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STANDARDS PUBLICATION NO. LE 5

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Procedure for Determining Luminaire Efficacy Ratings for Fluorescent Luminaires

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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NEMA Standards Publication No. LE 5-1993

PROCEDURE FOR DETERMINING LUMINAIRE EFFICACY RATINGS FOR FLUORESCENT LUMINAIRES

Published by

National Electrical Manufacturers Association
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Foreword

This Standard Publication was developed to assist the federal government, state governments and manufacturers of lighting fixtures in performing a standardized test method for determining the luminaire efficacy rating of fluorescent lighting fixtures incorporating various shielding media and various types of applicable lamps and ballasts.

This Standards Publication was prompted by the need of the lighting fixture manufacturing industry to have a uniform method of determining energy efficiency of their products using various components. It is not the intent of this Standards Publication to inhibit luminaire design or to impose arbitrary tolerances on any luminaire manufacturer.

The preparation of this standards publication was done by the Indoor Lighting Section in close cooperation with the Lamp, Ballast, and Outdoor Lighting Sections of the NEMA Lighting Equipment Division. Input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the Indoor Lighting Section of NEMA by contacting:

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The information given in this standard is valid as of the date of publication. The provisions of the 1992 EPCA limit the availability of some lamps included in this standard, and a revision is in process.

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Purpose

The purpose of this standards publication is to:

a. Provide governmental agencies with a practical and uniform method for calculating a metric for regulating the energy efficiency of fluorescent luminaires

b. Create a workable and realistic number of fluorescent luminaire types for regulating energy efficiency

c. Organize the types of luminaires into categories which will reasonably represent the design function, physical and dimensional attributes, and the photometric characteristics of the various types of high volume luminaires

d. Preserve for the lighting fixture manufacturers and the lighting industry the right to use laboratory facilities, testing methods, and completed test data that currently exist and are in accordance with approved industry standards

e. Establish a luminaire efficacy rating (LER) based on rated lumens per watt, in place of a standard based solely on either coefficients of utilization or luminaire efficiency. The word rated is used so as not to require the use of absolute photometry and to be able to use published rated lumen values. LER is calculated using both ballast factor (rated or actual test value) and total input watts (rated or actual test value) to establish the rated efficacy of the luminaire (LER is given in rated lumens per watt).

It is the intent of this LER methodology for fluorescent luminaires to use the F40 T12 halophosphor lamp(s) and premium magnetic (E) ballast(s) as the basis for establishing minimum values for regulatory purposes. Because all other currently available lamp/ballast systems are more efficient than the chosen base (F40 T12 lamp/ (E) ballast), a less efficient fixture and/or a less efficient shielding medium may be used with an appropriate high efficiency lamp/ballast system to meet an established minimum LER requirement. This provides the industry with the necessary design flexibility, without increasing the consumption of lighting energy.

Scope

This standards publication provides a procedure for the determination of the luminaire efficacy rating of fluorescent luminaires under laboratory test conditions.

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Section 1
REFERENCED PUBLICATIONS

The following publications are adopted in whole or in part as indicated by reference in this standards publication.

American National Standards Institute (ANSI)
11 West 42nd Street, 13th Floor
New York, NY 10036

ANSI C82.2-1984 (R 1989)	*Methods of Measurement of Fluorescent Lamp Ballasts*
ANSI C82.3-1983 (R 1989)	*Specifications for Fluorescent Lamp Reference Ballasts*
ANSI C78.1-1991	*Dimensional and Electrical Characteristics of Rapid Start Type Fluorescent Lamps*
ANSI/IEEE 100-1988	*IEEE Standard Dictionary of Electrical and Electronics Terms*

Illuminating Engineering Society of North America (IES)
345 E. 47th Street
New York, NY 10017

IES Lighting Manual (LM) 41-1985	*Approved Method for Photometric Testing of Indoor Fluorescent Luminaires*

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Section 2
DEFINITIONS

Luminaire efficacy rating

A term used to describe a mathematical method of determining the rated efficacy of a luminaire.

Ballast factor

A term used to describe the percentage of light output, produced when a fluorescent lamp(s) is energized from a commercially available ballast as compared to the light output produced when energized from a reference ballast. Ballast factor tests are run in accordance with ANSI C82.2.

Fixture

The structural parts of a luminaire, including parts designed to distribute the light, and to position and/or protect the lamp(s), to mount and support the ballast(s) and to provide a wireway or means of connecting the lamp(s) and ballast(s) to the power supply. A fixture includes the ballast(s), but does not include lamp(s).

Ballast

An auxiliary device used with an electrical discharge lamp(s) to obtain the necessary circuit conditions (voltage, current, and wave form) for the proper starting and operation of a particular fluorescent lamp(s) from a particular line voltage and frequency.

Fluorescent lamp

A low pressure mercury electric-discharge lamp in which a fluorescing coating (phosphor) transforms a portion of the ultraviolet energy generated by the arc discharge into visible light.

Luminaire

A complete lighting unit consisting of a lamp or lamps and ballast(s) together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps through the ballast(s) to the power supply.

Reference ballast

A ballast especially constructed to have certain prescribed electrical characteristics for use in testing electrical discharge lamps and other ballasts in accordance with ANSI C82.3.

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Section 3
SELECTION OF COMPONENTS

3.1 TEST SPECIMEN—LIGHTING FIXTURE

The fixture selected for test shall be clean and representative of the manufacturer's current and regular production.

3.2 TEST SPECIMEN(S)—FLUORESCENT BALLAST(S)

Ballast(s) chosen for the test shall be Certified Ballast Manufacturers (CBM) certified and shall be typical of current production with an average ballast factor as shown in Table 5-2. A CBM certified ballast is identified as having a ballast factor of 0.925 minimum in accordance with ANSI C82.2.

Any other test ballast not CBM certified, shall have the ballast factor calculated in accordance with 5.2.

Ballasts that are not CBM certified, shall be tested and certified as having ballast factors that are within ±0.025 of established average ballast factors, or the manufacturer's established ballast factor, for the particular ballast when tested in accordance with ANSI C822.

3.3 TEST SPECIMEN(S)—FLUORESCENT LAMPS

Lamps of stable output should be used. They should be constant in light output for constant line voltage and repeated operation.

Lamps selected for tests should be typical of current production and should be selected for uniform luminance and color from end-to-end and around the axis.

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Section 4
TESTING FACILITIES AND EQUIPMENT

4.1 FACILITIES

Because of the importance of obtaining accurate and repeatable measurements, a photometric laboratory shall be used for testing.

The photometric laboratory shall have facilities for performing tests in accordance with all applicable sections of the IES LM-41.

4.2 GENERAL CRITERIA

Due to the sensitivity of fluorescent lamp light output to air flows, all testing should be conducted in a simulated draft free environment. Since air movement is necessary to avoid thermal stratification, care should be taken to minimize any draft or air flow within the immediate vicinity of the test lamps or luminaire, or both.

Temperature should be controlled to 25°C (77°F) within a tolerance of ±1°C (1.8°F).

Lamp circuit pin connections should remain the same throughout the tests both for the calibration and for the luminaire test.

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Section 5
CALCULATIONS

5.1 LUMINAIRE EFFICACY RATING—FLUORESCENT LUMINAIRES

Luminaire Efficacy Rating (LER) shall be calculated for a given luminaire by the following formula:

$$LER = (EFF \times TLL \times BF) + \text{Watts Input}$$

Where:

LER = Luminaire Efficacy Rating, expressed in rated lumens per watt.

EFF = Luminaire Efficiency, expressed as a decimal.*

TLL = Total Lamp Lumens, total number of lamps in the test luminaire multiplied by the published rated lamp lumens or by the value in accordance with Table 5-1.

BF = Ballast factor of test ballast or the average ballast factor of test ballasts used in the photometric test.* If the photometric test was run prior to 1988 and actual ballast factor is not available, the ballast factor value is to be taken from Table 5-2.

WATTS INPUT = Total wattage of the luminaire as measured during the photometric test. If the photometric test was run prior to 1988 and actual measured input wattage is not available, the watts input value is to be taken from the tables of typical rated input watts, Tables 5-3 through 5-7.

5.2 CALCULATION OF BALLAST FACTOR

Ballast factor should be calculated in the following comparative method:

$$BF_T = BF_B \times (CF_T + CF_B)$$

Where:

BF_T = Ballast factor of the ballast being tested (unknown ballast factor)

BF_B = Ballast factor of base test ballast (known ballast factor)

CF_T = Calibration flux with ballast being tested

CF_B = Calibration flux using same lamps as being used in test for which ballast factor is being calculated (same as used for CF_T) and operated on base ballast(s) used for BF_B

5.3 BALLAST FACTOR/ENERGY SAVING LAMPS

The average published ballast factor to be applied to CBM test ballasts when energizing 34/35 Watt T-12 energy saving lamps should be in accordance with the Table 5-2.

*The photometric test for luminaire efficiency shall be in accordance with IES LM-41.

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Table 5-1
TYPICAL RATED FLUORESCENT LAMP LUMENS

Description	Watts	Phosphor	CRI	Rated Lumens
F40T12	40	Halophosphor	62 (Cool White)	3050
F40T12	40	Triphosphor	70–79	3200
F40T12	40	Triphosphor	80–89	3300
F40T12ES	34	Triphosphor	70–79	2800
F40T12ES, Plus	32	Triphosphor	70–79	2750
F40T10	42	Triphosphor	80–89	3700
F32T8	32	Triphosphor	80–89	2900
F96T12	75	Halophosphor	69 (Cool White)	6100
F96T12ES	60	Halophosphor	62 (Cool White)	5400
F96T12HO	110	Halophosphor	62 (Cool White)	8800
F96T12HOES	95	Halophosphor	62 (Cool White)	8050

Table 5-2
TYPICAL RATED AVERAGE BALLAST FACTORS—FLUORESCENT

Ballast Type Description	Lamp Type			
	F40-T-12	F40 T-12ES	F40 T-10	F32 T-8
1 Lamp Premium Magnetic (E)	.94	.87	.94	—
1 Lamp Premium MagneticT-8	—	—	—	.94
1 Lamp Heater Cutout	.86	.81	—	—
1 Lamp Electronic	*	*	*	*
2 Lamp Premium Magnetic (E)	.94	.87	.95	—
2 Lamp Premium MagneticT-8	—	—	—	.94
2 Lamp Heater Cutout	.83	.80	.84	—
2 Lamp Electronic	*	*	*	*
3 Lamp Magnetic	.94	.87	.94	—
3 Lamp Magnetic T-8	—	—	—	—
3 Lamp Heater Cutout	—	.81	—	—
3 Lamp Electronic	*	*	*	*
4 Lamp Electronic	*	*	*	*

*Due to the many variable designs of electronic ballasts, no typical rated ballast factor can be given.
Photometric tests must be run on each luminaire employing ballasts to determine efficiency, ballast factor, and watts input.

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Table 5-3
TYPICAL RATED INPUT WATTS
FLUORESCENT 2′× 4′ RECESSED—ENCLOSED OR LENSED

Lamps		Lamp Watts	Ballast Description	Input Watts
Quantity	Description			
4	F40 T-12	40	Premium Magnetic (E)	162
4	F40 T-12	40	Heater Cutout	137
4	F40 T-12ES	34	Premium Magnetic (E)	138
4	F40 T-12ES	34	Heater Cutout	112
4	F32 T-8	32	Premium Magnetic T-8	133
4	Lamp	—	Electronic	*
3	F40 T-12	40	Premium Magnetic (E)	128
3	F40 T-12	40	Heater Cutout	113
3	F40 T-12ES	34	Premium Magnetic (E)	113
3	F40 T-12ES	34	Heater Cutout	93
3	F32 T-8	32	Premium Magnetic T-8	103
3	Lamp	—	Electronic	*
2	F40 T-12	40	Premium Magnetic (E)	84
2	F40 T-12	40	Heater Cutout	70
2	F40 T-12ES	34	Premium Magnetic (E)	70
2	F40 T-12ES	34	Heater Cutout	56
2	F32 T-8	32	Premium Magnetic T-8	70
2	Lamp	—	Electronic	*

* Due to the many variable designs of electronic ballasts, no typical rated watts input can be given.
Photometric tests must be run on each luminaire employing electronic ballasts to determine efficiency, ballast factor, and watts input.

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Table 5-4
TYPICAL RATED INPUT WATTS
2′ × 4′ FLUORESCENT RECESSED—OPEN OR LOUVERED

Lamps		Lamp Watts	Ballast Description	Input Watts
Quantity	Description			
4	F40 T-12	40	Premium Magnetic (E)	165
4	F40 T-12	40	Heater Cutout	140
4	F40 T-12ES	34	Premium Magnetic (E)	140
4	F40 T-12ES	34	Heater Cutout	112
4	F32 T-8	32	Premium Magnetic T-8	140
4	Lamp	—	Electronic	*
3	F40 T-12	40	Premium Magnetic (E)	132
3	F40 T-12	40	Heater Cutout	115
3	F40 T-12ES	34	Premium Magnetic (E)	113
3	F40 T-12ES	34	Heater Cutout	93
3	F32 T-8	32	Premium Magnetic T-8	105
3	Lamp	—	Electronic	*
2	F40 T-12	40	Premium Magnetic (E)	85
2	F40 T-12	40	Heater Cutout	70
2	F40 T-12ES	34	Premium Magnetic (E)	70
2	F40 T-12ES	34	Heater Cutout	56
2	F32 T-8	32	Premium Magnetic T-8	70
2	Lamp	—	Electronic	*

• Due to the many variable designs of electronic ballasts, no typical rated watts input can be given.
Photometric tests must be run on each luminaire employing electronic ballasts to determine efficiency, ballast factor, and watts input.

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Table 5-5
TYPICAL RATED INPUT WATTS
FLUORESCENT PLASTIC WRAPAROUND

Lamps		Lamp Watts	Ballast Description	Input Watts
Quantity	Description			
2	F40 T-12	40	Premium Magnetic (E)	81
2	F40 T-12	40	Heater Cutout	69
2	F40 T-12ES	34	Premium Magnetic (E)	72
2	F40 T-12ES	34	Heater Cutout	54
2	F32 T-8	32	Premium Magnetic T-8	70
2	Lamp	—	Electronic	*
4	F40 T-12	40	Premium Magnetic (E)	164
4	F40 T-12	40	Heater Cutout	140
4	F40 T-12ES	34	Premium Magnetic (E)	144
4	F40 T-12ES	34	Heater Cutout	116
4	F32 T-8	32	Premium Magnetic T-8	142
4	Lamp	—	Electronic	*

* Due to the many variable designs of electronic ballasts, no typical rated watts input can be given.
Photometric tests must be run on each luminaire employing electronic ballasts to determine efficiency, ballast factor and watts input.

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Table 5-6
TYPICAL RATED INPUT WATTS
FLUORESCENT STRIP LIGHTS

Lamps		Lamp Watts	Ballast Description	Input Watts
Quantity	Description			
1	F40 T-12	40	Premium Magnetic (E)	49
1	F40 T-12	40	Heater Cutout	44
1	F40 T-12ES	34	Premium Magnetic (E)	42
1	F40 T-12ES	34	Heater Cutout	36
1	F32 T-8	32	Premium Magnetic T-8	36
1	Lamp	—	Electronic	*
2	F40 T-12	40	Premium Magnetic (E)	87
2	F40 T-12	40	Heater Cutout	71
2	F40 T-12ES	34	Premium Magnetic (E)	71
2	F40 T-12ES	34	Heater Cutout	57
2	F32 T-8	32	Premium Magnetic T-8	71
2	Lamp	—	Electronic	*
1	F96 T-12	75	Magnetic	99
1	F96 T-12HO	110	Magnetic	134
2	F96 T-12	75	Premium Magnetic (E)	156
2	F96 T-12HO	110	Premium Magnetic (E)	235
1 or 2	Lamp	—	Electronic	*

* Due to the many variable designs of electronic ballasts, no typical rated watts input can be given.
Photometric tests must be run on each luminaire employing electronic ballasts to determine efficiency, ballast factor, and watts input.

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Table 5-7
TYPICAL RATED INPUT WATTS
FLUORESCENT INDUSTRIALS

Lamps		Lamp Watts	Ballast Description	Input Watts
Quantity	Description			
2	F40 T-12	40	Premium Magnetic (E)	87
2	F40 T-12	40	Heater Cutout	71
2	F40 T-12ES	34	Premium Magnetic (E)	71
2	F40 T-12ES	34	Heater Cutout	57
2	F32 T-8	32	Premium Magnetic T-8	71
2	Lamp	—	Electronic	*
2	F96 T-12	75	Premium Magnetic (E)	156
2	F96 T-12HO	110	Premium Magnetic (E)	235
2	Lamp	—	Electronic	*

* Due to the many variable designs of electronic ballasts, no typical rated watts input can be given.
Photometric tests must be run on each luminaire employing electronic ballasts to determine efficiency, ballast factor, and watts input.

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Appendix A
THE RATIONALE AND RECOMMENDED REGULATIONS FOR FLUORESCENT LUMINAIRES

A.1 Luminaire Characteristics

In reviewing fluorescent luminaires, judging a luminaire by efficiency alone is a poor measure of merit. The most efficient luminaire is basically a "bare lamp." Likewise, judging a luminaire by its coefficient of utilization (CU) is inappropriate. A luminaire's CU not only a function of its efficiency, but its application as well. The CU is dependent in part on the geometry of the room in which it is installed and the reflectivity of the room surfaces.

Luminaires must be classified into various categories and rated within these categories. The following are some examples.

Type	Physical Dimensions
Recessed	Width
Surface mounted	Depth
Suspended	Length
Strip lights	
Plastic wraparounds	
Industrials	

Physical dimensions are important, because a luminaire that is recessed mounted within a ceiling must mate with the ceiling construction for width and length, and its depth must correlate with the available plenum depth.

The inexpensive wraparound unit may be shallow and narrow, so as to be inconspicuous in the space and to minimize cost. (Even the least efficient wraparound is much more efficient than the incandescent unit it replaces.)

Photometric Characteristics*
Spacing criterion—spacing to mounting height
Visual comfort probability
Shielding angle
Maximum average luminance
Side luminance
Coefficient of utilization
Efficiency

* For definitions, refer to the *IES Lighting Handbook: Reference Volume (1984).*

Electrical Characteristics
Number of lamps
Type and wattage of lamps
Number and type of ballast
Power factor
Watts input—total for luminaire

A.2 Fluorescent Market—Percentage by Types

The Department of Commerce reports four major types of fluorescent fixtures which constitute 90 percent of the fluorescent commercial, institutional, and industrial markets.*

Type	Description	Percent
1	Recessed (Air and Non-air)	41
2	Strip lights	25
3	Plastic wraparounds	13
4	Industrial	11
5	All others	10
	TOTAL	100

**Current Industrial Report: Electric Lighting Fixtures: 1990*, US Department of Commerce, Bureau of Census, Washington, DC, October 1990.

The type 1 recessed lighting fixture is comprised of many sizes from 1'× 1' to 4'× 4', but the predominate size is 2'× 4', which represents better than 75 percent of the market.

Size	Percent
2'× 4'	75
2'× 2'	12
1'× 4'	10
Other	3
TOTAL	100

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The approximate breakdown by lamp quantity for the 2'×4' recessed fixture is:

Lamps	Percent
4	53
3	28
2	18
Other	1
TOTAL	100

The type 2 (strip light) consists primarily of 4 and 8 foot lengths, using the 4 foot, rapid start 40 watt lamp or the 8 foot slimline or high output, rapid start fluorescent lamp. Approximately 20 percent are one lamp, and 78 percent are two lamp units.

The type 3 (plastic wraparound) fixture is primarily a 4 foot long fixture employing the 4 foot, rapid start lamp. The approximate lamp and fixture width breakdown is as follows.

No. of Lamps	Percentage	Fixture Width
1	5	3–8 inches
2	67	8–18 inches
3	1	13–18 inches
4	27	13–18 inches
TOTAL	100	

The type 4 (industrial) fixture is primary 4 and 8 feet in length, using the 4 foot, rapid start 40 watt lamp or the 8 foot, slimline or high output, rapid start lamp. The two lamp version comprises approximately 87 percent of the product.

A.3 Luminaire Types and Classifications

In analyzing the fluorescent lighting market, the Indoor Lighting Section has determined that the following types of luminaires, subdivided into the appropriate classifications, would be representative of the market.

2'×4' Recessed,
Enclosed or Lensed,
Spacing Criterion greater than 1.1,
2 Lamp, 3 Lamp, and 4 Lamp
Depth, <4", ≥4
VCP* ≤55, 56–69, 70–79, ≥80

*VCP is based on a room 60 ft × 60 ft × 8.5 ft, viewed both parallel and perpendicular to the lamps.

2'×4' Recessed,
Open or Louvered,
Spacing Criteria greater than 1.1,
2 Lamp, 3 Lamp, and 4 Lamp
VCP** ≥ 80
Shielding angle °, 22–29°, ≥30°

Plastic Wraparound
2 Lamp and 4 Lamp
Width, < 9"–12", >12"

Strip Lights
1 Lamp and 2 Lamp

Industrial
2 Lamp only

**VCP to be based on a room 60 ft × 60 ft × 8.5 ft, viewed both parallel and perpendicular to the lamps.

A.4 Luminaire Efficacy Rating for Heat Transfer Luminaires

The relative light output and watts input will vary with each luminaire design and with each air flow employed. The effect on relative light output and watts input is not exactly linear, but they are close. Luminaire efficacy rating will vary both up and down. Do not expect luminaire efficacy rating to change more than a few percentage points when room air passes through the lamp compartment of heat transfer types of recessed fluorescent luminaires.

A.5 Recommended Regulations—Fluorescent Luminaires Only

The minimum required luminaire efficacy rating (LER) for fluorescent luminaires shall be in accordance with Tables A-1 through A-5.

Table A-1
MINIMUM LER
2'×4' ENCLOSED OR LENSED RECESSED FLOURESCENT LUMINAIRES WITH SPACING CRITERION GREATER THAN 1.1
(See exceptions below.)

VCP*	≤55	56–69	70–79	≥80
4 lamp				
Depth < 4"	44	43	41	40
Depth ≥ 4"	45	44	43	41
3 lamp				
Depth < 4"	44	43	41	40
Depth ≥ 4"	46	44	43	42
2 lamp				
Depth < 4"	48	47	46	44
Depth ≥ 4"	50	48	47	46

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Note—Exceptions are the following:

a. Air handling luminaires with "floating door" construction may have LER values 6 percent lower than shown in Tables A-1 and A-2.

b. Luminaires with average luminance in the lengthwise, crosswise, and 45° plane that do not exceed 250 footlamberts at 55° from the vertical may have an LER value of 4 percent less than shown in Tables A-1 and A-2. This exception is in addition to that shown in note a.

c. If the spacing criterion is equal to or less than 1.1, add 6 percent to each number in the table.

*VCP is based on a room 60 ft × 60 ft × 8.5 ft, viewed both parallel and perpendicular to the lamps.

** A floating door is frame which appears visually separated from the fixture housing by a regressed area on all four sides/ends. The regressed area is normally painted black. Thus, the door frame appears to float.

Table A-2
2′ × 4′ OPEN OR LOUVERED RECESSED FLUORESCENT LUMINAIRES WITH VCP ≥ 80 AND SPACING CRITERION GREATER THAN 1.1

Shielding Angle	<22°	22–29°	≥30°
4 lamp	46	41	37
3 lamp	47	46	41
2 lamp	55	52	49

Note—Exceptions are the following:

a. Air handling luminaires with "floating door" construction may have LER values 6 percent lower than shown in Tables A-1 and A-2.

b. Luminaires with average luminance in the lengthwise, crosswise, and 45É plane that do not exceed 250 footlamberts at 55É from the vertical may have an LER value of 4 percent less than shown in Tables A-1 and A-2. This exception is in addition to that shown in note a.

c. If the spacing criterion is equal to or less than 1.1, add 6 percent to each number in the table.

Table A-3
2′ × 4′ MINIMUM LER PLASTIC WRAPAROUND LUMINAIRES

Width	<9"	9–12"	>12"
4 lamp	—	—	47
3 lamp	46	50	51

Table A-4
MINIMUM LER BARE LAMP STRIP LUMINAIRES

Number of Lamps	LER
2	58
1	51

Table A-5
MINIMUM LER BARE LAMP INDUSTRIAL LUMINAIRES

Number of Lamps	LER
2	56

All other commercial fluorescent luminaires are considered low volume and are excluded.

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NEMA STANDARDIZIATION BACKGROUND

The purpose of NEMA standards, their classification, and status are set forth in certain clauses of the NEMA *Standardization Policies and Procedures* manual and are referenced below:

Purpose Of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for their particular needs. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

(Standardization Policies and Procedures, p. 1)

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process, or procedure with reference to one or more of the following: nomenclature, composition, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(Standardization Policies and Procedures, p. 2)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the Standards Publication may be capable of otherwise equivalent performance.

(Standardization Policies and Procedures, p. 8)

Categories of Standards

National Electrical Manufacturers Association Standards are of three classes, which have received the affirmative vote of at least two-thirds of the Subdivision votes cast in the affirmative or negative:

1. NEMA Standard, which relates to a product, process, or procedure commercially standardized and subject to repetitive manufacture.
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development.
3. Adoptive Standard, which is adopted in whole or in part from the standards of another organization, either domestic, regional, or international.

(Standardization Policies and Procedures, pp. 7 & 16)

Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design, which standard has received the affirmative vote of at least two-thirds of the Subdivision votes cast in the affirmative or negative.

(Standardization Policies and Procedures, pp. 7 & 16)

Identification of Status

Standards in NEMA Standards Publications are identified as "NEMA Standard," "Suggested Standard for Future Design," or "Adoptive Standard." These indicate the status of the standard. A statement incorporating the auxiliary verb "shall" indicates that compliance with a requirement is mandatory for compliance with the standard. These classes of standards are identified in the foreword and throughout the text.

The material identified as "Authorized Engineering Information" is designated similarly. Statements incorporating other auxiliary verbs such as "should," "may," etc. refer to the authorized engineering information and not to procedures required for compliance with the standard.

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Memphis, TN 38119

Cooper Lighting Group
Elk Grove Village, IL 60007-2195

Metalux Division
Americus, GA 31709-1207

Duro-Test Corporation
Fairfield, NJ 07007

GE
Hendersonville, NC 28739

The Genlyte Group
Secaucus, NJ 07096

Wide-Lite Incorporated
San Marcos, TX 78660

O Z Gedney Company
Terryville, CT 06786

Hanson Industries
Hanson Lighting Group/USI
Bristol, PA 19007

Holophane Company, Inc
Newark, OH43055-7195

Hubbell Incorporated
Christianburg, VA 24073

Indy Lighting, Inc
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West Lafayette, OH 43845

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