

SECTION 16A

ELECTRICAL WORK, INTERIOR

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Federal Specifications (Fed. Spec.):

J-C-30A & Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
L-C-530B & Am-1 & Int Am-2	Coating, Pipe, Thermoplastic Resin or Thermosetting Epoxy
L-P-387A & Am-1 & Int Am-2	Plastic Sheet, Laminated, Thermosetting (For Designation Plates)
L-P-1035A	Plastic Molding Material, Vinyl Chloride Polymer and Vinyl Chloride-Vinyl Acetate Copolymer, Rigid
W-B-30A & Am-2	Ballast, Fluorescent Lamp (Non-Polychlorinated Biphenyl Type)
W-C-375B/GEN	Circuit Breakers, Molded Case; Branch Circuit and Service (General Specification)
W-C-586C	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
W-C-596E/GEN & Suppl 1A	Connector, Electrical, Power, General Specification for
W-C-1094A	Conduit and Conduit Fittings Plastic, Rigid
W-F-406b & Int Am-1	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
W-F-408C & Am-1	Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type)
W-F-414E ^x & Int Am-1	Fixture, Lighting (Flourescent, Alternating-Current, Pendant Mounting)
W-F-1234A	Fixture, Lighting (Flourescent Lamp, Industrial)
W-F-1662A & Int Am-2	Fixture, Lighting (Fluorescent, Alternating-Current, Recessed and Surface Ceiling)

W-F-1814 & Suppl 1	Fuse, Cartridge, High Interrupting Capacity (General Specification)
W-J-800D	Junction Box; Extension, Junction Box; Cover, Junction Box (Steel, Cadmium, or Zinc-Coated)
W-L-00116D	Lamps, Fluorescent (General Specification)
W-L-142A & Int Am-4	Lampholder, Adapter, and Shadeholder, Medium-Screw-Shell, 125, 250, and 600 Volts
W-L-305D & Int Am-1	Light Set, General Illumination (Emergency or Auxiliary)
W-P-115a & Am-3	Panel, Power Distribution
W-P-455a & Am-6	Plate, Wall, Electrical
W-S-610C & Am-1	Splice Conductor
W-S-865C & Am-1 & Int Am-2	Switch Box, (Enclosed), Surface-Mounted
CC-M-1807	Motors, Alternating Current, Fractional and Integral Horsepower (500 Hp and Smaller)
HH-I-553C & Am-1	Insulation Tape, Electrical (Rubber, Natural and Synthetic)
HH-I-595C	Insulation Tape, Electrical, Pressure- Sensitive Adhesive, Plastic
WW-C-00540c & Int Am-1	Conduit, Metal, Rigid: and Coupling, Elbow, and Nipple, Electrical Conduit: Aluminum
WW-C-566C	Conduit, Metal, Flexible

American National Standards Institute (ANSI) Standard:

C97.1-1972	Low-Voltage Cartridge Fuses 600 Volts or Less
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1.3 American Society for Testing and Materials (ASTM) Publication:

D 69-78	Friction Tape for General Use for Electrical Purposes
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American Water Works Association (AWWA) Standard:

C203-78	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines--Enamel and Tape--Hot-Applied
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1.5 Institute of Electrical and Electronics Engineers, Inc. (IEEE)
Standard:

No. 142 Recommended Practice for Grounding of
Industrial and Commercial Power Systems

1.6 National Electrical Manufacturers Association (NEMA) Standards:

ICS 1-1978 Industrial Control and Systems
Incl Rev 1
thru 3

ICS 2-1978 Industrial Control Devices, Controllers
Incl Rev 1 and Assemblies
thru 3

ICS 3-1978 Industrial Systems
Incl Rev 1

ICS 4-1977 Terminal Blocks for Industrial Control
Incl Rev 1 Equipment and Systems

ICS 6-1978 Enclosures for Industrial Controls and
Incl Rev 1 Systems

RN 1-1980 Polyvinyl-Chloride Externally Coated
Galvanized Rigid Steel Conduit and
Electrical Metallic Tubing

TC 6-1978 PVC and ABS Plastic Utilities Duct for
Underground Installation

1.7 National Fire Protection Association (NFPA) Publication:

No. 70-1981 National Electrical Code

No. 101-1981 Code for Safety to Life From Fire in
Buildings and Structures

1.8 Underwriters Laboratories, Inc. (UL) Standards:

Surface Metal Raceways and Fittings
(Dec 28, 1979, 9th Ed.; Rev Feb 25, 1982)

Rigid Metal Conduit (Oct 23, 1981, 9th Ed.)

UL 20 General-Use Snap Switches (Dec 28, 1979,
9th Ed.; Rev thru Feb 26, 1982)

UL 50 Cabinets and Boxes (Apr 25, 1980, 8th Ed.;
Rev thru Feb 11, 1982)

UL 57 Electric Lighting Fixture (Aug 30, 1972,
12th Ed.; Erratum Sep 23, 1975; Rev thru
Jul 22, 1982)

UL 360	Liquid-Tight Flexible Steel Conduit (Aug 12, 1980, 2nd Ed.; Rev thru Jan 25, 1982)
UL 467	Grounding and Bonding Equipment (Nov 7, 1972, 5th Ed.; Rev thru Mar 26, 1982)
UL 508	Industrial Control Equipment (May 9, 1977, 12th Ed.; Rev thru Mar 18, 1982)
UL 845	Motor Control Centers (Jun 10, 1980, 2nd Ed.; Rev Mar 17, 1982)
UL 869	Service Equipment (Aug 19, 1977, 5th Ed.; Rev thru Dec 13, 1982)
UL 943	Ground-Fault Circuit Interrupters (Dec 11, 1972, 1st Ed.; Rev thru Dec 5, 1977)
UL 1236	Battery Chargers (Apr 27, 1981, 2nd Ed.)
UL 1242	Outline of Proposed Investigation for Intermediate Metal Conduit Type I and Type II (Jan 14, 1977)

2. GENERAL:

2.1 Rules: The installation shall conform to the requirements of the National Electrical Code, except where requirements in excess thereof are specified herein.

2.2 Coordination: The contract drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall study building plans and details so that the outlets and equipment will be properly located and readily accessible. Lighting fixtures, equipment, and outlets shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the contract drawings, details of departures and reasons therefor shall be submitted as soon as practicable for written approval of the Contracting Officer.

2.3 Capacities of equipment and material shall be not less than those indicated.

3. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified elsewhere herein and as shown on the drawings and shall be the products of manufacturers regularly engaged in the manufacture of such products.

3.1 Ballast, Fluorescent Lamp: High-power-factor type conforming to Fed. Spec. W-B-30. In addition, ballasts shall be class P and shall be automatic-resetting type.

3.2 Cabinets for Telephone Systems: UL 50.

3.3 Conductors, Insulated: Fed. Spec. J-C-30, types as specified.

3.4 Conduit:

3.4.1 Flexible Steel Conduit: Fed. Spec. WW-C-566 and UL 360.

3.4.2 Zinc-Coated Rigid Steel Conduit: UL 6.

3.4.3 Rigid Aluminum: Fed. Spec. WW-C-540.

3.4.4 Rigid Plastic: Fed. Spec. W-C-1094 and NEMA TC 6.

3.4.5 Intermediate Metal Conduit (IMC): UL 1242, Type I.

3.4.6 Surface Metal Raceways: UL 5.

Conduit Coatings:

3.4.7.1 Plastic Resin System: Fed. Spec. L-C-530, type I; or Fed. Spec. L-P-1035, composition, type, class, and grade suitable for the purpose, thickness as required for the type I system of Fed. Spec. L-C-530; or NEMA RN 1, type A-40.

3.4.7.2 Epoxy System: Fed. Spec. L-C-530, type II.

3.4.7.3 Coal-Tar System: Primer and enamel conforming to AWWA C203. The thickness of the dry coating system shall be not less than 1/16 inch at any point.

3.5 Connectors, Wire Pressure: Fed. Spec. W-S-610.

3.6 Device Plates: Fed. Spec. W-P-455.

3.7 Battery Chargers: UL 1236.

3.8 Fittings, Cable and Conduit: Fed. Specs. W-F-406 and W-F-408.

3.9 Fixtures:

3.9.1 Fluorescent, Industrial-Type Fixtures: Fed. Spec. W-F-1234 modified as required for circuits specified.

3.9.2 Fluorescent, General-Purpose: Fed. Spec. W-F-414, type II, style A, B, C and D, and Fed. Spec. W-F-1662.

3.9.3 Fluorescent, General-Purpose, Surface and Recessed Mounted: Fed. Spec. W-F-1662.

Fuses:

3.10.1 Cartridge Fuses: Nonrenewable, dual element, time lag type, ANSI C97.1, class H.

3.10.2 Fuse, Cartridge, High Interrupting Capacity: Fed. Spec. W-F-1814, class G, J, K1, K5, K9, and L.

Fluorescent Lamps: Fed. Spec. W-L-116.

Light Sets: Fed. Spec. W-L-305.

3.13 Motors, AC, Fractional and Integral Hp (500 Hp and Smaller): Fed. Spec. CC-M-1807.

3.14 Motor Controls and Motor Control Centers: NEMA ICS 1, ICS 2, ICS 3, ICS 4, and ICS 6, UL 508 and UL 845.

3.15 Outlets, Conduit, Cast Metal or Malleable Metal: Fed. Spec. W-C-586.

3.16 Outlet Boxes: Sheet-steel outlet boxes shall conform to Fed. Spec. W-J-800.

3.17 Panelboards: Dead-front construction, Fed. Spec. W-P-115. Lighting and appliance branch circuits, feeder and distribution panelboards, class 1, type as specified hereinafter.

3.18 Receptacles: Fed. Spec. W-C-596, except receptacles with groundfault interrupters shall conform to UL 943, Class A or B.

3.19 Service Equipment: Fed. Spec. W-C-375, and UL 869.

Splice, Conductor: Fed. Spec. W-S-610.

Switches:

3.21.1 Enclosed Safety Switches: Fed. Spec. W-S-865, type NDS or NDD as indicated.

3.21.2 Snap Switches: UL 20.

Tape:

3.22.1 Friction Tape: ASTM D 69.

3.22.2 Plastic Tape: Fed. Spec. HH-I-595.

3.22.3 Rubber Tape: Fed. Spec. HH-I-553.

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

3.24 Grounding and Bonding: UL 467.

4. APPROVAL OF MATERIALS AND EQUIPMENT will be based on the manufacturer's published data.

4.1 The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been

tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer.

4.2 For other than equipment and materials specified to conform to UL standards, a manufacturer's statement indicating complete compliance with the applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers, or other commercial standard, is acceptable.

5. SHOP DRAWINGS shall be submitted for equipment not completely identifiable by information submitted in the materials and equipment lists, in accordance with requirements contained in the SPECIAL PROVISIONS, and will be submitted for but not limited to busways, cabinets, and panelboards.

6. WORKMANSHIP: All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the Contracting Officer, to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

7. GROUNDING: Except where specifically indicated otherwise, all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in nonmetallic raceways and neutral conductor of the wiring system shall be grounded. The ground connection shall be made at the main service equipment and shall be extended to driven ground rods on the exterior of the building.

7.1 Ground rods shall be of copper-clad steel not less than 3/4 inch in diameter, 8 feet long, driven full length into the earth. The maximum resistance measured in accordance with IEEE No. 142 of a driven ground shall not exceed 10 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods shall be installed not less than 6 feet on centers. If the resultant resistance exceeds 10 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Grounding counterpoise shall be configured pursuant to electrical drawings.

7.2 Ground bus shall be provided in the mechanical/electrical equipment room, motor control center, and as indicated on the drawings. Non-current-carrying metal parts of electric equipment shall be effectively grounded by bonding to the bus. The ground shall be bonded to the system neutral and a ground rod or rods as specified above having the upper ends terminating approximately 12 inches below the floor or grade. The ground bus shall be flat copper in one piece, if practicable. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment.

8. WIRING METHODS:

8.1 General: Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid aluminum or zinc-coated-steel

conduit, electrical metallic tubing, or intermediate metal conduit, type I. Insulated conductors contained in surface metal raceways shall be installed where indicated.

8.2 Conduit systems shall be installed as indicated. Conduit sizes shown on drawings are based on the use of TW for conductors smaller than No. 8 AWG, THW insulation for conductors No. 8 AWG and larger, except where otherwise indicated. Minimum size of raceways shall be 1/2 inch. Aluminum conduit may be used only where installed exposed in dry locations. IMC Type I may be used as an option for rigid steel conduit in areas as permitted by the National Electrical Code, except that IMC will not be used within slab-on-grade. IMC installed below slab-on-grade will be corrosion protected as required for rigid steel conduit by this specification. Non-aluminum sleeves shall be used where aluminum conduit passes through concrete floors and firewalls. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 6 inches away from parallel runs of flues, steam pipes and hot-water pipes. Raceways shall be concealed where possible within finished walls, ceilings, and floors other than slabs-on-grade.

8.2.1 Installing Conductors and Conduit Below Slab-on-Grade or in the Ground: All electrical wiring below slab-on-grade shall be protected by a conduit system. No conduit system shall be installed horizontally within concrete slabs-on-grade. For slab-on-grade construction, horizontal runs of rigid plastic or coated rigid steel or coated intermediate metal conduit (IMC) shall be installed below the floor slab. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field-wrapped with 0.010-inch thick pipe-wrapping plastic tape applied with a 50-percent overlay, or shall have a factory-applied plastic resin, epoxy, or coal-tar coating system. Zinc coating may be omitted from rigid steel conduit, or IMC which has a factory-applied epoxy system. Field made joints, fittings, abrasions, and coating holidays shall be coated with material equivalent to the above.

8.2.2 Installing in Slabs Other Than on Grade: Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer. Raceways crossing expansion joints in concrete slabs shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

8.2.3 Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

8.2.4 Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of

plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

8.2.5 Supports: Raceways shall be securely and rigidly fastened in place with pipe straps, wall brackets, conduit clamps, approved conduit hangers, threaded C-clamp with retainers or ceiling trapeze. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine or wood screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inch in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used, and bar hangers may be attached with saddle ties of not less than No. 16 AWG double-strand zinc-coated steel wire. In suspended-ceiling construction, only lighting-system-branch-circuit raceways shall be fastened to the ceiling supports. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the National Electrical Code, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the National Electrical Code. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200-pound tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

8.2.6 Exposed risers in wire shafts of multistory buildings shall be supported by U-clamp hangers at each floor level, and at intervals not to exceed 10 feet.

8.2.7 Telephone raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirements that no length of run shall exceed 50 feet for 1/2-inch and 3/4-inch sizes, and 150 feet for 1-inch or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1-inch size or larger shall be not less than ten times the nominal diameter.

8.2.8 Wiring in locations indicated shall conform to the National Electrical Code for hazardous locations. Equipment shall be suitable for Class I, Division 1, Groups C and D; and Class II, Division 1, Groups E, F, and G; with operating temperature of 100 degrees C.

8.3 Conductors in raceways and cable shall be of copper, except that aluminum conductors may be used as an equivalent for copper conductors of

No. 6 AWG and larger. Aluminum conductors shall have ampacity of not less than the copper conductors. Solderless pressure connectors, properly taped and wire connectors of insulating material shall be used for all splices where practicable. Pressure connectors for aluminum conductors shall have tinned aluminum bodies. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making of connections. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices where possible. Soldered mechanical joint insulated with tape shall be kept to a minimum.

8.3.1 Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors (with 10 amperes or more of load) for branch circuits of 120 volts more than 100 feet long, and of 277 volts more than 230 feet long, from panel to the center of load shall be No. 10 AWG.

8.3.2 Insulation: Insulated conductors shall conform to the requirements of the National Electrical Code for application.

8.3.3 Conductor identification in multiphase systems shall be by color coded insulation. The color of the insulation of the ungrounded conductors of different voltage systems shall be as follows:

120/208 volt, 3-phase: red, black, and blue;
277/480 volt, 3-phase: yellow, brown, and orange;
120/240 volt, single phase: red and black.
Equipment related receptacle grounds shall be green.

Control circuit conductor identification shall be made by color coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved by the Contracting Officer. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Where insulation of the required color is not available, electrical tape of the required color shall be half-lapped for the entire length within the indicated enclosures. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking is not acceptable.

9. BOXES AND SUPPORTS: Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be of the cast-metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces, in hazardous areas, and when installed exposed up to 7 feet above interior floors and walkways. In partitions of light steel construction, either bar hangers with 1-inch-long studs between metal studs or metal stud brackets with spring-steel tension clamps or machine bolts shall be used to rigidly secure boxes to building. Each box shall have the volume required by the National Electrical Code for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be not less than 4 inches except that smaller boxes may be installed as required by fixture configuration,

as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. Boxes for use in masonry-block or tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type, covers. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes and pendants for surface-mounted fixtures on suspended ceilings shall be supported independently of the ceiling supports. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Cast metal boxes with 3/32-inch wall thickness are acceptable. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box. Penetration of more than 1-1/2 inches into reinforced-concrete beams or more than 3/4 inch into reinforced-concrete joists shall avoid cutting any main reinforcing steel.

9.1 Boxes for use with raceway systems shall not be less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Boxes for other than lighting-fixture and telephone outlets shall be not less than 4 inches square except that 4- by 2-inch boxes may be used where only one raceway enters the outlet. Minimum size boxes for telephone outlets shall be not smaller than 4-11/16 inches square and 2-1/8 inches deep.

9.2 Pull boxes of not less than the minimum size required by the National Electrical Code shall be constructed of code-gage aluminum or galvanized sheet steel except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

9.3 Clock outlet, for use in other than a wired clock system, shall consist of an outlet box, a plaster cover where required, and a single receptacle with clock-outlet plate. The receptacle shall be recessed sufficiently within the box to allow the complete insertion of a standard cap, flush with the plate. A suitable clip or support for hanging the clock shall be secured to the top of the plate. Material and finish of the plate shall be as specified in paragraph DEVICE PLATES. Each telephone outlet shall consist of a horizontal cast housing with a 1-inch bushed side opening.

9.4 Conduits stubbed up through concrete floors for connections to freestanding equipment shall be provided with a short elbow and an adjustable top or coupling threaded inside for plugs, set flush with the

finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 6 inches above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made.

10. DEVICE PLATES of the one-piece type shall be provided for all outlets and fittings to suit the devices installed. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast metal, or impact resistant plastic having rounded or beveled edges. Plates on finished walls shall be of satin finish corrosion resistant steel or of satin finish chromium plated brass. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16-inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed. Device plates for telephone and intercommunication outlets shall have a 3/8-inch bushed opening in center.

11. RECEPTACLES:

11.1 Single and duplex receptacles shall be rated 15 amperes, 125 volts, two-pole, three-wire, grounded type with polarized parallel slots, in accordance with Fed. Spec. W-C-596. Bodies shall be of brown phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Receptacles with ground fault interrupters shall be in accordance with UL 943. Class and current rating shall be as indicated on the drawings.

11.2 Switched duplex receptacles shall be similar to those specified in paragraph "Single and duplex receptacles" above, except that the ungrounded pole of each receptacle shall be provided with a separate terminal. Top receptacle shall be switched when installed.

11.3 Weatherproof receptacles shall consist of a duplex receptacle as specified in paragraph "Single and duplex receptacles", mounted in a box with a gasketed, weatherproof, cast-metal cover plate and cap over each receptacle opening. The cap shall be provided with a spring-hinged flap.

11.4 Receptacles, 15-ampere, 250-volt, shall be duplex two-pole, three-wire, grounded type with bodies of brown phenolic compound supported by mounting yoke having plaster ears. The third grounding pole shall be connected to the metal yoke. Each receptacle shall be provided with cord-grip cap.

11.5 Receptacles, single, 20-ampere, 250-volt, shall be three-pole, three-wire, complete with appropriate mating cord-grip plug.

11.6 Special-purpose or heavy-duty receptacles shall be of the type and of ratings and number of poles indicated or required for the anticipated

purpose. Contact surfaces may be either round or rectangular. Locking facilities, where indicated, shall be accomplished by the rotation of the plug.

12. WALL SWITCHES shall be of the totally enclosed tumbler type with bodies of phenolic compound. Handles shall be ivory. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than two switches shall be installed in a single-gang position. Switches shall be rated 20-ampere, 120-volt for use on alternating current only. Pilot lights indicated on the drawings shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red.

13. SERVICE EQUIPMENT: Service-disconnecting means shall be of the enclosed circuit breaker type with external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated. Multipole circuit breakers shall be of the common-trip type having a single operating handle but for sizes of 100 amperes or less may consist of single-pole circuit breakers permanently assembled at the factory into a multipole unit having an internal, mechanical, nontamperable common trip mechanism and external handle ties.

14. PANELBOARDS: Lighting and appliance branch-circuit panelboards shall be circuit-breaker equipped, type I. Distribution, power, or feeder panelboards shall be circuit-breaker equipped, type I. Circuit-breaker interrupting capacities shall conform to Fed. Spec. W-C-375 unless otherwise indicated. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole circuit breakers shall be of the common-trip type having a single operating handle but for sizes of 100 amperes or less may consist of single-pole circuit breakers permanently assembled at the factory into a multipole unit having an internal, mechanical, nontamperable common trip mechanism and external handle ties. Circuit breakers used for motor-circuit disconnects and not in sight of the motor controller shall be capable of being locked in the open position. Wiring gutters dimensions for panelboards shall be in accordance with the requirements of the National Electrical Code. Panelboards shall not exceed 78 inches in height and shall be so mounted that the height of the top operating handle will not exceed 6 feet 6 inches from the floor. Locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate load served by each circuit and mounted in holder behind protective covering.

15. CABINETS: Cabinets for telephone systems shall have boxes constructed of code-gage zinc-coated sheet steel. Cabinets shall be constructed with interior dimensions not less than those indicated. Each trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with a 5/8-inch plywood backboard having a two-coat insulating varnish finish.

16. FUSES: The Contractor shall furnish a complete set of fuses for all switches, panels, bus plugs, switchgear, and control centers as required. Time-current-tripping characteristics of fuses serving motors or connected in series with circuit breakers shall be coordinated for the proper operation. Fuses shall have a voltage rating not less than the circuit voltage.

16.1 Cartridge fuses shall have an interrupting rating not less than 25,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge fuses shall be used for circuits rated in excess of 30 amperes, 125 volts, except where current-limiting fuses are indicated.

16.2 Cartridge fuses, current-limiting type, where indicated, shall have tested interrupting capacity not less than 100,000 amperes. Fuse-holders shall be the type that will reject all class H fuses.

17. UNDERGROUND-SERVICE CONDUITS: Empty conduits for underground electric-service cable and telephone cable shall be installed as indicated. Except where otherwise indicated, conduits shall terminate approximately 5 feet beyond the building wall and 2 feet below finished grade, with the outside ends bushed and plugged or capped.

18. MOTORS furnished under other sections of these specifications shall be of sufficient size for the duty to be performed and shall not exceed the full-load rating when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degrees C. ambient temperature of reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified elsewhere. The horsepower ratings indicated on electrical plans are for guidance only and do not limit the equipment size. When electrically driven equipment furnished under other sections of these specifications materially differs from the contemplated design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, and branch-circuit protection to accommodate the equipment actually installed.

19. MOTOR CONTROL: Each motor or group of motors requiring a single control, and not controlled from a motor-control center, shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 1/8 horsepower or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single- or double-pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. Automatic-control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the

devices used are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit. When combination manual-and-automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked Manual-Off-Automatic. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any Manual-Off-Automatic switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings.

19.1 Control centers shall be indoor type and shall contain combination starters and other equipment as indicated. Control centers shall be NEMA ICS 2 class 2, type C. Each control center shall be mounted on floor sills or mounting channels. Each circuit shall have a suitable metal or laminated plastic nameplate with white cut letters. Combination starters shall be provided with appropriate circuit breakers.

19.2 Contacts in miscellaneous control devices such as float switches, pressure switches, and auxiliary relays shall have current and voltage ratings in accordance with NEMA ICS 2 for rating designation B300.

20. MOTOR-DISCONNECT MEANS: Each motor shall be provided with a disconnecting means under this section of the specifications, when required by the National Electrical Code even though not indicated. For single-phase motors, a single- or double-pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Enclosed safety switches shall be horsepower rated in conformance with table III of Fed. Spec. W-S-865. Switches shall disconnect all ungrounded conductors.

21. TRANSFORMERS shall be general-purpose dry-type in an indoor enclosure. Three-phase transformers shall have not less than two windings per phase. Use of dry type transformers is limited to maximum 500 kVA. Use of auto-transformers is not allowed. Full-capacity NEMA standards taps shall be provided in the high-voltage winding. "T" connected transformers may be provided in the range of 15 kVA and less. Transformers with sound levels greater than 50 decibels shall be installed on resilient vibration-isolating mountings to prevent amplification of sound. Audible-sound-levels tests shall be made in accordance with NEMA ST 20. Transformers shall be the quiet type with sound level not exceeding the following:

<u>Transformer rating, kVA</u>	<u>Average sound level, decibels</u>
10-50	45
51-150	50

22. LAMPS AND LIGHTING FIXTURES of types and sizes as indicated.

22.1 Lamps of the proper type, wattage, and voltage rating shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

22.1.1 Incandescent lamps shall be for 120-volt operation unless otherwise specified.

22.1.2 Fluorescent lamps shall have standard cool-white color characteristics and shall be of a type that will not require starter switches. The 34- and 40-watt lamps shall be of the rapid-start type.

22.2 Fixtures shall conform to the following specifications and shall be as detailed on drawing No. 40-06-04, sheet Nos. 1, 15, 22, 28, 29, 45, 51, 52SP, 53, 53SP, 54, 55, 60SP, and 61, which accompany and form a part of this specification. Illustrations shown on these sheets are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent light-distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved by the Contracting Officer.

22.2.1 Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

22.2.2 Suspended fixtures shall be provided with swivel hangers in order to insure a plumb installation. Pendants 4 feet or longer installed shall be braced to limit swinging. Single-unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple-unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each unit length of chassis including one at each end. Rods shall be of not less than 3/16-inch diameter.

22.3 Emergency light sets shall be type I, class I, style D or E, with batteries and the number of heads as indicated. Sets shall be permanently connected, ahead of any local switches, to the circuit serving the normal lighting in the same area, by conductors installed in flexible conduit.

23. BATTERY CHARGERS shall be general purpose, continuous current output, with solid state rectifiers. Means shall be provided to regulate and adjust the DC output voltage. Chargers shall have continuous current ratings of 10-to-15 percent higher than battery current outputs based upon an 8-hour discharge.

24. IDENTIFICATION NAMEPLATES: Major items of electrical equipment and major components shall be permanently marked with an identification nameplate to identify the equipment by type or function and specific unit number as shown on the drawings. Unless otherwise specified, all identification nameplates shall be made of laminated plastic in accordance with Fed. Spec. L-P-387 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws or approved non-adhesive metal fasteners. At the option of the Contractor, the equipment manufacturer's standard embossed

nameplate material with black paint filled letters may be furnished in lieu of laminated plastic. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4-inch high letters

Panelboards

Starters

Safety Switches and Circuit Breakers

Motor Control Centers

Transformers

Equipment (air handling units, exhaust fans, pumps, etc.)

Switchboards

Power Receptacles (In Hazardous Areas)

25. EQUIPMENT CONNECTIONS: All wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph Wiring Methods. Flexible raceways 6 feet or less in length shall be provided to all electrical equipment subject to vibration or movement and for all motors. Liquid-tight raceways shall be used in damp or wet locations.

25.1 Motors, motor controls and other control equipment furnished under this section of the specifications, and shown on the drawings, shall be connected under this section of the specifications unless shown or specified otherwise. Except as otherwise specifically noted, automatic-control wiring, signaling, and protective devices are not included in this section of the specifications, but shall be furnished and installed under other sections of the specifications. Control wiring not shown on the drawings shall be furnished under the other sections of the specifications.

25.2 Flexible conduit of short length shall be provided for equipment subject to vibration or movement and for all motors. Liquid-tight flexible conduit shall be used in wet locations.

26. PAINTING AND FINISHING: Field-applied paint on exposed surfaces shall be provided under SECTION: PAINTING, GENERAL.

27. REPAIR OF EXISTING WORK: The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to

building, piping, or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government.

28. TESTS: After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or an authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. The Contractor shall submit in writing to the Contracting Officer upon completion of the project the measured ground resistance of each ground rod, indicating the location of the rod and the resistance and the soil conditions at the time the measurements were made.



TYPE 101
Incandescent Porcelain Lampholder for Outlet Box Mounting
Fed. Spec. W-L-142

<u>Suffix</u>	<u>Description</u>
A	Switchless
B	Pull switch, short length of chain, 4-foot length of linen cord and bell



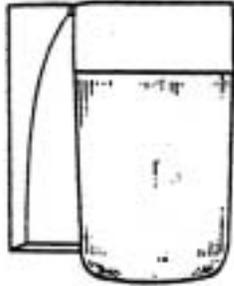
TYPE 102
Incandescent Adjustable Lampholder for Outlet Box Mounting
Fed. Spec. W-L-142

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

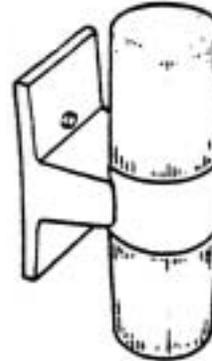
NOVEMBER 1980

DWG. NO. 40-06-04

SHEET



TYPE 124
One 100 Watt Lamp



TYPE 125
Two 100 Watt Lamps

Exterior Wall Mounted Enclosed and Gasketed
Incandescent Fixtures For Wet Locations

Suffix

Description

A

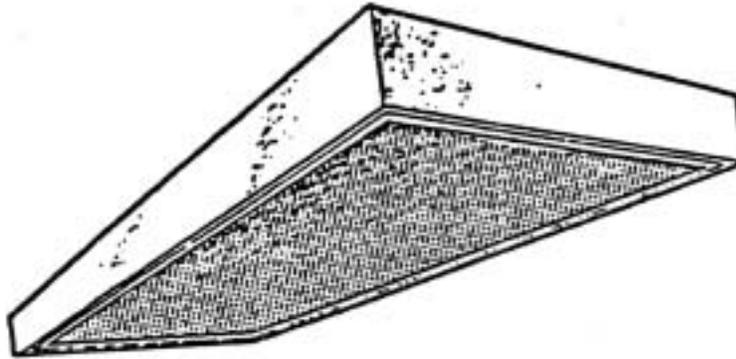
Without protective guard

B

With protective guard

Fixture shall conform to UL 57 for use in wet locations and shall be enclosed and gasketed. The round housing and wall bracket shall be cast aluminum provided with a brushed or satin aluminum finish and a clear acrylic lacquer protective coating. The lampholder shall be medium base glazed porcelain. The housing shall be threaded to receive the threaded globe. The globe shall be white opal tempered glass. The protective guard shall be cast aluminum and finished as specified for housing. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPES 213 & 214

TYPE 213

Surface, Ceiling Mounted Fluorescent Fixture, 1- by 4-foot, with
Acrylic Prismatic Lens, Metal Sides, Two 40 Watt Lamps
Fed. Spec W-F-1662

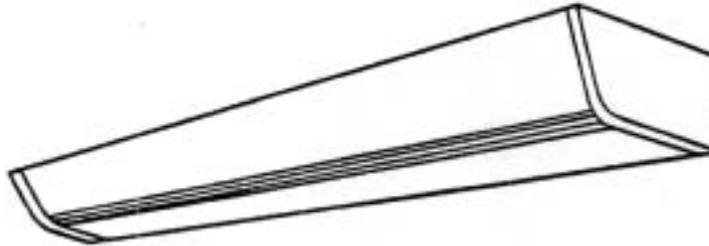
<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		45x45° Light-Stabilized Polystyrene egg crate louver
B	1	35x25° Parabolic Aluminized Louver Type 200 emergency unit

TYPE 214

Surface, Ceiling Mounted Fluorescent Fixture, 2- by 4-foot with
Acrylic Prismatic Lens and Metal Sides
Fed. Spec W-F-1662

<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		Two 40 watt lamps
B	1	Four 40 watt lamps Type 200 emergency unit

Fixture types indicated on this sheet shall also conform to requirements
specified and indicated in the contract documents.



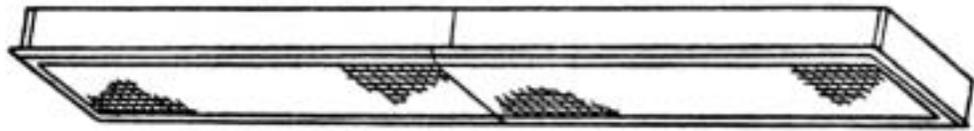
TYPE 224
One 40 Watt Lamp
48-inch Length

TYPE 225
Two 40 Watt Lamps
48-inch Length

Enclosed, Wall Mounted, Direct Fluorescent Fixture

Fixture shall conform to UL 57. Housing shall be of die-formed cold-rolled steel having a nominal thickness of not less than 0.030 inch. The back housing shall be one piece, solid along its entire length. End plates shall be die-formed steel and shall be fastened securely to the housing in a manner that permits no light leakage. All metal parts shall receive a rust inhibitive coating and a baked white enamel finish coat. Lens shall be prismatic, one piece, 0.125 inch nominal thickness, and 100 percent virgin acrylic. The lens shall be easily removed without the use of tools and shall be held in place by concealed hinges, by reinforcing ribs along the edges, or by resting on the end plates. The lens shall be attached to the housing so there is no light leakage. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 226
One 40 Watt Lamp
48-inch Length (Individual)

TYPE 227
Two 40 Watt Lamps
96-inch Length (Tandem)

Recessed Fluorescent Fixture For Corridors

First Suffix Second Suffix

Description

A
B
C

1 Prismatic acrylic lens
1/2- by 1/2- by 1/2-inch acrylic cube louver
1/2- by 1/2- by 1/2-inch polystyrene cube louver
Type 200 emergency unit

Fixture shall conform to UL 57. Housing shall be complete with integral side trim flanges and removable end trim flanges. Housing and trim flanges shall be cold-rolled steel. The lens or louver shall be installed in a manner that will prevent it from coming loose due to vibration. The ballasts and wiring shall be enclosed in a wireway that is continuous throughout the length of the fixture and which forms a wireway for circuits through the fixture. All metal parts shall receive a rust inhibitive coating before application of the finish coat. The finish coat shall be baked white enamel. Lenses and acrylic cube louvers shall be 100 percent virgin acrylic plastic. The lens or louver shall be four feet in length. Acrylic lens shall be flat, 0.125 inch nominal thickness, low brightness, with smooth top surface and a lower surface having a regular array of prismatic elements. Single-lamp ballasts shall be used for individually mounted fixtures and where odd fixtures occur at the ends of continuous rows. Two-lamp ballasts shall be used for tandem mounted fixtures. Fixture shall be prewired

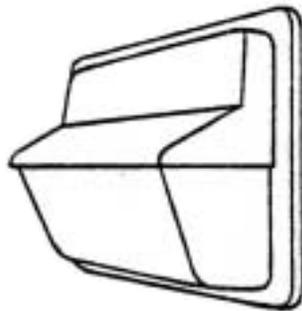
Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

NOVEMBER 1980

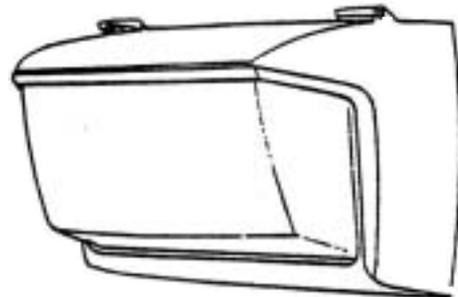
DWG. NO. 40-06-04

16A-23

SHEET 29



TYPE 501
Style A



TYPE 502
Style B

High Intensity Discharge Fixture for Exterior Wall Mounting,
Medium Output

Suffix

Description

A	175 watt mercury vapor lamp
B	70 watt high pressure sodium lamp
C	100 watt high pressure sodium lamp

Fixture shall conform to UL 57 for use in wet locations. The fixture housing, door assembly, and backplate shall be die-cast aluminum. The door assembly shall have integral cast aluminum hinges. The door assembly shall be held securely to the fixture housing with a stainless steel safety strap when the door is in the open position. The door assembly shall be held firmly against a sealing gasket between the fixture door and housing by stainless steel latches or with brass captive screws when the fixture door is closed. The refractor shall be prismatic borosilicate glass. The refractor shall be gasketed and securely held in the door frame, but shall be easily removed for replacement using a screwdriver. The reflector shall be aluminum with the manufacturer's standard commercial product finish suitable for light source provided. The lampholder shall be mogul base glazed porcelain and shall be field adjustable. The fixture shall have brushed aluminum finish and clear acrylic lacquer protective coating. Cast knockouts shall be provided in the backplate for recessed outlet box mounting. Ballast shall be of the high power factor type. Ballast shall be of the constant wattage autotransformer type for mercury vapor lamps and the regulating type for high pressure sodium lamps. Ballast shall start and operate the lamp at ambient temperatures from minus 20 degrees F to 105 degrees F. The fixture shall be prewired.

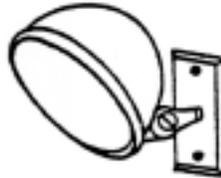
Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 600
12 Volt Emergency Battery Power Supply Unit

Unit shall conform to UL 57 and UL 924 and shall meet the requirements of NEC for emergency lighting. Unit shall be designed to provide light instantaneously and automatically upon failure of normal electrical service. Unit shall provide a capacity of not less than 144 watts for 1-1/2 hours and shall deliver this capacity until the battery has been discharged to 87-1/2 percent of nominal battery voltage. Battery and charger shall be contained in an 18-gage steel cabinet with an electrolyte-resistant undercoat and an enamel finish. Mounting brackets or shelf shall be provided for the cabinet, complete with mounting hardware, all with finish to match the unit. Mounting slots for wall or shelf mounting, conduit attachment means, and AC and DC connections shall be provided in the cabinet. Cabinet shall have separate battery compartment, removable charger and control chassis, hinged access door, and electrolyte view port. The cabinet shall provide for electrical connection of remote fixtures. The battery charger shall be solid state and shall provide a continuous, variable, current-limited charge rate. Battery charger shall recharge battery to rated voltage within 12 hours after discharge to 87-1/2 percent of nominal battery voltage. Low voltage disconnects to protect the battery when battery voltage drops to 87-1/2 percent of nominal battery voltage shall be provided. Battery shall be 12 volt, with lead calcium plates, sulfuric acid electrolyte, hydrometer indicators, sealed top, and transparent enclosure. Battery shall provide 10 years of maintenance-free service. Unit shall have charge indicator light, push-to-test switch, load relay with 30-ampere contacts, and two 10- to 20-ampere fused DC distribution circuits. Unit shall be prewired.

Power supply unit indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 601
Emergency Remote Mounted, 12 Volt Floodlight, For Use
With Type 600 Power Supply Unit

<u>Suffix</u>	<u>Description</u>
A	13 watt lamp
B	18 watt lamp
C	25 watt lamp
D	38 watt lamp

Fixture shall conform to UL 57 and UL 924. Floodlight housing shall be constructed of steel or aluminum and shall be provided with manufacturer's standard commercial product finish. Floodlight shall be fully adjustable in all directions with positive screw locking feature and shall be mounted on a single gang mounting plate. Floodlight shall be provided complete with mounting plate and mounting hardware finished to match the housing for wall outlet box mounting. Lens shall be frosted glass. Halogen type lamp shall be provided. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents, and Class I, Div. 1, Groups C & D and Class II, Div. 1, Groups E, F, & G.



TYPE 602
Remote Mounted, 12 Volt Exit Sign, For Use
With Type 600 Power Supply Unit

<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		Single face
B		Double face
	1	End mounted
	2	Top mounted
	3	Back mounted
	4	Stem mounted

Fixture shall conform to UL 57 and UL 924, and NFPA 101. Exit sign shall be of aluminum construction with a satin anodized finish. Mounting hardware shall be provided with finish to match fixture. Downlighting shall be provided. Aluminum stencil face shall have 6-inch letters with 3/4-inch stroke and red polymer diffuser. Two 20 watt incandescent lamps for normal use and two 20 watt, 15 candlepower minimum DC lamps for emergency lighting shall be provided. Arrows may be through or below the letters and shall be furnished as indicated. Fixture shall provide for extending lamp life using the design in the manufacturer's current standard commercial product. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 602
Remote Mounted, 12 Volt Exit Sign, For Use
With Type 600 Power Supply Unit

<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		Single face
B		Double face
	1	End mounted
	2	Top mounted
	3	Back mounted
	4	Stem mounted

Fixture shall conform to UL 57 and UL 924, and NFPA 101. Exit sign shall be of aluminum construction with a satin anodized finish. Mounting hardware shall be provided with finish to match fixture. Downlighting shall be provided. Aluminum stencil face shall have 6-inch letters with 3/4-inch stroke and red polymer diffuser. Two 20 watt incandescent lamps for normal use and two 20 watt, 15 candlepower minimum DC lamps for emergency lighting shall be provided. Arrows may be through or below the letters and shall be furnished as indicated. Fixture shall provide for extending lamp life using the design in the manufacturer's current standard commercial product. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents, and Class I, Div. 1, Groups C & D and Class II, Div. 1, Groups E, F, & G.



TYPE 603
Emergency Battery Pack Unit With Two 6 Volt Floodlights
Fed. Spec. W-L-305

Unit shall have electrolyte view port, charge indicator light, push-to-test switch, and ammeter. Battery shall be 6 volts. Unit shall have a low voltage disconnect circuit to disconnect the battery when the battery voltage drops to 87-1/2 percent of nominal battery voltage. Floodlights shall be mounted on the battery housing and control unit. Mounting brackets or shelf shall be provided, complete with all mounting hardware, all with finish to match unit. Unit shall be prewired.

Unit indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

NOVEMBER 1980

DWG. NO. 40-06-04

SHEET 54



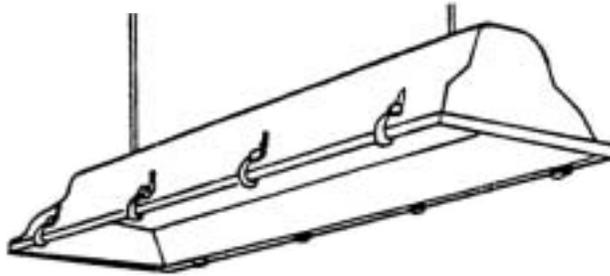
TYPE 604

Exit Sign With Self-Contained Emergency Battery

<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		Single face
B		Double face
	1	End mounted
	2	Top mounted
	3	Back mounted
	4	Stem mounted

Fixture shall conform to UL 57 and UL 924. Housing shall be aluminum or steel. Downlighting shall be provided. Face panel shall be molded polycarbonate plastic or glass, shall be of the white diffusing type similar to opal or albalite, and shall have 6-inch red letters with 3/4-inch stroke. Fixture housing shall be matte black finish, stencil face shall have brushed aluminum finish and clear acrylic lacquer protective coating. Two 20 watt incandescent lamps shall be provided for normal use and two 5 watt DC lamps shall be provided for emergency lighting. All wiring in the illuminated portion of the fixture housing shall be concealed. Arrows may be through or below the letters and shall be furnished as indicated. All ferrous metal parts shall receive a rust inhibitive coating before application of the finish coat. Mounting hardware shall be provided with finish to match housing. Fixture shall have an automatic solid state charger and a sealed, rechargeable, maintenance-free lead oxide or nickel cadmium battery. Fixture shall have a low voltage disconnect circuit to disconnect the battery when the battery voltage drops to 87-1/2 percent of nominal system voltage. Fixture shall have a light-emitting diode pilot light to show that the battery charger is functioning. A test switch to simulate a power failure and allow checking of emergency battery system shall be provided. Fixture shall provide for extending the lamp life using the design in the manufacturer's current standard commercial product. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



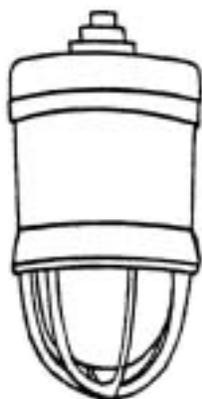
TYPE 709

Pendant Mounted, Industrial Fluorescent Fixture For Use In NEC Class II,
Groups F, G, and Class III Locations

<u>Suffix</u>	<u>Description</u>
A	Two 40 watt lamps
B	Three 40 watt lamps

Fixture shall conform to UL 844 for use in NEC Division 1 and 2 locations. Housing shall be fabricated in one piece of 20 gage steel using seamless welded construction. Fixture shall be of standard construction for use in noncorrosive areas. All interior and exterior metallic surfaces, including reflector and wireway cover, shall be finished with white porcelain enamel. The doorframe shall be 16 gage steel. All metallic surfaces shall receive a rust inhibiting coating before application of finish coat. The doorframe shall have full neoprene gasket between flat surfaces of the frame and housing. The lens shall be 1/4 inch thick heat and impact resistant glass. Ballast shall be thermally protected or fuse protected. Where fuses are provided they shall be installed in fuse holders that will not permit line connections to be accessible when the fuse is removed. Lampholders shall be white urea plastic. The lens shall be sealed in the doorframe. The doorframe shall be hinged and shall be held tightly sealed to the housing with stainless steel clamps. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 710
Without Reflector



TYPE 711
With Standard
Dome Reflector



TYPE 712
With 30 Degree Angle
Dome Reflector

High Intensity Discharge, Industrial Lighting Fixture For Use In
NEC Class I, Groups C, D, and Class II, Groups E, F, G, and
Class III Locations

<u>First Suffix</u>	<u>Second Suffix</u>	<u>Description</u>
A		100 watt mercury vapor lamp
B		175 watt mercury vapor lamp
C		175 watt metal halide lamp
D		100 watt high pressure sodium lamp
E		150 watt high pressure sodium lamp
	1	Pendant mounted
	2	Ceiling mounted
	3	Bracket mounted

Fixture shall conform to UL 844 for use in NEC Division 1 and 2 locations. The fixture shall be integrally ballasted. The conduit entry wiring compartment shall be mechanically sealed from the ballast compartment. The conduit entry compartment shall contain a wireless terminal block which will connect and disconnect the fixture from the power source when the fixture is installed or removed. The fixture shall be prewired and factory sealed. The housing and guard shall be cast aluminum with the manufacturer's standard commercial product protective finish. Lampholder shall be mogul base glazed porcelain. The fixture shall be provided with the type mounting specified or indicated. The globe shall be heat and impact resistant glass, threaded, fluted, ribbed or patterned. The reflector shall be the manufacturer's standard commercial product and finish. Ballast shall be of the high power factor type. The fixture ballast shall be of the constant wattage autotransformer type for mercury vapor

lamps, lead-peak regulating type for metal halide lamps, and regulating type for high pressure sodium lamps. Ballast shall start and operate the lamp at ambient temperatures ranging from minus 20 degrees F to 105 degrees F.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.