

Electrical Material Salient Characteristics

ITEM	QUANTITY	UNIT	ITEM DESCRIPTION
			EMT CONDUIT AND CONNECTORS (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
1	100	FT	1/2" EMT Conduit
2	100	EA	1/2" EMT CONNECTOR, COMPRESSION TYPE
3	100	EA	1/2" EMT COUPLING, COMPRESSION TYPE
4	100	FT	3/4 " EMT CONDUIT
5	100	EA	3/4" EMT CONNECTOR, COMPRESSION TYPE
6	100	EA	3/4" EMT COUPLING, COMPRESSION TYPE
7	100	FT	1 " EMT CONDUIT
8	100	EA	1" EMT CONNECTOR, COMPRESSION TYPE
9	100	EA	1" EMT COUPLING, COMPRESSION TYPE
10	100	FT	1-1/2" EMT CONDUIT
11	100	EA	1-1/2" INCH EMT CONNECTOR, COMPRESSION TYPE
12	100	EA	1-1/2" EMT COUPLING, COMPRESSION TYPE
13	100	FT	2 " EMT CONDUIT
14	100	EA	2" EMT CONNECTOR, COMPRESSION TYPE
15	100	EA	2" EMT COUPLING, COMPRESSION TYPE
16	100	EA	1" EMT 90
17	100	EA	1-1/2" EMT 90
18	100	EA	2" EMT 90
			CONDUIT SUPPORT MATERIAL (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
19	100	EA	1/2" EMT ONE HOLE STRAP
20	100	EA	3/4" EMT ONE HOLE STRAP
21	100	EA	1" EMT ONE HOLE STRAP
22	100	EA	1-1/2" EMT ONE HOLE STRAP
23	100	EA	2" EMT ONE HOLE STRAP
24	100	EA	K-8 CADDY CLIP
25	100	EA	K-12 CADDY CLIP
26	100	EA	K-16 CADDY CLIP
27	100	EA	KX CADDY CLIP
28	100	EA	1/2" EMT UNISTRUT STRAP
29	100	EA	3/4" EMT UNISTRUT STRAP
30	100	EA	1" EMT UNISTRUT STRAP
31	100	EA	1-1/2" EMT UNISTRUT STRAP
32	100	EA	2" EMT UNISTRUT STRAP
33	100	EA	1/4" ALL THREAD
34	100	EA	3/8" ALL THREAD
35	100	EA	5/8" SHALLOW SLOTTED UNISTRUT
36	100	EA	1-5/8" SLOTTED UNISTRUT
37	100	EA	1/4"-20, ZINC PLATED, HEX NUT
38	100	EA	1/4" ALL THREAD ROD COUPLING
39	100	EA	1/4"-20 UNISTRUT SPRING NUT
40	100	EA	3/8"-20, ZINC PLATED, HEX NUT
41	100	EA	3/8" ALL THREAD ROD COUPLING
42	100	EA	3/8"-20 UNISTRUT SPRING NUT
			FASTNERS (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
43	100	EA	1/4" BOLTS
44	100	EA	3/8" BOLTS
45	100	EA	1/4" X 1- 1/4" FENDER WASHER
46	100	EA	1/4 " X 1" FENDER WASHER
47	100	EA	3/8" X 1- 1/4" FENDER WASHER
48	100	EA	3/8" X 1" FENDER WASHER
49	100	EA	1/4" X 3" RED HEAD TRUBOLT WEDGE ANCHOR, ZINC
50	100	EA	3/8" X 3" RED HEAD TRUBOLT WEDGE ANCHOR, ZINC
51	1	EA	DOTTIE 1/4" PLASTIC ANCHOR WITH SCREW
52	1	EA	DOTTIE 3/8" PLASTIC ANCHOR WITH SCREW
53	100	EA	DOTTIE 1/4" X 4" TOGGLE BOLT
54	100	EA	DOTTIE 3/8" X 4" TOGGLE BOLT

Electrical Material Salient Characteristics

55	100	EA	DOTTIE 1/2" X 4" TOGGLE BOLT
56	1,000	EA	8" ZIP TIE, BLACK IN COLOR
57	1,000	EA	8" ZIP TIE, WHITE IN COLOR
58	1,000	EA	12" ZIP TIE, BLACK IN COLOR
59	1,000	EA	12" ZIP TIE, WHITE IN COLOR
60	50	EA	16" EXPANSION SLIDER BRACKET
61	1	EA	DOTTIE #1032PS 10-32 MACHINE SCREW KIT
62	1	EA	DOTTIE #832PS 8-32 MACHINE SCREW KIT
63	1	EA	DOTTIE #632PS 6-32 MACHINE SCREW KIT
			WIRING (see Section 26 05 19 Low-Voltage Electrical Power Conductors and Cables on pages 5-7 for specifications)
64	1000	FT	#12 THHN SOLID COPPER WIRE, BLACK
65	1000	FT	#12 THHN SOLID COPPER WIRE, RED
66	1000	FT	#12 THHN SOLID COPPER WIRE, BLUE
67	1000	FT	#12 THHN SOLID COPPER WIRE, WHITE
68	1000	FT	#12 THHN SOLID COPPER WIRE, GREEN
69	1000	FT	#12 THHN SOLID COPPER WIRE, BROWN
70	1000	FT	#12 THHN SOLID COPPER WIRE, ORANGE
71	1000	FT	#12 THHN SOLID COPPER WIRE, YELLOW
72	1000	FT	#10 THHN SOLID COPPER WIRE, BLACK
73	1000	FT	#10 THHN SOLID COPPER WIRE, RED
74	1000	FT	#10 THHN SOLID COPPER WIRE, BLUE
75	1000	FT	#10 THHN SOLID COPPER WIRE, WHITE
76	1000	FT	#10 THHN SOLID COPPER WIRE, GREEN
77	1000	FT	#8 THHN STRANDED COOPER WIRE, BLACK
78	1000	FT	#6 THHN STRANDED COOPER WIRE, BLACK
79	1000	FT	#4 THHN STRANDED COOPER WIRE, BLACK
80	1000	FT	#2 THHN STRANDED COOPER WIRE, BLACK
81	1000	FT	#1 THHN STRANDED COOPER WIRE, BLACK
82	1000	FT	14/2 MC SOILD COPPER
83	1000	FT	14/3 MC SOILD COPPER
84	1000	FT	12/2 MC SOILD COPPER
85	1000	FT	12/3 MC SOILD COPPER
86	1000	FT	12/4 MC SOILD COPPER
87	100	EA	SNAP-2-IT 3/8" CONNECTORS, ARLINGTON
88	100	EA	3-PORT, IN-SURE PUSH-IN WIRE CONNECTOR, IDEAL BRAND
89	100	EA	4-PORT, IN-SURE PUSH-IN WIRE CONNECTOR, IDEAL BRAND
90	100	EA	6-PORT, IN-SURE PUSH-IN WIRE CONNECTOR, IDEAL BRAND
91	500	EA	ORANGE WIRE NUTS, IDEAL BRAND
92	500	EA	YELLOW WIRE NUTS, IDEAL BRAND
93	500	EA	RED WIRE NUTS, IDEAL BRAND
94	100	EA	BLUE WIRE NUTS, IDEAL BRAND
95	50	EA	GRAY WIRE NUTS, IDEAL BRAND
96	50	EA	GREEN GROUNDING PIG TAILS
97	100	EA	WEATHERROOF WIRE CONNECTORS MODEL 62
98	20	EA	INSULATED MULTI TAP CONNECTOR 3 CONDUCTOR
			ELECTRICAL BOXES (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
99	100	EA	4 X 4 SPECIALS W/ 1/2" AND 3/4" KNOCKOUTS
100	100	EA	4 X 4 W/ 3/4" KNOCKOUTS
101	100	EA	4 X 4 SPECIAL DEEP W/ 1/2" AND 3/4" KNOCKOUTS
102	100	EA	4 X 4 DEEP W/ 3/4" KNOCKOUTS
103	100	EA	4 X 4 DEEP W/ 1" KNOCKOUTS
104	100	EA	4 X 4 SPECIALS W/ 1/2" AND 3/4" KNOCKOUTS, W/ BRACKETS
105	100	EA	4 X 4 W/ 3/4" KNOCKOUTS, W/ BRACKETS
106	100	EA	4 X 4 SPECIAL DEEP W/ 1/2" AND 3/4" KNOCKOUTS, W/ BRACKETS
107	100	EA	4 X 4 DEEP W/ 3/4" KNOCKOUTS, W/ BRACKETS
108	100	EA	2 X 4 ELECTRICAL BOX
109	100	EA	2 X 4 ELECTRICAL BOXES W/ BRACKET
110	100	EA	4 X4 BLANK COVER
111	100	EA	4 X 4 X 5/8" MUD RING SINGLE GANG

Electrical Material Salient Characteristics

112	100	EA	4 X 4 X 5/8" MUD RING TWO GANG
113	100	EA	4 X 4 X 3/4" MUD RING SINGLE GANG
114	100	EA	4 X 4 X 3/4" MUD RING TWO GANG
115	100	EA	4 X 4 X 1" MUD RING SINGLE GANG
116	100	EA	4 X 4 X 1" MUD RING TWO GANG
117	100	EA	4 X 4 X 1-1/2" MUD RING SINGLE GANG
118	100	EA	4 X 4 X 1-1/2" MUD RING TWO GANG
119	100	EA	RISE COVER FOR 4 X 4 BOX SINGLE GANG TOGGLE SWITCH
120	100	EA	RISE COVER FOR 4 X 4 BOX TWO GANG TOGGLE SWITCH
121	100	EA	RISE COVER FOR 4 X 4 BOX 4-PLEX RECEPTACLE
122	100	EA	RISE COVER FOR 4 X 4 BOX DUPLEX RECEPTACLE
123	100	EA	RISE COVER FOR 4 X 4 BOX SINGLE GFCI
124	100	EA	RISE COVER FOR 4 X 4 BOX TWO GFCI
125	100	EA	3-GANG ELECTRICAL BOXES WITH 1/2" AND 3/4" KNOCKOUTS
			CONNECTORS (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
126	100	EA	1/2" JAKE FLEX SCREW-IN CONNECTOR
127	100	EA	3/4" JAKE FLEX SCREW-IN CONNECTOR
128	100	EA	1" JAKE FLEX SCREW-IN CONNECTOR
129	100	EA	1/2" FLEX TO EMT CONNECTORS
130	100	EA	3/4" FLEX TO EMT CONNECTORS
131	100	EA	1" FLEX TO EMT CONNECTORS
132	100	EA	1/2" BOX CONNECTOR LIQUID TIGHT
133	100	EA	3/4" BOX CONNECTOR LIQUID TIGHT
134	100	EA	1" BOX CONNECTOR LIQUID TIGHT
135	100	EA	1-1/2" BOX CONNECTOR LIQUID TIGHT
136	100	EA	2" BOX CONNECTOR LIQUID TIGHT
137	100	EA	1/2" LIQUID TIGHT 90
138	100	EA	3/4" LIQUID TIGHT 90
139	100	EA	1" LIQUID TIGHT 90
140	100	EA	1-1/2" LIQUID TIGHT 90
141	100	EA	2" LIQUID TIGHT 90
142	100	EA	1/2" RIGID COUPLING
143	100	EA	3/4" RIGID COUPLING
144	100	EA	1" RIGID COUPLING
145	100	EA	1-1/2" RIGID COUPLING
146	100	EA	2" RIGID COUPLING
			LIQUID TIGHT FLEX (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
147	100	EA	1/2" LIQUID TIGHT FLEX
148	100	EA	3/4" LIQUID TIGHT FLEX
149	100	EA	1" LIQUID TIGHT FLEX
150	100	EA	1-1/2" LIQUID TIGHT FLEX
151	100	EA	2" LIQUID TIGHT FLEX
			RIGID CONDUIT (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)
152	100	EA	1/2" RIGID CONDUIT
153	100	EA	3/4" RIGID CONDUIT
154	100	EA	1" RIGID CONDUIT
155	100	EA	1-1/2" RIGID CONDUIT
156	100	EA	2" RIGID CONDUIT
157	100	EA	1/2" RIGID CONDUIT 90
158	100	EA	3/4" RIGID CONDUIT 90
159	100	EA	1" RIGID CONDUIT 90
160	100	EA	1-1/2" RIGID CONDUIT 90
161	100	EA	2" RIGID CONDUIT 90
			RECEPTACLE AND SWITCHES (see Section 26 27 26 Wiring Devices on pages 11-14 for specifications)
162	10	EA	20 AMP HOSPITAL GRADE IVORY RECEPTACLES
163	10	EA	20 AMP HOSPITAL GRADE IVORY RECEPTACLES (GFCI)
164	10	EA	20 AMP HOSPITAL GRADE IVORY SINGLE POLE TOGGLE SWITCH
165	10	EA	20 AMP HOSPITAL GRADE IVORY 3-WAY TOGGLE SWITCH
166	10	EA	20 AMP HOSPITAL GRADE IVORY TWO POLE TOGGLE SWITCH

Electrical Material Salient Characteristics

167	10	EA	20 AMP HOSPITAL GRADE RED RECEPTACLES
168	10	EA	20 AMP HOSPITAL GRADE RED GFCI
169	10	EA	20 AMP HOSPITAL GRADE RED TOGGLE SWITCHES
170	10	EA	20 AMP HOSPITAL GRADE GRAY RECEPTACLES
171	10	EA	20 AMP HOSPITAL GRADE GRAY (GFCI)
172	10	EA	20 AMP HOSPITAL GRADE GRAY SINGLE POLE TOGGLE SWITCH
173	10	EA	20 AMP HOSPITAL GRADE GRAY 3-WAY TOGGLE SWITCH
CABLE TRAY (see Section 27 05 33 Raceways and boxes for COMM Systems on page 18 for specifications)			
174	10	FT	CABLOFIL CABLE TRAY # CF105/150BL 6" (H) X 4" (W) X 10' (L)
175	1	EA	CABLOFIL # EACKITDC ELEVATION CHANGE KIT
176	1	EA	CABLOFIL # SWKDC 2-PIECE SPLICE WASHER KIT
177	1	EA	CABLOFIL # EZT90IN316L 90 DEGREE BEND KIT
178	1	EA	CABLOFIL # DROPOUTKITPG DROP OUT KIT
179	1	EA	CABLOFIL # CRP150 GC WALL BRACKET SUPPORT
180	1	EA	CABLOFIL # SF100PG CENTER HANGER
181	1	EA	CABLOFIL # 99420285 SPLICE KIT BARS
182	1	EA	CABLOFIL # 99520256 BEND KIT TYPE TEE
183	1	EA	CABLOFIL # GNDCL GROUNDING LUGS
LIGHTING (see Section 26 51 00 Interior Lighting on pages 14-17 for specifications)			
184	1	EA	LITHONIA LIGHTING 2RT8S S 17 MVOLT GEB10IS 2X2-LAY-IN 2-17W T8 LAMPS
185	1	EA	LITHONIA LIGHTING 2RT8S S 32 MVOLT GEB10IS 2X4 RECESSED T8 VOLUMETRIC
186	24	EA	FLOURESCENT LAMPS T-8 2 FT
187	24	EA	FLOURESCENT LAMPS T-8 4 FT
JUNCTION BOXES (see Section 26 05 33 Raceway and Boxes on pages 7-11 for specifications)			
188	1	EA	6" X 6" X 4" JUNCTION, INDOOR
189	1	EA	6" X 6" X 4" JUNCTION, OUTDOOR
190	1	EA	12" X 12" X 8" JUNCTION, INDOOR
191	1	EA	12" X 12" X 8" JUNCTION, OUTDOOR

Electrical Material Salient Characteristics

SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

SUBMITTALS

1. Electrical Data:
 - a. Submit the following data for approval:
 - 1) Electrical ratings and insulation type for each conductor and cable.
 - 2) Splicing materials and pulling lubricant.
2. Certifications:
 - a. Certification by the manufacturer that the conductors and cables conform to the requirements of the specifications.

APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.
- B. American Society of Testing Material (ASTM):
 - D2301-10.....Standard Specification for Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape
 - D2304-10.....Test Method for Thermal Endurance of Rigid
Electrical Insulating Materials
 - D3005-10.....Low-Temperature Resistant Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape
- C. National Electrical Manufacturers Association (NEMA):
 - WC 70-09.....Power Cables Rated 2000 Volts or Less for the
Distribution of Electrical Energy
- D. National Fire Protection Association (NFPA):
 - 70-17.....National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL):
 - 44-14.....Thermoset-Insulated Wires and Cables
 - 83-14.....Thermoplastic-Insulated Wires and Cables
 - 467-13.....Grounding and Bonding Equipment
 - 486A-486B-13.....Wire Connectors

Electrical Material Salient Characteristics

486C-13.....	Splicing Wire Connectors
486D-15.....	Sealed Wire Connector Systems
486E-15.....	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
493-07.....	Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables
514B-12.....	Conduit, Tubing, and Cable Fittings

CONDUCTORS AND CABLES

- A. Conductors and cables shall be in accordance with ASTM, NEMA, NFPA, UL, as specified herein, and as shown on the drawings.
- B. All conductors shall be copper.
- C. Single Conductor and Cable:
 - 1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
 - 2. No. 8 AWG and larger: Stranded.
 - 3. No. 10 AWG and smaller: Solid; except shall be stranded for final connection to motors, transformers, and vibrating equipment.
 - 4. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.
- D. Color Code:
 - 1. No. 10 AWG and smaller: Solid color insulation or solid color coating.
 - 2. No. 8 AWG and larger: Color-coded using one of the following methods:
 - a. Solid color insulation or solid color coating.
 - b. Stripes, bands, or hash marks of color specified.
 - c. Color using 19 mm (0.75 inches) wide tape.
 - 3. Conductors shall be color-coded as follows:

208/120 V	Phase	480/277 V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

Electrical Material Salient Characteristics

CONNECTORS AND TERMINATIONS

- A. Mechanical type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
- B. Long barrel compression type of high conductivity and corrosion-resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
- C. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be //zinc-plated//cadmium-plated// steel.

CONTROL WIRING

- A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. 14 AWG.

GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.
- B. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

SECTION 26 05 33 RACEWAY AND BOXES

APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American National Standards Institute (ANSI):
 - C80.1-05.....Electrical Rigid Steel Conduit
 - C80.3-05.....Steel Electrical Metal Tubing
 - C80.6-05.....Electrical Intermediate Metal Conduit
- C. National Fire Protection Association (NFPA):

Electrical Material Salient Characteristics

- 70-11.....National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
 - 1-05.....Flexible Metal Conduit
 - 5-11.....Surface Metal Raceway and Fittings
 - 6-07.....Electrical Rigid Metal Conduit - Steel
 - 50-95.....Enclosures for Electrical Equipment
 - 360-13.....Liquid-Tight Flexible Steel Conduit
 - 467-13.....Grounding and Bonding Equipment
 - 514A-13.....Metallic Outlet Boxes
 - 514B-12.....Conduit, Tubing, and Cable Fittings
 - 514C-07.....Nonmetallic Outlet Boxes, Flush-Device Boxes
and Covers
 - 651-11.....Schedule 40 and 80 Rigid PVC Conduit and
Fittings
 - 651A-11.....Type EB and A Rigid PVC Conduit and HDPE
Conduit
 - 797-07.....Electrical Metallic Tubing
 - 1242-06.....Electrical Intermediate Metal Conduit - Steel
- E. National Electrical Manufacturers Association (NEMA):
 - TC-2-13.....Electrical Polyvinyl Chloride (PVC) Tubing and
Conduit
 - TC-3-13.....PVC Fittings for Use with Rigid PVC Conduit and
Tubing
 - FB1-12.....Fittings, Cast Metal Boxes and Conduit Bodies
for Conduit, Electrical Metallic Tubing and
Cable
 - FB2.10-13.....Selection and Installation Guidelines for
Fittings for use with Non-Flexible Conduit or
Tubing (Rigid Metal Conduit, Intermediate
Metallic Conduit, and Electrical Metallic
Tubing)
 - FB2.20-12.....Selection and Installation Guidelines for
Fittings for use with Flexible Electrical
Conduit and Cable
- F. American Iron and Steel Institute (AISI):
 - S100-2007 North American Specification for the Design of Cold-Formed Steel
Structural Members

Electrical Material Salient Characteristics

MATERIAL

A. Conduit:

1. Size: In accordance with the NEC, but not less than 13 mm (0.5-inch).
2. Rigid Steel Conduit (RMC): Shall conform to UL 6 and ANSI C80.1.
3. Rigid aluminum: Shall conform to UL 6A and ANSI C80.5.
4. Rigid Intermediate Steel Conduit (IMC): Shall conform to UL 1242 and ANSI C80.6.
5. Electrical Metallic Tubing (EMT): Shall conform to UL 797 and ANSI C80.3. Maximum size not to exceed 105 mm (4 inches).
6. Flexible Metal Conduit: Shall conform to UL 1.
7. Liquid-tight Flexible Metal Conduit: Shall conform to UL 360.

C. Conduit Fittings:

1. Rigid Steel and Intermediate Metallic Conduit Fittings:
 - a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
 - b. Standard threaded couplings, locknuts, bushings, conduit bodies, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
 - c. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
 - d. Bushings: Metallic insulating type, consisting of an insulating insert, molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
 - e. Erickson (Union-Type) and Set Screw Type Couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
 - f. Sealing Fittings: Threaded cast iron type. Use continuous drain-type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

Electrical Material Salient Characteristics

2. Rigid Aluminum Conduit Fittings:

- a. Standard threaded couplings, locknuts, bushings, conduit bodies, and elbows: Malleable iron, steel or aluminum alloy materials; Zinc or cadmium plate iron or steel fittings. Aluminum fittings containing more than 0.4% copper are prohibited.
- b. Locknuts and Bushings: As specified for rigid steel and IMC conduit.

3. Electrical Metallic Tubing Fittings:

- a. Fittings and conduit bodies shall meet the requirements of UL 514B, ANSI C80.3, and NEMA FB1.
- b. Only steel or malleable iron materials are acceptable.
- c. Compression Couplings and Connectors: Concrete-tight and rain-tight, with connectors having insulated throats.

4. Flexible Metal Conduit Fittings:

- a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
- b. Clamp-type, with insulated throat.

5. Liquid-tight Flexible Metal Conduit Fittings:

- a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
- b. Only steel or malleable iron materials are acceptable.
- c. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

6. Expansion and Deflection Couplings:

- a. Conform to UL 467 and UL 514B.
- b. Accommodate a 19 mm (0.75-inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
- c. Include internal flexible metal braid, sized to guarantee conduit ground continuity and a low-impedance path for fault currents, in accordance with UL 467 and the NEC tables for equipment grounding conductors.
- d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat-resistant molded rubber material with stainless steel jacket clamps.

D. Conduit Supports:

Electrical Material Salient Characteristics

1. Parts and Hardware: Zinc-coat or provide equivalent corrosion protection.
2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
3. Multiple Conduit (Trapeze) Hangers: Not less than 38 mm x 38 mm (1.5 x 1.5 inches), 12-gauge steel, cold-formed, lipped channels; with not less than 9 mm (0.375-inch) diameter steel hanger rods.
4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

E. Outlet, Junction, and Pull Boxes:

1. UL-50 and UL-514A.
2. Rustproof cast metal where required by the NEC or shown on drawings.
3. Sheet Metal Boxes: Galvanized steel, except where shown on drawings.

SECTION 26 27 26 WIRING DEVICES

APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. National Fire Protection Association (NFPA):
 - 70-14.....National Electrical Code (NEC)
 - 99-15.....Health Care Facilities
- C. National Electrical Manufacturers Association (NEMA):
 - WD 1-10.....General Color Requirements for Wiring Devices
 - WD 6-12Wiring Devices - Dimensional Specifications
- D. Underwriter's Laboratories, Inc. (UL):
 - 5-11.....Surface Metal Raceways and Fittings
 - 20-10.....General-Use Snap Switches
 - 231-08.....Power Outlets
 - 467-13.....Grounding and Bonding Equipment
 - 498-12.....Attachment Plugs and Receptacles
 - 943-15.....Ground-Fault Circuit-Interrupters

Electrical Material Salient Characteristics

1449-14.....Surge Protective Devices

1472-15.....Solid State Dimming Controls

RECEPTACLES

- A. General: All receptacles shall comply with NEMA, NFPA, UL, and as shown on the drawings.
 - 1. Mounting straps shall be nickel plated brass, brass, nickel plated steel or galvanize steel with break-off plaster ears, and shall include a self-grounding feature. Terminal screws shall be brass, brass plated or a copper alloy metal.
 - 2. Receptacles shall have provisions for back wiring with separate metal clamp type terminals (four minimum) and side wiring from four captively held binding screws.
- B. Duplex Receptacles - Hospital-grade: shall be listed for hospital grade, single phase, 20 amperes, 120 volts, 2-pole, 3-wire, NEMA 5-20R, with break-off feature for two-circuit operation.
 - 1. Bodies shall be ivory in color.
 - 3. Duplex Receptacles on Emergency Circuit:
 - a. In rooms without emergency powered general lighting, the emergency receptacles shall be of the self-illuminated type.
 - 4. Ground Fault Current Interrupter (GFCI) Duplex Receptacles: Shall be an integral unit, hospital-grade, suitable for mounting in a standard outlet box, with end-of-life indication and provisions to isolate the face due to improper wiring. GFCI receptacles shall be self-test receptacles in accordance with UL 943.
 - a. Ground fault interrupter shall consist of a differential current transformer, self-test, solid state sensing circuitry and a circuit interrupter switch. Device shall have nominal sensitivity to ground leakage current of 4-6 milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes (+ or - 1 milliampere) on the load side of the device. Device shall have a minimum nominal tripping time of 0.025 second.
 - b. Self-test function shall be automatically initiated within 5 seconds after power is activated to the receptacles. Self-test function shall be periodically and automatically performed every 3 hours or less.

Electrical Material Salient Characteristics

- c. End-of-life indicator light shall be a persistent flashing or blinking light to indicate that the GFCI receptacle is no longer in service.
- 5. Tamper-Resistant Duplex Receptacles:
 - a. Bodies shall be gray in color.
 - 1) Shall permit current to flow only while a standard plug is in the proper position in the receptacle.
 - 2) Screws exposed while the wall plates are in place shall be the tamperproof type.
- C. Receptacles - 20, 30, and 50 amperes, 250 Volts: Shall be complete with appropriate cord grip plug.
- D. Weatherproof Receptacles: Shall consist of a duplex receptacle, mounted in box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. The weatherproof integrity shall not be affected when heavy duty specification or hospital grade attachment plug caps are inserted. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.

TOGGLE SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with nylon bodies. Handles shall be ivory in color unless otherwise specified or shown on the drawings.
 - 1. Switches installed in hazardous areas shall be explosion-proof type in accordance with the NEC and as shown on the drawings.
 - 2. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and provisions for back wiring with separate metal wiring clamps and side wiring with captively held binding screws.
 - 3. Switches shall be rated 20 amperes at 120-277 Volts AC.

WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel or ivory smooth nylon. Oversize plates are not acceptable.
- B. Color shall be ivory or 302 stainless steel
- C. In areas requiring tamperproof wiring devices, wall plates shall be type 302 stainless steel, and shall have tamperproof screws and beveled edges.

Electrical Material Salient Characteristics

- E. Duplex Receptacles on Emergency Circuit: Wall plates shall be red nylon with the word "EMERGENCY" engraved in 6 mm (1/4 inch) white letters. Wall plates shall be type 302 stainless steel, with the word "EMERGENCY" engraved in 6 mm (1/4 inch) red letters.

2.5 SURFACE MULTIPLE-OUTLET ASSEMBLIES

- A. Shall have the following features:
1. Enclosures:
 - a. Thickness of steel shall be not less than 1 mm (0.040 inch) for base and cover. Nominal dimensions shall be 40 mm x 70 mm (1-1/2 inches by 2-3/4 inches) with inside cross sectional area not less than 2250 square mm (3-1/2 square inches). The enclosures shall be thoroughly cleaned, phosphatized, and painted at the factory with primer and the manufacturer's standard baked enamel finish.
 2. Receptacles shall be duplex, hospital grade. See paragraph 'RECEPTACLES' in this Section. Device cover plates shall be the manufacturer's standard corrosion resistant finish and shall not exceed the dimensions of the enclosure.

SECTION 26 51 00 INTERIOR LIGHTING

APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American National Standards Institute (ANSI):
- C78.1-91.....Fluorescent Lamps - Rapid-Start Types -
Dimensional and Electrical Characteristics
 - C78.376-01.....Chromaticity of Fluorescent Lamps
- C. American Society for Testing and Materials (ASTM):
- C635-07.....Manufacture, Performance, and Testing of Metal
Suspension Systems for Acoustical Tile and Lay-
in Panel Ceilings
- D. Environmental Protection Agency (EPA):
- 40 CFR 261.....Identification and Listing of Hazardous Waste

Electrical Material Salient Characteristics

- E. Federal Communications Commission (FCC):
 - CFR Title 47, Part 15...Radio Frequency Devices
 - CFR Title 47, Part 18...Industrial, Scientific, and Medical Equipment
- F. Illuminating Engineering Society (IES):
 - LM-79-08.....Electrical and Photometric Measurements of
Solid-State Lighting Products
 - LM-80-08.....Measuring Lumen Maintenance of LED Light
Sources
 - LM-82-12.....Characterization of LED Light Engines and LED
Lamps for Electrical and Photometric Properties
as a Function of Temperature
- G. Institute of Electrical and Electronic Engineers (IEEE):
 - C62.41-91.....Surge Voltages in Low Voltage AC Power Circuits
- H. International Code Council (ICC):
 - IBC-12.....International Building Code
- I. National Fire Protection Association (NFPA):
 - 70-11.....National Electrical Code (NEC)
 - 101-12.....Life Safety Code
- J. National Electrical Manufacturer's Association (NEMA):
 - C82.1-04.....Lamp Ballasts - Line Frequency Fluorescent Lamp
Ballasts
 - C82.2-02.....Method of Measurement of Fluorescent Lamp
Ballasts
 - C82.4-02.....Lamp Ballasts - Ballasts for High-Intensity
Discharge and Low-Pressure Sodium (LPS) Lamps
(Multiple-Supply Type)
 - C82.11-11.....Lamp Ballasts - High Frequency Fluorescent Lamp
Ballasts
 - LL-9-09.....Dimming of T8 Fluorescent Lighting Systems
 - SSL-1-10.....Electronic Drivers for LED Devices, Arrays, or
Systems
- K. Underwriters Laboratories, Inc. (UL):
 - 496-08.....Lamp holders
 - 542-0599.....Fluorescent Lamp Starters
 - 844-12.....Luminaires for Use in Hazardous (Classified)
Locations
 - 924-12.....Emergency Lighting and Power Equipment
 - 935-01.....Fluorescent-Lamp Ballasts

Electrical Material Salient Characteristics

1029-94.....	High-Intensity-Discharge Lamp Ballasts
1029A-06.....	Ignitors and Related Auxiliaries for HID Lamp Ballasts
1598-08.....	Luminaires
1574-04.....	Track Lighting Systems
2108-04.....	Low-Voltage Lighting Systems
8750-09.....	Light Emitting Diode (LED) Light Sources for Use in Lighting Products

LIGHTING FIXTURES

- A. Shall be in accordance with NFPA, UL, as shown on drawings, and as specified.
- B. Sheet Metal:
 - 1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved), and parallel to each other as designed.
 - 2. Wire ways and fittings shall be free of burrs and sharp edges, and shall accommodate internal and branch circuit wiring without damage to the wiring.
 - 3. Hinged door frames shall operate smoothly without binding. Latches shall function easily by finger action without the use of tools.
- C. Ballasts and lamps shall be serviceable while the fixture is in its normally installed position. Ballasts shall not be mounted to removable reflectors or wire way covers unless so specified.
- D. Lamp Sockets:
 - 1. Fluorescent: Single slot entry type, requiring a one-quarter turn of the lamp after insertion. Lamp holder contacts shall be the biting edge type.
 - 2. Compact Fluorescent: 4-pin.
 - 3. High Intensity Discharge (HID): Porcelain.
- E. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, aircraft cable, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- F. Metal Finishes:

Electrical Material Salient Characteristics

1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion-resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking, and shall be applied after fabrication.
 2. Interior light reflecting finishes shall be white with not less than 85 percent reflectance.
- G. Lighting fixtures shall have a specific means for grounding metallic wire ways and housings to an equipment grounding conductor.
- H. Light Transmitting Components for Fluorescent Fixtures:
1. Shall be 100 percent virgin acrylic.
 2. Flat lens panels shall have not less than 3 mm (1/8 inch) of average thickness.
 3. Unless otherwise specified, lenses, reflectors, diffusers, and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction without distortion or cracking.

LAMPS

- A. Linear and U-shaped T8 Fluorescent Lamps:
1. Except as indicated below, lamps shall be low-mercury energy saving type, have a color temperature between 3500° and 4100°K, a Color Rendering Index (CRI) equal or greater than 80, average rated life equal to or greater than 24,000 hours when used with an instant start ballast and 30,000 hours when used with a programmed or rapid start ballast (based on 3 hour starts), and be suitable for use with dimming ballasts, unless otherwise indicated.
 2. Lamps shall comply with EPA Toxicity Characteristic Leachate Procedure (TCLP) requirements.

Electrical Material Salient Characteristics

SECTION 27 05 33 RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS

MATERIAL

A. Cable Tray:

1. Provide wire basket type of sizes indicated; with all required splicing and mounting hardware.
2. Materials and Finishes:
 - a. Electro-plated zinc galvanized (post plated) made from carbon steel and plated to ASTM B 633, Type III, SC-1.
 - b. Remove soot, manufacturing residue/oils, or metallic particles after fabrication.
 - c. Rounded edges and smooth surfaces.
3. Provide continuous welded top side wire to protect cable insulation and installers.
4. High strength steel wires formed into a 50 x 100 mm (2 inches by 4 inches) wire mesh pattern with intersecting wires welded together.
5. Wire Basket Sizes:
 - a. Wire Diameter: 5 mm (0.195 inch) minimum on all mesh sections.
 - b. Usable Loading Depth: 105 mm (4 inch) // 150 mm (6 inches) //.
 - c. Width: 300 mm (12 inches) // 450 mm (18 inches) // 600 mm (24 inches).
6. Fittings: Field-formed, from straight sections, in accordance with manufacturer's instructions.
7. Provide accessories to protect, support and install wire basket tray system.