DOCUMENT 00 90 00
ADDENDUM

ADDENDUM NO. [3] **Date: May 11, 2018**

RE: **WESTERN TECHNICAL COLLEGE**
INDOOR SHOOTING RANGE
11177 COUNTY RD A
SPARTA, WI 54656

FROM: HSR Associates, Inc
100 Milwaukee Street
La Crosse, WI 54603
(608) 784-1830

To: Prospective Bidders
This addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated May 2018. Acknowledge receipt of this Addendum in the space provided on the bid form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of [2] pages.

CHANGES TO BIDDING REQUIREMENTS AND CONDITIONS OF THE CONTRACT:

1. Section 00 11 13 ADVERTISEMENT FOR BIDS
    a. **The address for RECEIPT OF BIDS shall be: 505 North 9th St**

CHANGES TO SPECIFICATIONS:

2. Section 07 21 00 THERMAL INSULATION
    a. 2.02: Add as prior approval; 2 lb/ft³, 25 psi, Molded EPS Insulation in thickness to match R-value of basis of design.
        i. Foam-Control Plus 250.
3. Section 07 42 13 METAL WALL PANELS
    a. At new exterior metal siding panels install building wrap behind metal wall panels to prevent foamed-in-place insulation from sticking to back of panels.
    b. At existing metal wall panels install building wrap material over the back of the panels on the inside, securing to existing framing, to prevent foamed-in-place insulation from sticking to back of panels.

4. Section 08 71 00 DOOR HARDWARE
    a. 3.04, Hardware Schedule
        i. Replace Group 6 as follows:

HARDWARE GROUP 6

EACH PAIR OF HMD DOORS TO HAVE:

DR. 109B

8 EA	HINGES	FBB199 4.5 X 4.5 630 NRP	STANLEY
1 EA	EXIT ONLY LOCK	MB1-3-60-15-626	MARSHALL B
2 EA	MANUAL FLUSHBOLTS	FB458 626	IVES
1 EA	DUST PROOF STRIKE	DP2 626	IVES
2 EA	CLOSER	4111 SHCUSH 689	LCN
1 EA	THRESHOLD	S425A96	REESE
2 EA	SWEEPS	323C48	REESE
1 EA	WEATHERSTRIP	815A9684	REESE
2 EA	BRUSH ASTRAGALS	964C84	REESE

METAL ASTRAGAL BY HMD SUPPLIER

VERIFY WITH BULLET RESISTANT DR/FR SUPPLIER THAT THE USE OF SPECIFIED HARDWARE IS OK WITH THEIR PRODUCT

5. Division 26, 27 and 28 Specifications
    a. Sections attached hereto as part of Contract Documents.

CHANGES TO DRAWINGS

6. Sheet A100R REMOVAL AND REMODEL PLANS
    a. At door 104B saw cut existing slab and install a new concrete stoop similar to Detail 10S101.
7. Sheet A500 and A501 DETAILS
    a. At general Note E change angle size to L6 x 4 x 5/16 LLH. At existing overhead doors that are removed and infilled install L4 x 4 x 5/16 across door opening.
8. Sheet S001 STRUCTURAL GENERAL NOTES AND ABBREVIATIONS
    a. Under “Metal Plated Wood Trusses”, at “Total load def. L/240 (1” max)”, delete “(1” max)”.
9. Sheet E090 ELECTRICAL SITE PLAN
    a. Move the new transformer location east far enough to be able to bore under drive or trench minimally across the drive. If trench is used saw cut existing asphalt paving and patching with concrete is acceptable.

END OF DOCUMENT 00 90 00

SECTION 26 00 00
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SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1: GENERAL

Requirements of the General Conditions, Supplementary Conditions and Division 1 General Requirements of this Project Manual apply to all work under all Sections of Divisions 26, 27 and 28.

1.01 SECTION INCLUDES

A. Basic Electrical Requirements are specifically applicable to Divisions 26, 27 and 28 Sections, in addition to Division 1 - General Requirements.

1.02 INDUSTRY STANDARDS

A. Comply with all applicable OSHA regulations.

B. All materials shall have a U.L. label where a U.L. Standard and/or test exists.

1.03 TEMPORARY ELECTRICITY

A. Refer to Division 1, Section 01 50 00.

1.04 UNIT PRICES

A. Refer to Division 1, Section 01 22 00.

1.05 ALTERNATES

A. Refer to Division 1, Section 01 23 00.

1.06 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. 2009 International Building Code.

C. Wisconsin Department of Commerce.

1.07 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Submit Drawings where required in various Sections throughout this Division.

C. Identification numbers/letters used on shop drawings shall correlate with related product identification shown on the Drawings and mentioned in this Division.

D. Where more than one product, catalog number, etc. is shown on individual shop drawing sheet, the product to be provided shall be conspicuously identified.

E. Submitted Drawings shall bear the review stamp of the Electrical Contractor.

1.08 REGULATORY REQUIREMENTS

A. Electrical: Conform to NFPA 70.

B. Obtain permits, and request inspections from authority having jurisdiction.

1.09 TERMINOLOGY

A. The word "PROVIDE" means to furnish and install.

B. The word "ENERGIZE" means all material and labor necessary to apply voltage to a device or item of equipment to make same operational.

C. The word "CODE" means all applicable codes.

D. Unless noted otherwise, the terminology used throughout the Specifications shall be interpreted as defined in Article 100 of the NEC.

1.10 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.11 QUALIFICATIONS

A. Where specified in various Sections of this DIVISION, final wiring terminations to all equipment and testing of the completed system, shall be done by a factory authorized representative. The representative shall be part of a fully equipped service organization capable of furnishing adequate maintenance to the entire system, including factory replacement parts.

1.12 PRODUCTS

A. Provide all new materials and equipment unless noted otherwise.

B. Products specified by manufacturer only, or identified by manufacturer's type, style, model, catalog number, etc., establishes the quality required. Unless indicated otherwise, products of other manufacturers mentioned may be used without prior approval of the AE, provided the quality, performance, etc. is equal to that of the product specifically identified; and provided that any additional costs for labor and/or materials required to adapt another manufacturer's product to the original system design shall be included in the Bid.

C. Products furnished by the Electrical Contractor shall be purchased based on the electrical characteristics indicated on the Drawings and Specifications. Where this information is not given, this Contractor shall verify the voltage, phase, etc. with the AE before ordering concerned products.

D. It shall be understood that the use of materials or equipment other than those specified, or approved equal by the AE, shall constitute a violation of contract and that the AE shall have the right to require the removal of such materials or equipment and their replacement with the specified materials or equipment at the Contractor's expense.

E. All products used shall be the latest type or model produced by the manufacturers specified. If descriptive specifications or model number is obsolete, substitute current product.

F. All similar materials and equipment shall be a product of the same manufacturer.

G. All products shall be UL Listed/Labeled, where applicable.

1.13 SUBSTITUTIONS

A. Manufacturers not mentioned in this Division must request permission to use their products. Requests must be received no later than ten (10) days prior to the time set for receipt of Bids. Refer to "Approved Substitutions" in the INSTRUCTIONS TO BIDDERS.

B. No request for approval of "or equal" materials will be entertained except from the Prime Contractor, under whose jurisdiction the work in question is to be provided.

1.14 APPLICABLE CODES

A. Install all Electrical Work in accordance with the National Electrical Code, Wisconsin Administrative Code and Local Electrical Codes.

B. The Electrical Contractor is charged with responsibility for full compliance with local interpretations of applicable Codes. After entering into contract, this Contractor will be held to complete all work as per the foregoing without extra compensation.

C. Where conflict occurs between referenced Codes, the Code containing the most stringent requirements govern.

D. Comply with Drawings and Specifications when requirements are more stringent than the requirements of applicable Codes.

1.15 EXCAVATION AND BACKFILL

A. Provide all excavation and backfilling as required for the installation of the Electrical work.

B. Perform all stripping of topsoil, excavation, backfilling, compaction, grading, surface repair, and similar work as per applicable Sections of Division 31.

1.16 CONCRETE

A. Provide concrete pads, bases, etc. where indicated on the Drawings.

B. Construct as per applicable Sections of Division 3

1.17 REMOVAL/ALTERATIONS

A. Perform all removal and remodeling Work shown on the Drawings and specified herein.

B. Visit the Site, become familiar with the existing building, and accept the building as found.

C. Ballast and Battery removal: Discarded ballast and batteries shall become property of the Electrical Contractor and removed from the Site. Provide proper disposal according to Wisconsin regulations.

D. Lamp Removal: Discarded lamps shall become property of the Electrical Contractor and removed from the Site. Provide proper disposal according to Wisconsin regulations.

E. Except for existing Electrical System components indicated to be removed and reinstalled, all other removed components shall become property of the Electrical Contractor and removed from the Site.

F. Remove all existing electrical system components (such as raceways, outlet boxes, etc.) in remodeled areas that become unnecessary because of the new remodeling work. Plug unused openings in existing electrical boxes at locations where existing conduit has been removed.

G. Where branch circuit wiring is indicated to be removed, wiring shall be removed back to the nearest active outlet or panelboard.

H. Where the removal of an electrical component interrupts the branch circuit supply wiring to other components, install new wiring as necessary to energize existing components that remain.

I. Any existing circuits or equipment not shown on the Drawings and which are logically expected to be continued in service, and which may be interrupted or disturbed during construction, shall be reconnected in an approved manner. In addition, any existing Electrical System component which may require relocation or rerouting as a result of the new remodeling work shall be considered a part of the Work of this Division, and shall be done by this Contractor with no additional compensation.

J. New wiring in remodeled areas shall be installed in concealed raceways in new construction, and in surface raceways on existing building surfaces. "Wiremold" type surface raceways shall be installed in finished areas, and EMT surface raceways in unfinished spaces. Verify with AE.

K. Flexible metal conduit is acceptable in existing construction where it can be fished so as to provide a concealed installation. Verify with AE.

L. Reuse existing concealed raceways where possible.

M. Reinstall existing removed components where indicated. No removed components may be reinstalled unless specifically noted.

N. Thoroughly clean existing removed lighting fixtures to be reinstalled. Provide new lamps in reinstalled fixtures. Lamps shall be same type as in similar "new" fixtures. Refer to the Lighting fixture Schedule.

O. Provide new cover plates on all new wiring devices replacing existing devices in remodeled areas. Refer to Section 26 27 26.

P. Provide a blank cover plate on all wiring device boxes that have been abandoned, or are used as junction boxes. Refer to Section 26 27 26.

Q. Provide a Yorkville No. 76, or equal, blank cover plate on all flush ceiling outlet boxes that have been abandoned or are used as junction boxes. Where boxes are surface mounted, or located above an accessible suspended ceiling, provide a blank galvanized steel cover plate.

1.18 CUTTING AND PATCHING: Refer, also, to Sections 01 70 00.

A. Perform all work in advance of the Work of others whenever possible to eliminate unnecessary cutting.

B. Where such procedure is impossible, do all cutting in a neat manner.

C. Core drill concrete construction.

D. Obtain special permission from the AE before drilling or cutting structural members to accommodate work of this Division.

E. Do all drilling, cutting and similar preparatory work of existing construction necessary for the installation of the Work of this Division.

F. Construction/finishes cut (drilled) by the Electrical Contractor shall be patched by the Electrical Contractor to match adjacent finishes.

G. Patch holes resulting from removal of existing Electrical System components.

H. Patching includes painting, where applicable.

I. Wall penetrations shall be sealed, and adjacent wall surfaces returned to original condition.

J. Floor penetrations shall be sealed in accordance with CODE requirements.

1.19 INTERRUPTION OF POWER

A. Relative to an electric power interruption due to building construction and/or remodeling:
1) All power interruptions shall be verified in advance with the Owner.
2) After the power has been restored, the Electrical Contractor shall inspect all areas affected by the outage and restore all automatically controlled, electrically operated equipment to the same operating condition which existed prior to the interruption.

1.20 ACCESS PANELS

A. Provide metal access panels, where necessary, to make electrical system components accessible where required by Code.

B. Access panels shall be as specified in Section 08 31 00.

1.21 PAINTING

A. By General Contractor:
1) For painting of Electrical Work by the General Contractor, refer to Section 09 91 23.

B. By Electrical Contractor:
1) Touch up or completely paint all factory painted Electrical System components which have become rusted, scratched, or otherwise damaged during construction (which are not painted under Section 09 90 00) to match the original finish or pay for restoration of such items as may be stipulated by the AE.
2) Building surfaces/finishes previously painted by the General Contractor and damaged by the Electrical Contractor shall be repainted/refinished by the General Contractor at the Electrical Contractor's expense.

1.22 Fire, Smoke And Fire/Smoke Rated Surfaces:

A. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.

B. All fire stopping systems shall be provided by the same manufacturer.

C. UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions.

D. Use product that has a rating not less than rating of wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

E. Sleeves in concrete to be Schedule 40 steel pipe with integral water stop unless fire stop material used includes a sleeve that is an integral part of rated assembly.

F. Use firestop putty, caulk sealant, intumescent wrap/strips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

1.23 Non-Rated Surfaces:

A. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.

B. In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and cored opening or a water-stop type wall sleeve.

C. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effectively seal. Use galvanized sheet metal sleeves in hollow wall penetrations jurisdictions.

1.24 AS-BUILT DRAWINGS

A. Refer to Section 01 78 00.

1.25 TESTS

A. Upon completion of work, adjust voltage taps on transformers for an optimum operating voltage.

B. Balance loads between phases at each panelboard and at main switchboard. Correct unbalance greater than 5%.

C. Test all raceway systems to insure proper, effective grounding.

D. Lighting and power system and signals/communications systems wiring shall test free of shorts and grounds.

E. Perform other tests identified in various Sections throughout this Division.

F. Note: The above tests apply to all Work provided as part of this Project, unless indicated otherwise.

1.26 DEMONSTRATIONS

A. Provide competent personnel to meet the Owner or his representative to fully explain and familiarize the Owner with the operation of all equipment and systems installed under this Division.

1.27 OPERATING AND MAINTENANCE INSTRUCTIONS

A. This Contractor shall instruct the Owner relative to the operation and proper maintenance of all systems; and, the method of periodic system testing, where applicable.

B. Refer to Section 01 78 00.

1.28 GUARANTEE

A. Refer to General Conditions and Division 1.

B. Where technical specifications require, provide longer guarantee periods stipulated.

END OF SECTION

SECTION 26 05 01

ELECTRICAL DEMOLITION

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED SECTIONS

A. Section 01 70 00 – Cutting and Patching.

B. Section 02 41 00 - Demolition.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

D. Visit the Site, become familiar with the existing building, and accept the building as found. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Any existing circuits or equipment not shown on the Drawings and which are logically expected to be continued in service, and which may be interrupted or disturbed during construction, shall be reconnected in an approved manner. In addition, any existing Electrical System component which may require relocation or rerouting as a result of the new remodeling work shall be considered a part of the Work of this Division, and shall be done by this Contractor with no additional compensation.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide new typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps/ ballasts, and broken electrical parts.

3.05 INSTALLATION

A. Install relocated materials and equipment under the provisions of this section.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Building and Service Entrance Wires.

B. Wire Color

C. Wiring connectors and connections.

1.02 RELATED SECTIONS

A. Section 26 05 34 - Conduit.

B. Section 26 05 37 - Boxes.

C. Section 26 05 53 – Identification for Electrical Systems.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.07 COORDINATION

A. Coordinate Work under provisions of Division 1.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2: PRODUCTS

2.01 BUILDING and SERVICE ENTRANCE WIRES

A. Description: Single conductor insulated wire.

B. Conductor: Copper

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70; Type THHN/THWN-2.

2.02 WIRE COLOR

A. General
1. For wire sizes 10 AWG and smaller - Wire shall be colored as indicated below.
2. For wire sizes 8 AWG and larger - Identify wire with colored tape at all terminals, splices and boxes. Colors to be as indicated below.
3. In existing facilities, use existing color scheme.
4. In new facilities, use black and red for single phase circuits at 120/240 volts, use Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase, and use Phase A brown, Phase B orange and Phase C yellow for circuits at 277/480 volts single or three phase. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.
5. Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with the proper circuit.
6. Ground Conductors: Green for 6 AWG and smaller. For 4 AWG and larger, identify with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, contractor shall provide green with yellow tracer.

2.03 WIRING CONNECTORS – CONDUCTORS SIZED THROUGH #8 AWG.

A. Spring Wire Connectors: Pre-insulated

B. Manufacturers:
1. 3M “Scotchlok”
2. Ideal
3. Belden
4. Thomas and Betts
5. Substitutions: Under provisions of Section 01 60 00.

2.04 4WIRING CONNECTORS – CONDUCTORS SIZED #6 AND LARGER

A. Split Bolt Connectors, Mechanical Pressure Connectors, Compression Connectors (crimp type)

B. Manufacturers:
1. Burndy Corporation
2. Ideal Industries
3. Thomas and Bettts
4. 3M
5. Belden
6. Substitutions: Under provisions of Section 01 60 00.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Conductors #10 AWG and smaller may be solid or stranded with the following requirements or exceptions:

(1) Stranded conductors may only be terminated with UL or ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved method.

C. Provide separate neutral conductor for each branch circuit. (no multi-wire branch circuits with common neutrals).

D. Use conductor not smaller than 12 AWG for power and lighting circuits.

E. Use conductor not smaller than 14 AWG for fixture wire, where allowed by codes.

F. Use conductor not smaller than 16 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

I. Pull all conductors into raceway at same time.

J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

K. Protect exposed cable from damage.

L. Use stranded conductors for control circuits and light fixture whips.

M. Use suitable cable fittings and connectors.

N. Neatly train and lace wiring inside boxes, equipment, and panelboards.

O. Clean conductor surfaces before installing lugs and connectors.

P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Q. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

R. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

S. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 26 05 53.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.05 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.02 RELATED SECTIONS

A. Section 03 20 00 - Concrete Reinforcement.

B. Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NPFA 99 - Health Care Facilities.

1.04 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe.

B. Rod electrodes.

C. Metal frame of the building.

D. Concrete-encased electrode.

E. Plate electrode.

F. Active electrode.

G. Ground ring.

1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.06 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 ROD ELECTRODE

A. Manufacturers:
1. Blackburn
2. Copperweld
3. Weaver
4. Substitutions: Under provisions of Section 01 63 00.

B. Material: Copper-clad steel.

C. Diameter: 5/8 inch.

D. Length: 12 feet.

2.02 MECHANICAL CONNECTORS

A. Manufacturers:
1. Burndy
2. Blackburn
3. O.-Z./Gedney Company
4. Weaver
5. Substitutions: Under provisions of Section 01 63 00.

B. Material: Bronze.

2.03 EXOTHERMIC CONNECTIONS

A. Manufacturers:
1. Cadweld. Substitutions: Under provisions of Section 01 63 00.

2.04 WIRE

A. Material: Stranded copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 SERVICE GROUND

A. Install service grounding electrode conductor from identified conductor (neutral) in electric service equipment to the grounding electrode.

B. Underground water service and driven ground rod(s) shall be used as the grounding electrode. Bond to structural steel and reinforcing bars in concrete footings.

C. Service grounding electrode conductor shall be connected to water service at point where water supply pipe enters building. Provide bonding jumper around water meter.

D. Service grounding electrode conductor shall be installed in rigid galvanized steel conduit. Conduit shall be bonded to grounding conductor at each end of conduit.

E. Identified conductors (neutrals) shall not be grounded at any point on the load side of the main disconnect, except at separately derived systems.

F. The grounding conductor shall be run continuous (unspliced) throughout

3.03 EQUIPMENT GROUNDING

A. Equipment grounding shall comprise a permanent bonding together of all metallic, noncurrent - carrying parts of the Electrical System (raceways, boxes, panels, cabinets, equipment enclosures, housings, motor frames, lighting fixtures, etc.) to insure a continuous grounding circuit. Provide a grounding bushing on each conduit entering service entrance equipment, bonding same to equipment grounding stud/bar/bus.

B. Equipment Grounding Conductor: Provide separate, insulated grounding conductor in all branch circuit and feeder raceways. Terminate each end on suitable lug, bus, or bushing. Refer to NFPA 99 and NEC for grounding in patient care areas.

3.04 MISCELLANEOUS TRANSFORMERS

A. Ground all transformer secondaries. Install bonding jumper between secondary neutral and transformer case. Install grounding conductor (sized as per CODE Section 250-94) connecting the grounded circuit conductor of the derived system to:

1. The nearest available effectively grounded structural metal member of the structure, or
2. The nearest available effectively grounded metal water pipe, or
3. A ground rod assembly as specified above.

3.05 FLUSH MOUNTED WIRING DEVICES

A. Grounding continuity between the grounding system box and the grounding circuit of the device shall be established by connecting device to equipment grounding conductor with branch circuit wiring.

3.06 MOTORS AND EQUIPMENT

A. Ground all motors and equipment.

B. Separate ground wire required for all raceways.

3.07 LIGHTING FIXTURES

A. Ground all lighting fixture housings.

B. Fixture finish shall be scraped to insure metal-to-metal contact with outlet boxes and/or conduit fittings.

C. Separate ground wire required for flexible conduit connection to lighting fixtures.

3.08 INTERFACE WITH OTHER PRODUCTS

A. Interface with site grounding system.

B. Interface with lightning protection system installed under Section 26 41 13.

3.09 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall- of-potential method.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

C. Roof support system.

1.02 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:
1. Concrete Structural Elements: Use expansion anchors.
2. Steel Structural Elements: Use beam clamps, spring steel clips and welded fasteners.
3. Concrete Surfaces: Use expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

2.02 STEEL CHANNEL

A. 12 ga. steel, roll formed, 1-5/8 x 1-5/8" minimum size.

B. 1.8 lb. per foot minimum weight.

C. Complete with all end caps, fittings, closure strips for a complete installation.

D. Finish: Enamel prime coat.

2.03 ROOF SUPPORT SYSTEM

A. Rubber base for conduit support.

B. Material base: 100% recycled rubber, UV resistant.

C. Strut and pipe clamps, galvanized steel.

D. Manufacturers:
1. C-Port.
2. HAYDON.

PART 3: EXECUTION

3.01 INSTALLATION

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

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Obtain permission from Architect/Engineer before using powder-actuated anchors.

E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 26 05 34

CONDUIT

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Light Fixture whips

G. Fittings and conduit bodies.

1.02 RELATED SECTIONS

A. Section 07 84 00 - Fire Stopping.

B. Section 26 05 37 - Boxes.

C. Section 26 05 29 – Hangers and Supports for Electrical Systems

D. Section 26 05 53 – Identification for Electrical Systems.

E. Section 26 05 35 – Surface Raceways

F. Section 26 05 26 – Grounding and Bonding of Electrical System

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70 - National Electrical Code.

E. NECA "Standard of Installation."

F. NEMA TC 2 - Conduit EPC-40.

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

1.07 CONDUIT REQUIREMENTS

A. Minimum Size: 1/2 inch (13 mm) unless otherwise specified.

B. Underground Installations:
1. Use rigid steel conduit or nonmetallic rigid PVC conduit. (Refer to 3.01 J, this section)

C. Outdoor Locations, Above Grade:
1. Use rigid steel conduit.

D. Wet and Damp Locations:
1. Use rigid steel conduit.

E. Dry Locations:
1. Use electrical metallic tubing (EMT) and rigid steel conduit.

F. New Construction: (Refer to 1.07A,B,C,D and 1.07E above)
1. Conceal conduits in finished spaces.

G. Existing Construction: (Refer to 1.07A,B,C,D and 1.07E above)
1. If required fish flexible conduits concealed in walls.
2. Provide surface raceways where conduits can not be fished in walls. Refer to Specifications Section 26 05 35.

H. Hazardous Locations:
1. Use rigid steel conduit.

I. Equipment Connections: (Lights, motors, etc.)
1. Dry locations: Flexible metal conduits, 6’ maximum.
2. Damp and Wet locations: Liquidtight flexible metal conduit, 6’ maximum.
3. Kitchen equipment connections: Liquidtight flexible metal conduit, 6’ maximum.
4. Light fixtures: Flexible metal conduit or Light fixture whips, 6’ maximum.

PART 2: PRODUCTS

2.01 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Steel, threaded type.

2.02 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.03 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.04 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Steel, compression or set screw type.

2.05 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40, Rigid PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.06 LIGHT FIXTURE WHIPS

A. Description: Pre-Assembled AC/MC Light fixture whips.

B. Fittings: ANSI/NEMA FB 1.

PART 3: EXECUTION

3.01 INSTALLATION

A. All conduit sizes indicated on drawings are based on EMT conduit; unless specifically indicated. Contractor to appropriately resize conduits for PVC, Rigid Metal and other types of conduits to accommodate conductors to be installed.

B. Install conduit in accordance with NECA "Standard of Installation."

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 20 05 29.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

H. Do not attach conduit to ceiling support wires or to grid of lay-in tile ceilings.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Convert underground Nonmetallic conduits to Rigid metal when routing conduits above grade. Use EMT when routing conduits above building concrete slab.

K. Route exposed conduits and conduits installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit in and under slab from point-to-point.

M. Do not cross conduits in slab.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Install nonmetallic conduit in accordance with manufacturer's instructions.

R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

T. Install no more than equivalent of three 90-degree bends between boxes, junction boxes, and pull boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.

U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses [seismic] [, control] [and] expansion joints.

W. Provide suitable pull string in each empty conduit except sleeves and nipples.

X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Y. Ground and bond conduit under provisions of Section 26 05 26.

Z. Identify conduit under provisions of Section 26 05 53.

END OF SECTION

SECTION 26 05 37

BOXES

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.02 RELATED SECTIONS

A. Section 07 84 00 - Firestopping.

B. Section 26 27 26 - Wiring Devices:

C. Section 28 31 00 – Fire Detection and Alarm:

1.03 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment.

1.04 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.05 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2: PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Fire Alarm Boxes: Surface boxes used for mounting of fire alarm devices to be a heavy duty type, supplied by the manufacturer of the device installed.

2.02 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Provide flush mounting boxes in finished areas. Provide flush mounting after construction boxes in existing drywall locations.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit.

O. Use gang box where more than one device is mounted together. Do not use sectional box.

P. Use gang box with plaster ring for single device outlets.

Q. Use cast outlet box in exterior locations exposed to the weather and wet locations.

R. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

S. Set floor boxes level.

T. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
1. Interior Dry Locations: Use hinged enclosure under provisions of Section 26 27 16.
2. Other Locations: Use surface-mounted cast metal box.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

B. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

C. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.03 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closure in unused box opening.

END OF SECTION

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SECTION 26 05 38

AUXILIARY RACEWAY SYSTEMS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Computer/data raceways.

B. Telephone raceways.

C. Television distribution raceways.

D. Security System raceways.

1.02 RELATED SECTIONS

A. Section 26 05 34 - Conduit

PART 2: PRODUCTS – NOT USED.

PART 3: EXECUTION

3.01 INSTALLATION

A. Raceway system shall include raceways and boxes.

B. Minimum conduit size for outlets shall be 1".

C. Wall outlets shall comprise a 4" square box with a flush single gang raised cover and blank cover plate.

D. Provide conduit from the outlet boxes to the suspended ceiling space. Provide conduit sleeves with bushings through walls to allow cable pulling from corridor.

E. Install wall outlets at 18" unless noted otherwise.

F. Support raceways under the provisions of Section 26 05 29.

G. Install pullwire or polyethylene pulling string in each empty conduit.

H. Install blank coverplates at each box.

END OF SECTION

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SECTION 26 05 53

INDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Panelboard Directories

C. Wire and cable markers.

D. Underground Warning Tape.

1.02 RELATED SECTIONS

A. Division 9 - Painting.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 NAMEPLATES AND LABELS

A. Nameplates:
1. Engraved three-layer laminated plastic, black letters on white background.
2. Emergency systems shall use white letters on red background

B. Labels: Labels: Printed with 3/8 inch black letters on white pressure sensitive tape. Use only for identification of individual control device stations.

C. Locations and Sizes:
1. Nameplate: Panelboards, Switchboards and Motor Control Centers: 1/2 inch; identify equipment designation and voltage rating.
2. Nameplate: Equipment Enclosures: 1/2 inch; identify equipment designation.
3. Nameplate: Circuit Breakers, Switches, and Motor Starters in Distribution Panelboards, Switchboards or Motor Control Centers: 3/8 inch; identify load served.
4. Nameplate: Transformer: 1/2 inch; identify equipment designation; identify primary and secondary voltages.
5. Label: Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, and Motor Starters: 3/8 inch; identify load served and voltage rating.
6. Label: Junction boxes: 3/8 inch; identify system sources and loads served. Junction boxes and be neatly identified using a permanent marker.

2.02 PANELBOARD DIRECTORIES

A. Provide type written directory for all new panelboards. Provide clear plastic cover. Room names and numbers shall be Owner's designations, not as indicated on the plans.

B. Provide updated type written directory for all existing panelboards in remodeled areas.

2.03 WIRE MARKERS

A. Description: Cloth, tape, split sleeve, or tubing type wire markers.

B. Locations: (1) Each conductor at panelboard gutters.
(2) Pull boxes or junctions boxes larger than 4 11/16".

C. Legend:
1. Power and Lighting Circuits: Verify label identification numbering system with the Owner=s representative.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.04 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, colored yellow with suitable warning legend describing buried electrical lines.

PART 3: EXECUTION

3.01 BUILDING LABELING METHOD

A. Wording of nameplates and embossed labels shall define the components actual use. Nomenclature used on the Drawings and in Specifications are for construction purposes only. Actual nomenclature shall be verified with the Owner. Identify voltage where other than 120 volts.

3.02 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws or adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

END OF SECTION

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SECTION 26 09 16

ELECTRIC CONTROLS AND RELAYS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Contactors.

B. Time clocks with photoelectric controls.

C. Time clocks for hot water return pump control.

D. Photocell

1.02 REFERENCES

A. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

1.03 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 30 00.

PART 2: PRODUCTS

2.01 CONTACTORS

A. Electrically or Mechanically held as indicated on the Drawings.

B. Rated 20 amps per pole at 600 volts.

C. Heavy duty silver contacts.

D. 120 volt control circuit voltage.

E. NEMA 1 enclosure.

F. Manufacturers:
1. Zenith
2. ASCO
3. Cutler-Hammer
4. Square D

2.02 TIME CLOCK - EXTERIOR LIGHTING

A. Digital 4 channel multipurpose time clock.

B. 7 day/32 set points.

C. AM/PM or 24 hour format - user selectable.

D. Daylight saving and leap year compensation.

E. Manual override and battery back-up.

F. Complete with photocell.

G. Manufacturer:
1. Tork #DGLC\with EPC1 photocell.
2. Paragon
3. Intermatic
4. Substitutions: Under provisions of Section 01 30 00

2.03 TIME CLOCKS - HOT WATER RETURN PUMP CONTROL

A. Digital maintained contact, one channel clock.

B. 7 day/32 set points.

C. AM/PM or 24 hour format - user selectable.

D. Daylight saving and leap year compensation.

E. Manual override and battery back-up.

F. Manufacturer:
1. Tork #DGU 100.
2. Paragon
3. Intermatic
4. Substitutions: Under provisions of Section 01 30 00.

2.04 PHOTOCELL

A. Exterior Photocell
1. 120 volt
2. 2 minute delay
3. Mounting: ½" conduit
4. Switch type SPST
5. Lexan - Impact and Vandal Resistant
6. -40 degrees to 140 degrees Fahrenheit
7. 1800 VA ballast load
8. Manufacturer: Tork-2001 or equal.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. For the automatic dusk to dawn control of selected exterior lighting fixtures, provide photocontrol where indicated on the Drawings. Wire photocontrol to energize holding coil in relays or energize lighting fixtures, as indicated.

C. Test operation of emergency Lighting control unit.

END OF SECTION

SECTION 26 22 00

TRANSFORMERS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. General purpose dry type transformers.

1.02 RELATED SECTIONS

A. Section 26 05 34 - Conduit: Flexible conduit connections.

B. Section 26 05 26 - Grounding and Bonding.

C. Section 26 05 29 – Hangers and Supports.

1.03 REFERENCES

A. NEMA ST 20 - Dry Type Transformers for General Applications.

B. National Electrical Manufacturers Association (NEMA TP1-2002).

C. ANSI Standards C57.12.01 and C57.12.91.

D. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 DRY TYPE TRANSFORMERS

A. Manufacturers:
1. Cutler-Hammer
2. General Electric
3. Siemens
4. Square D

B. Energy efficient transformer: Transformers to meet Table 4-2 of the Guide for Determining Energy Efficiency for Distribution Transformers, published by the National Electrical Manufacturers Association (NEMA TP1-2002).

C. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

D. Transformers 15kVA and larger shall have a minimum of 6-2.5% full capacity primary taps for 480V primaries.

E. Transformer insulation shall be a UL recognized 220° C system. Neither the primary nor the secondary temperature shall exceed 220° C Transformer insulation shall be a UL recognized 220°C system.

F. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations above 112.5kVA shall be miter cut at the core corners to reduce hot spots, core loss, excitation current and sound level. The core laminations shall be clamped together with steel angles. Cores for transformers greater than 300kVA shall be clamped utilizing insulated bolts through the core laminations to provide proper pressure throughout the length of the core. The completed core and coil shall then be bolted to the base of the enclosure but isolated therefore by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.

G. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

H. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

I. The maximum temperature of the top of the enclosure shall not exceed 50° C rise above 40° C ambient.

J. Sound levels shall be warranted by the manufacturer not to exceed the following:

15 to 50kVA – 45db; 51 to 150kVA – 50db; 151 to 300kVA – 55db; 301 to 500kVA – 60db; 501 to 700kVA – 62db

PART 3: EXECUTION

3.01 INSTALLATION

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

B. Set transformer plumb and level.

C. Use flexible conduit, under the provisions of Section 26 05 34, 2 ft minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

D. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

E. Provide grounding and bonding in accordance with Section 26 05 26.

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

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SECTION 26 24 16

PANELBOARDS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Distribution panelboards.

B. Branch circuit panelboards.

1.02 RELATED WORK

A. Section 26 05 29 – Hangers and Supports for Electrical Systems

B. Section 26 05 53 – Identification of Electrical Systems

C. Section 26 05 26 – Grounding and Bonding of Electrical Systems

1.03 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

D. NEMA KS 1 - Enclosed Switches.

E. NEMA PB 1 - Panelboards.

F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

G. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of each document on site.

1.06 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Cutler-Hammer

B. General Electric

C. Siemens

D. Square D.

E. Substitutions: Under provisions of Section 01 63 00.

2.02 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, circuit breaker type.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

C. Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

D. Cabinet Front: Flush or surface type, fastened with concealed trim clamps. Provide hinged door with flush lock. Finish in manufacturer's standard gray enamel.

E. Minimum integrated short circuit rating: 35,000amperes rms symmetrical

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

C. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards[, or as indicated].

D. 120/208V branch circuit panelboards shall have UL Listed 200% rated neutrals for non-linear loads where indicated in the Panelboard Schedule.

E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

F. Enclosure: NEMA PB 1, Type 1.

G. Cabinet box: 6 inches deep; width: 20 inches. All multi-section panelboards shall be the same physical size for all sections.

H. Cabinet Front: Flush or surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports in accordance with Section 26 05 29.

C. Height: 6 ft (2 M) to top of panelboard; install panelboards taller than 6 ft (2 M) with bottom no more than 4 inches (10 cm) above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 5 empty 3/4 inch. Identify each as SPARE.

G. Circuit numbers indicated on drawings are for reference. Contractor to arrange branch circuits as required for wiring and load balancing. Indicate actual panelboard circuit numbers on record/as-built drawings.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. 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.

END OF SECTION

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SECTION 26 27 01

ELECTRIC SERVICE ENTRANCE

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service.

B. Meter Sockets

1.02 RELATED SECTIONS

A. Section 26 05 34 - Conduit.

B. Section 26 05 26 - Grounding and Bonding.

C. Section 26 24 16 - Panelboards

1.03 UTILITY ALLOWANCE

A. No allowance shall be included in the Bid. All electric service charges will be paid directly to the Utility by the Owner.

1.04 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.05 SYSTEM DESCRIPTION

A. Utility Company: Xcel Energy

B. System Characteristics: 480Y/277 volts, three phase, four- wire, 60 Hertz.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 UTILITY METERS

A. Meters will be furnished by Utility Company.

2.02 UTILITY METER BASE

A. The Electrical Contractor shall purchase meter base from Xcel Energy.

2.03 SELF CONTAINED METER SOCKET

A. Nema 3R rated and 10,000 rms symmetrical withstand current.

B. 320 amp, 480 volt, 3 phase, 4 wire with bonded neutral.

C. 7 Jaw with lever bypass and jaw release.

D. Meter socket shall be approved by Utility Company.

2.04 TRANSFORMER

A. Transformer(s) provided by Utility company.

B. Contractor to provide concrete transformer pad.

C. Provide (2) 5” rigid metal long sweep elbow for primary service conductors. Verify size and location with utility.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verify that service equipment is ready to be connected and energized.

3.02 PREPARATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Coordinate location of Utility Company's facilities to ensure proper access is available.

3.03 INSTALLATION

A. Install conduits from transformer to the service entrance equipment. Utility Company will provide service lateral from the transformer to the service equipment.

END OF SECTION

SECTION 26 27 17

EQUIPMENT WIRING

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment specified under other sections.

1.02 RELATED SECTIONS

A. Division 22 - Plumbing Equipment.

B. Division 23 - HVAC Equipment.

C. Section 26 05 34 - Conduit.

D. Section 26 05 19 – Low-voltage power Conductors and Cables.

E. Section 26 05 37 - Boxes.

1.03 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 COORDINATION

A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

D. Sequence electrical connections to coordinate with start- up schedule for equipment.

PART 2: PRODUCTS

2.01 CORDS AND CAPS

A. Attachment Plug Construction: Conform to NEMA WD 1.

B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

C. Cord Construction: ANSI/NFPA 70, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3: EXECUTION

3.01 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field- supplied attachment plug is indicated.

E. Install disconnect switches, controllers, control stations, and control devices as indicated.

F. Provide interconnecting conduit and wiring between devices and equipment where indicated.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates.

D. Occupancy sensors.

1.02 RELATED SECTIONS

A. Section 26 05 37 - Boxes.

B. Section 26 05 26 – Grounding and Bonding;

1.03 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. NEC 517: Health Care Facilities.

D. NFPA 99: Standard for Health Care Facilities

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:
1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
2. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 WIRING DEVICE MANUFACTURERS

A. Arrow-Hart

B. Hubbell Automation

C. Leviton

D. Pass and Seymour

E. Eagle

F. Cooper Wiring Devices

G. Substitutions: Under provisions of Section 01 63 00.

2.02 WALL SWITCHES

A. Quiet, toggle type:
1. Heavy-Duty Specification grade.
2. 20 amp, 120-277 volt.
3. A.C. only.
4. Back and side wired.
5. Color: White.
6. Manufacturer: Pass and Seymour #20AC1W or equal

B. Dimmer Switch
1. Specification grade.
2. Control: 0-10V.
3. Switch: 24V
4. Switch on/off with slide dimmer.
5. Color: White.
6. Manufacturer: Lutron #DVTV or equal: with PP-DV power pack.

C. Dimmer Switch (flood lighting)
1. Specification grade.
2. Control: 120V.
3. Switch: 120V
4. Switch on/off with slide dimmer.
5. Color: White.
6. Manufacturer: Lutron #DVSCCL or equal:

D. Pilot light type:
1. Heavy-Duty Specification grade.
2. 20 amp, 120-277 volt.
3. A.C. only.
4. Back and side wired.
5. Red pilot handle
6. Manufacturer: Pass and Seymour #20AC1RPL or equal

2.03 RECEPTACLES

A. Duplex Convenience Receptacles (Normal power)
1. Heavy-Duty Specification Grade, duplex, 2 pole, 3 wire grounding, straight blade, back and side wired.
2. 20 amp, 125 volt.
3. NEMA 5-20R.
4. Color: White.
5. Manufacturer: Pass & Seymour #5362, or equal

B. GFI Receptacles
1. Specification Grade
2. Duplex, 3 wire grounding, straight blade, side or screw pressure plate back wired.
3. 20 amp, 125 volt.
4. NEMA 5-20R.
5. Built-in ground fault interrupting protection.
6. "Test" and "Reset" buttons.
7. Feed-thru feature.
8. Color: White.
9. Manufacturer: Pass & Seymour #2095 or equal

C. Weather-Resistant GFI Receptacles
1. Duplex, 3 wire grounding, straight blade, side or screw pressure plate back wired.
2. 20 amp, 125 volt.
3. NEMA 5-20R.
4. Built-in ground fault interrupting protection.
5. "Test" and "Reset" buttons.
6. Color: White.
7. Manufacturer: Pass & Seymour 2095TRWRW or equal

2.04 WALL PLATES

A. Interior-Stainless Steel
1. 430 alloy.
2. Finish: Satin.
3. Manufacturer: Hubbell, Sierra Electric.

B. Interior-Stamped Galvanized Steel, Aluminum, or Die-Cast Metal:
1. Raised cover with captive screws.
2. Specifically designed for surface boxes in unfinished areas.

C. Weatherproof Covers:
1. Cast Aluminum cover.
2. Spring-loaded cover.
3. Heavy rubber gasket.
4. Nema 3R; Raintight while-in-use.

2.05 OCCUPANCY SENSORS

A. Type 'A' Sensors.
1. Passive infrared wall sensor.
2. Construction: Solid state electronics, molded plastic body, fits into single gang box.
3. Range and Coverage: Approximately 180° field of view up to 900 square feet.
4. Electrical Ratings: 120/277VAC: 0 to 1000 watts ballast rating.

5. Color: White.
6. Manufacturer: Hubbell Automation #IWSZP3P, or equal by Watt Stopper and Leviton.
7. Provide auxiliary contacts for HVAC equipment.

B. Type 'B' Sensors.
1. Ceiling mounted sensor utilizing ultrasonic technology.
2. Total volumetric coverage with no blind spots.
3. Controls for ultrasonic sensitivity and time adjustments.
4. 32.7 kHz frequency.
5. Manufacturer: Hubbell Automation #OMNI-US1000 with power switch pack or equal by Watt Stopper and Leviton.
6. Provide auxiliary contacts for HVAC equipment.

C. Type 'C' Sensors.
1. Ceiling mounted sensor utilizing ultrasonic and passive infrared technologies.
2. Adaptive Technology: Self Adjusting and Self Calibrating.
3. Controls for sensitivity and time adjustments.
4. 32.7 kHz frequency.
5. Manufacturer: Hubbell Automation #OMNI-DT2000 with power pack or equal by Watt Stopper and Leviton.
6. Provide auxiliary contacts for HVAC equipment.

PART 3: EXECUTION

3.01 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.02 INSTALLATION

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

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install all receptacles so that when the long dimension of the receptacle is:
1. Vertical, the grounding slot is "up".
2. Horizontal, the neutral slot is "up".

E. Connect wiring device grounding terminal to outlet box with bonding jumper.

F. Install stainless steel plates on switch, receptacle, and blank outlets in finished areas.

G. Mounting dimensions indicated are to center of device.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 37 to obtain mounting heights indicated on Drawings.

B. Install wall switch 46 inches (center of device) above finished floor.

C. Install convenience receptacle 18 inches (center of device) above finished floor unless noted otherwise.

3.04 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFI receptacle device for proper operation.

END OF SECTION

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SECTION 26 28 18

ENCLOSED SWITCHES

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Fusible switches.

B. Non-fusible switches.

C. Fuses.

1.02 REFERENCES

A. NEMA KS 1 - Enclosed Switches.

B. NFPA 70 - National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Cutler-Hammer

B. General Electric

C. Siemens

D. Square D.

E. Substitutions: Under provisions of Section 01 60 00.

2.02 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Heavy Duty 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. Fuse clips: Designed to accommodate Class J fuses. Provide auxiliary contacts for switches used at elevators.

B. Non-fusible Switch Assemblies: NEMA KS 1, Heavy Duty 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.

C. Enclosures: NEMA KS 1.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

2.03 FUSES

A. Description: Dual element, time delay, one-time fuse, 600 volt, UL 198C, Class J.

B. Interrupting Rating: 200,000 rms amperes.

PART 3: EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION

SECTION 26 41 14

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Automatic transient voltage surge suppression (TVSS) for electrical distribution systems.

1.02 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code

B. ANSI Standard C62.41 and C62.45.

C. UL 1449 and 1283.

1.03 SUBMITTTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Device dimensions, nameplate nomenclature, and electrical ratings.

C. Product data sheets with installation instructions.

D. Voltage current characteristic curves for each size and type of device.

E. Maximum Surge Current Rating test documentation. Tests will be performed with fuses and all disconnects intact.

F. Test documentation demonstrating that the TVSS is cable of surviving the specified number of ANSI/IEEE C62.41, Category C3 impulses without failure or performance degradation.

G. UL 1440, Second Edition documentation.

H. Complete test documentation package per the recommendations of NEMA LS1-1992.

1.04 REGULATORY REQUIREMENTS

A. ANSI/NFPA 70 – National Electrical Code

B. Furnish products listed and classified by Underwriters Laboratories Inc.

PART 2: PRODUCTS

2.01 MANUFACTURER

A. Liebert Corporation.

B. Current Technology.

C. Square D.

D. Substitutions: Under provisions of Section 01 63 00.

2.02 BRANCH PANEL SUPPRESSOR

A. Surface mounted enclosure.

B. Operating voltage: 120/208 volt, three phase, 3 wire.

C. Surge capacity: 65kA per mode (equivalent to 136 kA per phase).

D. The TVSS will be design tested to survive a minimum of 6,000 repetitive ANSI/IEEE C62.41, Category C3 impulses without failure or performance of degradation of more than 10%.

E. UL 1449 Second Edition Listed, 1283 Complimentary Listed and CUL.

F. Suppression modes: L-N, N-G, L-G. UL-1449, Second Edition Suppressed Voltage Rating shall be 400V for each listed suppression mode.

G. All MOV'S will be individually fused.

H. Manufacturer: Liebert Accuvar Series or Current Technology CG Plus Series.

PART 3: EXECUTION

3.01 INSPECTION

A. Examine equipment for size and type of arrester to ensure physical compatibility.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Service entrance TVSS will be connected to the service entrance equipment via a 60A, 3-pole circuit breaker. The TVSS will be located as close as possible to the phase, neutral and ground bus bars or lugs.

C. The branch panel TVSS will be located as close as possible to the panelboard neutral lug. A 60A, 3 pole circuit breaker will be provided by the panelboard manufacturer and will be located as close as possible to the TVSS location. All lead lengths will be kept short as possible avoiding unnecessary bends. When possible, twist the phase conductors around the neutral conductor.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Luminaires and accessories.

B. Led Drivers.

1.02 RELATED SECTIONS

A. Section 26 05 37 - Boxes.

1.03 REFERENCES

A. ANSI C78.379 - Electric Lamps - Classification of Beam Patterns of Reflector Lamps.

B. ANSI C82.11 – Standard for High Frequency Lamp ballasts.

C. ANSI/NFPA 70 - National Electrical Code.

D. ANSI/NFPA 101 - Life Safety Code.

E. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

F. IESNA-LM79 and IESNA-LM-80

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate fixture type on each cut-sheet; components and finishes for each luminaire.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Submit Lighting Ballast information with Manufacturer and model numbers.

E. Submit Fluorescent lamp information with Manufacturer and model numbers.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.01 LUMINAIRES

A. Furnish products as specified in schedule on Drawings.

B. Substitutions: Under provisions of Section 01 60 00.

C. Install ballasts and specified accessories at factory.

D. Provide lighting fixtures as shown on the Lighting Fixture Schedule.

E. Catalog numbers listed in the Lighting Fixture Schedule may be general in nature. Specific finishes, diffusers and/or accessories, if listed in the Lighting Fixture Schedule Remarks, shall take precedence and shall be furnished even though there may be a conflict in the catalog number given.

F. Furnish fixtures of type indicated and of specific design to fit particular ceiling construction. Check the Architectural Drawings and Specifications for ceiling construction and type, space above suspended ceilings and specific type of suspension system.

G. Furnish all accessories required to install fixtures in accordance with the manufacturer's recommendations including plaster frames, ends or caps, couplings, suspension assemblies, mounting brackets and other appurtenances required.

H. The fixture trims and frames, unless otherwise specifically noted, shall be of baked white enamel.

2.02 LIGHT EMITTING DIODE (LED) FIXTURES.

1. All LED lighting fixtures are to be tested, and documentation provided, in accordance to IESNA-LM79 and IESNA-LM-80. No Exceptions.
2. LED fixtures and drivers shall carry a minimum 5 year warranty from the manufacturer. Warranty shall cover replacement materials and labor for installation of devices failing within warranty period.
3. All LED fixtures, modules, or arrays, per type, shall be provided with the same date code of manufacture to minimize color temperature variation due to different binning cycles. Provide written documentation from Manufacturer on Manufacturer's letterhead stating such with submittals.
4. All LED fixtures shall have an absolute maximum Correlated Color Temperature variance of +/- 200 degrees Kelvin maximum. Products installed in field with greater variance shall be replaced at no cost to Owner.
5. All LED luminaires (LED modules/arrarys, drivers, thermal overloads) must be serviceable without disruption of surrounding mounting materials.

2.03 LED DRIVERS

General:

- Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.
- Minimum Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
- Driver shall have a rated life of 50,000 hours, minimum.
- Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- Driver shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
- Provide all of the following data on submittals:
    - Input watts
    - Power Factor (pf)
    - Crest Factor (cf) at full input power
    - Total Harmonic Distortion (THD).

PART 3: EXECUTION

3.01 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. The type of fixture to be provided for each outlet is indicated by a letter symbol on the Working Drawings.

C. If any fixture symbol on the Drawing is lacking a fixture type, provide a fixture same as other fixtures in like areas.

D. Install all incidental materials, fittings, hangers, supports, etc. to make the lighting fixture installation complete.

E. Recessed flanged type fixtures shall be adequately supported so that they can be drawn up tight to the ceiling surface without producing light leaks.

F. Flexible metal conduit (at least 4 feet, but not exceeding 6 feet in length) shall be used as a final raceway connection to fluorescent fixtures in accessible type suspended ceilings. Install fasteners on lay-in fixtures in T-bar ceilings.

G. Surface mounted fixtures shall be provided with auxiliary support so that they can be drawn up tightly and cannot be rotated. Fixture stud mounting to box only shall NOT BE considered adequate support.

H. Pendant type fixtures shall be equipped with stems and self-aligning hangers. Relative to fluorescent fixtures, a fixture stem shall be installed at the end of each fixture, or one stem near the junction of two fixtures. Where fixtures are installed on metal framing channels, channels shall be continuous for full length of each fixture row. Suspend channels from building structural system with hanger rods. Rods shall be spaced as recommended by the channel manufacturer to avoid excessive deflection.

I. Exit lights shall be located so that no other fixtures will interfere with the line of sight.

J. All 2 foot by 2 foot lighting fixtures shall be installed so that all lamps are oriented in the same direction within the same space or room.

K. All reflectors, shades, fixture bodies, etc., shall be free of dents and scratches. All glassware/plastic shall be free of cracks, chips, etc., and any plastic which is warped shall be replaced or provided with additional mounting clips to prevent reoccurrence..

L. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

M. Flexible metal conduit (at least 4 feet, but not exceeding 6 feet in length) shall be used as a final raceway connection to fluorescent fixtures in accessible type suspended ceilings.

N. Support luminaires larger than 2 x 4 foot (600 x 1 200 mm) size independent of ceiling framing.

O. Reference reflected ceiling plan for coordination of light fixture and diffuser locations.

P. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

Q. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.

R. Install wall mounted luminaires, exit signs at height as indicated on Drawings.

S. Install accessories furnished with each luminaire.

T. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.03 ADJUSTING

A. Adjust exit sign directional arrows as indicated.

B. Repair luminaires that have failed lamps at Substantial Completion.

3.04 CLEANING

A. Clean Work under provisions of Section 01 70 00.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

END OF SECTION

SECTION 27 10 05

STRUCTURED CABLING FOR VOICE AND DATA

PART 1: GENERAL

1.01 SCOPE

A. The applicable provisions of Division 1 shall govern work specified in this section.

1.02 WORK INCLUDED

A. Furnish and install a complete communications cabling system: Horizontal data cables.

B. Horizontal data cables shall be mounted on wall mounted equipment racks.

C. Provide various equipment for pulling, racking, terminating, testing documentation and labeling. Also provide other equipment as specified below.

D. All cables and splice equipment shall be furnished, installed, tested, and wired including proper grounding/bonding by the Contractor.

1.03 WORK SEQUENCE

A. During the construction period coordinate telecommunications schedule and operations with the Owner

B. For additional information pertaining to the sequencing of the work refer to Division 1.

1.04 UTILITY ALLOWANCE

A. No allowance shall be included in the Bid. All Telephone service charges will be paid directly to the Utility by the Owner.

1.05 SUBMITTALS

A. Submit six (6) sets, of which two (2) will be returned to the contractor, of Shop Drawings for all materials proposed, in accordance with provisions of Division 1.

B. Submit product data indicating cable and accessory construction, materials, ratings and all other parameters identified in Part 2 - Products below.

C. A complete description of the material which the contractor proposes to substitute and reason for substitution.

D. Submit manufacturer's installation instructions.

E. Work shall not proceed without the approved submittals.

1.06 SYSTEM DESCRIPTION

A. The system shall include the provision of horizontal data/ voice cable and video cabling installed as indicated on the drawings and routed to each telecommunications station or TV outlet box. **There shall be a minimum of one voice and one data cable run to each voice/data outlet, one data cable run to each data outlet, and one voice cable run to each voice outlet unless indicated otherwise on the floor plans.**

1.07 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions.

B. Accurately record exact sizes, locations and quantities of cables.

1.08 QUALITY ASSURANCE

A. The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in producing cable and/or accessories similar to those specified below.

1.09 CODE REQUIREMENTS

A. ANSI/IEEE C2 - National Electrical Safety Code

B. NFPA 70-1999 - National Electrical Code.

C. Wisconsin Department of Commerce Chapter Comm 16 - Wisconsin Electrical Code

D. EIA/TIA Standards

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver products to and receive products at the site under provisions of Division 1.

B. Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractors expense.

PART 2: PRODUCTS

2.01 HORIZONTAL COPPER DATA WIRE

A. All cables and equipment shall be furnished, tested, installed and wired by the Contractor. The following should be used for the horizontal cabling:

(1) Plenum Rated:
(2) Color: Blue for Data Cabling.

B. Transmission characteristics of the cable shall meet full Category 6 performance as specified by the EIA/TIA. Bidders must specify the methods by which the cables are tested to verify conformance to the specifications, the identity of the testing body and the quality control mechanisms employed by the manufacturer to insure product compliance.

C. Transmission characteristics of the Cables shall meet full Category 6 performance criteria as defined by the referenced TIA/EIA documents. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Cable is a part.

IMPORTANT: Cable and Termination Components (Jack, Patch Panel, Wiring Blocks) are specified to function as a System. The compatibility of the Cable to be installed with the proposed termination components shall be recognized and documented by the Termination Component Manufacturer.

D. The cable shall be restricted to four-pair size to support a broad range of applications. The pair twists of any pair shall not be exactly the same as any other pair. The pair twist lengths shall be selected by the manufacturer to ensure compliance with the near-end crosstalk requirements of EIA/TIA 568 and NEMA.

E. Cable shall meet specifications of NEMA (low loss), EIA/TIA 568, UL 444, and ICEA.

2.02 MODULAR JACKS AND FACE PLATES

A. Station cables shall each be terminated at their designated Workstation area and Data Rooms. The Category 6, 568B keyed data jacks are to be blue in color.

B. Data termination hardware shall meet full Category 6 performance specifications for connecting hardware. All pair combinations must be considered with the worst case measurement being the basis for compliance. Bidders must specify the methods by which the Jacks are tested to verify conformance to the specification, the identity of the testing body and the quality control mechanisms employed by the manufacturer to insure product compliance.

C. Face plates shall be furnished by the Contractor. Color of the face plates shall be white. Face plates shall consist of a mounting frame designed for use with modular jacks as identified on the floor plan. All modular jacks and outlet face plates will be made of high impact resistant nylon.

D. It is the contractors responsibility to insure that the manufacturers face plates align flush with the metal surface mounted outlet box selected to prevent the face plates from "over-hanging" the outlet, where it could be pulled off or damaged.

E. Each face plate shall be secured to the metal outlet box utilizing center pin reject security screws. The contractor shall provide a minimum of two (2) center pin reject tools per building.

F. Where a modular jack is not used in the faceplate a dust cover or blank shall be inserted into the jack opening.

G. This contractor where necessary, shall provide a modular mounting frame so that all face plates can be adjusted to level.

2.03 DATA PATCH PANEL

A. In the Data rooms, these modular jacks shall be positioned on rack mounted patch panels. Jacks shall be positioned in sequence of the station I.D. starting with the lowest identification number.

B. Data Patch Panels shall be sized to accommodate the total workstation count defined in the Drawings. No "High Density" data patch panels will be allowed. The largest single patch panel configuration shall not exceed 48 ports. A horizontal 'Wire" or "Slack Manager' is to be installed between each patch panel to accommodate the data patch cords.

C. Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.

D. Data patch panels will be mounted in data rack.

E. At all floor mounted rack locations, wire management hardware in the form of vertical and horizontal slack managers shall be installed by the contractor. This hardware shall be sufficient for routing of jumper cables from the patch panel to the area on the backboard or rack at which network electronics shall be positioned.

F. The modular patch panel shall be equipped with 8 pin RJ-45 type keyed jacks configured the same as Faceplate Jacks (EIA/TIA 568B), with 110 type style termination's for horizontal data wiring, capable of terminating all four cable pairs.

G. All Patch Panels, data jacks and other data related termination hardware shall support and be rated for 250 Megahertz data speeds per EIA/TIA 568B specifications. The terminating blocks shall be designed to maintain the cable's pair twists to the point of mechanical termination. The installer shall insure that the twists are preserved. All panels shall have port identification capabilities. Panels shall be labeled by mechanical means identifying jacks in sequence of station

2.04 Wall Mounted Data Cabinet

A. 36” high, wall mounted 19” relay racks. Racks should be drilled and tapped to accept 12-24 screws using the industry standard 5/8, 5/8, 1/2” hole pattern.

B. Clear Acrylic Window double hinge removable sides.

C. Heavy duty steel construction.

D. Black powder-coated finish.

E. Manufacturer: Markertek #SRW18USDPG or Equal.

PART 3: EXECUTION

3.01 GENERAL WIRE AND INSTALLATION REQUIREMENTS

A. Furnish and install all conduit, cables, connectors and equipment as shown on drawings and as specified above.

B. All cable termination's shall be completed by qualified personnel utilizing state-of-the-art equipment and techniques.

C. Four cable pairs are to be terminated on each modular jack at each station.

D. Data pairs shall terminate on the Data Patch Panels and mounted in an equipment rack located in the building MDF. All cabling for this project shall be terminated in the following manner, unless otherwise identified:

E. Data: All Category 6 rated horizontal cable shall be terminated on Category 6 rack mounted patch panels. All termination equipment shall meet full Category 6 performance criteria, as specified by the EIA / TIA Technical System Bulletin (TSB) #40. Bidders must specify the methods by which the cables are tested to verify conformance to the specifications, the identity of the testing body and the quality control mechanisms employed by the manufacturer to insure product compliance. Data wiring shall be sequenced by using the TIA-568B wiring standard.

F. All distribution cable shall be concealed, in conduit or a secured metal raceway system (wireway or equivalent) in all public areas, or as designated on the floor plans. All other routing, such as that found with typical MDF/IDF closets and wall fields, shall be kept clear of other trades work and supported according to code utilizing "D-type" mounting ring, cable trays and louver-head adder racks.

G. The contractor shall provide to the Engineer, prior to installation, drawings showing the proposed installation for his approval.

H. All cables shall be installed splice-free unless otherwise specified.

3.02 WORK BY OWNER

A. All network electronic equipment and patch cables not specified herein.

B. Voice cross connection wiring at telephone service equipment.

3.03 TESTING

A. System testing, procedures and Contractor Responsibilities are as follows:

1. Test Equipment - Contractor is responsible for supplying all test equipment and personnel to conduct acceptance test.
2. Contractor Responsibility - Contractor shall conduct acceptance testing according to a schedule coordinated with the Owner. Representatives of the Owner may be in attendance to witness the test procedures. The contractor shall offer adequate advance notice to the Owner as to allow for such participation.
3. Procedures - Contractor shall describe how they will conduct the tests and provide copies of all test results to the Architect/Engineer.

B. Tests to be conducted:

1. Category 6 tests (all cables, voice or data): Each installed station cable shall be tested to 250-MHZ for compliance with the specified Attenuation and NEXT performance characteristics as defined by TIA TSB-36 and -40. Measurements, which shall consider installed cable length, shall include cabling, patch panel and RJ45 faceplate. All pair combinations shall be tested with compliance being based upon the worst case pair combination.

C. The Contractor shall make the following tests during the course of construction and at completion of the work. The necessary instruments, meters, etc., for making these tests shall be supplied by the Contractor, this shall include a competent person for making these tests.

D. Each pair of each horizontal cable shall test free of shorts within the pairs, open or misswired pairs, shorts between pairs and transposed pairs when tested with an appropriate measuring instrument based on NEC requirements of insulation value of the particular wire. This same test shall be performed for all cross connects from the voice jacks to the Main Distribution Frame (MDF) in the case of Voice circuit paths and from the data jacks to the intermediate Distribution Frame (IDF) in the case of Data circuit paths.

E. In addition to the above tests, all data cable from the data jack to the MDF shall be tested using a Microtest Pentascanner or equivalent to provide verification of the horizontal telecommunications link. The test for this link shall be include (1) the jack at the work area, (2) the horizontal "station" cable, and (3) the jack at the DF on which station cabling is terminated. Note that the maximum length of station cable shall not exceed 90 meters which allows 10 meters for equipment and patch cables. Worst case performance, based on a maximum length of 100 meters, shall be as follows:

Frequency (MHz)	PS-NEXT Loss (dB; Worst Case)	Attenuation (maximum dB)
1.0	62.0	1.9
4.0	61.8	3.5
8.0	57.0	5.0
10.0	55.5	5.5
16.0	52.2	7.0
20.0	50.7	7.9
25.0	49.1	8.9
31.3	47.5	10.0
62.5	42.7	14.4
100.0	39.3	18.6
200.0	34.3	27.4
250.0	32.7	31.1

F. The tests that shall be made and documentation provided shall consist of wire map, near-end crosstalk, attenuation, cable length, resistance and noise using TDR technology and be provided in hard copy.

G. Alternately the contractor may furnish the above information on a 3.5" disc. This disc shall contain the electronic equivalent of the bid specification requirements along with the software required to view such data. If this information can be provided in a standard format such as TIFF, PCX, etc. or a standard format readable from general purpose office automation type of software package, identification of such format is all that is required. The contractor shall furnish two disks to the Owner for distribution prior to final payment.

H. The results of the above tests shall be placed in a binder with three sets provided to the A/E.

I. In the event results of the tests are not satisfactory, the Contractor shall make such adjustments, replacement and changes as are necessary and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary at no additional expense to the project or owner.

J. Tests related to connected equipment of others shall only be done with permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.

K. Three (3) record copies of all test readings shall be submitted to the Engineer for approval. The Contractor shall notify the Engineer at least one week in advance of the test date so that the Engineer may choose to be present.

3.04 CABLE PULLING

A. Beginning installation means contractor accepts existing conditions.

B. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

C. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used.

D. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSVIEEE C2 standards. Manufacturers recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.

E. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

F. Avoid abrasion and other damage to cables during installation.

3.05 CABLE ROUTING

A. All wiring shall be run in conduit, a secured metal raceway, or as designated on the floorplan, and mounted from the building structure. All cable shall be free of tension at both ends.

B. To reduce or eliminate EMI, the following minimum distances shall be adhered to: Five (5) inches from power lines of 2kVa. Eighteen (18) inches from high voltage lighting (including fluorescent). Thirty-nine (39) inches from power lines of 5kVa or greater. Thirty-nine (39) inches from transformers and motors.

3.06 FILL RATIOS

A. Contractor is responsible for maintaining a maximum fill ratio of 40% for horizontal conduit and raceway systems, and a 60% fill ratio for vertical pathways.

3.07 LABEL IDENTIFICATION

A. Each "Faceplate" and each cable entering the outlet shall be labeled with the unique identifying code to be submitted at a later date. Cable shall be labeled with a tag which is wrapped around the cable sheath (not a "flag"). Faceplate labels shall be placed on the outside of the cover and on the base. All Labeling shall be by mechanical means in black ink on non-removable tags. Hand lettered designations are not acceptable. (See Label Identification).

3.08 WARRANTY

A. Contractor shall provide a manufacturer's warranty of at least two years for all cable, connectors, termination equipment and labor.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1: GENERAL

1.01 SECTION INCLUDES

A. A complete Addressable Fire Alarm System as described herein and as shown on the Drawings; to be wired, connected, and left in first class operating condition. Include but not limited to sufficient control panels, automatic smoke detectors, duct smoke detectors, heat detectors, manual stations, alarm indicating appliances, and all other necessary material for complete operating systems.

B. The fire alarm system shall allow for loading and editing special instructions and operating sequences such as cross zoning. as required. The systems shall be capable of on site programming to accommodate system expansion and facilitate changes in operation. All software operations 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.

C. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

D. The complete installation shall conform to the applicable sections of NFPA-72, NFPA-70, and National Electrical Code with particular attention to Article 760.

E. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the project specifications.

F. Provide relay to initiate fire alarm at owners Honeywell security panel.

1.02 RELATED SECTIONS

A. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

B. Section 26 05 34 – Conduits.

C. Section 26 05 37 - Boxes

1.03 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 72 - National Fire Alarm Code.

C. NFPA 101 - Life Safety Code.

1.04 REGULATORY REQUIREMENTS

A. System: UL listed.

B. Conform to requirements of NFPA 101.

1.05 QUALIFICATIONS

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

B. Installer: Company specializing in smoke detection and fire alarm systems certified by manufacturer as fire alarm installing contractor.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 30 00.

B. Provide all information and materials required for state review of fire alarm system: system description, sequence of operation, wiring diagrams, voltage drop calculations, battery calculations, data sheets, equipment ratings, layout, dimensions, and finishes.

C. Submit documents for state review; and pay all fees required. Include all forms, drawings and documents required as per IBC section 907: Paragraph 907.1.2 Fire alarm Shop Drawings.

D. Submit manufacturer's installation instructions under provisions of Section 01 30 00.

1.07 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Section 01 70 00.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Section 01 70 00.

B. Include operating instructions, and maintenance and repair procedures.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Simplex

B. Notifier

C. EST – Edwards System Technology

D. Substitutions: Under provisions of Section 01 60 00.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

A. Control Panel: Modular construction with surface wall-mounted enclosure.

B. Power Supply: Provide adequate power and wiring to serve control panel modules, remote detectors, relays, door holders and alarm signaling devices. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes.

C. Detection Circuits: Supervised with alarm and trouble indication.

D. Signal Circuits: Supervised signal module(s), sufficient for signal devices connected to system.

E. Remote Station Signal Transmitter: Electrically supervised, capable of transmitting alarm and trouble signals over telephone lines to remote central station.

F. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.

2.03 INITIATING DEVICES

A. Manual Station:
1) Semi-flush mounted, single action addressable manual station with break-glass rod.
2) Gymnasiums: Semi-flush mounted, double action addressable manual station.

B. Smoke Detector: Intelligent/addressable photoelectric type with plug-in base. Detector has internal self-adjustment and self diagnostic capabilities. Two-wire detector with common power supply and signal circuit.

C. Duct Mounted Smoke Detector: Intelligent/addressable photoelectric type with plug-in base, auxiliary SPDT relay contact, remote key-operated NORMAL-RESET-TEST switch, duct sampling tubes extending width of duct, and visual indication of detector actuation, in duct-mounted housing. Detector has internal self-adjustment and self diagnostic capabilities. Two-wire detector with common power supply and signal circuit.

D. Heat Detector: addressable fixed temperature type with plug-in base. Refer to Drawings for fixed temperature setting.

2.04 SIGNALING DEVICES

A. Alarm Lights: ADA complying strobe lamp and flasher. Provide wire guards when mounted in gymnasiums or similar areas.

B. Alarm Horn: Flush type fire alarm horn. Sound Rating: 87 dB at 10 feet (3 m). Provide ADA complying integral strobe lamp and flasher. Provide 90dB horns for all mechanical rooms. Provide wire guards when mounted in gymnasiums or similar areas.

C. Provide synchronization modules.

2.05 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 25 05 19.

B. Initiating and Signal Circuits: Building wire as specified in Section 25 05 19.

PART 3: EXECUTION

3.01 INSTALLATION

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

B. Install manual pull stations at 46 inches above the floor. Provide box and raceway extensions at existing locations, if required.

C. Install audible and visual signal devices at 80 inches above the floor to the bottom of the device, unless noted otherwise. Devices maybe mounted at 96” to the top of the devices to accommodate chalkboards, tack-boards, etc.

D. Install all wiring in a metal raceway.

E. Fire alarm visual (strobe) signals shall be synchronized.

F. Provide a smoke detector within 5 feet (horizontal distance) of the fire alarm control panel, remote annunciator and power supplies for visual notification. (alarm lights/strobes)

G. Provide adequate 120 volt branch circuit wiring to each power supply for visual notification devices. Verify locations and quantities of power supplies with fire alarm supplier.

H. Provide all required wiring and control relays to shut down air handling units; upon initiation of building fire alarm system. Coordinate installation with division 23.

3.02 FIELD QUALITY CONTROL

A. Test in accordance with NFPA 72 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 WORK BY OWNER

A. Contracting with a company for remote monitoring of the fire alarm system.

B. Cross connections between owners' telephone demarcation blocks and incoming telephone service.

3.05 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation and required response to each.

END OF SECTION