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American National Standard

ANSI C78.41-1995

for electric lamps:

Guidelines for Low Pressure Sodium Lamps

National Electrical Manufacturers Association

1300 North 17th Street
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Rosslyn, Virginia 22209
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American National Standard

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ANSI C78.41-1995
Revision of ANSI C78.41-1987 (R1991)

AMERICAN NATIONAL STANDARD
for electric lamps:

Guidelines for
Low Pressure Sodium Lamps

Secretariat
National Electrical Manufacturers Association

Approved July 10, 1995
American National Standards Institute

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Foreword (This Foreword is not part of American National Standard C78.41-1995.)

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Electric Lamps, C78 and ASC Subcommittee on C78-4 High Intensity Discharge Lamps and ASC Subcommittee C82-2, High Intensity Discharge Lamp Ballasts. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time of publication of this standard these main committee and subcommittee members were:

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Organization of this Standard

This standard has been arranged in three parts:

Part I covers general information. It provides references to other related American National Standards and also offers brief explanations of the meaning of some of the numerical data given on the individual lamp data sheets in Part II.

Part II contains an individual data sheet for each type of low pressure sodium lamp.

Part III contains the maximum outline drawings applicable to each size of lamp.

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Guidelines for low pressure sodium lamps

Part I: General Information:

1 Scope

This standard describes the physical and electrical requirements of the principal types of single-ended low pressure sodium lamps. The electrical data provides the specific basis for ballast requirements for these lamps.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI C78.380-1984 (R1993), *Electric Lamps – High Intensity Discharge Lamps – Method of Designation*
ANSI C78.386-1989 (R1994), *Electric Lamps – Mercury Lamps – Methods of Measuring Characteristics*
ANSI C79.1-1994, *Nomenclature for Glass Bulbs Intended For Use With Electric Lamps*
ANSI C81.61-1990, *Electric Lamp Bases*
ANSI C81.61a-1993, *Electric Lamp Bases*
ANSI C81.62-1991, *Lampholders for Electric Lamps*
ANSI C81.62a-1993, *Lampholders for Electric Lamps*
ANSI C81.63-1991, *Gauges for Electric Lamp Bases and Lampholders*
ANSI C81.63a-1993, *Gauges for Electric Lamp Bases and Lampholders*
ANSI C81.64-1993, *Guidelines and General Information for Electrical Lamp Bases, Lampholders and Gauges*
ANSI C82.5-1990 (R1995), *Reference Ballasts for High Intensity Discharge Lamps*
ANSI SR30a, *Procedure for Use in Preparation of Lamp, Space Drawings (in process of becoming ANSI C78.30-19xx).*
IEC 61-1 (1983), *Lamp Caps* (the first part of IEC 61, *Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety*)
IEC 192, *Low Pressure Sodium Vapour Lamps*

3 Lamp designations

Designations for low pressure sodium lamps are assigned in accordance with ANSI C78.380.

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4 Bulb designations

Bulb designations are defined in ANSI C79.1.

5 Base specifications

The BY22d base is described in ANSI C81.61.

6 Maximum outline drawing

The maximum outline drawings in Part III of this standard show the maximum limits of the space that may be occupied by any part of the bulb for each lamp type. These limits are in accordance with IEC 192. Most luminaires for low pressure sodium lamps constrain the dome end of the lamp and take up any eccentricity of the lamp by means of a moveable base holder. Accordingly, the maximum outline drawings allow for the maximum bulb diameter at the dome end and for eccentricity at the base end.

7 Methods of measurement

An American National Standard for the methods of measuring the electrical characteristics and the bulb and base temperatures of low pressure sodium lamps has not yet been written. Until such a standard is written, general guidelines for these measurements may be found in ANSI C78.386.

8 Electrical characteristics

8.1 Lamp operating characteristics

The values of lamp volts, amperes and watts shown on the individual lamp data sheets in Part II of this standard apply for lamps that have aged 100 hours. Lamp rms voltage may increase with operating hours; contact lamp manufacturer for details.

8.2 Warm-up time

Bare lamps operating in still air shall reach a stabilized voltage within the time limit and at the ambient temperature specified on the applicable lamp data sheet in Part II of this standard. For this test, LPS lamps have reached a stabilized voltage when their lamp voltage does not vary more than 2% in any 1 minute period. Lamps shall meet this requirement when operated on the appropriate reference ballast specified in Part II, Section 4, and in the allowed operating position most adverse to warm-up.

9 Reference ballasts

Reference ballasts shall meet the general requirements described in ANSI C82.5.

10 Ballast design

The following requirements shall be met over the full range of primary voltage allowed for the ballast.

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10.1 Open circuit voltage

The minimum ballast open circuit voltages shown on the individual lamp data sheets assure starting and operating reliability over lamp life. The percentage probability has not yet been determined.

10.2 Starting current

Starting current shall be measured 5 to 15 seconds after the lamp has been energized and shall be within the limits shown on the applicable lamp data sheet.

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Part II
Lamp Data Sheets

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18 Watt Low Pressure Sodium Lamp, L69

Bulb: T16 Clear

Base: Bayonet, BY22d

1 Lamp designation

L69RA-18

2 Physical characteristics

Nominal diameter	51 mm (2.01 in.)
Maximum overall length	216 mm (8.50 in.)
Light center length	135 mm ± 20 mm (5.31 in. ± 0.79 in.)
Effective arc length*	85 mm ± 10 mm (3.35 in. ± 0.39 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	47	57	67
Lamp current (amperes, rms)	–	0.35	–
Lamp wattage (watts)	–	18	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	300
Reference current (amperes, rms)	0.35
Impedance (ohms)	829
Power factor	0.06 ± 0.005

* Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:

300 volts, rms
425 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.28
Maximum current (amperes, rms)..... 0.43

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

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35 Watt Low Pressure Sodium Lamp, L70

Bulb: T16 Clear

Base: Bayonet, BY22d

1 Lamp designation

L70RB-35

2 Physical characteristics

Nominal diameter	51 mm (2.01 in.)
Maximum overall length	311 mm (12.24 in.)
Light center length	185 mm ± 20 mm (7.28 in. ± 0.79 in.)
Effective arc length*	190 mm ± 10 mm (7.48 in. ± 0.39 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	60	70	80
Lamp current (amperes, rms)	–	0.60	–
Lamp wattage (watts)	–	37	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	480
Reference current (amperes, rms)	0.60
Impedance (ohms)	775
Power factor	0.06 ± 0.005

* Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:
390 volts, rms,
552 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.49
Maximum current (amperes, rms)..... 0.74

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

NOTE—The rated wattage for this lamp is 37W (see 3.1)

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55 Watt Low Pressure Sodium Lamp, L71

Bulb: T16 Clear Base: Bayonet, BY22d

1 Lamp designation

L71RC-55

2 Physical characteristics

Nominal diameter	51 mm (2.01 in.)
Maximum overall length	425 mm (16.73 in.)
Light center length	240 mm ± 20 mm (9.45 in. ± 0.79 in.)
Effective arc length*	300 mm ± 10 mm (11.81 in. ± 0.39 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	98	109	120
Lamp current (amperes, rms)	–	0.59	–
Lamp wattage (watts)	–	56	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	480
Reference current (amperes, rms)	0.60
Impedance (ohms)	775
Power factor	0.06 ± 0.005

* Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:

410 volts, rms
580 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.48
Maximum current (amperes, rms)..... 0.73

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

NOTE—The rated wattage for this lamp is 56W (see 3.1)

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90 Watt Low Pressure Sodium Lamp, L72

Bulb: T20.5 Clear

Base: Bayonet, BY22d

1 Lamp designation

L72RD-90

2 Physical characteristics

Nominal diameter	65 mm (2.56 in.)
Maximum overall length	528 mm (20.79 in.)
Light center length	290 mm ± 20 mm (11..28 in. ± 0.79 in.)
Effective arc length*	400 mm ± 15 mm (15.75 in. ± 0.59 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	99	112	125
Lamp current (amperes, rms)	–	0.94	–
Lamp wattage (watts)	–	91	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	480
Reference current (amperes, rms)	0.90
Impedance (ohms)	500
Power factor	0.06 ± 0.005

*Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:
420 volts, rms
594 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.76
Maximum current (amperes, rms)..... 1.16

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

NOTE—The rated wattage for this lamp is 91W (see 3.1)

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135 Watt Low Pressure Sodium Lamp, L73

Bulb: T20.5 Clear

Base: Bayonet, BY22d

1 Lamp designation

L73RE-135

2 Physical characteristics

Nominal diameter	65 mm (2.56 in.)
Maximum overall length	775 mm (30.51 in.)
Light center length	415 mm ± 25 mm (16.34 in. ± 0.98 in.)
Effective arc length*	650 mm ± 15 mm (25.59 in. ± 0.59 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	143	164	185
Lamp current (amperes, rms)	–	0.95	–
Lamp wattage (watts)	–	135	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	650
Reference current (amperes, rms)	0.92
Impedance (ohms)	655
Power factor	0.06 ± 0.005

* Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:
540 volts, rms
764 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.77
Maximum current (amperes, rms)..... 1.17

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

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180 Watt Low Pressure Sodium Lamp, L74

Bulb: T20.5 Clear Base: Bayonet, BY22d

1 Lamp designation

L74RF-180

2. Physical characteristics

Nominal diameter	65 mm (2.56 in.)
Maximum overall length	1120 mm (44.09 in.)
Light center length	580 mm ± 30 mm (22.83 in. ± 1.18 in.)
Effective arc length*	945 mm ± 25 mm (37.20 in. ± 0.98 in.)
Operating position	as indicated
Maximum bulb temperature	150°C (302°F)
Maximum base temperature	150°C (302°F)
Maximum outline dimensions	see Part III

3 Electrical characteristics

3.1 Lamp operating characteristics

The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C ± 5°C (77°F ± 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (volts, rms)	210	240	270
Lamp current (amperes, rms)	–	0.91	–
Lamp wattage (watts)	–	185	–

3.2 Warm-up time

The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize ..... 15 minutes

4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (volts, rms)	650
Reference current (amperes, rms)	0.92
Impedance (ohms)	655
Power factor	0.06 ± 0.005

* Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

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5 Information for ballast design

5.1 Open circuit voltage

The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be:
600 volts, rms
849 volts, peak

5.2 Starting and warm-up current

The minimum current shall be measured at the minimum allowed ballast primary voltage. The maximum current shall be measured at the maximum allowed ballast primary voltage.

Minimum current (amperes, rms)..... 0.74
Maximum current (amperes, rms)..... 1.12

5.3 Crest factor of lamp operating current

The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals

The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 volts, peak.

NOTE—The rated wattage for this lamp is 185W (see 3.1)

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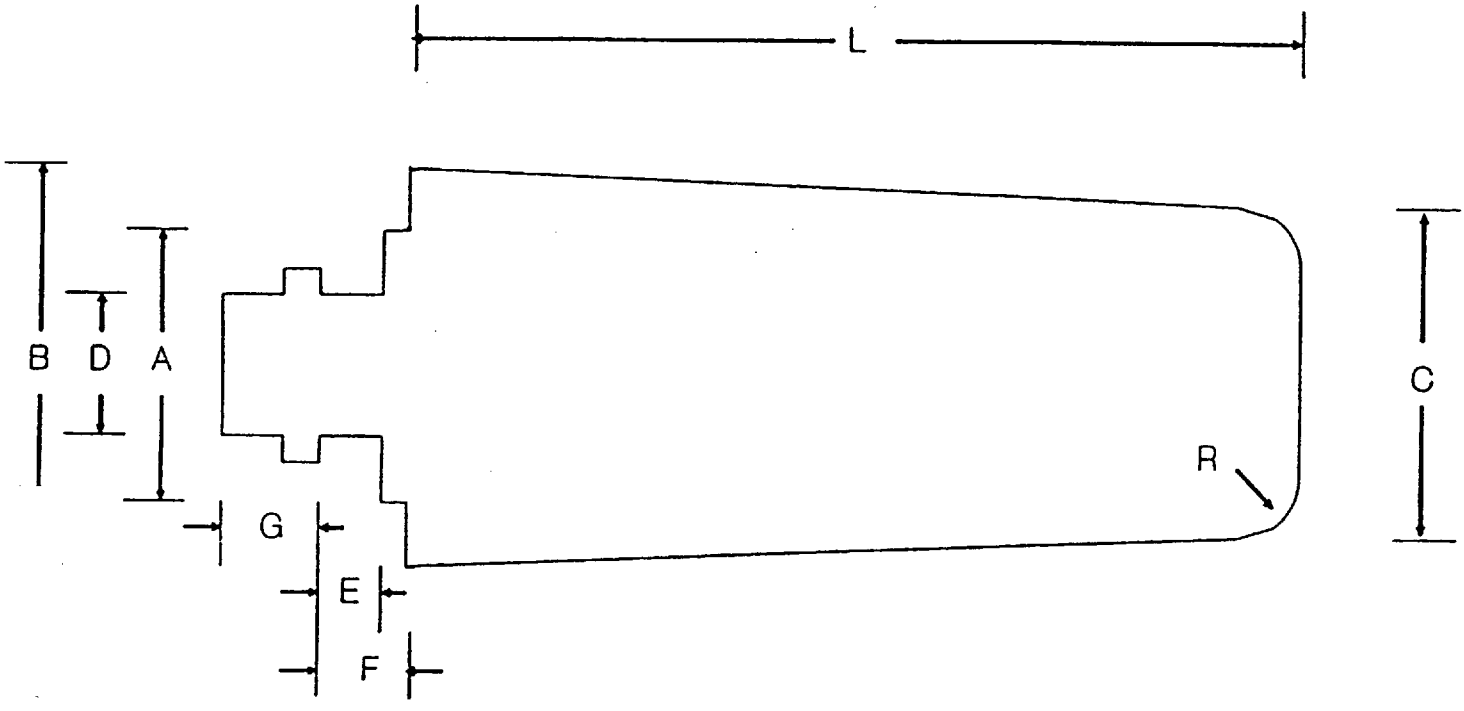

LAMP TYPE	L	B	C	A	R	E	F	D	G
90W L72	512.5	72	68	50	10	6.7	27	22.3	10.2
135W L73	759.9	72	68	50	10	6.7	27	22.3	10.2
180W L74	1104.5	72	68	50	10	6.7	27	22.3	10.2

ALL DIMENSIONS IN mm.

Maximum outline drawing for 18W, 35W, 55W

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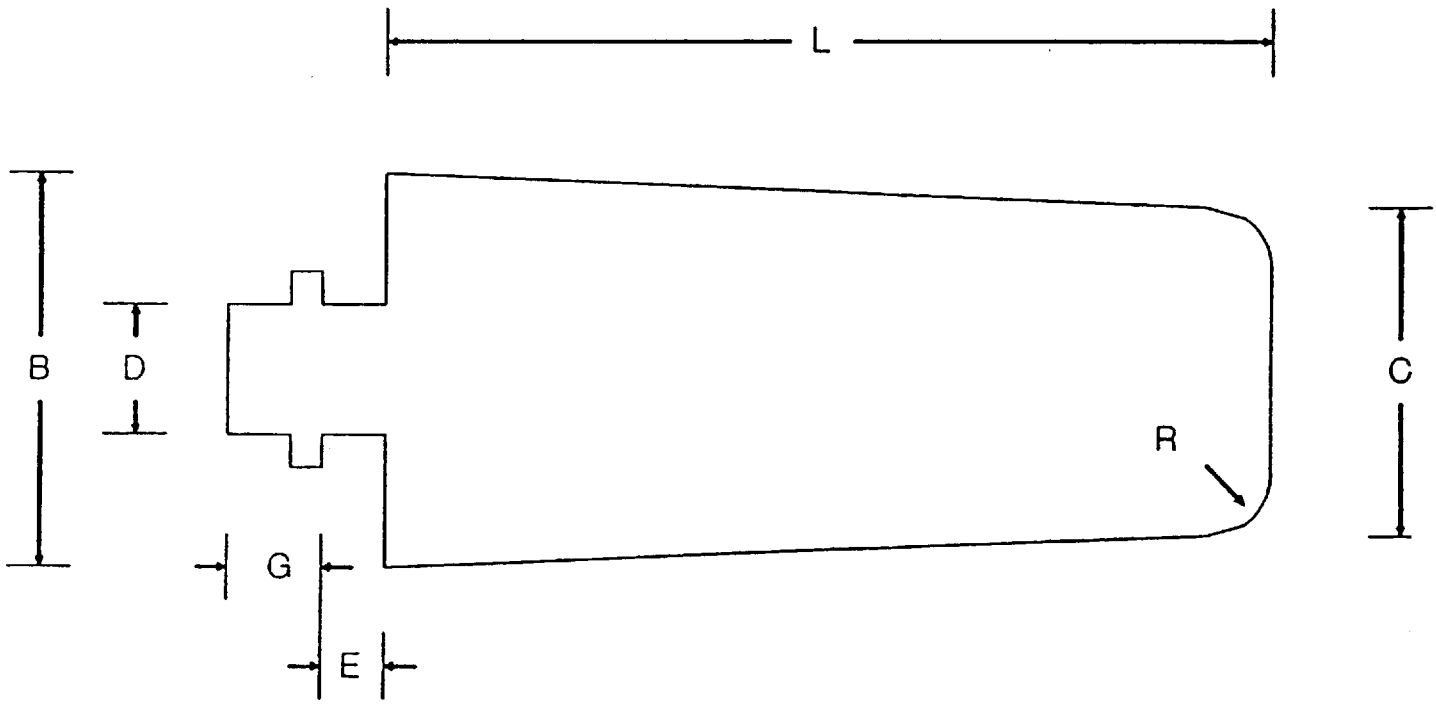

LAMP TYPE	L	B	C	R	E	D	G
18W L69	200.5	58	54	10	6.7	22.3	10.2
35W L70	295.5	58	54	10	6.7	22.3	10.2
55W L71	409.5	58	54	10	6.7	22.3	10.2

ALL DIMENSIONS IN mm.

Maximum outline drawing for 90W, 135W, 180W

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