NEW YORK STATE | Office of General Services

DESIGN & CONSTRUCTION GROUP
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ALBANY, NY 12242

ADDENDUM NO. 4 TO PROJECT NO. 47572

CONSTRUCTION, HVAC AND ELECTRICAL WORK
REPLACE WINDOWS BUILDING 33, 34 & 36
INDUSTRY LIMITED SECURE CENTER
375 RUSH-SCOTTSVILLE ROAD
RUSH, NEW YORK

August 19, 2025

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

CONSTRUCTION WORK SPECIFICATIONS

1. Page 088853 – 4, Article 1.9: Delete this article in its entirety.

HVAC WORK SPECIFICATIONS

2. SECTION 230900 INSTRUMENTATION AND CONTROL FOR HVAC: Discard the Section bound in the Project Manual and substitute the accompanying Section (pages 230900 – 1 thru 230900 – 9) noted "ADDENDUM 04".

3. SECTION 260502 BASIC ELECTRICAL MATERIALS AND METHODS FOR DIRECT DIGITIAL BUILDING CONTROL SYSTEM: Add the accompanying Section (pages 260502 – 1 and 260502 – 16) to the Project Manual.

END OF ADDENDUM

Brady Sherlock, P.E.
Director, Division of Design
Design & Construction

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Control panel enclosures.
2. Humidistats.
3. Thermostats.
4. Control air dampers.
5. Electric damper actuators.

B. Related Requirements:

1. Section 230553 - Identification for HVAC Piping and Equipment: Nameplates and labeling for control panels specified in this Section.
2. Section 233300 - Air Duct Accessories: Installation requirements for dampers and other duct-mounted products furnished in this Section.
3. Section 260502 - Basic Electrical Materials And Methods For Direct Digital Building Control System: Execution requirements for electric connections specified by this Section.

1.2 REFERENCE STANDARDS

A. Air Movement and Control Association International, Inc.:

1. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating.

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of control components in duct systems with work of Section 233300 - Air Duct Accessories.

1.4 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Section 013300 - Submittal Procedures: Requirements for submittals.

E. Product Data:

1. Submit description and engineering data for each control system component, including sizing as applicable.

F. Shop Drawings:

1. Indicate operating data, system drawings, wiring diagrams, and written, detailed operational description of sequences.
2. Coordinate submittals with information requested in Section 230993 - Sequence of Operations for HVAC Controls.

G. Manufacturer's Instructions: Submit installation requirements for each control component.

H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

I. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

J. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

K. Manufacturer’s installation instructions shall be provided along with product data.

L. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

1.6 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for closeout procedures.

B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.

C. Operation and Maintenance Data: Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Extra Stock Materials:

1. Furnish 1 of each type of thermostat and humidistat.

1.8 QUALITY ASSURANCE

A. Control Air Damper Performance: According to AMCA 500-D “Laboratory Methods of Testing Dampers for Rating”.

1.9 QUALIFICATIONS

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

B. Installer: Company specializing in performing Work of this Section with minimum three years’ experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept controls on-Site in original factory packaging and inspect for damage.

C. Store materials according to manufacturer's instructions.

1.11 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CONTROL COMPONENT MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Alerton Inc.
2. American Auto-Matrix.
3. Automated Logic Corporation.
4. Delta Controls Inc.
5. Distech Controls.
6. Honeywell International Inc.
7. Invensys Building Systems.
8. Johnson Controls, Inc.
9. KMC Controls (formerly Kreuter Manufacturing Company).
10. Reliable Controls Corporation.
11. Schneider Electric USA, Inc.
12. Siemens Industry, Inc., Building Technologies Division.
13. Teletrol Systems Incorporated.
14. Trane.
15. Approved equivalent.

B. Manufacturers:

1. Substitutions: Section 016000 - Product Requirements.

2.2 CONTROL PANEL ENCLOSURES

A. Furnish enclosure for each system under automatic control.

B. Equipment Mounting:

1. Within Cabinet: Relays and controls.
2. Flush on Cabinet Panel Face: Temperature indicators, pressure gages, pilot lights, push buttons, and switches.

C. Construction:

1. Comply with NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”, Type 1.
2. Material: Steel.

D. Covers:

1. Continuous hinge.
2. Closure: Flush latch operable by key.

E. Finish: Manufacturer's standard enamel

2.3 HUMIDISTATS

A. Manufacturers:

1. Substitutions: Section 016000 - Product Requirements

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Schneider Electric USA, Inc.
2. Approved equivalent.

C. Room Humidistats:

1. Type: Wall mounted; proportioning.
2. Throttling Range: Adjustable, 2 to 5 percent relative humidity.
3. Operating Range: 30 to 80 percent.
4. Maximum Temperature: 110 degrees F (43 degrees C).
5. Covers: Furnish set point indication.

2.4 THERMOSTATS

A. Manufacturers:

1. Substitutions: Section 016000 - Product Requirements.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Honeywell International Inc.
2. Siemens Industry, Inc., Building Technologies Division.
3. Approved equivalent.

C. Line Voltage Thermostats:

1. Selector Switch:

a. Integral.
b. Manual HAND-OFF-AUTO.
c. Single-pole.

2. Dead Band: Maximum 2 degrees F (1 degree C).
3. Cover: Locking with set point adjustment.

D. Room Thermostat Accessories:

1. Furnish insulating bases for thermostats located on exterior walls.
2. Thermostat Guards:

a. Material: Metal.
b. Mounting: On separate base from thermostat.

3. Adjusting Key: Manufacturer's standard.

2.5 CONTROL AIR DAMPERS

A. Manufacturers:

1. Substitutions: Section 016000 - Product Requirements.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arrow United Industries.
2. Ruskin Company.
3. Approved equivalent.

C. Frames:

1. Materials: Galvanized steel, welded or riveted with corner reinforcement.
2. Minimum Thickness: 16 gage (1.6 mm).

D. Blades:

1. Material: Galvanized steel.
2. Blade Size:

    a. Width: 6 inches (150 mm).
    b. Length: 48 inches (1.2 m).
    c. Minimum Thickness: 22 gage (0.85 mm).

3. Attach to minimum 1/2-inch (13-mm) shafts with set screws.

E. Seals:

1. Blades:

    a. Material: Synthetic elastomeric.
    b. Mechanically attached.
    c. Field replaceable.

2. Jambs: Stainless-steel spring.

F. Bearings:

1. Shaft: Molded-synthetic sleeve, mounted in frame.
2. Linkage: concealed in frame, plated steel.

G. Outside Air Damper Leakage: Maximum rate of 3 cfm per sq. ft. (0.13 L/s per sq m) at 1-inch wg (250-Pa) pressure differential.

H. Maximum Pressure Differential: 6-inch wg (1.5 kPa).

I. Temperature Limits: Minus 40 to 200 degrees F (Minus 40 to 93 degrees C).

2.6 ELECTRIC DAMPER ACTUATORS

A. Manufacturers:

1. Substitutions: Section 016000 - Product Requirements.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belimo
2. Bettis
3. Siemens
4. Approved equivalent.

C. Operation: Two position, spring return.

D. Enclosure: Comply with NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”, Type 1.

E. Mounting: Direct.

F. Stroke:

1. Full Stroke: 90 seconds, end to end.
2. Spring Return: 15 seconds, return to normal.

G. Protection: Electronic stall.

H. Electrical Characteristics:

1. Control Input: Zero to 10 V dc or zero to 20 mA dc.

I. Nominal Power: 24 or 120V ac as indicated on plans.

J. Torque: Sized for minimum 150 percent of required duty.

K. Duty Cycle: Rated for 65,000 cycles.

L. Accessories:

1. Cover-mounted transformer.
2. Auxiliary potentiometer.
3. Damper linkage.
4. Direct-drive feedback potentiometer.
5. Output position feedback.
6. Field-selectable, rotational, spring return direction.
7. Field-adjustable zero and span.
8. End switch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that air-handling units and ductwork installation has been completed and that air filters are in place before installing sensors in airstreams.

C. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings before installation.

D. Verify that building systems to be controlled are ready to operate.

3.2 INSTALLATION

A. Thermostats and Humidistats:

1. Install after locations have been coordinated with other work.
2. Install 48 inches (1.2 m) above floor.
3. Align with light switches.

B. Thermostats:

1. Install guards on thermostats in public areas and high security areas.

C. Control Panels:

1. Install control panels adjacent to associated equipment on vibration-free walls or freestanding supports.
2. Use one cabinet for more than one system in same equipment room.
3. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face, as specified in Section 230553 - Identification for HVAC Piping and Equipment.
4. Label with appropriate equipment or system designation as specified in Section 230553 - Identification for HVAC Piping and Equipment.
5. Install HAND-OFF-AUTO switches to override automatic interlock controls when switch is in HAND position.

D. Install conduit and electrical wiring as specified in Section 260502 - Basic Electrical Materials And Methods For Direct Digital Building Control System.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. After completion of installation, test and adjust control equipment.

C. Submit data showing set points and final adjustments of controls.

D. Calibration:

1. Check calibration of instruments.
2. Recalibrate instruments out of calibration.
3. Replace defective instruments.

E. Manufacturer Services: Furnish services of manufacturer’s representative experienced in installation of products furnished under this Section for not less than 6 days on-Site for installation, inspection, field testing, and instructing Director’s Representative’s personnel in maintenance of equipment.

F. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified, and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

G. Furnish Installation Certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.4 DEMONSTRATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate complete operation of systems, including sequence of operation, equipment startup, shutdown, routine maintenance, and emergency repair procedures, to Director’s Representative's personnel.

3.5 MAINTENANCE

A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance service.

END OF SECTION

SECTION 260502 - BASIC ELECTRICAL MATERIALS AND METHODS FORDIRECT DIGITAL BUILDING CONTROL SYSTEM

PART 1 GENERAL

1.1 REFERENCES

A. NEMA, ANSI, and UL.

1.2 SUBMITTALS

A. Product Data:

1. Catalog sheets, specifications and installation instructions.
2. Statement from the Company producing the system, for each size and type of cable proposed for communication bus use, indicating that the electrical characteristics meet the requirements of the Company.
3. For fire rated construction, prove that materials and installation methods proposed for use are in accordance with the listing requirements of the classified construction.

B. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel this specification section, if available. A statement of the contractor's good faith effort to obtain the EPD shall be provided if not available.

1. Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

PART 2 PRODUCTS

2.1 RACEWAYS, FITTINGS AND ACCESSORIES

A. Rigid Ferrous Metal Conduit: Steel, hot dipped galvanized on the outside and inside, UL categorized as Rigid Ferrous Metal Conduit (identified on UL Listing Mark as Rigid Metal Conduit - Steel or Rigid Steel Conduit), by Allied Tube & Conduit Corp., LTV Copperweld, or Wheatland Tube Co.

B. Intermediate Ferrous Metal Conduit: Steel, galvanized on the outside and enameled on the inside, UL categorized as Intermediate Ferrous Metal Conduit (identified on UL Listing Mark as

Intermediate Metal Conduit or IMC), by Allied Tube & Conduit Corp., LTV Copperweld, or Wheatland Tube Co.

C. Electrical Metallic Tubing: Steel, galvanized on the outside and enameled on the inside, UL categorized as Electrical Metallic Tubing (identified on UL Listing Mark as Electrical Metallic Tubing), by Allied Tube & Conduit Corp., LTV Copperweld, or Wheatland Tube Co.

D. Flexible Metal Conduit: Galvanized steel strip shaped into interlocking convolutions, UL categorized as Flexible Metal Conduit (identified on UL Listing Mark as Flexible Steel Conduit or Flexible Steel Conduit Type RW), by AFC Cable Systems Inc., Anamet Electrical Inc., Electri-Flex Co., or International Metal Hose Co.

E. Liquid-tight Flexible Metal Conduit: UL categorized as liquid-tight flexible metal conduit (identified on UL Listing Mark as Liquid-Tight Flexible Metal Conduit, also specifically marked with temperature and environment application data), by AFC Cable Systems Inc., Anamet Electrical Inc., Electri-Flex Co., or Universal Metal Hose Co.

F. Surface Metal Raceway, Fittings and Accessories: By Thomas & Betts Corp., Mono-Systems Inc. or Wiremold Co. Area and conductor capacity indicated for each size raceway is for reference. Follow manufacturer's recommended raceway capacity for all types and sizes of conductors:

1. Size 1: Nominal area .3 sq. in. min., 4 No. 12 THW max.; Thomas & Betts B400, Mono-Systems SMS 700, or Wiremold's V700.
2. Size 2: Nominal area .75 sq. in. min., 11 No. 12 THW max.; Thomas & Betts SR250, Mono-Systems SMS2100, Wiremold's 2100.
3. Size 3: Nominal area 2.8 sq. in. min., 43 No. 12 THW max.; Thomas & Betts SR500, Mono-Systems SMS3200, or Wiremold's G3000.

G. Wireways, Fittings and Accessories:

1. NEMA 1 (Without Knockouts): Hoffman Enclosures Inc. Bulletin F-40, Hubbell/Wegmann's HSK, Lee Products Co.'s S Series, Rittal/Electromate's EW & EWHC Lay-In Wireway System, or Square D Co.'s Square-Duct Class 5100.

H. Insulated Bushings, Plastic Bushings, Insulated Grounding Bushings: By Appleton Electric Co., Cooper/Crouse-Hinds, OZ/Gedney Co., or Thomas & Betts Corp.

I. Connectors and Couplings:

1. Locknuts: UL, steel/zinc electroplate; Appleton Electric Co.'s BL-50 Series, Cooper/Crouse-Hinds' 11 Series, OZ/Gedney Co.'s 1-50S Series, Raco Inc.'s 1002 Series, Steel City/T&B Corp.'s LN-101 Series, or Thomas & Betts Corp.'s 141 Series.

2. Couplings (For Rigid Metal and IMC Conduit): Standard galvanized threaded couplings as furnished by conduit manufacturer, Allied Tube & Conduit Corp.'s Kwik-Couple, or Thomas & Betts Corp.'s Shamrock.
3. Three Piece Conduit Coupling (For Rigid Metal and IMC Conduit): Steel, malleable iron, zinc electroplate; Allied Tube & Conduit Corp.'s Kwik-Couple, Appleton Electric Co.'s EC-50 Series, Cooper/Crouse-Hinds' 190M Series, OZ/Gedney Co.'s 4-50 Series, Raco Inc.'s 1502 Series, Steel City/T & B Corp.s EK-401 Series, or Thomas & Betts Corp.'s 675 Series.
4. Electrical Metallic Tubing Couplings and Insulated Connectors: Compression type, steel/zinc electroplate; Appleton Electric Co.'s TW-50CS1, TWC-50CS Series, Cooper/Crouse-Hinds' 1650, 660S Series, Raco Inc.'s 2912, 2922 Series, Steel City/T & B Corp.'s TC-711 Series, or Thomas & Betts Corp.'s 5120, 5123 Series.
5. Flexible Metal Conduit Connectors: Arlington Industries Inc.'s Saddle-Grip, OZ/Gedney Co.'s C-8T, 24-34T, ACV-50T Series, or Thomas & Betts Corp.'s Nylon Insulated Tite-Bite Series.
6. Liquid-tight Flexible Metal Conduit Connectors:

    a. Dry, Damp Locations: Steel, malleable iron, zinc electroplate, insulated throat; Appleton Electric Co.'s STB Series, Cooper/Crouse-Hinds' LTB Series, OZ/Gedney Co.'s 4Q-50T Series, Raco Inc.'s 3512 Series, Steel City/T & B Corp.'s LT-701 Series, or Thomas & Betts Corp.'s 5332 Series.
    b. Wet Locations: OZ/Gedney Co.'s 4Q-TG Series (hot-dip/mechanically galvanized), or Thomas & Betts Corp.'s 3322 Series (PVC coated).

J. Conduit Bodies (Threaded):

1. Dry, Damp Locations: Zinc electroplate malleable iron or cast-iron alloy bodies with zinc electroplate steel covers; Appleton Electric Co.'s Unilets, Cooper/Crouse-Hinds' Condulets, OZ/Gedney Co.'s Conduit Bodies, or Thomas & Betts Corp.'s Conduit Bodies.
2. Wet Locations: Malleable iron or cast-iron alloy bodies and covers with hot dipped galvanized or other specified corrosion resistant finish; Cooper/Crouse-Hinds' Condulets (Corro-free epoxy powder coat), Thomas & Betts Corp.'s Conduit Bodies (hot dipped galvanized), or OZ/Gedney Co.'s Conduit Bodies (hot dipped galvanized). Stainless steel cover screws, covers gasketed to suit application.

K. Expansion Fittings:

1. Dry, Damp Locations:

    a. Malleable iron, zinc electroplate finish: Appleton Electric Co.'s XJ or OZ/Gedney Co.'s AX (TX for EMT), with external bonding jumper.
    b. Electrogalvanized Steel: Cooper/Crouse-Hinds' XJG (XJG-EMT for EMT), or Thomas & Betts Corp.'s XJG, with internal grounding.

2. Wet Locations: Cooper/Crouse-Hinds XJG (Corro-free epoxy powder coat), OZ Gedney Co.'s AX, EXE (end type, hot dipped galvanized), or Thomas & Betts Corp.'s XJG (hot dipped galvanized).

L. Deflection Fittings:

1. Dry Locations: Appleton Electric Co.'s DF, Cooper/Crouse-Hinds' XD, or OZ/Gedney Co.'s Type DX.
2. Wet Locations: Ductile iron couplings with hot dipped galvanized finish, neoprene sleeve, and stainless-steel bands, Appleton Electric Co.'s CF; or bronze couplings, neoprene sleeve, and stainless-steel bands, OZ/Gedney Co.'s Type DX.

M. Sealing Fittings:

1. Dry, Damp Locations: Appleton Electric Co.'s EYS, ESU w/Kwiko sealing compound and fiber filler, Cooper/Crouse-Hinds' EYS, EZS w/Chico A sealing compound and Chico X filler, OZ/Gedney Co.'s EY, EYA with EYC sealing compound and EYF damming fiber, or Thomas & Betts Corp.'s. EYS w/Chico A sealing compound and Chico X filler.

    a. Other Type Fittings: As required to suit installation requirements, by Appleton Electric Co., Cooper/Crouse-Hinds, OZ/Gedney Co, or Thomas & Betts Corp.

2. Wet Locations: Malleable iron body with hot dipped/mechanically galvanized finish, neoprene sleeve, and stainless-steel bands, Appleton electric Co.'s CF; or bronze couplings, neoprene sleeve, and stainless-steel bands, OZ/Gedney Co.'s Type DX.

    a. Horizontal: Cooper/Crouse-Hinds' EYS with Chico A sealing compound and Chico X filler, OZ/Gedney Co.'s EYD with EYC sealing compound and EYF damming fiber, or Thomas & Betts Corp.'s. EYS w/Chico A sealing compound and Chico X filler.
    b. Vertical (with Drain): Cooper/Crouse-Hinds with Chico A sealing compound and Chico X filler, OZ/Gedney Co.'s EY, EYA with EYC sealing compound and EYF damming fiber, or Thomas & Betts Corp.'s. w/Chico A sealing compound and Chico X filler.
    c. Other Type Fittings. As required to suit installation requirements, by Cooper/Crouse-Hinds, OZ/Gedney Co., or Thomas & Betts Corp. with hot dipped/mechanically galvanized finish or epoxy powder coat.

N. Sealant for Raceways Exposed to Different Temperatures: Sealing compounds and accessories to suit installation; Appleton Electric Co.'s DUC, or Kwiko Sealing Compound with fiber filler, Cooper/Crouse-Hinds' Chico A Sealing Compound with Chico X fiber, Electrical Products Division 3M Scotch products, OZ Gedney Co.'s DUX or EYC sealing compound with EYF damming fiber, or Thomas & Betts Corp.'s Blackburn DX.

O. Vertical Conductor Supports:

    a. Dry, Damp Locations: Kellems/Hubbell Inc.'s Conduit Riser Grips, or OZ/Gedney Co.'s Type M, Type R.
    b. Wet Locations: Kellems/Hubbell Inc.'s Conduit Riser Grips (stainless steel or tin coated bronze), or OZ/Gedney Co.'s hot dipped galvanized finish Type CMT or Type W.

2.2 OUTLET, JUNCTION AND PULL BOXES

A. Galvanized Steel Boxes For Concealed Work: Standard galvanized steel boxes and device covers by Appleton Electric Co., Beck Mfg./Picoma Industries, Cooper/Crouse-Hinds, Raco/Div. of Hubbell , or Steel City/T & B Corp.

B. Galvanized Steel Junction and Pull Boxes For Exposed Work: Code gage, galvanized steel screw cover boxes by Delta Metal Products Inc., Hoffman Enclosures Inc., Hubbell Wiegmann, Lee Products Co., or Rittal/Electromate.

C. Threaded Type Boxes For Exposed Work:

1. Outlet Boxes:

   a. For Dry, Damp Locations: Zinc electroplate malleable iron or cast-iron alloy boxes by Appleton Electric Co., Cooper/Crouse-Hinds Co., OZ/ Gedney Co., or Thomas & Betts Corp. with zinc electroplate steel covers to suit application.
   b. For Wet Locations: Malleable iron or cast-iron alloy boxes with hot dipped galvanized or other specified corrosion resistant finish as produced by Cooper/Crouse-Hinds (hot dipped galvanized or Corro-free epoxy powder coat), OZ/Gedney Co. (hot dipped galvanized), or Thomas & Betts Corp. (hot dipped galvanized) with stainless steel cover screws, and malleable iron covers gasketed to suit application.

2. Junction And Pull Boxes:

   a. For Dry, Damp Locations: Zinc electroplate cast iron boxes by Appleton Electric Co., Cooper/Crouse-Hinds, OZ/Gedney Co., or Thomas & Betts Corp. with zinc electroplate steel or cast-iron cover.
   b. For Wet Locations: Cast iron boxes by Cooper/Crouse-Hinds' (hot dipped galvanized or Corro-free epoxy powder coat), OZ/Gedney Co. (hot dipped galvanized), or Thomas & Betts Corp. (hot dipped galvanized) with stainless steel cover screws and cast-iron cover gasketed to suit application.

3. Conduit Bodies, Threaded (Provided with a Volume Marking):

   a. For Dry, Damp Location: Zinc electroplate malleable iron or cast-iron alloy bodies with zinc electroplate steel covers; Appleton Electric Co.'s Unilets, Cooper/Crouse-Hinds' Condulets, OZ/Gedney Co.'s Conduit Bodies, or Thomas & Betts Corp.'s Conduit Bodies.
   b. For Wet Locations: Malleable iron or cast-iron alloy bodies with hot dipped galvanized or other specified corrosion resistant finish; Cooper/Crouse-Hinds' Condulets (hot dipped galvanized or Corro-free epoxy power coat), OZ/Gedney Co.'s Conduit Bodies (hot dipped galvanized), or Thomas & Betts Corp.'s Conduit Bodies (hot dipped galvanized) with stainless steel cover screws and malleable iron covers gasketed to suit application.

D. Specific Purpose Outlet Boxes: As fabricated by manufacturers for mounting their equipment.

E. Outlet Boxes and Related Products for Fire Rated Construction:

1. Parameters For Use of Listed Metallic Outlet or Device Boxes: UL Electrical Construction Equipment Directory - Metallic Outlet Boxes (QCIT).
2. Wall Opening Protective Materials: As listed in UL Fire Resistance Directory - Wall Opening Protective Materials (CLIV), or UL Electrical Construction Equipment Directory - Wall Opening Protective Materials (QCSN).

2.3 CONDUCTORS AND ACCESSORIES

A. Date of Manufacture: No insulated conductor over one year old when delivered to the site will be acceptable.

B. Conductors: Annealed uncoated copper or annealed coated copper in conformance with the applicable standards for the type of insulation to be applied on the conductor.

C. Types for Power and Class 1, 2 and 3 Circuits:

1. Power Wiring:

a. General: Rated 600V, NFPA 70 Type FEP, THHN, THW, THW-2, THWN, THWN-2, XHH, XHHW, XHHW-2.

2. Class 1 Wiring:

a. No. 18 and No. 16 AWG: Insulated copper conductors suitable for 600 volts, NFPA 70 types KF-2, KFF-2, PAFF, PF, PFF, PGF, PGFF, PTFF, SF-2, SFF-2, TF, TFF, TFN, TFFN, ZF, or ZFF.
b. Larger than No. 16 AWG: Insulated copper conductors suitable for 600 volts, in compliance with NFPA 70 Article 310.
c. Conductor with other types and thickness of insulation may be used if listed for Class 1 circuit use.

3. Class 2 Wiring:

a. Multiconductor Cables: NFPA 70 Article 725, Types CL2P, CL2R, CL2.
b. Other types of cables may be used in accordance with NFPA 70 Table 725-61 “Cable Uses and Permitted Substitutions”, as approved.

4. Class 3 Wiring:

a. Single Conductors No. 18 and No. 16 AWG: Same as Class 1 No. 18 and No. 16 AWG conductors, except that:

1) Conductors are also listed as CL3.
2) Voltage rating not marked on cable except where cable has multiple listings and voltage marking is required for one or more of the listings.

b. Multiconductor Cables: NFPA 70 Article 725, Types CL3P, CL3R, CL3.
c. Other types of cables may be used in accordance with NFPA 70, Table 725-61 "Cable Uses and Permitted Substitutions", as approved.

D. Types for Interior Communication Bus Circuits:

1. Number of conductors and conductor size as recommended by the Company producing the system, except that conductor size shall not be less than No. 18 AWG.
2. Multiconductor Cables NEC Type PLTC:

a. Insulated copper conductors.
b. Cable shall have a voltage rating of not less than 300 volts.

3. Conductors twisted, shielded and jacketed as recommended by the Company producing the system.
4. All electrical characteristics shall meet the requirements of the Company producing the system (conductor to conductor capacitance, dc resistance, velocity of propagation, etc.).

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F. 2. Connectors:

1. General: Connectors specified are part of a system. Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system.
2. Splices:

a. Spring Type:

1) Rated 105° C, 600V: Buchanan/Ideal Industries Inc.'s B-Cap, Electrical Products Div./3M's Scotchlok Type Y, R, G, B, O/B+, R/Y+, or B/G+, or Ideal Industries Inc.'s Wing Nuts or Wire Nuts.
2) Rated 150° C, 600V; Ideal Industries Inc.'s High Temperature Wire-Nut Model 73B, 59B.

b. Indent Type with Insulating Jacket:

1) Rated 105° C, 600V: Buchanan/Ideal Industries Inc.'s Crimp Connectors, Ideal Industries Inc.'s Crimp Connectors, Penn-Union Corp.'s Penn-Crimps, or Thomas & Betts Corp.'s STA-KON.

c. Indent Type (Uninsulated): Anderson/Hubbell's Versa-Crimp, VERSAtile, Blackburn/T&B Corp.'s Color-Coded Compression Connectors, Electrical Products Div./3M's Scotchlok 10000, 11000 Series, Framatome Connectors/Burndy's Hydent, Penn-Union Corp.'s BCU, BBCU Series, or Thomas & Betts Corp.'s Compression Connectors.
d. Connector Blocks: NIS Industires Inc.'s Polaris System, or Thomas & Betts Corp.'s Blackburn AMT Series.
e. Resin Splice Kits: Electrical Products Div./3M's Scotchcast Brand Kit Nos. 82A Series, 82-B1 or 90-B1, or Scotchcast Brand Resin Pressure Splicing Method.

f. Heat Shrinkable Splices: Electrical Products Div./3M's ITCSN, Raychem Corp.'s Thermofit Type WCS, or Thomas & Betts Corp.'s SHRINK-KON Insulators.
g. Cold Shrink Splices: Electrical Products Div./3M's 8420 Series.

G. Terminals: Nylon insulated pressure terminal connectors by Amp-Tyco/Electronics, Electrical Products Div./3M, Framatome Connectors/Burndy, Ideal Industries Inc., Panduit Corp., Penn-Union Corp., Thomas & Betts Corp., or Wiremold Co.

H. Insulation Tapes:

1) Plastic Tape: Electrical Products Div./3M's Scotch Super 33+ or Scotch 88, Plymouth Rubber Co.'s Plymouth/ Bishop Premium 85CW.
2) Rubber Tape: Electrical Products Div./3M's Scotch 130C, or Plymouth Rubber Co.'s Plymouth/Bishop W963 Plysafe.

I. Moisture Sealing Tape: Electrical Products Div./3M's Scotch 2200 or 2210, or Plymouth Rubber Co.'s Plymouth/Bishop 4000 Plyseal-V.

J. Wire Management Products: Cable clamps and clips, cable ties, spiral wraps, etc., by Catamount/T&B Corp., or Ideal Industries, Inc.

2.4 SUPPORTING DEVICES

A. "C" Beam Clamps:

1. For 1 Inch Conduit Maximum: B-Line Systems Inc.'s BG-8-C2, BP-8-C1 Series, or Caddy/Erico Products Inc.'s BC-8P and BC-8PSM Series.
2. For 3 Inch Conduit Maximum: Appleton Electric Co.'s BH-500 Series beam clamp with H50WB Series hangers, Kindorf/T&B Corp.'s 500 Series beam clamp with 6HO-B Series hanger, or OZ/Gedney Co.'s IS-500 Series beam clamp with H-OWBS Series hanger.
3. For 1/4 Inch Hanger Rods: B-Line Systems Inc.'s BC, Caddy/Erico Products Inc.'s BC, Kindorf/T&B Corp.'s 500, 510, or Unistrut Corp.'s P1648S, P2398S, P2675, P2676.
4. For 3/8 Inch Hanger Rods: Caddy/Erico Products Inc.'s BC, Kindorf/T&B Corp.'s 231-3/8, 502, or Unistrut Corp.'s P1649AS, P2401S, P2675, P2676.

B. Pipe Straps: Two-hole steel conduit straps; Kindorf/T&B Corp.'s C-144 Series, or Unistrut Corp.'s P-2558 Series.

C. Pipe Clamps: One-hole malleable iron clamps; Kindorf/T&B Corp.'s HS-400 Series, or OZ/ Gedney Co.'s 14-G Series.

D. Supporting Fastener (Metal Stud Construction): Metal stud supports, clips and accessories as produced by Caddy/Erico Products Inc.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide wiring for the Direct Digital Building Control System.

1. Provide Class 1, 2, and 3 wiring, communication bus wiring and connections.
2. Provide power wiring from DDC System equipment to nearest electrical panelboard. Coordinate source with Electrical Work Contractor.

3.2 RACEWAY INSTALLATION

A. Conduit Installed Concealed:

1. Install conduit concealed unless otherwise indicated on the drawings.
2. Existing Construction:

    a. Run conduit in existing chases and hung ceilings.
    b. If conduit cannot be installed concealed due to conditions encountered in the building, report such conditions and await approval in writing before proceeding.

3. New Construction:

    a. Run conduit in the ceilings, walls, and partitions.
    b. Conduit may not be installed in concrete floor slab (concrete slabs that are both ceilings and floors shall be treated as floor slabs).

B. Conduit Installed Exposed:

1) Install conduit exposed where indicated on the drawings. If not indicated, conduit may be installed exposed, as approved, in:

    a. Unfinished spaces, and finished spaces housing mechanical or electrical equipment that is generally accessible only to facility maintenance personnel.
    b. Areas where existing conduits have been installed exposed.
    c. Areas where conduit cannot be installed concealed.

2) Install conduit tight to the surface of the building construction. Exceptions:

a. Where otherwise indicated or directed.
b. Where conduit is exposed in wet locations. Install entire wiring system including conduit, boxes, and fittings so that there is 1/4-inch air space between it and the wall or supporting surface.

3) Install vertical runs perpendicular to the floor.
4) Install runs on the ceiling perpendicular or parallel to the walls.
5) Install horizontal runs parallel to the floor.
6) Do not run conduits near heating pipes.
7) Installation of conduit directly on the floor will not be permitted.

D. Conduit Size: Not smaller than 1/2-inch electrical trade size.

E. Raceways Exposed to Different Temperatures: Where portions of an interior raceway system are exposed to widely different temperatures, seal interior and exterior of raceway to prevent circulation of air from a warmer to a colder section through the raceway installation.

1. Refrigerated Rooms: Install conduit body or junction box in the raceway system on warm side of refrigerated room. After conductors are installed, seal interior of the raceway at the conduit body or junction box.
2. Heated Areas to Unheated Areas: After conductors are installed, seal interior of the raceway at the nearest conduit body, outlet or junction box in the heated area adjoining the unheated area.

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H. Conduit in Waterproofed Floors: Install conduit runs in waterproof floors to avoid penetrating the waterproofing. Avoid penetration of waterproofing with conduit risers so far as practicable.

1. Where it is necessary to puncture the waterproofing for a conduit riser, install a standard weight steel pipe sleeve extending one inch above the finished floor level. Flash the steel pipe sleeve to the waterproofing with 16-ounce copper. Construct the flashing with a copper tube extending the full height of the sleeve, soldered to a copper base extending 6 inches in all directions from the sleeve.
2. The flashing will be integrated into the waterproofing by the Construction Contractor. Provide solid cast brass floor plates with chromium finish where pipe sleeves are exposed in rooms.

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J. Raceway Schedule:

1. Rigid Ferrous Metal Conduit: Install in all locations unless otherwise specified or indicated on the drawings.
2. Intermediate Metal Conduit: May be installed in all locations except:

a. Hazardous areas.
b. Where other type raceways are specified or indicated on the drawings.

3. Electrical Metallic Tubing:

    a. May be installed concealed above suspended ceilings where conduit does not support equipment.
    b. May be installed concealed in hollow areas in dry locations, including:

        1) Hollow concrete masonry units, except where cores are to be filled.
        2) Drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

    c. May be installed exposed in dry non-hazardous locations at elevations over 10'-0" above finished floor where conduit does not support equipment.

4. Flexible Metal Conduit: Install equipment grounding conductor in the flexible metal conduit and bond at each box or equipment to which conduit is connected:

    a. Use 1 to 3 feet of flexible metal conduit for final conduit connection to:

        1) Equipment subject to vibration (dry locations)
        2) Equipment requiring flexible connection for adjustment or alignment (dry locations).

    b. Use above existing non-removable suspended ceilings where rigid type raceways cannot be installed due to inaccessibility of space above ceiling.
    d. May be installed concealed in drywall construction with sheet metal studs, except where studs are less than 3-1/2 inches deep.

5. Liquid-tight Flexible Metal Conduit: Install equipment grounding conductor in liquid-tight flexible metal conduit and bond at each box or equipment to which conduit is connected:

    a. Use 1 to 3 feet of liquid-tight flexible metal conduit (UL listed and marked suitable for the installation's temperature and environmental conditions) for final conduit connection to:

        1) Equipment subject to vibration (damp and wet locations).
        2) Equipment requiring flexible connection for adjustment or alignment damp and wet locations).

6. Surface Metal Raceway: Use as exposed raceway system in finished spaces at locations, when approved, where raceways cannot be installed concealed:

    a. Use surface metal raceway system of size required for number of wires to be installed therein.
    b. Do not run raceway through walls that have a plaster finish nor through masonry walls or floors. Install a pipe sleeve, or a short length of conduit with junction boxes or adapter fittings for raceway runs through such areas. Run raceway along top of baseboards, care being taken to avoid telephone and other signal wiring. Where raceway crosses chair railing or picture molding, cut the chair railing or picture molding to permit the raceway to lie flat against the wall. Run raceway around door

frames and other openings. Run raceway on ceiling or walls perpendicular to or parallel with walls and floors.

c. Secure raceway at intervals not exceeding 36 inches.

d. Where equipment is mounted on an outlet box and the equipment base is larger than the outlet box, provide finishing collar around equipment base and outlet box or provide finishing collar/outlet box:

1) Finishing Collar: Same finish and peripheral dimensions as the equipment base, including provisions for mounting, slots to fit over raceway and of depth to cover outlet box and extend back to ceiling or wall.

2) Combination Finishing Collar/Outlet Box: Same finish and peripheral dimensions as the equipment base to be mounted thereon, gage or thickness of metal as required by National Electrical Code, including provision for mounting and knockouts for entrance of raceway.

7) Wireways: May be used indoors in dry locations for exposed raceway between grouped, wall mounted equipment.

K. Fittings and Accessories Schedule:

1. General:

a. Use zinc electroplate or hot dipped galvanized steel/malleable iron or cast alloy fittings and accessories in conjunction with ferrous raceways in dry and damp locations unless otherwise specified or indicated on the drawings.

b. Use malleable iron or cast iron alloy fittings and accessories having hot dipped/mechanically galvanized finish or other specified corrosion resistant finish in conjunction with ferrous raceways in wet locations unless otherwise specified or indicated on the drawings.

c. Use caps or plugs to seal ends of conduits until wiring is installed (to exclude foreign material).

d. Use insulated grounding bushings on the ends of conduits that are not directly connected to the enclosure (such as stub-ups under equipment, etc.) and bond between bushings and enclosure with equipment grounding conductor.

e. Use expansion fittings where raceways cross expansion joints.

f. Use deflection fittings where raceways cross expansion joints that move in more than one plane.

g. Use 2 locknuts and an insulated bushing on end of each conduit entering sheet metal cabinet or box in dry or damp locations.

1) Plastic bushing may be used in lieu of insulated bushing on 1/2- and 3/4-inch conduit.

2) Terminate conduit ends within cabinet/box at the same level.

h. Use watertight hub on end of each conduit entering cabinets or boxes (in wet locations) that are not constructed with integral threaded hubs.

2. For Rigid and Intermediate Metal Conduit: Use threaded fittings and accessories. Use 3-piece conduit coupling where neither piece of conduit can be rotated.

3. For Electrical Metallic Tubing: Use compression type connectors and couplings.
4. For Flexible Metal Conduit: Use flexible metal conduit connectors.
5. For Liquid-tight Flexible Metal Conduit: Use liquid-tight connectors.
6. For Surface Metal Raceway: Use raceway manufacturer's standard fittings and accessories.
7. For Wireways: Use wireway manufacturer's standard fittings and accessories.

3.3 OUTLET, JUNCTION AND PULLBOX INSTALLATION

A. Box Schedule For Concealed Conduit System:

1. Non-Fire Rated Construction:

   a. Depth: To suit job conditions and comply with NFPA 70 Article 370.
   b. For Junction and Pull Boxes: Use galvanized steel boxes with flush covers.
   c. For Devices:

      1) Plaster or Cast-In-Place Concrete Walls: Use 4 inch or 4-11/16 inch galvanized steel boxes with device covers.
      2) Walls Other Than Plaster or Cast-In-Place Concrete: Use type of galvanized steel box which will allow wall plate to cover the opening made for the installation of the box.

2. Recessed Boxes in Fire Rated (2 hour maximum) Bearing and Nonbearing Wood or Steel Stud Walls (Gypsum Wallboard Facings):

   a. Use listed single and double gang metallic outlet and device boxes. The surface area of individual outlet or device boxes shall not exceed 16 square inches.
   b. The aggregate surface area of the boxes shall not exceed 100 square inches per 100 square feet of wall surface.
   c. Securely fasten boxes to the studs. Verify that the opening in the wallboard facing is cut so that the clearance between the box and the wallboard does not exceed 1/8 inch.
   d. Separate boxes located on opposite sides of walls or partitions by a minimum horizontal distance of 24 inches. This minimum separation distance may be reduced when wall opening protective materials are installed according to the requirements of their classification.
   e. Use wall opening protective material in conjunction with boxes installed on opposite sides of walls or partitions of staggered stud construction in accordance with the classification requirements for the protective material.

3. Other Fire Rated Construction: Use materials and methods to comply with the listing requirements for the classified construction.

B. Box Schedule For Exposed Conduit System:

1. Dry and Damp Locations: Use zinc electroplate or hot dipped galvanized threaded type malleable iron or cast-iron alloy outlet, junction, and pull boxes or conduit bodies provided with a volume marking in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.

    a. Galvanized steel boxes may be used in conjunction with conduit sizes over 1 inch in non-hazardous dry and damp locations.
    b. Galvanized steel boxes may be used in conjunction with electrical metallic tubing where it is installed exposed as branch circuit conduits at elevations over 10’-0” above finished floor.

2. Wet Locations: Use threaded type malleable iron or cast-iron alloy outlet junction and pull boxes or conduit bodies (provided with a volume marking) with hot dipped galvanized or other specified corrosion resistant coating in conjunction with ferrous raceways unless otherwise specified or indicated on the drawings.
3. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Equipment Used With Exposed Raceway):

    a. Use finishing collar where surface mounted equipment is installed on an exposed raceway outlet box and the equipment base is larger than the outlet box.
    b. Use combination finishing collar/outlet box where surface mounted equipment is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into equipment body due to equipment design.

C. Specific Purpose Outlet Boxes: Use to mount equipment when available and suitable for job conditions. Unless otherwise specified, use threaded type boxes with finish as specified for exposed conduit system, steel (painted) for surface metal raceway system and galvanized steel for recessed installations.

3.4 CONDUCTOR INSTALLATION

A. Install conductors in raceways.

1. Exceptions:

    a. Raceway is not required for plenum rated Class 2, or Class 3 circuits, or communication bus circuits installed above suspended ceilings.

B. Conductor Size: Install conductors of size shown on drawings or specified. Where conductor size is not indicated, the minimum size allowed is:

1. For Power Circuits: No. 12 AWG.
2. For Class 1 Circuits:

    a. No. 18 and No. 16 AWG may be used provided they supply loads that do not exceed 6 amps (No. 18 AWG), or 8 amps (No. 16 AWG).

b. Larger than No. 16 AWG: Use to supply loads not greater than the ampacities given in NFPA 70 Section 310-15.

3. For Class 2 Circuits: Any size to suit application.
4. For Class 3 Circuits: No. 18 AWG.
5. For Communication Bus Circuits: No. 18 AWG.

C. Color Code for Wiring: In accordance with ICEA/NEMA WC-30 "Color Coding of Wires and Cables". Other coding methods may be used, as approved.

D. Use wire management products to bundle, route, and support wiring in junction boxes, pullboxes, wireways, gutters, channels, and other locations where wiring is accessible.

E. Insulated Conductor Schedule:

1. Power Circuits:

a. FEP, THHN, THW, THW-2, THWN, THWN-2, XHH, XHHW, or XHHW-2: Wiring in dry or damp locations (except where special type insulation is required).
b. THWN, THWN-2, XHHW, XHHW-2, USE, or USE-2: Wiring in wet locations (except where type USE or USE-2 insulated conductors are specifically required, or special type insulation is required).

2. Class 1 Circuits: Use Class 1 wiring specified in Part 2 (except where special type insulation is required).
3. Class 2 Circuits: Use Class 2 wiring specified in Part 2 (except where special type insulation is required).
4. Class 3 Circuits: Use Class 3 wiring specified in Part 2 (except where special type insulation is required).
5. Interior Communication Bus Circuits: Use multiconductor cable PLTC.
6. Exterior Communication Bus Circuits:

a. Aerial Cables:

1) Use messenger supported IMSA style cable, or jacketed sunlight resistant type TC cable on pole line.

F. Connector Schedule:

1. Temperature Rating: Use connectors that have a temperature rating, equal to, or greater than the temperature rating of the conductors to which they are connected.
2. Splices:

a. Dry Locations:

1) For Conductors No. 8 AWG or Smaller: Use spring type pressure connectors, indent type pressure connectors with insulating jackets, or connector blocks (except where special type splices are required).

b. Damp Locations: As specified for dry locations, except apply moisture sealing tape over the entire insulated connection (moisture sealing tape not required if heat shrinkable splices or cold shrink splices are used).

c. Wet Locations: Use uninsulated indent type pressure connectors and insulate with resin splice kits, cold shrink splices or heat shrinkable splices. Exception: Splices above ground which are totally enclosed and protected in NEMA 3R, 4, 4X enclosures may be spliced as specified for damp locations.

3. Terminations:

a. For Conductors No. 10 AWG or Smaller: Use terminals for connecting wiring to terminal strips, and to equipment designed for use with terminals.

3.5 SUPPORTING DEVICE INSTALLATION

A. Attachment of Conduit System:

1. Wood Construction: Attach conduit to wood construction by means of pipe straps or pipe clamps and wood screws or lag bolts.
2. Masonry Construction: Attach conduit to masonry construction by means of pipe straps or pipe clamps and masonry anchorage devices.
3. Steel Beams: Attach conduit to steel beams by means of "C" beam clamps and hangers.
4. Conduit Above Suspended Ceiling: Do not rest conduit directly on runner bars, T-bars, etc. Support conduit from ceiling supports or from construction above suspended ceiling.

B. Metal Stud Construction: Attach raceways and boxes to metal studs by means of supporting fasteners manufactured specifically for the purpose.

1. Support and attach outlet boxes so that they cannot torque/twist. Either:

a. Use bar hanger assembly, or:
b. In addition to attachment to the stud, also provide far side box support.

END OF SECTION