

SECTION 260560
INSTALLATION OF WIRE AND CABLE

PART 1 - GENERAL
1.1 GENERAL
A. The Provisions of Section 260500, General Requirements for Electrical Work, apply to the Work of this Section.
1.2 CODES AND STANDARDS:
A. Products shall comply with the following codes and standards and shall be UL-listed and labeled where applicable.
UL 486A Wire Connectors and Soldering Lugs for use with Copper Conductors.
UL 510 Electrical Insulating Tape
PART 2 - PRODUCTS
2.1 WIRE AND CABLE
A. Wire and cable are specified in other Sections of Division 26.
2.2 TERMINATIONS AND SPLICES
A. Power Wiring:
1. Terminal lugs, connectors and splices shall be tin plated, high conductivity copper compression type. They shall have chamfered barrels and be permanently identified with conductor sizes.
2. Terminal lugs for conductors No. 3/0 AWG and larger shall be long barrel NEMA two hole type.
3. Splices shall be long barrel butt type with a center stop in the splice barrel.
4. Hydraulic crimping tools with proper die sizes which require full closure before reopening shall be used.
B. Lighting and branch circuits
1. Splices and taps in lighting and branch circuit wiring shall be 3M Scotchlok spring connectors or equal.
C. Metal clad cable connectors.
1. For non-jacketed metal clad cable in dry locations, cable terminations shall be O.Z. Gedney Type PK for use with galvanized steel armor or Type PK-A for use with aluminum armor. Cable terminations shall be provided with locknuts and bushings.
PART 3 - EXECUTION
3.1 PREPARATION OF RACEWAYS
A. Raceways shall be substantially completed before any wiring is installed in them. Before any wiring is pulled into a conduit, the conduit shall be cleaned and tested for obstructions and cleared of foreign material that may be found.
3.2 PULLING INTO RACEWAYS
A. All possible care shall be taken in pulling of wiring into conduits or other raceways. The cable reels or coils shall be set up in such a way that the conductor may be trained into the raceway as directly as possible with a minimum number of changes of direction or amount of bending. Where several cables are contained in one conduit, all such cables shall be pulled in together.
B. The use of pulling lubricants shall be restricted to non-hardening type, approved by UL and the cable manufacturer.
3.3 SPLICES AND TERMINATIONS
A. All power and control wiring shall be continuous and shall not be spliced unless otherwise indicated on the Drawings.
B. Bolts, nuts and hardware used for terminations shall be silicone bronze. All terminations shall be properly torqued and provided with Belleville washers.
C. Where terminations are made on insulated buses, the terminations shall be insulated using the proper tape(s) and fillers for the voltage level of the cable.
D. Connections in motor terminal boxes shall be made by installing compression type lugs on the motor branch circuit conductors and the motor leads and bolting the lugs together then insulating with motor lead connection kits, Raychem, 3M or equal.
3.4 IDENTIFICATION
A. All power wiring conductors shall be color coded as follows:

Phase	208Y/120V	480Y/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

END OF SECTION 260560

SECTION 262416
PANELBOARDS

PART 1 - GENERAL
1.1 GENERAL
A. The provisions of Section 260500, General Requirements for Electrical Work, apply to the Work of this Section.
1.2 CODES AND STANDARDS
A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:
NEMA AB-1 Molded Case Circuit Breakers
NEMA PB-1 Panelboards
UL 50 Enclosures for Electrical Equipment
UL 67 Panelboards
UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures
1.3 SUBMITTALS
A. Manufacturer's product data sheets.
B. Circuit breaker schedules.
C. Dimensioned plans, elevations, sections and details.
1.4 MANUFACTURERS
A. Subject to compliance with the requirements of this Section:
Square D
Approved equal
PART 2 - PRODUCTS
2.1 GENERAL
A. Panelboards shall be of the sizes, rating and arrangement shown on the Drawings.
B. Panelboards shall be provided complete with all overcurrent devices, accessories and trim.
C. All panelboards shall be provided with safety barriers for dead front construction.
D. The required short circuit ratings of assembled panelboards are shown on the drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the drawings, series rated combinations will not be permitted.
E. Provide through-feed or sub-feed lugs as indicated on panel schedules.
2.2 CABINETS
A. Boxes shall be code gauge galvanized sheet steel.
B. Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.
C. Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.
D. Directory frames shall be metal frame with plastic covers.
2.3 BUS
A. All bus work shall be copper.
B. Neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.
C. Panelboards shall be provided with copper ground busses. Provide isolated ground busses where indicated on the drawings.
D. Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.
2.4 OVERCURRENT DEVICES
A. Overcurrent devices shall be trip-free molded case, bolt-on, thermal-magnetic circuit breakers.
B. Main circuit breakers shall be individually mounted and bolted to bus assembly. Back-fed branch mounted circuit breakers are prohibited.
C. Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.
D. Ground fault and arc fault circuit breakers shall require no more panel space than standard breakers.
E. All connections shall be rated for 75° C copper conductors.
PART 3 - EXECUTION
3.1 PANELBOARDS
A. Panelboards shall be labeled in accordance with Section 260500, General Requirements for Electrical Work.
B. Panelboard covers are required to have 2 labels. The first, an Arc flash warning label and the second, an OSHA label requiring 3 feet, (3 feet 6 inches or 4 feet as applicable), clearance in front of the panel.
END OF SECTION 262416
SECTION 263213
AUTOMATIC TRANSFER SWITCHES
PART 1 - GENERAL
1.1 SUMMARY
A. This specification covers requirements for providing and acceptance testing of automatic transfer switches.
B. The manufacturer shall have a local representative who can provide factory trained service, required stock of replacement parts, and technical assistance.
1.2 MANUFACTURERS
A. Subject to compliance with the requirements of this Section:
Cummins Power Generation
Russelectric, Inc.
B. All products specified under this section shall be warranted by the manufacturer or a factory authorized dealer unconditionally. Warranty shall include total service 24 hours per day, 7 days per week with a 4 hour response time. All costs incurred including labor, materials, travel and other expenses are to be covered by the warranty.
1.3 SUBMITTALS
A. Manufacturers data and catalog cuts on the automatic transfer switches.
B. Dimensioned outline drawings indicating weights, components, accessories, and field connections.
C. Electrical drawings including schematic and connection diagrams showing terminal block identification and arrangement, field and unit wiring connection. Drawings shall be specific to this installation and show all equipment being provided and wired. Typical wiring diagrams and marked up catalog cuts are unacceptable.

END OF SECTION 262416

SECTION 263213

AUTOMATIC TRANSFER SWITCHES

AUTOMATIC TRANSFER SWITCHES

1.4 TESTING

A. Acceptance testing
1. The Contractor shall perform installation acceptance testing in the field in accordance with NFPA 110, Section 7.13.
PART 2 - PRODUCTS
2.1 AUTOMATIC TRANSFER SWITCHES
A. Provide 4 pole, switched neutral, closed transition, automatic transfer switches in NEMA 1 enclosures, sized as shown on the Drawings.
B. The switches shall be listed under UL Standard 1008.
C. The switches shall be electrically operated, mechanically held and microprocessor controlled. The main contacts shall be heavy duty silver alloy with separate arcing surfaces and multiple leaf arc chutes to cool and quench the arcs. Contacts are to be rated for 100% continuous duty. 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.
D. The voltage of each phase shall be monitored with pickup adjustable to 95% and drop out adjustable from 70 to 90% of the pickup setting. Low voltage on any phase will initiate a generator start signal after the adjustable start delay.
E. Adjustable time delays shall be provided for:
1. Engine start.
2. Transfer from Normal to Emergency.
3. Transfer from Emergency to Normal.
4. Stop (cool down).
F. An override switch to retransfer load to Normal prior to time shall be provided.
G. Provide the following features:
1. Exercise clock selectable for load or no-load operation.
2. Auxiliary contacts for switch in Normal and Emergency positions. (2 sets of contacts in each position).
3. Auxiliary contacts for Normal Source Available.
4. Manual transfer operating handle.
5. Door mounted indicating lights showing switch position, source(s) available and lamp test switch.
6. Momentary test switch to simulate normal failure.
PART 3 - EXECUTION
3.1 FIELD QUALITY CONTROL
A. Contractor shall engage a factory authorized technician from the equipment manufacturer to perform start-up and testing.
B. Tests and Inspections:
1. Perform tests recommended by manufacturer.
2. NFPA 110 Acceptance tests: Perform tests required by NFPA 110.
C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

END OF SECTION 263213

SECTION 265100

LIGHTING FIXTURES

PART 1 - GENERAL
1.1 GENERAL
A. Provisions of Section 260500, General Requirements for Electrical Work and Section 260560, Installation of Wire and Cable apply to the work of this section.
1.2 CODES AND STANDARDS
A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:
CBM Labels Certified Ballast Manufacturers Assoc.
NEC Art. 410 National Electrical Code
FCC, Part 18 RFI and EMI
ANSI C62.41 Line Transient Protection
UL 1570 Fluorescent Lighting Fixtures
UL 924 Emergency Lighting and Power Equipment
UL 1088 Temporary Lighting
1.3 SUBMITTALS
A. Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals shall be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.
B. Submit on a separate sheet for each fluorescent fixture type specified, the ballast manufacturer, type and technical data for that ballast.
C. Submit on a separate sheet for each light fixture specified, the proposed lamp and manufacturers data for that lamp.
1.4 MANUFACTURERS
A. Provide products of the manufacturers specified on the contract drawings and as listed under Part 2 of this section.
PART 2 - PRODUCTS
2.1 GENERAL
A. Light fixtures shall be provided with housings, trims, ballasts, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation.
B. Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 52.
C. Deliver interior lighting fixtures in factory fabricated containers and wrapping, which properly protect fixtures from damage.
D. Store interior lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.
E. Fixtures installed in ceilings, suspended from ceilings or on walls shall have a plastic film covering protecting lens, lower and lamps from dust, dirt and debris. Plastic film shall not be removed until construction is completed.

END OF SECTION 265100

2.2 FLUORESCENT FIXTURES

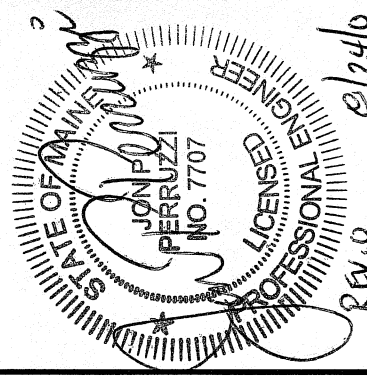
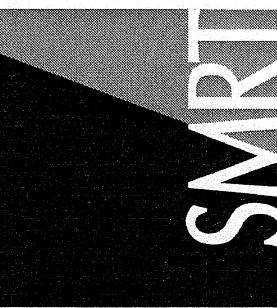
A. General: Provide fluorescent fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings.
B. Indoor fluorescent fixtures containing double-ended T8 or T5 lamps shall be provided with an internal disconnecting means to disconnect power to the fixture.
C. Fluorescent-Lamp Ballasts: Provide low-energy solid state fluorescent lamp ballasts, operating lamps with a frequency of >20KHz and capable of operating lamp types indicated. Ballasts shall be high power factor >0.90, Class A sound rating. Ballasts shall have lamp current crest factor of 1.7 or less and total harmonic distortion less than 20%. Ballasts shall be UL listed, Class F, and meet FCC 47CFR Part 18 Non-Consumer and meet applicable ANSI standard.
1. Ballasts that operate T8 lamps shall have the following requirements:
a. Normal ballast factor (0.88-1.03)
b. Ballast shall be Programmed Start type
c. Ballast must be capable of 0°F starting.
d. Ballast shall be one of the following:
1. Sylvania Quicktronic PROStart PSN series.
2. General Electric Ultramax series.
3. Advance Optanium IOP series.
2. Ballasts that operate T4 compact fluorescent lamps shall have the following requirements:
a. Ballasts shall have an end of lamp life sensing circuit capable of shutting the lamp down to prevent lamp glass from cracking and lamp base sockets from melting.
b. Ballast factor shall be 0.95 - 1.1.
c. Ballast shall be Programmed Start type to operate lamps in series.
d. Ballast must be capable of 0°F starting.
e. Ballast shall be one of the following:
1. Sylvania Quicktronic Prostart CF series.
2. General Electric ProLine CFL series.
3. Advance SmartMate ICF series.
2.3 LAMPS
A. Provide fluorescent lamps of types as indicated on the contract drawings.
B. T8 Lamp Type:
1. All lamps shall have a minimum 85 CRI and an average rated life of 30,000 hours based on 3hrs/start when used with a programmed rapid start ballast. A 17 Watt lamp shall be minimum 1350 lumens. A 32 Watt straight lamp shall be minimum 2950 lumens.
2. Lamp color temperature shall be cool white, 3500K unless otherwise noted.
a. Lamps shall be one of the following:
b. Sylvania Octron 800XPS series.
c. General Electric Ecolum Starcoat T8 series.
d. Philips 800 Alto T8 series.
C. Compact Fluorescent (T4) Lamp Type:
1. All lamps shall have an average rated life of 12,000 hours, and a minimum 82 CRI. A 32 Watt lamp shall be minimum 2200 lumens. A 42 Watt lamp shall be minimum 3200 lumens.
2. All lamps shall have 4 pin bases for operation on electronic ballasts.
3. Lamp color temperature shall be cool white, 3500K unless otherwise noted.
a. Lamps shall be one of the following:
b. Sylvania DULUX T/E/IN ECO series.
c. General Electric Ecolum series.
d. Philips Alto series. PL-T/PL-C.
D. Lamps shall be manufactured by Osram Sylvania, General Electric, Philips Lighting Co. or approved equal.

PART 3 - EXECUTION

3.1 GENERAL
A. Examine all areas and conditions under which lighting fixtures are to be installed and structure which will support lighting fixtures. Notify the General Contractor in writing of any conditions which are detrimental to proper installation and completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
B. Coordinate light fixture installations with other trades. Fluorescent light fixtures should be installed at least two feet away from smoke detectors. Coordinate all lighting fixtures with mechanical piping and ductwork to allow for proper clearance.
3.2 INSTALLATION
A. Install all lighting fixtures at locations and heights indicated, in accordance with the architectural reflected ceiling plans.
B. Provide fixtures and/or fixture outlet boxes with hangers, channel or other method of fastening and supporting fixtures required for proper installation.
C. Luminaires installed in suspended ceilings shall be independently supported, directly from the building structure. Each luminaire shall be supported at each end.
D. Tighten connectors and terminals, including screws and bolts in accordance with equipment manufacturer's published torque tightening values for equipment connectors. All screws and bolts shall have washers.
3.3 SPLICES AND TERMINATIONS
A. Twist on wire connectors shall be installed which utilize square-wire spring grips and thermo plastic shells. Install connectors to meet the manufacturer's torquing requirements. Install wire connectors of size required as not to exceed the manufacturers UL-listed CSA recognized wire combinations.
3.4 FIELD QUALITY CONTROL
A. At date of substantial completion, all lamps that are not functioning, have color deficiencies, or are noticeably dimmed shall be replaced with new lamps as determined by the Engineer.
B. All lamps used for temporary lighting in new light fixtures shall be replaced with new lamps.
C. All light fixtures shall be cleaned of dirt and debris upon completion of construction. All finger prints and smudges shall be cleaned.
D. All installed fixtures during remainder of construction shall be protected in accordance with Section 2.1 Paragraph E of this specification section.
E. All light fixtures shall be grounded in accordance with article 250 and 410 of the NEC. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.
F. All light fixtures damaged in shipping or during installation shall be replaced with new fixtures at no cost to the Owner.

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Rev. 0 8/24/10

Bramhall Radiology
ANGIO RENOVATIONS
PORTLAND, ME
ISSUED FOR CONSTRUCTION
8.24.10
CURRENT ISSUE STATUS

NO.	DATE	DESCRIPTION
0	8.24.10	ISSUED FOR CONSTRUCTION

GRAPHIC SCALE:
0' 1'

SCALE: NONE

PROJECT MANAGER: DMV

IC/DRAWN BY: COS

DATE OF RECORD: JPP

PROJECT NO.: 09022-01

DATE: 8.24.10

SHEET TITLE:
ANGIO
SPECIFICATIONS
SHEET 2

SHEET No. E-003