minimum) to 17 inches (maximum) from finished floor to rim.
   c. Set bearing nuts on floor mounted carrier supports to position wall hung fixtures 1/16 inch clear of finished wall.
   d. Caulk the joint between fixture back and wall with Type 1D sealant; strike a neat joint.
2. Floor Supported Fixtures:
   a. Install lip of urinal below floor level for proper floor drainage.
   b. Set fixture in bed of setting compound; remove excess.
   c. Caulk perimeter of fixture with Type 1D sealant; strike a neat joint.
3. After connections are tightened, install cap nuts and washers.

J. Flush Valves:
1. Standard Fixtures: Install flush valves on fixture centerline, and at following heights above fixture rim or back to centerline of water inlet to flush valve.
   a. Water Closet: 11-1/2 inches.
   b. Urinal: 11-1/2 inches.
2. Handicapped Accessible Fixtures: Install flush valves on fixture centerline, and at following height above finished floor to centerline of flush valve operator. Distance between centerline of flush valve operator and centerline of water inlet is 1-1/2 inches.
   a. Water Closet: Approximately 31-1/2 inches, and mounted on wide side of stall.
      1) Coordinate mounting height with Construction Work Contractor to avoid interference with grab bar, and to facilitate flush valve servicing.
   b. Urinal: Maximum 44 inches.
3. Set oscillating handles parallel to wall on exposed installation.
4. Slip joints in flush pipe connections allowed only at fixture spud and vacuum breaker ends; others shall be screwed connections.
5. Score tubing ends before assembling to assure tight slip joint connections. No score marks shall be visible after assembly.
6. In utility corridors, solder screwed flush pipe connections.

3.03 CLEANING, FLUSHING AND ADJUSTMENT

A. Clean fixture and trim. Remove grease and dirt; polish surfaces but leave stickers and warning labels intact.

B. Flush supply piping and traps; clean strainers.

C. Adjust stops for proper delivery.

D. Adjust metering faucets for proper timing.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Eyewash.

1.02 RELATED SECTIONS

A. Section 221113 - Facility Piping.

1.03 REFERENCES

A. ANSI Z358.1. - Emergency Eyewash and Shower Equipment

1.04 SUBMITTALS

A. Submit product data under provisions of Section 013300.

1.05 WARRANTY

A. Provide manufacturer’s standard warranty under provisions of Section 017800.

B. Minimum 1 year.

C. Warranty to include coverage for materials.

PART 2 - PRODUCTS

2.01 EYEWASH

A. Manufacturers:
   1. Honeywell International, Inc., Model 32-001000-0000
   2. Approved equal.

B. Flow rate of 0.4 gpm for the entire 15 minutes of flushing period.

C. Self-contained / no plumbing required.

D. Constant flow rate.

E. Compliance with ANSI Z358.1.

F. Integral fluid reservuoir to capture waste fluid.

PART 3 - EXECUTION

3.01 DEMONSTRATION

A. Demonstrate operation of emergency fixture unit to Owner.

END OF SECTION 224533

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the general requirements for all mechanical items and systems required by the Contract Documents.

B. Comply with all Contract Requirements, General Conditions, Supplementary Conditions, and Division 1 Sections applying to or affecting the Work of Division 23.

C. Unless specifically dimensioned, the Work shown on the Drawings is in diagrammatic form only to show general arrangement.

D. Include, in the Work, all accessories and appurtenances, necessary and integral, for the intended operation of any system, component, or device, as such systems, components, and devices are specified.

E. Do not install pipe or conduit through ductwork.

F. If the pipe or duct size shown on the Drawings does not match the connection size of the equipment that it is connected to, provide the necessary transition pieces at the piece of equipment.

G. Do not use or allow to be used asbestos or asbestos-containing materials on this project. Be rigorous in assuring that all materials, equipment, systems, and components thereof do not contain asbestos. Any deviations from this requirement shall be remedied at the Contractor's expense without regard to prior submittal approvals.

1.02 RELATED DOCUMENTS

A. The General Conditions and General Requirements Division 1 apply to the Work of this Section.

1.03 REFERENCE STANDARDS

A. Compliance with the following codes and standards shall be required:

1. Codes, Rules and Regulations of the State of New York
2. AABC American Air Balance Council
3. ADC Air Diffusion Council
4. AGA American Gas Association
5. AMCA Air Moving and Conditioning Association
6. ANSI American National Standards Institute
7. ARI American Refrigeration Institute
8. ASA Acoustical Society of America
9. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
10. ASME American Society of Mechanical Engineers
11. ASSE American Society of Sanitary Engineers
12. ASTM American Society for Testing Materials
13. AWS American Welding Society
14. AWWA American Water Works Association
15. BSA Board of Standards and Appeals
16. FM Factory Mutual
17. F.S. or FED Spec. Federal Specification
18. IRI Industrial Risk Insurers
19. MEA Materials and Equipment Acceptance
20. MSS Manufacturer's Standardization Society of the Valve and Fitting Industry
21. NACE National Association or Corrosion Engineers
22. NEBB National Environmental Balancing Bureau
23. NEC National Electrical Code (NFPA 70) / 2023
24. NEMA National Electrical Manufacturers Association

25. NFPA National Fire Protection Association
26. OSHA Occupational Safety and Health Act
27. SMACNA Sheet Metal and Air Conditioning Contractor's National Association
28. TEMA Tubular Exchanger Manufacturers Association
29. UL Underwriters Laboratories, Inc.
30. USAS USA Standards Institute (Formerly ASA)

B. Compliance with the following Codes, Rules and Regulations and those referenced within as applicable to work in the State of New York shall be required:
1. New York State Industrial Code Rules
2. New York State Building Code 2025
3. New York State Fire Code 2025
4. New York State Existing Building Code 2025
5. New York State Fuel Gas Code 2025
6. New York State Plumbing Code 2025
7. New York State Energy Conservation Construction Code 2025
8. New York State Mechanical Code 2025
9. New York State Property Maintenance Code 2025
10. New York State Residential Code 2025
11. NYS ASHRAE 90.1-2025 - NYS version of the Energy Standard for Buildings Except Low-Rise Residential Buildings
12. DEC New York State Department of Environmental Conservation - 6 NYCRR Part 613 Handling and Storage of Petroleum

1.04 DEFINITIONS

A. "Provide" means furnish and install, complete the specified material, equipment or other items and perform all required labor to make a finished installation.

B. "Furnish and install" has the same meaning as given above for "Provide."

C. Refer to General Conditions for other definitions.

1.05 ABBREVIATIONS

A. Reference by abbreviation may be made in the Specifications and the Drawings in accordance with the following list:
1. HVAC Heating, Ventilating and Air Conditioning
2. CM Construction Manager
3. AC Air Conditioning
4. H & V Heating and Ventilating
5. AWG American Wire Gauge
6. BWG Birmingham Wire Gauge
7. USS United States Standard
8. B & S Brown & Sharpe
9. OS & Y Outside Screw and Yoke
10. IBBM Iron Body Brass Mounted
11. WSP Working Steam Pressure
12. PSIG Pounds per Square Inch Gauge
13. PRV Pressure Reducing Valve
14. GPM Gallons per Minute
15. MBH Thousand BTU per hour
16. BTU British Thermal Units
17. WG Water Gage
18. LB Pound (Also shown as: #)
19. ASME American Society of Mechanical Engineers

20. ASTM American Society for Testing Materials
21. ABMA American Boiler Manufacturers Association
22. ASA American Standards Associates
23. MER Mechanical Equipment Room

See Drawings for additional abbreviations

1.06 REVIEW OF CONTRACT DOCUMENTS AND SITE

A. Give written notice with the submission of bid to the Architect/Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractors shall acknowledge that they have examined the Plans, Specifications and Site, and that from his own investigations he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials; availability of labor, utilities, roads and uncertainties of weather; the composition and condition of the ground; the characters quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work; all federal, state, county, township and municipal laws, ordinances and regulations particularly those relating to employment of labor, rates of wages, and construction methods; and all other matters which can in any way affect the Work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for successfully performing the Work.

C. Owner assumes no responsibility for any understanding or representation made during or prior to the negotiation and execution of this Contract unless such understanding or representations are expressly stated in the Contract and the Contract expressly provides that the responsibility, therefore, is assumed by the Owner.

1.07 MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. Make all Work agree with these established lines and levels. Verify all measurements at site; and check the correctness of same as related to the Work.

1.08 LABOR AND MATERIALS

A. Provide all materials and apparatus required for the Work of new and first-class quality. Furnish, deliver, arrange, erect, connect and finish all materials and equipment in every detail, so selected and arranged as to fit properly into the building spaces.

B. Remove all materials delivered, or work erected, which does not comply with Drawings or Specifications, and replace with proper materials, or correct such work as directed, at no additional cost to the Owner.

1.09 COVERING OF WORK

A. Do not cover up or hide from view any duct, piping, fitting, or other work of any kind before it has been examined or approved by the Architect/Engineer and/or other authority having jurisdiction over the same. Remove and correct immediately any unacceptable or imperfect work or unauthorized or disapproved materials discovered immediately after being disapproved.

1.10 PROTECTION

A. Protect the Work and material of all trades from damage and replace all damaged material with new.

B. Protect work and equipment until the Work is finally inspected, tested, and accepted; protect the Work against theft, injury or damage; and carefully store material and equipment received on site

which is not immediately installed; close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Preserve all public and private property, along and adjacent to the Work, and use every precaution necessary to prevent damage or injury thereto. Use suitable precautions to prevent damage to pipes, conduits and other underground structures or utilities, and carefully protect from disturbance or damage all property marks until an authorized agent has witnessed or otherwise referenced their location, and do not remove them until directed.

1.11 CUTTING AND PATCHING

A. Provide all cutting and rough patching required for the Work. Perform all finish patching.

B. Furnish and locate all sleeves and inserts required before the floors and walls are built, pay the cost of cutting and patching required for pipes where sleeves and inserts were not installed in time, or where incorrectly located. Provide all drilling required for the installation of hangers.

C. Punch or drill all holes cut through concrete slabs or arches from the underside. Do not cut structural members without the approval of the Architect/Engineer. Perform all cutting in a manner directed by the Architect/Engineer.

D. Do not do any cutting that may impair strength of building construction. Do no drill any holes, except for small screws, in beams or other structural members without obtaining prior approval. All Work shall be done in a neat manner by mechanics skilled in their trades and as approved.

1.12 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Rigging Plan
      a. Include the name of the rigging company; a layout drawing that details the crane with its outriggers extended outward. Provide dimensions showing how rigging operations will affect the road and parking lines being used, the type of crane and its specification including crane arm height, lift capacity, crane reach.
   2. Safety Data Sheets
   3. Training Plan & Schedule
   4. Training Verification Record

B. Reports
   1. Compliance with listings and approvals for equipment and for fire ratings.
   2. Acceptance certificates from inspecting agencies.
   3. Complete printed and illustrated operating instructions in report format.
   4. Manufacturer's performance tests of equipment.
   5. Field pipe and duct testing reports.
   6. Field operating test results for equipment.
   7. Performance report on the balancing of air and water systems.
   8. Performance reports for vibration isolation equipment.
   9. Manufacturer's reports on motorized equipment alignment and installation.

C. Specific references to any article, device, product or material, fixture or item of equipment by name, make or catalog number shall be interpreted as establishing a basis of cost and a standard of quality. All devices shall be of the make and type listed by Special Agencies, such as the Underwriters' Laboratories, and where required, approved by the Fire Department or authority having jurisdiction.

1.13 SPACE ALLOTMENTS AND SUBSTITUTIONS

A. The space allotments and equipment layouts on the Drawings are based on the manufacturer’s model indicated or scheduled as the “Basis of Design”. Ensure that any equipment that is submitted other than the “Basis of Design” will fit in the space allotment and will provide the

necessary maintenance clearances as recommended by the manufacturer. If maintenance clearances are not met, pay for any changes such that maintenance clearances will be met.

B. Bear all costs associated with re-layout of the equipment, changes to piping/ductwork, and other changes as required if approved equipment other than the “Basis of Design” equipment is purchased. This shall also include any structural steel modifications and structural steel design changes. Submit, at no cost to the Owner, a steel design stamped by a structural engineer licensed in the state in which the Work is to be performed for structural modifications that must be made resulting from the use of equipment other than the “Basis of Design” or not specified.

1.14 PAINTING

A. Prime paint all bare supplemental steel, supports and hangers required for the installation of Division 23 Work in accordance with “Painting” Specification Section. Touch up welds of galvanized surfaces with galvanizing primer per ASTM A780.

1.15 SAFETY DATA SHEETS

A. Submit safety data sheets (SDS) for all chemicals, hydraulic fluids, seal oils, lubricating oils, glycols and any other hazardous materials used in the performance of the Work, in accordance with the US Department of Labor, Occupational Safety and Health Administration (OSHA) hazard communication and right-to-know requirements stipulated in 29 CFR 1910.1200 (g).

1.16 MOTORS AND STARTERS

A. Provide new NEMA Standard electric motors, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating. Provide motors with a service factor of at least 1.15.

B. Equip motors for belt driven equipment with rails with adjusting screws for belt tension adjustment. Weather protect motors exposed to the weather.

C. Install high efficiency electric motors for air handling units, relief fans, and exhaust fans.

D. Provide all motors for use with Variable Frequency Drives with “high efficiency inverter duty” insulation class “F” with class “B” temperature rise and that conform to or exceed the International Energy Conservation Code or the Federal EP Act of 1992 requirements for efficiency.

E. Provide stainless steel nameplates, permanently attached to the motor, and having the following information as a minimum:
   1. Manufacturer
   2. Type
   3. Model
   4. Horsepower
   5. Service Factor
   6. RPM
   7. Voltage/Phase/Frequency
   8. Enclosure Type
   9. Frame Size
   10. Full-Load Current
   11. UL Label (where applicable)
   12. Lead Connection Diagram
   13. Bearing Data
   14. Efficiency at Full Load.

F. Provide motors whose sound power levels do not exceed that recommended in NEMA MG 1-12.49.

G. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.

H. Provide NEMA 4X weatherproof enclosures for VFDs, motor starters, etc. on all manufacturer provided or field installed electrical devices for equipment located outdoors, unless otherwise noted in specifications or plans.

I. Provide weatherproof NEMA 4X disconnect switches when located outdoors.

J. Motor Characteristics:
   1. 120V/1/60 Hz, 208V/1/60 Hz or 240V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 C. continuous rise.
   2. 208V/3/60 Hz, 240V/3/60 Hz or 460/3/60 Hz: NEMA B, normal starting torque, single speed, squirrel-cage type, open drip-proof, rated 40 C continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

1.17 ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

A. Install the Work in such a manner that noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, do not to exceed sound pressure levels determined by the noise criteria curves published in the ASHRAE guide.

B. Acoustical Tests
   1. Owner may direct the Contractor to conduct sound tests for those areas he deems too noisy.
   2. If NC level exceeds the requirements of the Contract Documents due to improper installation or operation of mechanical systems, make changes or repairs to bring noise levels to within required levels.
   3. Retest until specified criteria have been met.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Instructions and Demonstration for Owner's Personnel
   1. Provide operating and maintenance instruction to the Owner when project is completed and all HVAC equipment serving the building is ready to be turned over to the Owner.
   2. Turn over the HVAC equipment to the Owner only after the final testing and proper balancing of HVAC systems.
   3. Instruct the Owner's personnel in the use, operation and maintenance of all equipment of each system.
   4. The above instruction requirements are in addition to that specified for specific equipment or systems. Conform to specified requirements if more stringent or longer instruction is specified for specific equipment or systems.

1.19 CODES, RULES, PERMITS & FEES

A. Give all necessary notices, obtain all permits and pay all government sales taxes, fees, and other costs, in connection with the Work. Unless indicated otherwise, fees for all utility connections, extensions, and tap fees for water, storm, sewer, gas, telephone, and electricity will be paid directly to utility companies and/or agencies by the Owner. File all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for the Work and deliver same to the Owner's Representative before request for acceptance and final payment for the Work.

B. Conform to the requirements of the NFPA, NEC, FM, UL and any other local or State codes which may govern.

1.20 RECORD DRAWINGS

A. During the progress of the Work, make a record set of drawings of all changes by which the actual installation differs from the Drawings.

B. Create all record drawings in AutoCAD version 2020 or later in .dwg format. Upon completion of the Work, submit a digital copy (PDF) to the Architect/Engineer for approval of the record drawings, of the same size as the Drawings for approval. Upon approval by the

Architect/Engineer furnish the Owner a digital copy (PDF) of the record drawings along with one hard copy for the Owner's records.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CLEANING AND ADJUSTING

A. Cleaning
   1. Blow out, clean and flush each system of piping and equipment, to thoroughly clean the systems.
   2. Clean all materials and equipment; leave in condition ready to operate and ready to receive final finishes where required.
   3. Clean the operating equipment and systems to be dust free inside and out.
   4. Clean concealed and unoccupied areas such as plenums, pipe and duct spaces and equipment rooms to be free of rubbish and dust.

B. Adjusting
   1. Adjust and align equipment interconnected with couplings or belts.
   2. Adjust valves of all types and operating equipment of all types to provide proper operation.
   3. Clean all strainers after system cleaning and flushing and again before system startup.

C. Lubrication
   1. Lubricate equipment as recommended by the manufacturer, during temporary construction use.
   2. Provide complete lubrication just prior to acceptance.

D. Permanent Equipment Operating During Construction
   1. Use only in same service as the permanent applications.
   2. Use disposable filters during temporary operation.
   3. Replace expendable media, including belts used for temporary operation and similar materials just prior to acceptance of the Work.
   4. Repack packing in equipment operated during construction just prior to system acceptance, using materials and methods specified by the equipment manufacturer.

E. Retouch or repaint equipment furnished with factory finish as required to provide same appearance as new.

F. Tools
   1. Provide one set of specialized or non-standard maintenance tools and devices required for servicing the installed equipment.

3.02 EQUIPMENT BASES, PLATFORMS AND SUPPORTS

A. Provide supporting platforms, steel supports, anchor bolts, inserts, etc., for all equipment and apparatus provided.

B. Obtain prior approval for installation method of structural steel required to frame into building structural members for the proper support of equipment, conduit, etc. Welding will be permitted only when approved by the Architect/Engineer.

C. Submit shop drawings of supports to the Architect/Engineer for approval before fabricating or constructing.

D. Provide leveling channels, anchor bolts, complete with nuts and washers, for all apparatus and equipment secured to concrete pads and further supply exact information and dimensions for the location of these leveling channels, anchor bolts, inserts, concrete bases and pads.

E. Where supports are on concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.03 ACCESSIBILITY

A. Install valves, dampers and other items requiring access conveniently and accessibly located with reference to the finished building.

3.04 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof, even with the Owner's consent, is not an indication of acceptance of the Work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

3.05 MODIFICATIONS OF EXISTING WORK

A. Coordinate the Work with all other contractors and provide necessary dimensions for all openings. Provide all cuts and openings which are necessary for the Work for passage of piping and ductwork

B. Upon completion, remove all temporary piping and equipment, shoring, scaffolds, etc., and leave all areas clean and free from material and debris resulting from the Work performed under this Section. Provide rough patching in areas required.

3.06 EQUIPMENT INSTALLATION

A. Locate and set equipment anchor bolts, dowels and aligning devices for equipment requiring them.

B. Level and shim the equipment; coordinate and oversee the grouting work.

C. Perform field assembly, installation and alignment of equipment under direct supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.

D. Alignment and Lubrication Certification for Motor Driven Apparatus

1. After permanent installation has been made and connections have been completed, but before the equipment is continuously operated, have a qualified representative of the equipment manufacturer inspect the installation and report in writing on the manufacturer's letterhead on the following:
    a. Whether shaft, bearing, seal, coupling, and belt drive alignment and doweling is within the manufacturer’s required tolerances so that the equipment will remain aligned in the normal service intended by the Contract Documents and that no strain or distortion will occur in normal service.
    b. That all parts of the apparatus are properly lubricated for operation.
    c. That the installation is in accordance with manufacturer's instructions.
    d. That suitable maintenance and operating instructions have been provided for the Owner's use.
    e. Make any corrections to items that are required or recommended based on the manufacturer’s inspection and have the equipment re-inspected.

E. Belt Drives

1. V-belt drives - a driving and driven sheave grooved for belts of trapezoidal cross-section. Construct belts of fabric and rubber so designed so as not to touch the bottom of the grooves, the power being transmitted by the contact between the belts and V-shaped groove sides. Design drives for a minimum of 150 percent of motor horsepower. Provide companion type driven sheaves.
2. Select drives to provide for 12-1/2 percent variation in speed, plus or minus, from specified speed. Provide all motors with adjustable sheaves except where indicated otherwise in the Specifications or on the Drawings.
3. Install all fans with adjustable pitch sheaves on their drive motors. Select sheaves to provide air quantities under specified conditions. Put air systems into operation, and determine as a result of the completed air balance the actual size of sheaves required to produce specified air quantities on installed systems. The adjustable pitch sheaves shall then be replaced with the proper size fixed sheaves. Remove adjustable pitch sheaves from premises. Provide fixed motor sheaves manufactured by Wood's.

4. Where indicated on the Drawings or specified, provide spare motor, bearings, and belts.

F. Machinery Guards
1. Protect motor drives by guards furnished by the equipment manufacturer or in accordance with the Sheet Metal and Air Conditioning Contractors National Association's Low Pressure Duct Manual. Provide guards of all types approved as acceptable under OSHA Standards.

G. Equipment Start-up
1. Require each equipment manufacturer to provide qualified personnel to inspect and approve equipment and installation and to supervise the start-up of the equipment and to supervise the operating tests of the equipment.
2. If a minimum number of hours for start-up and instruction are not stated with the equipment specifications, these shall be 2 full 8-hour working days as a minimum.
3. Advise Owner of start-up at least 72 hours in advance.

3.07 CLOSEOUT PROCEDURES

A. Field Review and Punchlist:
1. Notice of substantial completion Contractor shall submit written notice of substantial completion prior to requesting 'Substantial Completion Punchlist Inspection'.
2. Air and hydronic test balance reports Contractor shall submit all air and hydronic test balance reports a minimum of 5 days prior to requesting punchlist inspection. The reports shall be complete for all subject equipment. If any reports are missing or incomplete, contractor shall identify those items and provide a schedule of balancing completion and excepted report submission.
3. Piping pressure test As applicable, contractor shall provide written record of successful piping pressure test for each piping system, on company letterhead, with required data per specification, duration of test, and photographic evidence of gauge at test pressure.
    a. The contractor shall provide a written response to the punchlist items within 2 weeks of receipt of punchlist with a schedule of completion of the open items (or commentary if discussion or objection are raised).
4. If contractor requests a punchlist inspection and engineer finds incomplete work within the work claimed to be substantially complete, the engineer will inform the contractor and may (at engineer's choice) terminate the inspection prior to reviewing all work. The Contractor will be responsible for reimbursing engineer for subsequent punchlist activities.
5. Upon receipt of engineer's punchlist inspection report, the contractor shall respond to each comment with an acknowledgement of each item (initialed, dated and photo evidence of completed work) or disagreement and written explanation of disagreement.
6. The contactor may respond with acknowledgement by providing photo of corrective action, or at the engineer's choice and upon contractor's written confirmation that all punchlist items have been addressed, may request a final punchlist inspection.

B. General Operating and Maintenance Instructions Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instructions in the proper operation and maintenance of the entire Work. Where installers are not expert in the required procedures, include instruction by the manufacturer's representatives.

C. Where applicable, provide instruction and training, including application of special coatings systems, at manufacturer's recommendation.

D. Provide a detailed review of the following items:
1. Maintenance manuals
2. Record documents and catalog cuts for each piece of equipment.
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels

7. Identification systems
8. Control sequences
9. Hazards
10. Cleaning

E. Warranties, bonds, maintenance agreements: and similar continuing commitments.

F. Demonstrate the following procedures:
1. Start-up
2. Shut-down
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization.

G. Prepare instruction periods to consist of approximately 50% classroom instruction and 50% "hands-on" instruction. Provide minimum instruction periods as follows:

Systems or Equipment	Training Time (Hours)
Chillers	16 hrs.
Cooling Towers	16 hrs.
Roof Top Units	8 hrs.
Air Handlers	8 hrs.
Boilers and Burners	16 hrs
DDC Control System	24 hrs.
All other equipment	4 hrs. (each)

Note: Consult individual equipment specification sections for additional training requirements.

H. Training Plan & Schedule Prepare a written schedule and agenda for each session and submit for review and approval. Include date, location, purpose, specific scope, proposed attendance and session duration.

I. Training Verification Record Record training sessions in digital format, format as selected by the Owner. Turn over digital files to the Owner after training has been completed.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the draining, disconnecting, dismantling, demolition, removal, relocation, rerouting, and reconnection of existing mechanical facilities, in a neat and workmanlike manner, of mechanical systems, materials, and accessories as required, as shown on the Drawings and specified herein, to accomplish alteration, restoration, and to accommodate the Work.

1.02 RELATED WORK

A. General Mechanical Requirements - Section 230010

1.03 REFERENCES

A. ANSI A10.6 - Safety Requirements for Demolition

B. BOCA Building Code

C. IBC (Including State Amendments)

D. NADC - Demolition Safety Manual

E. NFPA Fire Code

F. NFPA 51B - Cutting and Welding Processes

G. NFPA 70 - National Electrical Code

H. NFPA 241 - Safeguarding Building Construction and Demolition Operations

I. OSHA 29 CRF 1910 - Occupational Safety and Health Standards

J. US EPA - Clean Air Act Amendment of 1990.

1.04 QUALITY ASSURANCE

A. Only employ workers skilled in the specific trades involved for cutting, patching and removal.

B. Job Conditions: Prior to start of the Work, make an inspection accompanied by the Architect/Engineer to determine physical condition of adjacent construction that is to remain.

1.05 SPECIAL PRECAUTIONS

A. Do not torch cut ductwork.

B. Torch cutting of other mechanical equipment will be permitted only with the specific written approval of the Architect/Engineer.

C. Include “Fire Watch” procedures as required by the Fire Code and/or Owner’s Fire Insurance Carrier for any cutting work that may produce sparks. Submit fire watch procedures for approval.

D. Perform draining operations so that damage to existing building components does not occur.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adequately sized rubbish containers for the proper and safe disposal of all debris.

PART 3 - EXECUTION

3.01 PREPARATION

A. Construct temporary partitions enclosing respective work prior to any demolition work. Erect temporary fencing and signage around demolished materials.

B. Protect existing materials and equipment which are not to be demolished.

C. Prevent movement of structure; provide required bracing and shoring.

D. Do not begin the work until the time schedules and manner of operations have been approved by the Architect/Engineer and Owner. Include all interruptions of existing services in schedules submitted for approval by the Architect/Engineer and Owner.

3.02 GENERAL

A. Provide alteration and demolition of mechanical facilities as required by the Drawings and Specifications. The Drawings are diagrammatic and do not show the exact location of all existing mechanical work. Where existing equipment is to remain in service during construction, provide rerouting and reconnection of mechanical services as required to maintain continuous service.

B. Review all equipment with the Architect/Engineer and Owner prior to disposal. Completely remove existing ductwork, piping, conduit and similar items to be abandoned that are not embedded in walls or floor slabs unless otherwise shown on the Drawings. Cap open ends at all walls and floors.

C. Remove, store and protect all equipment or materials designated to be turned over to the Owner. Coordinate exact location of storage with the Owner.

D. Temporarily cap ends of ductwork, piping and sanitary vent piping to avoid entry of dirt, debris, or discharge of foul odors and gases.

E. Where existing louvers or ductwork penetrations are to remain, blank-off the opening on the inside with galvanized sheet metal on both sides of 2-inch thick, 6 pcf density rigid fiberglass board insulation. Paint side attached to the opening with weather resistant flat black paint.

F. Do not close or obstruct egress width to exits.

G. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to the Architect/Engineer and Owner.

H. Conform to procedures applicable when discovering hazardous or contaminated materials.

I. Conduct demolition to minimize interference with adjacent building structures or Owner's operations.

J. Cease operations immediately if structure appears to be in danger or hazardous materials are encountered. Notify Architect/Engineer. Do not resume operations until directed.

K. Demolish in an orderly and careful manner. Do not cut or remove more than is necessary to accommodate the new construction or alteration.

L. Remove demolished materials from site daily. Do not burn or bury materials on site. Dispose of all material at an approved disposal facility.

M. Protect finished surfaces at all times and repair or replace, if damaged, to match existing construction to the satisfaction of the Architect/Engineer.

3.03 PIPING REMOVAL

A. Cut off all welded piping square at the locations indicated on the Drawings. No cutting is required where the demolition ends at a flanged valve or equipment. Close off all openings of any remaining valves, piping or fittings with weld caps or blind flanges to prevent debris from entering the existing system.

B. Disconnect all threaded piping at the location indicated on the Drawings. Close off all openings of remaining valves, piping, fittings and equipment with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.

C. Remove all pipe hangers, supports, miscellaneous steel and anchors with the piping.

3.04 PROTECTION FROM FREEZING

A. It is intended that the building remain protected from damage due to freezing temperatures. To that end, keep in place and in operation existing equipment and systems used for heating until scheduling permits shutdown.

B. Where the removal of equipment, etc. will leave an area unprotected from freezing, notify the Owner and Architect/Engineer at least 72 hours in advance prior to removal so appropriate steps can be taken by the Owner to protect the area. Provide temporary heating equipment sufficient to prevent freezing.

C. It is the Contractor's responsibility to ensure that piping systems that are being worked on are completely drained from water prior to the start of demolition. If water is not drained and the water freezes it is the Contractor's responsibility to replace piping and repair all damages caused by water leakage at his own expense.

3.05 DISCONNECTION AND INTERRUPTION OF MECHANICAL SERVICES

A. When portions of an existing piping system or ductwork system are removed, and this removal causes loss of operation to another piece of equipment due to open or disconnected piping or ductwork, cap piping or ductwork or provide temporary piping or ductwork system to retain operation of the system.

3.06 MECHANICAL EQUIPMENT REMOVAL

A. Remove all mechanical equipment as shown on the Drawings. Remove all electrical work, including wiring between equipment, and wiring to power source or point of origin.

B. Where equipment is supported by steel and/or structural supports, remove these supports.

3.07 DUCTWORK REMOVAL

A. Disconnect all ductwork which must be removed, at the closest joint and support the remaining ductwork.

B. Prepare all remaining ductwork joints at the point of disconnection to receive new ducts or blank-off panels.

C. Remove all ductwork supports and miscellaneous steel with ductwork to be demolished.

3.08 INSULATION REMOVAL

A. Remove insulation, together with all piping, fittings, valves and equipment designated for demolition.

3.09 CONTROL WIRING REMOVAL

A. Disconnect and remove all control wiring and tubing, including conduit, for the Automatic Temperature Control (ATC) System associated with equipment and systems to be removed.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this Specification. Size hangers and supports to fit the piping's outside diameter.

1.02 REFERENCES

A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process

D. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)

E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture

F. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application

1.03 QUALITY ASSURANCE

A. Provide hangers and supports used in fire protection piping systems listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturer’s name, part number, and applicable size stamped in the part itself for identification.

C. Design and manufacture hangers and supports in conformance with MSS SP 58.

1.04 SUBMITTALS

A. Submit for review, products utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Pipe, Hangers, and Supports Product Data Submittal
      a. Pipe Hanger and Support Application Schedule.
      b. Product data on all hanger and support devices, including shields and attachment methods. Include as a minimum as part of product data materials, finishes, approvals, load ratings, and dimensional information.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, provide pipe hanger and support systems manufactured by:
   1. Cooper B-Line, Inc.
   2. Carpenter and Patterson
   3. Grinnell

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers
   1. Uninsulated pipes 2 inch and smaller:
      a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
      b. Adjustable steel swivel J-hanger, B-Line B3690.
      c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
      d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
      e. Adjustable steel clevis hanger, B-Line B3104 or B3100.

2. Uninsulated pipes 2-1/2 inch and larger:
   a. Adjustable steel clevis hanger, B-Line B3100.
   b. Pipe roll with sockets, B-Line B3114.
   c. Adjustable steel yoke pipe roll, B-Line B3110.
3. Insulated pipe- Hot or steam piping:
   a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
   b. 2-1/2 inch and larger pipes
      1) Adjustable steel yoke pipe roll with pipe covering protection saddle. B-Line B3110 with B3160-B3165 series.
      2) Pipe roll with sockets with pipe covering protection saddle, B-Line B3114 with B3160-B3165 series.

B. Pipe Clamps
1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

C. Multiple or Trapeze Hanger
1. Construct trapeze hangers from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
3. For pipes subjected to axial movement:
   a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
   b. Strut mounted pipe guide, B-Line B2417.

D. Wall Supports
1. Pipes 4 inch and smaller:
   a. Carbon steel hook, B-Line B3191.
   b. Carbon steel J-hanger, B-Line B3690.

E. Floor Supports
1. Hot piping under 6 inch and all cold piping:
   a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line B3093 and B3088T or B3090 and B3088. Screw or weld pipe saddle to appropriate base stand.

F. Vertical Supports
1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.
2. Copper Tubing Supports
   a. Size hangers to fit copper tubing outside diameters.
      1) Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
      2) Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
      3) Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
      4) Adjustable steel clevis hanger, B-Line B3104CT.
   b. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
   c. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

G. Plastic Pipe Supports
1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.

2. Supplementary Structural Supports
    a. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Provide roll formed channels, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to Architect/Engineer for approval. Use clamps and fittings designed for use with the strut system.

H. Pipe Supports Between Anchors and Pipe Expansion Loops
1. Provide supports between pipe anchors designed to cause minimal resistance to piping movement. Provide roller hanger supports or slide plates between anchors.
2. Provide supports near the L bends of pipe thermal expansion loops. No more than 12 inches from either side of the horizontal elbow.

2.03 UPPER ATTACHMENTS

A. Beam Clamps
1. Use beam clamps where piping is to be suspended from building steel. Select clamp type on the basis of load to be supported, and load configuration.
2. Use center loaded beam clamps where specified. For steel clamps provide B-Line B3050, or B3055. For malleable iron or forged steel beam clamps with cross bolt provide B-Line B3054 or B3291-B3297 Series as required to fit beams.

B. Concrete Inserts
1. Use cast in place spot concrete inserts where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Select spot inserts to allow for lateral adjustment and to have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Use continuous concrete inserts where applicable. Provide 12 gauge channels, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with Styrofoam inserts and end caps with nail holes for attachment to forms. Provide continuous concrete inserts with a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.
3. Provide Drop-In, shell type anchors with an internally threaded, all-steel shell with expansion cone insert and flush embedment lip. Manufacture anchors from plated carbon steel, 18-8 stainless steel and 316 stainless steel. Install anchors with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 specifications. Test anchors to ASTM E488 criteria and listed by ICC (formerly ICBO) and SBCCI. Provide anchors listed by the following agencies as required by the local building code: UL, FM. Select inserts to suit threaded hanger rod sizes, Redhead Multi-Set.

2.04 ACCESSORIES

A. Hanger Rods shall be threaded both ends or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

B. Provide shields that are 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.

C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

2.05 FINISHES

A. Indoor Finishes
1. Coat hangers and clamps for support of bare copper piping with copper colored epoxy paint, B-Line Dura-Copper®. Use additional PVC coating of the epoxy painted hanger where necessary.
2. Zinc plate hangers for other than bare copper pipe in accordance with ASTM B633 OR provide an electro-deposited green epoxy finish, B-Line Dura-Green®.

3. Provide pre-galvanized strut channels in accordance with ASTM A653 SS Grade 33 G90 or provide an electro-deposited green epoxy finish, B-Line Dura-Green®.

B. Outdoor and Corrosive Area Finishes
1. Hot dip galvanize hangers and struts located outdoors after fabrication in accordance with ASTM A123. Provide all hanger hardware as hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
2. Provide hangers and strut manufactured of type 304 stainless steel with stainless steel hardware where located in corrosive areas.

PART 3 - EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Adequately support pipe by pipe hanger and supports specified in PART 2 PRODUCTS. Allow for forces imposed by expansion joints, satisfy structural requirements and maintain proper clearances with respect to adjacent piping, equipment and structures. Size hangers for insulated pipes sized to accommodate insulation thickness.

B. Keep the different types of hangers to a minimum and provide hangers that are neat, without complicated bolting and with the number of parts of each hanger and its anchor kept to a minimum.

C. Make accurate weight balance calculations to determine the required supporting forces at each hanger or support location and the pipe weight load at each equipment connection.

D. Provide pipe hangers capable of supporting the pipe in all conditions of operation selected to allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

E. Painted or shop prime all hangers and supports that are not galvanized.

F. Support horizontal steel piping in accordance with MSS SP-58 and NYS 2025 Mechanical Code, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 1-1/4	3/8	7
1-1/2	3/8	9
2	3/8	10
2-1/2	1/2	11
3	1/2	12
3-1/2	1/2	12
4	5/8	12
5	5/8	12
6	3/4	12
8	3/4	12
10	7/8	12
12	7/8	12
14	1	12
16	1	12

G. Support horizontal copper tubing in accordance with MSS SP-58 and NYS 2025 Mechanical Code, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
1/2 to 3/4	3/8	5

1	3/8	6
1-1/4	3/8	7
1-1/2	3/8	8
2	3/8	8
2-1/2	1/2	9
3	1/2	10
3-1/2	1/2	11
4	1/2	12
5	1/2	12
6	5/8	12
8	3/4	12

H. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.

I. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

J. Place a hanger within 12 inches of each horizontal elbow.

K. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

L. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Space trapeze hangers according to the smallest pipe size, or install intermediate supports according to schedules in this Section.

M. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

N. Where horizontal piping movements are greater than ½ inch, or where the hanger rod angularity from the vertical is greater than four degrees from the cold to hot position of the pipe, offset the hanger pipe and structural attachments in such a manner that the rod is vertical in the hot position.

O. In any part of the building which is steel-framed, attach hangers to the building structural steel beams. Where hangers do not correspond with the building structural steel beams, provide supplemental steel members continuously welded or bolted to the building structural steel beams. Provide two (2) coats of primer on the supplemental steel. In any parts of the building which is a concrete structure, attach hangers to the concrete structure by installing anchors into the concrete.

3.02 CONCRETE INSERTS

A. Secure pipe hangers attached to concrete structure and slabs with embedded inserts, anchor bolts or concrete fasteners. Use a safety factor of 5 in selection of all inserts and expansion bolts unless there are seismic requirements (See “Seismic Restraint” specification if applicable). In which case, the larger of the two loadings shall govern the design.

B. Provide inserts for placement in formwork before concrete is poured.

C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

D. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.

E. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the marking and identification materials for identifying mechanical equipment, ductwork and piping systems.

B. Mark and identify all mechanical equipment, ductwork and piping systems described herein, and as shown and specified in the Contract Documents.

1.02 REFERENCES

A. ANSI A13.1 - Scheme for the Identification of Piping Systems.

B. Z53.1 - Safety Color Code for Marking Physical Hazards.

C. OSHA 29 CFR 1910 - Subpart J, General Environmental Controls

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include, but not be limited to:
   1. Mechanical System Identification Product Data Submittal
      a. Product Data: Provide manufacturer's catalog literature for each required product.
      b. Tags: Submit samples of tags, attachments, labeled, and identified.
   2. Identification Scheme
      a. Submit the scheme of identification codes.
      b. Steam Trap Schedule: Submit steam trap schedules listing proposed steam trap number, location, type, sizes, and service.
      c. Valve Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
      d. Equipment Schedules: Submit mechanical equipment schedules, listing proposed equipment numbers, their location, and function.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Seton

B. Bunting

C. W.H. Brady Company

2.02 VALVE TAGS

A. Provide valve tags for all valves installed for this project. Valve tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.

B. Valve tags shall be permanently stamped and marked with a service designation, normal valve position, and an identifying number as large as possible. Each valve shall have a separate and distinct number coordinated with the service designations shown on the Drawings and the Owners existing valve numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the valve tag numbering system.

2.03 STEAM TRAP TAGS

A. Provide steam trap tags for all steam traps installed for this project. Steam trap tags shall be constructed of brass with stamped letters and service designation tag size minimum 1-1/2 inches (38 mm) diameter with smooth edges, brass S hook.

B. Each steam trap tag shall be permanently stamped and marked with a service designation and a unique identifying number as large as possible.

C. Each trap shall have a separate and distinct number coordinated with the service designations shown on the Drawings and the Owners existing trap numbering system. Coordinate with the Architect/Engineer and Owner before finalizing the trap tag numbering system.

2.04 PIPE MARKERS

A. All accessible piping installed indoors for this project, insulated and uninsulated shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. “Accessible” piping shall include exposed piping, and piping located above lay-in ceilings. Markers shall include system name, flow arrow, and color code and pipe diameter.

B. All piping installed outdoors for this project, insulated and uninsulated, shall be identified with wraparound pipe markers. Pipe markers shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. The marker shall be printed with weather-resistant ink.

C. Where pipes are too small or not readily accessible for application of pipe markers, a brass identification tag at least 1 ½ inches in diameter, with depressed ½ inch high black letters and numerals, shall be securely fastened at locations specified for pipe markers.

D. See pipe marker schedule for size requirements of pipe markers.

2.05 MECHANICAL EQUIPMENT MARKERS

A. Identify all mechanical equipment, bare or insulated, installed in the rooms or on the roof, by means of lettered and numbered nameplate (not stenciled) identifying the equipment and service. Refer to the Drawings for equipment identifications. Nameplates shall be aluminum with permanent 1 ½ inch high white letters on a black background, mechanically affixed and installed in a readily visible location on the equipment. Coordinate the final equipment designation with the Owner.

B. In addition to markers, all mechanical equipment shall be furnished with the manufacturer’s identification plate showing the name of equipment, manufacturer’s name and address, date of purchase, model number and performance data.

2.06 DUCT WORK IDENTIFICATION

A. Provide full air distribution system identification at each side of a wall penetration, in a mechanical room, at all changes in direction and at no more than 50 foot intervals. Provide arrows identifying direction of flow.

B. Fire damper or Smoke damper access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch in height reading: SMOKE DAMPER or FIRE DAMPER.

C. Identification shall be preprinted labels.

D. Letter Size: 1-1/2 inches in height.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply piping system markers and valve tags in the following locations:
   1. Adjacent to each valve and fitting.
   2. At each branch location and riser take-off
   3. At each side of a pipe passage through floors, walls, ceiling and partitions.
   4. At each pipe passage to and from underground areas.
   5. Every 20 feet on all horizontal and vertical pipe runs.

B. Provide arrow markers showing direction of flow incorporated into or adjacent to each piping system marker. Use double-headed arrows if flow is in both directions.

C. Apply all piping system markers where view is unobstructed; markers and legends shall be clearly visible from operating positions.

D. Apply all tags and piping system markers in accordance with the manufacturer's instructions. Do not attach tags to valve handle such that the normal or emergency operation of the valve will be hindered.

3.02 VALVE CHART

A. Provide valve chart identifying each valve's number size of valve and service.

B. Frame the chart and locate the schedule in the Mechanical Equipment Room. (Aluminum Frame with plastic window).

C. Provide a compact disc that has the valve schedule in a spreadsheet format. The spreadsheet software to be used for the schedule shall be identified by the Owner.

3.03 SCHEDULES

A. Pipe Marker Letter Size Schedule:

Outside diameter of insulation or pipe Inches	Letter height Inches	Color field Inches
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1 - 1/4	12
8 to 10	2 - 1/2	24
Over 10	3 - 1/2	24

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section specifies requirements for testing, adjusting, and balancing of all air and hydronic fluid distribution systems, including the equipment and devices associated with each system.

B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the mechanical installations specified in other Sections of the Specifications.

1.02 RELATED WORK

A. Drawings and general provisions of the Contract, including General Conditions, any Supplemental Conditions, and Division 01 Specification Sections, govern the work of this section.

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include, but not be limited to:

1. Certified Balancing Reports
    a. Testing, adjusting, and balancing agency certification: Submit proof that the testing, adjusting, and balancing agency meets the requirements of Article 1.04 “Quality Assurance” below, and all other specified requirements.
    b. Certified Balancing Reports: Submit certified test reports, signed by the authorized representative of the testing and balancing agency. Certify the reports to be proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Submittal of test report shall be in the following format:
        1) Draft Report: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft report may be handwritten, but must be complete, factual, accurate and legible. Organize and format draft reports in the same manner specified herein for the final reports. Submit digital (PDF) of draft reports. Only one complete set of draft reports will be returned.
        2) Final Report: Upon verification and approval of draft reports, prepare final reports, type written and organized and formatted as described herein. Submit digital (PDF) of final reports.
            (a) Report Format: Submit reports using the standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Include schematic systems diagrams. Divide the contents into the below listed divisions, separating them by divider pages with titles descriptive of the contents:
                (1) General Information and Summary.
                (2) Air Systems.
                (3) Hydronic Systems.
            (b) Report Contents: Provide the following minimum information, forms and data:
                (1) General Information and Summary: Identify the testing, adjusting and balancing Agency, Contractor, Owner, Architect/Engineer, and Project on the inside cover sheet. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the seal and name, address, telephone number and signature of the Agency’s responsible certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures, along with the proof of calibrations.

(2) Include in the remainder of the reports the appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each item of equipment and system. Prepare a schematic diagram for each item of equipment and system, to accompany each respective report form.

(c) Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards within a period not exceeding six months prior to conducting the test procedures.

(d) Existing Systems: Where existing systems are to be added to or modified include in the report results of operational tests taken prior to modifications including but not limited to existing fan and pump curves, pressure readings and flow measurements. Include in the report copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications and, where existing equipment is retained, operating points after system balance. Where terminals are adjusted or modified include terminal performance curves/data and final readings.

1.04 QUALITY ASSURANCE

A. Test, adjust and balance systems and equipment by using competent mechanics regularly employed by a testing, adjusting and balancing Subcontractor whose primary business is the testing, adjusting and balancing of building mechanical systems. The testing, adjusting and balancing Subcontractor shall be a business established for a minimum of 10 years.

B. The testing, adjusting, and balancing Subcontractor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

C. Instrumentation type, quantity, and accuracy shall be as described in AABC's "National Standards for Field Measurement and Instrumentation, or Total System Balance, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. All instrumentation shall be calibrated at least every 6 months or more frequently if required by the instrument manufacturer.

1.05 PERFORMANCE REQUIREMENTS

A. Comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below for procedures, measurements, instruments and test reports for testing, adjusting and balancing work:
   1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
   2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
   3. National Environmental Balancing Bureau (NEBB)
   4. Associated Air Balance Council (AABC)

B. Set the air delivery or intake of each diffuser, grille and register to be as designed or within five percent of the air flow rates shown on the Drawings.

C. Set the fan air flow rate and static pressure rise across the fan to be within 10 percent above the design value at design speed.

1.06 JOB CONDITIONS

A. Require the testing and balancing specialist to review his/her work with the respective manufacturers of the equipment and devices involved, and coordinate and schedule all work.

B. Furnish and install balancing dampers, pressure taps, gauges, valves, and other components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Owner. Make all adjustment or replacement parts recommended by the testing and balancing specialist in strict accordance with the respective equipment manufacturer's recommendations.

C. Coordinate with the control manufacturer's representative to set the adjustment of the automatically operated dampers and control valves to operate as required.

1.07 GENERAL

A. The Owner will occupy the building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

B. Complete all tests specified herein to the satisfaction of the Architect/Engineer before final acceptance.

C. The Architect/Engineer, or his representative, is the sole judge of the acceptability of the tests. The Architect/Engineer may direct the performance of any such additional tests, as he deems necessary in order to determine the acceptability of the systems, equipment, material and workmanship. No additional payment will be made for any test required by the Architect/Engineer.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

B. Obtain copies of approved shop drawings of all air handling and hydronic equipment, air outlets (supply, return and exhaust), manual valves, automatic valves and the temperature control diagrams, including intended sequence of operations.

C. Existing Systems: Where existing systems are to be added to or modified perform operational tests prior to modifications including but not limited to existing fans and pumps curves, pressure readings and flow measurements.

1. Obtain copies of the equipment and motor nameplate data along with equipment performance curves indicating operating points prior to any modifications. Where terminal units are to be adjusted or modified obtain performance data for these units.

D. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable. Do not proceed with testing, adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the testing and balancing specialist.

E. Examine the air systems to see that they are free from obstructions. Determine that all dampers and registers are open, moving equipment is lubricated, clean filters are installed, and automatic controls are functioning; and perform other inspections and maintenance activities necessary for proper operation of the systems.

F. Examine the hydronic systems to see that they are free from abnormal obstructions, and that all piping, valves and equipment have been properly made fully operational. Determine that all equipment and control systems are performing correctly by functional testing.

G. Where existing systems are to be modified or added to ensure that all strainers and filters are clean and any operational problems that will prevent system balance have been brought to the attention of the Owner and repaired.

3.02 TESTING, ADJUSTING AND BALANCING

A. Notify the Owner 48 hours in advance of starting any tests. Do not perform any tests until acknowledgment of notification and approval has been received from the Owner.

B. Provide all necessary instruments and personnel for the tests. If, in the opinion of the Architect/Engineer, the results of such tests show that the Work has not complied with the requirements of the Contract Documents, make all additions or changes necessary to put the

system in proper working condition and pay all expenses for all subsequent tests which are necessary to determine whether the Work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Architect/Engineer.

C. Test all packaged equipment in strict accordance with the equipment manufacturer's requirements.

D. Perform any and all other tests that may be required by the local municipality or other governing body, board or agency having jurisdiction.

E. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

F. Actuate all safety devices in a manner that clearly demonstrates their workability and operation.

G. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of test procedure.

H. Perform tests and compile test data for all air systems and hydronic systems.

I. Include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems, and a schematic diagram for location of balancing valves, flow indicators, equipment, and devices for hydronic systems.

J. All instruments used shall be provided by the entity performing the Work of this Section, and shall be accurately calibrated and maintained in good working order.

K. Air Systems

Perform the testing, adjusting and balancing of air systems in accordance with the detailed procedures outlined in the referenced standards; including but not be limited to the following:

1. Test, record and adjust fan rpm to design requirements.
2. Test and record motor full load amperes.
3. Make a pitot tube traverse of main supply ducts and obtain design flow rate at fans.
4. Test and record system static pressure, velocity pressure and total pressure.
5. Test and adjust system for design supply, transfer and return air flow rate.
6. Test and adjust system for minimum and maximum design flow rates of outside air.
7. Test and record return air temperatures.
8. Test and record coil and fan leaving air temperatures.
9. Adjust all main supply, return, relief, and exhaust air ducts to proper design flow rate.
10. Adjust all zones to proper design flow rate for supply, return, transfer, relief and exhaust air.
11. Test and adjust each diffuser, grille and register.
12. Identify each grille, diffuser and register as to location and area on the schematic diagram.
13. Identify and list in the final report size, type and manufacturer of diffusers, grilles and registers and all tested equipment. Use manufacturer's data on all equipment to make required calculations for testing, adjusting and balancing. Include design required velocity and test resultant velocity, required flow rate and test resultant flow rate after adjustment as part of readings and tests of diffusers, grilles and registers.
14. Adjust all diffusers, grilles and registers to minimize drafts in all areas.
15. Permanently mark all dampers after air balance is complete so that they can be restored to their correct position, if disturbed later.
16. Seal openings in ductwork for pitot tube insertion with snap-in plugs after air balance is complete.

L. Hydronic Systems

1. Perform the testing, adjusting and balancing of hydronic systems in accordance with the detailed procedures outlined in the referenced standards; and including but not limited to the following:
    a. Preliminary procedure prior to balancing:
        1) Examine water in system and determine if water has been treated and cleaned.

2) Check expansion tank to determine that it is not air bound and the system is completely full of water.
3) Purge all air vents of water systems, check automatic air vents and determine if they are operating properly. Repair or replace any air vents that are not operating properly.
4) Coordinate with control manufacturer for required cooling and heating temperature controls and corresponding, automatic valve operation settings.
5) Open all normally open valves to full open position. Set automatic valves to full coil flow.
6) Complete air balance before final water balance begins.
7) Check water pumps for pump rotation and for proper flow rate delivery against manufacturer's pump curves.
8) Set all balancing valves for required flow delivery at mains and branch mains to cooling and heating elements.
9) Upon completion of flow readings and adjustments of balancing valves, mark all settings and record data, so that they can be restored to their correct "balanced" position, if disturbed later.

b. Include the following as part of the final balancing:
1) After required cooling and heating temperature controls and automatic valve operation settings are made, recheck pump flow requirements and readjust system as required.
2) Record pressure drop through coil at set flow rate of coil for full cooling and for full heating. Set pressure drop across bypass valve to match coil pressure drop.
3) Record and check the following items at each cooling and heating element:
4) Inlet water temperatures and static pressure at connections.
5) Leaving water temperatures and pressure drop of each coil.
6) Flow rate through coil with control valve stroked manually wide open.
7) Record operating suction and discharge pressures of each pump and final total dynamic head and rated amperage versus actual amperage of pump motors.
8) Record entering and leaving water temperatures and flow through all equipment and devices.
9) Check and record all flow rates at all locations in the piping system with flow meters.
10) Upon completion of air and hydronic systems testing, patch insulation, ductwork and housings, using materials identical to those removed.
11) Perform final testing, adjusting and balancing during summer season for air conditioning systems and during winter season for heating systems, including operation when outside conditions are within 5 degrees F wet bulb temperature of maximum summer design condition, and within 10 degrees F dry bulb temperature of minimum winter design condition.
12) Retest, adjust, and balance systems subsequent to system modifications. Resubmit test results.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the insulation, jackets, and accessories for piping as scheduled in Part 3 of this Section and as shown on the Drawings.

1.02 RELATED REQUIREMENTS

A. Section 230702 - Firestopping for HVAC

B. Section 232000 - Pipe, Valves, and Fittings

1.03 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 255 - Surface Burning Characteristics of Building Materials.

B. New York Codes and Standards (current adopted):
   1. 2025 Mechanical Code of New York State
   2. 2025 Energy Conservation Construction Code of New York State
   3. ASHRAE 90.1-2025

C. Greenguard

D. Underwriters Laboratories, Inc. (UL):
   1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

E. American Society for Testing and Materials (ASTM):
   1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   3. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
   5. ASTM C335 - Standard Test Method for Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
   6. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
   7. ASTM C518 - Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
   9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   10. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
   11. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation
   12. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   13. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   14. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.
   15. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
   16. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.
   17. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
   18. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
20. ASTM D1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
21. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.

1.04 DEFINITIONS

A. Greenguard: Greenguard Environmental Institute

B. IAQ: Indoor Air Quality

C. EPA: Environmental Protection Agency.

D. WHO: World Health Organization

E. ASJ: All Service Jacket

F. SSL: Self-Sealing Lap

G. FSK: Foil-Scrim-Kraft; jacketing

H. PSK: Poly-Scrim-Kraft; jacketing

I. PVC: Polyvinyl Chloride

J. FRP: Fiberglass Reinforced Plastic

K. Cold Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 60 degrees F or lower.

L. Hot Service Piping/ Surfaces: Pipes or surfaces where the normal operating temperature is 105 degrees F or higher.

1.05 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Piping Insulation Product Data Submittal
      a. Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
      b. Provide manufacturer's installation instructions that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing products specified with minimum 3 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience.

B. Materials:
   1. Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255 and UL 723.
   2. Insulation for duct, pipe and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer’s identification, product density, and thickness.

B. Follow manufacturer’s recommended storage and handling practices.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of each product (tapes, adhesives, mastics, cements, insulation, etc.).

B. Maintain temperature before, during, and after installation for a minimum of 24 hours.

C. Supply fiberglass products that assure excellent IAQ (Indoor Air Quality) performance through Greenguard Certification.

D. Mold: Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold growth remove it from the Site. If the material is wet but shows no sign of mold, dry rapidly and thoroughly. If it shows signs of facing degradation from wetting remove it from the Site.

PART 2 - PRODUCTS

2.01 FIBER GLASS INSULATION

A. Approved Manufacturers:
   1. Knauf Insulation
   2. Johns Manville Corporation
   3. Owens Corning Corporation
   4. CertainTeed Corporation

B. Fiber glass insulation meeting ASTM C547, ASTM C585, and ASTM C795; rigid molded, noncombustible.

C. Factory applied vapor barrier jacket: ASJ/SSL conforming to ASTM C1136 Type I and ASTM E96, secured with self-sealing longitudinal laps and butt strips.

2.02 FIBER GLASS INSULATION JACKETS AND ACCESSORIES

A. Field-Applied Jackets and Fitting Covers
   1. PVC - 25/50 or Indoor/Outdoor, UV-resistant fittings, jacketing and accessories, white or colored. Fitting cover system consisting of pre-molded, high-impact PVC materials with fiber glass inserts. Approved Manufacturer: Proto Corporation.
      a. Thickness: 10 mil.
      b. Closures: stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.
   2. Laminated Self-Adhesive Water and Weather Seals - Permanent acrylic self-adhesive System; weather resistant, high puncture and tear resistance; meeting or exceeding requirements of UL 723; applied in strict accordance with manufacturers' recommendations.

B. Fitting Insulation
   1. Pre-formed fiberglass, preformed perlite, mitered fiberglass, mitered perlite or calcium silicate in lieu of PVC systems. Protect fittings with field-applied fitting covers.

C. Tapes
   1. Vapor barrier type, self-sealing, non-corrosive, fire-retardant. Approved Manufacturer: Compac Corporation

2.03 ELASTOMERIC INSULATION

A. Approved Manufacturers:
   1. Armacell LLC
   2. K-Flex USA, Inc.

B. Flexible, tubular (Type 1) or sheet/roll form (Type 2) closed-cell elastomeric insulation complying with ASTM C534, Grade 1 - Standard (temperature range(-)297°F to 220°F; use molded tubular material wherever possible.

2.04 ELASTOMERIC INSULATION ACCESSORIES

A. Adhesives:

1. Air dried, waterproof vapor barrier contact adhesive, compatible with insulation for joining of seams and butt joints.

B. Finishes:
1. Provide a weather and UV resistant protective finish for outdoor applications in accordance with the manufacturer's recommendations.

2.05 HIGH DENSITY JACKETED INSULATION INSERTS FOR HANGERS AND SUPPORTS

A. For use with Fiberglass Insulation:
1. Hot Service Piping:
a. Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300 degrees F; ASTM C 533.
b. Perlite: Minimum density 12 pcf, K of 0.60 at 300 degrees F; ASTM C 610.

B. For Use with Flexible Elastomeric Foam Insulation:
1. Provide to prevent thermal bridging and formation of condensation.
a. Provide insulated piping supports at clamping points to prevent crushing and cross section area reduction of insulation.
b. Load bearing PET or closed cell EPDM core.
c. UV degradation resistant exterior
d. Outside diameter shall match insulation sizes
e. Armacell ArmaFix EcoLight, Aeroflex Arefix, or equal

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that all piping is tested and approved prior to insulation installation.

B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

3.02 INSTALLATION (GENERAL)

A. Install all materials using skilled labor regularly engaged in this type of work. Install all materials in strict accordance with manufacturer's recommendations, building codes, and industry standards.

B. Locate insulation and cover seams in the least visible location. Extend all surface finishes in such a manner as to protect all raw edges, ends and surfaces of insulation.

C. On cold surfaces where a vapor retarder must be maintained, apply insulation with a continuous, unbroken moisture and vapor seal. Insulate and vapor seal all hangers, supports, anchors, or other projections secured to cold surfaces to prevent condensation.

D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. For hot piping conveying fluids 140°F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140°F, insulate flanges and unions at equipment.

G. Maintain continuous pipe insulation through walls, ceiling or floor openings, or sleeves except where firestop or firesafing materials are required.

H. Install insulation neatly, accurately and without voids, in accordance with manufacturer's instructions and NIAC National Commercial and Industrial Insulation Standards.

I. Insulate fittings, valves and flanges using premolded covers with precut insulation inserts.

J. Insulate piping using insulation of type and thickness scheduled in this Section.

K. Install metal shields between hangers or supports and the piping insulation. Install rigid insulation inserts as required between the pipe and the insulation shields. Fabricate inserts to be of equal

thickness to the adjacent insulation and vapor seal as required. Insulation inserts shall be no less than the following lengths:

1½" to 2½" IPS	10" long
3" to 6" IPS	12" long
8" to 10" IPS	16" long
12" and over IPS	22" long

L. Pipe exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor) to be finished with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.

3.03 INSTALLATION (FIBER GLASS)

A. Provide a continuous vapor retarder on piping operating below ambient temperatures. Seal all joints, seams and fittings.

B. Firmly butt and secure ends with appropriate butt-strip material. On high-temperature piping, double layering with staggered joints when recommended by the insulation manufacturer. When double layering, the inner layer should not be jacketed.

C. Insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

3.04 INSTALLATION (ELASTOMERIC)

A. Piping:
   1. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, slide unslit sections over the open ends of piping or tubing. Adhere and seal all seams and butt joints using adhesive.
   2. Push insulation onto the pipe, never pull. Stretching of insulation may result in open seams and joints.
   3. Tape the ends of the tubing before slipping the insulation over the new pipes to prevent dust from entering the pipe.
   4. Clean cut all edges. Do not leave rough or jagged edges of the insulation. Use proper tools such as sharp non-serrated knives.
   5. On cold piping, adhere insulation directly to the piping at the high end of the run using a two-inch strip of adhesive on the inner diameter of the insulation and on the pipe. Coat all exposed end cuts of the insulation with adhesive. Adhere all penetrations through the insulation and termination to the substrate to prevent condensation migration.
   6. Use sheet insulation on all pipes larger than 6-inch diameter. Do not stretch insulation around the pipe. On pipes larger than 12-inch diameter, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24-inch diameter, completely adhere insulation.
   7. Stagger seams when applying multiple layers of insulation.

B. Valves, Flanges and Fittings:

1. Insulate all fittings with the same insulation thickness as the adjacent piping. Adhere all seams and mitered joints with adhesive. Sleeve screwed fittings and adhere with a minimum 1” overlap onto the adjacent insulation.
2. Insulate valves, flanges, strainers, and Victaulic couplings using donuts covered with sheet or oversized tubular insulation.

C. Hangers:
1. Support piping system using high density inserts with sufficient compressive strength. Apply elastomeric foam insulation with the same or greater thickness than the pipe insulation to pipe supports. Seal all joints with adhesive.
2. Standard and split hangers - Insulate piping supported by ring hangers with the same insulation thickness as the adjacent pipe. Seal all seams and butt joints with adhesive. Sleeve ring hangers using oversized tubular insulation. On cold piping, extend insulation up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
3. Clevis hangers or other pipe support systems - Install saddles under all insulated lines at unistrut clamps, clevis hangers, or locations where insulation may be compressed due to the weight of the pipe. Insert and adhere wooden dowels or blocks of a thickness equal to the insulation to the insulation between the pipe and the saddle.
4. Pre-insulated pipe hangers can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. Adhere a pair of non-skid pads to the clamps to minimize the movement. In addition, to prevent loosening of the clamps, use an antivibratory fastener, such as a nylon-locking nut.

D. Exterior Applications:
1. Paint all outdoor exposed piping with two coats of UV resistant finish. Prior to applying the finish, wipe the insulation with denatured alcohol. Do not tint the finish.
2. Locate seams for all outdoor exposed piping on the lower half of the pipe.

3.05 PIPING INSULATION MATERIAL SCHEDULE

SYSTEM OR SERVICE	LOCATION	INSULATION TYPE	JACKET
HEATING HOT WATER	INSIDE	FIBER GLASS	ALL SERVICE JACKET
CONDENSATE DRAINS	INSIDE	ELASTOMERIC	
STEAM (LPS) TO 15 PSIG.	INSIDE	FIBER GLASS	ALL SERVICE JACKET
STEAM CONDENSATE	INSIDE	FIBER GLASS	ALL SERVICE JACKET

3.06 MINIMUM PIPING INSULATION THICKNESS (IN.)

FLUID OPERATING TEMP. RANGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (IN.)				
	CONDUCTIVITY BTU*IN./(H* SQ. FT.*°F)	MEAN RATING TEMP (°F)	<1	1 TO < 1-1/2	1-1/2 TO < 4	4 TO < 8	=8
> 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5

40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
< 40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
   1. Penetrations in floor-ceiling assemblies.
   2. Penetrations in roof-ceiling assemblies.
   3. Penetrations in walls and partitions.
   4. Penetrations in smoke barriers.
   5. Construction enclosing compartmentalized areas.

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:

B. Firestopping for HVAC Product Data Submittal
   1. Product Data: For each type of through-penetration firestop system product indicated.
   2. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
   3. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.04 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements and those specified in “Performance Criteria” Article:
   1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.

B. Engage an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer’s willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.

C. Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

D. Conduct conference at Project site to comply with requirements in Division 01.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer’s labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency’s classification marking; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.06 PROJECT CONDITIONS

A. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install through-penetration firestop systems when substrates are wet due to rain, frost, condensation, or other causes.

C. Do not use materials that contain flammable solvents.

1.07 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 PERFORMANCE CRITERIA

A. Fire Test Requirements:
   1. Underwriters Laboratories, Inc. (UL):
      a. UL 1479, “Fire Tests of Through Penetration Firestops”.
      b. UL 263, “Fire Tests of Building Construction and Materials”.
      c. UL 723, “Surface Burning Characteristics of Building Materials”.
   2. American Society of Testing and Materials (ASTM):
      a. ASTM E814, “Fire Tests of Through Penetration Fire Stops”.
      b. ASTM E119, “Fire Tests of Building Construction and Materials”.
      c. ASTM E84, “Surface Burning Characteristics of Building Materials”.

B. References:
   1. Underwriters Laboratories (UL); “Fire Resistance Directory.”
      a. Through Penetration Firestop Systems (XHEZ)
      b. Fill, Void or Cavity Materials (XHHW)
      c. Firestop Devices (XHJI)
      d. Forming Materials (XHKU)
   2. All major building codes:
      a. International Building Code published by ICC.
   3. National Fire Protection Association (NFPA); “NFPA 101: Life Safety Code”.

C. Performance Requirements:
   1. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
   2. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
   3. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

4. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words “Chase Wall Optional.”
5. Provide through-penetration firestop systems subjected to an air leakage test conducted in accordance with the Standards, UL 1479 for penetration firestop systems, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the firestop system to restrict the movement of smoke.

2.03 MANUFACTURERS

A. Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
   1. Acceptable Manufacturer: Specified Technologies Inc., Email: specseal@stifirestop.com, Website: www.stifirestop.com.
   2. Approved Equals by Hilti, 3M, and Johns Manville.

B. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.04 MATERIALS

A. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant
   2. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant
   3. Specified Technologies, Inc. (STI) SpecSeal Series LC Endothermic Sealant

C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
   2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars

D. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty

E. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series RED2 Wrap Strip
   2. Specified Technologies, Inc. (STI) SpecSeal Series BLU2 Wrap Strip

F. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSB Firestop Pillows

G. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal Series SSM Firestop Mortar

H. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal SIL300 Silicone Firestop Sealant
   2. Specified Technologies, Inc. (STI) SpecSeal SIL300SL Self-Leveling Silicone Firestop Sealant

I. Composite Sheet: Intumescent material sandwiched between a galvanized steel sheet and steel wire mesh protected with aluminum foil, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal CS Composite Sheet

J. Cast-In-Place Firestop Device: Single component molded firestop device installed on forms prior to concrete placement with totally encapsulated, tamper-proof integral firestop system and smoke sealing gasket. Device shall allow for a concrete floor thickness of minimum 2-1/2 inches up to 36 inches without the use of field applied extension tubing. The following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal CID Cast-In Firestop Device

K. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestop gasket for use on steel HVAC ducts, the following products are acceptable:
   1. Specified Technologies, Inc. (STI) SpecSeal FyreFlange Firestop Angles

PART 3 - EXECUTION

3.01 PREPARATION

A. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General Requirements: Install through-penetration firestop systems in accordance with “Performance Criteria” Article and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer’s Instructions: Comply with manufacturer’s instructions for installation of through-penetration firestop systems products.
   1. Seal all openings or voids made by penetrations to ensure an air and water-resistant seal.
   2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of through-penetration firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
   3. Protect materials from damage on surfaces subjected to traffic.

3.03 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage a qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.04 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Roof curbs.

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Roof Accessories for HVAC Systems Product Data Submittal
      a. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.
   2. Roof Accessories for HVAC Systems Shop Drawings
      a. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.
   3. Roof Accessories for HVAC Systems Coordination Drawings
      a. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
         1) Size and location of roof accessories specified in this Section.
         2) Method of attaching roof accessories to roof or building structure.
         3) Other roof-mounted items including mechanical and electrical equipment, piping, and conduit.

1.04 QUALITY ASSURANCE

A. Standards: Comply with the following:
   1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
   2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

1.05 ROOF WARRANTY

A. All work performed in connection with new equipment on roof shall be performed and installed in accordance with roof manufacturer's recommendations. Contractor shall pay for and arrange for services of authorized representative of roofing manufacturer to inspect all work affecting roof and shall obtain statement of continuation of roof warranty from manufacturer. Contractor shall submit all roof work to architect and obtain approval.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Roof Curbs, Equipment Supports, Pipe Curb Assemblies or Pipe Portals, Pipe Mounting Pedestals, Duct Mounting Pedestals:
      a. Custom Curb, Inc.
      b. Pate Co. (The).
      c. Roof Products & Systems (RPS) Corporation.
      d. ThyCurb, Inc.

2.02 MATERIALS, GENERAL

A. Aluminum Sheet: ASTM B 209 for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.

B. Extruded Aluminum: ASTM B 221 alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.

C. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 coating designation; commercial quality, unless otherwise indicated.
   1. Structural Quality: Grade 40, where indicated or as required for strength.

D. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M with Class AZ-50 coating, structural quality, Grade 40, or as required for strength.

E. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

F. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

G. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
   1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

I. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.

J. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

K. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

L. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.03 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch-thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.

C. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.

D. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.

E. Provide manufacturer's standard rigid or semirigid insulation.

F. Provide formed cants and base profile coordinated with roof insulation thickness.

G. Fabricate units to minimum height of 12 inches, unless otherwise indicated.

H. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.04 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.05 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Conversion-Coated and Factory-Primed Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below).
   1. Organic Coating: Air-dried primer of not less than 2.0-mil dry film thickness.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

D. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 606.1 or AAMA 608.1.
   1. Color: As selected by Architect from the full range of industry colors and color densities.

E. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
   1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.
   2. Color: As selected by Architect from manufacturer's full range.

F. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.
      a. For Spray Application: Comply with ASCA 96.
      b. For Coil-Coated Sheets: Comply with AAMA 620.
      c. Color and Gloss: As selected by Architect from manufacturer's full range.

2.06 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.
   1. Shop Primer: Exterior galvanized metal primer per Division 9 Section "Painting."

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with a

minimum dry film thickness of 1 mil for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

D. High-Performance Organic Finish: Cleaned and primed with inhibitive primer and organic coating as specified below. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 621 for coil-coated sheets. Note: Marine Grade for Waterfront (salt laden).
      a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. For all rooftop supports (including pipe, conduit, and/or ductwork), install as per roof support manufacturer's instructions and roof manufacturer's instructions (to maintain existing roof warranty). Install every 10 feet minimum and every change in direction.

C. Installation shall also comply with the specification section for Vibration Isolation and Seismic Restraints.

D. Roof curbs and equipment rails shall be level at the top with pitch built-in when deck slopes ¼ of an inch per foot or greater.

E. Equipment Rails shall span a minimum of two (2) joists and not cantilever more than 6-inches.

F. Pipe mounting pedestals shall be mounted on top of deck over every other bar joist or not more than 10 feet on center.

G. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated.

H. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

I. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

J. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.

K. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.02 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION

PART 1 - GENERAL

1.01 COMMISSIONING CONTRACT

A. The Owner will employ an independent Commissioning Authority (CA). The mechanical contractor shall support all commissioning efforts as defined herein and as required by the CA, in reference to specifications or as otherwise required under standard care of the type of project and its delivery.

1.02 DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 23.

B. Commissioning is an ongoing process and shall be performed throughout construction. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 shall be familiar with the commissioning plan issued by the Commissioning Authority (CA) as it applies to the work of Division 23 and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

C. Commissioning shall conclude with the completion of all required deferred testing, training, and system documentation as specified and required to ensure the proper operation of the mechanical equipment and systems provided by this Division.

D. This Section covers mechanical systems commissioning, as required to demonstrate that the equipment and systems of Division 23 are ready for safe and satisfactory operation, as defined by project documents. Commissioning shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing, adjusting, and balancing of systems, preparation of equipment and systems documentation, and of maintenance and operation manuals, Owner training, and preparation of record drawings.

1.03 QUALITY ASSURANCE

A. The mechanical contractor shall identify a mechanical commissioning supervisor. The mechanical commissioning supervisor should have a minimum of ten years experience in mechanical contracting. The mechanical commissioning supervisor shall become familiar with the design intent and the requirements of the commissioning process as defined in this Section. The mechanical commissioning supervisor shall attend all commissioning meetings and coordinate the commissioning schedule as outlined by the CA. The mechanical commissioning supervisor shall assist the CA in coordinating and executing the required commissioning activities.

1.04 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Commissioning Plan for Approval
   2. Final Commissioning Report

1.05 MECHANICAL CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The mechanical commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the mechanical contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as required here-in.

D. Mechanical commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
   1. Construction Phase

a. The Contractor shall attend a Commissioning Scoping meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and may increase in frequency to weekly during the start-up, pre-functional and functional testing phases. The Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scoping meeting and other commissioning meetings, as appropriate, during the construction process.
b. The Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
c. The Contractor shall provide the CA with electronic cut sheets and shop drawing submittals of equipment that is to be commissioned.
d. The Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
g. The Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.
h. The Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
i. The CA shall prepare the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
j. Contractor shall prepare a preliminary schedule for Division 23 commissioning activities, to include pipe and duct system testing, flushing and cleaning, equipment start-up, and TAB start and completion, for use by the CA and shall update the schedule as appropriate. CA will assist in providing expected time durations for Cx activities.
k. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction. Mechanical equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.

l. The Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.
m. The Contractor shall perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.
n. The Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air or water related systems.
o. The CA shall generate the functional testing procedure and record to the mechanical contractor. The mechanical contractor shall review and provide support to the functional testing process. Contractor shall operate boilers, pumps, etc., and systems in accordance with the CA requirements, open and close disconnects and switch normal and emergency power requirements as directed by the CA and the functional testing procedures.
p. The Contractor shall report in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.

2. Acceptance Phase. The Contractor shall assist and cooperate with the CA in the commissioning process by:
a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
b. For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
c. Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
d. Provide a TAB representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
e. Including cost of sheaves and belts that may be required to obtain required equipment performance, as measured by the test and balance effort.
f. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
g. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
h. Installing a P/T plug at each water sensor that is an input point to the Control System.
i. Providing skilled technicians to execute starting and operation of equipment.
j. The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
k. The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, DX and hot water systems to generate loading strategies) during the functional testing.
l. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
m. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequence of operation to as-built conditions.

n. Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
o. Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
p. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
q. Provide updated diagrammatic logic for all TAB adjustments to the system.
r. Warranty Period. During the warranty period, the Contractor shall:
    1) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
    2) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.06 TAB CONTRACTOR RESPONSIBILITIES

A. Six weeks prior to the starting of the T&B, submit to the CA, the qualifications of the site technician(s) for the project, including three (3) names of contractors and facility managers of recent projects on which the personnel were in charge. The Owner and CA will approve the site technician for this job.

B. Three months prior to the start of the TAB, submit a TAB plan and approach for each system. The plan shall be reviewed by the TAB and the CA for review and approval. The submitted plan shall include:
    1. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and Contractors to sufficiently understand the design intent for each system.
    2. An explanation of the intended use of the building control system.
    3. All field check-out sheets and logs to be used that lists each piece of equipment to be tested adjusted and balanced with the data cells to be gathered for each.
    4. Final test report forms to be used during this process:
        a. Detailed step by step procedures for TAB work for each system and issue: terminal flow calibration; diffuser proportioning; branch and submain proportioning; total flow calculations; and rechecking diversity issues.
        b. List all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of each of the test procedures, parameters and formulas to be used.
        c. Details of how total flow will be determined (Air: sum of terminal flows via BMS calibrated readings or via hood, pitot tube or flow stations). Details of how total water flow will be determined (Water: pump curves, circuit setters, flow station, ultrasonic, etc.).
        d. The identification and types of measurement instruments to be used and their most recent calibration date.
        e. Specific procedures that will ensure that both air and watersides will be operating at there lowest possible pressure at the point where the system will operate.
        f. Confirmation that the TAB contractor understands the outside air ventilation criteria under all conditions and how this will be measured during normal, economizer and unoccupied conditions.
        g. Details of how building static, room static and exhaust fan capacity will be checked.
        h. Proposed selection points for traverse measurement locations on the as-built documents. Review the placement of the HVAC measurement devices for proper straight runs and accuracy.
        i. Submit a plan for testing and checking the fume hood system exhaust requirements.
        j. Plan for formal progress reports including scope and frequency.
        k. Plan for formal deficiency reports including scope and frequency.

1) TAB contractor shall attend commissioning meetings as directed by the CA and the general contractor.
2) TAB contractor shall communicate in writing to the controls contractor and the CA all setpoint and parameter changes made or problems and discrepancies identified during the TAB process that would affect the control loop system set-up and operation.
3) Submit written report of discrepancies, deficit or uncompleted work by others, contract interpretation requests and list of completed tests to the CA at least once per week.
4) After the TAB plan is accepted and two-weeks prior to TAB work, the contractor shall conduct a pre-balancing conference. Prior to the pre-balancing conference, the TAB contractor shall inspect the system readiness for testing and balancing. The TAB contractor shall prepare a list of deficiencies and uncompleted work that will affect the TAB process. This list shall be submitted to the CA and the general contractor.
5) The TAB contractor shall review the projected schedule and provide, in writing, to the CA and CM any delays in the schedule and what items will require completion prior to the TAB work.
6) The CA agent shall conduct independent verification of 10% of air and water end-devices for acceptance after the TAB contractor states in writing that they are complete with Testing & Balancing. The TAB contractor shall provide a mechanic to assist the CA in this verification and shall include this in the scope and price of the Work.
7) The TAB agent shall submit the TAB report to the CA for his review and comment. All data contained shall be re-verified in the field by the CA. A minimum of ten percent of the airflow readings shall be verified by the CA using his own equipment. All selection points shall be random. Total airflow shall be verified on all mains in the supply and the exhaust ducts.

1.07 CONTROL CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The controls commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the controls contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as required here-in.

D. Controls commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:
   1. Construction Phase
      a. Contractor shall attend a Commissioning Scope meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and increase in frequency to weekly during the start-up, pre-functional and functional testing phases. Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scope meeting and other commissioning meetings, as appropriate, during the construction process.
      b. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.

c. Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
d. Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; points listing; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.
e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.
f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.
g. Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.
h. Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
i. CA shall prepare for the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
j. Controls contractor shall prepare a preliminary schedule for their commissioning activities, to include wiring, instrument installation, calibration, point-to-point verification, sequence of operation testing and emergency operating procedural testing for use by the CA and shall update the schedule as appropriate. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction.
k. Controls instrument and equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.
l. Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical/controls-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.
m. Contractor shall perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
n. Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Point-to-point verification shall be completed with discrepancies and problems remedied before functional testing of the respective controls related systems.
o. The CA shall generate the functional testing procedure and record to the controls contractor. The controls contractor shall review and provide support to the functional

testing process. Contractor shall aid in operating boilers, pumps, etc., and systems in accordance with the CA requirements, turn on and off normal and emergency power requirements as directed by the CA and the functional testing procedures.

p. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.
    1) Acceptance Phase. Contractor shall assist and cooperate with the CA in the commissioning process by:
        (a) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
        (b) For a given area, have all required, pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
        (c) Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
        (d) Provide a controls representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
        (e) Providing skilled technicians to execute starting and operation of equipment.
        (f) The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
        (g) The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, chilled water and hot water systems to generate loading strategies) during the functional testing.
        (h) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
        (i) Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
        (j) Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
        (k) Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
        (l) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
        (m) Provide a detailed marked up drawings of all the instruments and their installed location (P&ID) for instruments and components.
    2) Warranty Period. During the warranty period, the Contractor shall:
        (a) Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
        (b) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS

2.01 SYSTEMS TO BE COMMISSIONED

A. The following are systems to be commissioned:
   1. Unit Ventilators
   2. Exhaust Fans
   3. Control Valves for miscellaneous HVAC Systems (including Fin Tube, Convectors, etc.).
   4. Dampers for miscellaneous HVAC Systems (including Outside Air/Exhaust Air/Relief Air/Return Air).
   5. ATC System (test functionality as it has been modified by systems above)

2.02 TEST EQUIPMENT

A. All standard testing equipment required to the mechanical portion startup, initial checkout shall be provided by the Contractor responsible for the equipment or system being tested. This includes TAB and controls verification.

B. The CA shall perform their own system verification and performance check-out. The CA shall provide their own calibrated equipment as required for this testing.

C. All testing equipment associated with functional performance verification and point-to-point required by the CA shall be the responsibility of the CA. All testing equipment associated with the control's contractor point-to-point verification shall be the responsibility of the control's contractor.

D. Special equipment, tools and instruments (only available from vendor or specific to a piece of equipment) required for the functional testing of that equipment, according to the requirements of the contract documents and the functional test procedures shall be provided to the CA by the installing contractor and shall become the property of the Owner at project completion as indicated in the specification.

E. Proprietary test equipment and software required by any manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide test equipment, demonstrate its use and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon successful completion of the commissioning process as required in the specifications.

PART 3 - EXECUTION

3.01 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1.

3.02 STARTUP PLAN AND PREFUNCTIONAL TESTING

A. The mechanical contractor and associated subcontractors shall be responsible for the installation of complete systems and sub-systems, fully functional, meeting the design objectives of the Contract Documents. Contractor shall follow the approved start-up, initial checkout, and pre-functional testing procedures. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility to the CA or Owner.

B. Pre-functional testing as directed and performed by the contractor shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing to may proceed without delays. Sampling strategies shall not be used for pre-functional testing. The pre-functional testing for all equipment and subsystems of a given system shall be successfully completed and documented prior to functional performance testing of the system. The mechanical contractor and sub-contractors shall sign off on the CA's pre-functional test sheets that they are complete and the system is ready. The CA will verify and conduct their own independent verification and start-up in parallel to the Contractor's verification. Any deficiencies identified during this process shall be noted and

reviewed by the Contractors. Start-up and functional testing shall not proceed until all the deficiencies are corrected and verified by the CA.

C. The following procedures shall apply to all equipment and systems to be commissioned.
   1. Start-up and Initial Checkout Plan. The contractor shall develop the detailed start-up and pre-functional testing plans for all equipment to be reviewed by the CA. The primary role of the CA in this process shall be to review the installation for construction completeness and ensure that all components have been installed as per the design documents. Only when pre-functional testing is complete and signed off by all Contractors, shall the Contractor start-up the equipment. Equipment and systems to be commissioned are identified in this Section Part 2.
   2. The start-up and initial checkout plan shall consist of the following as a minimum:
      a. The manufacturer's standard written start-up and checkout procedures copied from the installation manuals and manufacturer's normally used field checkout sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
      b. First-run checklist for equipment, to include:
         1) Equipment properly set.
         2) Alignment of shafts and couplings.
         3) Adjustment of vibration isolators.
         4) Piping and equipment properly connected.
         5) Completion of initial lubrication procedures.
         6) Clean filters in place, as appropriate.
         7) Wiring properly connected.
         8) Electrical overload relays appropriate for load.
         9) Electrical accessories properly installed and adjusted.
         10) Controls, safeties, and time switches properly calibrated and set-up.
         11) Verification of direction of motor rotation after final electrical connections by jogging motor.
         12) Measurements of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.
         13) The Contractor shall submit the start-up reports to the CA for review.

D. The CA shall review and approve the procedures and the format for documenting them, noting any procedures that need to be added.

E. Two weeks prior or startup, the Contractor shall schedule start-up and checkout with the Owner and CA. The execution of the start-up and checkout shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures and with the approved procedures. The CA may be present for the Contractor's required startup and checkout of all systems and equipment to be commissioned.

F. Sensor Calibration. Calibration of all sensors shall be included as part of the pre-functional testing and listed on the appropriate test checklists and reports, according to the specified procedures and accuracies for the devices and systems being tested.

G. All contractor responsible start-up, checkout forms shall be completed and submitted to the CA for review.

3.03 FUNCTIONAL PERFORMANCE TESTS

A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, fire alarm, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. FPV shall include; testing all sequences of operations, verification of system capacity, generating

simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses such as power failures, freeze conditions, low-oil pressures, equipment failures, etc. shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each contractor is required is supply personnel to assist during the functional performance testing where applicable.

B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.

C. Functional testing shall be conducted by the CA. Functional testing may not proceed until the systems have been properly installed, started-up and all deficiencies have been corrected.

D. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion shall not relieve the Contractor from fully completing the system, including all pre-functional checklists.

E. The Contractor shall provide personnel to operate the systems while functional performance testing is commencing. This shall include but not be limited to; starting and stopping of systems, opening and closing valves to create false loads on the system (with the capabilities of the existing system) and allowing the CA to manipulate the building automation systems to modulate the system requirements.

F. The Contractor shall review the commissioning functional performance testing procedure supplied by the CA. After functional testing commences, the Contractor and the CA shall sign the functional test record and provide the owner and the CM a copy to review. All deficiencies either corrected in the field or outstanding shall be documented on the functional test forms for review by all parties.

G. All functional testing must be completed and approved by the CA and the owner before the project will be considered substantially complete.

3.04 DEFERRED TESTING

A. Deferred Testing. The Contractor shall be available to assist in seasonal testing (Summer, Winter and Intermediate), tests delayed until weather or other conditions until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system’s performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and “As built” documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

3.05 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM/Owner within two days of test completion. The CA shall review the Contractor’s startup testing reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the

CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing contractor and the commissioning team.
   1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the Contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
   2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CA. The CA shall schedule the retest of the equipment or system involved.
   3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.

C. During the functional performance testing of multiple units of similar equipment, the CA will test all of the installed equipment and components identified. If, under such a testing procedure, three or more identical pieces of equipment (size along does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CA. In such a case, the Contractor shall provide the CA with the following:
   1. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CA within two weeks of the original notice.
   2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc., and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.
   3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
   4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week of approval of the proposed solution.
   5. Cost of Retesting
      a. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or start-up test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.

b. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once at “no charge” for their time. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
c. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back-charges to the responsible party.

3.06 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the CM for inclusion in the O&M manuals, according to this section and and other applicable section, prior to the training of owner personnel.

C. The CA shall receive a copy of the O&M manuals for review.

D. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and diskettes, shall cover all mechanical systems. Documentation shall include the following: operations and maintenance documentation directory; emergency information; operating manual; emergency information; maintenance manual; test reports; and construction documents.

E. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner and CA before systems start-up and commissioning, and shall be updated, revised and completed during, and at completion of, commissioning.

3.07 TRAINING OF OWNER PERSONNEL

A. The mechanical commissioning supervisor shall be responsible for training coordination and scheduling of required training and for ensuring that all required training is completed. The CA shall oversee the content and adequacy of the training of Owner personnel.

B. Prepare and submit a syllabus describing an overview of the program, describing how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, description of contents and outline for each lecture, and recommended reference material and outside reading. Obtain direction from the Owner on which operating personnel shall be instructed in each system. Proposed training schedules, materials, and lesson plans shall be submitted to the CA for review of the content and adequacy of the training of Owner personnel for commissioned equipment or systems.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:
1. Provide the CA with training plan one week before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer’s representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.

6. The controls contractor shall attend sessions other than the controls training, for each type of equipment controlled by the BAS, to discuss the interaction of the BAS as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

3.08 WRITTEN WORK PRODUCTS

A. Written work products of Contractors shall consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and pre-functional checklists.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All work of this Division shall be coordinated and provided by the single Building Management System (BMS) Contractor.

B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 Sections for details.

C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

D. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.02 BMS DESCRIPTION

A. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.

B. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.

C. Servers shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform: Microsoft SQL Server Express or Microsoft SQL Server as dictated elsewhere in this specification.

D. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

E. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

F. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.

G. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
   1. Operator information, alarm management and control functions.
   2. Enterprise-level information and control access.
   3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
   4. Diagnostic monitoring and reporting of BMS functions.
   5. Offsite monitoring and management access.
   6. Energy management
   7. Standard applications for terminal HVAC systems.
   8. BACnet integration to the Variable Refrigerant Flow Equipment

1.03 QUALITY ASSURANCE

A. General

1. The Building Management System Contractor shall be a manufacturer-owned branch office of a recognized national manufacturer that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems.
2. Quality Management Program
   a. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manger shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
      1) Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
      2) Manage the financial aspects of the BMS Contract.
      3) Coordinate as necessary with other trades.
      4) Be responsible for the work and actions of the BMS workforce on site.

1.04 WORK BY OTHERS

A. BMS RESPONSIBILITY MATRIX: The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX:

WORK	FURNISH	INSTALL	LOW VOLT. WIRING/TUBE	LINE POWER
BMS low voltage wiring	BMS	BMS	BMS	N/A
BMS communications bus wiring	BMS	BMS	BMS	N/A
BMS conduits and raceway	BMS	BMS	BMS	BMS
Automatic dampers	BMS	HVAC Contractor	N/A	N/A
Automatic valves	HVAC Contractor	HVAC Contractor	BMS	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations	BMS	HVAC Contractor	BMS	BMS
BMS Current Switches	BMS	BMS	BMS	N/A
BMS Control Relays	BMS	BMS	BMS	N/A
All BMS Nodes, equipment, housings, enclosures and panels	BMS	BMS	BMS	Electrical Contractor
Packaged RTU Network Thermostats	BMS	BMS	BMS	Electrical Contractor
Packaged RTU factory-mounted controls	HVAC Contractor	HVAC Contractor	HVAC Contractor	Electrical Contractor

1.05 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Shop Drawings, Product Data, and Samples Submittal
      a. List of all shop drawings: The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.
      b. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
      c. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.
      d. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
      e. Index of all submittals and shop drawings: Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
      f. The BMS Contractor shall correct any errors or omissions noted in the first review.
      g. At a minimum, submit the following:
         1) BMS network architecture diagrams: including all nodes and interconnections.
         2) Systems schematics, sequences and flow diagrams.
         3) Points schedule: for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
         4) Graphic Display screen types and associated menus: Submit samples.
         5) Detailed Bill of Material: List for each system or application, identifying quantities, part numbers, descriptions, and optional features.
         6) Control Damper Schedule: Including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
         7) Details of all BMS interfaces and connections: to the work of other trades.
         8) Product data sheets or marked catalog pages including part number, photo and description for all products including software.

1.06 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals
   1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:
      a. Table of contents.
      b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
      c. Manufacturer’s product data sheets or catalog pages for all products including software.
      d. System Operator’s manuals.
      e. Archive copy of all site-specific databases and sequences.
      f. BMS network diagrams.
      g. Interfaces to all third-party products and work by other trades.
      h. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized

table of contents shall provide dynamic links to view and print all product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents.

2. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server

1.07 WARRANTY

A. BMS Standard Material and Labor Warranty:
   1. Provide a one-year labor and material warranty on the BMS.
   2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.
   3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor's normal business hours.

PART 2 - PRODUCTS

2.01 LARGE GENERAL DESCRIPTION

A. Building Management System (BMS): The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

B. The Building Management System shall consist of the following:
   1. Standalone Network Automation Engine(s)
   2. Field Equipment Controller(s)
   3. Input/Output Module(s)
   4. Local Display Device(s)
   5. Distributed User Interface(s)
   6. Network processing, data storage and communications equipment
   7. Other components required for a complete and working BMS
   8. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
   9. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
      a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
      b. The System shall maintain all settings and overrides through a system reboot.
   10. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

2.02 BMS ARCHITECTURE

A. Automation Network
   1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.
   2. The BMS shall network multiple user interface clients, automation engines, system controllers and application-specific controllers. Provide one (1) application and data system server for long term data storage that also permits up to five (5) simultaneous system users.

3. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
4. Network Automation Engines (NAE) and Network Control Engines (NCE) shall reside on the automation network.
5. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network
1. Network Automation Engines (NAE) and Network Control Engines (NCE) shall provide supervisory control over the control network and shall be capable of supporting both of the following communication protocols as required:
   a. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9
   b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
2. The Network Engines shall be BACnet Testing Labs (BTL) certified and carry the BTL Label. The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
3. Control networks shall provide either “Peer-to-Peer,” Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
4. DDC Controllers shall reside on the control network.
5. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135. LonWorks is only acceptable for third party integration where the third party device is unable to communicate using BACnet protocol.
6. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
7. The PICS shall be submitted prior to contract award, when requested, as a condition of award. Otherwise, they shall be part of the project submittal package.

C. Integration
1. BACnet Protocol Integration - BACnet
   a. The neutral protocol used between systems shall be either BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008 or BACnet MS/TP communicating at 38,400 baud.
   b. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
   c. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.03 USER INTERFACE

A. Dedicated Web Based User Interface
1. The BMS Contractor shall provide and install on the maintenance manager’s personal computer the ability for command entry, information management, network alarm management, and database management functions for the BMS. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.
2. Dedicated User Interface Architecture - The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.
   a. Latest version of an internet browser for user interface functions
   b. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions
   c. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports

d. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries

B. Distributed Web Based User Interface
1. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.
2. The software shall run on wired and wireless network, on PC, laptop, tablet or smartphone, using Microsoft Edge or latest applicable browser supporting the following functions:
a. Configuration
b. Commissioning
c. Data Archiving
d. Monitoring
e. Commanding
f. System Diagnostics

C. Site Management User Interface Application Components
1. Operator Interface
a. An integrated browser based client application shall be used as the user operator interface program.
b. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
c. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
d. The user interface software shall provide help menus and instructions for each operation and/or application.
e. The system shall support customization of the UI configuration and a home page display for each operator.
f. The system shall support user preferences in the following screen presentations:
1) Alarm
2) Trend
3) Display
4) Applications
g. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
h. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
1) User access for selective information retrieval and control command execution
2) Monitoring and reporting
3) Alarm, non-normal, and return to normal condition annunciation
4) Selective operator override and other control actions
5) Information archiving, manipulation, formatting, display and reporting
6) BMS internal performance supervision and diagnostics
7) On-line access to user HELP menus
8) On-line access to current BMS as-built records and documentation
9) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications
i. The system shall support a list of application programs configured by the users that are called up by the following means:
1) The Tools Menu

2) Hyperlinks within the graphics displays
3) Key sequences

j. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

2. Navigation Trees
   a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.
   b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
   c. The navigation trees shall be “dockable” to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.
3. Alarms
   a. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:
      1) Log date and time of alarm occurrence.
      2) Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
      3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
      4) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
      5) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
      6) Any attribute of any object in the system may be designated to report an alarm.
   b. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
   c. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.
   d. The BMS shall annunciate application alarms at minimum, as required by Part 3.
4. Reports and Summaries
   a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:
      1) All points in the BMS
      2) All points in each BMS application
      3) All points in a specific controller
      4) All points in a user-defined group of points
      5) All points currently in alarm
      6) All points locked out
      7) All user defined and adjustable variables, schedules, interlocks and the like.

b. Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.
c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
d. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

5. Schedules
   a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
      1) Weekly schedules
      2) Exception Schedules
      3) Monthly calendars
   b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
   c. It shall be possible to define one or more exception schedules for each schedule including references to calendars
   d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
   e. Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.
   f. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.
   g. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.
   h. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history
6. Password
   a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
   b. Each user shall have the following: a user name (accept 24 characters minimum), a password (accept 12 characters minimum), and access levels.
   c. The system shall allow each user to change his or her password at will.
   d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
   e. A minimum of six levels of access shall be supported individually or in any combination as follows:
      1) Level 1 = View Data
      2) Level 2 = Command
      3) Level 3 = Operator Overrides
      4) Level 4 = Database Modification
      5) Level 5 = Database Configuration
      6) Level 6 = All privileges, including Password Add/Modify
   f. A minimum of 100 unique passwords shall be supported.

g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
h. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.
i. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

7. Screen Manager
   a. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.
8. Dynamic Color Graphics
   a. The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.
   b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.
      1) The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
   c. Graphics runtime functions - A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:
      1) All graphics shall be fully scalable
      2) The graphics shall support a maintained aspect ratio.
      3) Multiple fonts shall be supported.
      4) Unique background shall be assignable on a per graphic basis.
      5) The color of all animations and values on displays shall indicate the status of the object attribute.
      6) Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data that compliment the graphic.
   d. Operation from graphics - It shall be possible to change values (setpoints) and states in system controlled equipment directly from the graphic.
   e. Floor Plan graphics - The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate thermal comfort using dynamic colors to represent zone temperature deviations from zone setpoint(s). Floor plan graphics shall display overall metrics for each zone in the floor.
   f. Aliasing - Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.
   g. Graphic editing tool - A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.
      1) The graphic editing tool shall provide a library of standard HVAC equipment, floor plan, lighting, security and network symbols.

2) The graphic editing tool shall provide for the creation and positioning of library symbols by dragging from tool bars or drop-downs and positioning where required.
3) The graphics editing tool shall permit the importing of AutoCAD drawings for use in the system.
4) The graphic editing tool shall be able to add additional content to any graphic by importing images in the SVG, PNG or JPG file formats.

9. Historical trending and data collection
   a. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:
      1) Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:
         (a) Defined time interval
         (b) Upon a change of value
         (c) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.
   b. Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon one of the following: user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.
10. Trend data viewing and analysis
   a. Provide a trend viewing utility that shall have access to all database points.
   b. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.
   c. The trend viewing utility shall have the capability to define trend study displays to include multiple trends
   d. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.
   e. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.
   f. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.
   g. The Display shall support the user’s ability to change colors, sample sizes, and types of markers.
11. Database Management
   a. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.
   b. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.
   c. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:
      1) Backup
      2) Purge
      3) Restore
   d. The Database Manager shall support four tabs:
      1) Statistics - shall display Database Server information and Trend, Alarm (Event), and Audit information on the Databases.

2) Maintenance - shall provide an easy method of purging records from the Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.
3) Backup - Shall provide the means to create a database backup file and select a storage location.
4) Restore - shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.

e. The Status Bar shall appear at the bottom of all Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:
1) Ready
2) Purging Record from a database
3) Action Failed
4) Refreshing Statistics
5) Restoring database
6) Shrinking a database
7) Backing up a database
8) Resetting internet information Services
9) Starting the Device Manager
10) Shutting down the Device Manager
11) Action successful

f. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.

g. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

h. The Monitoring Settings window shall have the following sections:
1) General - Shall allow the user to set and review scan intervals and start times.
2) Email - Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.
3) Warning - shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.
4) Alarm - shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.
5) Database login - Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.

i. The Monitoring Settings Taskbar shall provide the following informational icons:
1) Normal - Indicates by color and size that all databases are within their limits.
2) Warning - Indicates by color and size that one or more databases have exceeded their Warning limit.
3) Alarm - Indicates by color and size that one or more databases have exceeded their Alarm limit.

j. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

2.04 NETWORK AUTOMATION ENGINES (NAE)

A. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.

B. Automation network - The NAE shall reside on the automation network and shall support a subnet of system controllers.

C. User Interface - Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.

D. The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.

E. Network Automation Engines supporting 100 or fewer field controllers shall support a minimum of two (2) concurrent users. Network Engines with multiple field buses or supporting more than 100 field controllers shall support a minimum of four (4) concurrent users.

F. The web based user shall have the capability to access all system data through one NAE.

G. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.

H. Systems that require the user to address more than one NAE to access all system information are not acceptable.

I. The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.

J. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.

K. The web based UI shall support the following functions:
   1. Configuration
   2. Commissioning
   3. Data Archiving
   4. Monitoring
   5. Commanding
   6. System Diagnostics
      a. Systems that require workstation software or modified web browsers are not acceptable.
      b. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
      c. Processor - The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
      d. Memory - Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
      e. Hardware Real Time Clock - The NAE shall include an integrated, hardware-Based, real-time clock.
      f. Communications Ports - Network Automation Engines supporting 100 or fewer field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
         1) USB port
         2) URS-232 serial data communication port
         3) RS-485 port
         4) Ethernet port
   7. Network Automation Engines with multiple field buses or supporting more than 100 field controllers shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
      a. Two (2) USB port

b. Two (2) URS-232 serial data communication port
c. Two (2) RS-485 port
d. One (1) Ethernet port

8. Diagnostics - The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
9. Power Failure - In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
10. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
11. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
12. Certification - The NAE shall be listed by Underwriters Laboratories (UL).

2.05 NETWORK CONTROL ENGINE (NCE)

A. The Network Control Engine (NCE) shall meet all of the programming, supervisory and communications requirements of the Network Automation Engine described above plus provide the additional features and capabilities described below.

B. The Network Control Engine (NCE) shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points. It shall reside on the automation network and shall support a subnet of 32 Field Controllers

C. User Interface - Each NCE shall have the ability to deliver a web based User Interface (UI) as previously described for Network Automation Engines.

D. The NCE shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per controller per warranty year per controller to re-tune loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season.

E. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.

F. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

G. The NCE shall support the following number and types of inputs and outputs:
1. Ten Universal Inputs - shall be configured to monitor any of the following:
a. Analog Input, Voltage Mode
b. Analog Input, Current Mode
c. Analog Input, Resistive Mode
d. Binary Input, Dry Contact Maintained Mode
e. Binary Input, Pulse Counter Mode
f. Eight Binary Inputs - shall be configured to monitor either of the following:
g. Dry Contact Maintained Mode
h. Pulse Counter Mode
2. Four Analog Outputs - shall be configured to output either of the following
a. Analog Output, Voltage Mode
b. Analog Output, Current Mode

3. Seven Binary Outputs - shall output the following:
   a. 24 VAC Triac
4. Four Configurable Outputs - shall be configured to output either of the following:
   a. Analog Output, Voltage Mode
   b. Binary Output, 24 VAC Triac Mode
5. The NCE shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
6. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.
7. All Network Control Engines shall be provided with a panel mountable Local Controller Display either as an integral part of the NCE or as a remote device communicating over the SA Bus.
8. The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol and shall allow the user to view monitored points without logging into the system.
9. The Display shall provide password protection with User adjustable password time-out. It shall also allow the user to view and change setpoints, modes of operation, and parameters.
10. The Display shall be menu driven with separate paths for:
    a. Input/Output
    b. Parameter/Setpoint
    c. Overrides
11. The Display shall use easy-to-read English text messages and shall allow the user to select the points to be shown and in what order.
12. The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.
13. The display shall be a minimum of 4 lines and a minimum of 20 characters per line
14. The NCE shall be microprocessor-based with a minimum word size of 32 bits. The processor shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.
15. Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
16. The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.
17. Communications Ports - The NCE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
    a. USB port
    b. RS-232 serial data communication port
    c. RS-485 port
    d. RJ-45 Ethernet port
    e. RJ-12 jack
    f. The NCE shall support an optional internal modem with RJ-12 6-pin telephone line connector.
18. Diagnostics - The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
19. Power Failure - In the event of the loss of normal power, The NCE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

20. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
21. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.
22. Field Controller Bus - The NCE shall support the same communication protocols as described for the Network Engines.

2.06 DDC SYSTEM CONTROLLERS

A. Field Equipment Controller (FEC)
1. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that supports and communicates via BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network. It shall be BACnet Testing Labs (BTL) certified as a BACnet Application Specific Controller (B-ASC) and carry the BTL Label.
2. The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals as well as four (4) hours per warranty year per controller to re-tune loops according to current system conditions. This time shall be equally divided between the change from heating season to cooling season and back to heating season
3. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
4. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB. It shall include troubleshooting LED indicators.
5. The FEC shall support the following types of direct wired inputs and outputs:
    a. Universal Inputs - shall be configured to monitor any of the following:
        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
        4) Binary Input, Dry Contact Maintained Mode
        5) Binary Input, Pulse Counter Mode
    b. Binary Inputs - shall be configured to monitor either of the following:
        1) Dry Contact Maintained Mode
        2) Pulse Counter Mode
    c. Analog Outputs - shall be configured to output either of the following
        1) Analog Output, Voltage Mode
        2) Analog Output, current Mode
    d. Binary Outputs - shall output the following:
        1) 24 VAC Triac
    e. Configurable Outputs - shall be capable of the following:
        1) Analog Output, Voltage Mode
        2) Binary Output Mode
6. The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).
7. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
8. The FC Bus shall support communications between the FECs and NAE(s) or NCE(s).
9. The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE or NCE.
10. The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus). The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.

11. The FEC shall support, but not be limited to, the following applications:
    a. Optional chilled water/central plant optimization applications
    b. Heating central plant applications
    c. Built-up air handling units for special applications
    d. Terminal & package units
    e. Special programs as required for systems control
12. The FEC shall support the same Local Controller Display previously described for use with the Network Control Engine. All FEC controllers located indoors serving mechanical equipment other than ceiling hung terminal units shall be provided with their own Local Controller Display.

2.07 FIELD DEVICES

A. Input/Output Module (IOM)
   1. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.
   2. The IOM shall communicate with the FEC over the FC Bus or the SA Bus.
   3. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
      a. The IOM shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
      b. The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
      c. A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.
   4. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

B. Networked Thermostat (TEC)
   1. The networked thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, reheat coil valves or other similar equipment.
   2. The TEC shall communicate over the Field Controller Bus using BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
   3. The TEC shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
      a. The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
      b. A BACnet Protocol Implementation Conformance Statement shall be provided for the TEC.
   4. The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interfaceable through a Network Automation Engine.
   5. The Networked Thermostat shall include an intuitive User Interface providing plain text messages.
      a. Two line, 8 character backlit display
      b. LED indicators for Fan, Heat, and Cool status
      c. Five (5) User Interface Keys
         1) Mode
         2) Fan
         3) Override
         4) Degrees C/F
         5) Up/Down
      d. The display shall continuously scroll through the following parameters:
         1) Room Temperature
         2) System Mode
         3) Schedule Status - Occupied/Unoccupied/Override
         4) Applicable Alarms

6. The Networked Thermostat shall provide the flexibility to support any one of the following inputs:
   a. Integral Indoor Air Temperature Sensor
   b. Duct Mount Air Temperature Sensor
   c. Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator
   d. Two configurable binary inputs
7. The Networked Thermostat shall provide the flexibility to support any one of the following outputs:
   a. Three Speed Fan Control
   b. Two On/Off
   c. Two Floating
   d. Two Proportional (0 to 10V)
8. The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
9. The Networked Thermostat shall provide the flexibility to adjust the following parameters:
10. Adjustable Temporary Occupancy from 0 to 24 hours
11. Adjustable heating/cooling deadband from 2º F to 5º F
12. Adjustable heating/cooling cycles per hour from 4 to 8
13. Where required by application and indicated on plans or room schedules provide the Networked Thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.
14. The Networked Thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

2.08 SYSTEM TOOLS

A. System Configuration Tool (SCT)
   1. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE).
   2. The configuration tool shall provide an archive database for the configuration and application data.
   3. The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.
   4. The configuration tool shall include the following features:
      a. Basic system navigation tree for connected networks
      b. Integration of Metasys N1, LonWorks, and BACnet enabled devices
      c. Customized user navigation trees
      d. Point naming operating parameter setting
      e. Graphic diagram configuration
      f. Alarm and event message routing
      g. Graphical logic connector tool for custom programming
      h. Downloading, uploading, and archiving databases
   5. The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:
      a. BACnet Devices
      b. LonWorks devices
   6. The configuration tool shall be capable of programming the Field Equipment Controllers.
      a. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
      b. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
      c. The configuration tool shall contain a library of standard applications to be used for configuration.
   7. The configuration tool shall be capable of programming the field devices.

a. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
b. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
c. The configuration tool shall contain a library of standard applications to be used for configuration

8. A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
   a. The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
   b. The wireless use of configuration tool shall be the same as a wired connection in every respect.
   c. The wireless connection shall use the Bluetooth Wireless Technology.

2.09 INPUT DEVICES

A. General Requirements
   1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

B. Temperature Sensors
   1. General Requirements:
      a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
      b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.
      c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	Accuracy
Accuracy	+/- .5°F
Room Temp	+/- .5°F
Duct Temperature	+/- .5°F
All Others	+/- .75°F

   2. Room Temperature Sensors
      a. Room sensors shall be constructed for either surface or wall box mounting.
      b. Room sensors shall have the following options:
         1) Setpoint reset slide switch providing a +3 degree (adjustable) range.
         2) A momentary override request push button for activation of after-hours operation.
   3. Room Temperature Sensors with Integral Display
      a. Room sensors shall have an integral display when specified in the sequence of operations or elsewhere in these documents.
   4. Thermo wells
      a. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.
      b. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
      c. Thermo wells and sensors shall be mounted in a threadolet or 1/2” NFT saddle and allow easy access to the sensor for repair or replacement.
      d. Thermo wells shall be constructed of 316 stainless steel.
   5. Outside Air Sensors
      a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.

b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

6. Duct Mount Sensors
   a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
   b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
   c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.
7. Averaging Sensors
   a. For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
   b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
   c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

C. Humidity Sensors
1. The sensor shall be a solid-state type, relative humidity sensor of the Bulk Polymer Design. The sensor element shall resist service contamination.
2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.
4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealtite fittings and stainless steel bushings.
5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.

D. Differential Pressure Transmitters
1. General Air and Water Pressure Transmitter Requirements:
   a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
   b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
   c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
   d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
2. Building Differential Air Pressure Applications (-1” to +1” w.c.)
   a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.

b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
   1) -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)
   2) 4-20 mA output.
   3) Maintain accuracy up to 20 to 1 ratio turndown.
   4) Reference Accuracy: +0.2% of full span.

3. Low Differential Air Pressure Applications (0" to 5" w.c.)
   a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
   b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
      1) (0.00 - 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
      2) 4-20 mA output.
      3) Maintain accuracy up to 20 to 1 ratio turndown.
      4) Reference Accuracy: +0.2% of full span.

E. Status and Safety Switches
   1. General Requirements
      a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.
   2. Current Sensing Switches
      a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
      b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
      c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
   3. Air Filter Status Switches
      a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
      b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
      c. Provide appropriate scale range and differential adjustment for intended service.
   4. Air Flow Switches
      a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
   5. Air Pressure Safety Switches
      a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
      b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.

6. Low Temperature Limit Switches
    a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
    b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
    c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.
    d. The low temperature limit switch shall be equal to Johnson Controls A70.

2.10 OUTPUT DEVICES

A. Actuators
1. General Requirements
    a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.
2. Electronic Damper Actuators
    a. Electronic damper actuators shall be direct shaft mount.
    b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.
    c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
    d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
3. Electronic Valve Actuators
    a. Electronic valve actuators shall be manufactured by the valve manufacturer.
    b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
    c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
    d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall

provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.

B. Control Valves

1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.
2. Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. In general, valves (2 or 3-way) serving variable flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI. Valves (3-way) serving constant flow air handling unit coils with secondary circuit pumps shall be sized for a pressure drop equal to 25% the actual coil pressure drop, but no less than 2 PSI. Mixing valves (3-way) serving secondary water circuits shall be sized for a pressure drop of no less than 5 PSI. Valves for terminal reheat coils shall be sized for a 2 PSIG pressure drop, but no more than a 5 PSI drop.
3. Ball valves shall be used for hot and chilled water applications, water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units except those described hereinafter.
4. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all special applications as indicated on the valve schedule. Valve discs shall be composition type. Valve stems shall be stainless steel.
5. Butterfly valves shall be acceptable for modulating large flow applications greater than modulating plug valves, and for all two-position, open/close applications. In-line and/or three-way butterfly valves shall be heavy-duty pattern with a body rating comparable to the pipe rating, replaceable lining suitable for temperature of system, and a stainless steel vane. Valves for modulating service shall be sized and travel limited to 50 degrees of full open. Valves for isolation service shall be the same as the pipe. Valves in the closed position shall be bubble-tight.

C. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
2. The signal isolation transducer shall provide ground plane isolation between systems.
3. Signals shall provide optical isolation between systems.

2.11 MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.

2. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices-such as relays, transducers, and so forth-that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
5. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

PART 3 - PERFORMANCE/EXECUTION

3.01 BMS SPECIFIC REQUIREMENTS

A. Graphic Displays
1. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection.

B. Remote Access:
1. The Owner shall be provided the ability to use a smart device such as a tablet PC or smart phone, to remotely monitor and control the BMS system. Provide unique login passwords to limit the remote user to the AC unit associated with his/her space within the building.

3.02 INSTALLATION PRACTICES

A. BMS Wiring
1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 26 Electrical. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.
2. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
4. Class 2 Wiring
   a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
   b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5’ from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. BMS Line Voltage Power Source

1. 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 26.
2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
3. DDC terminal unit controllers may use AC power from motor power circuits.

C. BMS Raceway
1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 3/4".
2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

D. Penetrations
1. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

E. BMS Identification Standards
1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
   a. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

F. BMS Panel Installation
1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
2. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.

G. Input Devices
1. All Input devices shall be installed per the manufacturer recommendation
2. Locate components of the BMS in accessible local control panels wherever possible.

H. HVAC Input Devices - General
1. All Input devices shall be installed per the manufacturer recommendation
2. Locate components of the BMS in accessible local control panels wherever possible.
3. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
4. Outside Air Sensors
   a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
   b. Sensors shall be installed with a rain proof, perforated cover.
5. Building Differential Air Pressure Applications (-1" to +1" w.c.):
   a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
   b. The interior tip shall be inconspicuous and located as shown on the drawings.

6. Duct Temperature Sensors:
   a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
   b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
   c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
   d. The sensor shall be mounted to suitable supports using factory approved element holders.
7. Space Sensors:
   a. Shall be mounted per ADA requirements.
   b. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
8. Low Temperature Limit Switches:
   a. Install on the discharge side of the first water or steam coil in the air stream.
   b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
   c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.
9. Air Differential Pressure Status Switches:
   a. Install with static pressure tips, tubing, fittings, and air filter.
10. Water Differential Pressure Status Switches:
    a. Install with shut off valves for isolation.

I. HVAC Output Devices
   1. All output devices shall be installed per the manufacturers recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.
   2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke.
   3. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
   4. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

3.03 TRAINING

A. The BMS contractor shall provide the following training services:
   1. Forty (40) hours of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.04 COMMISSIONING

A. Fully commission all aspects of the Building Management System work.

B. Acceptance Check Sheet
   1. Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.
   2. Submit the check sheet to the Engineer for approval
   3. The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.

C. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work specified as part of this Section consists of the integration of equipment controls supplied as part of manufactured items, materials and equipment required by the Drawings and under Divisions 23 and 26 to achieve operational and coordinated Sequences of Operation as Specified. Work shall include management of the system start up and operational check out, coordination of functions of controllers supplied as part of equipment packages, sizing of control valves and damper operators for dampers, interconnection of systems, provision and installation of all accessory devices required for complete system operation including dampers, control valves and actuators not provided as part of equipment, coordination of start up and testing and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

1.02 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 00 and Division 01.

B. The following Sections constitute related work:
   1. Section 230010 - General Mechanical Requirements
   2. Equipment and Systems specified under Division 23
   3. Division 26

1.03 QUALITY ASSURANCE

A. System Installer Qualifications
   1. The Integrator shall have a minimum of five years experience in the integration of systems of a similar nature to those of this Project.
   2. The Integrator shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

B. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
   1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
   2. National Electrical Code - NFPA 70.

C. All products used in this installation shall be new, currently under manufacture, and shall have been applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 5 years after completion of this Contract.

1.04 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Control Product Data Submittal
      a. Work plan and schedule: for the start up and check out of all systems including time requirements and resources required from all Sub-Contractors involved.
      b. Complete list of equipment: to be used indicating quantity, manufacturer and model number.
      c. Schedule of all control valves: including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
      d. Schedule of all control dampers: This shall include the damper size, pressure drop, manufacturer and model number.

e. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover.
f. The submittals required under this Section shall be considered as For Information Only. Review by the Architect/Engineer shall not relieve the Contractor from the responsibility of providing fully operational systems.
g. System Installer Qualifications: Submit qualification statement per the requirements outlined above.

2. Shop Drawings
   a. Sequence of operation: Submit a written sequence of operation for each system indicating which functions are to be controlled by controls provided as part of manufactured equipment and which functions will be under control of devices provided as part of this Section.
   b. Contractor shall provide shop drawings and manufacturer’s standard specification data sheets on all materials and hardware to be provided. No work may begin on any segment of this project until the Architect/Engineer and Owner have reviewed submittals for conformity with the Drawings and Specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.
   c. Interconnecting wiring diagrams: Submit interconnecting wiring diagrams for all systems. These diagrams may rely on diagrams for controls of manufactured equipment provided that the interface points are clearly identified and copies of the manufactured item’s control diagrams are submitted for information as part of the submittal package.

1.05 WARRANTY

A. Control system: Warrant all work as follows:
   1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
   2. At the end of the final start-up/testing, if equipment and systems are operating in a manner satisfactory to the Owner and Architect/Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of Owner's acceptance shall be the start of warranty.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY AND PERFORMANCE

A. Products specified are not intended to form a complete scope of supply. They are intended to set a level of quality for items that the Contractor may need to supply to implement a complete Sequence of Operation. Products of a comparable quality and performance may be submitted for approval by the Architect/Engineer.

2.02 MOTORIZED DAMPERS

A. Dampers shall be modulating double-acting opposed blade or parallel blade dampers as required, designed and tested in accordance with AMCA 500, and meeting current energy code. Obtain and verify the location, size and pressure rating of each damper prior to fabrication and delivery. Verify the layout of equipment and ductwork before dampers are fabricated. Pressure drop shall not exceed 0.03 inches water gauge static pressure at 1000 fpm in the fully-open position, and shall be rated for at least 2000 fpm average velocity. Damper shut-off pressure rating shall exceed the fan maximum total head-pressure.

B. Dampers shall be constructed of extruded aluminum or at least No. 16 gauge galvanized steel, with each blade being not more than 8 inches; wide damper frame channel shall be at least 5

inches deep. Each blade end shall have a 3/8 inch stainless steel or plated steel shaft rotating in self-lubricating bearings mounted in a damper channel frame. Blades mounted vertically shall be supported by thrust bearings. Control shaft shall be at least ½ inch diameter.

C. Flat-steel damper blades shall be made rigid by folding the edges. Blades shall have interlocking edges and shall be provided with EPDM or neoprene compressible seals at point of contact. Foam seals are not acceptable. Provide compression-type stainless steel jamb seals continuously along blade edges.

D. Each damper shall be assembled in the manufacturer's shop as a complete unit. Dampers, when closed, shall be guaranteed by the manufacturer not to leak in excess of 20 cfm per square foot at 4 inches w.g. static pressure. Provide dampers with operators having sufficient power to limit leakage to the rate specified.

E. Damper seals shall be suitable for an operating range of minus 20 degrees F (or 20 degrees F below the heating outside design temperature, whichever is lower) at the lower end to 200 degrees F at the upper end.

F. A complete damper assembly shall have blades no longer than 48 inches and no higher than 48 inches. Where greater length or height is required, the assembly shall be made of a combination of sections. Dampers shall be sized for the required air velocity and pressure classification.

G. Approved Manufacturers: Greenheck (VDC-23), Arrow or approved equal.

2.03 ELECTRONIC DAMPER/VALVE ACTUATORS

A. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

B. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
   1. Damper actuators shall fail normally open or closed as described on the Drawings or as follows:
      a. Outdoor Air Intake - normally closed.
      b. Air Exhaust - normally closed.
      c. Other applications - as as required by the Sequence of Operation.

C. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation.

D. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.

E. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not required more than 11 VA.

F. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.

G. Actuators shall be provided with a conduit fitting and a minimum 1 meter electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

H. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation

I. Actuators shall be Underwriters Laboratories Standard 60730-1 listed.

J. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

K. Provide a single damper actuator when dampers are less than 4 feet in width. Otherwise provide two damper actuators (one on each side of the ductwork).

2.04 CONTROL VALVES

A. Control valves shall be two-way or three-way type for two-position or modulating service as required.

B. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
   1. Water Valves:
      a. Two-way: 150% of total system (pump) head.
      b. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
   2. Steam Valves: 150% of operating (inlet) pressure.

C. Valve Failure Position:
   1. Valves shall fail normally open or closed as indicated on the Drawings or as follows:
      a. Heating coils in air handlers - normally open.
      b. Chilled water control valves - normally closed
      c. Other applications - as scheduled or as required by Sequence of Operation.
   2. Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

D. Water Valves:
   1. Body and trim materials shall be as specified in “Pipe, Valve & Fittings” specification. Equal percentage ports for modulating service.
   2. Sizing Criteria:
      a. Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 5 psi maximum.
      b. Contractor shall verify sizing criteria with manufacturer.

E. Steam Valves:
   1. Body and trim materials shall be as specified in “Pipe, Valve & Fittings” specification. Linear ports for modulating service.
   2. Sizing Criteria:
      a. Two-position service: pressure drop 10% to 20% of inlet pressure (psig).
      b. Modulating service 15 psig or less: pressure drop 80% of inlet pressure (psig).
      c. Modulating service 16 psig to 50 psig: pressure drop as scheduled on plans.
      d. In all cases above the contractor shall verify sizing criteria with the valve manufacturer.

2.05 TEMPERATURE SENSORS

A. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.

B. Duct sensors shall be rigid or averaging as required. Averaging sensors shall be a minimum of 5 feet in length.

C. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

D. Space sensors shall be equipped with set-point adjustment, override switch, display, and communication port.

E. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2 degrees F.

F. The space temperature, setpoint, and override confirmation shall be annunciated by a digital display for each zone sensor. The setpoint shall be selectable utilizing buttons.

2.06 HUMIDITY SENSORS

A. Room Humidity sensors shall have an accuracy of ±1% from 10% to 80% RH with One-point adjustment calibration. The operating temperature range shall be -10° to 150°F max.

B. Duct sensors shall have a sensing range of 20% to 80% with accuracy of ±1% R.H. Duct sensors shall be provided with a sampling chamber.

C. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. and shall be suitable for ambient conditions of -40 degrees F to 170 degrees F.

D. Humidity sensor's drift shall not exceed 1% of full scale per year.

2.07 STATIC PRESSURE SENSORS

A. Sensor shall have linear output signal. Zero and span shall be field-adjustable.

B. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.

C. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.

D. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

2.08 LOW LIMIT THERMOSTATS

A. Safety low limit thermostats shall be vapor pressure type with an element 20 ft minimum length. Element shall respond to the lowest temperature sensed by any one foot section.

2.09 FLOW SWITCHES

A. Flow-proving switches shall be either paddle or differential pressure type, as shown on the Drawings or as specified.

B. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified:

C. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.

D. Current sensing relays may be used for flow sensing or terminal devices.

2.10 RELAYS

A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.

B. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.11 TRANSFORMERS AND POWER SUPPLIES

A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

C. Unit shall operate between 0 degrees C and 50 degrees C.

D. Unit shall be UL recognized.

2.12 CURRENT SWITCHES

A. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the control system.

2.13 LOCAL CONTROL PANELS

A. All indoor control cabinets shall be fully enclosed NEMA 1 or NEMA 4 rating as required. Provide cabinet with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.

B. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

C. Provide on/off power switch with over-current protection and main air gauge for control power sources to each local panel.

2.14 AIR FLOW MEASURING STATIONS

A. Air flow measuring stations shall be multi-point, multi-axis flow ring or cross sensor. Single point or flow bar sensors are not acceptable. The airflow measurement station shall measure from 15 percent to 100 percent of unit nominal airflow. The air flow measuring station shall adjust for temperature variations and shall provide a 2 to 10 Vdc signal that corresponds to actual airflow for controlling and documenting airflow. The accuracy of the airflow measurement station shall be +- 5 percent.

B. Air flow measuring stations shall be provided by the air handler manufacturer or the VAV box manufacturer. See air handler or VAV box specification section for more details.

2.15 WALL MOUNTED CARBON DIOXIDE SENSORS

A. Carbon dioxide sensors shall be of the wall mounted type.

B. Sensors shall be of the auto-calibrated type designed to operate from 24VAC or 24VDC power.

C. Range: 0-2000 ppm CO2

D. Accuracy: ±30 ppm CO2 + 3% of reading

E. Annual Zero Drift: ±10 ppm

F. Response Time: < 3 minutes

G. Output Signals:
   1. 0-10 VDC
   2. 4-10 mA or 2-10 VDC

H. Resolution of Analog Outputs: 2 ppm CO2

I. Housing Material: Polycarbonate/ABS blend

J. The space temperature, setpoint, and override confirmation shall be annunciated by a digital display for each zone sensor. The setpoint shall be selectable utilizing buttons.

PART 3 - EXECUTION

3.01 GENERAL WORKMANSHIP

A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible location as defined by Chapter 1 Article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment

enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.02 WIRING

A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these Specifications. Where the requirements of this Section differ with those in Division 26, the requirements of this Section shall take precedence.

B. Do not install Class 2 wiring in conduit containing Class 1 wiring. Do not use boxes and panels containing high voltage for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

C. Control wiring located in a plenum space that is not installed in a conduit shall be plenum rated.

D. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to wire connections shall be at a terminal blocks, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

E. Maximum allowable voltage for control wiring shall be 120V. Provide and install step down transformers.

F. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.

G. Maintain fire rating at all penetrations in accordance with other Sections of this Specification and local codes.

H. Size of conduit and size and type of wire shall be the design responsibility of the Contractor, in keeping with the manufacturer's recommendations and the NEC.

I. Locate control and status relays in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.

J. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.

K. Adhere to Division 26 requirements for installation of raceway.

L. Maintain an updated (as-built) wiring diagram with terminations identified at the job site.

M. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3feet in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture liquid tight, flexible metal conduits shall be used.

3.03 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequate for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Install duct static pressure tap with tube end facing directly down-stream of air flow.

F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.

I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.04 FLOW SWITCH INSTALLATION

A. Install using a thread-o-let in steel pipe. In copper pipe use C x C x F Tee, no pipe extensions or substitutions allowed.

B. Mount a minimum of 5 pipe diameters upstream and 5 pipe diameters downstream or 2 feet which ever is greater, from fittings and other obstructions.

C. Install in accordance with manufacturers' instructions.

D. Assure correct flow direction and alignment.

E. Mount in horizontal piping - flow switch on top of the pipe.

3.05 ACTUATOR INSTALLATION

A. Mount and link control damper actuators per manufacturer's instructions.

B. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5 degrees open position, manually close the damper, and then tighten the linkage.

C. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

D. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.06 WARNING LABELS

A. Affix plastic labels on each starter and equipment automatically controlled. Label shall indicate the following:

C A U T I O N

This equipment is operating under automatic control and may start at any time without warning.

3.07 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2 inches of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.08 CLEANING

A. The Contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.09 PROTECTION

A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.10 FIELD QUALITY CONTROL

A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.11 ACCEPTANCE

A. Control System: The control systems will not be accepted as meeting the requirements of completion until all tests described in this Specification have been performed to the satisfaction of both the Engineer and Owner.

B. The full range of operation for all Sequences of Operation shall be demonstrated. Where sequences are dependent on season or outside conditions these conditions may be simulated for the purpose of demonstration if approved by both the Architect/Engineer and the Owner. If simulations cannot be acceptably created the Contractor shall perform the demonstration during the proper period.

C. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work specified as part of this Section consists of the work required to achieve operational and coordinated Sequences of Operation as described. Work includes coordination of functions of controllers supplied as part of equipment packages, sizing of control valves, interconnection of systems, provision and installation of all accessory devices required for complete system operation, including devices not provided as part of equipment, coordination of start-up and testing, and demonstration of the operation of Sequences of Operation to the Owner and his representatives.

B. The control system operation of all equipment shall be subject to the operational modes, conditions, and logic described in this Section and the controlled equipment manufacturer's recommendations.

C. Training of the Owner's personnel in the operation, troubleshooting, adjustment, and repair of all system controls.

1.02 RELATED SECTIONS AND WORK

A. Section 230923 - Automatic Temperature Controls and Building Automation System

B. Section 230991 - Instrumentation and Control Integration

C. Division 26 - Electrical Specifications

D. Owner's Building Management System (BMS)

E. Owner's Fire Alarm System (FAS)

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Modify/extend the existing Somers Primrose Elementary School automatic temperature control system as required to incorporate the HVAC equipment modifications.
   1. Company: ITC North Commercial
   2. Address: 7 Nancy Court, Suite 4, Wappingers Falls, NY 12590
   3. Contact: Kyle Moy
   4. Phone Number: (845) 204-8341

PART 3 - EXECUTION

3.01 GENERAL

A. General
   1. Conform to the requirements of the Owner's standards for all electrical work and devices.
   2. System and system components shall be BACnet compatible.
   3. All set points and operating points shall be able to be transmitted to and set from the BMS system. Specific points to be enabled shall be at the discretion of the Owner.
   4. All systems shall be capable of operating independently of the BMS system based on set points and limits either input from the BMS system or manually.
   5. Coordinate all work with the requirements and characteristics of the BMS system and the equipment provided for the project under this phase or earlier phases.
   6. All space sensors and thermostats shall have an LCD display indicating their set point, the condition sensed and the mode of operation they are responding to.
   7. All equipment to be integrated with the BMS shall be fully integrated with new or existing facility controls and devices including interlocks, icons, graphics, read-outs and reports.

3.02 HVAC SEQUENCES

A. Unit Ventilators

B. Exhaust Fans - Classroom Relief/Exhaust

C. Exhaust Fans - Restrooms

D. Duct Smoke Detectors / Fire Alarm

E. Freezestat

F. Motor Starters or Variable Frequency Drives

G. CO2 Sensors and Demand Control Ventilation

H. CO2 Sensors

I. Demand Control Ventilation

3.03 UNIT VENTILATORS

A. The unit ventilators shall be controlled in accordance with ASHRAE Cycle II. The units shall be indexed for occupied/unoccupied modes of operation through the ATC panel. Provide for each unit an ATC panel, wall mounted sensor with override push button, low limit supply air sensor, freezestat, modulating hot water or steam control valve (as required - see drawings), a spring return modulating outside/return air damper actuator, and supply & exhaust fan relays/contacts (as required).
   1. Where required:
      a. Provide an interlock with the associated classroom relief/exhaust fan.
   2. Note: Unit ventilators shall be provided with cooling coil. Connection to cooling coil to be provided in the future.

B. When the unit ventilator is indexed to the occupied heating mode, the supply fan shall run continuously. The associated relief/exhaust fans shall run continuously. The outside air damper will open to its minimum position. On a call for heat, the heating control valve will modulate open to maintain the heating space temperature. On a call for cooling, the heating valve will modulate fully closed. Once the heating valve closes fully, the outside air damper will modulate open for free cooling (economizer cycle). If the discharge air temperature begins to drop below 60 degrees F., the outside air damper shall modulate back to the minimum position, and the heating control valve will modulate open. A low limit discharge air sensor shall prevent unit discharge air from dropping below 60 degrees F. (adjustable).

C. Morning Warm-Up shall operate in the following sequence before indexing the unit ventilator into the occupied heating mode. If the actual space temperature is three or more degrees F. (adjustable) below the occupied space temperature setpoint, when occupied mode is initiated, the unit will begin the morning warm-up cycle. During morning warm-up, the controller shall provide maximum heating with the outside air damper fully closed until the temperature at the space sensor is within the morning warm-up dead band. (Normally within three degrees of the space sensor setpoint). When warm-up is achieved, the unit will operate in the occupied mode.

D. When the unit ventilator is indexed to the unoccupied heating mode, the supply fan will remain off. The associated exhaust fans will remain off. The outside air damper will close. The heating control valve will open fully if the outside air temperature is below 40 degrees F. (adjustable). On a drop in space temperature below the unoccupied setpoint, the supply fan will cycle on with the heating control valve fully open until the room temperature exceeds the unoccupied setpoint.

E. Provide a dirty filter switch at each of the filter banks. The switch shall be set as per the filter manufacturer’s rating for a dirty filter. Whenever the filter exceeds this rating, the filter switch shall indicate a dirty filter alarm to the ATC system.
   1. Alternate: Provide dirty filter alarm based on run hours.

F. Provide an airflow switch or a current sensor at each supply and each associated exhaust fan. The switch/sensor shall provide fan status and fan failure to the ATC system.

G. The unit ventilator control panel shall have a fail-safe operation that can be triggered by several occurrences:
   1. Freezestat
   2. Failure of the space sensor, or

3. Discharge air sensor

H. Upon detection of any of the above faults, the ATC panel shall go through the following sequence:
   1. Outside air damper shall close.
   2. The hot water or steam heating valve shall open.
   3. Supply air fans shall be off.

3.04 EXHAUST FANS - CLASSROOM RELIEF/EXHAUST

A. For like-in-kind exhaust fan replacements for fans providing relief/exhaust to classrooms, fans shall be interlocked with the associated new classroom unit ventilators to provide relief/exhaust air systems where applicable for minimum or maximum/economizer exhaust.

B. The exhaust fans shall be indexed for occupied - unoccupied modes of operation through the ATC system. During the occupied cycle, the respective "minimum" exhaust fans shall run continuously. During the unoccupied cycle, the respective exhaust fans shall remain off.

C. Provide a differential pressure switch or current sensor at each of the exhaust fans. The switch/sensor shall provide fan flow status and fan failure to the ATC system.

3.05 EXHAUST FANS - RESTROOMS

A. For like-in-kind exhaust fan replacements for fans providing exhaust to restrooms or other back-of-house spaces, the fans shall be indexed to run via the ATC system on an occupied-unoccupied schedule.
   1. Occupied: the fans shall run continuously.
   2. Unoccupied: the fans shall be off.

3.06 DUCT SMOKE DETECTORS / FIRE ALARM

A. A duct smoke detector shall be furnished by the electrical contractor and installed in the ductwork by the mechanical contractor. The electrical contractor shall provide wiring from the duct smoke detector to the associated unit’s motor starter and to the building fire alarm system. Whenever products of combustion are sensed, the unit's fans will shut down.

B. Where indicated on the drawings, the electrical contractor shall provide wiring from the building’s fire alarm system to a set of contacts at the HVAC unit’s control panel to indicate a fire alarm condition and for secondary shutdown.

C. Where indicated on the drawings, the mechanical contractor shall provide wiring from an additional set of contacts from the duct smoke detector to the HVAC unit’s control panel to indicate a fire alarm condition and for secondary shutdown.

3.07 FREEZESTAT

A. A two-pole freezestat shall be installed on the leaving side of all heating coils. One set of contacts is wired in series with the unit duct smoke detector for fan shutdown. A second set of contacts closes when the device is tripped, sending an alarm signal to the control panel.

3.08 MOTOR STARTERS OR VARIABLE FREQUENCY DRIVES

A. All safety devices shall be wired so they stop the motor with the hand-off-auto switch in the hand as well as the auto position. This will normally mean breaking the common wire from the hand-off-auto switch to the starter’s holding coil through the safety devices.

3.09 CO2 SENSORS AND DEMAND CONTROL VENTILATION

A. Demand Control Ventilation shall comply with the "Manual of Planning Standards, 2026, The University of the State of New York, The State Education Department" including:
   1. Part 6: Heating, Ventilating, and Air Conditioning Requirements, S604 Demand Control Ventilation.

3.10 CO2 SENSORS

A. Provide CO2 sensors for assembly areas or areas indicated on the drawings (conference rooms, classrooms, assembly areas, fellowship, lounge, cafeteria, etc.) where occupancy can greatly

vary during the day. Wall mounted CO2 sensor shall have a maximum range of 0-2000 ppm. When the CO2 level exceeds 850 ppm (adjustable), the unit shall go into the occupied mode and outside air shall be provided. Outdoor air levels are typically assumed to be 400 ppm. As CO2 levels go up, occupants can become uncomfortable, unproductive, and tired. ASHRAE Standard 62 recommends enough outside air be brought in to keep CO2 levels below 1,000 ppm maximum.

3.11 DEMAND CONTROL VENTILATION

A. Demand Control Ventilation shall be provided the HVAC systems. DCV is an energy-saving control strategy that reduces the rate at which outdoor air is delivered to a zone during periods of partial occupancy.

B. DCV is a feedback control method to maintain indoor air quality that automatically adjusts the ventilation rate provided to a space in response to changes in conditions such as occupant number or indoor pollutant concentration. The control strategy is mainly intended to reduce the energy use by heating, cooling, and ventilation systems compared to buildings that use open-loop controls with constant ventilation rates.

C. References:
   1. ISO ICS 91.140.30: Ventilation and Air-Conditioning Systems.
   2. ASHRAE 62.1 & 62.2: The Standards for Ventilation and Indoor Air Quality.
   3. ASHRAE 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings.
      a. Sections 6.4.3.8, 6.5.3.8, and 6.5.3.7.

D. Methods of Estimating Occupancy:
   1. Gas detection - CO2 Sensors.
   2. Motion or Occupancy Sensors.
   3. Timed Schedules.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the pipe, valves, fittings, and joining materials for use with the piping systems described in this Section and as shown on the Drawings.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 230529 - Pipe Hangers and Supports

C. Section 230555 - Mechanical System Identification

D. Section 230700 - Pipe Insulation

E. Section 232007 - Piping Specialties

1.03 ABBREVIATIONS

A. The following are standard abbreviations:
   1. CWP: Cold working pressure.
   2. EPDM: Ethylene-propylene-diene-terpolymer rubber.
   3. NRS: Nonrising stem.
   4. OS&Y: Outside screw and yoke.
   5. PTFE: Polytetrafluoroethylene plastic.
   6. SWP: Steam working pressure.
   7. TFE: Tetrafluoroethylene plastic.
   8. NPS: Nominal Pipe Size

1.04 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Piping Product Data Submittal
      a. Product Data: For each type of valve indicated: Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
      b. Product data on pipe, fittings, gaskets, and bolts. Include dimensions, specifications, and manufacturer. Provide pipe and valve application schedule.
      c. Provide product data, including but not be limited to dimensions, specifications, manufacturer, installation and operation instructions, temperature and pressure ratings, end connections, and required clearances on piping specialties included in this Specification.
      d. Welder Certifications - Furnish the names of pipe welders and welding operators employed by the Contractor to perform the Work who have been qualified to use the welding procedures which have been qualified in accordance with the specified pressure piping codes or AWS or NFPA standards.
   2. Piping Shop Drawings
      a. Where deviations from the Drawings and Specifications are proposed for any reason, submit shop drawings identifying proposed deviations showing layout of all piping, fittings, materials, dimensions, and fabrication and installation details. Submit a comparison table of the specified features and ratings of the specified item and those of the proposed deviation to allow a direct comparison.
      b. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility. No dimensional or coordination check will be made.

c. The Contractor has the sole responsibility to review the Drawings, coordinate piping fabrication, and provide clearances and access for installation, maintenance and balancing of this Work, and Work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the piping.
d. Submit all layout shop drawings on not less than ¼ inch equals 1 foot scale drawings.

1.05 REFERENCES

A. Division 01 - Quality Control: Requirements for references and standards.
B. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
C. ANSI C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
D. ASME B16.3 - Malleable Iron Threaded Fittings.
E. ASME B16.5 - Steel Pipe Flanges and Flanged Fittings
F. ASME B16.9 - Factory-Made Wrought Steel Buttwelding Fittings
G. ASME B16.15 - Cast Bronze Threaded Fittings
H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
I. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
J. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
K. ASME B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings.
L. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
M. ASME B16.39 - Pipe Unions, Malleable Iron Threaded
N. ASME-B31.1 - Power Piping.
O. ASME B31.2 - Fuel Gas Piping.
P. ASME B31.5 - Refrigeration Piping.
Q. ASME B31.9 - Building Service Piping.
R. ASME B36.10M - Welded and Seamless Wrought Steel Pipe
S. ASME SEC IV - Construction of Heating Boilers.
T. ASME SEC IX - Welding and Brazing Qualifications.
U. ASTM A47 - Ferritic Malleable Iron Castings
V. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
W. ASTM A74 - Cast Iron Soil Pipe and Fittings.
X. ASTM A105 - Forgings, Carbon Steel, for piping components.
Y. ASTM A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
Z. ASTM A181 - Forgings, Carbon Steel, for General Purpose Piping
AA. ASTM A197 -Cupola Malleable Iron
BB. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
CC. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile
DD. ASTM B32 - Solder Metal.
EE. ASTM B42 - Seamless Copper Pipe.
FF. ASTM B62 - Composition Bronze or Ounce Metal Castings
GG. ASTM B75 - Seamless Copper Tube

HH. ASTM B88 - Seamless Copper Water Tube.

II. ASTM B306 - Copper Drainage Tube (DWV).

JJ. ASTM B584 - Copper Alloy Sand Castings for General Applications

KK. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

LL. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

MM. AWS A5.8 - Specification for Brazing Filler Material

NN. AWWA C651 - Disinfecting Water Mains.

OO. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

PP. NFPA 30 - Flammable and Combustible Liquids Code

QQ. NFPA 54 - National Fuel Gas Code.

RR. NSF 61 - Domestic Water Pipe, Valves, and Fittings.

SS. Mechanical Code of New York State-Latest Edition

TT. Plumbing Code of New York State-Latest Edition

UU. Fuel Gas Code of New York State-Latest Edition

VV. FM - Factory Mutual Compliance

WW. UL - Underwriter's Laboratory Compliance

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Set butterfly valves closed or slightly open.
   6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Protect all flange faces with wood, plastic or soft metal to prevent damage to parts.

E. Protect all pipe threads from damage with plastic plugs or caps.

F. Mark and identify all piping materials in accordance with the Reference Standards specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

A. When two or more valves of the same type are used in the same service, furnish all valves of this type from the same manufacturer.

B. Specific manufacturer's model numbers are cited in the following Piping Material Schedules to establish the desired quality and performance for each type valve or material. Equivalent products by other approved manufacturers are also acceptable. Approval shall be subject to review by the Architect/Engineer.

2.02 LOW PRESSURE STEAM AND CONDENSATE (INCLUDING VENTS, RELIEF AND DRAIN LINES)

Item	Pipe Size	Description	Manufacturer/ Model No.
Piping	All sizes	Schedule 40, seamless steel, ASTM A 53 Grade B (all condensate and blowdown piping shall be schedule 80 seamless steel)	Wheatland
Joints	2 inches & smaller 2 ½ inches & larger	Threaded Connections Welded Connections	
Fittings	2 inches & smaller 2 ½ inches & larger	125#, cast iron, threaded, ASTM A126 Standard Weight, Seamless steel, butt welded, ASTM A234	Anvil Weldbend
Flanges	2 ½ inches & larger	150#, forged steel, weld neck, bore to match pipe ID, ASTM A181	Weldbend
Bolts	All Sizes	Alloy Steel, Hex Head Bolts and Nuts, ASTM A307 Grade B	
Unions	2 inches & smaller	150#, malleable iron, brass trim, threaded ends ASTM A197, ASME B16.3	Anvil
Gaskets	All Sizes	Spiral wound metallic gaskets	Flexitallic Style LS/LSI
Gate Valves	2 inches & smaller 2 ½ inches & larger	Class 125, threaded connections, rising stem, union bonnet, solid wedge, bronze body and wedge, non-asbestos packing and ductile iron hand wheel. MSS-SP80, ASTM B62 Class 125, flanged connections, OS & Y, cast-iron body and bonnet, bronze trim, solid-wedge disc, 200 psig CWP rating. ASTM A-126 Class B	Nibco T-124 Nibco F-617-O
Swing Check Valves	2 inches & smaller 2 ½ inches & larger	Class 125, Y-pattern swing type, threaded connections, bronze body with TFE seat disc. MSS-SP80, ASTM B 62 Class 125, swing-type, flanged connections, cast iron body with	Nibco T413-Y Nibco F918-

Item	Pipe Size	Description	Manufacturer/ Model No.
		bronze trim, non asbestos gasket. MSS-SP71, ASTM A-126 Class B	B
Globe Valves	2 inches & smaller	Class 150, threaded connections, bronze body, bonnet, and seat, TFE disc, copper-silicone bronze stem, union-ring bonnet, 300 psig CWP rating. ASTM B-62	Nibco T-235-Y
	2 ½ inches & larger	Class 125, flanged connections, cast-iron body and bonnet with bronze trim, 200 psig CWP rating. ASTM A-126 Class B	Nibco F-718-B
Ball Valves	2 inches & smaller	Two-Piece, Full-Port, threaded connections, bronze body, type 316 stainless-steel vented ball and stem, reinforced TFE seats, 150 psig SWP and 600-psig CWP ratings. MSS SP-110, ASTM B 584 Alloy C84400, ASME B1.20.1	Nibco T-585-70-66
Butterfly Valves	2 ½ inches & larger	Single flange, full lug, 720 psig CWP and 50 psig SWP rating, permanently lubricated 300-series stainless-steel bushings with graphite and modified PTFE seats, graphite packing and gasket, one-piece duplex stainless-steel stem and stainless-steel disc. Valves NPS 6 and smaller shall have lever-lock operator; valves NPS 8 and larger shall have weatherproof gear operator. MSS SP-88, API 609, ANSI B 1634A, ANSI B16.5	Nibco LCS7822-3/5

2.03 HEATING HOT WATER PIPING

Item	Pipe Size	Description	Manufacturer/ Model No.
Pipe	2 inches and smaller	Type L, hard drawn copper tubing, ASTM B88	Mueller Industries Wheatland
	2 ½ inches and larger	Schedule 40, seamless steel, ASTM A 53 Grade B	
Joints	2 inches and smaller	Lead-free solder, ASME B32; Water Soluble Flux, ASTM B-813	J.W. Harris-

Item	Pipe Size	Description	Manufacturer/ Model No.
	2 ½ inches and larger	Welded Connections	Bridgit
Fittings	2 inches and smaller 2 ½ inches and larger	Cast copper alloy or wrought copper ASME B16.18 or ASME B16.22 Standard Weight, Seamless steel, butt welded, ASTM A234	Nibco Weldbend
Flanges	2 ½ inches and larger	150#, forged steel, weld neck, bore to match pipe ID, ASTM A181	Weldbend
Bolts	All sizes	Alloy Steel, Hex Head Bolts and Nuts, ASTM A307 Grade B	
Unions	2 inches & smaller	Wrought copper, solder unions, ASME B16.22	Nibco
Dielectric Unions	2 1/2 inches & smaller	Dielectric Type, Copper to Steel	Watts Regulator Series 3000
Gaskets	All Sizes	Spiral wound metallic gaskets	Flexitallic Style LS/LSI
Ball Valves	2 inches & smaller	Two-Piece, full-Port, threaded connections, bronze body, chrome-plated brass/bronze ball, TFE seats, separate packnut with adjustable stem packing, anti-blowout stem, 150 psig SWP and 600-psig CWP ratings. MSS SP-110, ASTM B584 Alloy C84400	Nibco T-585-70
Check Valves	2 inches & smaller 2 ½ inches & larger	Class 125, Y-pattern swing type, soldered connections, bronze body with TFE seat disc. MSS-SP80, ASTM B 62 Class 125, swing-type, flanged connections, cast iron body with bronze trim, non asbestos gasket. MSS-SP71, ASTM A-126 Class B	Nibco S413-Y Nibco F918-B
Butterfly Valves	2 ½ inches & larger	Full-lug type with ductile-iron body, one-piece Type 416 stainless-steel stem, copper bushing, aluminum-bronze disc, and molded-in EPDM seat. Valve sizes 2 ½” through 6” shall	Nibco LD-2000-3/5

Item	Pipe Size	Description	Manufacturer/ Model No.
		have lever lock operator; valve sizes 8” and larger shall have weatherproof gear operator. MSS SP-67	
Balancing Valves	2 inches & smaller	Provide ball or globe style with flow balancing and shut-off capabilities, memory stops, and minimum two metering ports. Female sweat, NPT threaded, or press connections to match system piping. Bronze, brass or steel construction consistent with system temperature and pressure. Minimum design pressure and temperature shall be 175 psig at 250 deg F. Provide with upstream strainer.	Armstrong CBV B&G Circuit Setter IMI STAS/ATAD
Balancing Valves	2 ½ inches & larger	Valve shall be of cast iron construction with 125 psi ANSI flanged connections suitable up to 175 psi working pressure. Valves 2-1/2”-3” pipe shall have a brass ball with glass and carbon filled TFE seat rings. Valves 4”-12” shall be fitted with a bronze seat, replaceable bronze disc with EPDM seal insert, and stainless steel stem. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplate to assure specific valve setting. Valves to be leak-tight at full rated working pressure. Design pressure and temperature shall be 175 psig at 250 deg F. Provide with upstream strainer.	Bell and Gossett Circuit Setter

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Unless otherwise shown, route piping in the most direct manner parallel to building lines in accordance with the Drawings. Group piping whenever practical at common elevations.

B. Accurately align, support and connect piping without forcing.

C. Locate piping so that access to and clearance around equipment, and minimum piping headroom of 6'-8" is maintained, except where otherwise shown.

D. Space piping so that insulation and flanges, if any, have at least 1 inch clearance after maximum movement.

E. Where pipe elevations are not shown, pitch supply and return lines to positive drain points and/or coils.

F. Provide accessible flanges or union connections on the supply and return connections of terminal equipment and other items which must be disconnected for maintenance. Where unions are furnished as an integral part of the equipment, additional unions are not required unless required for access to or removal of components. Arrange equipment piping connections so that maintenance can be made without removing large sections of pipe or relocating the equipment.

G. In Domestic Water Systems, connect branch lines to the top of the line. For all other liquid systems, connect branch lines to the bottom or lower half of the line, preferably the bottom.

H. Connect branch lines in steam service and compressed air to the top or upper half of the line, preferably the top.

I. Use fittings for all changes of direction. Bending of steel pipe is not permissible.

J. Clean all piping materials before installation to remove grease, loose dirt, mill scale and other foreign matter.

K. Provide air vents at all high points of water piping, and valved drains at all low points of water piping for complete venting, draining and flushing of the piping system. Locate and provide air vents at multiple high points that are necessary to prevent air binding in the piping system. Install additional air vents and drains if directed by the Architect/Engineer, at no cost to the Owner. As a minimum provide drains and air vents
   1. In each section of piping separated by valves.
   2. On all coils.
   3. For each riser, where riser or runout to riser has a valve installed.
   4. In low point of piping to each down fed convector or radiator.

L. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide loops, pipe offsets and anchors.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Install gate or ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.

O. Sleeve pipes passing through partitions, walls and floors.

P. Identify piping under provisions of “Mechanical System Identification” Specification.

Q. Provide escutcheons at all locations where piping installed exposed to view penetrates wall, partitions, floors and ceilings.

R. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

S. Install flexible connectors at inlet and discharge connections of pumps and other vibration producing equipment.

T. Install strainers on the supply side of each control valve, pressure regulating valve, solenoid valve, trap, and elsewhere as indicated.

U. For pressurized liquid piping systems installed horizontally make reductions in pipe sizes using eccentric reducer fitting installed with the level side up to allow air venting.

V. For all nipples up to and including six inches in length provide extra-heavy shoulder type. For all nipples over six inches in length provide corresponding material, quality and thickness as the pipe on which they are used. Do not use close nipples. Provide nipples with designation mark of the manufacturer conforming to the ASTM pipe specifications for system served.

W. Make connections to all cooling and heating units with single or multiple cooling or heating coils in accordance with the manufacturer’s instructions and labeling on equipment

X. For pressures over 15 psig, use nipples and caps instead of plugs for permanent closures. Plugs in equipment provided by equipment manufacturers are acceptable.

Y. Do not install piping above electrical panels. Route piping around panels.

3.02 STEAM AND CONDENSATE PIPING SYSTEMS

A. Install drip legs with steam traps at low points and natural drainage points in the steam system, such as at the ends of mains, bottoms of risers, and ahead of pressure regulators, control valves, isolation valves, pipe bends, and expansion joints.

B. On straight runs with no natural drainage points, install drip legs with steam traps at intervals not exceeding 150 feet where pipe is pitched down in the direction of the steam flow and a maximum of 100 feet where the pipe is pitched up so that condensate flow is opposite of steam flow.

C. Size drip legs same diameter as the main up to 6 inches. In steam mains 6 inches and larger, provide drip legs half the size of the distribution line but never less than 6 inches. The length of the drip leg; 1-1/2 times the diameter of the distribution line but not less than 18 inches.

D. Equip drip legs and dirt pockets with capped gate valves to allow removal of dirt and scale.

E. In piping systems installed horizontally, make reductions in pipe sizes using eccentric reducer fitting installed with the level side down.

F. Install steam supply piping at a uniform grade of 1/4 inch in ten feet downward in the direction of flow or toward the trap when a trap is present.

G. Install condensate return piping at a uniform grade of 1/2 inch in ten feet downward in the direction of flow.

H. Install automatic air vents at the end of all steam mains and headers, and on large equipment steam spaces to facilitate start-up and heat transfer. Locate the air vent at a high point of the piping system or equipment, or where the air collects. Pipe the outlet to a safe place, cut the pipe end at a 45 degree angle. Install an isolation valve upstream of automatic air vents.

3.03 THREADED CONNECTIONS

A. Ream pipe ends to remove burrs.

B. Use only standard ANSI taper threads. Threads shall be full, sharp, clean, and free of fins and burrs.

C. Apply joint sealing tape or paste to male threads only. Do not use paste on compressed air lines. When sealing fuel oil piping, use a thread-sealing compound suitable for oil when making up joints. When sealing natural gas piping, use a thread-sealing compound suitable for natural gas when making up joints.

D. Do not use close or short nipples of a size where the length of unthreaded pipe is less than the width of a pipe wrench.

E. Thredolets or similar code-approved fittings may be used for branch connections.

F. Provide unions at all threaded valve locations to facilitate the removal of the valve.

G. Joint Sealing Compound; Hercules, RectorSeal or approved equal.

3.04 WELDED CARBON STEEL CONNECTIONS

A. Perform welding using qualified welders and procedures following specified reference standards.

B. Do not use mitered welds for elbows.

C. Welded branch connections may be used in place of welding tees provided that requirements of the applicable ASME Code for pressure piping, B31.1 and/or B31.9 are met.

D. Weldolets or similar code-approved fittings may be used for branch connections.

E. Qualifications of welders, welding procedures, performance of welders and welding operators are required complying with the requirements of ASME B31.9 and ASME Boiler and Pressure Vessel

Code, Section IX. Keep records and certifications required by code on file and available for inspection.

F. Whenever welding is done close to walls, floors or building structure, thoroughly clean the surfaces of weld splatter. Remove weld splatter from the surface of all welds, pipe and pipe supports.

G. Provide long radius pattern for welding elbows unless otherwise shown on the Drawings.

H. Examine and inspect welded pipe joints as follows:
   1. Visually examine all welded pipe joints for imperfections using qualified representatives. Submit qualifications to the Architect/Engineer.
   2. Make available to the Architect/Engineer records of visual examinations upon request.
   3. Remove weld defects by grinding or chipping and repair or replace joints in accordance with approved procedures.
   4. Make shop and field welded joints available to the Owner for nondestructive inspection and examination upon request.

3.05 FLANGED CONNECTIONS

A. Arrange flange bolt holes to straddle the pipe vertical and horizontal centerlines, and match the orientation of mating flanges.

B. Install piping to equipment without strain.

C. Provide gaskets at all flanged connections suitable for the design and temperature of the fluid contained, and in accordance with Part 2 of this Section.

D. Mate flat face flanges together and raised face flanges together.

3.06 COPPER TUBING CONNECTIONS

A. Provide soldered or brazed in accordance with Part 2 of this Section.

B. Make soldered and brazed connections in accordance with the procedures in the current edition of the Copper Tube Handbook of the Copper Development Association.

C. Qualifications of brazers, brazing procedures, and performance of brazers and brazing operators are required in compliance with the requirements of ASME B31.1, ASME B31.9, and the Boiler and Pressure Vessel Code, Section IX. Keep records and certifications required by the code on file and available for inspection.

D. Make solder joints on all copper water piping with 95/5 solder. Absolutely no lead-based solder will be accepted.

E. Clean joints thoroughly before soldering.

F. Remove excess solder and flux with a cloth or brush to leave a uniform clean fillet.

G. For refrigeration copper tubing connections, comply with ASME B31.5. Make brazed joints on all refrigeration piping.

3.07 CONNECTIONS OF DISSIMILAR METALLIC MATERIALS

A. Isolate connections between dissimilar metallic materials using dielectric connections. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

3.08 VALVES

A. Provide valves of the same size as the pipe in which they are installed, unless shown otherwise on the Drawings. At pumps, match valve size to pipe size and not pump connection size.

B. Install valves with the stem on or above the horizontal. Install valves with the stem horizontal if requirements of headroom, access or chain operation must be met.

C. Pack valves and adjust glands before final acceptance.

D. Install valve extension stems or chain operators where the center of valve hand wheels is more than 6 feet-6 inches above the floor and valve is 2 ½" and larger. Prove chain hooks where required to prevent fouling of chains on equipment and to clear walkways. Terminate chains approximately 3 feet-6 inches above the floor. Provide worm gear operators or impact hand wheels for all valves 6 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation and a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation.

F. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

G. Locate valves for easy access and provide separate support where necessary.

H. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Lift Check Valves: With stem upright and plumb

I. Install butterfly valves with stems horizontal to allow support for the disc and the cleaning action of the disc.

J. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

K. Install balancing valves with lengths of straight pipe upstream and downstream of valve as per manufacturer's instructions such that calibrated accuracy is maintained As a minimum provide straight lengths as per the following table;

REQUIRED STRAIGHT LENGTHS

Valve Size	Upstream (In Pipe Diameters)	Downstream (In Pipe Diameters)
½"-3"	3	1
4"-12"	5	2

L. Chain wheel Actuators- Valve actuation assembly with sprocket rim, brackets, and chain.
   1. Sprocket rim with Chain guides: Ductile Iron (Aluminum for applications exposed to weather), of type and size required for valve.
   2. Brackets: Type, number, size, and fasteners required to securely mount actuator on valve.
   3. Chain: Stainless steel, of size required to fit sprocket rim.
   4. Manufacturers:
      a. Babbitt Steam Specialty Co.
      b. Roto Hammer Industries

3.09 CONTROL VALVE INSTALLATION

A. Install all control valves so that the stem position is not more than 60 degrees from the vertical up position.

B. Install valves in accordance with the manufacturer's recommendations.

C. Install control valves so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes, ducts and/or equipment.

D. Install isolation valves at control valves such that control valve body may be serviced without draining the supply/return side piping system. Install unions at all connections to screwed type control valves.

3.10 PRESSURE TESTING, FLUSHING AND CLEANING

A. Pressure test piping systems in accordance with applicable codes and as described herein.

B. Pressure testing - Schedule pressure testing so that it may be witnessed by the Architect/Engineer, Owner, or their representative. Perform tests in accordance with the following procedures:
   1. Before testing, complete the installation of each pipe line, including final supports, hangers and anchors. Perform testing before insulation or paint is applied for examination during the test. Clean piping and equipment of metal cuttings and foreign matter as they are installed.
   2. Codes - Pressure test piping to assure integrity of material and workmanship in accordance with the applicable ASME Code for pressure piping (B31) and New York State Code.
   3. Protection of Equipment - Protect equipment, instruments and piping specialties which are not included in the test by either disconnecting from the piping and blanking off the end of the pipe with a blind flange, plug or cap, or isolating by insertion of a line blind or spool piece as required. Disconnect pneumatic control lines and close all openings.
   4. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   5. Piping may be tested in sections or circuits as required for the progress of the work.
   6. Provide all systems to be pressurized with the appropriate gauges, certified calibrated by the manufacturer, and pressure-relieving devices.
   7. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test. Do not allow test pressure to exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
   8. Records - Provide records of all tests showing line designation, test pressure, ambient temperature, date of test, retests and signature of witness.

C. Hydrostatic Test Procedures - Perform hydrostatic testing in accordance with ASME B31.9.
   1. Perform test using the pressure indicated under “Pressure Testing Schedule”
   2. After hydrostatic test pressure has been applied for at least two hours, examine piping, joints, and connections for leakage while maintaining test pressure. Repeat hydrostatic test until there are no leaks.
   3. Repair leaks as specified under “Repair of Line Leaks”

D. Service Testing - Perform service testing in accordance with ASME B31.9.
   1. For gases and steam and condensate service not over 15 psig, and for nontoxic, noncombustible, nonflammable liquids at pressures not over 100 psig and temperatures not over 200 degrees F a system test with the service fluid is acceptable. This exemption does not apply to natural gas piping.
   2. Bring the piping system up to operating pressure gradually with visual examination at a pressure between one-half and two-thirds of design pressure. Make a final examination at operating pressure.
   3. Repair leaks as specified under “Repair of Line Leaks”
   4. Repeat service test until there are no leaks.

E. Repair of Line Leaks - Comply with the following procedures for repair of leaks. In each case retest after repairs are made.
   1. Soldered/Brazed Joints - Remove solder/brazing alloy and reapply with proper flux.
   2. Flanged Joints - Check to determine flange end alignment and that all bolts are uniformly tightened with the required torque. If leak persists, depressurize the line, remove gasket, examine flange end face, and insert new gasket.
   3. Threaded Joints - Tighten joint to a required torque. If leak does not stop, replace pipe and/or fittings. Do not use pipe dope, cement or seal weld to stop pipe leaks.
   4. Gasketed Joints - Remove existing gasket and insert new gasket.
   5. Welded Steel Joints - Repair pipe in accordance with applicable ASME B31 code.
   6. Leaks in Material - Leaks located in pipe or fitting material require the replacement of that section of pipe or fitting and a repeat of the entire system using the complete procedure required for that system. Caulking, welding or epoxy is not permitted. Repair all damage caused by leaks.

F. Flushing - Complete pressure testing requirements prior to flushing. Performance of the flushing may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of flushing any system. Perform system flushing in accordance with the following procedures:
   1. Flush all main and branch steam and liquid piping systems after pressure testing is complete with new potable water while draining the system at all low points. Isolate all connected equipment and flush individually.
   2. Flushing for piping and equipment will be considered complete when water samples taken at all low points indicate clear discharge-with no visible solids. If not clear, continue flushing and sampling until discharge is clear.

G. Cleaning - Complete flushing requirements prior to cleaning. Performance of the cleaning may be witnessed by the Architect/Engineer, Owner, or their representative, provide ample notification to all parties in advance of cleaning any system. Perform system cleaning in accordance with the following procedures:
   1. Clean all steam and condensate lines by blowing them out with live steam. Discharge steam and condensate from each main and branch safely to atmosphere for a minimum of five minutes.
   2. Clean hot water/chilled water lines as described below:
      a. When flushing discharge is clear, fill piping systems with water and sufficient approved alkaline cleaning material to remove dirt, oil and grease. Include all connected equipment in the cleaning.
      b. Vent system and place in operation, with automatic controls operating at set point temperature or an operating temperature designated by the Architect/Engineer. Circulate the solution through the system for a minimum of 4 consecutive hours.
      c. After 4 hours, drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during the cleaning operations. Refill system with clean water.
   3. Clean temporary pump strainers and strainers at coils, etc. every 2 hours periodically during cleaning procedures. Do not remove temporary strainers until all cleaning steps are completed and the operation of the system indicates that the system is free of all foreign matter.
   4. Blow out all piping and equipment after cleaning and final flushing is completed and the system is drained with clean dry instrument air for a minimum of 15 minutes or until all water is expelled from the system. Upon completion seal the system by closing all drains and vents.
   5. Following the Architect/Engineer approval of the above flushing and cleaning procedures, immediately fill each system and chemically treat and monitor in accordance with the “Chemical Treatment Systems” specifications.

H. Pressure Testing Schedule:

Service	Test Type	Design Operating Pressure (psig)	Test Pressure (psig)
Steam Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Condensate Piping	Hydrostatic		1.5 times maximum working pressure, but not less than 100 psi
Heating Hot Water Supply & Return	Hydrostatic		1.5 times maximum working

			pressure, but not less than 100 psi

3.11 PIPE FREEZING

A. Where pipe freezing is required because of the lack of isolation valves, completely freeze piping using a jacket of liquid nitrogen. Provide the services of a company specializing in pipe freezing to perform the Work. Submit to the Architect/Engineer evidence that the company has performed this work for at least 5 years.

B. Approved Manufacturer's:
   1. Freeze Tech, Inc.
   2. Pro Tapping, Inc.

3.12 HOT TAPPING

A. Provide a hot tapping tool for cutting holes in piping under pressure without interrupting system operation and without release or loss of fluid.

B. Provide hot taps to permit new tie-ins to existing piping systems, insertion of flow meters, and permanent or temporary bypasses.

C. Hot tap rating, ½ through 48 inch line size: 1500 psig maximum operating pressure at 100 degrees F and 750 degrees F maximum operating temperature at 700 psig.

D. Provide the following information on the line to be tapped to the hot tap vendor before starting the Work:
   1. Line size, wall thickness, and pipe material.
   2. Fluid in line, and operating pressure and temperature.
   3. Dimensional information and restrictions, if any.
   4. Tap size and orientation (if other than 90 degrees perpendicular to run of the pipe, give full details).

E. Provide the services of a company specializing in hot taps to perform the Work. Submit to the Architect/Engineer evidence that the company has performed this work for at least 5 years.

F. Approved Manufacturer's:
   1. Topaz, Inc.
   2. Pro Tapping, Inc.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

B. Condensate Drain.

1.02 RELATED SECTIONS

A. Section 230529 - Pipe Hangers and Supports

B. Section 230555 - Mechanical System Identification

C. Section 230700 - Piping Insulation.

1.03 REFERENCES

A. Section 014500 - Quality Control: Requirements for references and standards.

B. ASTM D1784 - Rigid Vinyl Compounds.

C. ASTM D1785 - PVC Plastic Pipe, Schedule 40

D. ASTM D2466 - PVC Plastic Fittings, Schedule 40

E. ASTM D2665 - PVC Drain, Waste, and Vent Pipe and Fittings

F. ASTM D2564 - Solvent Cements for PVC Pipe and Fittings

G. ASTM D2321 - Underground Installation of Thermoplastic Pipe (non-pressure applications)

H. ASTM F1668 - Procedures for Buried Plastic Pipe

I. ASTM F1866 - Fabricated PVC DWV Fittings

J. NSF Standard 14 - Plastic Piping Components and Related Materials.

K. NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 SUBMITTALS FOR REVIEW

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:

1. Condensate Drain Piping Product Data Submittal

a. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of New York and Town code.

B. Identify pipe with marking including size, ASTM material classification and ASTM specification.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Section 016500 – Product Delivery, Storage, and Handling: Transport, handle, store, and protect products.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 014536 – Environmental Quality Control: Moisture control affecting products on site.

PART 2 - PRODUCTS

2.01 CONDENSATE DRAIN PIPING (DIAMETER LESS THAN OR EQUAL TO 1")

A. Copper Type L Pipe and Fitting System.

B. Pipe and fittings shall be manufactured from Type L Copper.

C. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.

D. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

E. Testing with or transport/storage of compressed air or gas in Copper pipe or fittings shall not be permitted.

F. The system is intended for pressure drainage applications where the temperature will not exceed 140°F.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013100 - Project Management and Coordination: Verification of existing conditions before starting work.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and the requirements of the Plumbing Code of New York State.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. Effect changes in size with reducing fittings.

C. Install piping to maintain headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to fittings. Refer to Section 230700.

F. Provide access where valves and fittings are not exposed.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Sleeve pipes passing through partitions, walls and floors.

I. Identify piping under provisions of Section 230555.

3.04 APPLICATION

A. Install unions downstream at equipment or apparatus connections.

3.05 ERECTION TOLERANCES

A. Section 014500 - Quality Control: Tolerances.

B. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients.

3.06 FIELD QUALITY CONTROL

A. Drainage System: Test plug all system openings with the exception of the system's highest point. Fill system with water to the point of overflow and subject the highest point to 10-foot head of water. The system shall be considered tight if the pressure is held for not less than 30 minutes without signs of leakage.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section describes the pipe specialties for piping systems including, but not limited, to the following:
   1. Drain Valves
   2. Strainers
   3. Air Vents
   4. Escutcheons
   5. Dielectric Connections

1.02 REFERENCES

A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Piping Specialties Product Data Submittal
      a. Product Data: Submit product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes and finishes. Include produce description, model and dimensions.
      b. Submit manufacturer's instructions for maintenance and repair.
      c. Submit a valve and specialty application schedule.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions and replacement parts list.

1.05 RELATED WORK

A. Section 232000 - Pipe, Valves and Fittings

1.06 QUALIFICATIONS

A. Companies specializing in making products specified with at least 5 years of experience and products that have been on the market for at least 3 years.

PART 2 - PRODUCTS

2.01 DRAIN VALVE

A. Provide drain valves, ball type with ¾ inch hose connector, at all low points of water systems, on strainers, and in all locations as shown on the Drawings. Provide minimum 3/4 inch drain size. Provide caps or plugs with chain at all drain and fill valves.

2.02 STRAINERS

A. General:
   1. Provide strainers ahead of all pumps, automatic control valves, as specified for piping installations, as shown on the Drawings, and as required for proper functioning of equipment.

B. Steam and Water Strainers
   1. “Y” type or “Basket” type, as shown on the Drawings.
   2. Provide a strainer screen blow down valve the full size of the blow-off tapping for each strainer. Provide gate valves for steam service and ball valve with ½ inch hose end for water service.
   3. Stainless steel strainer screens with perforations as follows:

Pipe Size (Inches)	Water Service Perforations (Inches)	Steam Service Perforations (Inches)
Thru 4	1/16 (except at cooling tower pumps shall be 1/8)	1/32
Over 4	1/8	3/64

1. Select the length of the nipple connecting the blow-off valve to the strainer basket flange so that the blow-off valve is clear of the insulation.
2. Select strainers with bodies compatible with connected piping from the following schedule for the service intended.

Size	Manufacturer	Strainer Type	Model No.	Description
2 inches & smaller	Mueller Steam Specialty	Y	11 M	Cast iron body, threaded ends, ANSI Class 250
2 inches & smaller	Mueller Steam Specialty	Y	358 S	Bronze body, soldered ends, ANSI Class 125, for copper pipe
2 ½ inches & larger	Mueller Steam Specialty	Y	758	Cast iron body, flanged ends, ANSI Class 125
2 inches & smaller	Mueller Steam Specialty	Basket	125	Cast iron body, screwed ends, ANSI Class 125
2 inches & smaller	Mueller Steam Specialty	Basket	125 B	Bronze body, screwed ends, ANSI Class 150, for copper pipe
2 ½ inches & larger	Mueller Steam Specialty	Basket	166	Cast iron body, flanged ends, ANSI Class 250

2.03 AIR VENTS

A. Automatic Air Vents:
   1. Float actuated high capacity air vent designed to purge free air from the system and provide shutoff at pressures up to 150 psig at a maximum temperature of 250 degrees F. Design to prevent air from entering the system if system pressure drops below atmospheric pressure and to purge free air at pressures up to 150 psig during normal system operation.
   2. Cast iron and fitted with components of stainless steel, brass, and EPDM.
   3. Provide a shutoff ball valve before the automatic air to isolate the air vent from the system.
   4. Approved Manufacturer: ITT Bell & Gossett Model 107A.

B. Manual Air Vents:
   1. ½ inch ball valves with ½ inch hose ends.

2.04 ESCUTCHEONS

A. Provide escutcheons with spring-catch fasteners at all locations where insulated or uninsulated piping, installed exposed to view, penetrates wall, partitions, floors, and ceilings.

B. Plain pattern, chrome-plated brass for all piping except galvanized steel.

C. Galvanized around galvanized steel pipe.

D. Deep recess to cover sleeves at floor penetrations.

2.05 DIELECTRIC CONNECTIONS

A. Approved Manufacturer: Watts Regulator Series 3000 Dielectric Unions and Flange Systems

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install work in accordance with manufacturer's instructions and as shown on the Drawings.

B. Furnish and connect to all valves, brass tags, polished or lacquered, with stamp lettering or numbers filled in with black paint. Identify each zone.

C. See "Pipe, Valve and Fitting" Specification for more information.

D. Secure escutcheons to the pipe or insulation and flush with the building surface.

E. Clean the valves and place them in final operating position

3.02 STRAINER INSTALLATION

A. Installed strainers so they are readily accessible

B. Remove start-up strainer screen from suction diffusers and strainers and install permanent screens prior to balancing water systems.

3.03 AIR VENT INSTALLATION

A. Provide automatic air vents with ¼ inch copper drip lines to the nearest floor or roof drain.

B. Install air vents where shown on the Drawings and at the high points of all systems and at other locations as required to allow complete venting of air from the system.

3.04 DIELECTRIC CONNECTIONS

A. Isolate connections between dissimilar metallic materials. Use dielectric unions or flanges that provide a complete isolation of the two ends, including bolts for flanges, using materials suitable for the design pressure, temperature and fluid contained.

END OF SECTION

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes steam specialties, including vacuum breakers for steam and condensate piping systems.

1.02 REFERENCES

A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

B. ASME B31.1 - Power piping.

C. ASME B31.9 - Building Services piping.

1.03 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include, but not be limited to:
   1. Steam Specialties Product Data Submittal
      a. Product Data: Provide product data for manufactured products and assemblies required for the Work. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model, and dimensions.
      b. Submit the manufacturer's instructions for maintenance and repair.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and a replacement parts list.

1.05 RELATED WORK

A. Section 232000 - Pipe, Valves, and Fittings

PART 2 - PRODUCTS

2.01 VACUUM BREAKERS

A. Steam Systems (Atmospheric Return)
   1. Provide Vacuum Breakers on all modulating or on/off heat exchangers and coils, except in vacuum return systems. Installed in the supply side between the control valve and equipment and be of hardened ball check valve design with all working parts manufactured from stainless steel. Construction; Brass or stainless steel bodies as required for the application, suitable for operating conditions of 210 psig (or 304 psig) saturated steam.
   2. Approved manufacturers: - Spirax/Sarco Model VB.
   3. Install in a vertical position with cap at the top at the highest point of the circuit. Provide n isolating valve upstream of device.

B. Steam Systems (Vacuum Return)
   1. Provide swing check valves of the type specified for the piping system between the coil and the vacuum return line. Provide isolation valves and union upstream and downstream of the device.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install Work in accordance with manufacturer’s instructions and as shown on the Drawings.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Pipes, Valves, and Fittings: Section 232000.

1.02 SUBMITTALS

A. Submit for review, products utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include, but not be limited to:
   1. Steam Traps Product Data Submittal
      a. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions for each type of trap.
      b. Submit the manufacturer's instructions for maintenance and repair.

PART 2 - PRODUCTS

2.01 TRAPS - GENERAL

A. Unless otherwise indicated, size combination float and thermostatic, inverted bucket and impulse traps of capacity to continuously discharge 2-1/2 times the normal condensate rate of particular equipment or apparatus being served.

B. Combination float and thermostatic, and inverted bucket traps with integral strainers may be submitted for approval, in lieu of a separate trap and strainer, if the integral strainer and trap meet individual trap and strainer specifications.

2.02 COMBINATION FLOAT AND THERMOSTATIC TRAPS

A. Product Requirements: Design for 125 psig steam pressure, when used in systems up to 30 psig inclusive, and 175 psig steam pressure for systems operating from 31 psig to 125 psig inclusive. Base maximum ratings on 1/2 psi differential through the trap. Size orifices rated for the operating steam pressure. Wearing parts shall be renewable.

B. Materials: Cast iron body and cover; copper or stainless steel float; brass or stainless steel valve mechanisms; stainless steel valve seats and stainless steel or bronze valve heads. Air vent of the balanced pressure type with bronze, monel, or stainless steel bellows; stainless steel or hard bronze valve head and seat.

C. Applications: Steam heating coils, heat exchangers, steam main, and riser drip legs.

2.03 THERMOSTATIC TRAPS

A. Class 125, bronze angle-pattern body with integral union tailpiece and screw-in cap; balanced-pressure, stainless-steel or Monel bellow element; and renewable, hardened stainless-steel head and seat.

B. Application: Steam fin tube and convectors.

2.04 THERMOSTATIC RADIATOR TRAPS

A. Design and Materials: Balanced pressure volatile liquid filled bellows type, designed to operate at 25 psig steam pressure. Furnish bronze bodies with finished terminals and brass union; thermostatic seamless tubing bellows of phosphor bronze, monel metal or stainless steel, with a minimum of seven folds, stainless steel valve head and seat.

B. Application: Steam radiators.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install traps in accordance with the manufacturer's printed installation instructions.

B. Unless otherwise indicated, install gate valve, strainer, and union upstream from the trap; install union, check valve, and gate valve downstream from trap.

C. When steam trap discharge is elevated, provide a check valve after the trap.

D. Install dirt pockets/ drip legs at all drops and risers of steam condensate lines.

E. Provide steam trap tagging, identification and schedule in accordance with valve tagging specification.

F. When freezing is a possibility, install thermodynamic steam traps in the vertical position otherwise thermodynamic traps may be installed in the horizontal position.

G. When freezing is a possibility, install float and thermostatic steam traps with a Liquid Expansion Steam Trap below the drain tapping of the trap as recommended by the manufacturer.

H. Provide piping upstream and downstream of steam traps (from drip leg connection or equipment outlet connection to condensate return main connection) at least 1 pipe size greater than trap size.

I. Combination Float and Thermostatic Traps:
   1. Use to trap equipment controlled by a modulating valve. Do not install inverted bucket traps for this service.
   2. Use where indicated, to drip the end of each steam main, and at other points where indicated, for steam systems with operating pressures up to and including 15 psig.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section describes the galvanized steel, flexible, and aluminum ductwork for HVAC duct systems in accordance with SMACNA Duct Construction Standards, except as otherwise specified.

B. The construction material for each ductwork system shall be as listed in the “Ductwork Material Schedule” at the end of this Section.

C. This Section also describes the fittings, access doors, hangers and supports, manual volume dampers, and sealants for each ductwork system as required.

1.02 RELATED WORK

A. Section 230594 - Balancing of Air Systems

1.03 REFERENCES

A. ASHRAE - Handbook Fundamentals; Latest Edition.

B. SMACNA - HVAC Duct Construction Standards, Metal and Flexible (latest issue)

C. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D. ASTM B209 - Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.

E. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

F. UL 555 S - Fire Dampers & Smoke Dampers.

G. NFPA 96 - Standard for Commercial Cooking Operations

H. New York State Mechanical Code.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, SMACNA, and New York State Mechanical Code standards.

1.05 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:

1. Ductwork Shop Drawings
    a. Coordinate layout duct drawings that differ from ductwork shown on the Drawings.
    b. The review of deviations will be for pressure drop only. The review will not address clearances or accessibility to maintain or balance the air systems. No dimensional or coordination check of the shop drawings will be made. The Contractor has the sole responsibility to review the Drawings, coordinate ductwork fabrication, and provide clearances and access for installation, maintenance and balancing of this work, and work of other trades. Unless specifically dimensioned, Drawings indicate approximate locations only. The Contractor has the sole responsibility to locate and route the ductwork.
    c. Deviations such as changing direction or transforming or dividing ductwork must maintain ductwork cross-sectional area and not exceed transformation taper of 15 degrees.
    d. Plans and section showing all equipment and accessories.
    e. Minimum 3/8 in. scale, double line, showing sizes, transverse joints, transitions, elevations, clearances and accessories; sections where required.
2. Sheet Metal Product Data Submittal
    a. Submit product data for materials and equipment listed within Part 2 of this specification.

1.06 QUALITY ASSURANCE

A. Construct all ductwork in accordance with referenced SMACNA Standards, except as otherwise stated. Ductwork pressure classifications shall be in accordance with referenced SMACNA Standards, except as otherwise specified.

B. For all uninsulated ductwork casings and plenums located outdoors, the reinforcement members shall be galvanized steel or stainless steel.

C. Construction pressure classification of ductwork are shown on the Drawings. If not shown, the pressure classification shall be greater than or equal to the maximum operating static pressure (minimum 2" w.c. pressure classification).

D. All ductwork shall be free from pulsation, chatter, vibration and objectionable noise. If any of these defects appear after a system is in operation, correct by removing and replacing, or reinforcing the ductwork, at no additional cost to the Owner.

E. For all galvanized steel ductwork, zinc coating shall be minimum G90 per ASTM A653.

PART 2 - PRODUCTS

2.01 GALVANIZED STEEL RECTANGULAR DUCTS AND FITTINGS

A. Construct ducts of galvanized sheet steel meeting ASTM A 653 with G90 coating designation, and in accordance with the latest SMACNA HVAC Duct Construction Standards Metal And Flexible and pressure classifications as stated on the Drawings (minimum 2" w.c. pressure classification).

B. No ducts shall be less than No. 22 U.S. Gauge.

C. Piping, conduit and structure shall not penetrate ductwork. Where this condition cannot be avoided and with the written permission of the Architect/Engineer, follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transition sections shall slope a maximum of 15 degrees.

D. Provide 90-degree full-radius elbows with a centerline radius 1.5 times the duct width in the plane of the bend.

E. For elbows with centerline radius less than 1.5 times the width of the duct in the plane of the bend, provide turning vanes.

F. Provide square throat elbows with manufactured turning vanes.

G. All dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets.

H. For split fittings, the split shall be proportional to the air flow. Construct per SMACNA HVAC Duct Construction Standards- Metal and Flexible.

I. Transitions and Offsets shall follow SMACNA HVAC Duct Construction Standards Metal and Flexible, except that sides of transitions shall slope a maximum of 15 degrees.

J. All branch take-offs perpendicular to the main shall be a 45 degree entry.

K. Longitudinal seams shall be of the Pittsburgh Lock type outlined in the SMACNA HVAC Duct Construction Standards Metal and Flexible.

L. Duct transverse joints shall be selected and used consistent with the static pressure class, applicable sealing requirements, materials involved, duct support intervals and other provisions for proper assembly of ductwork outlined in the SMACNA HVAC Duct Construction Standards - Metal and Flexible. Transverse joints T-25a, T-25b (Ductmate) shall only be used. Metal clips will only be allowed (NO PVC). Ductmate shall not be used for the following (use transverse joints T-15 through T-24 in these cases):

1. The Ductmate '45' system shall not be used for applications with duct gauges heavier than 10 or lighter than 22.

2. The Ductmate '35' system shall not be used for applications with duct gauges heavier than 16 GA. or lighter than 26 GA.
3. The Ductmate '25' system shall not be used for application with duct gauges heavier than 20 GA. or lighter than 26 GA.

2.02 TURNING VANES

A. Manufactured with same material as ductwork that it is installed in and to the same pressure classification as ductwork that they are installed in.

B. Provide turning vanes in all square duct elbows and as noted on the Drawings.

C. Vanes shall be as detailed in SMACNA HVAC Duct Construction Standards Metal and Flexible.
1. Single thickness 2" or 4" vanes up to 36" length.
2. Double wall 2" vanes up to 48" length.
3. Double wall 4" vanes up to 72" length.

D. Where a rectangular duct changes in size at a square-throat elbow fitting, use single thickness turning vanes with trailing edge extensions aligned with the sides of the duct.

2.03 ACCESS DOORS

A. For access doors for use in ductwork receiving Fire Rated Blanket Insulation see Ductwork Insulation Section for requirements. Fabricate all other access doors in accordance with SMACNA Duct Construction Standards Metal And Flexible and as indicated.

B. For HVAC duct systems, construct doors of the same material as the ductwork. Minimum size of access doors shall be 8 inches by 8 inches, unless shown otherwise.

C. Provide walkthrough doors where shown. These doors shall have a minimum clear width of 18 inches. Provide doors with 8 inch square double pane wire glass windows. Locate windows not to exceed 5 feet-6 inches to centerline above finished floor of installed casing. Walk-through doors shall be operable from both sides of the door.

D. Access doors shall be insulated same as duct.

E. Provide with continuous neoprene gaskets around perimeter of access doors for airtight seal.

F. Provide all access doors with cam lock latches.

G. Provide access doors with watertight gaskets in shower room exhaust ductwork. Doors shall be of extra-heavy stainless construction.

H. All access doors serving a fire damper shall be painted red and shall have a label with white letters not less than ½ inch high reading “FIRE DAMPER”. No external ductwork insulation shall conceal a fire damper access door unless there is a label attached to the insulation indicating the exact location of the access door.

I. Provide access doors in following locations:
1. Heaters and coils in ducts: entering and leaving side.
2. Automatic dampers: linkage side.
3. Fire damper, on both sides of ducts.
4. Smoke detection heads.
5. On both sides of ducts where necessary to provide maintenance accessibility to equipment on either side.
6. Heating and Cooling coils.
7. Fan Plenums.
8. In-Line Fans (suction and discharge sides)
9. Other items requiring access for service/maintenance

J. Where duct access doors are concealed the Contractor shall furnish and pay for installation of access doors to be mounted in the fire rated walls and ductwork enclosures. The access doors must be fire resistive and minimum 6” larger on each side then the duct access door for the above mentioned applications.

2.04 MANUAL VOLUME DAMPER

A. Fabricate in accordance with SMACNA Duct Construction Standards Metal And Flexible, and as indicated.

B. Fabricate single blade dampers for duct sizes up to 12 inches in height.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 4 inches for ducts above 6 inches in height. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

E. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

F. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

G. Volume damper shall be provided at each duct branch and also where shown on the Drawings. Volume dampers must be installed at each branch even if they are not shown on the Drawing.

H. Approved Manufacturers:
   1. Ruskin Mfr. Co.
   2. Arrow Damper & Louver.
   3. Imperial Damper Co.

2.05 BACKDRAFT DAMPERS

A. Dampers shall be low-leakage, parallel-blade type. Damper sizes shall be suitable for duct sizes noted on the Drawings. The dampers shall be suitable for a minimum 4000 fpm velocity.

B. Damper frames shall be minimum No. 12 gauge galvanized steel blades shall be minimum No. 16 gauge galvanized steel or Type 6063-T5 aluminum with press-fit ball bearings.

C. Dampers shall be complete with adjustable counterweights and linkage for duty at .20 inches w.g. and 3500 fpm.

D. Provide neoprene or silicone rubber blade seals.

E. Approved manufacturers - Ruskin Manufacturing Company or Engineer approved equivalent.

2.06 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 DUCT HANGERS AND SUPPORTS

A. Provide trapeze, strap or angle iron hangers meeting SMACNA HVAC Duct Construction Standards Metal and Flexible.

B. Materials of hangers, supports and fasteners shall conform to the manufacturer’s load ratings.

C. Hangers, supports, upper attachments and inserts shall be hot-dip galvanized steel or stainless steel.

D. Fasteners for HVAC duct systems shall be hot-dip galvanized steel, cadmium-plated steel or stainless steel.

E. Secure ductwork hangers attached to concrete structures and slabs with embedded inserts, anchor bolts or concrete fasteners. A safety factor of 5 should be used in selection of all inserts and expansion bolts (if applicable safety factor shall be determined by analysis of seismic loads and the greater safety factor shall be used).

F. Provide hangers and supports not more than 12 inches from each face of a horizontal elbow.

G. Plenums shall be supported to permit personnel to enter the plenum. If no structural steel design is shown on the Drawings, it is the responsibility of the Contractor to provide the services of a licensed structural engineer in the in which the project is to be constructed to submit a structural design for review.

2.08 SEALANTS

A. Where ducts are not continuously welded or soldered, provide sealants and gaskets as required to meet the specified duct leakage allowance.

B. Provide Gaskets, Sealers, Mastics and Tapes as manufactured by Ductmate, or Engineer approved equivalent.

2.09 FIRE DAMPERS

A. Fabricate and install in accordance with NFPA 90A and UL Safety Standard 555, and AMCA Standard 500.

B. Fire Resistance: For penetrations through construction rated less than 3 hours, 1 ½ hours. For penetrations through construction rated for 3 hours or more, 3 hours.

C. Pressure Differential Rating: 4 in. w. g.

D. Velocity Rating: 2000 fpm

E. Fabricate curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades in air stream. Fabricate fire dampers for vertical and horizontal position.

F. Fabricate multiple blade fire dampers with 16 gauge galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

G. Fusible links, UL 33, shall separate at 165 degrees F.

H. Acceptable Manufacturers:
   1. Greenheck Model DFD 150, 200 and 350
   2. Ruskin Mfr. Co.
   3. Arrow Damper & Louver.
   4. Imperial Damper Co.
   5. Engineer-approved equivalent.

2.10 STANDARD FLEXIBLE CONNECTIONS

A. Provide fabric flexible duct connections.

B. Fabric shall be UL approved, fire-retardant, closely-woven glass, double coated with neoprene, and a minimum of 6 inches wide.

C. Shall be installed at duct connections to all ceiling hung fans and where vibration will be transmitted through ductwork.

D. Approved Manufacturers:
   1. “Ventglas” by Vent Fabrics, Inc.or Engineer approved equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Install ductwork in accordance with applicable SMACNA Duct Construction Standards Metal And Flexible and approved submittals, and as shown on the Drawings. Duct sizes shown are inside clear dimensions. Where internal duct liners are used, duct sizes shown are inside clear of liner. For ductwork located outside, provide reinforcing sufficient to support wind and snow loads.

B. The Drawings indicate general locations of ducts. Make additional offsets or changes in direction as required at no additional cost to the Owner.

C. Wherever ductwork is divided, maintain the cross-sectional area.

D. Do not exceed 15-degree taper when constructing duct transitions.

E. Close the open ends of ducts during construction to prevent debris and dirt from entering.

F. Secure casings and plenums to curbs according to the requirements of the SMACNA HVAC Duct Construction Standards Metal and Flexible.

G. Make changes in direction with long radius bends.

H. All unused portions of HVAC supply air and exhaust louvers shall be blanked off with Louver Blank Off Panels, see Ductwork Insulation Section.

I. All welded and scratched galvanized steel surfaces shall be touched up with zinc-rich paint.

J. 2 Hr. rated wall penetration: Where small size duct (up to 6 inches x 6 inches) is penetrating a 2 Hr wall the duct shall be constructed of 16 gauge galvanized sheet metal.

K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

L. Patch and repair all wall penetrations.

M. Insulation: Where Drawings and Specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

3.02 FITTING INSTALLATION

A. Use minimum of four sheet metal screws per joint.

B. Apply approved sealant on duct-to-duct joint before assembly. Apply additional sealant after assembly to make joint airtight.

3.03 HANGER AND SUPPORT INSTALLATION

A. Support ductwork hung from building structure using trapeze, strap or angle iron hangers conforming to SMACNA HVAC Duct Construction Standards Metal and Flexible. Provide supplemental structural steel to span joists where required.

B. Do not support ductwork from furring, hung ceilings, metal floor deck, metal roof deck or from another duct or pipe.

C. Do not hang lighting fixtures or piping from ductwork.

D. Do not use perforated band iron.

E. Support ductwork at each change in direction.

F. Where duct connects to or terminates at masonry openings or at floors where concrete curbs are not used, provide a continuous 1 ½ inch by 1 ½ inch by 3/16 inch galvanized steel angle support around the ductwork. Bolt and seal the supports to the building construction using expansion bolts and caulking compound. Seal shall be watertight at floor or wall and duct such that a spill will no pass down through the opening.

G. Fasten plenums and casings connected to concrete curbs using continuous 1 ½ inch by 1 ½ inch by ¼ inch galvanized steel angle support. Set the angle support in a continuous bead of caulking compound and anchor it to the curb with 3/8 inch diameter anchors on 16 inch centers. Terminate sheet metal at curb and bolt to angle support. Seal sheet metal to curb with a continuous bead of caulking.

H. For insulated ductwork, install hangers on the outside of the insulation. To maintain the insulation value, inset a piece of 1 inch thick, 6 pcf fiberglass board with a foil/scrim/kraft (FSK) jacket at these supports.

3.04 SEALING

A. Where ductwork is not continuously welded, soldered or gasketed, make seams and joints airtight with sealants.

B. Install the sealants in accordance with the sealant manufacturer's instructions and recommendations.

C. Seal all ductwork seams, joints, fastener penetrations and fittings connections with sealants in accordance with SMACNA Seal Classifications as required by SMACNA Duct Pressure Classification. All ductwork, regardless of pressure classification, shall have a minimum Seal Class B.

D. Completely fill all voids when liquid sealing ductwork. Several applications may be necessary to fill voids caused by shrinkage or runout of sealant.

3.05 DUCT-MOUNTED DEVICES AND ACCESS DOORS

A. Install all dampers, coils, airflow measuring stations, humidifiers and other duct-mounted devices, specified in other sections of the specifications or as shown and provide transformations to dimensions as required. Install devices in accordance with manufacturer's recommendations. Install dampers and coils a minimum of 4 feet away from changes indirection or transitions. Allow five (5) equivalent diameters of straight ductwork upstream and one (1) equivalent diameter of straight ductwork downstream of airflow measuring devices.

B. Install access doors in ductwork, plenums and where specified and as shown. Provide access doors for inspection and cleaning automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 18 x 18 inch size for shoulder access and as indicated. Install access doors in the bottom of the ductwork unless they are inaccessible in this location; then install the access doors in either the side or top of the ductwork, whichever is more accessible.

C. Provide fire damper at locations indicated, and where outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway, duct connections, corrosion resistant springs, bearings, bushings and hinges.

D. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Engineer.

E. Provide flexible connections immediately adjacent to equipment in ducts associated with motorized equipment. Cover connections to medium pressure fans with leaded vinyl sheet, held in place with metal straps.

F. Pilot Ports: Locate pilot ports for measuring airflow in each main supply duct at the downstream end of the straightest run of the main and before the first branch take-off. Form pilot ports by drilling 7/16 inches holes in the duct, lined up perpendicular to airflow on maximum 8-inch centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

3.06 CONTROL DAMPER INSTALLATION

A. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.

B. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal ±1/8".

C. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.

D. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)

E. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.

F. Provide a visible and accessible indication of damper position on the drive shaft end.

G. Support ductwork in area of damper when required to prevent sagging due to damper weight.

H. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

I. Dampers that are to be installed with air flow measuring stations shall be installed in duct runs with a minimum amount of straight duct upstream and downstream of the damper to allow accurate flow readings by the air flow measuring station. The Contractor shall verify with the manufacturer the length of straight duct runs required.

3.07 DUCTWORK AND EQUIPMENT LEAK TESTING

A. Leak test each ductwork system within ten working days of ductwork installation and before ductwork is insulated and concealed.

B. All HVAC ductwork shall be tested. Follow general procedures and use apparatus as outlined in the SMACNA HVAC Air Duct Leakage Test Manual.

C. Test all ductwork at 100 percent of the pressure classifications indicated.

D. Air testing during erection shall include separate leakage air tests of air riser, horizontal distribution system, and, after all ductwork is installed and the central stations apparatus is erected, leakage testing of the whole system.

E. Use Appendix C in the SMACNA HVAC Air Duct Leakage Test Manual to determine allowable leakage rates for each duct section tested.

F. All devices, including access doors, airflow measuring devices, sound attenuators, damper casings, sensors, test ports, etc. that are furnished and/or installed in duct systems shall be included as part of the duct system leakage allowance. All joints shall be inspected and checked for audible leakage, repaired, if necessary, and retested. Duct leakage shall be limited to the following:

Average Size of Run Diameter or Equivalent	*A/100 ft. Run
12 inches or less	10
20 inches or less	15
30 inches or less	25
40 inches or less	30
50 inches or less	30
* (A) = Permissible loss in cfm	

G. Total system leakage shall not exceed 10 percent of the scheduled design capacity of the system when tested as per SMACNA testing methods.

3.08 PAINTING

A. Upon completion of the installation, remove all protecting materials, thoroughly remove all scale and grease and leave in a clean condition for painting. Ductwork to be painted shall be as shown on the Drawings. Painting shall be in accordance with the requirements of the “Painting” Specification Section.

3.09 DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	DUCTWORK MATERIAL
Supply, Outside Air & Exhaust Ductwork	Galvanized Steel

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Provide exhaust fans, as specified herein, with accessories and of sizes and capacities as noted herein, and as scheduled and in locations shown on drawings.

B. Products listed in Part 2 of this Section include:
   1. Centrifugal Downblast Roof Fans

1.02 ACCESSORIES:

A. Provide accessories as scheduled. Refer to the control diagrams and specifications, sequence of operations specifications, and the electrical drawings for detailed requirements.
   1. Backdraft dampers
   2. Motorized dampers with appropriately sized actuators
   3. Motor speed controls: Interlocks, controls, and monitoring devices
   4. Disconnect switches
   5. Roof curbs
   6. Curb Adapters
   7. Wind or seismic restraints, guy wires, etc.

1.03 RELATED WORK

A. Section 061000: Rough Carpentry

B. Section 076200: Flashing and Sheet Metal

C. Section 079200: Joint Sealants

D. Section 230010: General Mechanical Requirements

E. Section 230594: Balancing of Air and Hydronic Systems

F. Section 230991: Instrumentation and Controls Integration

G. Section 230993: Sequence of Operations

1.04 REFERENCE CODES AND STANDARDS

A. AMCA 99 - Standards Handbook

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating

C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans

D. ASHRAE Handbook, HVAC Applications Volume “Sound and Vibration Control”

E. UL listed and labeled.

1.05 SUBMITTALS

A. Submit for review, products utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include but not be limited to:
   1. Exhaust Fan Product Data Submittal
      a. Assembly Drawings - Show fan layout, housing, materials, gauges, dimensions, weights and installation details
      b. Product data - Manufacturer’s fan performance (data includes cfm, rpm, bhp, motor nameplate data, tip speed, outlet velocity and static pressure) and sound performance (data includes sound power level ratings by octave bands) as tested in accordance with AMCA Standards 210 and 300.
      c. Fan performance curves - Submit curves for all fans with system performance shown, and for plus or minus 10 percent and plus or minus 20 percent change in fan rpm. Curves shall include plotted rpm, horsepower, cfm, static pressure, and fan surge line and operating point.
      d. Certified AMCA Ratings - Submit ratings for air and sound performance.

e. UL Listing - Submit listing if specified.

1.06 QUALITY ASSURANCE

A. Factory balance each fan statically and dynamically, test run before shipment, and key fan wheel to fan shaft. Fans shall operate quietly and without pulsation or vibration. Conduct sound power level tests for each type fan at the factory in accordance with AMCA 300.

B. Fans shall operate in the stable range of their performance curves.

C. The fan external static pressures shown in the schedules are those required by the ductwork and apparatus, and do not include the internal and intake fan losses, inlet vanes or integral outlet dampers, inlet screens, outlet velocity heads or drive losses.

D. Factory performance test each fan assembled in or as part of apparatus specified to be performance tested. Test shall display scheduled performance characteristics, using certified, calibrated testing instruments provided by the manufacturer of the apparatus.

E. All fan performance ratings shall be based up on factory tests performed in accordance with AMCA 210 and 300. One fan of each type specified shall have actual factory performance tests performed prior to shipment. All fans shall be certified by AMCA and carry its seal.

PART 2 - PRODUCTS

2.01 GENERAL

A. See exhaust fan equipment schedules on the drawings for addtional information, requirements, and accessories.

2.02 CENTRIFUGAL DOWNBLAST ROOF FANS

A. Roof mounted exhaust fans shall be of the downblast, direct-drive type, as scheduled.

B. The fan housing shall fan housing shall consist of the motor cover, shroud, curb cap and lower windband, and shall be constructed of heavy-gauge aluminum. Housing shall have a rigid internal support structure and leakproof design. The fan shroud shall be one-piece with a rolled bead for extra strength, which directs exhaust air downward. The low windband shall be one piece with formed edges for added strength and the curb cap shall include prepunched mounting holes to ensure correct attachment to the roof.

C. The fan wheel shall be centrifugal, non overload, backward-inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

D. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors shall be readily accessible for maintenance. Motors shall be mounted on true vibration isolators, out of the airstream. Each vibration isolator shall be sized to match the weight of each fan.

E. A NEMA 3R disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.

F. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.

G. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

H. Fans shall be Greenheck model G (downblast), or Engineer approved equivalant.

PART 3 - EXECUTION

3.01 GENERAL

A. Install fans, including all necessary structural supports and bracing as scheduled and located on the contract drawings in accordance with manufacturer’s instructions and approved submittals.

B. Connect duct to fans to allow for straight and smooth air flow.

C. Provide flexible connections (minimum of 4”) between fan and duct.

D. Install fan level: +/- 5 degrees vertical. Final installation shall be free of all leaks from both fan and associated ductwork.

3.02 START-UP, TESTING, DEMONSTRATION

A. Start-up fans after checkout to insure proper alignment and phased electrical connections.

B. Test fans individually and as part of system.

C. Insure supply / exhaust fans and dampers are properly interlocked, operate with control system as required to maintain building pressurization and exhaust per design documents and for proper building operation.

D. Provide all associated start-up and testing reports.

E. Demonstrate operation to Owner and instruct maintenance personnel in operation of equipment.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Furnish and install new and/or replacement unit ventilators as shown on the drawings.

B. Include starters, disconnects, and required electrical devices, except where specified as furnished or factory-installed by the manufacturer.

C. Provide interlock wiring between electrically-operated terminal units and between terminal units and field-installed control devices.

D. Interlock wiring specified, as factory-installed, is the work of this section.

E. Provide the following electrical work as work of this section:
   1. Control wiring between field-installed controls, indicating devices, and terminal unit control panels.
   2. Control wiring specified, as work of Division 23 for HVAC controls is work of that section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of terminal units of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Units shall be tested and certified in accordance with ARI Standard 840.

C. Unit insulation and adhesive shall meet the requirements for flame spread rating of lower than 25 per ASTM E84 and smoke generation rating of lower than 50 per ASTM E84. Only closed-cell insulation shall be used. The use of fiberglass insulation is not acceptable.

D. Each coil shall be factory tested for leakage at 350 psig air pressure with the coil submerged in water.

1.04 SUBMITTALS

A. Submit for review, products and procedures utilized under this Contract per the requirements of section 013300-Submittals. Submissions shall include, but not be limited to:
   1. Unit Ventilator Product Data Submittal
      a. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gauges and finishes of materials, and installation instructions.
      b. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
      c. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to terminal units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
      d. Samples: Submit 3 samples of each type of cabinet finish and color furnished.
      e. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 01.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.

B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with Manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.

PART 2 - PRODUCTS

2.01 UNIT VENTILATORS

A. Manufacturer: Subject to compliance with requirements. Provide unit ventilators of one of the following:
   1. Carrier (basis of design)
   2. Trane
   3. Daikin
   4. Engineer approved equivalent

B. General: Provide unit ventilators having cabinet sizes, and in locations indicated, and of capacities, style, and having accessories as scheduled. Unit ventilators shall be designed for floor (vertical) mounting. Units shall incorporate hot water or steam heat as specified. Include in basic unit cabinets, dampers, fan board assembly, motors, and coils. The unit shall be a factory-assembled bolt-together unit ventilator. Contained within the unit enclosure shall be a factory-installed motor, wiring, blowers, coil(s), bearing, and outdoor/return air dampers. Units shall be of draw-thru design. Blow-thru design is not acceptable.

C. Unit Construction:
   1. Unit frame shall be constructed of heavy gage galvanized steel components that form a rigid foundation and resist corrosion.
   2. Unit shall be 21 7/8 inches deep and include a false back to allow alignment of unit outside air passage with existing outside air louver connection.
   3. Unit composed of three main sub-assembled modules: Blower Module, Coil Module and Damper Module. Modules shall be removable without disassembling the unit.
   4. Modules shall be externally insulated using closed cell insulation.
   5. Unit back shall be insulated using closed cell insulation.
   6. Exterior access panels shall be constructed of heavy gage galvanized steel that has been cleaned and pretreated before painting to maximize corrosion resistance. Exterior service access panels shall be retained by tamper-resistant fasteners. Panels shall be electrostatically coated with polyester powder baked on textured paint.

D. Vertical Unit:
   1. Cabinet shall be provided with three 16-gauge exposed front panels, service access panels with tamper-resistant hex socket head threaded fasteners and retainer chains for safety and ease of service.
   2. Cabinet models shall have standard textured baked powder finished panels. Cabinet tops shall be charcoal bronze with a steel bar-stock discharge grille. Cabinet top shall have textured charcoal finish.
   3. External access panels shall be easily removed from outside of the unit for easy access to filters and routine maintenance. Unit top shall be easily removed for routine maintenance.
   4. Unit shall include leveling legs to compensate for floor irregularities.

E. Coils:
   1. Hot water coils shall be constructed of mechanically expanded copper tubing minimum wall .016" inside, aluminum fins, minimum thickness .025". The fin surface shall be enhanced to the maximum degree by incorporating a raised lance design. Coils shall be pressure tested at no less than 350 psig at the factory to ensure they are leak tight. Hot water coils shall be constructed of mechanically expanded copper tubing minimum wall .016", inside aluminum fins minimum thickness .045". The coil performance shall be maximized by incorporation of a waffle design of the fin surface. Coils shall be pressure tested at no less than 350 psig at

the factory to ensure they are teak tight. A coil low limit shall be factory mounted on the leaving side of the heating coil. If the capillary device senses a temperature less than 38°F along any 6" the device will actuate, device shall be SPDT (single pull, double throw), auto reset.

2. Steam heating exchanger elements shall be double tube (DT) steam distributing, freeze-resistant type with the same end (or for floor units, either same end or opposite end connections), as indicated on the plans. A pressure equalizing device (vacuum breaker) shall be factory-installed to prevent the retention of condensate in the coil. The installing contractor shall connect the equalizing device to the return line beyond the trap using the tubing provided.
3. DX cooling coils are for future cooling.

F. Pipe Tunnel:
1. Units rated 750 to 1500 CFM vertical units shall have an integral pipe tunnel that can be used for piping across the unit. This tunnel shall be insulated, with closed cell insulation, from the unit and accessible from each end compartments to allow maximum flexibility of crossover piping installation.

G. Drain Pans:
1. Unit drain pan shall be double sloped welded galvanized steel to prevent standing water.
2. Drain pan will be coated to prevent external condensation during cooling.
3. Drain connections (7/8 inch OD) shall be supplied on both ends of pan for field conversion of slope and drain hand connection if required.
4. Drain pan slope shall be field convertible without removing the coil module.
5. Heating only units shall come equipped with a double sloped drain pan for future cooling needs.

H. Fan and Motor:
1. Fan and motor assembly shall be direct driven. One end of drive shaft shall be mounted in a sleeve-type or ball bearing, with other end of shaft supported by motor bearings.
2. Fan wheels shall be double-width, double-inlet with forward-curved blades, and shall operate at low speed. Fan wheels shall be mounted on a hollow one piece steel shaft.
3. Fan wheels shall be statically and dynamically balanced.
4. Fan (blower) housings shall be constructed from heavy-gauge steel and mounted to a heavy-gauge galvanized steel fan deck.
5. To prevent vibration transmission to the unit frame, motor and shaft bearing shall be resiliently mounted. The drive shaft shall be connected to motor with a flexible coupling.
6. Fan motors shall be mounted outside of the airstream on a heavy-gauge steel partition and removable without removing the blower module.
7. Units shall be supplied with permanently split capacitor (PSC) multi-tap transformer motors. All motors shall have integral high temperature reset and shall be protected with cartridge-type fuse(s).

I. Filters:
1. Unit shall be supplied with 1-inch throwaway filter. The unit shall be capable of incorporating a 2 inch filter. For even loading, filter shall be positioned to filter mixed outdoor and return air.
2. Filter track shall be field adjustable to accept 1-inch or 2-inch permanent or renewable media replacement filters.

J. Dampers:
1. Unit shall contain a single outdoor-air/return-air damper with multiple sealing points. Damper shall be constructed of extruded aluminum with external closed cell insulation. The damper assembly shall include an anti-draft plate to prohibit outdoor air from penetrating the classrooms through the damper assembly.

2. As scheduled: Unit shall contain a single (heating coil and/or cooling coil) face/bypass control damper for full modulation of heating and cooling supply air control.

K. Accessories:
1. Exterior wall louver

L. Provide finished side panels and matching filler sections by the same manufacturer, where new unit ventilators are smaller than the existing unit ventilators being replaced, or where the unit ventilator is larger than the existing and no new cabinetry is specified. No unfinished wall surfaces shall be exposed after installation.

M. A2L Refrigerant Leak Detection System
1. Unit ventilators shall be supplied with DX cooling coils. Connection to remote condensing unit shall occur in the future.
2. The leak detection system consists of one or more refrigerant detection sensors. When the system detects a leak, the following mitigation actions will be initiated until refrigerant has not been detected for at least 5 minutes:
a. Energize the supply fan(s) to deliver a required minimum amount of circulation airflow.
b. Disable compressor operation.
c. Provide an output signal to fully open all zoning dampers, such as VAV boxes.
d. Provide an output to energize additional mechanical ventilation (if needed).
e. Units without airflow proving will disable electric heat sources.
3. Building fire and smoke systems may override this function.
4. If the refrigerant sensor has a fault, is at the end of its life, or is disconnected, the unit will initiate the mitigation actions. Mitigation actions may be verified by disconnecting the sensor.
5. The refrigerant sensors do not need service. Use only manufacturer-approved sensors when replacement is required.
6. Notes:
a. Factory-installed manufacturer's controllers are programmed with leak detection sequence of operations at the factory.
b. Field-installed unit controllers require field programming of the leak detection sequence of operations by the controls contractor. See UL 60335–2–40 for more information.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF UNIT VENTILATORS

A. General: Install unit ventilators as indicated, and in accordance with manufacturer's installation instructions.

B. Locate unit ventilators as indicated, level and shim units, anchor to substrate.

C. Provide all blocking, weather striping, insulation boards, fire rated marine grade plywood, etc. To provide a level, plumb and air and weather tight seal of unit ventilators to existing exterior wall / outside air louver.

D. Adjust and level unit ventilators to within ±1/8" of adjacent cabinetry surfaces. Bring to the attention of the construction manager any conditions which prevent the ability to meet this requirement as soon as they are found.

E. Install piping as indicated.

F. Protect units with protective covers during balance of construction.

G. Coordinate all demolition or modification of existing equipment and adjacent cabinetry with the Owner prior to the start of any work.

H. In no case shall there be any exposed sharp corners or edges which can lead to cuts or abrasions by the nominal activity of the occupants.

3.03 ELECTRICAL WIRING

A. General: Install electrical devices furnished by manufacturer not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram.

B. Verify that electrical wiring installation is in accordance with manufacturer's submittal. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.04 ADJUSTMENT AND CLEANING

A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.

B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer. Provide extra touch up paint to owner.

C. Install new filter units for terminals requiring the same.

D. Test, adjusting, and balancing is specified in other Division 23 sections; not work of this section.

END OF SECTION

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PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavation and backfill for electrical work.

B. Demolition of existing electrical systems.

C. Secondary power wiring and distribution system.

D. Wiring devices.

E. Wiring for built-in equipment.

F. Distribution panels and switches.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications shall have UL listing and label. Specifications and drawings indicate name, type, or catalog numbers of materials and equipment to be used as standards. Proposals shall be based on these standards. Contractor may use materials and equipment equivalent to those specified, subject to Engineer's approval.

PART 3 - EXECUTION

3.01 COORDINATION

A. Carefully examine specifications, drawings and project site to be thoroughly familiar with items which require electrical connections and coordination. Electrical drawings are diagrammatic and shall not be scaled for exact sizes.

B. Notify other Contractors of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to the Owner. Engineer to be mediating authority in all disputes arising on project.

C. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a clarification shall be requested of the Engineer for decision before preceding with such work.

D. Insofar as it is possible to determine in advance, advise masonry tradesmen to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should the Contractor neglect doing this, any cutting and/or patching required to be done is at this Contractor's expense.

E. FIRE ALARM – For any facilities that utilize an existing fire alarm system, the contractor shall coordinate with the owner and fire alarm monitoring company prior to removing or disabling any devices. It shall be the contractor’s responsibility to provide fire watch as per the latest addition of the Fire Code of New York State. The contractor shall provide fire watch for all areas of a facility while occupied and unoccupied when any device or part of the fire alarm system is de-activated or put into “test mode”.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of work under this Division.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Holes cut through floor slabs to be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs to be properly sealed, fire proofed and waterproofed.

D. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TESTS

A. On completion of work, installation shall be completely operational and entirely free from ground, short circuits, and open circuits. Perform a thorough operational test in presence of the Engineer. Balance all circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Engineer with a copy of such tests including identification of each circuit and readings recorded, also the main service ground resistance test as described in Section 260526 of these specifications. Test information to include ampere readings of all panels and major circuit breakers, isolation resistance reading of motors and transformers.

3.04 IDENTIFICATION OF EQUIPMENT

A. Properly identify the following:
   1. Distribution panels.
   2. Disconnect switches.
   3. Individually mounted circuit breakers.

B. Use permanently attached black phenolic plates with 1/4-inch white engraved lettering on the face of each, attached with two sheet metal screws.

C. Panelboard identification plates shall indicate panel by name.

3.05 INSTALLATION

A. The Contractor shall carefully move and replace existing equipment, appliances and all related items, as required to conduct proposed work.

B. Install and conduct all work per applicable NEC, State and local codes.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, safety of structure and dust control.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct egress width to exits.

E. Do not turn off electric equipment without authorization from Owner.

F. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.04 SCHEDULING

A. Schedule Work to coincide with new construction.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify field circuiting arrangements at the School.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on visual field observation. Report discrepancies to the Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing condition.

3.02 PREPARATION

A. Provide power, wiring and connections to maintain all existing power, control and telemetry systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction, as indicated on drawings.

B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

D. Repair adjacent construction and finishes damaged during demolition and extension work.

E. Provide caps and filler plates/plugs for all openings in equipment and enclosures after removal of conduits.

F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

G. Remove demolished materials from site as work progresses.

H. Completely remove and dispose of all electrical power, control, and telemetry feeds including conduits, conductors, boxes and supports not scheduled to remain after new construction is tested and operational.

I. Where existing devices and equipment are called to be removed, Contractor shall maintain circuit continuity to all existing devices and equipment remaining on that circuit. Contractor shall provide all required conduit, conductors and boxes as required.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Remove temporary work.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wires and cables.

B. In general, the wires and cables included under this Section shall include, but not be limited to, the following:
   1. 600V power and control cable
   2. Communication cables

C. All conductors to be continuous from origin to panel or equipment termination without splices.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

B. NECA Standard of Installations.

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

1.04 QUALITY ASSURANCE

A. Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacturing, installing and servicing of similar items with a history of successful production acceptable to the Engineer as specified herein and in accordance with the General Conditions.

B. Contractor shall submit the following information pertaining to the manufacturer(s):
   1. Complete literature, performance, and technical data describing the proposed equipment and listing of items made by the manufacturer.
   2. Location of closest service office from which this equipment shall be serviced.
   3. Location of closest parts inventory for item installation.

1.05 COORDINATION

A. Coordination:
   1. Coordinate wire and cable required with the equipment being furnished by others for the satisfactory operation of the equipment or system.
   2. Review installation procedures under other sections and contracts and coordinate them with the work specified herein.
   3. Notify other prime contractors in advance of the installation of the work included to provide them with sufficient time for installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the work included in this Section.

1.06 PROJECT CONDITIONS

A. Verify that embedded conduit, in masonry and concrete, is installed as shown on the Drawings prior to the work being enclosed by others.

B. The Contractor shall be present at all concrete pours made by the General Contractor.

C. Conductor sizes are based on copper at 75°C.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned or specifically called for such as where conduit is to be embedded in concrete or masonry. Route wire and cable as required to meet project conditions and shall be routed above ceilings, directly under joists, in pipe trenches, where available, and in masonry. Where exposed conduit is permitted, it shall be run to maximize wall space.

E. Field verify destination location to determine cable routing.

F. Where wire and cable routing is not shown for proposed destination, determine exact routing and lengths required. Routing shall be reviewed with the Engineer.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Install products in accordance with manufacturer's recommendations.

B. Single copper conductors with 600-volt insulation.

C. Minimum size of feeder conductors and grounds shall be No. 12 AWG.

D. Insulation: No. 12 AWG and No. 10 AWG, provide ANSI/NFPA 70, Type THWN-2 for interior circuits and type XHHW-2 for exterior circuits. Exterior circuits shall be considered circuits where any portion of the circuit is run exterior of the building, in which case the entire length of the circuit shall be continuous wire of Type XHHW-2.

E. Use solid conductor for feeder and branch circuits, 10 AWG and smaller.

F. All conductors shall include complete set of manufacturer's markings for insulation and conductor size.

G. Manufacturers shall be SOUTHWIRE, PRYSMIAN GROUP, OKONITE, ANIXTER or approved equal.

H. Provide white colored neutral conductors; provide black, color coded phase conductors; provide green colored ground conductors.

2.02 4-PAIR CATEGORY 6A UNSHIELDED TWISTED PAIR CABLE

A. Manufacturers: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include the following:
   1. Belden Corporation, Carmel, IN (800) 246-2673.
   2. Avaya, Basking Ridge, NJ (800) 344-02232.
   3. Berk-Tek, Incorporated, New Holland, PA (800) 237-5835.
   4. CommScope, Hickory, NC (800) 982-1708.
   5. Draka Comteq, Franklin, MA (888) 541-7100.
   6. General Cable, Highland Heights, KY (800) 424-5666.
   7. Mohawk/CDT Leominster, MA (978) 537 9961.
   8. NORDX/CDT, Worcester, MA (800) 331-0779.
   9. Superior Essex, Atlanta, GA. (800) 685-4887.
   10. Tyco Electronics, Harrisburg, PA (800) 522-6752.

B. Conductors: 4 twisted pair - 24 AWG, solid copper w/ RJ-45 connector ends
   1. Individually insulated plenum rated conductors under common plenum rated sheath unless entire cable is installed within conduit/EMT or if area where cable is installed is not considered a return air plenum according to any applicable codes.
   2. Complies with individual characteristics established in ANSI/TIA/EIA-568-B, and all addendums for Category 6 cable performance specification.
   3. Overall Nominal Diameter: .365 x .165 in.
   4. Nominal Impedance: 100 ohms plus or minus 15 percent.
   5. Certified capable of performing to minimum 350 MHz.

C. Mechanical Characteristics
   1. Operating temperature: -20°C to +80°C
   2. Bulk cable weight: 29 lbs./1000 ft.
   3. Maximum recommended pulling tension: 45 lbs.
   4. Minimum bend radius: 1 in.

D. Flame test: UL1666 Riser

E. Electrical Characteristics:
   1. Nom. Mutual Capacitance @ 1 KHz 15.0 pF/ft
   2. Maximum Capacitance Unbalance (pF/100 m) 49.2 pF/100 m

3. Nominal Velocity of Propagation 70 %
4. Maximum Delay (ns/100 m) 510 @ 100MHz ns/100 m
5. Maximum Delay Skew (ns/100m) 25 ns/100 m
6. Maximum Conductor DC Resistance @ 20 Deg. C 9 Ohms/100 m
7. Maximum DCR Unbalance @ 20 Deg. C 3 %
8. Max. Operating Voltage - UL 300 V RMS

2.03 MECHANICAL CONNECTORS

A. Conductor tapping connectors shall be BURNDY Servit split bolt, Series KS and KS3, or approved equal.

B. Split bolt connectors shall use BURNDY Type SC Servit cover on indoor applications.

C. Terminal lugs shall be BURNDY Universal Terminal Series. Terminal lugs shall be sized for proper ampacity and proper number of conductor holes. Each conductor shall occupy only one hole on a terminal lug.

D. Conductor tapping connectors for multiple conductors shall be BURNDY Series V-Tap with V-Tap covers, and V-Blok mounting platforms.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
1. Make terminations in accordance with cable manufacturers instructions for the particular type of wire and cable.
2. Splices are not allowed in the underground duct and manhole systems. If splices are required, the Contractor shall obtain approval in writing from the Engineer prior to splicing.
3. All splices shall be in made in terminal boxes.

B. Wire and Cable Sizes: The sizes of wire and cable shall be as shown on the Contract Drawings, or if not shown, as approved by the Engineer. Minimum size wire shall be No. 12 AWG for all power, lighting and receptacle circuits. Wires for control circuits shall be No. 14 AWG minimum. Wire for instrumentation circuits shall not be smaller than No. 16 AWG. If due to field routing the voltage drop exceeds 2.5%, the size of conductors shall be increased such that 2.5% is the maximum voltage drop incurred.

C. Number of Wires: The number of wires indicated on the Contract Drawings for the various control, indications, and metering circuits were determined for general schemes of control and for particular indication and metering systems. Coordinate wiring schemes with equipment schematics.

D. Wiring Identification: All wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with the equipment terminal wire numbers. Where no wire numbers are indicated, the Contractor shall assign wire numbers. Wire numbers shall not be duplicated.

E. Cable Identification Tags: The Contractor shall furnish all labor and materials and affix in a permanent way to each cable in manholes, cable compartments and vaults, junction boxes, pull boxes and points of termination, a laminated plastic tag, bearing clearly printed, the cable number indicated on the Contract Drawings or some other approved identification number or symbol. All cables shall be temporarily tagged with its full ID number immediately after it has been pulled.

F. Wiring Supplies: Only electrical wiring supplies manufactured under high standards of production and meeting the approval of the Engineer shall be used. Friction tape shall be in accordance with ASTM D69.

G. Training of Cable: Furnish all labor and material required to train cables around cable vaults within buildings and in manholes in any outdoor underground duct system. Sufficient length of cable shall be provided in each manhole and vault so that the cable can be trained and racked in an approved manner. In training or racking, the radius of bend of any cable shall be not less than the manufacturer's recommendation. All manhole cables shall be arc and fireproofed.

H. Connections at Control Panels, Limit Switches and Similar Devices:
   1. Where stranded wires are terminated at panels, and/or devices connections shall be made by solderless lug, crimp type ferrule or solder dipped.
   2. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7-strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and shall install No. 14 AWG stranded wires to the junction box in a conduit.

I. Pulling Temperature: Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage with an ambient temperature not lower than 55 degrees F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

J. Color Coding:
   1. Conductor jacket shall be color coded as follows:

AC POWER

480V/277 Volt 3 phase	208Y/120 Volt 3 phase (PSEGLI)	208Y/120 Volt 3 phase (NEC)	240/120 Volt 3 phase (PSEGLI)	240/120 Volt 3 phase (NEC)
Phase A Brown	Phase A Blue	Phase A Black	Phase A Blue	Phase A Black
Phase B Orange	Phase B Black	Phase B Red	Phase B Black	Phase B Orange (HiLeg)
Phase C Yellow	Phase C Red	Phase C Blue	Phase C Orange	Phase C Blue
Neutral White	Neutral White	Neutral White	Neutral White	Neutral White
Ground Green	Ground Green	Ground Green	Ground Green	Ground Green

   2. Equipment Ground - GREEN

3.02 IDENTIFICATION

A. Identify wire and cable under provisions of Section 260553.

B. Identify each conductor with its circuit number.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014500.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Field Testing:
   1. Wires and cables shall be tested before being connected to motors, devices or terminal blocks.
   2. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the Owner.

3. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.

E. Continuity Tests: All cables, wires and shields shall be tested for continuity. Testing for continuity shall be by test light or buzzer.

F. Insulation-Resistance Tests:
   1. 600V power and control cables and wires shall be tested for their insulation-resistance values. Test shall utilize a megohmmeter with applied voltage to be 1000VDC for one (1) minute. Insulation-resistance test shall be performed on each conductor with all other conductors grounded. The resistance value shall be 20 megohms or greater.

END OF SECTION

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PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Ground clamps:
   1. OZ ELECTRICAL MANUFACTURING COMPANY, Type "CG" for connection to water main piping and Type "GC" for connection to ground rod; with cable installed parallel or 90 degrees to pipe/rod under separate clamp.
   2. Or equal by STEEL CITY or APPLETON

B. Raceways, conductors, outlet boxes, pull and junction boxes to be furnished in accordance with applicable sections of these specifications.

C. Rod Electrode: Solid Copper, 3/4-inch diameter, 10 feet long.

D. Wire: Copper, sized to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.
   2. Effectively bond all grounding conductors to grounding rod electrodes, equipment enclosures and ground busses.
   3. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

B. Feeder/Branch Circuits:
   1. All circuits shall have a separate green grounding conductor in conduit sized in accordance with NFPA 70. Minimum size of conductor shall be No. 12 AWG.
   2. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit to have a jumper wire sized to ampacity of branch breaker and to be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

C. Transformers:
   1. Transformers shall be grounded and grounding conductors and conduits sized in accordance with NFPA 70.

3.02 TEST

A. Test ground on main service. Ground system resistance shall be no greater than 10 ohms using test equipment similar to a "Biddle" test. Test data to be submitted to the Engineer for approval and such approved test data to become a part of the Record Documents.

END OF SECTION

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PART 1 - GENERAL

1.01 SECTION INCLUDES

A. System of supporting devices and hangers for support or bracing for conduit, electrical equipment, safety switches, fixtures, panelboards, outlet boxes, junction boxes and cabinets.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Provide appropriate corrosion-resistant supporting devices and hangers for electrical equipment, as manufactured by ERICO PRODUCTS, INC., CADDY FASTENERS, STEEL CITY, MINERALLAC or equivalent.
   1. "Z" purlin clips.
   2. Conduit clips.
   3. Beam clamps (universal and vertical flange).
   4. Beam clamps (set screw type).
   5. Combination push-in conduit clips.
   6. Combination conduit hanger clamps.
   7. Flexible conduit clips.
   8. Special combination conduit clips.
   9. One hole steel straps.
   10. Conduit hangers.

B. Provide materials, sizes and types of anchors, fasteners and supports to carry the loads of equipment, wire in conduit and conduit.

2.02 CHANNEL SUPPORT SYSTEM

A. Channel systems and supports shall be manufactured by KINDORF/THOMAS & BETTS, or approved equal.

B. Channels shall be 1-1/2" x 1-1/2".

C. Channels and all associated accessories and bolts shall be hot dip galvanized.

D. Channels shall have 9/16" bolt holes on 1-1/2" centers.

E. Provide end caps for all channels.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3 feet of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed 10 feet in accordance with currently effective edition of the National Electric Code.

B. In seismic zones, support conduits 1 inch and smaller at 6 foot intervals.

C. Install clamps secured to structure for feeder and other conduits routed against structure. Use drop rods and hangers to support conduits run apart from the structure.

D. Provide and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, etc.

E. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. Prepainted or galvanized support material is not required to be painted or repainted.

F. Do not use chains, perforated iron, baling wire or tie wire for supporting conduit runs. Use of clips to support conduit to top of t-bar ceiling grid will not be permitted.

G. Obtain permission from Engineer before drilling or cutting structural members.

H. Install surface mounted cabinets and panelboards with a minimum of four anchors.

I. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.

J. Install products in accordance with manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Conduit system with associated couplings, connectors and fittings. Conduits to be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
   1. Conduit Use - Rigid Galvanized Conduit:
      a. All exterior circuits above ground.
   2. Conduit Use - PVC Sch. 80
      a. All exterior circuits below ground.
   3. Conduit Use - Electrical Metallic Tubing (EMT) Conduit:
      a. All interior circuits above ground.
   4. Conduit Use - Metal Clad (MC) Cable:
      a. All 15 and 20 amp branch circuits concealed in walls or ceilings.
   5. Conduit Use - Flexible Liquid-tight Metal Conduit:
      a. Connecting motors, generators and other equipment subject to vibration, maximum length - 3 feet.
      b. Passing through building expansion joints.
   6. J-Hooks
      a. For use above finished ceilings for CAT 6 data cable only.

B. Device Boxes: Provide each fixture switch, receptacle and other wiring device with a box of appropriate size and depth for its particular location use unless indicated otherwise.

C. Pull boxes, junction boxes and wire troughs

1.02 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NFPA 70 - National Electric Code.

C. NECA Standard of Installation.

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. NEMA TC 3 - PVC Fittings for use with Rigid PVC conduit and tubing.

F. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

G. ANSI/NEMA OS1 - Sheet-steel outlet boxes, device boxes, covers and box supports.

H. NEMA 250 - Enclosures for electrical equipment (1000 volts maximum).

1.03 SUBMITTALS

A. Submit product data under provisions of Section 013300.

B. Shop Drawings, prior to start of work:
   1. Manufacturer’s catalog cuts for the conduit, boxes, fittings and supports proposed for use.
   2. Contractor shall not proceed with the installation of materials until all the above is submitted, reviewed, and approved.

1.04 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc.

B. Conform to requirements of ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017839.

B. Accurately record actual routing of all conduits.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products in accordance with manufacturers' recommendations.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing abovegrade. Provide appropriate covering.

1.07 PROJECT CONDITIONS

A. Verify all conduit routings by field measurements.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Provide all required sweeps, boxes and fittings.

PART 2 - PRODUCTS

2.01 RIGID GALVANIZED CONDUIT

A. Rigid conduit shall be hot dipped, galvanized, or electro-galvanized steel by Wheatland, Triangle, Republic or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.

C. ERICKSON couplings, Series 676 or approved equal, shall be used where neither length of conduit can be rotated.

D. Conduit connectors shall be threaded type. Set screw and compression type connections ARE NOT acceptable.

E. Sealing fitting locknuts shall be Series 142SL.

F. Steel or malleable iron insulated bullet hub, Series 370-379, complete with sealing "O" ring. DO NOT use "die cast" material.

G. Entrance ells shall be Series 1491 or approved equal.

H. Combination coupling shall be Series 531 for connecting rigid galvanized conduit to electrical metallic tubing.

2.02 PVC CONDUIT

A. PVC conduit shall be manufactured by WHEATLAND, TRIANGLE REPUBLIC or approved equal.

B. Description: NEMA TC 2; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC3.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Electrical metallic tubing shall be WHEATLAND, TRIANGLE, REPUBLIC, or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR, or approved equal. Catalog numbers used below are those of THOMAS & BETTS CORP. based on 3/4-inch size and are considered standards by which equivalents are to be judged.

C. EMT connectors shall be TC-2125C compression type with threaded locknut. Set screw connectors will not be acceptable.

D. EMT couplings shall be TK-2125C compression type. Set screw connectors will not be acceptable.

2.04 METAL CLAD CABLE (MC)

A. Metal clad cable shall be manufactured by BICCGENERAL or approved equal.

B. Associated couplings, connectors and fittings shall be as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO., EFCOR or approved equal.

C. Conductors shall be types THHN and THWN. Ground wire shall be sized as per NEC with green THHN/THWN insulation. All conductors shall be cabled and wrapped in polyester tape. All conductors shall be rated for 600 VAC.

D. Armor material shall be Aluminum Interlocked Armor.

E. MC Cable shall be rated for use in air plenums.

2.05 SURFACE MOUNTED RACEWAY (WIREMOLD)

A. Manufacturer: Wire Mold shall be manufactured by LEGRAND or approved equal.

B. Model: 700 Series - One-Piece Steel Surface Raceway.

C. Paint wire mold to match existing wall color.

D. UL5 and ADA compliant.

E. UL and cUL Listed.

2.06 DUCT SEAL

A. RectorSeal or approved equal.

B. Model #: 81881

2.07 J-HOOKS

A. TO BE USED ABOVE FINISHED CEILING ONLY. FOR TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE ONLY. ALL EXPOSED TELEPHONE, PA, CAT 6 DATA AND FIRE ALARM CABLE SHALL BE IN CONDUIT.

B. Erico Caddy HP J. Hook Series or approved equal.

C. Provide wire retainers for all.

D. Provide mounting hardware and accessories as required.

E. Spacing of J-Hooks and supports shall not exceed 5’-0” on center.

2.08 FLEXIBLE LIQUID-TIGHT METAL CONDUITS AND FITTINGS

A. Liquid-tight flexible metal conduit shall be ANACONDA or approved equal.

B. Description: Interlocked steel construction with PVC jacket.

C. Provide flexible liquid-tight conduits and fittings as manufactured by THOMAS & BETTS CORP., O.Z. GEDNEY CO. or approved equal. Catalog numbers used below are those of the THOMAS & BETTS CORP., based on 3/4" size and are to be considered as standards by which equivalents are to be judged. All conduit shall be liquid-tight flexible type, UL type UA, or suitable for exposure to continuous or intermittent moisture.

D. Flexible liquid-tight connectors shall be Series 5333 or approved equal.

2.09 OUTLET AND DEVICE BOXES

A. Acceptable Manufacturers: Raco, General Electric or approved equal.

B. Sheet Metal Outlet Boxes - All concealed boxes shall be NEMA OSI, galvanized steel:
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported. Provide 1/2" male fixture stubs where required.

C. Concrete Ceiling Boxes: Concrete type.

D. Cast Boxes: All exposed surface mounted boxes shall be NEMA FB1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer.

2.10 PULL BOXES

A. All pull boxes used for this project shall be minimum Oldcastle DB--B3-6 or specifically approved equal for all customer installed power and control circuits.

B. Provide H-20 Cast-Iron Traffic Load Cover. Cover shall have 3” high logo “Electric”.

2.11 JUNCTION BOXES

A. Acceptable Manufacturers: RACO, GENERAL ELECTRIC or approved equal.

B. Sheet metal boxes: NEMA OS1, galvanized steel.

C. Covers: Galvanized steel.

2.12 WIRE TROUGH

A. Wireways shall be manufactured by Square D, Class 526, rain tight trough or approved equal.

B. Wireway shall be completely enclosed with removable covers.

C. Construction: 16 Gauge Galvanized Steel. 8-inch and 12-inch wire trough shall be 14-gauge galvanized steel.

D. Finish: ANSI-49 epoxy paint applied by cathodic electro-deposition paint process over a corrosion resistant phosphate preparation.

E. UL listed.

2.13 EXTERIOR WIRE TROUGH

A. Wireways shall be manufactured by SQUARE D, Class 526, rain tight.

B. Wireway shall be completely enclosed with removable covers.

C. Construction: Wireway shall be constructed of Type 304 stainless and shall have stainless steel screw clamps, and oil resistant gaskets.

D. All hardware, bolts, brackets, and supports shall be constructed of Type 304 stainless steel.

2.14 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT THREAD COMPOUND

A. KOPR-SHIELD or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF CONDUITS

A. Minimum size of conduits shall be 3/4-inch.

B. Minimum conduit depth shall be 24" below grade, measured to the top of the conduit on exterior underground installations.

C. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors and fittings.

D. All threaded conduits and fittings shall have KOPR-SHIELD compound applied to all threads prior to assembly.

E. Make bends or offsets with standard ells or field bends with an approved bender.

F. Run concealed conduits in direct line with long sweep bends or offsets. Run exposed conduits parallel to and at right angles to building lines. Group multiple conduit runs in banks.

G. Secure conduits to all boxes and cabinets with double locknuts and bushings so system will be electrically continuous from service to all outlets.

H. Install conduit in accordance with NECA Standard of Installation.

I. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

J. Complete all conduit systems before pulling conductors.

K. Support conduits under provisions of Section 260529.

L. Provide approved expansion joints or fittings and bonding jumpers where conduits in concrete pass through building expansion joints.

M. Provide cable supports in conduits rising vertically in accordance with the National Electric Code, Article 300-19.

N. Provide No. 12 AWG copper pull wires or nylon cord in all empty conduits. Steel wire not acceptable as pull wire.

O. Install conduit to preserve fire resistance rating of partitions and other elements.

P. Ground and bond conduit under provisions of Section 260526.

Q. Where neither length of conduit can be rotated, ERICKSON couplings Series 676 shall be used.

R. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated bullet hub, complete with recessed sealing "O" ring, shall be used, Series 370-379. DO NOT use die cast material.

S. Conduits shall not be installed within concrete slabs unless specifically noted in contract documents; no exceptions.

T. Where conduits running overhead pass through building expansion joints, install flexible liquid tight conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3-inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

V. Arrange supports to prevent misalignment during wiring installation.

W. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

X. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

Y. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

Z. Do not attach conduit to ceiling support wires.

AA. Arrange conduit to maintain headroom and present neat appearance.

BB. Route exposed conduit parallel and perpendicular to walls.

CC. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

DD. Route conduit in and under slab from point-to-point.

EE. Maintain adequate clearance between conduit and piping.

FF. Bring conduit to shoulder of fittings; fasten securely.

GG. Use conduit hubs with sealing locknuts to fasten conduit in damp and wet locations.

HH. Install no more than equivalent of three 90-degree bends on interior locations between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch size.

II. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

JJ. Do not use dissimilar strap or clamp supports. Provide dielectric tape, fittings, straps, and bushings where dissimilar metals are used.

KK. Where fittings for liquid-tight flexible conduit are brought into an enclosure with a knockout, a gasket assembly, consisting of one piece "O" ring, with a Buna-R sealing material, Series 5200, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

LL. A copper ground wire sized in accordance with NEC shall be installed on the inside of the conduit as a jumper around flexible conduit to assure a continuity of ground.

MM. Install a copper jumper across all flexible conduit including lighting fixtures, controls and other utilization equipment.

NN. Install liquid-tight flexible conduit in such a manner as to prevent liquids from running on surface toward fittings.

OO. Allow sufficient slack conduit to reduce the effect of vibration.

PP. Complete all conduit systems before pulling the conductors.

QQ. Support in accordance with requirements of National Electric Code.

3.02 INSTALLATION OF BOXES

A. Install boxes concealed in finished walls.

B. Locate boxes to prevent moisture from entering or accumulating within them.

C. Support boxes independently of conduit, as required by the National Electric Code.

D. Provide 4" x 1-1/2" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square ceiling outlet boxes.

E. Where required to hang a specific fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

F. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed concealed in concrete block walls. For increased cubic capacity, provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gang-type outlet boxes only in drywall construction.

G. Provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls for telephone outlets. Single gang device boxes are not acceptable.

H. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

I. Provide condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

J. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed, in accordance with the National Electric Code.

K. Effectively close unused openings in boxes with metal plugs or plates.

L. Set boxes so that front edges are flush with finished surfaces.

M. Support boxes from structural members with approved braces.

N. Install blank device plates on outlet boxes left for future use.

O. Provide bushings in holes through which cords or conductors pass.

P. Install boxes so that the covers will be accessible at all times.

Q. Electrical boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one

side only in each framing space and that openings do not exceed 16 square inches. All clearance between such boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than 16 square inches so as not to interfere with the wall rating.

3.03 INSTALLATION OF PULL BOXES, JUNCTION BOXES AND WIRE TROUGHS

A. Provide junction boxes as shown on Drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8-inches deep. Provide screw covers for junction boxes.

B. Install boxes in conduit runs wherever necessary to avoid long runs or too many bends. Do not exceed 100-foot runs without pull boxes. Install pull boxes at all 90-degree bends.

C. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.

D. Install boxes with covers in accessible locations. Size boxes in accordance with the National Electric Code.

E. Do not install pull boxes or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

F. Coordinate installation of exterior pull boxes with General contractor to establish elevations of finished grades and pavements. All castings shall have chimney adjustment of + 6”.

3.04 CONDUIT LOCATIONS

A. Route all conduit concealed in walls or above finished ceilings. Provide boxes and conduits concealed in walls for all power and controls.

B. Surface mounted conduits will only be allowed on block walls in unfinished spaces.

C. Surface mounted raceway (wiremold) conduit will only be allowed on finished block walls or on plaster walls, where conduit cannot be run concealed. All horizontal runs shall be installed above finished ceilings, where drop ceilings are located.

D. All conduit shall be primed and painted to match existing adjacent wall color.

E. J-Hooks are only permitted to be used above finished ceilings CAT 6 data cable.

END OF SECTION

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PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.02 REFERENCES

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300 - SUBMITTALS.

B. Product Data: Provide catalog data for nameplates, labels and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Underwriters Laboratories, Inc. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
   1. Distribution Panelboards.
   2. Disconnect Switches..

C. Letter Size:
   1. Use 1/4 inch (6 mm) letters for identifying all control pilot lights.

D. Labels: Embossed adhesive tape, with 3/16” (5mm) white letters on black background. Use for identifying existing equipment, distribution panels, switchboards, disconnect switches, and individual electrical devices.

2.02 WIRE MARKERS

A. Manufacturers:
   1. 3M ELECTRICAL SPECIALTY DIV., Product Scotch Code.
   2. THOMAS & BETTS CORP., Product E-Z Code.
   3. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Epoxy film tape type wire markers.

C. Locations: Each conductor at panelboards, auxiliary gutters, pull boxes, outlet and junction boxes, circuit breakers and each load connection.

D. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.03 CONDUIT MARKERS

A. Manufacturers:
   1. THOMAS & BETTS CORP.
   2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: Self-sticking vinyl; black letters on orange background.

C. Location: Furnish markers for each conduit longer than 6 feet (1.8 m).

D. Spacing: 20 feet (6 m) on center.

2.04 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. THOMAS & BETTS CORP., Model NAF-0700.
   2. Substitutions shall be permitted only after receiving written approval from the Engineer.

B. Description: 6 inch (150 mm) wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Apply conduit markers at 20 foot (6 m) intervals.

E. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches (75 mm) below finished grade.

3.03 ELECTRICAL EQUIPMENT IDENTIFICATION

A. The Contractor shall identify all existing circuits in existing distribution panels, switchboards and disconnect switches to remain.

B. Label all circuits identifying the load served including all individual circuit breakers.

C. Label all new circuit breakers and switches used for new feeder and branch circuits.

D. Contractor shall furnish a minimum of 5 custom engrave three-layer laminated plastic labels with up to 20 words per label as directed by the engineer/owner in addition to the required labels for all pilot devices, switches, controls and timers.

END OF SECTION