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REPORT

on

LANDSCAPE LIGHTING SYSTEMS, LOW VOLTAGE

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DESCRIPTION

PRODUCT COVERED:

USL, CNL - Low Voltage Landscape Lighting Power Unit,  
Model No. GT-81062-6012-WP.

GENERAL:

These products comply with the applicable requirements in Sec. Gen. and with the following description.

For products that are C-UL, all components are either Listed or Recognized under the C-UL program or investigated to determine compliance with the Canadian requirements.

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

USL indicates product complies with the Standard for Low Voltage Landscape Lighting Systems, UL 1838, and the United States country specific requirements.

CNL indicates product complies with the Canadian Standards Association Standard for Extra-Low Voltage Landscape Lighting Systems, CSA C22.2 TIL No. B-58B, and the Canadian country-specific requirements.

RATINGS:

Power Units:

Model	Input	Output
GT-81062-6012-WP	120 V, 0.8 A	12 V, 60 W

## INSTALLATION INSTRUCTIONS:

Per Section General.

## MARKINGS:

See Sec. Gen. In addition, this product shall also be marked the following.

Power Units - These products shall be marked:

1. "Not for use with dimmers" in Form B-4.
2. "Suitable For Indoor or Outdoor Use" in Form D-4.
3. "Suitable For Ground Installation" in Form A-1.
4. "WARNING - Risk of Fire. If installation involves running wiring through a building structure, special wiring methods are needed. Consult a qualified electrician." in Form B-1.
- \*5. "CAUTION - To reduce the risk of fire, replace only with same type \_\_\_\_ A, \_\_\_\_ V fuse". The blank spaces are filled in with the appropriate fuse rating. This marking is located near fuseholder. The word "CAUTION" in letters not less than 3.2 mm high and remaining letters of statement in letters not less than 1.6 mm high.
6. "Not for use with submersible fixtures" in Form A-3 on smallest shipping container.
7. "For use with low voltage landscape fixtures or fitting only", or "For use with low voltage landscape lighting systems only" in Form A-3 on smallest shipping container.

1. Enclosure - R/C (QMFZ2) company GE Plastics Japan, Ltd. (E45587), designated 243R, or GE Plastics USA (E121562), designated HS2000X, minimum 2.0 mm thick, shape as shown, two halves construction and secured together with screws, overall dimensions as shown in ILL. 1, top enclosure provided with 17.5 by 11.0 mm cut out opening at opposite sides for strain relief bushing of input and output cord. Bottom enclosure provided with two integrally molded mounting tabs, each measured 24 by 16.5 by 4.0 mm thick.

2. Secondary Cord - Listed, Type SPT-3, min. No. 18 AWG, 2-conductor, rated minimum 75°C, minimum 15.2 cm long.

Alternate - Same as above except Listed, Type SPT-2 W.

3. Power Supply Cord - Listed non-detachable, rated minimum 10 A, 125 V, having cord Type SJTW, rated 105°C, No. 18 AWG minimum, three conductors, one end terminated in a molded on grounding type plug with 125 V, 15 A [NEMA 5-15P] configuration; the other end terminated to transformer terminals inside enclosure. Cord measures minimum 0.6 m and maximum 1.8 m long. Cord is positively routed away from secondary circuits, wiring and splices.

Alternate - Same as above except cord with two conductors, terminated in a molded on non-grounding polarized type attachment plug with 125 V, 15 A (NEMA 1-15P) configuration.

4. Supply Cord Strain Relief - Molded-on strain relief bushing, two flange type, each flange measured 18.0 by 15.1 by 3.1 mm thick, center portion measured 10.8 mm wide by 2.2 mm gap, also provided with integral cord guard. Complying with the strain relief test denoted in Sec. Gen.

Alternate (For non-grounding type power supply cord) - Same as above except each flange measured 15 by 13.3 by 3 mm thick, center portion measured 8.3 mm wide by 2 mm gap.

5. Output Cord Strain Relief - Same as Supply Cord Strain Relief described above except measured 14.7 by 13.1 by 3.1 mm thick for each flange, 7.6 mm wide by 2.2 mm gap for center portion.

6. Grounding (Provided for grounding type power supply cord) - Green grounding conductor of supply cord terminated with a crimp-on copper ring connector and connected to core of transformer with star washer and screw.

## 7. Transformer - Constructed as follows:

- A. Core - Laminated steel, E. I. Combination, overall: 66 by 55 by 36 mm stack high.
- B. Coils - Wound of enameled copper wire. Primary winding measured 0.4 mm diameter, secondary winding measured 0.85 mm diameter. Winding mechanically secured and soldered to 0.5 mm thick copper alloy tabs in bobbin.
- C. Thermal Cutoff - Recognized Component (XCMQ2), Uchihashi Estec Co., Ltd., Cat. No. 123 (rated 130°C, 2 A, 250 V ac). Secured in primary winding.

Alternate - Same as above except NEC Corp., Type SM126A0.

Alternate - Same as above except Aupo Electrics Ltd., Type P4 or A4, rated 250 V ac, 2 A, 130°C, or Type P4-1A or A4-1A, rated 250 V ac, 1 A, 130°C.

Alternate - Same as above except Xiamen Set Electronics Co., Ltd., Type K4, rated 250 V ac, 2 A, 130°C, or Type F4, rated 250 V ac, 1 A, 130°C.

Alternate - Same as above except R/C (XCMQ2), Aupo Electrics Ltd., Type P4-F or A4-F, rated 250 V ac, 2 A, 130°C, or Type P4-1A-F or A4-1A-F, rated 250 V ac, 1 A, 130°C.

- D. Bobbin - Two provided, each Two-flange type, secured in a bobbin frame, molded of Recognized Component (QMFZ2), Dupont, Type 101L (rated 94V-2), minimum 1.0 mm thick. Overall assembly measured 62.5 by 42.1 by 33.4 mm, bobbin frame provided with integrally molded barrier at opposite side of bobbin end for insulation of primary and secondary winding.
- E. Winding Insulation -

Location	Material	Thickness (mm)	No. of Turns (T) or Pieces (P)
Primary outerwrap	Polyester tape	0.05	2T
Primary / core	Bobbin	1.0	--
Primary / thermal cutoff	Polyester tape	0.05	1T
Primary crossover	Acetate cloth tape	0.05	1P
Primary / Secondary	Bobbin	0.22	--

8. Potting Compound - Epoxy, completely filled inside enclosure and screw holes in enclosure.
- \*9. Fuse - Listed, miniature fuse (20 by 5 mm diameter), rated 7 A, **min. 125 V to max. 250 V** or 5 A, **min. 125V to max. 250 V**, connected in secondary circuit.
10. Fuseholder - Recognized Component (IZLT2), Shin Chin Industrial Co., Ltd., Cat. No. R3-12, secured in enclosure by lock nut.

Alternate - Same as above except R/C (IZLT2/8), manufactured by STELVIO SPA, Cat. No. PTF/35. Suitable for use only with Fuse rated 5A, 250V.

## ALTERNATE CONSTRUCTION FOR MODEL GT-81062-6012-WP - FIG. 2

General - Fig. 2 illustrates the overall view of alternate construction for Model GT-81062-6012-WP. The alternate construction of Model GT-81062-6012-WP is same as those described in Fig. 1 except as noted below.

1. Enclosure - Same as Fig. 1 except provided with 17.5 by 11.0 mm and 19.0 by 10.0 mm cut-out openings at opposite sides for strain relief bushing of input and output cord.
2. Secondary Cord - Same as Fig. 1 except for Listed, Type SPT-3, min. No. 18 AWG, three 2-conductor provided.

Alternate - Same as above except Listed, Type SPT-2 W.

5. Output Cord Strain Relief - Same as Fig. 1 except outer portion flange measured 18 by 13.8 by 2.85 mm thick, inside portion flange measured 19.4 by 15.5 by 3.6 mm thick, 15 mm wide by 2.2 mm gap for center portion.

## GENERAL

## PRODUCT COVERED:

USL, CNL Low voltage landscape lighting systems, power units, luminaires and fittings.

## GENERAL:

Products constructed as described in this Section General and as indicated by CNL in the individual Descriptions are eligible to bear both the UL Listing Mark and the C-UL Mark. These products shall be evaluated using the requirements of Standard UL 1838 for Low Voltage Landscape Lighting Systems and this Section General in combination with any Appendices and descriptions in this volume.

All components of products bearing the C-UL mark shall be Listed or Recognized for Canada or CSA Certified, in addition to being UL Listed or Recognized.

## TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

Products designated USL have been investigated using requirements contained in the Standard UL 1838 for Low Voltage Landscape Lighting Systems.

Products designated CNL have been investigated using requirements contained in Canadian Standards Association T.I.L. B-58B.

## FACTORY LOCATION AND IDENTIFICATION:

When more than one manufacturing location is indicated on the Authorization Page Addendum for the Procedure Volume, the factory code is as seen below. The factory identification and associated manufacturing location are as follows:

Location

Factory Identification



## MARKING:

A required Marking shall be legible, shall be one of the types designated by a form letter in Table 1 and shall be in one of the locations designated by form numbers in Table 2. The wording, form letter and form number shall be in accordance with the specifications following the tables. The combination of label material and printed ink for indelible printed labels shall be a (PGDQ2) Marking and Labeling System and shall be permanent, and rated for the type of surface including temperature to which it will be affixed.

TABLE 1

## Form Designations for Type and Height of Marking

Form Letter of Marking	Type	Minimum Height In., (mm)
A	Paint-stenciled, die-stamped indelibly printed lettering <sup>a</sup> , or indelibly printed label. <sup>b</sup>	1/8 <sup>c</sup> (3.2)
B	On unit in form of pressure sensitive label, decalcomania transfer, paper label, paint-ink or die-stamped lettering, or equivalent. A tie-on tab, stuffer sheet, or equivalent is not acceptable.	Not specified unless otherwise indicated.
C	In the form of instructions on or with the unit. A tie-on tab, stuffer sheet, marking on carton, or equivalent is to be used.	Not specified
D	Indelibly printed, paint stenciled, ink-stamping lettering (including rubber ink stamps), lettering in a pressure-sensitive label, or the equivalent.	1/4 (6.4)
E	In combination with the Listing mark.	Not specified

<sup>a</sup> Indelibly printed lettering shall be applied by a stamping device (other than a rubber ink stamp) that results in consistent and even pressure applied to the printing process regardless of operator.

<sup>b</sup> An indelibly printed label and ink combination shall be permanent and rated for the type of surface to which it will be affixed, in accordance with the Standard for Marking and Labeling Systems, UL 969.

<sup>c</sup> For very small luminaires or fittings, such as an insulation piercing connector, the height may be 1/16 in. (1.6 mm) high. If a "WARNING" or "CAUTION" is required, these words shall be 3/32 in. (2.4 mm) high.

TABLE 2

## Form Designations for Location of Marking

Form Letter of Marking	Location
1	Where readily visible: To installing electrician, to persons inspecting splices to the branch- circuit supply wires, and at or near the point where supply connections are to be made.
2	At a point where visible during relamping.
3	On smallest unit shipping carton.
4	Where visible during or after installation.

All Products - All products shall be marked in Form B-1 with the Listee's name, file number or trademark. The marking shall also include the catalog or model number and all electrical ratings and the date code. The electrical ratings on the power unit should include the primary input voltage, current and maximum load. The electrical ratings shall also include the secondary voltage and maximum power in watts where appropriate.

POWER UNITS - Required per the individual report:

A power unit shall be marked in Form B-1 with the manufacturer's name, the catalog or model number, the electrical ratings and the date or other dating period of manufacture not exceeding any three consecutive months.

Exception: The date of manufacture is able to be abbreviated or may be in a nationally recognized conventional code or in a code affirmed by the manufacturer, provided that the code:

- a) Does not repeat in less than 10 years; and
- b) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.

A power unit marked: "Suitable for Ground Installation", shall be in Form A-1.

A power unit with a supply wire marking, shall be in Form A-1 or E-1. (The supply wire temperature marking noted above shall also be provided in Form B on the carton or package in which the power unit is packed. The wording of the marking shall be a minimum 1/4 inch (6.4 mm) in height).

A power unit provided with a wire terminal for the connection of an equipment grounding conductor shall be marked, "GROUND," "GRND," or "GND in Form B-1, adjacent to the terminal or screw. (The electrical symbol for grounding alone does not meet the intent of the requirement).

A power unit with a provision for connection to multiple branch circuit supplies shall be marked in Form A-1 with the word "CAUTION" and the following or the equivalent: "This control unit has more than one power supply point. Disconnect all power supplies before servicing." The marking shall be provided at each supply connection point if, when the unit is installed as intended, each supply connection point is not in line-of-sight of the other supply connection point or points.

A power unit that is marked "WARNING" and the following or equivalent wording "To reduce the risk of electric shock, install only on a circuit protected by a GFCI", shall be in form A-1.

A power unit that is marked "Not for use with dimmers", shall be in form B-4. ("Dimmer", if used, must be a magnetic low-voltage dimmer if the power unit is magnetic and Dimmer, if used, must be electronic low-voltage dimmer if the power unit is electronic).

A power unit marked "Suitable for Indoor Use Only", shall be in form D-4. In addition, the power unit shall be marked in Form B-1 with the word "WARNING" and the following or equivalent wording: "Risk of Fire. Installation involves special wiring methods to run wiring through a building structure. Consult a qualified electrician." In addition, there shall be no literature, carton markings, or illustrations depicting or implying outdoor installation of the power unit.

A power unit marked, "Suitable for Outdoor Use Only", shall be in Form D-4. In addition, there shall be no literature, carton markings, or illustrations depicting or implying indoor use.

A power unit marked, "Suitable for Indoor or Outdoor Use", shall be in Form D-4. In addition, the power unit shall be marked in Form B-1 with the word "WARNING" and the following or equivalent wording "Risk of Fire. If installation involves running wiring through a building structure, special wiring methods are needed. Consult a qualified electrician."

A power unit marked "Not for use with submersible fixtures" shall be in Form D-3. (The word "fixtures" may be substituted with "luminaires").

A power unit marked "Suitable for Use with Submersible Luminaires or Submersible Pumps", or equivalent, shall be in Form A-1 and Form D-3.

The shipping container of a Power Unit shall indicate that the power unit is only for use with low voltage landscape luminaires and fittings, unless permitted to be marked for other uses, in Form D-3.

A power unit marked with a specific lamp load, shall be in Forms A-3 and D-3. In addition, the installation instructions, in Form C, shall include a statement informing the user how to calculate the total lamp (bulb) wattage.

A Power Unit marked double insulation shall be in Form B-1. (The double-insulation symbol - a square within a square - is able to be used in addition to but not in place of the words "Double Insulation").

\*

A power provided with a terminal block shall be marked, where visible at the point of secondary wire connections, in 1/8 inch (3.2 mm) high lettering, "Read Installation Instructions before Wiring" or equivalent.

#### POWER UNIT INSTALLATION INSTRUCTIONS:

Installation instructions shall be provided with the power unit. Specific instructions for mounting, proper wiring, grounding, and servicing shall be included. The instructions shall inform the installer that the main secondary wiring is intended for shallow burial - less than 6 inches (152 mm) - unless the manufacturer has provided wiring intended for direct burial.

The instructions for a conduit-connected power unit shall include the statements "WARNING - Risk of Electric Shock. Install power unit 5 feet (1.5 m) or more from a pool or spa and 10 feet (3.05 m) or more from a fountain. Where the power unit is installed within 10 feet (3.05 m) of a pool or spa connect power unit to a GFCI protected branch circuit."

The instructions for a power-supply cord connected power unit shall include the statements "WARNING - Risk of Electric Shock. Install power unit 5 feet (1.5 m) or more from a pool, spa, or fountain. Where the power unit is installed (a) indoors within 10 feet (3.0 m) of a pool, spa, or fountain or (b) outdoors, connect power unit to a receptacle protected by a GFCI."

The installation instructions shall state how to order additional lengths of wire for connection in the secondary or state the proper accessory kit to purchase.

The instructions shall provide information to the user on how to determine the number of luminaires and the lamp wattages to be used with the power unit.

The installation instructions for a cord-connected power unit shall warn the user not to use an extension cord and shall also state that an outdoor power unit shall be connected to a GFCI protected hooded flush type cover plate receptacle marked "Wet Location" while in use.

## LUMINAIRE or FITTING MARKINGS:

A luminaire or electrical fitting shall be marked in Form B-1 with the manufacturer's name, the catalog or model number, and the date or other dating period of manufacture not exceeding any three consecutive months.

Exception: The date of manufacture shall be permitted to be abbreviated.

A luminaire marked "For Outdoor Use Only" shall be in Form A-4.

A luminaire or fitting shipping container shall indicate that it is only for use with low voltage landscape lighting power units with a maximum output rating of \_\_\_ volts, 300 watts per secondary, unless evaluated for other uses. The voltage shall not exceed the voltage of the system or 15 volts. The marking shall be in Form A-3.

Recessed luminaires marked "For installation in the ground only" or "For installation in poured concrete only" shall be in Form A-3 and A-4.

A luminaire marked for non-combustible surfaces, shall be in form A-4. In addition, the installation instructions shall provide a WARNING that the luminaire shall be installed on or in a non-combustible surface.

A Luminaire lamp replacement marking shall be in Form A-2, on each luminaire luminaire (or fitting).

A connector shall be provided with markings or instructions that state the proper wire size(s) and type(s) to be used with the connector. When a connector is a fitting-to-line type of connector, the maximum wattage shall be provided for both connections.

The exterior of the carton or package for an underwater or floating product shall be marked with the following information:

" WARNING - RISK OF ELECTRIC SHOCK"

- Use only in ponds and small decorative fountains.
- DO NOT use in water intended for swimming, wading, immersion, or bathing.
- Low voltage circuit must be supplied by a power unit marked as suitable for supplying submersible luminaires.
- "Maximum depth: \_\_\_" where the blank is filled in the value used in the Water Leakage Test.

The tie-on tag shall be attached to the luminaire or electrical fitting or to a factory-connected unit low voltage cable within 12 inches (30 cm) of where the cable enters the product.

## LUMINAIRE INSTALLATION INSTRUCTIONS

Installation instructions shall be provided with the equipment that include specific instructions for mounting, proper wiring, and servicing. The instructions shall inform the installer that the main low voltage cable is intended for shallow burial - less than 6 inches (152 mm) - unless the manufacturer has provided wiring suitable for direct burial.

The installation instructions shall state how to order additional lengths of main low voltage cable for connection of the equipment or state proper accessory kit to purchase.

The instructions for other than a pond and small decorative fountain luminaire shall include the statements "WARNING - Risk of Electric Shock. Install all luminaires 10 feet (3.05 m) or more from a pool, spa, or fountain."

A luminaire shall not use tungsten halogen lamps unless the luminaire is marked for such lamps.

Instructions shall be provided and indicate the unit low voltage cable shall:

- a) be protected by routing in close proximity to the luminaire or fitting, or next to a building structure such as a house or deck;
- b) not be buried except for a maximum 6 inches (15.2 cm) in order to connect to the main low voltage cable; and
- c) have the length cut off so that it is connected to a connector within 6 inches (15.2 cm) from a building structure, a luminaire, or fitting.

A underwater or floating luminaire or fitting shall have the installation and user instructions for Underwater and floating products shall include the warning information specified marking above. This information shall appear as the first set of instructions.

## TUNGSTEN HALOGEN LUMINAIRES

A luminaire fitting shall be marked where visible during setup, or a label shall be attached to the power-supply cord with the word, "WARNING" and the following or the equivalent: "Risk Of FIRE/INJURY TO PERSONS. Keep away from combustibles. Turn off/unplug to change lamp. Do not touch lamp."

Exception: The marking may be in the form of a pictograph complying with the requirements noted below.

The tungsten halogen lamp replacement marking may be in the form of a pictograph or a combination of a pictograph and word(s) provided the marking is investigated and found to contain:

- a) An attention-getting flag, symbol, or word;
- b) An indication of the possible risk; and
- c) What can be done to reduce the risk.

A luminaire with a single-ended tungsten-halogen lamp marked with "CAUTION" and the following, or equivalent: "To reduce the risk of fire, do not use a lamp identified for use in enclosed luminaires", shall be in form A-2

A luminaire permitted to be marked, "Replace after Servicing" or equivalent, shall be in form A-2.

## TUNGSTEN HALOGEN LUMINAIRE INSTRUCTIONS

A tungsten-halogen luminaire shall be provided with instructions that include the items in the following list or equivalent statements for each item. The statements "INSTRUCTIONS PERTAINING TO A RISK OF FIRE OR INJURY TO PERSONS" AND "IMPORTANT SAFETY INSTRUCTIONS" or the equivalent shall precede the list, and the statement "SAVE THESE INSTRUCTIONS" or the equivalent shall either precede or follow the list. All words shown entirely in upper case letters shall be in upper case letters or shall be emphasized to distinguish them from the rest of the text.

INSTRUCTIONS PERTAINING TO A RISK OF FIRE, OR INJURY TO PERSONS

IMPORTANT SAFETY INSTRUCTIONS

Lighted lamp is HOT!

WARNING - To reduce the risk of FIRE OR INJURY TO PERSONS:

Turn off/unplug and allow to cool before replacing lamp.

Lamp gets HOT quickly! Contact only switch/plug when turning on.

Do not touch hot lens, guard, or enclosure.<sup>a</sup>

Keep lamp away from materials that may burn.

Do not touch the lamp at any time. Use a soft cloth. Oil from skin may damage lamp.

Do not operate the luminaire fitting with a missing or damaged shield.

Exception: Reference to a shield is able to be replaced with equivalent wording.

## SAVE THESE INSTRUCTIONS

<sup>a</sup> An explanation, a picture, or a drawing of a lens, a guard, a shield, or an enclosure shall be provided so that the user will be able to identify these parts on the luminaire fitting.

For luminaires designated CNL, the following markings shall be provided in addition to the previously identified Marking. These markings shall be provided on all units. The individual descriptions may require additional markings. Method of marking text, size, along with location of the letters shall be as given in Tables 3 and 4 below.

TABLE 3

Format - Minimum Size Designation for  
Marking Height and Typestyle

Size Designation	Letter Height, mm (in.)	Typestyle Upper Case
S16	1.6 (0.062)	Not specified
S24	2.4 (0.094)	Univers Bold
S32	3.2 (0.125)	Not specified
S48	4.8 (0.188)	Univers Bold

TABLE 4

Format - Location Designation for Marking

Location Designation	Description
L1	Visible during relamping and after installation
L2	Visible during installation
L3	Visible during installation and inspection of wire connections, located near the supply connections
L4	On the smallest unit package or carton
L5	On an instruction sheet or tag

Tungsten halogen or HID luminaires provided with a lamp containment barrier shall be marked in Format S24-L1, "KEEP PROTECTIVE BARRIER IN PLACE" OR



"REPLACE REMOVABLE PARTS AFTER SERVICING."

Power units and other component or devices such as luminaires and connectors shall be marked with the following:

1. In Format S24-L4 or -L5, "FOR LANDSCAPE LIGHTING SYSTEMS ONLY."
2. In Format S24-L4 or -L5, "THE DEVICE IS ACCEPTED AS A COMPONENT OF A LANDSCAPE LIGHTING SYSTEM WHERE THE SUITABILITY OF THE COMBINATION SHALL BE DETERMINED BY CSA OR LOCAL INSPECTION AUTHORITIES HAVING JURISDICTION."
3. In Format S24-L4 or -L5, "OUTDOOR USE ONLY."

A permanently connected power unit with a total input current of more than 12 A and not more than 16 A shall be marked in Format S24-L4 or -L5, "NOT FOR USE IN DWELLING UNITS."

An in-ground recessed luminaire shall be marked in Format S24-L3, "SUITABLE FOR IN-GROUND RECESSED MOUNTING."

A recessed luminaire intended for outside wall mounting shall be marked in Format S24-L3, "SUITABLE FOR OUTSIDE RECESSED WALL MOUNTING ONLY. DO NOT MOUNT IN CEILINGS."

A power unit shall be marked in Format S24-L4 or -L5, "DO NOT CONNECT TWO OR MORE POWER SUPPLIES IN PARALLEL."

A recessed luminaire shall be marked in format S24-L3, "MIN. \_\_\_\_°C SUPPLY CONDUCTORS", where the blank is filled in with the temperature noted in the individual report.

## MANUFACTURER AND PRODUCTION TESTS:

Grounding Continuity - Each grounded power unit design is to be tested as a random production line test, for grounding continuity between the grounding means and the accessible dead-metal parts of the power unit.

Any effective indicating device (an ohmmeter, low voltage battery and buzzer combination, or the like) may be employed for the test described above; however, the maximum voltage applied shall not exceed 12 V.

Dielectric Voltage Withstand - Each power unit shall be subjected to the application of a 40 to 70 Hz potential between (1) (grounded units only) primary wiring, including connected components, and accessible dead-metal parts; (2) primary winding and accessible low voltage (15 V or less) metal parts including terminals. The potential shall be 1000 V plus twice the rated voltage for grounded power units and twice this voltage [2 x (1000 + 2 x rated voltage)] for double insulated power units. The potential shall be applied for 1 min or 1 s if the test potential is increased by 20 percent. The results are considered acceptable if there is no dielectric breakdown.

The test equipment shall include a transformer having an essentially sinusoidal output, a means of indicating the test potential, and an audible or visual indication of breakdown. In the event of breakdown, manual reset of an external switch or an automatic reject of the unacceptable unit under test is required. During the test, any switches to be in the "ON" position, both the sides of the primary circuit of the fixture are to be connected to the other and to one terminal of the test equipment, and the second test equipment terminal is to be connected to the accessible dead metal.

Polarity Test - Each power unit shall be checked as a routine production-line test to verify that there is electrical continuity between the grounded supply-circuit conductor of the attachment plug (wide blade of a 2-wire type) and the part of the product intended to be connected to the grounded supply-circuit conductor of the attachment plug. The polarity shall be determined either visually or through the use of an electrical test. Equivalently, polarity may be verified between the ungrounded supply-circuit conductor of the attachment plug and the part of the plug that is intended to be connected to the ungrounded conductor.

## GENERAL CONSTRUCTION:

The products in this Procedure shall comply with the following requirements and the additional descriptions given elsewhere in this Procedure.

## CORROSION PROTECTION:

## Power Units -

The inside and outside surfaces of cast ferrous metal, sheet steel, or ferrous tubing shall be protected against corrosion by one of the coatings described in Table 5 or a method described in the individual sections.

Exception No. 1 - A metal part, such as a decorative part, that is not required for conformance with this Standard need not be protected against corrosion.

Exception No. 2 - Stainless steel need not be additionally protected against corrosion.

Exception No. 3 - Edges, fasteners, and welds complying with A, B, C, and D need not be additionally protected against corrosion.

Exception No. 4 - A power unit marked for indoor use only need not comply with this requirement.

- A. Hinges, bolts, and fasteners made of ferrous materials shall be protected against corrosion by zinc-coating, cadmium-plating, enameling or painting.

Exception No. 1 - Hinge pins need not be provided with corrosion protection.

Exception No. 2 - A power unit marked for indoor use only need not comply with this requirement.

- B. Sheet steel or other metal that is painted to comply with A shall be properly cleaned of grease and the like prior to painting.
- C. Punched holes and cut edges in ferrous material need not be corrosion protected.
- D. Welds in iron or steel (other than stainless steel) shall be painted with one coat of any outdoor paint.

Exception No. 1 - Power unit marked for indoor use only need not comply with this requirement.

Exception No. 2 - One coat of any indoor paint is acceptable over a spot weld on galvanized steel.

TABLE 5  
Steel Coatings

Type of Coating	Type or Thickness <sup>1)</sup> In. (mm)	Description
(A) Hot-dipped mill galvanized steel	G90 <sup>2)</sup> G60 <sup>2)</sup> A60 <sup>2)</sup>	- With 1 coat of outdoor paint <sup>3)</sup> With 1 coat of outdoor paint <sup>3)</sup>
(B) Zinc coating other than Type (A)	0.00061 (0.0155) <sup>4)</sup> 0.00041 (0.0104) <sup>4)</sup>	With 1 coat of outdoor paint <sup>3)</sup>
(C) Cadmium coating	0.0010 (0.0254) 0.00075 (0.01905) 0.0005 (0.0127)	With 1 coat of outdoor paint <sup>3)</sup> With 2 coats of outdoor paint <sup>3)</sup>
(D) Vitreous enamel <sup>5)</sup>	-	-
(E) Organic coatings <sup>6)</sup>	-	-

- 1) As determined by ASTM Method B555-1975, Guidelines for Measurement of Electrodeposited Metallic Coating Thicknesses by the Dropping Test.
- 2) Conforming with the coating designation G90, G60, or A60 in Table 1 of ASTM A525-1981, Specification for Sheet Steel, Zinc-Coated (Galvanized) by the Hot Dip Process, General Requirements, with no less than 40 percent of the zinc on any side based on the minimum single spot test requirement in this ASTM Standard.
- 3) Identified as outdoor paint by paint manufacturer.
- 4) Average thickness with a spot minus tolerance of 0.00007 in. (0.00178 mm).
- 5) Acceptable on sheet steel at least 0.026 in. (0.66 mm) thick.
- 6) Complying with the Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment, UL 1332.

Luminaires or Fittings -

All inside and outside surfaces of sheet steel or other mechanical parts of iron or steel shall be zinc coated, cadmium plated, enameled, or painted, except for punched holes or cut edges.

Exception: Punched holes and cut edges inferrous material need not be corrosion protected.

## GROUNDING:

Power units described in the individual Report that are not identified as being double insulated shall be grounded by any of the following means, and the grounding means shall be at the same location as the power supply connections.

1. Pigtail lead grounding conductor, with a continuous green colored covering if covered with insulation, sized the same as the power supply leads, terminated by a screw or rivet and extending not less than 6 in. further than the point of the supply connection, or
2. A wire binding screw with a green colored head that is hexagonal shaped, slotted or both, No. 8 or larger size, and provided with upturned lugs, a cup washer, or recessed to hold the wire under the head of the screw, threaded into metal no less than 0.030 in. thick and with no fewer than two full threads in the metal (sheet metal and self-tapping screws not acceptable), or
3. A pressure terminal connector rated for the size of the wires to be connected with the marking adjacent to the terminal or screw "GRND" or "GND", or
4. If the power unit is supplied with a cord, the cord shall contain an equipment grounding conductor.
5. A pigtail ground lead may not be secured to the power unit by a screw, bolt, lug or other means that is also used to secure any electrical component or another mechanical item, which may be removed or disassembled for servicing.

## WIREWAYS:

The wire enclosure shall be free from burrs, fins and other sharp edges that can come in contact with wires.

Threads of sheet metal and self-taping screws shall not be exposed in a wiring enclosure for a distance of more than 3-1/6 in. (4.8 mm), unless wires are securely held away from such screw threads.

## WIRING:

The conductor shall be made of copper or copper alloy, shall have insulation rated for the potential, temperature and condition of service to which it will be subjected as indicated in the individual Reports.

## POLARITY (PRIMARY CIRCUIT-POWER UNIT ONLY):

The polarity shall be maintained electrically through all components of a system.

A grounded (neutral) conductor shall have insulation that is white or natural gray in color where visible to the installer or, if a braid is employed, the braid shall be white or natural gray in color. The field wiring terminals to which the designated grounded conductor is electrically connected shall be of metal white in color or shall be identified by means of a metal plated coating white in color or may be identified with the Marking "NEUT", "NEUTRAL" or "N" if a statement included in the instructions manual denoting "N" as the neutral terminal.

## SPACINGS:

Electrical spacings between (1) uninsulated live parts of opposite polarity and (2) uninsulated live parts and dead-metal parts shall be no less than those indicated in Table 6.

For supply wiring terminals the spacings between the supply wiring terminals of opposite polarity and between the terminals and a grounded dead-metal part shall not be less than 1/8 in. (3.2 mm) through air and 1/4 in. (6.4 mm) over surface, or as indicated in Table 6 whichever is greater.

TABLE 6

## Electrical Spacings

Minimum Spacing In Inches, (mm)					
	0-15 V (0-21.2 V) <sup>a</sup>	16-50 V (21.2-212 V) <sup>a</sup>	51-150 V (72-212 V) <sup>a</sup>	151-300 V (213-423 V) <sup>a</sup>	Over 300 V (Over 424 V) <sup>a</sup>
Through Air	N/A	1/16 (1.6)	1/8 (3.2)	1/4 (6.4)	3/8
Over Surface	N/A	1/16	1/4	3/8 (9.5)	3/8
To Enclosure	N/A	1/2 (12.7)	1/2	1/2	1/2

<sup>a</sup> The figures in parentheses are peak voltages. When evaluating the voltage of a circuit that produces other than an essentially sinusoidal waveform, both rms and peak values are considered and the requirement for the larger spacing is to be applied.



Minimum Spacings - For products designated CNL, Clearance through Air and Creepage Distances for Uninsulated Live Parts on Primary Circuits per table 7.

Table 7

## Electrical Spacings for CNL

Voltage range, rms volts	Voltage range, peak volts	Clearance Through air, mm (in)	Creepage distance, mm (in)
0 - 150	0 - 212	3.2 (0.125)	6.4 (0.250)
151 - 300	213 - 420	6.4 (0.250)	9.5 (0.375)
301 - 600	421 - 848	9.5 (0.375)	9.5 (0.375)
601 - 2000	849 - 2828	9.5 (0.375)	12.7 (0.500)
2001 - 5000	2829 - 7070	25.4 (1.000)	25.4 (1.000)
5001 - 7000	7071 - 9898	38.1 (1.500)	38.1 (1.500)

## CONDUIT OPENINGS:

Dimensions Associated with Openings for Conduit per table 8.

Table 8

## Conduit Openings

Nominal Trade Size of Conduit	Minimum Unthreaded Opening Diameter <sup>a</sup>	Throat Diameter				Minimum Diameter of Flat Surface
		Minimum		Maximum		
Inches	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	
1/2	0.875 (22.2)	0.56 (14.2)	0.62 (15.7)	1.15 (29.2)		
3/4	1.109 (28.2)	0.74 (18.8)	0.82 (20.8)	1.45 (36.8)		
1	1.375 (34.9)	0.94 (23.9)	1.05 (26.7)	1.80 (45.7)		
1-1/4	1.734 (44.0)	1.24 (31.5)	1.38 (35.1)	2.31 (58.7)		

<sup>a</sup> A plus tolerance of 0.031 inch (0.79 mm) and a minus tolerance of 0.015 inch (0.38 mm) applies to the knockout diameter. Knockout diameters will be measured other than at points where a tab may remain after removal of knockout.

## Threaded Conduit Opening -

The minimum unobstructed diameter of the flat surface surrounding the back of an opening for unthreaded conduit shall be as indicated in Table 8.

If threads for the connection of threaded conduit are tapped all the way through a hole, there shall be no fewer than 3-1/2 or more than 5 threads. The construction of the hole shall be such that a conduit bushing can be properly attached and the minimum unobstructed diameter surrounding the back of the hole shall be as indicated above.

If threads for the connection of threaded conduit are not tapped all the way through a hole, there shall be no fewer than five full threads. The unthreaded parts of the hole and the back edge shall be smooth and well rounded for protection of the conductors. The unthreaded throat diameter of the hole shall have an internal diameter as indicated above.

MAIN LOW VOLTAGE CABLE:

This is the wiring used to connect power unit secondary to the luminaire or fitting. The wiring shall be one of the types described below and sized in accordance to the table 9.

1. Listed SPT-3.
2. Listed SPT-2 W.
3. Listed Underground Low Energy Circuit Cable.
4. Listed wire that is intended for wet locations, is sunlight resistant, and is intended for direct burial as specified in the individual report.

Table 9

Wire AWG and Ampacity

Wire gauge (AWG)	Ampacity (amperes)				
	18	16	14	12	10
SI equivalent, mm <sup>2</sup> sectional area	0.82	1.3	2.1	3.3	5.3
	7	10	15	20	25
	(10) <sup>a</sup>	(13) <sup>a</sup>	(18) <sup>a</sup>	(25) <sup>a</sup>	(30) <sup>a</sup>

<sup>a</sup> These ampacities are applicable to 3-conductor cords and 4-conductor cords with three conductors carrying current. The corresponding ampacities for these sizes of 2-conductor cords and 3-conductor cords with two conductors carrying current are shown in parentheses.

UNIT LOW VOLTAGE CABLE:

This is the wiring that is part of the luminaire or fitting that connects to the Main Low Voltage Cable in order to supply power to the luminaire or fitting.

The wiring may be the same type as the Main Low Voltage Cable described above or may be Listed SPT-1 type wiring marked for outdoor use (W), XTW, CXTW, or Recognized appliance wiring material (AWM) equivalent to these as specified in the individual sections. The size and temperature of the wire shall be described in the individual sections.