

**PROPOSED NEW FACILITY BID
203 SOUTH MAIN ST.
ELLENVILLE, NY 12428**

PREPARED FOR:

**ELLENVILLE FIRE DISTRICT
PO Box 268
ELLENVILLE, NY 12428**

ARCHITECT:

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Electrical Specifications

**Issued for Bid
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ELECTRICAL

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PART 1 GENERAL

THE PROJECT IS BEING AWARDED AS A SINGLE PRIME GENERAL CONSTRUCTION CONTRACT. ALL ELECTRICAL WORK SHALL BE BID AS A SUBCONTRACT TO THE GENERAL CONTRACTOR.

1.01 WORK INCLUDED

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions (refer to Project Manual) apply to work of this Section.
- B. Supply and install all conduit, wire, outlets, junction boxes, fixtures, lamps etc. to make a complete and safe system. Supply and install new electric reels, all lights and receptacles. Provide and install all power wiring including but not limited to motor operated doors, circulating water pumps, motorized dampers, split systems and rooftop HVAC units, unit heaters, etc. and any items installed by other trades that require line voltage.
- C. Provide new service entrance equipment, primary to designated pole, all as required by UTILITY CO. to provide a complete system including electrical service, phone service and cable services.
- D. All conduit, wire and boxes shall be concealed behind finished walls and ceilings except in the mechanical room and electrical room including concealed in masonry walls (coordinate with GC mason contractor. All wire, switchgear, panelboards and disconnects shall be copper.
- E. Provide all power wiring (complete) and control wiring conduits (shown on electrical plans) installed for all Sprinkler, HVAC and Plumbing equipment. Coordinate with the responsible contractors. Coordinate and turn over to Mechanical (HVAC) and Plumbing contractor all components and accessories for their installation.
- F. Provide new emergency generator and installation including Automatic Transfer Switch, rigging and all other items to provide a complete system. Provide a minimum of two (2) load tests upon completion. One test to be for adjustments and rectifying any conditions requiring correction. Second test to be after corrections are made as required for full load to pass for certification.
- G. Provide and install all conduits and wire for telephone, computer, surveillance, access and cable TV systems. Refer to IT drawings for complete scope of work.
- H. All work shall conform to NEC 511 or as otherwise directed and approved by the Board of Fire Underwriters.
- I. Provide and install reinforced concrete pad for generator. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment. Contractors shall furnish all tools, machinery, equipment, appurtenances and appliances necessary for the satisfactory handling and execution of their work.
- K. The work under these contracts shall include all labor, materials and incidentals necessary to execute a complete workmanlike job in accordance with the requirements of the Code and all local authorities having jurisdiction.
- L. All work shall be done in such locations and at such times as directed.
- M. The contractors shall place and store his materials as directed.
- N. The contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his machines, materials, employees, or work and shall

- pile in neat piles outside of building as directed. He shall cooperate with all other trades appurtenant to his work. At the completion of the work, he shall remove all his tools, scaffolding and surplus materials.
- O. Contractors shall be responsible for initiating, maintaining and supervising all safety precautions in accordance with O.S.H.A. requirements.
 - P. In the event that part of the building will be occupied during construction, the interior of the building will be separated and the Contractor will schedule his work accordingly.
 - Q. Supply and install complete addressable fire alarm, CO2 SYSTEM & smoke detection system. (MINIMUM AS PER PLANS)
 - S. Temporary light and power (200A. 3P., 4W) to GC trailer on site including meter and pole (all cost of operating for duration of project to be paid by owner).
 - T. Extend temporary light and power to new facility under construction including temporary lighting throughout facility and receptacles for duration of project or until permanent service is activated (refer to project manual).

1.02 RELATED WORK

- A. Section 1A - General material, equipment and workmanship standards.
- B. Section 2B - Excavation and backfill.
- C. Section 3A - Concrete .
- D. Section 7C - Flashing of electrical work.
- E. Section 9G - Finish painting.

1.03 DRAWINGS AND COORDINATION

- A. It is not the intention of the drawings to show every item, piece of equipment and detail but rather to show systems to be included. Provide systems with all appurtenant equipment to make a complete operating system.
- B. Inspect the work area prior to commencing the job. Install work as closely as possible to layouts shown on drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult Architect before making changes which affect the function, structural integrity or appearance of systems.
- C. Dimensions, elevations and locations are shown approximately. Verify measurements in field.
- D. Architect reserves the right to order changes in layout of such items as switches, fixtures and outlets if such changes do not substantially affect costs and if affected items have not been fabricated or installed.
- E. In some cases, drawing are based on products of one manufacturer, as listed in the specifications. Contractor to be responsible for modifications made necessary by substitution of products of other manufacturers.
- F. Do not install part of a system until all critical components of the system and related

- systems have been approved. Coordinate parts of system.
- G. Coordinate work with the work specified in other sections. Relocate work prior to installation if required for proper installation and functioning of other systems.
 - H. Install products in accordance with manufacturers' instructions. Notify Architect if contract documents conflict with manufacturers' instructions. Comply with Architect's interpretations.
 - I. Provide brackets, supports, anchors and frames required for installation of work specified in this division.
 - J. Provide all cutting and patching, excavation and backfilling required for installation of work specified in this Section.
 - K. Provide temporary lighting and power for duration of construction schedule or until permanent service is provided.

1.04 PROJECT RECORD DRAWINGS

- A. Submit shop drawings in accordance with Section 16011E.
- B. Note that the General Conditions specify that project record drawings be prepared.

1.05 EQUIPMENT CLEARANCES

- A. Deliver equipment knocked down if necessary.
- B. Install equipment with adequate clearances for maintenance and operation both of the equipment and of adjacent equipment.

1.06 PRELIMINARY OPERATION

- A. Operate electrical systems with required supervision for at least 2 full days prior to substantial completion.
Make necessary adjustments and check proper operation.

1.07 TESTS PRIOR TO SUBSTANTIAL COMPLETION

- A. Tests shall be attended by representatives of electrical subcontractors, equipped with instruments required to demonstrate proper functioning of systems, as specified.
Demonstrate the following:
 - 1. Equipment is installed and operating in accordance with manufacturer's specifications and instructions and with these specifications.
 - 2. Safety controls are operating as specified.
 - 3. Motors are equipped with starters and proper overload protection and not operating under overload. Obtain ammeter readings.
 - 4. Instruments are recording properly.

5. Submit reports in triplicate listing system tested, date, results and description of fault corrected, if any.

1.08 WARRANTY

A. Submit written warranty or warranties covering work specified in Division 16. Period: 2 years from the date of substantial completion of the building or of the equipment being accepted and warranted, whichever is later. Owner is to receive full use of equipment for period of warranty.

1.09 MAINTENANCE AND OPERATING INSTRUCTIONS AND PRODUCTS

- A. Submit maintenance and operating instructions for equipment requiring maintenance and operation.
 1. List replacement parts and order procedure.
 2. Include lubrication instructions and schedule, with types of lubricant to be used.
 3. Furnish 1 complete replacement set of fuses.
- B. Instruct Owner's personnel in use of equipment specified in this Division.
- C. Submit maintenance and operating manuals for equipment specified in this Division.

1.10 ELECTRICAL SYSTEMS IDENTIFICATION

- A. See Section 16195E - Electrical Identification.

1.11 CODES AND ORDINANCES

- A. Conform to the requirements of all codes and ordinances of authorities having jurisdiction, as specified in the General Conditions. In particular, conform to the State of New York Building Code, which incorporates the National Electrical Code by reference and NFPA.
- B. Conform to the State of New York Building Code energy conservation requirements, including certification, labelling and maintenance instructions for equipment.

1.12 REMOVAL AND DISPOSAL OF WASTE MATERIALS

- A. Remove and dispose of all debris and waste materials from the site in a safe and legal manner.

END OF SECTION

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ELECTRICAL GENERAL PROVISIONS
ELECTRICAL - PROJECT 2501

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Rigid metal conduit and fittings.
- C. Electrical metallic tubing and fittings.

1.02 RELATED WORK

- A. Section 3A - Cutting and Patching.
- B. Section 2B - Trenching: Excavation and backfill for conduit and utilities on site.

1.03 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.5 - Rigid Aluminum Conduit.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. FS WW-C-563 - Electrical Metallic Tubing.

PART 2 PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.02 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. EMT: ANSI C80.3 galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel set screw type.

PART 3 EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type installed or for Type THW conductors, whichever is larger; 3/4 inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route all conduit concealed and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

3.02 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of three 90- degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction, as around beams.
- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Where conduit penetrates fire-rated walls and floors, provide pipe sleeve two sizes larger than conduit; pack void around conduit with oakum and fill ends of sleeve with fire- resistive compound. Provide die-electric protection where required.
- L. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof with pitch pocket. Coordinate with mason as walls are being installed.

3.03 CONDUIT INSTALLATION SCHEDULE

- A. Underground Installations More than Five Feet From Foundation Wall: PVC
- B. Installations In or Under Concrete Slab, or Underground Within Five Feet of Foundation Wall: Rigid steel conduit.
- C. Exposed Outdoor Locations: Rigid steel conduit.
- D. Wet Interior Locations: Rigid steel conduit.
- E. Concealed Dry Interior Locations: M/C CABLE
- F. Exposed Dry Interior Locations: Above 8ft.Rigid aluminum conduit. Below 8 ft. AFF - Rigid Steel Conduit.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Wall and ceiling outlet boxes.
- C. Pull and junction boxes.

1.02 REFERENCES

- A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

PART 2 PRODUCTS

2.01 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with 1/2 inch male fixture studs where required.

2.02 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hinged enclosure.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, recessed-mounted junction box, UL listed as raintight. Cast aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Cast Metal Boxes for Underground Installations: NEMA 250; Type 4, inside flange recessed cover box for flush mounting, UL listed as raintight. Galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws.
- E. Fiberglass Handholes for Underground Installations: Die- molded with pre-cut 6 x 6 inch cable entrance at center bottom of each side; fiberglass weatherproof cover with non-skid finish.

PART 3 EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in all areas prior to rough-in.
- C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors.
- D. Locate and install to maintain headroom and to present a neat appearance.

3.02 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.
- B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of conduit except for cast boxes that is connected to two rigid metal conduits, both supported within 12 inches of box.
- E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- F. Install boxes in walls without damaging wall insulation.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- H. Position outlets to locate luminaires as shown on reflected ceiling plans.
- I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- L. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.
- M. All outlet boxes are to be installed above fin tube radiation. Coordinate heights and locations with mechanical contractor.

3.03 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Wall switches.
- C. Receptacles.
- D. Device plates and box covers.

1.02 REFERENCES

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
- B. FS W-S-896 - Switch, Toggle.
- C. NEMA WD 1 - General-Purpose Wiring Devices.
- D. NEMA WD 2 - Semiconductor Dimmers for Incandescent Lamps.
- E. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.03 SUBMITTALS

- A. Submit product data in accordance with Section 16011E.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES.

- A. Leviton.
- B. Hubbell.

2.02 WALL SWITCHES

- A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: FS W-S-896; AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: Ivory plastic. Hubbell Model #1221.

2.03 ACCEPTABLE MANUFACTURERS - RECEPTACLES

- A. Leviton.
- B. Hubbell.

2.04 RECEPTACLES

- A. Convenience and Straight-blade Receptacles: NEMA WD 1. Hubbell #5262.
- B. Locking-Blade Receptacles: NEMA WD 5. Hubbell Model #4700.
- C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20 R, ivory plastic face. Hubbell Model #5262I.
- D. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings.
- E. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter. Hubbell Model #GF5262.

2.05 ACCEPTABLE MANUFACTURERS - WALL PLATES

- A. Leviton.
- B. Hubbell.

2.06 WALL PLATES

- A. Decorative Cover Plate: Brushed Stainless steel. Hubbell Model #S-1.
- B. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers. Hubbell Model #5206.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install wall switches as shown, to coordinate with architectural drawings, OFF position down.
- B. Install convenience receptacles as shown to coordinate with architectural drawings, grounding pole on bottom.
- C. Install specific-use receptacles at heights shown on Contract Drawings.
- D. Corridor Convenience Receptacles: Hospital Grade. Hubbell #8300.
- E. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
- F. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas,

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ELLENVILLE FIRE DISTRICT**

**WIRING DEVICE
ELECTRICAL - PROJECT 1
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- above accessible ceilings, and on surface-mounted outlets.
- G. Install devices and wall plates flush and level
 - H. Install receptacles above fin tube radiation. Coordinate heights and locations with mechanical contractor.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of contract, including General and Supplementary Conditions apply to work of this Section.
- B. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.
- C. Underground service from utility pole to pad mounted transformer and to facility service equipment.

1.02 RELATED WORK

- A. Section 3A - Concrete work

1.03 SYSTEM DESCRIPTION

- A. System Voltage: 120/208 volts, three phase, four- wire, 60 Hertz.

1.04 QUALITY ASSURANCE

- A. Utility Company:
- B. Install service entrance in accordance with Utility Company's rules and regulations.

1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 16011E.
- B. Submit Utility Company prepared drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Make arrangements with Utility Company to obtain permanent electric service to the Project.
- B. Underground: Supply and install primary cable in conduit from service pole to new site transformer and from transformer to new facility service equipment. Contractor shall leave sufficient slack cable for Utility Company to connect service lateral conductors at top of pole.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Disconnect switches.
- C. Fuses.
- D. Enclosures.
- E. Shunt trip breaker for elevator.

1.02 REFERENCES

- A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.
- B. ANSI/UL 198E - Class R Fuses.
- C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses).
- D. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.
- E. NEMA KS 1 - Enclosed Switches.

1.03 SUBMITTALS

- A. Submit product data in accordance with Section 16011E.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

- A. Square-D.
- B. General Electric.

2.02 DISCONNECT SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1; FS W-S-865; quick-make, quick-break, load interrupter enclosed knife

switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Square-D H series.

- B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Square-D H series.
- C. Enclosures: NEMA KS 1; as indicated on Drawings.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

- A. See Contract Drawings

2.04 FUSES

- A. Fuses 600 Amperes and Less: As indicated on Drawings; current limiting, one-time fuse, 600 volt.
- B. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install disconnect switches where indicated on Drawings.
- B. Install fuses in fusible disconnect switches.

3.02 DISCONNECT SWITCHES

- A. See Contract Drawings.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Power system grounding.
- C. Electrical equipment and raceway grounding and bonding.

1.02 SYSTEM DESCRIPTION

- A. Ground the electrical service system neutral at service entrance equipment to metallic water service and to supplementary grounding electrodes.
- B. Ground each separately-derived system neutral to nearest effectively grounded metallic water pipe.
- C. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with Section 16011E.
- B. Indicate location of system grounding electrode connections, and routing of grounding electrode conductor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ground Rods: Copper-encased steel, 3/4 inch diameter, minimum length 10 feet.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.

- B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.
- D. Use minimum 6 AWG copper conductor for communications service grounding conductor. Leave 10 feet slack conductor at terminal board.
- E. Isolated Grounding Systems: Use insulated equipment grounding conductor and connect only to service grounding electrode.
- F. Provide grounding and bonding at Utility Company's metering equipment in accordance with Section 16420E.

3.02 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Service and distribution panelboards.
- C. Lighting and appliance branch circuit panelboards.
- D. Load centers.

1.02 RELATED WORK

- A. Section 16480 - Motor Control: Motor Starter panelboards.

1.03 REFERENCES

- A. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service.
- B. FS W-F-870 - Fuseholders (For Plug and Enclosed Fuses).
- C. FS W-P-115 - Power Distribution Panel.
- D. FS W-S-865 - Enclosed Knife Switch
- E. NEMA AB 1 - Molded Case Circuit Breakers.
- F. NEMA KS 1 - Enclosed Switches.
- G. NEMA PB 1 - Panelboards.
- H. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- I. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

1.04 SUBMITTALS

- A. Submit shop drawings and installation instructions for equipment and component devices in accordance with Section 16011E.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.05 SPARE PARTS

- A. Keys: Furnish two each to Owner.
- B. Fuses: Furnish to Owner one spare fuses of each type and rating installed.
- C. Fuse Pullers: Furnish one fuse puller to Owner.
- D. Circuit Breakers: Provide spares as indicated on Contract Drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURES - PANELBOARDS

- A. Square-D.
- B. General Electric.

2.02 PANELBOARDS

- A. All buswork in panelboards to be copper.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.
- B. Height: 6 ft.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

3.02 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

3.03 PANELBOARD SCHEDULE

- A. See contract drawings.

END OF SECTION

PART 1 GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Automatic transfer switch.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 16425E - Switchboards: Installation of transfer switch.

1.03 RELATED WORK

- A. Section 16622E - Package Engine-Generator System: Testing requirements.

1.04 REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in automatic transfer equipment with three years experience.

1.06 SUBMITTALS

- A. Submit product data in accordance with Section 16011E.
- B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.
- C. Submit manufacturer's installation instructions.

1.07 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include instructions for operating equipment.
- C. Include instructions for operating equipment under emergency conditions.

- D. Identify operating limits which may result in hazardous or unsafe conditions.
- E. Document ratings of equipment and each major component.
- F. Include routine preventive maintenance and lubrication schedule.
- G. List special tools, maintenance materials, and replacement parts.

1.08 REGULATORY REQUIREMENTS

- A. Conform to applicable code for standby electrical systems.

2.02 AUTOMATIC TRANSFER

- A. Description: NEMA ICS 2; automatic transfer switch.
- B. The automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The automatic transfer switch shall be mechanically held and electrically operated by a single-solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to ensure only one of two possible positions - normal or emergency. The automatic transfer switch shall be suitable for use with emergency sources.

2.03 AUTO TRANSFER SWITCH

- A. Configuration: Electrically-operated, mechanically-held transfer switch.
- B. Sequence of Operation: Switch position is selected by control switch mounted in switch cover.
- C. All main contacts shall be of silver composition. They shall be protected by arcing contacts in sizes 400-Amperes and over. They shall be of the blow-on configuration and of segmented construction in ratings 600-Amperes and over. The operating transfer time in either direction shall not exceed one-sixth (1/6) of a second.
- D. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.
- E. The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. Sensing and control

logic shall be solid-state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation, interfacing relays shall be industrial-control-grade, plug-in type with dust covers and locking clips.

- F. Automatic transfer switches utilizing components of molded case circuit breakers, linear actuators, contactors or parts thereof which have not been intended for continuous duty or repetitive load transfer switching are not acceptable.
- G. The automatic transfer switch shall conform to the requirements of NEMA Standard ICS2-447 and Underwriters' Laboratories UL-10008 and shall be UL listed.
- H. For single-phase switches, the normal source voltage across live lines shall be monitored, and for three phase switches all phases of the normal shall be monitored line-to-line. Closes differential voltage shall be adjustable from 70% to 98% of the pickup value. The transfer to emergency will be initiated upon reduction of normal source to 85% of nominal voltage and retransfer to normal shall occur when normal source restores to 95% of nominal.
- I. Harnessing between transfer switch and control panel shall have built-in disconnect for routine maintenance. All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks.

Automatic operation of the switch shall not require power from any source other than the line-to-line voltage of the source to which the switch is transferring.

2.04 RATINGS

- A. Ratings: NEMA ICS 2; as follows:
 - 1. Voltage: 120/208 volts, three phase, four wire, 60 Hz.
 - 2. Switched Poles: 4 with overlapping neutral transition..
 - 3. Load Inrush Rating: Combination load.
 - 4. Continuous Rating: 1000 amperes.

2.05 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine Generator: 0.6 to 6 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable.

- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Re-Transfer to Normal Power: 1 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: Five minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period. Transfer load to alternate source during engine exercise period. Provide Load/No Load selector switch.

2.06 ENCLOSURE

- A. Enclosure: ICS 6; Type 1.

2.07 ACCESSORIES

- A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION, EMERGENCY SWITCH POSITION.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Push Button Return to Normal Switch: Mount in cover of enclosure to initiate Manual transfer from alternate to normal source.
- D. Transfer Switch Main Shaft Auxiliary Contacts: 1 normally open; 1 normally closed.
- E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; Initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal voltage.
- G. In spur-phase relay. Monitors the normal and emergency sources and will not permit transfer until the phase voltages have been plus or minus 10% for approximately 60 \ milliseconds. If the source supplying the load fails or drops below an adjustable 10% to 30%, this relay will override itself and permit immediate transfer. This accessory operate in both directions. (Required for use with meter loads of 15 HP or larger). Programmed transition will not be acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as instructed by manufacturer.

- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Interior luminaires and accessories.
- C. Exterior luminaires and accessories.
- D. Lamps.
- E. Ballasts.

1.02 RELATED WORK

- A. Section 9G - Painting.

1.04 SUBMITTALS

- A. Submit product data in accordance with Section 16011E.
- B. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminaire type.
- C. Submit manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site.
- B. Store and protect products.

PART 2 PRODUCTS

2.01 INTERIOR LUMINAIRES AND ACCESSORIES

- A. See contract drawings. Contractor must coordinate and select proper trim on lighting fixtures for Ceiling being installed.
- B. Recessed LED Luminaires: Provide trim type and accessories required for installation in ceiling system installed.

2.02 EXTERIOR LUMINAIRES AND ACCESSORIES

- A. See contract drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install lamps in luminaires and lampholders.
- B. Support all luminaires directly from building structure not from ceiling.
- C. Install recessed luminaires to permit removal from below. Use plaster frames or Install grid clips.
- D. Embedded Luminaire Poles: Depth as indicated below finished grade. Install plumb.

3.02 RELAMPING

- A. Relamp luminaires which have failed lamps at completion of Work.

3.03 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Touch up luminaire finish at completion of work.

3.04 LUMINAIRE SCHEDULE

- A. See contract drawings.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Packaged engine generator system with integral double wall 500 gallon diesel fuel tank.
- C. Exhaust silencer and fittings.
- D. Fuel fittings.
- E. Battery and charger.
- F. weatherproof exterior enclosure with critical muffler inside enclosure.
- G. enclosure shall be rated at 75dba@7meters for duplication of annunciator panel for generator status and trouble.
- H. Remote annunciator panel

1.04 REFERENCES

- A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. ANSI/NEMA MG 1 - Motors and Generators.
- C. ANSI/NFPA 70 - National Electrical Code.
- D. ANSI/NFPA 99 - Health Care Facilities.
- E. ANSI/NEMA AB 1 - Molded Case Circuit Breakers.

1.06 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 16011E.
- B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.
- C. Submit product data showing dimensions, weights, ratings, interconnection points,

internal wiring diagrams, etc. for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, radiator, and remote annunciator.

- D. Submit manufacturer's installation instructions.

1.07 PROJECT RECORD DOCUMENTS

- A. Submit record documents.
- B. Accurately record location of engine generator and mechanical and electrical connections.

1.08 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include instructions for normal operation, routine maintenance requirements, service manuals for engine, oil sampling and analysis for engine wear, and emergency maintenance procedures.
- C. Provide three sets of operation and maintenance manual.

1.09 QUALIFICATIONS

- A. Manufacturer: Company specializing in packaged engine generator system with minimum three years documented experience.
- B. Supplier: Authorized distributor of engine generator manufacturer with service facilities within 50 miles of project site.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site.
- B. Store and protect products.
- C. Accept packaged engine generator set and accessories on site in crates and verify damage.
- D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.11 WARRANTY

- A. Provide one year warranty. From date of initial start-up. Warranty shall cover complete package. Individual component warranties will not be acceptable.

1.12 MAINTENANCE SERVICE

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- A. Furnish service and maintenance of packaged engine generator system for one year from Date of Substantial Completion. Which shall consist of changing the oil, oil filters, fuel filter, and air filter.

1.13 EXTRA MATERIALS

- A. Provide two sets of each oil, and air filter element required for the engine generator system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A Generac or equal. Refer to contract drawings for specifications.

2.02 ENGINE

- A. Type: RADIATOR COOLED inline or V-type, four stroke cycle, two stroke cycle, electric ignition internal combustion engine, cubic inch displacement, HP, cylinder.
- B. Rating: Sufficient to operate at 100 percent load for duration of a power failure at specified elevation and ambient limits.
- C. Fuel System: Diesel
- D. Engine Speed: 1800 rpm.
- E. Governor: Isochronous type to maintain engine speed within plus or minus 0.25 percent, steady state and no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment by service technician.
- F. Safety Devices: Engine shutdown on high water temperature, low water level, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
- G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine- generator control panel.
- H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F and suitable for operation on 120 volts AC.
- I. Radiator: WATER COOLED.
- J. Engine Accessories: Lube oil filter, Low water level shut-off, intake air filter, lube oil cooler, belt-driven water pump, gas solenoid fuel valve, fuel filter, critical silencer, flexible couplings for fuel line and exhaust line, wall thimble and rain cap. Include

water temperature gage, and lube oil pressure gage on engine-generator control panel.

- K. Mounting: Provide unit with suitable vibration isolators and mount on structural steel base. Provide spring type vibration isolators between the generator and pad or base.

2.03 GENERATOR

- A. Generator: ANSI/NEMA MG 1; three phase, four pole, reconnectible brushless synchronous generator with brushless exciter.
- B. Rating: Refer to drawings.
- C. Insulation: ANSI/NEMA MG 1, Class F.
- D. Temperature Rise: 105 degrees C continuous.
- E. Enclosure: ANSI/NEMA MG 1.
- F. Voltage Regulation: Include generator-mounted volts per Hertz exciter-regulator to match engine and generator characteristics, with voltage regulation +/- one percent from no load to full load. Include manual controls to adjust voltage drop +/- 5 percent voltage level, and voltage gain.

2.04 ACCESSORIES

- A. Exhaust Silencer: Critical type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, rain cap suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions.
- B. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 72 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
- C. Battery Tray: Metal battery tray.
- D. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.
- E. Line Circuit Breaker: NEMA AB 1 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; number and rating as indicated. Mount unit in enclosure to meet ANSI/NEMA 250, Type 1 requirements.
- F. Engine-Generator Control Panel: Suitable for indoor use NEMA 1, ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for the following equipment and features:
 - 1. Frequency Meter: 45-65 Hz range, 3-1/2 inch dial.

2. AC Output Voltmeter: 3-1/2 inch dial, 2 percent accuracy, with phase selector switch.
3. AC Output Ammeter: 3-1/2 inch dial, 2 percent accuracy, with phase selector switch.
4. Output voltage adjustment.
5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, low water level, overspeed, and overcrank.
6. Engine start/stop selector switch.
7. Engine running time meter.
8. Oil pressure gauge.
9. Water temperature gage.
10. Auxiliary Relay: Operates when engine runs.
11. Remote Alarm Contacts: Pre-wire SPCT contacts to terminal strip for remote alarm functions required by ANSI/NFPA 99.
12. Low water level alarm.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.
- B. Verify that required utilities are available in proper location and ready for use.
- C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Transfer switch shall be installed a minimum of 18" AFF to conform with NEC Section 511.

3.03 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.
- C. During test, record the following at 20 minute intervals:
 1. Kilowatts.
 2. Amperes.
 3. Voltage.
 4. Coolant temperature.
 5. Room temperature.
 6. Frequency.

7. Oil pressure.

D. Test alarm and shutdown circuits by simulating conditions.

3.04 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems. Allow for two (2) separate tests.

1.05 ADJUSTING

A. Adjust work.

B. Adjust generator output voltage and engine speed.

3.06 CLEANING

A. Clean work.

B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.07 DEMONSTRATION

A. Provide systems demonstration.

B. Describe loads connected to emergency system and restrictions for future load additions.

C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency power.

3.08 QUALITY ASSURANCE

A. To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and local representative shall be responsible for two separate tests: design prototype tests, and final production tests.

1. Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, a similar design prototypes and reproduction models, which will not be sold, shall have been used for the following tests.

a. Maximum power (kw)

b. Maximum motor starting (kVA) at 30% instantaneous voltage dip.

c. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1-22.40 & 16.40.

d. Governor speed regulation under steady-state and transient conditions.

e. Voltage regulation and generator transient response

f. Fuel consumption at 1/4, 1/2, 3/4, and full load.

g. Harmonic analysis, voltage waveform deviation, and telephone influence factor.

h. Three-phase short circuit tests.

i. Alternator cooling air flow.

j. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.

k. Endurance testing.

2. Final Production Tests: Each generator set shall be tested two (2) times under varying loads with guards and exhaust system in place. Test shall include:

a. Single-step load pickup.

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- b. Transient and steady-state governing.
- c. Safety shutdown device testing.
- d. Voltage regulation.
- e. Rated Power.
- f. Maximum Power.
- g. Upon request, arrangements to either witness this test will be made or a certified test record will be sent prior to shipment.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Engine control panel.
- C. Generator control panel.
- D. Engine alarm panel.
- E. Annunciator panel in radio room

1.02 RELATED WORK

- A. Section 16495E - Transfer Switch.
- B. Section 16622E - Package Engine Generator Set.

1.04 REGULATORY REQUIREMENTS

- A. Provide audio and visual alarms in accordance with National Electrical Code and applicable electrical inspection authority.

1.05 SUBMITTALS

- A. Submit shop drawings in accordance with Section 16011E.
- B. Submit manufacturer's installation instructions.
- C. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. GENERAC or equal.

2.02 ENGINE CONTROL PANEL

- A. Mount in steel enclosure in control panel, complete with oil pressure gage, water temperature gage, low oil pressure shutdown contacts, high water temperature alarm contacts, high water temperature shutdown contacts, overspeed shutdown contacts, low water level and cranking limiter relay.

2.03 ENGINE ALARM PANEL

- A. Incorporate in generator control panel complete with generator OFF-START-AUTO selector switch, cranking limiter, trouble horn and double pole, double throw silencing switch with red indicating light and illuminated annunciators with engraved nameplates reading:
 - 1. Low oil pressure alarm
 - 2. High water temperature alarm
 - 3. Low oil pressure shut down
 - 4. High water temperature shut down
 - 5. Overspeed shut down
 - 6. Over cranking shut down
 - 7. Low water level.
 - 8. Switch "OFF" (Flashing Red).
 - 9. Emergency stop
 - 10. Low fuel
 - 11. System ready (Green).
 - 12. Low water temperature.
 - 13. Pre-Alarm high water temperature (Yellow).
 - 14. Pre-Alarm low oil pressure (Yellow).

2.04 ANNUNCIATORS

- A. Locking type with manual reset button for DC operation from battery bank incorporating contacts for remote indication.
- B. Provide contacts so that when shutdown occurs from one set of shutdown contacts, subsequent operation of shutdown contacts are locked off from operating annunciators.
- C. Operation of silencing switch to silence trouble alarm but pilot to remain illuminated.
- D. On return to normal and resetting of annunciators, trouble horn to sound again until switch is returned to normal position.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install alarms and instrumentation in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this Section.
- B. Fire alarm and smoke detection systems. Shall be addressable type.

1.02 RELATED SECTIONS

- A. Section 8G - Door Hardware: Door closers.
- B. Section 15010S - Sprinkler system.
- C. Section 15010H - Duct mounted smoke detectors.
- D. Section 15910H - Fire dampers.
- E. Section 16120 - Wire and Cable.

1.03 REFERENCES

- A. NFPA 72A - Installation, Maintenance, and Use of Local Protective Signaling System for Guard's Tour, Fire Alarm, and Supervisory Service.
- B. NFPA 72B - Installation, Maintenance, and Use of Auxiliary Protective Signaling System for Fire Alarm Service.
- C. NFPA 72C - Installation, Maintenance, and Use of Remote Station Protective Signaling System.
- D. NFPA 72E - Automatic Fire Detectors.
- E. NFPA 72G - Notification Appliances for Protective Signaling Systems.
- F. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.
- G. NFPA 101 - Life Safety Code.

1.04 REGULATORY REQUIREMENTS

- A. System: UL and FM listed.
- B. Conform to requirements of NFPA 101.
- C. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE Fire Alarm System manufacturer under the appropriate category by the Underwriters

Laboratories, Inc. (UL) and shall bear the UL label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.

1.05 SYSTEM DESCRIPTION

- A. Fire Alarm System: NFPA 72A; NFPA 72B; NFPA 72C; automatic manual fire alarm system.
- B. System Supervision: Provide electrically-supervised system, with supervised alarm initiating and alarm signaling circuits. Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode. Occurrence of single ground or open condition on alarm initiating circuit does not disable that circuit from transmitting in ALARM.
- C. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device causes system to enter ALARM, which includes the following operations:
 - 1. Sound and display local fire alarm signaling devices with non-coded signal.
 - 2. Transmit non-coded signal to remote station equipment.
 - 3. Indicate location of alarm zone on fire alarm control panel.
 - 4. Transmit signals to building elevator control panel to initiate return to main floor or alternate floor.
 - 5. Transmit signal to building mechanical systems to initiate shutdown of fans and damper operation.
 - 6. Transmit signal to release door hold-open devices by zone.
- D. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm initiating circuits have cleared.
- E. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
 - 1. Visual and audible trouble alarm by zone at control panel.
 - 2. Visual and audible trouble alarm at annunciator panel.
 - 3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
 - 4. Transmit trouble signal to remote station.
- F. Lamp Test: Manual LAMP TEST function causes alarm indication at each zone at fire alarm control panel.
- G. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to:
 - 1. Sound and display local fire alarm signaling devices.

2. Indicate location of alarm zone on fire alarm control panel.

H. Zoning: As per Contract Drawings.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five years experience.
- B. Installer: Company specializing in smoke detection and fire alarm systems with five years experience.

1.07 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 16111E.
- B. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes.
- C. Submit manufacturer's installation instructions under provisions of Section 16111E.
- D. Submit manufacturer's certificate that system meets or exceeds specified requirements.

1.08 PROJECT RECORD DRAWINGS

- A. Submit as-built documents.
- B. Include location of end-of-line devices.

1.09 OPERATION AND MAINTENANCE DATA

- A. Submit data under provisions of Section 16111E.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Include manufacturer representative's letter stating that system is operational.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section GC and SGC.
- B. Store and protect products under provisions of Section GC and SGC.

1.11 EXTRA MATERIALS

- A. Provide spare parts.
- B. Provide ten manual station break-glass rods.
- C. Provide two keys of each type.
- D. Provide five smoke detectors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. SEE DRAWINGS
- B. Substitutions: Under provisions of Section 16111E.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Where shown on the plans, provide and install a Edwards Fire alarm Control Panel. Construction shall be modular with solid state, microprocessor based electronics. All visual indicators shall be high contrast, LED type.
- B. The Control Panel shall contain but not be limited to the following features: (minimum).
 - 1. 8 - Initiating Device Circuits
 - 2. 2 - Alarm Indicating Appliance Circuits
 - 3. 8 - Supervised Annunciator Circuits
 - 4. 1 - Local Energy, Shunt Master Box or Reverse Polarity Remote Station Connection (selectable).
 - 5. 2 - Form C Alarm Contacts (2.0 amps ea)
 - 6. 1 - Form C Trouble Contact (2.0 amps ea)
 - 7. 1 - Earth Ground Supervision Circuit
 - 8. 1 - Automatic Battery Charger
 - 9. 1 - Power Supply Rated at 5 amps
 - 10. 1 - Standby Batteries (1 set)
 - 11. 1 - Resident non-volatile programmable operating System memory for all operating requirements (1 lot)
 - 12. 1 - Supervised Manual Evacuation Switch.
- C. The alarm initiating circuits shall be capable of interfacing Smoke Detectors, Heat Detectors and Manual Stations on the same 2 wire loop, with a maximum of (30) Smoke Detectors per circuit.
- D. Switches shall be provided for Reset, 1 amp Test, and Signal Silence functions.

- E. Signal circuits shall operate 24 VDC polarized audible alarm devices and shall provide either Class A or Class B operations with a 2 amp outdoor maximum per circuit.
- F. Expansion modules shall be system interconnected by a 10 or 40 pin plug and harness assembly and shall be operable and supervised by the main control panel.
- G. Through the use of a program mode dip-switch the fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. No special tools, modems, or off-board programmer shall be required to program the system so as to accommodate and facilitate expansion, building parameter changes or changes as required by local codes. All instructions shall be stored in a non-volatile programmable memory within the Fire Alarm Control Panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
- H. Battery Backup. The batteries shall be lead calcium, maintenance free and shall provide sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours with five minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

2.03 PERIPHERAL DEVICES

- A. Manual Stations shall be Edwards double action and shall be constructed of high impact, red lexan with raised white lettering and a smooth high gloss finish. The break glass rod station shall have a hinged front with key lock.

Stations which utilize screwdrivers, allen wrenches or other commonly available tools shall not be accepted. Stations shall be keyed alike with the Fire Alarm Control Panel. When the station is operated, the handle shall lock in a protruding manner to facilitate quick visual identification of the activated station.

- B. Smoke Detectors shall be Photoelectric with type base. Detector design must provide for 360° smoke entry. Detectors shall be listed to UL standard 268 and shall be documented compatible with the control equipment to which it is connected. Detectors shall be listed for this purpose by Underwriters Laboratories, Inc. The Detectors shall obtain their operating power from the Fire Alarm Panel supervised detection loop. The operating voltage shall be 24 VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the Control Panel.

Each Detector shall have a flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. The detector may be reset by actuating the Control Panel reset switch.

- C. Automatic Heat Detector shall be rate of rise and fixed temperature type. When the

fixed temperature portion is activated, the units shall be non-restorable and give visual evidence of such operation. Heat Detectors shall be Simplex type 2098 135°.

- D. Bells shall be vibrating. The bells shall be polarized and shall be operated by 24 BDC. Each bell assembly shall include separate wire leads for in/out wiring for each device conductors to signal circuit conductors shall NOT be accepted. Bells shall have a minimum sound pressure level output of 85dB at 10 feet. Bells shall be 10 inches diameter, finished in baked on red enamel paint and be UL listed for fire alarm use. Bells shall be suitable for surface or semi-flush mounting and be suitable for use within combination audi/visual units.
- E. .Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices.
The housing shall be designed to accommodate either horns, bells, chimes or speakers. The unit shall be completed with tamper resistant, Pyramidal shaped lexan lens with "Fire" lettering visible from a 180 field of view. The front panel or bezel which is constructed of UL listed Noryl, may be inverted so that the lens is below the audible device. Integral Xenon strobe shall provide 8000 peak candle power and be adjustable from 1 to 3 flashes power second. Xenon strobe shall provide 4-wire connection to insure properly supervised in/out system connection. Unit shall be complete with all mounted hardware including backbox. Audio/Visual unit shall be UL listed for its intended purpose.
- F. Magnetic Door Holders shall be Simplex type 2088 and shall have an approximate holding force of 35 pounds. The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing. Unit shall be capable of being either surface, flush, semi-flush or floor mounted as required. Doorholders shall be UL listed for their intended purpose.
- G. Duct Smoke Detectors shall be Simplex type 2098-9648 and shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle. The detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive materials shall be used. Detector construction shall be of the split type, that is, mounting base with twist-lock detecting head. Contacts between the base and head shall be of the bifurcated type using spring-type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the Control Panel. Detector design shall provide full solid state construction and compatibility with other normally open fire alarm detection loop devices, (heat detectors, pull stations, etc.) Duct housing couplings shall be slotted to insure proper alignment of the sampling and exhaust tubes. Detector shall have an alarm LED visible through a transparent front cover. Detectors shall obtain their operating power from the supervised current in the fire alarm loop. Installation must comply with NFPA-90A.

2.04 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16120E.
- B. Initiating and Signal Circuits: Non-power limited fire-protection signaling cable, copper conductor, 150 volt insulation rated 60 degree C.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install system in accordance with manufacturer's instructions.
- B. Install manual station with operating handle 54 above floor. Install audible and visual signal devices 90 inches above floor.
- C. Use 14 AWG minimum size conductors for fire alarm detection and signal circuit conductors. Install wiring in conduit.
- D. Mount end-of-line device in box with last device or separate box adjacent to last device in circuit.
- E. Mount outlet box for electric door holder to withstand 80 pounds pulling force.
- F. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, duct smoke detectors, and elevator.
- G. Automatic Detector Installation: NFPA 72E.

3.02 FIELD QUALITY CONTROL

- A. Provide field inspection and testing.
- B. Test in accordance with NFPA 72H and local fire department requirements.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services.
- B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

3.04 FIRE ALARM WIRE AND CABLE COLOR CODE

- A. Provide fire alarm unit conductors with color coded insulation, or use color coded tape at each conductor termination and in each junction box as follows:
 - 1. Power Branch Circuit Conductors: Black.
 - 2. Initiating Device Circuit: Red.

3. Detector Power Supply: Violet.
4. Signal Device Circuit: Blue (positive), white (negative).
5. Door Release: Gray, gray.
6. Municipal Trip Circuit: Orange, orange.
7. Municipal Fire Alarm Loop: Black, white.

3.05 ZONE SCHEDULE

- A. See riser diagram on contract drawings

3.06 TEST

- A. A factory trained technician shall supervise the final connections and shall test and adjust all equipment upon completion. Each detector, station and signal shall be tested by the manufacturer's representative, in the presence of a representative of the owner and a Test Report shall be made out, in triplicate, and signed by the owners representative, indicating that he witnessed the actual individual test of the system.

3.07 WARRANTY

- A. The contractor shall guarantee all wiring to be free from inherent mechanical and electrical defects for two (2) years. Manufacturer shall make available to the owner a local Service Department, which shall stock standard parts on the premises. Maintenance is to be provided during normal working hours, at no cost to the owner, for a period of twelve (12) months from the date of completion of the installation, unless damage is caused by misuse, abuse or accident.

END OF SECTION

PART I GENERAL

1.1 SUMMARY

- A. Furnish all labor, components and items of service required for the completion of a functional and unobtrusive lightning protection system.
- B. If any departures from the contract drawings are deemed necessary by the contractor, submit details of such departures and reasons as soon as possible to the architect for approval. No such departures shall be made without the prior written approval of the architect.

1.2 QUALITY ASSURANCE

- A. A national testing laboratory (Underwriters Laboratories or Applied Research Laboratories) shall list the components and provide certification of the lightning protection system installation (inspect and certify) for compliance with applicable standards.
- B. The system shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest approved design.
- C. All components specified for this work shall be manufactured by Heary Bros. Lightning Protection Co., Inc., Springville, New York, or approved equal. The equipment manufacturer shall be an approved manufacturer. For approval of a manufacturer other than specified, proposed component data and installation drawings must be submitted for review not less than 10 days prior to bid.

1.3 SUBMITTALS

- A. Submit complete shop drawings, showing the type, size, cable routings, ground rods and locations of all equipment, to the architect for approval, prior to start of work.
- B. Submit samples and pertinent catalog data to the architect for approval upon request.

PART 2 PRODUCTS

2.1 STANDARD

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- A. All equipment shall be new, the product of a single manufacturer as outlined above, and of a design and construction to suit the application where it is used in accordance with accepted industry standards.

2.2 EQUIPMENT

- A. All components shall be aluminum and of the size, weight and construction to suit the application where used in accordance with requirements for Class I structures.
- B. Roof conductors shall be aluminum, 24 strands 14-gauge, 98,600 circular mils, net weight 110 lbs. / 1000 ft.
- C. Down conductors shall be copper, 29 strands 17-gauge, 65,600 circular mils, net weight 190 lbs./1000ft.
- D. Air terminals shall be solid round aluminum bar 1/2" x 12" minimum, and shall project 10" minimum above the object to be protected.
- E. Air terminal bases shall be aluminum with bolt pressure cable connectors and shall be securely mounted with stainless steel screws or bolts.
 - 1. Offset type bases shall be used at parapets and secured with stainless steel screws or anchors.
 - 2. Adhesive type bases shall be secured with an adhesive compound which is compatible with the roofing system. The roofing manufacturer shall approve the adhesive compound.
- F. Ground rods shall be 5/8" x 10'-0" minimum. They shall be connected to the system with a two-bolt copper clamp having a minimum length of 1-1/2" and employing stainless steel cap screws.
- G. Cable fasteners shall be substantial in construction, galvanically compatible with the conductor and mounting surface.
- H. Bonding devices, cable splicers and connectors shall be of aluminum with bolt pressure cable connectors.
- I. Equipment on stacks and chimneys shall be protected from corrosion and sized in accordance with requirements.
- J. Bolts, nuts and screws shall be stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The installation shall be accomplished by an experienced installer. The installer shall work under the direct supervision of a manufacturer as listed above or a qualified distributor of such manufacturer's products.
- B. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible.
- C. Provide complete cable network on the roof including; air terminals, splices, bonding connectors and cable downleads to ground rods. Down conductors shall run in 1" PVC conduit concealed within the building construction to ground.
- D. The electrical contractor shall furnish and install all necessary PVC conduit and junction boxes.
- E. A bimetal transition fitting shall be used where aluminum roof conductor and copper down conductor are spliced together.

3.2 COORDINATION

- A. Work with other trades to insure a correct, neat and unobtrusive installation.
- B. Assure a sound bond to the main water service and to assure interconnection with other building ground systems, including both telephone and electrical.
- C. Install proper arresters on the power and telephone service by either the utility or the electrical contractor as applicable.

3.3 COMPLETION

- A. Provide an as-built drawing to the architect, for the owner, upon completion of the installation.
- B. Provide certification (UL, ARL or approved equal).

PART 4 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

- A. Heary Bros. Lightning Protection Co., Inc. T. 800-421-6141 F. 716-941-3828
- B. Approved equal

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PART 5 INSPECTION AND LISTING LABORATORY

- A. Applied Research Laboratories, Inc.
- B. Underwriters Laboratories

END OF SECTION