

RFI 2

On sheet E0.00 there is a note on the right side of the page above the Electrical Installation Requirements that states all single pole circuits to be provided with gfcı breakers. Does this mean the GFCI receptacles on sheet E1.00 can be quoted as regular duplex receptacles?

The note for the GFCI receptacles is a typo and can be deleted.

There should be GFCI receptacles as noted on the plan sheet E1.00.

The attached A9.0 &A10.0 are for the electrical bid specs.

DIVISION 16 - ELECTRICAL SYSTEMS (CONTINUED)

SECTION 16150 - MOTOR CONTROLLERS AND CONTACTORS

1. RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Division 1 Specification Sections apply to work of this section.
 2. SCOPE
 A. The work, apparatus and materials which shall be furnished under these specifications and accessories shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete electrical systems as indicated on the drawings and as specified herein.
 B. Coordinate all required interlocks with Division 15, Motor starters shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

3. DESCRIPTION OF WORK
 A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:
 1. Manual motor starters.
 2. Combination disconnect/VVNR motor starters.

4. QUALITY ASSURANCE
 A. Manufacturers: General Electric, Square D, Allen Bradley.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.
 C. Codes and Standards:
 1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.

2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.
 3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

5. SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of motor controller required. Include data substantiating that materials comply with requirements.

6. INDIVIDUAL MOTOR CONTROLLERS
 A. Manual motor starters For 115 volts, single phase motors one horsepower and smaller, shall be single pole, horsepower rated switches with thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 609, General Electric CR-101 or Square D Class 2510 with stainless steel cover plates.
 B. Magnetic Full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated with three thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 509, General Electric CR-306 or Square D Class 8536. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

C. Combination magnetic, full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated contacts, with three thermal overload units and heaters. A three pole horsepower rated, fusible disconnect switch shall also be included integral within the enclosure. Provide fuses sized as recommended by the motor manufacturer. Starters shall be Allen-Bradley Bulletin 512, General Electric CR-308 or Square D Class 8538. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

4. SUBMITTALS
 A. Product Data: Submit manufacturer's data on circuit and motor disconnects, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

5. ACCEPTABLE MANUFACTURERS
 A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include the following:
 4. General Electric Co.

6. ITE/Siemens

7. FABRICATED SWITCHES
 A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated, fusible or non-fusible type as indicated, amperes as indicated, 60 Hz, 3-blades, 4-poles, solid neutral and incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position. Construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA Type 3R enclosures, where applicable. Provide grounding kit. Provide 240 volt rated switches for 208Y/120 volt systems and 600 volt rated switches for 277Y/480 volt systems.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

DIVISION 16 - ELECTRICAL SYSTEMS (CONTINUED)

SECTI

7. INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES
 A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's 'Standard of Installation', and in accordance with recognized industry practices.
 B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
 C. Coordinate circuit and motor disconnect switch installation work with other materials necessary for the complete installation of motors and controllers within sight of controller position unless otherwise indicated.
 D. Provide a nameplate indicating the equipment served and protected.

6. GROUNDING

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

9. FIELD QUALITY CONTROL
 A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

10. PAINTING AND FINISHES
 A. Painting repair all scratches to factory painted and primed finish with factory supplied touch-up paint.

11. QUALITY ASSURANCE
 A. Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
 B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.
 D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

E. Install fuses, if any, in fused circuit breakers.
 9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard, panelboards, electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities
 3. Transformers
 4. Intercom system master station
 5. IV/audio monitoring master station
 6. Fire alarm master station
 7. Each switch in main switchboard

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
 C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

7. QUALITY ASSURANCE
 A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
 C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
 D. UL Compliance: Comply with requirements of UL 98, 'Enclosed and Labeled'.
 E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub No. KS 1, 'Enclosed Switches' and 250, 'Enclosures for Electrical Equipment (1000 Volts Maximum).'
 F. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard, panelboards, electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities
 3. Transformers
 4. Intercom system master station
 5. IV/audio monitoring master station
 6. Fire alarm master station
 7. Each switch in main switchboard

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
 C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

7. QUALITY ASSURANCE
 A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
 C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
 D. UL Compliance: Comply with requirements of UL 98, 'Enclosed and Labeled'.
 E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub No. KS 1, 'Enclosed Switches' and 250, 'Enclosures for Electrical Equipment (1000 Volts Maximum).'
 F. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard, panelboards, electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities
 3. Transformers
 4. Intercom system master station
 5. IV/audio monitoring master station
 6. Fire alarm master station
 7. Each switch in main switchboard

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
 C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

7. QUALITY ASSURANCE
 A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
 C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
 D. UL Compliance: Comply with requirements of UL 98, 'Enclosed and Labeled'.
 E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub No. KS 1, 'Enclosed Switches' and 250, 'Enclosures for Electrical Equipment (1000 Volts Maximum).'
 F. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard, panelboards, electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities
 3. Transformers
 4. Intercom system master station
 5. IV/audio monitoring master station
 6. Fire alarm master station
 7. Each switch in main switchboard

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
 C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

7. QUALITY ASSURANCE
 A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
 C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
 D. UL Compliance: Comply with requirements of UL 98, 'Enclosed and Labeled'.
 E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub No. KS 1, 'Enclosed Switches' and 250, 'Enclosures for Electrical Equipment (1000 Volts Maximum).'
 F. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard, panelboards, electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities
 3. Transformers
 4. Intercom system master station
 5. IV/audio monitoring master station
 6. Fire alarm master station
 7. Each switch in main switchboard

8. COMMUNICATIONS SYSTEMS TERMINAL CABINETS; SOUND, CCIV, CLOCK, TELEPHONE, ETC.
 A. Install signs at locations indicated or, where not otherwise indicated, at location for best viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not penetrate substrate.
 B. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be constructed of galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings:
 1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
 1. Greenfield Mfg. Co. Inc.

2. Midland-Ross Corp.
 3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Von HuFfel Tube Corp.

5. Unistrut Div.; GTE Products Corp.
 H. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from 3' and smaller, 20-gage; 4' to 6', 16-gage; over 6', 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plus tic pipe; remove burrs.

5. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal.

6. INSTALLATION OF SUPPORTING DEVICES
 A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
 C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

7. QUALITY ASSURANCE
 A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
 B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
 C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
 D. UL Compliance: Comply with requirements of UL 98, 'Enclosed and Labeled'.
 E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub No. KS 1, 'Enclosed Switches' and 250, 'Enclosures for Electrical Equipment (1000 Volts Maximum).'
 F. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

8. Fuses: Provide fuses for safety switches, as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

9. ADJUST AND CLEAN
 A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

10. FIELD QUALITY CONTROL
 A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

11. EQUIPMENT/SYSTEM IDENTIFICATION - WHERE APPLICABLE
 A. General: Install engraved plastic-ionomine sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), block lettering in white field

