DEPARTMENT OF THE NAVY
NAVAL FACILITIES
ENGINEERING COMMAND
GUIDE SPECIFICATION

NFGS-16510 (December 1981)

Superseding
TS-16510 (July 1979)
and Amendment-1
(December 1979)

SECTION 16510

LIGHTING, INTERIOR

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SECTION 16510 (B)

LIGHTING, INTERIOR (A)

PART 1 - GENERAL

1.1 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. (C)

1.1.1 Military Standard (Mil. Std.):

MIL-STD-461B	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

1.1.2 American National Standards Institute (ANSI) Publications:

C78.1330-1976	Mercury Lamps with Integral Means for Extinguishing the Arc After the Outer Envelope is Broken
C82.1-1977	Specifications for Fluorescent Lamp Ballasts
C82.2-1977	Methods of Measurement of Fluorescent Lamp Ballast
C82.4-1978	Specifications for High-Intensity-Discharge Lamp Ballasts (Multiple Supply Type)

1.1.3 Illuminating Engineering Society (IES) Publication:

(1981 Edition)	Lighting Handbook

1.1.4 National Electrical Manufacturers Association (NEMA) Publications:

ICS 2-1978 (REV 2-80)	Industrial Control Devices, Controllers, and Assemblies

ICS 6-1978 (REV 1-80)	Enclosures for Industrial Controls and Systems
LE 2-1974 (R 1980)	H-I-D Lighting System Noise Criterion (LS-NC) Ratings

1.1.5 National Fire Protection Association (NFPA) Publications:

70-1981	National Electrical Code (NEC)
101-HBK-1979	Life Safety Code

1.1.6 Underwriters' Laboratories, Inc., (UL) Standards:

20-1979	General Use Snap Switches
57-1972 (R AUG 80)	Electric Lighting Fixtures
773-1974 (R APR 81)	Plug-In, Locking Type Photocontrols for Use With Area Lighting
773A-1978	Nonindustrial Photoelectric Switches for Lighting Control
844-1978 (R SEP 79)	Electric Lighting Fixtures for Use in Hazardous Locations
924-1979 (R JUL 80)	Emergency Lighting Equipment
935-1978 (R SEP 80)	Fluorescent Lamp Ballasts
1029-1980	High-Intensity-Discharge-Lamp Ballasts
1570-1979 (R FEB 80)	Fluorescent Lighting Fixtures

1.2 GENERAL REQUIREMENTS: Section 16011, "Electrical General Requirements," applies with the following additions and modifications. (D,E) The work includes the provision of new lighting fixtures, photocell switches, ~~dimmer switches~~, time switches, contactors, and battery-powered units and systems for interior use, including lighting fixtures and accessories mounted on the exterior surfaces of buildings. Materials not normally furnished by manufacturers of these devices are specified in Section 16402, "Interior Wiring Systems."

1.3 SUBMITTALS: Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting system specified.

1.3.1 Manufacturer's Data:

a. Lighting fixtures, including lamps and ballasts
b. [Lighting contactors]
c. [Photocell switch]
d. [Time switch]
e. [Dimmer switch]
f. [Power hooks]
g. [Emergency lighting equipment]
h. [_____]
i. [_____]
j. [_____]

1.3.2 Shop Drawings:

a. Lighting fixture assemblies
b. [Emergency lighting systems]
c. [_____]
d. [_____]

[Shop drawings for lighting fixture assemblies shall include computerized horizontal footcandle data at a task plane height of _____ feet.]

1.3.3 Certified Test Reports: (F)

a. Computerized candlepower distribution data in horizontal plane at angles of every [5] [____] degrees between [0 and 180] [_____] degrees, coefficients of utilization, efficiency, and distribution class. Testing shall be by an independent testing laboratory. Excerpts of test data on manufacturer's letterhead are not acceptable.

b. [_____]

1.3.4 Samples: (F)

a. Lighting fixtures (one sample for each type)

b. [_____]

PART 2 - PRODUCTS

2.1 FLUORESCENT LIGHTING FIXTURES: UL 1570 [, except lighting fixtures for damp and wet locations shall conform to UL 57]. (G)

2.1.1 Fluorescent Lamps: [Provide the number, type, and wattage indicated.] [Provide lamp Type _____ conforming to ANSI C78.___.] (H)

2.1.2 Fluorescent Ballasts: UL 935, ANSI C82.1, and shall be labeled Certified Ballast Manufacturers (CBM) certified by Electrical Testing Laboratories (ETL). Ballasts shall be high power factor type [unless indicated otherwise] and shall be designed to operate on the voltage system to which they are connected. Ballasts shall be Class P and shall have sound rating "A" [unless otherwise noted]. Fixtures and ballasts shall be designed and constructed to limit the ballast case temperature to 90 degrees Celcius (C) when installed in an ambient temperature of [40] [_____] degrees C. (I)

2.1.2.1 Low Temperature Ballasts: Provide fluorescent ballasts having a minimum starting temperature of minus [20] [30] degrees C in fixtures mounted [in cold rooms,] [outdoors,] [in unheated buildings,] [and as indicated]. (J)

2.1.2.2 Energy Saving Ballasts: Provide energy saving fluorescent ballasts of the CBM certified full light output type. The ballasts shall have an average input wattage of [86 or less when operating two F40T12 lamps] [50 or less when operating one F40T12 lamp] [159 or less when operating two F96T12 lamps] [___ or less when operating ___ _____ lamps] tested in accordance with ANSI C82.2 methods. [Ballast shall be compatible for use with energy-saving lamps.] (K)

2.1.3 Open-Tube Fluorescent Fixtures: Provide with spring-loaded telescoping sockets or lamp retainers (two per lamp).

2.1.4 Electromagnetic Interference Filters: Provide in each fluorescent fixture mounted [in shielded enclosures] [where indicated]. Filters shall be integral to the fixture assembly (one filter per ballast) and shall supress electromagnetic interference as required by Mil. Std. MIL-STD-461.

~~2.2 HIGH-INTENSITY-DISCHARGE (HID) LIGHTING FIXTURES: UL 57.~~ (L)

2.2.1 HID Lamps: [Provide the number, type, and wattage indicated.] [Provide lamp Type _____ conforming to ANSI C78.___.] [Mercury vapor and metal halide lamps used in open fixtures shall have extinguishing mechanisms to prevent operation of lamps when outer globe is broken. Mercury vapor lamps of this type shall conform to ANSI C78.1330.] (H)

2.2.2 HID Ballasts: UL 1029 and ANSI C82.4 and shall be constant wattage autotransformer (CWA) or regulator, high power factor type, [unless otherwise indicated]. Ballasts shall be designed to operate on the voltage system to which they are connected. Single-lamp ballasts shall have a minimum starting temperature of minus 30 degrees C. Ballasts shall be designed for installation in a normal ambient (M)

temperature of [40] [____] degrees C. Ballasts shall be constructed so that open circuit operation will not reduce their average life. High Pressure Sodium (HPS) ballasts shall have a solid-state igniter/starter with an average life in the pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 degrees C. Average life is defined as the time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

2.2.3 HID Lighting System Noise Criteria: Provide HID lighting system[s] located [as indicated] [in library] [in _____] which [has] [have] a corrected Lighting System Noise Criterion (LS-NC) rating of __. LS-NC ratings, correction factors, and methods of determination shall be as specified in NEMA LE 2. (N)

2.3 INCANDESCENT LIGHTING FIXTURES: UL 57. (O)

2.3.1 Incandescent Lamps: [Provide the number, type, and wattage indicated.] [Provide lamp Type _____ conforming to ANSI C78.____.] (H)

2.3.2 Incandescent Dimmer Switch: UL 20, single-pole, [600] [____]-watt, 120-volt ac, full-range rotary on-off type with built-in electromagnetic interference filter. (P)

2.4 RECESS- AND FLUSH-MOUNTED FIXTURES: Provide type that can be relamped from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as shown on sketches or as indicated.

2.5 SUSPENDED FIXTURES: Provide hangers capable of supporting twice the combined weight of the fixtures to which they are attached. [Provide with swivel hangers to insure a plumb installation. Hangers shall be cadmium-plated steel with swivel-ball tapped for the conduit size indicated.] [Hangers shall be shock absorbing type where indicated.] Hangers shall allow fixtures to swing within an angle of 20 degrees. Brace pendants 4 feet or longer [provided in shops or hangars] to limit swinging. Single-unit suspended [fluorescent] fixtures shall have twin stem hangers. Multiple-unit or continuous row fluorescent fixtures 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 a minimum 3/16-inch diameter.

2.6 FIXTURES FOR HAZARDOUS LOCATIONS: In addition to requirements stated elsewhere in this section, provide [fluorescent] [HID] [incandescent] fixtures for hazardous locations which conform to UL 844 or which have Factory Mutual certification for the class and division indicated.

2.7 LIGHTING CONTACTOR: NEMA ICS 2, electrically operated, mechanically held unit rated [_____ volts, _____ amperes, _____ poles] [as indicated]. Provide in NEMA [1] [4] [____] enclosure conforming to

NEMA ICS 6. Unit shall have silver alloy double-break contacts and coil clearing contacts and shall require no arcing contacts. [Provide contactor with [hand-off-automatic] [on-off] selector switch.] [Unit shall be hermetically sealed.]

2.8 TIME SWITCH: Astronomic dial type arranged to turn "ON" at sunset, "OFF" at sunrise, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise. Provide switch with automatically wound spring mechanism to keep the switch on time for a minimum of 15 hours following failure of normal power. Provide time switch with a manual on-off bypass switch. Housing for the time switch shall be surface mounted, NEMA [1] [3] [____] conforming to NEMA ICS 6.

~~2.9 PHOTOCELL SWITCH: UL 773 or UL 773A, as applicable, hermetically sealed cadmium-sulphide cell rated [_____] volts ac, 60 hertz with single-throw contacts rated [1000] [_____] watts and [_____] volts. The unit shall be mounted [in a cast weatherproof aluminum housing with swivel arm designed to mount on or beside each flood light] [integral to the fixture] [in a high-impact resistant noncorroding and nonconductive molded plastic housing with an EEI-NEMA locking-type receptacle]. The unit shall turn on below 3 footcandles and off at 3 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. A directional lens shall be mounted in front of the cell to prevent fixed light sources from creating a turnoff condition. Aim unit according to manufacturer's recommendations.~~

~~2.10 POWER HOOK FIXTURE HANGERS: Provide UL listed assembly consisting of a through-wired power hook housing, an interlocking plug and receptacle, a power cord, and a fixture support loop. Power hook housing shall be cast aluminum having two 3/4-inch threaded hubs. Fixture support loop shall be cast aluminum having provisions for accepting 3/4-inch threaded fixture stems. Power cord shall consist of 16 inches of No. 16 3-conductor type SO cord. Assembly shall be rated ____ volts, ____ amperes, ____-wire, ____-pole.~~

2.11 EXIT SIGNS: UL 924, NFPA 70, and NFPA 101. Exit signs shall be [as indicated] [as described on NAVFAC Sketch NFGS-16510-48] [self-powered type] [remote-powered type.] (Q)

2.11.1 Self-Powered Exit Signs (Battery Type): Provide with automatic power failure device, test switch, pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed wet or gel electrolyte type, operate unattended, and require no maintenance (including additional water) for a period of not less than [5] [10] years.

2.11.2 Self-Powered Exit Signs (Luminous Source Type): Provide with solid-state tritium gas energy source which allows legibility in total darkness at 100 feet after 10 years. In addition to the requirements of UL and NFPA, signs shall be licensed for use by the public by the U.S. Nuclear Regulatory Commission.

2.11.3 Remote-Powered Exit Signs: Provide remote ac/dc exit signs having provisions for wiring to external ac and dc power sources. Unit shall have a minimum of two ac lamps for normal illumination and two bayonet base dc lamps for emergency lighting.

2.12 EMERGENCY LIGHTING EQUIPMENT: UL 924, NFPA 70, and NFPA 101. (R)
Provide [sealed beam lamps rated [8] [18] [25] [35]] [halogen-sealed beam lamps rated [____] [8] [12] [20]] watts at the specified voltage. [Provide the accessories required for remotely mounting lamps where indicated]. Plug and receptacle service to emergency lighting equipment will not be allowed.

2.12.1 Unit Equipment: Provide each unit with an automatic power failure device, test switch, ac ON pilot light, separate high-charge indicating light, fully automatic solid-state charger, low voltage battery disconnect device, [automatic overload protection,] [brown-out sensitive circuit to activate battery when ac input falls to 75 percent of normal voltage,] [time delay feature for areas with HID lighting] and provide with a rack for wall or column mounting. Charger shall be either trickle, float, constant current, or constant potential type or a combination of these. Battery shall be sealed wet or gel electrolyte type, operate unattended, and require no maintenance (including additional water) for a period of not less than 10 years. Emergency lighting units shall be rated for 12 volts, except units having no remotely mounted lamps and having no more than two unit-mounted lamps may be rated 6 volts.

2.12.2 Fluorescent Emergency System: Each system shall consist of an automatic power failure device, cover-mounted test switch and pilot light, and fully automatic solid-state charger in a self-contained power-pack. Charger shall be either trickle, float, constant current or constant potential type, or a combination of these. Battery shall be sealed wet or gel electrolyte type with capacity as required to supply power to [_____ lamps] [the number of lamps shown for each unit]. Battery shall operate unattended and require no maintenance (including additional water) for a period of not less than 5 years. Unit shall be capable of operating a dead fluorescent lamp.

2.12.3 Central Emergency System: Central battery system shall provide _____ watts of emergency power at [[277] [120] [___] volts, 60 hertz sine wave ac] [[32] [____] volts dc] for a minimum period of [90] [_____] minutes. The battery system shall be designed to handle surges during loss and recovery of the voltage. System shall deliver its full rated output to incandescent and fluorescent lamps.

2.12.3.1 Operation: With normal power applied, the batteries shall be automatically charged. Upon loss of normal supply voltage, the system shall automatically disengage itself from the normal input line and, within one second, switch to a self-contained inverter. Inverter shall have built-in protection when the output is shorted or overloaded. When

normal line voltage resumes, the emergency system shall automatically switch back to normal operation before the power loss. The transfer switch for this function shall be sized to handle 125 percent of full load.

2.12.3.2 Charger: [Two-rate type for lead-calcium batteries] [Three-rate type for nickel-cadmium batteries]. The battery charger shall be solid-state, completely automatic, maintaining the batteries in a fully charged condition, and recharging the batteries to full capacity within 16 hours after full discharge.

2.12.3.3 Batteries: The batteries shall be [sealed lead-calcium type, operate unattended, and require no maintenance (including additional water) for a period of not less than 10 years] [nickel-cadmium type, operate unattended, and require no maintenance (including additional water) for a period of not less than 5 years].

2.12.3.4 Accessories: Provide visual indicators to indicate normal power, inverter power, and battery charger operation. Provide test switch to simulate power failure by interrupting the input line, [battery voltage meter,] [load ammeter,] [automatic brown-out circuitry to switch to emergency power when input line voltage drops below 75 percent of normal value,] [electrolyte level detector that will activate a visual or audio alarm in the event of a low water condition,] [time delay feature for areas with HID lighting,] [and] [low voltage cutoff to disconnect inverter when battery voltage drops to approximately 80 percent of nominal voltage].

2.12.3.5 Enclosure: A free standing cabinet shall be provided with floor stand and shall be constructed of 12-gage sheet steel with baked-on enamel finish and locking type latch.

2.13 INSTANT RESTRIKE DEVICE: UL listed, solid-state potted module, suitable for mounting inside the luminaire. Maximum surface temperature of metal mounting surface shall not exceed 80 degrees C. Instant restrike device shall be compatible with mogul-based HPS lamps, ballasts, and lamp sockets up to 150 watts. Restrike range shall be 105 to 130 volts ac. Voltage shall not exceed 250 volts peak or 150 volts ac rms. [Provide one instant restrike device for each device for each HPS fixture.] [Provide instant restrike devices as indicated.] (S)

** OR **

2.13 AUXILIARY INSTANT-ON QUARTZ SYSTEM: UL listed, automatically switched instant-on [150] [250]-watt quartz lamp. Quartz lamp shall come on when the luminaire is initially energized and following a momentary power outage and shall remain on until HID lamp reaches approximately 60 percent light output. Wiring for quartz lamp shall be internal to the ballast and shall be independent of the incoming line voltage to the ballast. [Provide instant-on quartz system for each HPS fixture.] [Provide instant-on quartz system as indicated.] (S)

PART 3 - EXECUTION

3.1 INSTALLATION: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved shop drawings. The installation shall meet with the requirements of NFPA 70. Mounting heights specified or indicated shall be to bottom of fixture. Obtain approval of the exact mounting of lighting fixtures on the job before installation is commenced and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semirecessed fixtures may be supported from suspended ceiling support system ceiling tees if the ceiling system support rods or wires are provided at a minimum of four rods or wires per fixture and located not more than 6 inches from each corner of each fixture. Provide support rods or wires for round fixtures or fixtures smaller in size than the ceiling grid at a minimum of four rods or wires per fixture and locate at each corner of the ceiling grid in which the fixture is located. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently or with at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees. (T)

3.1.1 Exit and Emergency Lights: Wire exit lights on separate circuits and serve from [an emergency panel] [a separate breaker] [a fused disconnect switch]. Connect this [panel] [breaker] [switch] ahead of the main service disconnect switch. The lights shall have only one control, which shall be [the circuit breaker in the emergency panel] [the disconnect switch]. Wire emergency lights ahead of the switch to the normal lighting circuit located in the same room or area. (U)

3.2 GROUNDING: Ground noncurrent-carrying parts of equipment as specified in Section 16402, "Interior Wiring Systems." Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.3 FIELD TESTS: Perform the following field tests. The Government will provide electric power required for field tests.

3.3.1 Operating Test: After the installation has been completed, conduct an operating test to show that the equipment operates in accordance with the requirements of this section.

3.3.2 Insulation Resistance Test: Perform as specified in Section 16402, "Interior Wiring Systems," both before connection of fixtures and equipment and after fixtures and equipment are connected and ready for use.

3.3.3 Ground Resistance Tests: Perform as specified in Section 16402, "Interior Wiring Systems."

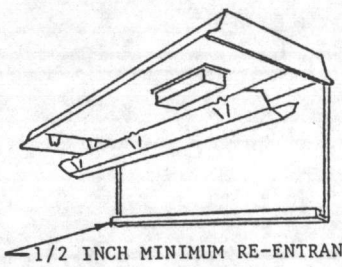
LIST OF SKETCHES

SKETCH NUMBER	TITLE
NFGS-16510-1	Surface Mounted Wrap-Around Luminaire for Office/Classroom Type Spaces
NFGS-16510-2	Surface Mounted Wrap-Around Luminaire for Other Than Office Type Spaces
NFGS-16510-3	Fluorescent Troffer Luminaire
NFGS-16510-4	Wall-Mounted Fluorescent
NFGS-16510-5	Wall-Mounted Indirect Fluorescent Wood Shielding
NFGS-16510-6	Industrial Fluorescent
NFGS-16510-7	Strip Fluorescent
NFGS-16510-8	Wet/Damp Location Luminaire
NFGS-16510-9 thru 19	Reserved for future Fluorescent Luminaire
NFGS-16510-20	Recess Mounted Commercial HID
NFGS-16510-21	Surface Mounted Commercial HID
NFGS-16510-22	High Bay Industrial HID
NFGS-16510-23	Low Bay Industrial HID
NFGS-16510-24	Indirect HID Luminaire
NFGS-16510-25	HID Wall-Mounted Luminaire
NFGS-16510-26	18-Watt Low-Pressure Sodium Wall Mount
NFGS-16510-27 thru 39	Reserved for Future HID Luminaires
NFGS-16510-40	Step Light
NFGS-16510-41	Adjustable Incandescent Interior Spot Light

NFGS-16510-42	Semi-Recessed Baffle Downlight (Incandescent)
NFGS-16510-43	Recessed Incandescent
NFGS-16510-44	Adjustable Semi-Recessed Spot Light
NFGS-16510-45	Exterior Incandescent Luminaire
NFGS-16510-46	Ceiling-Mounted Vandal-Resistant Luminaire
NFGS-16510-47	Wall-Mounted Vandal-Resistant Luminaire
NFGS-16510-48	Exit Sign
NFGS-16510-49	Explosion-Proof Luminaire
NFGS-16510-50	Obstruction Light
NFGS-16510-51 thru 98	Reserved for Future Incandescent/Specialty Luminaires
NFGS-16510-99	Sample-Lighting Fixture Schedule

NFGS-16510 (SEPTEMBER 1981)

LUMINAIRE REQUIREMENTS



1. 20 GAGE (U.S. STANDARD) FORMED STEEL HOUSING. CHEMICAL TREATMENT FOR RUST PREVENTION. BAKED WHITE ENAMEL FINISH. 85% MIN. REFLECTANCE (INTERIOR). HOUSING SHALL NOT PERMANENTLY DEFORM NOR SHALL IT DEFLECT MORE THAN ONE INCH (TWO INCHES FOR TYPE B) WHEN LIFTED BY ONE CORNER.

2. SECURE HOUSING ENDS BY RIVETS OR SCREWS. PROVIDE A KNOCKOUT IN EACH END AND TWO IN TOP OF HOUSING.

3. OVERALL LUMINAIRE LENGTH SHALL BE 48 INCHES NOMINAL. OVERALL WIDTH SHALL BE 12 INCHES MINIMUM FOR 2 LAMP, 15-1/2 INCHES MINIMUM FOR 4 LAMP. OVERALL HEIGHT SHALL BE 3-1/2 INCHES MAXIMUM.

4. LENS SHALL BE CLEAR 100% ACRYLIC HAVING A MINIMUM OVERALL (BOTTOM OF LENS) THICKNESS OF 0.140 INCH WITH A MAXIMUM PRISM PENETRATION DEPTH OF 0.07 INCHES (0.055 INCH MIN. OVERALL SIDE THICKNESS).

5. LENS SHALL BE PRISMATIC TYPE, INJECTION MOLDED INTO A SINGLE 5 SIDED UNIT WITH 1/2 INCH MINIMUM RE-ENTRANT FLANGE ON EACH LONG SIDE FOR ADDITIONAL STRENGTH.

6. LENS SHALL BE CAPABLE OF HINGING AND LATCHING FROM EITHER SIDE OF FIXTURE.

7. LUMINAIRE SHALL HAVE LUMINOUS ENDS.

8. BALLAST: HIGH POWER FACTOR ($\geq$.9) ETL, CBM APPROVED RAPID START CLASS P ENERGY SAVING BALLAST WITH SOUND RATING OF "A". SECURE BALLASTS TO HOUSING WITH AT LEAST ONE SCREW AND SLIP ON BRACKET OR TWO SCREWS-ONE AT EACH END.

9. PHOTOMETERICS: MINIMUM COEFFICIENT OF UTILIZATION (CU) FOR THE FOLLOWING CAVITY REFLECTANCES: CEILING = 80% WALL = 50% FLOOR = 20%
LUMINANCE USING 3100L LAMP WITH AVG:MAX. RATIO NOT TO EXCEED 1:5

	TYPE A	TYPE B	AVG LUMINANCE (fl)
RCR = 1	CU = 0.71	0.67	45° = 2250
2	0.64	0.60	55° = 1605
3	0.57	0.54	65° = 1125
4	0.51	0.48	75° = 750
MIN. EFFICIENCY	69%	62%	85° = 495

10. SPACING TO MOUNTING HEIGHT RATIO SHALL BE NOT LESS THAN 1.35 FOR TYPE A 1.3 FOR TYPE B.

SURFACE MOUNTED WRAP-AROUND LUMINAIRE FOR OFFICE/CLASSROOM TYPE SPACES

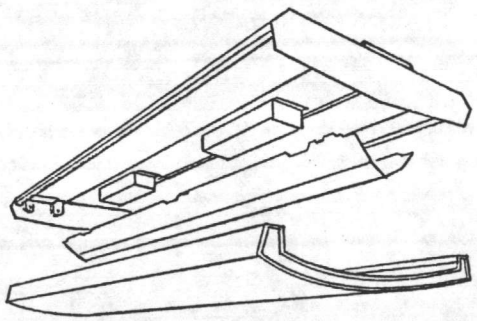
STYLE NL- 1

TYPE A - 2 LAMP
TYPE B - 4 LAMP

SKETCH NFGS-16510 - 1

NFGS-16510 (SEPTEMBER 1981)

LUMINAIRE REQUIREMENTS



1. 22 GAGE (U.S. STANDARD) FORMED STEEL HOUSING. CHEMICAL TREATMENT FOR RUST PREVENTION. BAKED WHITE ENAMEL FINISH. 85% MINIMUM REFLECTANCE (INTERIOR). HOUSING SHALL NOT PERMANENTLY DEFORM NOR SHALL IT DEFLECT MORE THAN THE FOLLOWING WHEN LIFTED BY ONE CORNER: Type A-1/2", Type B-1", Type C-2"

2. SECURE HOUSING ENDS BY RIVETS OR SCREWS. PROVIDE A KNOCKOUT IN EACH END AND TWO IN TOP OF HOUSING.

3. OVERALL LUMINAIRE NOMINAL DIMENSIONS (± 10%) SHALL BE:

TYPE	LENGTH	WIDTH	DEPTH
A	48"	4"	4 1/2"
B	48"	10"	3 1/2"
C	48"	15"	3 1/2"

4. LENS SHALL BE CLEAR EXTRUDED 100% ACRYLIC HAVING A MIN. OVERALL (BOTTOM OF LENS) THICKNESS OF 0.10 INCHES WITH A MAXIMUM PRISM PENETRATION DEPTH OF 0.07 INCHES (0.055 INCH MIN. OVERALL SIDE THICKNESS) AND WELDED END PLATES TO FORM A SINGLE PIECE, 5 SIDED BASKET.

5. LENS SHALL BE PRISMATIC TYPE.

6. LENS SHALL HINGE ALONG ENTIRE LENGTH OF FIXTURE (LIFT AND SHIFT TYPE). LENS SHALL BE CAPABLE OF HINGING FROM BOTH SIDES OF FIXTURE.

7. BALLAST: HIGH POWER FACTOR (≥.9) ETL, CBM APPROVED RAPID START CLASS P ENERGY SAVING BALLAST WITH SOUND RATING OF "A". SECURE BALLAST TO HOUSING WITH AT LEAST ONE SCREW AND SLIP-ON BRACKET OR 2 SCREWS - ONE AT EACH END.

8. PHOTOMETRICS: MINIMUM COEFFICIENT OF UTILIZATION (CU) FOR THE FOLLOWING CAVITY REFLECTANCES: CEILING = 80% WALL = 50% FLOOR = 20% LUMINANCE USING 3100L LAMP WITH AVG:MAX. RATIO NOT TO EXCEED 1:5

ROOM CAVITY RATIO	CU = TYPE A	TYPE B	TYPE C	AVG LUMINANCE (fL)
1	0.76	0.71	0.67	45° - 2250
2	0.66	0.64	0.60	55° - 1605
3	0.59	0.57	0.54	65° - 1125
4	0.52	0.51	0.48	75° - 750

9. SPACING TO MOUNTING HEIGHT RATIO SHALL BE NOT LESS THAN 1.3

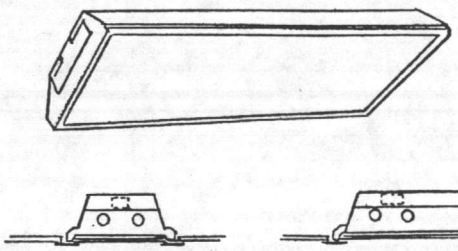
SURFACE MOUNTED WRAP AROUND LUMINAIRE FOR OTHER THAN OFFICE TYPE SPACES

TYPE A - 1 LAMP
TYPE B - 2 LAMP
TYPE C - 4 LAMP

SKETCH NFGS-16510-2

STYLE
NL- 2

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. HOUSING SHALL BE 22 GAGE (U.S STD) MIN. 5" MAX. HEIGHT AND SHALL NOT PERMANENTLY DEFORM WHEN LIETED BY ONE CORNER WITH LENS DOOR IN PLACE NOR WITH LENS DOOR REMOVED. LENS DOOR SHALL NOT OPEN WHEN LUMINAIRE IS LIFTED BY ONE CORNER. LUMINAIRE SHALL HAVE LESS THAN THE FOLLOWING DEFLECTION WHEN LIFTED BY ONE CORNER WITH LENS DOOR REMOVED:

TYPE:	A	B	C, D & E
	3"	2 1/2"	4"

2. HOUSING SHALL BE CHEMICALLY TREATED FOR RUST PREVENTION AND HAVE BAKED WHITE ENAMEL FINISH 85% MIN. REFLECTANCE (INTERIOR). ENDS SHALL BE SECURED BY RIVETS OR SCREWS.
3. LATCHES SHALL BE A MINIMUM OF 20 GAGE (U.S. STANDARD) STEEL OR 26 GAGE (U.S. STANDARD) SPRING STEEL. DIRECTION OF TRAVEL TO OPEN SHALL BE STAMPED ON LENS FRAME WHEN NOT OBVIOUS.
4. LENS DOOR SHALL BE 20 GAGE (U.S. STANDARD) STEEL, SHALL BE CAPABLE OF DISASSEMBLY FOR LENS REPLACEMENT. PROVIDE LIGHT TIGHT FIT WITHOUT MOVABLE BAFFLES.
5. LENS SHALL BE 0.156" (FOR TYPES A, C, D, E) AND 0.125" (FOR TYPE B) PLUS OR MINUS 10% OVERALL (0.09 MAX. PRISM PENETRATION) CLEAR PRISMATIC 100% ACRYLIC.
6. DOOR SHALL BE CAPABLE OF HINGING AND LATCHING FROM BOTH SIDES OF LUMINAIRE. PROVIDE SAFETY TYPE HINGES.
7. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$.9) ETL, CBM APPROVED RAPID START CLASS P ENERGY SAVING BALLAST WITH SOUND RATING OF "A" SECURE BALLAST TO HOUSING WITH AT LEAST ONE SCREW AND SLIP-ON BRACKET OR 2 SCREWS ONE AT EACH END.
8. PHOTOMETRICS: MINIMUM COEFFICIENT OF UTILIZATION (CU) FOR THE FOLLOWING CAVITY REFLECTANCES: CEILING = 80% WALL = 50% FLOOR = 20% LUMINANCE USING 3100L LAMP WITH AVG:MAX RATIO NOT TO EXCEED 1:5

ROOM CAVITY RATIO	TYPE:	A	B	C	D	E	AVG. LUMINANCE (fL)
	CU						
1		0.67	0.60	0.73	0.70	0.67	45° - 2250
2		0.60	0.54	0.66	0.63	0.60	55° - 1605
3		0.54	0.48	0.59	0.56	0.54	65° - 1125
4		0.49	0.44	0.53	0.51	0.49	75° - 750
MIN. S/MH		1.2	1.1	1.3	1.3	1.3	85° - 495

PROVIDE MIN. VISUAL COMFORT PROBABILITY (VCP) OF 65 (ASSUME 30'x30'x10'H ROOM). WHEN "OFFICE TYPE" INDICATED, PROVIDE MIN. VCP OF 70

9. PROVIDE MOUNTING HARDWARE COMPATABLE WITH CEILING MATERIAL.

TYPE A - 2'X 2' 2 LAMP
TYPE B - 1'X 4' 2 LAMP
TYPE C - 2'X 4' 2 LAMP
TYPE D - 2'X 4' 3 LAMP
TYPE E - 2'X 4' 4 LAMP

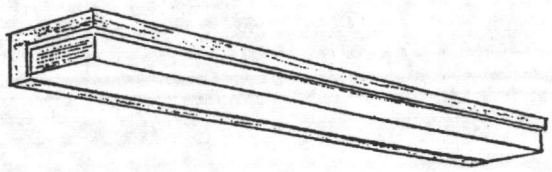
TROFFER

SKETCH NFGS-16510-3

STYLE

NL- 3

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 20 GAGE (U.S. STD.) STEEL BACK PLATE & REFLECTOR. CHEMICAL TREATMENT FOR RUST PREVENTION. BAKED WHITE ENAMEL FINISH. PROVIDE KNOCKOUTS THRU BACK PLATE.

2. 20 GAGE (U.S. STD.) DIE FORMED STEEL OR EXTRUDED ALUMINUM HOUSING. BAKED BLACK ENAMEL OR BRUSHED ALUMINUM FINISH UNLESS INDICATED OTHERWISE.

3. MAXIMUM OVERALL LUMINAIRE HEIGHT SHALL BE 5 INCHES. MAXIMUM LUMINAIRE DEPTH SHALL BE 8 INCHES. MAXIMUM LUMINAIRE LENGTH SHALL BE
   26 INCHES - TYPE A
   38 INCHES - TYPE B
   50 INCHES - TYPE C

4. LENS SHALL BE CLEAR 100% ACRYLIC HAVING AN OVERALL NOMINAL THICKNESS OF 0.110 INCHES PLUS OR MINUS 10%. UPLIGHT LENS SHALL BE 100% ACRYLIC WITH A MINIMUM OF 0.09 INCHES OVERALL THICKNESS.

5. LENS SHALL BE PRISMATIC (TO REDIRECT LIGHT, PREVENTING DIRECT GLARE AT HIGH VIEWING ANGLES) OR LUMINAIRE SHALL HAVE OPAQUE FRONT.

6. LENS SHALL HAVE SPRING STEEL LATCHES.

7. LUMINAIRE SHALL PROVIDE UP AND DOWN LIGHT. UP LIGHT SHALL BE SEPARATELY SWITCHED WHERE INDICATED.

8. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$.9) ETL CBM APPROVED CLASS P WITH SOUND RATING OF "A" - BALLASTS FOR 30 AND 40 WATT LAMPS SHALL BE RAPID START. BALLASTS FOR 20 WATT LAMPS SHALL BE TRIGGER START. BALLASTS FOR 40 WATT LAMPS SHALL BE ENERGY SAVING TYPE. SECURE BALLASTS TO HOUSING WITH AT LEAST ONE SCREW AND SLIP-ON BRACKET OR 2 SCREWS - ONE AT EACH END.

9. WHERE LUMINAIRE REQUIRES SEPARATELY SWITCHED UP LIGHT, LUMINAIRE SHALL HAVE 2 BALLASTS AND METAL BAFFLE BETWEEN LAMPS.

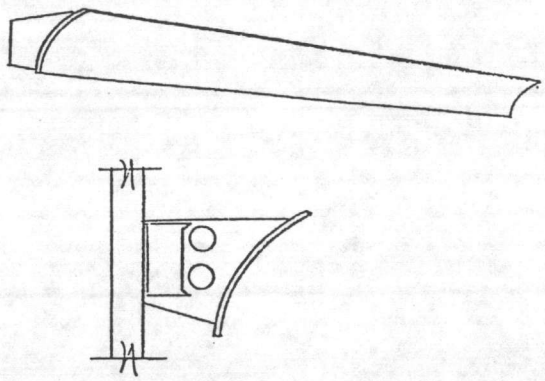
WALL MOUNTED FLUORESCENT

TYPE A 2 - 20 W LAMPS
TYPE B 2 - 30 W LAMPS
TYPE C 2 - 40 W LAMPS

STYLE
NL-4

SKETCH NFGS-16510 -4

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 20 GAGE (U.S. STD) STEEL CHANNEL & COVER HOUSING BALLAST AND SUPPORTING WOOD SHIELDING. CHEMICALLY TREAT FOR RUST PREVENTION AND FINISHED WITH BAKED WHITE ENAMEL FINISH.

2. PROVIDE SHIELD SUPPORT SUCH THAT NO FASTENERS, SCREWS, TABS OR UNNECESSARY KNOCKOUTS ARE VISIBLE WHEN LUMINAIRE IS IN PLACE.

3. SHIELD SHALL BE 1/4" MOLDED PLYWOOD CURVED TO PROVIDE OPTIMUM LIGHT DISTRIBUTION. FINISH WITH WALNUT VENEER & CLEAR MATTE LACQUER. PROVIDE MATCHING WOOD END CAPS AT EACH END OF EACH RUN TO COVER STEEL CHANNEL.

4. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$.9) ETL CBM APPROVED RAPID START ENERGY SAVING TYPE CLASS P WITH A SOUND RATING OF A.

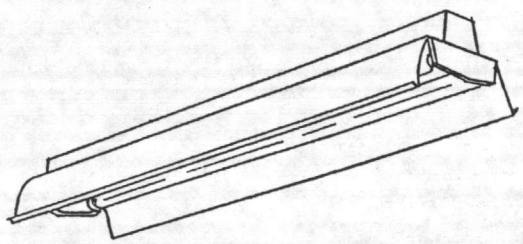
WALL-MOUNTED INDIRECT FLUORESCENT
WOOD SHIELDING

TYPE A - 2 LAMP 4 FT (NOMINAL)
B - 4 LAMP 8 FT (NOMINAL)

SKETCH NFGS-16510 -5

STYLE
NL-5

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. HOUSING SHALL BE MIN. 20 GAGE (U.S. STANDARD) DIE FORMED COLD ROLLED STEEL, CHEMICALLY TREATED FOR RUST PREVENTION & FINISHED WITH WHITE BAKED ENAMEL OR POLYESTER FINISH. PROVIDE TOP AND END KNOCKOUTS.

2. HOUSING WELDED OR SECURED BY SCREWS OR RIVETS INTO A SINGLE ASSEMBLY.

3. RELECTOR SHALL BE MIN. 22 GAGE (U.S. STANDARD) (SOLID WHEN LUMINAIRE IS MOUNTED BELOW CATWALKS, ETC. 10-25% APERTURED WHEN PROTECTED FROM FALLING OBJECTS). PROVIDE 30° SHIELDING CENTER VEE. CHEMICALLY TREAT FOR RUST PREVENTION AND FINISH WITH WHITE BAKED ENAMEL, PORCELAIN ENAMEL, OR POLYESTER FINISH. MINIMUM REFLECTANCE SHALL BE 85%.

4. THE LUMINAIRE SHALL NOT PERMANENTLY DISTORT WHEN LIFTED BY ONE CORNER.

5. SPACING TO MOUNTING HEIGHT RATIO = 1.3

6. LUMINAIRE SHALL BE CAPABLE OF CONTINUOUS ROW AND SINGLE UNIT PLACEMENT WITH PENDANT OR SURFACE MOUNTING.

7. SPRING LOADED PLUNGER TYPE SOCKETS.

8. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$.9) ETL, CBM APPROVED CLASS P ENERGY SAVING BALLAST WITH A SOUND RATING OF B (RAPID START OR SLIMLINE).

9. MINIMUM COEFFICIENT OF UTILIZATION (CU) WITH THE FOLLOWING CAVITY REFLECTANCE OF: CEILING = 80% WALL = 50% FLOOR = 20%
LUMINANCE USING 3100L LAMP WITH AVG:MAX. RATIO NOT TO EXCEED 1:5

ROOM CAVITY RATIO	CU	AVG. LUMINANE (fL)
1	0.85	85° - 1350
2	0.73	55° - 1250
3	0.68	65° - 1250
4	0.60	75° - 850
		85° - 600

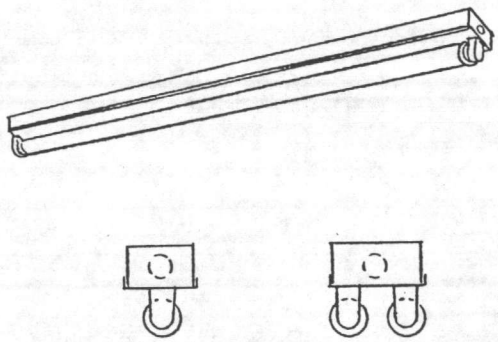
INDUSTRIAL FLUORESCENT

TYPE A - 48" 2 LAMP 430 MA.
TYPE B - 96" 2 LAMP 430 MA.

SKETCH NFGS-16510 -6

STYLE
NL-6

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 20 GAGE (U.S. STD) STEEL CHANNEL. WELD OR RIVET END PLATES IN PLACE.
2. CHEMICALLY TREAT STEEL FOR RUST PREVENTION AND FINISH WITH BAKED WHITE ENAMEL.
3. PROVIDE SPRING LOADED PLUNGER TYPE SOCKETS.
4. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$.9) ETL, CBM APPROVED, ENERGY SAVING CLASS P BALLAST WITH A SOUND RATING OF C.

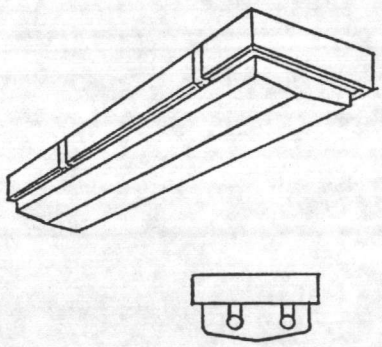
STRIP FLUORESCENT

TYPE A - 1 LAMP 48" LONG 430 MA.
TYPE B - 2 LAMPS 48" LONG 430 MA.
TYPE C - 1 LAMP 96" LONG 430 MA.
TYPE D - 2 LAMPS 96" LONG 430 MA.

SKETCH NFGS-16510-7

STYLE NL-7

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. MOLDED 100% ACRYLIC DIFFUSE LENS (NOT CLEAR) FULLY GASKETED.

2. PLATED BRASS OR STAINLESS STEEL LATCHES. (PLASTIC LATCHES MAY BE SUPPLIED WITH TYPE A LUMINAIRE.)

3. BALLAST SHALL BE HIGH POWER FACTOR ($\geq$ .9) ETL CBM APPROVED RAPID START CLASS P ENERGY SAVING BALLAST WITH A SOUND RATING OF A. SECURE BALLAST TO HOUSING WITH AT LEAST ONE SCREW AND SLIP-ON BRACKET OR 2 SCREWS - ONE AT EACH END.

4. UL LISTED FOR DAMP LOCATION. PROVIDE UL "WET" LABEL WHEN INDICATED.

5. OVERALL LUMINAIRE LENGTH SHALL BE 48" NOMINAL.

6. MINIMUM COEFFICIENT OF UTILIZATION (CU) WITH CAVITY REFLECTANCES OF 80% CEILING, 50% WALLS AND 20% FLOOR SHALL BE:

RCR	CU
1	0.67
2	0.55
3	0.50
4	0.45

7. MINIMUM SPACING TO MOUNTING HEIGHT RATIO SHALL BE 1.3.

WET/DAMP LOCATION LUMINAIRE

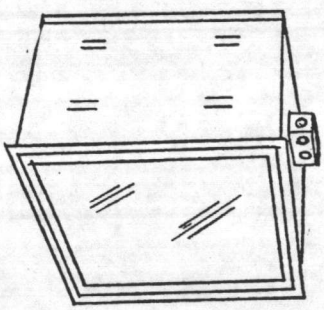
TYPE A FIBERGLASS OR PLASTIC HOUSING
TYPE B ALUMINUM HOUSING

SKETCH NFGS-16510-8

STYLE
NL-8

NFGS-16510-9 through-19
(Reserved for Future Fluorescent Luminaire)

NFGS-16510 (SEPTEMBER 1981)



TYPE A - 150W TO 250W HIGH PRESSURE SODUIM

TYPE B - 175W - 400W METAL HALIDE

LUMINAIRE REQUIREMENTS

1. 24" x 24" (NOMINAL) SQUARE, 13" MAXIMUM HEIGHT. PROVIDE HARDWARE SUITABLE FOR CEILING MATERIAL USED.
2. STEEL OR ALUMINUM HOUSING WITH CORROSION RESISTANT FINISH.
3. ALUMINUM REFLECTOR.
4. PRISMATIC TEMPERED GLASS LENS SECURED BY CAPTIVE SCREWS OR CAM LATCHES.
5. HIGH POWER FACTOR ($\geq$0.9) BALLAST AS INDICATED IN THE SPECIFICATIONS.
6. PROVIDE AUXILIARY QUARTZ LAMP AND ARC SENSING RELAY WHERE INDICATED.
7. PROVIDE LAMP AS INDICATED.
8. LAMP & BALLAST SHALL BE SERVICEABLE FROM THE BOTTOM OF THE FIXTURE UNLESS OTHERWISE NOTED.
9. SPACING TO MOUNTING HEIGHT RATIO SHALL NOT BE LESS THAN 1.0.
10. FOR REFLECTANCES OF 80% CEILING, 50% WALLS, 20% FLOORS THE COEFFICIENT OF UTILIZATION SHALL NOT BE LESS THAN THE FOLLOWING:

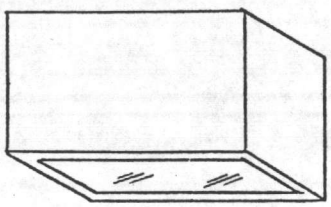
	CU	
RCR	TYPE A	TYPE B
1	.63	.72
2	.57	.66
3	.49	.60
4	—	.54
5	—	.49

RECESS MOUNTED COMMERCIAL HID

STYLE NL-20

SKETCH NFGS-16510 - 20

NFGS-16510 (SEPTEMBER 1981)



TYPE A - 150W TO 250W HIGH PRESSURE SODUIM

TYPE B - 175W - 400W METAL HALIDE

LUMINAIRE REQUIREMENTS

1. LUMINAIRE SHALL BE 24" x 24" (NOMINAL) SQUARE AND SHALL NOT EXCEED 15" IN HEIGHT.
2. 20 GAGE (U.S. STD) STEEL OR ALUMINUM HOUSING WITH WHITE POLYESTER OR BAKED ENAMEL FINISH.
3. ALUMINUM REFLECTOR.
4. FULLY GASKETED PRISMATIC, TEMPERED GLASS LENS, SECURED BY CAPTIVE SCREWS OR CAM LATCHES.
5. HIGH POWER FACTOR ($\geq$0.9) BALLAST AS INDICATED IN THE SPECIFICATIONS.
6. PROVIDE AUXILIARY QUARTS LAMP AND ARC SENSING RELAY WHEN INDICATED.
7. PROVIDE LAMP AS INDICATED.
8. LAMP & BALLAST SHALL BE SERVICEABLE FROM THE BOTTOM OF THE FIXTURE UNLESS OTHERWISE NOTED.
9. SPACING TO MOUNTING HEIGHT RATIO SHALL NOT BE LESS THAN 1.0.
10. FOR REFLECTANCES OF 80% CEILING, 50% WALLS, 20% FLOORS. THE COEFFICIENT OF ULTILIZATION SHALL NOT BE LESS THAN THE FOLLOWING:

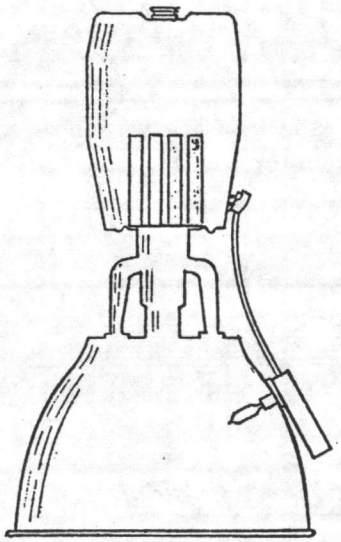
	CU	
RCR	TYPE A	TYPE B
1	.63	.72
2	.57	.66
3	.49	.60
4	—	.54
5	—	.49

SURFACE MOUNTED COMMERCIAL HID

SKETCH NFGS-16510 - 21

STYLE NL-21

NFGS-16510 (SEPTEMBER 1981)



TYPE A - 400W-1000W HIGH PRESSURE SODIUM
TYPE B - 400W-1000W METAL HALIDE

LUMINAIRE REQUIREMENTS

1. CAST ALUMINUM HOUSING. SPUN ALUMINUM REFLECTOR PROVIDE VENTILATION OPENINGS AT TOP OF REFLECTOR.

2. PROVIDE CUSHIONED, SHOCK ABSORBING FIXTURE HANGER. PROVIDE CUSHIONED POWER HOOK WHEN INDICATED.

3. PROVIDE WIRE GUARD OR TEMPERED GLASS LENS WHEN INDICATED.

4. PROVIDE QUARTZ AUXILIARY LAMP & ARC SENSING RELAY WHEN INDICATED.

5. LAMP & HIGH POWER FACTOR ($\geq$0.9) BALLAST AS INDICATED ON PLANS & SPECIFICATION

6. MINIMUM COEFFICIENTS OF UTILIZATION (CU) FOR CAVITY REFLECTANCES OF 80%, CEILING, 50% WALLS, 20% FLOOR SHALL BE:

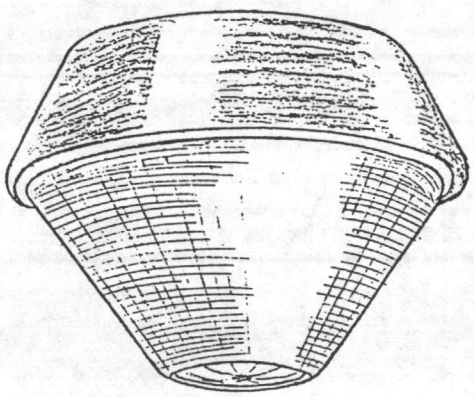
ROOM CAVITY RATIO:	TYPE:	A	B
1		0.93	0.89
2	CU	0.85	0.80
3		0.80	0.70
MIN. EFFICIENCY		84%	80%
MIN. SPACING/MTG HT RATIO		.95	.95

HIGH-BAY INDUSTRIAL H.I.D.

SKETCH NFGS-16510-22

STYLE
NL-22

NFGS-16510 (SEPTEMBER 1981)



TYPE A 100-150W
TYPE B 250-400W HIGH PRESSURE SODIUM

TYPE C 175W
TYPE D 250-400W METAL HALIDE

LUMINAIRE REQUIREMENTS

1. SHEET OR CAST ALUMINUM HOUSING. FINISH WITH ENAMEL OR EPOXY.
2. ACRYLIC REFRACTOR OR THERMAL & SHOCK RESISTANT GLASS LENS.
3. PROVIDE CUSHIONED FIXTURE HANGER. PROVIDE CUSHIONED POWER HOOK WHEN INDICATED.
4. PROVIDE QUARTZ AUXILIARY LAMP & ARC SENSING RELAY WHEN INDICATED.
5. LAMP & HIGH POWER FACTOR ($\geq$ 0.9) BALLAST AS INDICATED ON PLANS AND IN SPECIFICATION.
6. MINIMUM COEFFICIENT OF UTILIZATION (CU) WITH CAVITY REFLECTANCES OF 80% CEILING 50% WALL, 20% FLOOR SHALL BE:

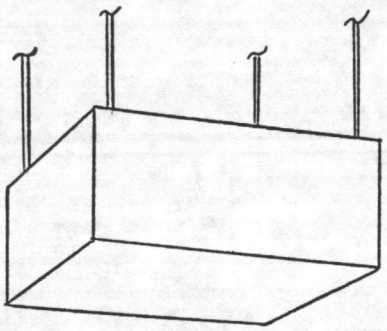
RCR	TYPE:	A	B	C	D
1		0.79	0.85	0.79	0.80
2	CU.	0.68	0.73	0.69	0.70
3		0.59	0.60	0.6	0.60
MIN. EFFICIENCY		80%	85%	80%	85%
MIN. SPACING/MTG HT RATIO		1.8	1.8	1.8	1.8

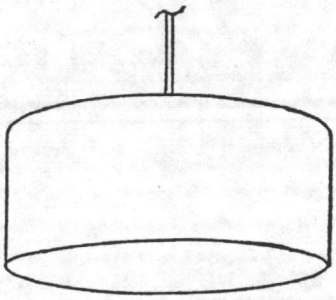
LOW BAY INDUSTRIAL HID

SKETCH NFGS-16510-23

STYLE
NL-23

NFGS-16510 (SEPTEMBER 1981)





LUMINAIRE REQUIREMENTS:

1. 20 GAGE (U.S. STANDARD) STEEL HOUSING WITH ALL SEAMS WELDED AND GROUND SMOOTH. CHEMICALLY TREAT FOR RUST PREVENTION & PROVIDE BAKED ENAMEL, OR POLYESTER FINISH (BEIGE UNLESS INDICATED OTHERWISE).
2. ALUMINUM REFLECTOR WITH TEMPERED GLASS LENS.
3. PROVIDE 175, 250, 400, WATT METAL HALIDE OR 150, 250, 400 WATT HIGH PRESSURE SODIUM LAMPS (SINGLE OR TWIN) AS INDICATED ON THE PLANS.
4. HIGH POWER FACTOR ($\geq$0.9) ENCAPSULATED BALLAST AS INDICATED IN THE SPECIFICATIONS.
5. PROVIDE COMPUTER GENERATED DOCUMENTATION OF THE MAXIMUM, MINIMUM AND AVERAGE INITIAL FOOTCANDLE LEVELS FOR THE SYSTEM AS INDICATED ON THE PLANS. ASSUME REFLECTANCES OF 80%, 50%, 20% FOR CEILINGS, WALLS & FLOORS RESPECTIVELY.
6. PROVIDE 60% MIN. FIXTURE LUMEN OUTPUT BETWEEN 30° TO 90° FROM VERTICAL.

TYPE A:
CEILING MOUNTED
30 INCH MAXIMUM DISTANCE FROM BOTTOM OF FIXTURE TO CEILING UNLESS OTHERWISE INDICATED.

RCR	MIN. CU	
	150-250W	400W
1	0.50	0.56
2	0.43	0.49
3	0.38	0.43
4	0.33	0.38

TYPE B:
WALL MOUNT LUMINAIRE-
(RIGIDLY MOUNT TO WALL)
FORWARD THROW OPTICS.

RCR	MIN. CU
1	0.36
2	0.32
3	0.28
4	0.24

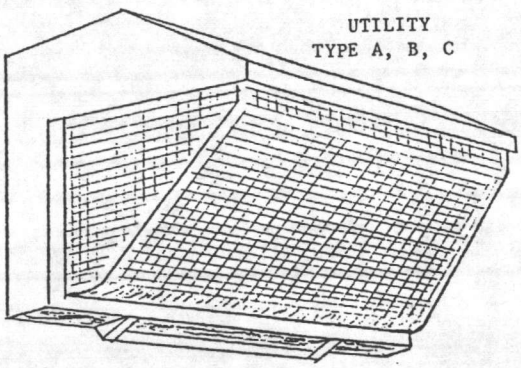
INDIRECT HID LUMINAIRE

SKETCH NFGS-16510-24

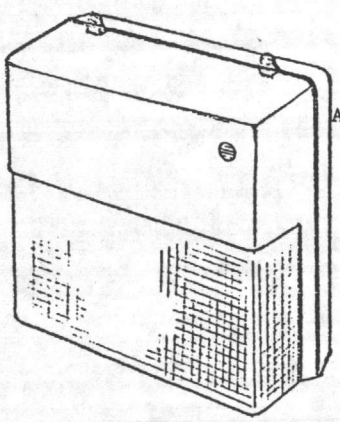
STYLE NL-24

NFGS-16510 (SEPTEMBER 1981)

UTILITY
TYPE A, B, C



ARCHITECTURAL
TYPE D,E



LUMINAIRE REQUIREMENTS

1. CAST ALUMINUM OR 1/8" MIN. THICKNESS EXTRUDED ALUMINUM HOUSING FOR HIGH PRESSURE SODIUM (HPS) METAL HALIDE (M.H.) LUMINAIRES.
2. CAST ALUMINUM, 1/8" MIN. THICKNESS EXTRUDED ALUMINUM, ABS PLASTIC OR POLYCARBONATE HOUSING FOR LOW PRESSURE SODIUM (LPS) & 35/50/70W HPS LUMINAIRES.
3. HINGED, U.V. STABILIZED POLYCARBONATE LENS OR HINGED TEMPERED GLASS WITH POLYCARBONATE SHIELD.
4. LAMP SIZE AS INDICATED IN FIXTURE SCHEDULE.
5. PROVIDE ALUMINUM REFLECTOR.
6. BALLAST SHALL BE HIGH POWER FACTOR TYPE ($\geq$ .85) WITH CHARACTERISTICS AS INDICATED.
7. PROVIDE PHOTO ELECTRIC CONTROL WHEN INDICATED.

TYPE A, D 35-150W HPS
TYPE B, E 175W M.H.
TYPE C 35, 55W LPS

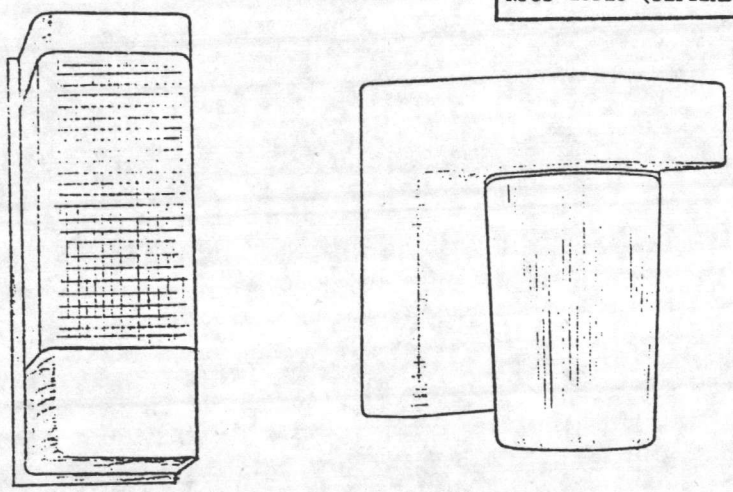
NOTE: TYPES D & E MAY BE SUBSTITUTED FOR TYPES A & B RESPECTIVELY BUT NOT VICE VERSA.

H.I.D. WALL MOUNTED LUMINAIRE

STYLE .
NL-25

SKETCH NFGS-16510-25

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. PROVIDE ALUMINUM BACKPLATE.
2. PROVIDE ACRYLIC OR POLYCARBONATE PRISMATIC (NON-CLEAR) LENS.
3. MAXIMUM DIMENSIONS SHALL BE 16" x 9" x 6-1/2"
4. PROVIDE SOCKET & 120 VOLT BALLAST SUITABLE TO SERVE A 18W LOW PRESSURE SODIUM LAMP.
5. PROVIDE CAPACITOR TO CORRECT POWER FACTOR TO $\geq$0.8.

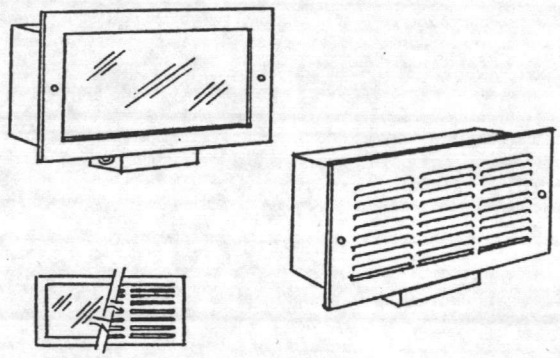
18 WATT LOW PRESSURE SODIUM
WALL MOUNT

STYLE
NL-26

SKETCH NFGS-16510-26

NFGS-16510-27 through-39
(Reserved for Future HID Luminaires)

NFGS-16510 (SEPTEMBER 1981



LUMINAIRE REQUIREMENTS

1. 16 GAGE (U.S. STD) STEEL OR CAST ALUMINUM HOUSING WITH WHITE ENAMEL FINISH OR SPECULAR ALUMINUM REFLECTOR.
2. 3/16" CAST ALUMINUM FACE PLATE WITH BRUSHED SATIN FINISH AND CLEAR ACRYLIC LAQUER.
3. 5" X 11" X 4" DEEP MAXIMUM DIMENSIONS.
4. COMPLETE GASKET ASSEMBLY WITH NEOPRENE FOR EXTERIOR USE.
5. PROVIDE INCANDESCENT LAMPS AS INDICATED IN FUXTURE SCHEDULE.

TYPE A - DIFFUSE TEMPERED GLASS OR POLYCARBONATE FRONT

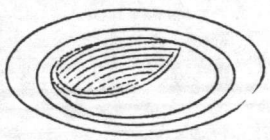
TYPE B - LOUVER FRONT.

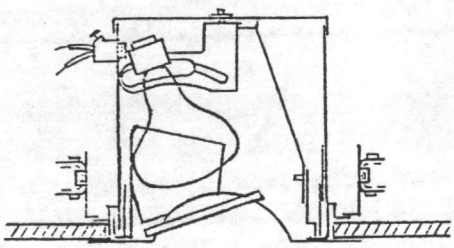
STEP LIGHT

SKETCH NFGS-16510-40

STYLE NL-40

NFGS-16510 (SEPTEMBER 1981)





LUMINAIRE REQUIREMENTS

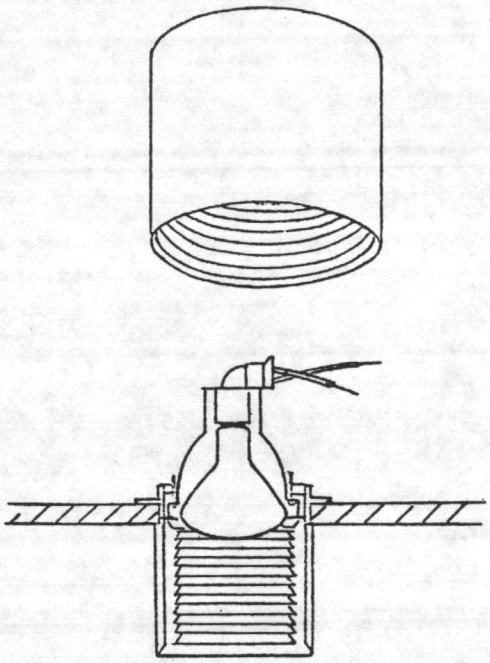
1. 20 GAGE (U.S. STD) STEEL HOUSING WITH MATTE BLACK FINISH.
2. PROVIDE LOW-GLOSS WHITE ENAMEL. TRIM RING WITH 12" MAXIMUM DIAMETER.
3. SPECULAR ALUMINUM REFLECTOR.
4. HEAT RESISTANT SPREAD LENS.
5. 0° - 30° ADJUSTABLE SOCKET ASSEMBLY WITH 358° ROTATION.
6. PROVIDE TRIM SUITABLE FOR RECESS MOUNTING OF LUMINAIRE IN CEILING MATERIAL SPECIFIED.
7. PROVIDE PORCELAIN SOCKET WITH COPPER SCREW SHELL SUITABLE FOR 150W PAR OR R LAMP.

ADJUSTABLE INCANDESCENT
INTERIOR SPOT LIGHT

STYLE NL-41

SKETCH NFGS-16510-41

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 20 GAGE (U.S. STD) STEEL OR ALUMINUM HOUSING WITH DIE CAST ALUMINUM PLASTER RING.

2. PROVIDE A 5 TO 7 INCH APERTURE BLACK GROOVED BAFFLE WITH BRUSHED OR SATIN ALUMINUM EXTERIOR FINISH. THE EXPOSED LENGTH OF THE LUMINAIRE SHALL BE 5 TO 7 INCHES.

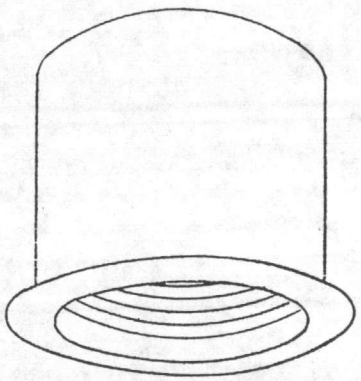
3. PORCELAIN LAMP SOCKET WITH COPPER SCREW SHELL SUITABLE FOR A 150 WATT PAR OR R LAMP.

SEMI - RECESSED BAFFLE DOWNLIGHT
(INCANDESCENT)

SKETCH NFGS-16510-42

STYLE
NL-42

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

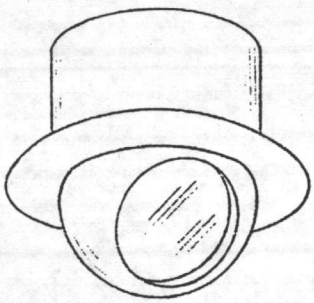
1. 20 GAGE (U.S. STD) GALVANIZED STEEL OR ALUMINUM HOUSING WITH ALUMINUM REFLECTOR.
2. PROVIDE MATTE WHITE PAINTED TRIM RING.
3. REGRESSED LENS SHALL BE HEAT RESISTANT GLASS HELD IN PLACE WITH A CONCEALED TORSION TYPE HINGE.
4. PROVIDE PORCELAIN LAMP SOCKET WITH COPPER SCREW SHELL SUITABLE FOR A 150W LAMP.

RECESSED INCANDESCENT

STYLE NL-43

SKETCH NFGS-16510-43

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 20 GAGE (U.S. STD) STEEL HOUSING.
2. ALUMINUM BALL WITH DIE CAST ALUMINUM TRIM RING WITH MATTE WHITE FINISH.
3. BALL ADJUSTABLE FROM 0° - 45° FROM VERTICAL & ROTATABLE FOR 359°
4. PROVIDE MATTE BLACK LOUVER WHEN INDICATED.
5. PORCELAIN SOCKET SUITABLE FOR USE WITH UP TO 75 W. ER-30 LAMP

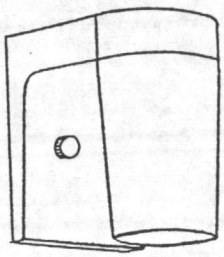
ADJUSTABLE SEMI-RECESSED SPOT LIGHT

STYLE NL-44

SKETCH NFGS-16510-44

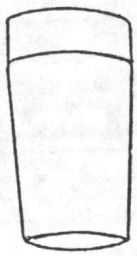
NFGS-16510 (SEPTEMBER 1981)

WALL MOUNTED



TYPE A

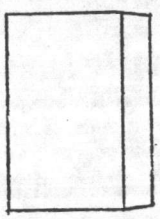
CEILING MOUNTED



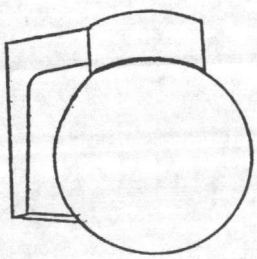
TYPE A1

LUMINAIRE REQUIREMENTS

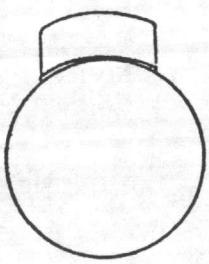
1. CAST ANODIZED SATIN ALUMINUM HOUSING WITH CLEAR LACQUER COATING. PROVIDE PORCELAIN SOCKET WITH COPPER SCREW. SHELL SUITABLE FOR A 100 W INCANDESCENT LAMP.
2. GLOBE SHALL BE WHITE POLYCARBONATE.
3. PROVIDE HEAT RESISTANT VAPORTIGHT GASKET BETWEEN GLOBE & HOUSING. PROVIDE NEOPRENE GASKET BETWEEN LUMINAIRE & WALL OR CEILING.



TYPE B



TYPE C



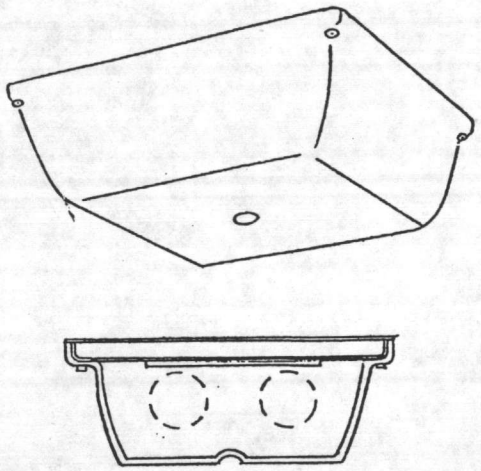
TYPE C1

EXTERIOR INCANDESCENT LUMINAIRE

SKETCH NFGS-16510-45

STYLE NL-45

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENT

1. 16 GAGE (U.S. STD) STEEL OR ALUMINUM BACK PLATE.
2. POLYCARBONATE PRISMATIC OR OPAL LENS HELD IN PLACE WITH 4 STAINLESS STEEL SCREWS.
3. FULLY GASKETED AROUND LENS AND BETWEEN LUMINAIRE AND CEILING WITH DOUBLE BAKED NEOPRENE GASKETS.
4. U.L. LISTED FOR DAMP LOCATIONS.
5. MOUNT LUMINAIRE TO CEILING WITH 4-1/4" SCREWS.
6. PROVIDE WIRING COMPARTMENT SUITABLE FOR USE WITH 60°C WIRE INSULATION.

TYPE A - UP TO 2-100W A-19 INCANDESCENT LAMPS MAX. DIMENSIONS 12"x12"x6"D

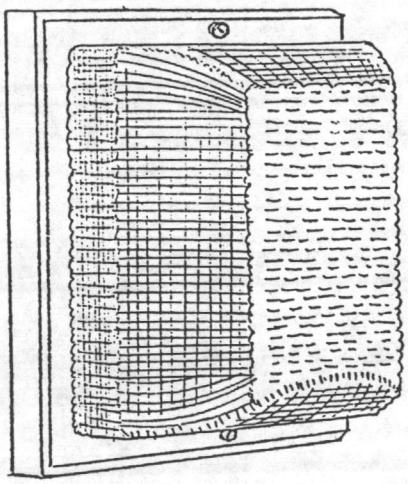
TYPE B - 35W, 50W OR 70W HIGH PRESSURE SODIUM LAMP AS INDICATED MAX DIMENSIONS 12-1/2"x 12-1/2"x8-1/2"D

CEILING MOUNTED
VANDAL-RESISTANT LUMINAIRE

STYLE
NL-46

SKETCH NFGS-16510-46

NFGS- 16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. 16 GAGE (U.S. STD.) STEEL TEMPERED ALUMINUM OR POLYCARBONATE BACK PLATE.
2. POLYCARBONATE PRISMATIC DIFFUSER HELD IN PLACE WITH STAINLESS STEEL SCREWS.
3. FULLY GASKETED AROUND LENS & BETWEEN WALL & LUMINAIRE WITH DOUBLE BAKED NEOPRENE GASKETS.
4. U.L. LISTED FOR WET LOCATIONS.
5. MOUNT LUMINAIRE ON WALL WITH 4-1/4" SCREWS.
6. PROVIDE WIRING COMPARTMENT SUITABLE FOR USE WITH 60°C WIRE INSULATION.

TYPE A - UP TO 100W INCANDESCENT MAX
DIMENSIONS 6"Wx9"Nx5"D

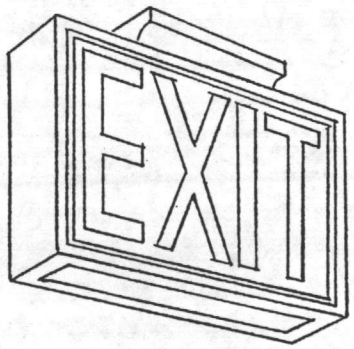
TYPE B - 35W, 50W OR 70W HIGH PRESSURE SODIUM LAMP AS INDICATED MAX. DIMENSIONS 12-1/2"Wx12-1/2"Hx 8-1/2"D

WALL-MOUNTED
VANDAL-RESISTANT LUMINAIRE

SKETCH NFGS-16510-47

STYLE
NL- 47

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. LETTERS SHALL BE 6" TALL WITH 3/4" STROKES FORMED BY A STENCIL FACE.
2. PROVIDE RED FIBERGLASS PANEL BEHIND STENCIL FACE.
3. PROVIDE 2 LONG LIFE INCANDESCENT LAMPS.
4. PROVIDE DOWN LIGHT.
5. PROVIDE ILLUMINATED ARROWS AS INDICATED.
6. PROVIDE SINGLE OR DOUBLE FACE AS INDICATED.
7. PROVIDE CEILING, END WALL, BACK WALL OR PENDANT MOUNTING AS INDICATED.
8. UNITS MOUNTED EXPOSED TO THE ENVIRONMENT SHALL HAVE A DAMP OR WET UL LABEL AS APPROPRIATE AND SHALL NOT BE CONSTRUCTED OF STEEL.

TYPE A ALUMINUM OR PAINTED STEEL HOUSING AND STENCIL FACE. (SEE NOTE 8)

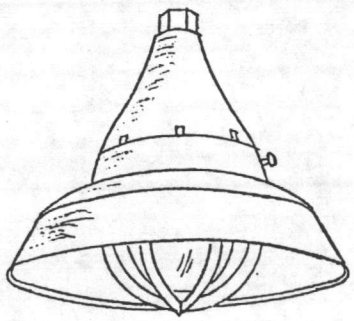
TYPE B PLASTIC HOUSING ENCLOSED IN POLYCARBONATE WITH STENCIL ON INSIDE OF POLYCARBONATE HOUSING. (SEE NOTE 8)

EXIT SIGN

SKETCH NFGS-16510-48

STYLE NL-48

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. LUMINAIRE SHALL MEET UL 844 OR FM STANDARD FOR HAZARDOUS LOCATIONS.
2. HOUSING SHALL BE COPPER FREE CAST ALUMINUM WITH LAQUER OR EPOXY FINISH.
3. ALL JOINTS SHALL BE OF THE THREADED TYPE.
4. HEAT AND IMPACT RESISTANT PRESTRESSED GLASS GLOBE.
5. PROVIDE WHITE PORCELAIN ENAMEL STEEL, FIBERGLASS REINFORCED POLYESTER OR GLASS COATED DOME REFLECTOR.
6. PROVIDE GLOBE GUARD WHEN INDICATED.
7. PROVIDE LAMPS AS INDICATED.
8. MOUNTING AS INDICATED.

TYPE A 60-200 WATT INCANDESCENT LUMINAIRE RATED FOR CLASS 1 DIVISION 1 GROUP D ATMOSPHERE.

TYPE B 60-200 WATT INCANDESCENT LUMINAIRE RATED FOR CLASS 1 DIVISION 2 GROUP D ATMOSPHERE.

TYPE C 70-250 WATT HPS OR 175-400 WATT MET. HALIDE LUMINAIRE RATED FOR CLASS 1 DIVISION 1 GROUP D ATMOSPHERE.

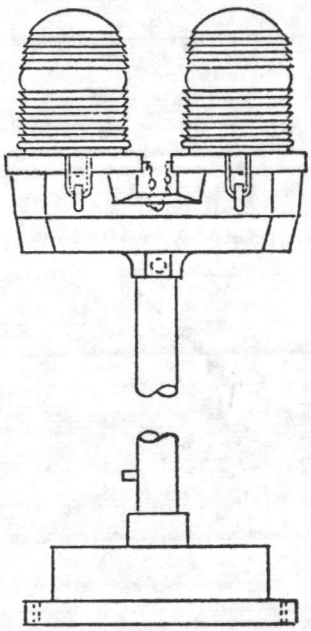
TYPE D 70-250 WATT HPS OR 175-400 WATT MET. HALIDE LUMINAIRE RATED FOR CLASS 1 DIVISION 2 GROUP D ATMOSPHERE.

EXPLOSION-PROOF LUMINAIRE

STYLE NL-49

SKETCH NFGS-16510-49

NFGS-16510 (SEPTEMBER 1981)



LUMINAIRE REQUIREMENTS

1. LUMINAIRE SHALL MEET FEDERAL AVIATION ADMINISTRATION SPECIFICATIONS FOR OBSTRUCTION LIGHTING (L-810).
2. CAST ALUMINUM HOUSING.
3. ONE PIECE 360° RED, HEAT RESISTANT GLASS FRESNEL GLOBE. PROVIDE TOGGLE TYPE LATCHES & CLAMPING TO SECURE GLOBES. PROVIDE SAFETY CHAINS ON GLOBES.
4. MOUNT PHOTO ELECTRIC CONTROL TO CONTROL LAMPS.
5. MOUNT LUMINAIRE ON 1" RIGID STEEL CONDUIT. PROVIDE JUNCTION BOX AND MOUNTING PLATE AT BASE UNLESS INDICATED OTHERWISE.
6. LAMPS SHALL BE RATED 100 WATT 130 VOLT, MULTIPLE, MEDIUM BASE. TWO LAMPS ARE REQUIRED.

OBSTRUCTION LIGHT

SKETCH NFGS -16510-50

STYLE NL-50