

## ***Nonresidential Appendix NA8 – 2008***

# **Appendix NA8 – Illuminance Categories and Luminaire Power**

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### ***Illuminance Categories***

Please see Chapter 10 in the IESNA Lighting Handbook, Ninth Edition.

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### ***Illuminance Categories and Luminaire Power***

Luminaire power shall be taken from the following tables.

Table NA8-1 – Fluorescent Circline

Table NA8-2 – Compact Fluorescent 2D

Table NA8-3 – Compact Fluorescent

Table NA8-4 – Long Compact Fluorescent

Table NA8-5 – Fluorescent U-Tubes

Table NA8-6 – Fluorescent Linear Lamps – Preheat

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Table NA8-12 – Fluorescent Instant Start (single pin base "Slimline") T8 & T12, 8 ft.

Table NA8-13 – High Intensity Discharge

Table NA8-14 – 12 Volt Tungsten Halogen Lamps Including MR16, Bi-pin, AR70, AR111, PAR36

Table NA8-1 – Fluorescent Circline

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
Rapid Start (22 W)	1	FC8T9	1	MAG STAND.	Mag. Stand.	29	8" OD
T5 Program Start (22 W)	1	FC9T5	1	ELECT NO	Electronic Normal Light	28	8" OD
	2	FC9T5	1	ELECT NO	Electronic Normal Light	53	
T5 Program Start (40 W)	1	FC12T5	1	ELECT NO	Electronic Normal Light	44	12" OD
	2	FC12T5	1	ELECT NO	Electronic Normal Light	84	
T5 Rapid Start (55 W)	1	FC12T5HO	1	ELECT NO	Electronic Normal Light	61	12" OD
	2	FC12Tag5HO	1	ELECT NO	Electronic Normal Light	111	
	1	FC12T5HO	1	ELECT DIM	Electronic Dimming	8~62	
	2	FC12T5HO	1	ELECT DIM	Electronic Dimming	18~120	
T5 Rapid Start (40 + 22 W)	1+1	FC12T5/FC9T5	1	ELECT NO	Electronic Normal Light	68	8" & 12" OD

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-2 – Compact Fluorescent 2D

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
10W, GR10q-4 Four Pin Base	1	CFS10W/GR10q	1	MAG STD	Mag. Stand.	16	3.6" across
	1	CFS10W/GR10q	1	ELECT	Electronic	13	
	2	CFS10W/GR10q	1	ELECT	Electronic	26	
16W, GR10q-4 Four Pin Base	1	CFS16W/GR10q	1	MAG STD	Mag. Stand.	23	5.5" across
	1	CFS16W/GR10q	1	ELECT	Electronic	15	
	2	CFS16W/GR10q	1	ELECT	Electronic	30	
21W, GR10q-4 Four Pin Base	1	CFS21W/GR10q	1	MAG STD	Mag. Stand.	31	5.5" across
	1	CFS21W/GR10q	1	ELECT	Electronic	21	
	2	CFS21W/GR10q	1	ELECT	Electronic	42	
28W, GR10q-4 Four Pin Base	1	CFS28W/GR10q	1	MAG STD	Mag. Stand.	38	8.1" across
	1	CFS28W/GR10q	1	ELECT	Electronic	28	
	2	CFS28W/GR10q	1	ELECT	Electronic	56	
(38W, GR10q-4 Four Pin Base	1	CFS38W/GR10q	1	ELECT	Electronic	37	8.1" across
	2	CFS38W/GR10q	1	ELECT	Electronic	74	

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-3 – Compact Fluorescent

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
Twin (5 W, G23 Two Pin Base - F5TT Lamp)	1	CFT5W/G23	1	MAG STD	Mag. Stand.	9	4.1" MOL
	2	CFT5W/G23	2	MAG STD	Mag. Stand.	18	
Twin (7 W, G23 Two Pin Base - F7TT Lamp)	1	CFT7W/G23	1	MAG STD	Mag. Stand.	11	5.3" MOL
	2	CFT7W/G23	2	MAG STD	Mag. Stand.	22	
Twin (7 W, 2G7 Four Pin Base - F7TT Lamp)	1	CFT7W/2G7	1	ELECT	Electronic	8	5.3" MOL
	2	CFT7W/2G7	2	ELECT	Electronic	16	
Twin (9 W, G23 Two Pin Base - F9TT Lamp)	1	CFT9W/G23	1	MAG STD	Mag. Stand.	13	6.5" MOL
	2	CFT9W/G23	2	MAG STD	Mag. Stand.	26	
Twin (9 W, 2G7 Four Pin Base - F9TT Lamp)	1	CFT9W/2G7	1	ELECT	Electronic	10	6.5" MOL
	2	CFT9W/2G7	2	ELECT	Electronic	20	
Twin (13 W, GX23 Two Pin Base - F13TT)	1	CFT13W/GX2 3	1	MAG STD	Mag. Stand.	17	7.5" MOL
	2	CFT13W/GX2 3	2	MAG STD	Mag. Stand.	34	
Twin (13 W, 2GX7 Four Pin Base - F13TT)	1	CFT13W/2GX 7	1	ELECT	Electronic	17	7.5" MOL
	2	CFT13W/2GX 7	2	ELECT	Electronic	34	
Quad (9 W, G23-2 Two Pin Base - F9DTT Lamp)	1	CFQ9W/G23-2	1	MAG STD 120	120 V Mag. Stand.	13	4.4" MOL
	2	CFQ9W/G23-2	2	MAG STD 120	120 V Mag. Stand.	26	
Quad (13 W, G24d-1 Two Pin Base - F13DTT Lamp)	1	CFQ13W/G24 d-1	1	MAG STD 120	120 V Mag. Stand.	18	6.0" MOL
	2	CFQ13W/G24 d-1	2	MAG STD 120	120 V Mag. Stand.	36	
	1	CFQ13W/G24 d-1	1	MAG STD 277	277 V Mag. Stand.	16	
	2	CFQ13W/G24 d-1	2	MAG STD 277	227 V Mag. Stand.	32	
Quad (13 W, GX23-2 Two Pin Base)	1	CFQ13W/GX2 3-2	1	MAG STD	Mag. Stand.	17	4.8" MOL
	2	CFQ13W/GX2 3-2	2	MAG STD	Mag. Stand.	34	
Quad (16W GX32d-1 Two Pin Base)	1	CFQ16W/GX3 2d-1	1	MAG STD	Mag. Stand.	20	5.5" MOL
	2	CFQ16W/GX3 2d-1	2	MAG STD	Mag. Stand.	40	
Quad (18 W, G24d-2 Two Pin Base - F18DTT Lamp)	1	CFQ18W/G24 d-2	1	MAG STD 120	120 V Mag. Stand.	25	6.8" MOL
	2	CFQ18W/G24 d-2	2	MAG STD 120	120 V Mag. Stand.	50	
	1	CFQ18W/G24 d-2	1	MAG STD 277	227 V Mag. Stand.	22	
	2	CFQ18W/G24 d-2	2	MAG STD 277	227 V Mag. Stand.	44	
	1	CFQ22W/GX3 2d-2	1	MAG STD	Mag. Stand.	27	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
Quad (22W, GX32d Two Pin Base)	2	CFQ22W/GX3 2d-2	2	MAG STD	Mag. Stand.	54	
Quad (26 W, G24d-3 Two Pin Base - F26DTT Lamp)	1	CFQ26W/G24 d-3	1	MAG STD 120	120 V Mag. Stand.	37	7.6" MOL
	2	CFQ26W/G24 d-3	2	MAG STD 120	120 V Mag. Stand.	74	
	1	CFQ26W/G24 d-3	1	MAG STD 277	227 V Mag. Stand.	33	
	2	CFQ26W/G24 d-3	2	MAG STD 277	227 V Mag. Stand.	66	
	1	CFQ26W/G24 d-3	1	ELECT 277V	277 V Electronic	28	
	2	CFQ26W/G24 d-3	2	ELECT 277V	277 V Electronic	54	
Quad (28W GX32d Two Pin Base)	1	CFQ28W/GX3 2d-3	1	MAG STD	Mag. Stand.	34	6.8" MOL
	2	CFQ28W/GX3 2d-3	2	MAG STD	Mag. Stand.	68	
Quad (10 W, G24q-1 Four Pin Base)	1	CFQ10W/G24 q-1	1	MAG STD 120	120 V Mag. Stand.	16	4.6" MOL
	2	CFQ10W/G24 q-1	2	MAG STD 120	120 V Mag. Stand.	32	
	1	CFQ10W/G24 q-1	1	MAG STD 277	227 V Mag. Stand.	13	
	2	CFQ10W/G24 q-1	2	MAG STD 277	227 V Mag. Stand.	26	
Quad (13 W, G24q-1 Four Pin Base)	1	CFQ13W/G24 q-1	1	MAG STD 120	120 V Mag. Stand.	18	6.0" MOL
	2	CFQ13W/G24 q-1	2	MAG STD 120	120 V Mag. Stand.	36	
	1	CFQ13W/G24 q-1	1	MAG STD 277	227 V Mag. Stand.	16	
	2	CFQ13W/G24 q-1	2	MAG STD 277	227 V Mag. Stand.	32	
	1	CFQ13W/G24 q-1	1	ELECT	Electronic	16	
	2	CFQ13W/G24 q-1	2	ELECT	Electronic	29	
Quad (13 W, GX7 Four Pin Base)	1	CFQ13W/GX7	1	MAG STD	Mag. Stand.	17	4.8" MOL
	2	CFQ13W/GX7	2	MAG STD	Mag. Stand.	34	
Quad (18 W, G24q-2 Four Pin Base)	1	CFQ18W/G24 q-2	1	MAG STD 120	120 V Mag. Stand.	25	6.8" MOL
	2	CFQ18W/G24 q-2	2	MAG STD 120	120 V Mag. Stand.	50	
	1	CFQ18W/G24 q-2	1	MAG STD 277	227 V Mag. Stand.	22	
	2	CFQ18W/G24 q-2	2	MAG STD 277	227 V Mag. Stand.	44	
	1	CFQ18W/G24 q-2	1	ELECT	Electronic	21	
	2	CFQ18W/G24 q-2	2	ELECT	Electronic	38	

Type	Lamps		Ballasts		System Watts	Comment	
	Number	Designation	Number	Description			
Triple (13 W, GX24q-1 Four Pin Base)	1	CFM 13W/GX24q-1	1	MAG STD Mag. Stand.	18	4.2" MOL	
	2	CFM 13W/GX24q-1	2	MAG STD Mag. Stand.	36		
	1	CFM 13W/GX24q-1	1	ELECT Electronic	16		
	2	CFM 13W/GX24q-1	2	ELECT Electronic	29		
Triple (18W, GX24q-2 Four Pin Base)	1	CFM 18W/GX24q-2	1	MAG STD Mag. Stand.	25	5.0" MOL	
	2	CFM 18W/GX24q-2	2	MAG STD Mag. Stand.	50		
	1	CFM 18W/GX24q-2	1	ELECT Electronic	21		
	2	CFM 18W/GX24q-2	2	ELECT Electronic	38		
Triple (26W, GX24q-3 Four Pin Base)	1	CFTR 26W/GX24q-3	1	MAG STD Mag. Stand.	37	4.9 to 5.4" MOL	
	2	CFTR 26W/GX24q-3	2	MAG STD Mag. Stand.	74		
	1	CFTR 26W/GX24q-3	1	ELECT Electronic	28		
	2	CFTR 26W/GX24q-3	1	ELECT Electronic	57		
	1	CFTR 26W/GX24q-3	1	ELECT DIM Electronic Dimming	8~29		BF .05~1.0
	2	CFTR 26W/GX24q-3	1	ELECT DIM Electronic Dimming	12~57		BF .05~1.0
Triple (32 W, GX24q-3 Four Pin Base)	1	CFTR32WGX2 4q-3	1	ELECT Electronic	36		
	2	CFTR32WGX2 4q-3	1	ELECT Electronic	69		
	1	CFTR32WGX2 4q-3	1	ELECT DIM Electronic Dimming	9~38		BF .05~1.05
	2	CFTR32WGX2 4q-3	1	ELECT DIM Electronic Dimming	20~76		BF .05~1.05
Triple or Quad (42W, GX24q-4 Four Pin Base)	1	CFTR42WGX2 4q-4	1	ELECT Electronic	46		
	2	CFTR42WGX2 4q-4	1	ELECT Electronic	94		
	1	CFTR42WGX2 4q-4	1	ELECT DIM Electronic Dimming	10~49		BF .05~1.05
	2	CFTR42WGX2 4q-4	1	ELECT DIM Electronic Dimming	20~98		BF .05~1.05
Triple or Quad (57W, GX24q-5 Four Pin Base)	1	CFTR57WGX2 4q-5	1	ELECT Electronic	62		
	1	CFTR57WGX2 4q-5	1	ELECT DIM Electronic Dimming	18~66		BF .05~1.05
Triple or Quad (70W, GX24q-6 Four Pin Base)	1	CFTR70WGX2 4q-6	1	ELECT Electronic	75		
	1	CFTR70WGX2 4q-6	1	ELECT DIM Electronic Dimming	18~80		BF .05~1.00

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-4 – Long Compact Fluorescent

Type	Lamps		Ballasts		System Watts	Comment		
	Number	Designation	Number	Designation			Description	
T5 Twin (18W - F18TT Lamp)	1	FT18W/2G11	1	MAG.	Mag. Energy Efficient	23	BF~1.0	
	2	FT18W/2G11	1	MAG.	Mag. Energy Efficient	46	BF~1.0	
	3	FT18W/2G11	1	MAG.	Mag. Energy Efficient	69		
	1	FT18W/2G11	1	ELECT	Electronic	24		
	2	FT18W/2G11	1	ELECT	Electronic	35		
	3	FT18W/2G11	1	ELECT	Electronic	52		
T5 Twin (24-27W- F24TT or F27TT Lamp)	1	FT24W/2G11	1	MAG.	Mag. Energy Efficient	32		
	2	FT24W/2G11	1	MAG.	Mag. Energy Efficient	66		
	3	FT24W/2G11	1	MAG.	Mag. Energy Efficient	98		
	1	FT24W/2G11	1	ELECT	Electronic	27	BF~1.0	
	2	FT24W/2G11	1	ELECT	Electronic	52	BF~1.0	
T5 Twin (36-39W - F36TT or F39TT Lamp)	1	FT36W/2G11	1	MAG.	Mag. Energy Efficient	51		
	2	FT36W/2G11	1	MAG.	Mag. Energy Efficient	66		
	3	FT36W/2G11	2	MAG.	Mag. Energy Efficient	117		
	1	FT36W/2G11	1	ELECT	Electronic	37		
	2	FT36W/2G11	1	ELECT	Electronic	70		
	1	FT36W/2G11	1	ELECTHO	Electronic High Output	46	BF=1.22	
	2	FT36W/2G11	1	ELECTHO	Electronic High Output	86	BF=1.20	
T5 Twin (40 W - F40TT Lamp)	1	FT40W/2G11	1	MAG.	Mag. Energy Efficient	43		
	2	FT40W/2G11	1	MAG.	Mag. Energy Efficient	86		
	3	FT40W/2G11	2	MAG.	Mag. Energy Efficient	130		
Electronic Ballasts	1	FT40W/2G11	1	ELECT NO	Electronic	41	BF~.90	
	2	FT40W/2G11	1	ELECT NO1	Electronic	72	BF~.88	
	2	FT40W/2G11	1	ELECT NO2	Electronic	78	BF~.97	
	3	FT40W/2G11	1	ELECT NO	Electronic	103	BF~.86	
						110	BF~.88	
	1	FT40W/2G11	1	ELECT HO	Electronic High Output	50	BF ~ 1.1	
	1	FT40W/2G11	1	ELECT DIM1	Electronic Dimming	10- 45	BF .05~1.0	
	2	FT40W/2G11	1	ELECT DIM1	Electronic Dimming	17- 97	BF .05~1.0	
	1	FT40W/2G11	1	ELECT DIM2	Electronic Dimming	11-38	BF .05~.88	
	2	FT40W/2G11	1	ELECT DIM2	Electronic Dimming	16-76	BF .05~.88	
	T5 Twin (50 W - F50TT Lamp)	1	FT50W/2G11	1	ELECT NO	Electronic Normal Output	54	BF~.98
		2	FT50W/2G11	1	ELECT NO	Electronic Normal Output	106	BF~.98
1		FT50W/2G11	1	ELECT HO	Electronic High Output	61	BF~1.12	
2		FT50W/2G11	1	ELECT HO	Electronic High Output	115	BF~1.10	
1		FT50W/2G11	1	ELECT DIM	Electronic Dimming	51		
2		FT50W/2G11	1	ELECT DIM	Electronic Dimming	92		
T5 Twin (55 W - F55TT Lamp)		1	FT55W/2G11	1	ELECT NO	Electronic Normal Output	58	BF~.92
						62	BF~1.0	
	2	FT55W/2G11	1	ELECT NO	Electronic Normal Output	109	BF~.90	
					116	BF~.95		

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation Description		
	1	FT55W/2G11	1	ELECT DIM	Electronic Dimming	8-62 BF .01-.98
	2	FT55W/2G11	1	ELECT DIM	Electronic Dimming	8-120 BF .01-.98
T5 Twin (80 W – F80TT Lamp)	1	FT80W/2G11	1	ELECT NO	Electronic	91 BF~1.00

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-5 – Fluorescent U-Tubes

Type	Lamps		Ballasts		System Watts	Comment	
	Number	Designation	Number	Designation Description			
2 ft. Fluorescent U-Tube T8 (32W - FBO31T8 or F32T8/U/6 Lamp)	1	FB31T8/F32T8U	0.5	MAG.	Mag. Energy Efficient	35 Tandem wired	
	1	FB31T8/F32T8U	1	MAG.	Mag. Energy Efficient	36	
	2	FB31T8/F32T8U	1	MAG.	Mag. Energy Efficient	69	
	3	FB31T8/F32T8U	1.5	MAG.	Mag. Energy Efficient	104 Tandem wired	
	3	FB31T8/F32T8U	2	MAG.	Mag. Energy Efficient	105	
	1	FB31T8/F32T8U	1	ELECT NO	Electronic Normal Output	39	
	2	FB31T8/F32T8U	1	ELECT NO	Electronic Normal Output	62	
	3	FB31T8/F32T8U	1	ELECT NO	Electronic Normal Output	92	
	1	FB31T8/F32T8U	1	ELECT DIM	Electronic Dimming	9-33 BF .05-.88	
	2	FB31T8/F32T8U	1	ELECT DIM	Electronic Dimming	14-64 BF .05-.88	
	3	FB31T8/F32T8U	1	ELECT DIM	Electronic Dimming	18-93 BF .05-.88	
	4	FB31T8/F32T8U	1	ELECT DIM	Electronic Dimming	25-116 BF .05-.88	
	2 ft. Fluorescent U-Tube T12 ("Energy Saving" 34W)	1	FB40T12/ES	0.5	MAG.	Mag. Energy Efficient	36 Tandem wired
		1	FB40T12/ES	1	MAG.	Mag. Energy Efficient	43
2		FB40T12/ES	1	MAG.	Mag. Energy Efficient	87	
3		FB40T12/ES	1	MAG.	Mag. Energy Efficient	105	
3		FB40T12/ES	1.5	MAG.	Mag. Energy Efficient	108 Tandem wired	
3		FB40T12/ES	2	MAG.	Mag. Energy Efficient	115	
1		FB40T12/ES	0.5	ELECT	Electronic	30 Tandem wired	
1		FB40T12/ES	1	ELECT	Electronic	31	
2		FB40T12/ES	1	ELECT	Electronic	59	
3		FB40T12/ES	1	ELECT	Electronic	90	
3		FB40T12/ES	1.5	ELECT	Electronic	88 Tandem wired	
3		FB40T12/ES	2	ELECT	Electronic	90	

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Table NA8-6 – Fluorescent Linear Lamps – Preheat

Type	Lamps		Ballasts			System Watts	Comment
	Nmbr	Designation	Nmbr	Designation	Description		
Fluorescent Preheat T5 (8W)	1	F8T5	1	MAG STD	Mag. Stand.	12	12" MOL
Fluorescent Preheat T8 (15W)	1	F15T8	1	MAG STD	Mag. Stand.	22	18" MOL
Fluorescent Preheat T12 (15W)	1	F15T12	1	MAG STD	Mag. Stand.	23	18" MOL
Fluorescent Preheat T12 (20W)	1	F20T12	1	MAG STD	Mag. Stand.	25	24" MOL
	2	F20T12	1	MAG STD	Mag. Stand.	50	24" MOL
Fluorescent Preheat T8 (30W)	1	F30T8	1	MAG STD	Mag. Stand.	46	30" MOL
	2	F30T8	1	MAG STD	Mag. Stand.	79	30" MOL

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Table NA8-7 – Fluorescent Linear Lamps T5

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
~23" Fluorescent Program Start T5 (14W)	1	F14T5	1	ELECT	Elect. Program Start BF=1	18	
	2	F14T5	1	ELECT	Elect. Program Start BF=1	34	
~34.5" Fluorescent Program Start T5 (21W)	1	F21T5	1	ELECT	Elect. Program Start BF=1	27	
	2	F21T5	1	ELECT	Elect. Program Start BF=1	50	
~46" Fluorescent Program Start T5 (28W)	1	F28T5	1	ELECT	Elect. Program Start BF=1	30	
	2	F28T5	1	ELECT	Elect. Program Start BF=1	60	
~58.5" Fluorescent Program Start T5 (35W)	1	F35T5	1	ELECT	Elect. Program Start BF=1	40	
	2	F35T5	1	ELECT	Elect. Program Start BF=1	78	
~23" Fluorescent Program Start T5 High Output (24W)	1	F24T5HO	1	ELECT	Elect. Program Start BF=1	29	
	2	F24T5HO	1	ELECT	Elect. Program Start BF=1	55	
~34.5" Fluorescent Program Start T5 High Output(39W)	1	F39T5	1	ELECT	Elect. Program Start BF=1	43	
	2	F39T5	1	ELECT	Elect. Program Start BF=1	85	
~46" Fluorescent Program Start T5 High Output (54W)	1	F54T5	1	ELECT	Elect. Program Start BF=1	62	
	2	F54T5	1	ELECT	Elect. Program Start BF=1	121	
	1	F54T5	1	ELECT DIM	Elect. Dimming	8-63	
	2	F54T5	1	ELECT DIM	Elect. Dimming	18-125	
~57.5" Fluorescent Program Start T5 High Output (80W)	1	°F80T5	1	ELECT	Elect. Program Start BF=1	90	

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Table NA8-8 – Fluorescent Rapid Start T-8

Type	Lamps		Ballasts			System Watts	Comment	
	Number	Designation	Number	Designation	Description			
2 foot Fluorescent Rapid Start T8 (17W)	1	F17T8	1	MAG.	Mag. Energy Efficient	31		
	2	F17T8	1	MAG.	Mag. Energy Efficient	45		
Electronic Ballasts	1	F17T8	1	ELECT NO	Electronic Normal Output	22		
	2	F17T8	1	ELECT NO	Electronic Normal Output	33		
	3	F17T8	1	ELECT NO	Electronic Normal Output	53		
	3	F17T8	2	ELECT NO	Electronic Normal Output	55		
	4	F17T8	1	ELECT NO	Electronic Normal Output	63		
2 foot Fluorescent Rapid Start T8 (17W)	1	F17T8	1	ELECT DIM	Electronic Dimming	8~20	BF .05~.88	
	2	F17T8	1	ELECT DIM	Electronic Dimming	10~37	BF .05~.88	
	3	F17T8	1	ELECT DIM	Electronic Dimming	12~56	BF .05~.88	
	4	F17T8	1	ELECT DIM	Electronic Dimming	18~69	BF .05~.88	
3 foot Fluorescent Rapid Start T8 (25W)	1	F25T8	1	MAG.	Mag. Energy Efficient	33		
	2	F25T8	1	MAG.	Mag. Energy Efficient	65		
Electronic Ballasts	1	F25T8	1	ELECT NO	Electronic Normal Output	27		
	2	F25T8	1	ELECT NO	Electronic Normal Output	48		
	3	F25T8	1	ELECT NO	Electronic Normal Output	68		
	4	F25T8	1	ELECT NO	Electronic Normal Output	89		
	1	F25T8	1	ELECT RO	Electronic Reduced Output	24		
	2	F25T8	1	ELECT RO	Electronic Reduced Output	41		
	3	F25T8	1	ELECT RO	Electronic Reduced Output	59		
	4	F25T8	1	ELECT RO	Electronic Reduced Output	76		
	1	F25T8	1	ELECT HO	Electronic High Output	29	BF~1.05	
	2	F25T8	1	ELECT HO	Electronic High Output	51	BF~1.05	
	3	F25T8	1	ELECT HO	Electronic High Output	74	BF~1.05	
	1	F25T8	1	ELECT DIM	Electronic Dimming	8~25	BF .05~.94	
	2	F25T8	1	ELECT DIM	Electronic Dimming	13~49	BF .05~.94	
	3	F25T8	1	ELECT DIM	Electronic Dimming	16~76	BF .05~.94	
	4	F25T8	1	ELECT DIM	Electronic Dimming	22~96	BF .05~.88	
	4 foot Fluorescent Rapid Start T12 for T-8 ballasts ("Energy Saving" 25W)	1	F25T12ES	1	ELECT NO	Electronic Normal Output	27	
		2	F25T12ES	1	ELECT NO	Electronic Normal Output	52	
		3	F25T12ES	1	ELECT NO	Electronic Normal Output	77	

Type	Lamps		Ballasts			System Watts	Comment	
	Number	Designation	Number	Designation	Description			
	4	F25T12ES	1	ELECT NO	Electronic Normal Output	95		
4 foot Fluorescent Instant Start T8 ("Energy Saving" 30W)	1	F32T8/30ES	1	ELECT NO	Electronic Normal Output	29		
	2	F32T8/30ES	1	ELECT NO	Electronic Normal Output	54		
	3	F32T8/30ES	1	ELECT NO	Electronic Normal Output	79		
	4	F32T8/30ES	1	ELECT NO	Electronic Normal Output	104		
	1	F32T8/30ES	1	ELECT RO	Electronic Reduced Output	27		
	2	F32T8/30ES	1	ELECT RO	Electronic Reduced Output	48		
	3	F32T8/30ES	1	ELECT RO	Electronic Reduced Output	70		
	4	F32T8/30ES	1	ELECT RO	Electronic Reduced Output	91		
	1	F32T8/30ES	1	ELECT NO EE	EE Normal Output	33		
	2	F32T8/30ES	1	ELECT NO EE	Energy efficiency Normal Output	52		
	3	F32T8/30ES	1	ELECT NO EE	Energy efficiency Normal Output	77		
	4	F32T8/30ES	1	ELECT NO EE	Energy efficiency Normal Output	101		
	1	F32T8/30ES	1	ELECT RO EE	EE Reduced Output	28		
	2	F32T8/30ES	1	ELECT RO EE	EE Reduced Output	45		
	3	F32T8/30ES	1	ELECT RO EE	EE Reduced Output	66		
	4	F32T8/30ES	1	ELECT RO EE	EE Reduced Output	88		
	4 foot Fluorescent Rapid Start T8 (32W)	1	F32T8	0.5	MAG.	Mag. Energy Efficient	35	Tandem wired
		1	F32T8	1	MAG.	Mag. Energy Efficient	44	
		2	F32T8	1	MAG.	Mag. Energy Efficient	74	
3		F32T8	1.5	MAG.	Mag. Energy Efficient	105	Tandem wired	
3		F32T8	2	MAG.	Mag. Energy Efficient	109		
4 foot Fluorescent Rapid Start T8 (32W)	4	F32T8	2	MAG.	Mag. Energy Efficient	140	(2) two-lamp ballasts	
	1	F32T8	1	ELECT NO	Electronic Normal Output	32		
	2	F32T8	1	ELECT NO	Electronic Normal Output	62		
	3	F32T8	1	ELECT NO	Electronic Normal Output	93		
	4	F32T8	1	ELECT NO	Electronic Normal Output	114		
	1	F32T8	1	EE NO	EE Normal Output	35		

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation Description		
	2	F32T8	1	EE NO EE Normal Output	55	
	3	F32T8	1	EE NO EE Normal Output	82	
	4	F32T8	1	EE NO EE Normal Output	107	
	1	F32T8	1	ELECT RO Electronic Reduced Output	29	
	2	F32T8	1	ELECT RO Electronic Reduced Output	51	
	3	F32T8	1	ELECT RO Electronic Reduced Output	76	
	4	F32T8	1	ELECT RO Electronic Reduced Output	98	
	2	F32T8	1	ELECT HO Electronic High Output	77	BF~1.13
	3	F32T8	1	ELECT HO Electronic High Output	112	BF~1.18
	1	F32T8	1	EE RO EE Reduced Output	30	
	2	F32T8	1	EE RO EE Reduced Output	48	
	3	F32T8	1	EE RO EE Reduced Output	73	
	4	F32T8	1	EE RO EE Reduced Output	96	
	2	F32T8	1	ELECT TL Electronic Two Level (50 & 100%)	65	
	1	F32T8	1	ELECT DIM1 Electronic Dimming	9~35	BF .05~1.0
	2	F32T8	1	ELECT DIM1 Electronic Dimming	15~68	BF .05~1.0
	3	F32T8	1	ELECT DIM1 Electronic Dimming	20~102	BF .05~1.0
	1	F32T8	1	ELECT DIM2 Electronic Dimming	9~33	BF .05~.88
	2	F32T8	1	ELECT DIM2 Electronic Dimming	14~64	BF .05~.88
	3	F32T8	1	ELECT DIM2 Electronic Dimming	18~93	BF .05~.88
	4	F32T8	1	ELECT DIM2 Electronic Dimming	25~116	BF .05~.88
5 foot Fluorescent Rapid Start T8 (40W)	1	F40T8	1	MAG. Mag. Energy Efficient	50	
	2	F40T8	1	MAG. Mag. Energy Efficient	92	
	1	F40T8	1	ELECT Electronic	46	
	2	F40T8	1	ELECT Electronic	79	
	3	F40T8	1	ELECT Electronic	112	
3 foot Fluorescent Rapid Start T12 ("Energy-Saving" 25W)	1	F30T12/ES	1	MAG STD Mag. Stand.	42	
	2	F30T12/ES	1	MAG STD Mag. Stand.	74	
	3	F30T12/ES	1.5	MAG STD Mag. Stand.	111	Tandem wired
	3	F30T12/ES	2	MAG STD Mag. Stand.	116	
	2	F30T12/ES	1	MAG. Mag. Energy Efficient	66	
	1	F30T12/ES	1	ELECT Electronic	26	
	2	F30T12/ES	1	ELECT Electronic	53	
3 foot Fluorescent Rapid Start T12 ("Stand." 30W)	1	F30T12	1	MAG STD Mag. Stand.	46	
	2	F30T12	1	MAG STD Mag. Stand.	80	

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation Description		
	3	F30T12	1.5	MAG STD Mag. Stand.	118	Tandem wired
	3	F30T12	2	MAG STD Mag. Stand.	125	
	2	F30T12	1	MAG. Mag. Energy Efficient	73	
	1	F30T12	1	ELECT Electronic	30	
	2	F30T12	1	ELECT Electronic	66	
4 foot Fluorescent Rapid Start T12 ("Energy- Saving Plus"32W)	1	F40T12/ES Plus	0.5	MAG. Mag. Energy Efficient	34	Tandem wired
	1	F40T12/ES Plus	1	MAG. Mag. Energy Efficient	41	
	2	F40T12/ES Plus	1	MAG. Mag. Energy Efficient	68	
	3	F40T12/ES Plus	1	MAG. Mag. Energy Efficient	99	
	3	F40T12/ES Plus	1.5	MAG. Mag. Energy Efficient	102	Tandem wired
	3	F40T12/ES Plus	2	MAG. Mag. Energy Efficient	109	
	4	F40T12/ES Plus	2	MAG. Mag. Energy Efficient	136	(2) Two-lamp ballasts

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-9 – Fluorescent Rapid Start T-12

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
4 foot Fluorescent Rapid Start T12 ("Energy-Saving"34W)	1	F40T12/ES	0.5	MAG STD**	Mag. Stand.	42	Tandem wired
	1	F40T12/ES	1	MAG STD**	Mag. Stand.	48	
	2	F40T12/ES	1	MAG STD**	Mag. Stand.	82	
	3	F40T12/ES	1.5	MAG STD**	Mag. Stand.	122	Tandem wired
	3	F40T12/ES	2	MAG STD**	Mag. Stand.	130	
	4	F40T12/ES	2	MAG STD**	Mag. Stand.	164	(2) Two-lamp ballasts
	1	F40T12/ES	0.5	MAG.	Mag. Energy Efficient	36	Tandem wired
	1	F40T12/ES	1	MAG.	Mag. Energy Efficient	43	
	2	F40T12/ES	1	MAG.	Mag. Energy Efficient	72	
	3	F40T12/ES	1	MAG.	Mag. Energy Efficient	105	
	3	F40T12/ES	1.5	MAG.	Mag. Energy Efficient	108	Tandem wired
	3	F40T12/ES	2	MAG.	Mag. Energy Efficient	112	
	4	F40T12/ES	2	MAG.	Mag. Energy Efficient	144	(2) Two-lamp ballasts
	2	F40T12/ES	1	MAG HC	Mag. Heater Cutout	58	
	3	F40T12/ES	1.5	MAG HC	Mag. Heater Cutout	87	Tandem wired
	4	F40T12/ES	2	MAG HC	Mag. Heater Cutout	116	(2) Two-lamp ballasts
	2	F40T12/ES	1	MAG HC FO	Mag. Heater Cutout Full Light	66	
	3	F40T12/ES	1.5	MAG HC FO	Mag. Heater Cutout Full Light	99	Tandem wired
	4	F40T12/ES	2	MAG HC FO	Mag. Heater Cutout Full Light	132	(2) Two-lamp ballasts
	1	F40T12/ES	0.5	ELECT	Electronic	30	Tandem wired
	1	F40T12/ES	1	ELECT	Electronic	31	
	2	F40T12/ES	1	ELECT	Electronic	62	
	3	F40T12/ES	1	ELECT	Electronic	90	
	3	F40T12/ES	1.5	ELECT	Electronic	93	Tandem wired
	3	F40T12/ES	2	ELECT	Electronic	93	
	4	F40T12/ES	1	ELECT	Electronic	121	
	4	F40T12/ES	2	ELECT	Electronic	124	(2) Two-lamp ballasts
	2	F40T12/ES	1	ELECT AO	Elec. Adjustable Output (to 15%)	60	
	3	F40T12/ES	1.5	ELECT AO	Elec. Adjustable Output (to 15%)	90	Tandem wired
	4	F40T12/ES	2	ELECT AO	Elec. Adjustable Output (to 15%)	120	(2) Two-lamp ballasts

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
4 foot Fluorescent Rapid Start Stand. (40W)	1	F40T12	0.5	MAG.	Mag. Energy Efficient	44	Tandem wired
	1	F40T12	1	MAG.	Mag. Energy Efficient	46	
	2	F40T12	1	MAG.	Mag. Energy Efficient	88	
	3	F40T12	1	MAG.	Mag. Energy Efficient	127	
	3	F40T12	1.5	MAG.	Mag. Energy Efficient	132	Tandem wired
	3	F40T12	2	MAG.	Mag. Energy Efficient	134	
	4	F40T12	2	MAG.	Mag. Energy Efficient	176	(2) Two-lamp ballasts
	2	F40T12	1	MAG HC	Mag. Heater Cutout	71	
	3	F40T12	1.5	MAG HC	Mag. Heater Cutout	107	Tandem wired
	4	F40T12	2	MAG HC	Mag. Heater Cutout	142	(2) Two-lamp ballasts
4 foot Fluorescent Rapid Start Stand. (40W) cont.	2	°F40T12	1	MAG °F FO	Mag. Heater Cutout Full Light	80	
	3	°F40T12	1.5	MAG °F FO	Mag. Heater Cutout Full Light	120	Tandem wired
	4	°F40T12	2	MAG °F FO	Mag. Heater Cutout Full Light	160	(2) Two-lamp ballasts
	1	°F40T12	0.5	ELECT	Electronic	36	Tandem wired
	1	°F40T12	1	ELECT	Electronic	37	
	2	°F40T12	1	ELECT	Electronic	72	
	3	°F40T12	1	ELECT	Electronic	107	
	3	°F40T12	1.5	ELECT	Electronic	108	Tandem wired
	3	°F40T12	2	ELECT	Electronic	109	
	4	°F40T12	1	ELECT	Electronic	135	
	4	°F40T12	2	ELECT	Electronic	144	(2) Two-lamp ballasts
	2	°F40T12	1	ELECT RO	Electronic Reduce Output (75%)	61	
	3	°F40T12	1	ELECT RO	Electronic Reduce Output (75%)	90	
	3	°F40T12	1.5	ELECT RO	Electronic Reduce Output (75%)	92	Tandem wired
	4	°F40T12	2	ELECT RO	Electronic Reduce Output (75%)	122	(2) Two-lamp ballasts
	2	°F40T12	1	ELECT TL	Elec. Two Level (50 & 100%)	69	
	3	°F40T12	1.5	ELECT TL	Elec. Two Level (50 & 100%)	104	Tandem wired
	4	°F40T12	2	ELECT TL	Elec. Two Level (50 & 100%)	138	(2) Two-lamp ballasts
	2	°F40T12	1	ELECT AO	Elec. Adjustable Output (to 15%)	73	
	3	°F40T12	1.5	ELECT AO	Elec. Adjustable Output (to 15%)	110	Tandem wired

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation		
	4	°F40T12	2	ELECT AO	Elec. Adjustable Output (to 15%)	146 (2) Two-lamp ballasts
	2	°F40T12	1	ELECT DIM	Electronic Dimming (to 1%)	83
	3	°F40T12	1.5	ELECT DIM	Electronic Dimming (to 1%)	125 Tandem wired
	4	°F40T12	2	ELECT DIM	Electronic Dimming (to 1%)	166 (2) Two-lamp ballasts

RO = ballast factor 70 to 85% NO = ballast factor 85 to 100% HO = ballast factor >100%

Table NA8-10 – Fluorescent Rapid Start High Output (HO) T8 & T12, 8 ft

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation		
8 foot Fluorescent Rapid Start T8 High Output (86W)	1	F96T8/HO	1	ELECT	Electronic	88
	2	F96T8/HO	1	ELECT	Electronic	160
8 foot Fluorescent Rapid Start T12 High Output ("Energy-Saving" 95W)	1	F96T12/HO/ES	1	MAG STD	Mag. Stand.	125
	2	F96T12/HO/ES	1	MAG STD**	Mag. Stand.	227
	2	F96T12/HO/ES	1	MAG.	Mag. Energy Efficient	208
	2	F96T12/HO/ES	1	ELECT	Electronic	170
8 foot Fluorescent Rapid Start T12 High Output ("Stand." 110W)	1	F96T12/HO	1	MAG STD	Mag. Stand.	140
	2	F96T12/HO	1	MAG STD**	Mag. Stand.	252
	2	F96T12/HO	1	MAG.	Mag. Energy Efficient	237
	1	F96T12/HO	1	ELECT	Electronic	119
	2	F96T12/HO	1	ELECT	Electronic	205
8 foot Fluorescent Rapid Start T12 Very High Output ("Energy-Saving" 195W)	1	F96T12/VHO/ES	1	MAG STD	Mag. Stand.	200
	2	F96T12/VHO/ES	1	MAG STD	Mag. Stand.	325
8 foot Fluorescent Rapid Start T12 Very High Output ("Stand." 215W)	1	Stand.96T12/VHO	1	MAG STAND.	Mag. Stand.	230
	2	Stand.96T12/VHO	1	MAG STAND.	Mag. Stand.	452

RO = ballast factor 70 to 85% NO = ballast factor 85 to 100% HO = ballast factor >100%

Table NA8-11 – Fluorescent Instant Start (single pin base "Slimline") T12, 4 ft

Type	Lamps		Ballasts		System Watts	Comment
	Number	Designation	Number	Designation		
4 foot Fluorescent Slimline Energy-Saving T12 (32W)	1	Stand.48T12/ES	1	MAG STAND.	Mag. Stand.	51
	2	Stand.48T12/ES	1	MAG STAND.	Mag. Stand.	82
4 foot Fluorescent Slimline Stand. Stand. (39W)	1	Stand.48T12	1	MAG Stand.	Mag. Stand.	59
	2	Stand.48T12	1	MAG Stand.	Mag. Stand.	98

RO = ballast factor 70 to 85% NO = ballast factor 85 to 100% HO = ballast factor >100%

Table NA8-12 – Fluorescent Instant Start (single pin base "Slimline") T8 &amp; T12, 8 ft.

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
8 foot Fluorescent T8 Slimline (59W)	1	F96T8	1	MAG.	Mag. Stand.	58	
	2	F96T8	1	MAG.	Mag. Stand.	120	
	2	F96T8	1	ELECT NO	Electronic Normal Output	110	
	1	F96T8	1	ELECT HO	Electronic High Output	72	BF~1.10
	2	F96T8	1	ELECT HO1	Electronic High Output	140	BF~1.10
	2	F96T8	1	ELECT HO2	Electronic High Output	151	BF~1.20
8 foot Fluorescent T12 Slimline ("Energy- Saving" 60W)	1	F96T12/ES	1	MAG STD	Mag. Stand.	87	
	2	F96T12/ES	1	MAG STD**	Mag. Stand.	135	
	2	F96T12/ES	1	MAG.	Mag. Energy Efficient	112	
	1	F96T12/ES	1	ELECT	Electronic	70	
	2	F96T12/ES	1	ELECT	Electronic	107	
8 foot Fluorescent T12 Slimline ("Stand." 75W)	1	F96T12	1	MAG STD	Mag. Stand.	101	
	2	F96T12	1	MAG STD**	Mag. Stand.	160	
	2	F96T12	1	MAG.	Mag. Energy Efficient	144	
	1	F96T12	1	ELECT	Electronic	85	
	2	F96T12	1	ELECT	Electronic	132	

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-13 – High Intensity Discharge

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
Mercury Vapor	1	H40	1	MAG STD	Mag. Stand.	51	
	1	H50	1	MAG STD	Mag. Stand.	68	
	1	H75	1	MAG STD	Mag. Stand.	92	
	1	H100	1	MAG STD	Mag. Stand.	120	
	1	H175	1	MAG STD	Mag. Stand.	205	
	1	H250	1	MAG STD	Mag. Stand.	285	
	1	H400	1	MAG STD	Mag. Stand.	454	
	1	H1000	1	MAG STD	Mag. Stand.	1080	
Metal Halide	1	M35/39	1	MAG STD	Mag. Stand.	58	
	1	M35/39	1	ELECT	Electronic	44	
	1	M50	1	MAG STD	Mag. Stand.	68	
	1	M50	1	ELECT	Electronic	58	
	1	M70	1	MAG STD	Mag. Stand.	95	
	1	M70	1	ELECT	Electronic	86	
	1	M100	1	MAG STD	Mag. Stand.	130	
	1	M100	1	ELECT	Electronic	110	
	1	M125	1	MAG STD	Mag. Stand.	150	
	1	M150	1	MAG STD	Mag. Stand.	189	
	1	M150	1	ELECT	Electronic	168	
	1	M175	1	MAG STD	Mag. Stand.	208	
	1	M200	1	MAG STD	Mag. Stand.	232	
	1	M225	1	MAG STD	Mag. Stand.	258	
	1	M250	1	MAG STD	Mag. Stand.	295	
	1	M320	1	MAG STD	Mag. Stand.	368	
	1	M320	1	MAG LR	277v Linear Reactor	345	
	1	M360	1	MAG STD	Mag. Stand.	422	
	1	M360	1	MAG LR	277v Linear Reactor	388	
	1	M400	1	MAG STD	Mag. Stand.	461	
	1	M400	1	MAG LR	277v Linear Reactor	426	
	1	M450	1	MAG STD	Mag. Stand.	502	
	1	M450	1	MAG LR	277v Linear Reactor	478	
	1	M750	1	MAG STD	Mag. Stand.	820	
	1	M900	1	MAG STD	Mag. Stand.	990	
	1	M1000	1	MAG STD	Mag. Stand.	1080	
1	M1500	1	MAG STD	Mag. Stand.	1650		
1	M1650	1	MAG STD	Mag. Stand.	1810		
High Pressure Sodium	1	S35	1	MAG STD	Mag. Stand.	47	
	1	S50	1	MAG STD	Mag. Stand.	66	
	1	S70	1	MAG STD	Mag. Stand.	93	
	1	S100	1	MAG STD	Mag. Stand.	128	
	1	S150	1	MAG STD	Mag. Stand.	188	
	1	S200	1	MAG STD	Mag. Stand.	240	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
High Pressure Sodium <i>cont.</i>	1	S250	1	MAG STD	Mag. Stand.	302	
	1	S400	1	MAG STD	Mag. Stand.	469	
	1	S1000	1	MAG STD	Mag. Stand.	1100	
Low Pressure Sodium	1	LPS18	1	MAG STAND.	Mag. Stand.	30	
	1	LPS35	1	MAG STAND.	Mag. Stand.	60	
	1	LPS55	1	MAG STAND.	Mag. Stand.	80	
	1	LPS90	1	MAG STAND.	Mag. Stand.	125	
	1	LPS135	1	MAG STAND.	Mag. Stand.	178	
	1	LPS180	1	MAG STAND.	Mag. Stand.	220	

RO = ballast factor 70 to 85%    NO = ballast factor 85 to 100%    HO = ballast factor >100%

Table NA8-14 – 12 Volt Tungsten Halogen Lamps Including MR16, Bi-pin, AR70, AR111, PAR36

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	1	20 watt lamp	1	ELECT	Electronic Power Supply	23	
	1	25 watt lamp	1	ELECT	Electronic Power Supply	28	
	1	35 watt lamp	1	ELECT	Electronic Power Supply	38	
	1	37 watt lamp	1	ELECT	Electronic Power Supply	41	
	1	42 watt lamp	1	ELECT	Electronic Power Supply	45	
	1	50 watt lamp	1	ELECT	Electronic Power Supply	54	
	1	65 watt lamp	1	ELECT	Electronic Power Supply	69	
	1	71 watt lamp	1	ELECT	Electronic Power Supply	75	
	1	75 watt lamp	1	ELECT	Electronic Power Supply	80	
	1	100 watt lamp	1	ELECT	Electronic Power Supply	106	
	1	20 watt lamp	1	MAG	Mag. Transformer	24	
	1	25 watt lamp	1	MAG	Mag. Transformer	29	
	1	35 watt lamp	1	MAG	Mag. Transformer	39	
	1	37 watt lamp	1	MAG	Mag. Transformer	42	
	1	42 watt lamp	1	MAG	Mag. Transformer	46	
	1	50 watt lamp	1	MAG	Mag. Transformer	55	
	1	65 watt lamp	1	MAG	Mag. Transformer	70	
	1	71 watt lamp	1	MAG	Mag. Transformer	76	
	1	75 watt lamp	1	MAG	Mag. Transformer	81	
	1	100 watt lamp	1	MAG	Mag. Transformer	108	

### **E. Low-Voltage Lighting**

§130(d)4

This method applies to any low-voltage lighting system having a transformer, including low-voltage track lighting, or individual low-voltage luminaires.

The wattage of luminaires or lighting systems with permanently installed or remotely installed transformers shall be determined as follows:

1. The rated wattage of the lamp/transformer combination, listed on a permanent, pre-printed, factory-installed label, as specified by UL, and
2. For luminaires with transformers rated greater than 50 W, the factory-installed wattage label shall not consist of peel-off or peel-down layers or other methods which allow the rated wattage to be changed after the luminaire or lighting system has been shipped from the manufacturer.

### **F. LED Lighting Source Systems**

§130(d)5

LED lighting source systems shall be the maximum rated input wattage of the system as defined in §101. LED lighting system wattage shall be tested in accordance with Reference Joint Appendix JA8 or IES LM-79-08.

The Standards require that the maximum rated input wattage shall be listed on a permanent, pre-printed, factory-installed label as specified by Underwriters Laboratories (UL). However, there have been new LED lighting systems recently introduced, where a centrally located driver is being used to operate more than one luminaire. Therefore, when multiple luminaires are connected to a single power supply/driver, the label used to determine the maximum wattage of the LED system shall be located on the LED power supply/driver, and the wattage of the system shall be based on the connected load of that LED power supply/driver as determined by the luminaire manufacturer or the rating of that LED power supply/driver as determined by the manufacturer of the power supply/driver.

### **G. Miscellaneous Lighting Systems**

§130(d)6

This method applies only to lighting systems which have not already been addressed by another subsection of §130(d), and is primarily intended to address new technologies. This method shall not be applied to incandescent, fluorescent, HID, or LED luminaires because these lighting technologies are already addressed in different subsections of §130(d).

The wattage of all other miscellaneous lighting equipment shall be the maximum rated wattage of the lighting equipment, or operating input wattage of the system, listed on a permanent, pre-printed, factory-installed label, or published in manufacturer's catalogs, based on independent testing lab reports as specified by UL 1574 or UL 1598.

<b>Term</b>	<b>Definition</b>
<i>INTEGRATED PART LOAD VALUE (IPLV)</i>	is a single-number figure of merit based on part load EER or COP expressing part load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment as determined using the applicable test method in the Appliance Efficiency Regulations or § 112.
<i>INTERIOR PARTITION</i>	is an interior wall or floor/ceiling that separates one area of conditioned space from another within the building envelope.
<i>INTERNALLY ILLUMINATED SIGN</i>	See <i>Sign</i> .
<i>IPLV</i>	See <i>Integrated Part Load Value</i> .
<i>ISO 13256-1</i>	is the International Organization for Standardization document entitled "Water-source heat pumps -- Testing and rating for performance -- Part 1: Water-to-air and brine-to-air heat pumps," 1998.
<i>ISO/IEC 17011</i>	is the International Organization for Standardization and the International Electrotechnical Commission document entitled "Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies." (EN ISO/IEC 17011:2004)
<i>ISO/IEC 17020</i>	is the International Organization for Standardization and the International Electrotechnical Commission document entitled "General criteria for the operation of various types of bodies performing inspection." (EN ISO/IEC 17020:2004)
<i>ISO/IEC 17025</i>	is the International Organization for Standardization and the International Electrotechnical Commission document entitled "General requirements for the competence of testing and calibration laboratories." (EN ISO/IEC 17025:2005)
<i>ISOLATION DEVICE</i>	is a device that prevents the conditioning of a zone or group of zones in a building while other zones of the building are being conditioned.
<i>KITCHEN</i>	See <i>Residential Space Type</i> .
<i>KITCHEN/FOOD PREPARATION</i>	See <i>Nonresidential Functional Area or Type of Use</i>
<i>KNEE WALL</i>	is a sidewall separating conditioned space from attic space under a pitched roof. Knee walls should be insulated as an exterior wall as specified by the chosen method of compliance.
<i>LANDSCAPE LIGHTING</i>	See <i>Outdoor Lighting</i> .
<i>LANTERN</i>	See <i>Outdoor Lighting</i> .
<i>LAUNDRY</i>	See <i>Nonresidential Functional Area or Type of Use</i> .
<i>LEFT SIDE</i>	is the left side of the building as one faces the front facade from the outside. This designation is used on the Certificate of Compliance and other compliance documentation .
<i>LIBRARY</i>	See <i>Nonresidential Functional Area or Type of Use</i> .
<i>LIGHT EMITTING DIODE (LED),</i>	is a <i>pn</i> junction semiconductor device that emits incoherent

Term	Definition
	<p>optical radiation when biased in the forward direction. The acronym “LED” typically refers to an LED component, LED device, or LED package.</p> <p><b>Hybrid LED Luminaire</b> is a complete lighting unit consisting of a light source and driver together with parts to distribute light, to position and protect the light source, and to connect the light source to a branch circuit. The light sources in the Hybrid LED Luminaire contain both LED Source Systems, or LED Lamps, as well as other type of light sources such as incandescent or fluorescent lamps. The Hybrid LED Luminaire is intended to be connected directly to a branch circuit.</p> <p><b>LED Array</b> is an assembly of LED components, LED devices or LED packages on a printed circuit board or substrate, possibly with optical elements and additional thermal, mechanical, and electrical (LED Control Circuitry) interfaces that are connected to the load side of LED Driver (Power Source). LED Array does not contain an LED Driver (Power Source) and is not connected directly to the branch circuit.</p> <p><b>LED Component</b> (or LED Device, or LED Package) is a semiconductor die that contains wire bond connections, possibly with an optical element, or a thermal, mechanical, or electrical interface. LED Component, LED Device, or LED Package does not contain an LED Driver (Power Source) and is not connected directly to the branch circuit.</p> <p><b>LED Control Circuitry</b> is electronic components located between the Power Source (LED Driver) and the LED Component, or LED Device, or LED Package designed to limit voltage and current, to dim, to switch or otherwise control the electrical energy to the LED. The circuitry does not include a Power Source.</p> <p><b>LED Driver</b> is a power source with integral LED control circuitry designed to meet the specific requirements of an LED lamp, an LED array, or an LED Module. Typically LED Driver (Power Source) contains the LED Control Circuitry.</p> <p><b>LED Lamp</b> is an LED Component, LED Device, or LED Package and other optical, thermal, mechanical and electrical (LED Control Circuitry) components with an integrated LED Driver (Power Source) and a standardized base that is designed to connect to the branch circuit via a standardized base, lamp-holder, or socket.</p> <p>In North America, “a standardized base” refers to an ANSI standard base. In the U.S. “branch circuit” is used to describe the “mains voltage” in IEC documents.</p> <p>Note: Non-integrated type of LED Lamp should not be defined, it is a LED Module.</p> <p><b>LED Light Engine with Integral Heat Sink</b> (or LED Light Source System) is a subsystem of an LED Luminaire that includes one or more LED Components, LED Devices or LED</p>

Term	Definition
	<p>Packages, an LED Array, or LED Module; an LED Driver (Power Source); electrical and mechanical interfaces; and an integral heat sink to provide thermal dissipation. An LED Source System may be designed to accept additional components that provide aesthetic, optical, and environmental control (other than thermal dissipation). An LED Source System with standardized base is an LED Lamp.</p> <p><b>LED Luminaire</b> is a complete LED lighting unit consisting of a light source and driver together with parts to distribute light, to position and protect the light source, and to connect the light source to a branch circuit. The light source itself may be an LED Components, LED Packages or LED Devices, LED Array, an LED Module, an LED Source System, or an LED Lamp. The LED Luminaire is intended to be connected directly to a branch circuit.</p> <p><b>LED Module</b> is a component part of an LED Source System that includes one or more LED Components, LED Devices or LED Packages, possibly with optical elements and additional thermal, mechanical, and electrical (LED Control Circuitry) interfaces that are connected to the load side of LED Drive (Power Source). The LED Module does not contain a power source. An LED Array is equivalent to an LED Module.</p>
<i>LIGHTING ZONE</i>	See <i>Outdoor Lighting</i> .
<i>LIQUID LINE</i>	is the refrigerant line that leads from the condenser to the evaporator in a split system air conditioner or heat pump. The refrigerant in this line is in a liquid state and is at an elevated temperature. This line should not be insulated.
<i>LISTED</i>	is equipment, materials, or services included in a list published by an organization that is recognized to have the authority to evaluate and test the equipment, material or services. The organization performs periodic inspection and evaluation to ensure that the listed equipments, material, or services meet identified standards or has been tested and found suitable for a specified purpose. The recognized organizations include but are not limited to the Underwriters Laboratories (UL).
<i>LOCKER/DRESSING ROOM</i>	See <i>Nonresidential Functional Area or Type of Use</i> .
<i>LOUNGE/RECREATION</i>	See <i>Nonresidential Functional Area or Type of Use</i> .
<i>LOW BAY</i>	See <i>Nonresidential Functional Area or Type of Use, General commercial and industrial work</i>
<i>LOW-E COATING</i>	is a low emissivity metallic coating applied to glazing in fenestration products. See <i>Soft Coat and Hard Coat</i> .
<i>LOW-RISE ENCLOSED SPACE</i>	is an enclosed space located in a building with 3 or fewer stories.

## **Joint Appendix JA8 – 2008**

# **Appendix JA8 – Testing of Light Emitting Diode Light Sources**

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### **JA8.1 Scope**

The testing methods in this appendix shall be used to determine wattage, luminous flux, and efficacy for all light emitting diode (LED) luminaires, and LED light Engines with Integral Heat Sink. Each device tested shall produce the same quantity and quality of light. LED Luminaires or LED Light Engines with Integral Heat Sink producing different Correlated Color Temperature (CCT), Color Rendering Index (CRI), total flux (per linear foot for linear systems) or other quantitative and qualitative differences in light shall be separately tested.

The power (wattage) of luminaires and integral trims containing only LED light sources shall be determined in accordance with JA 8. 2. For luminaires containing LED light sources in addition to one or more other lighting technologies (i.e., Hybrid LED Luminaires), the power of the LED Light Engines with Integral Heat Sink shall be determined in accordance with JA 8. 2, and the power of non-LED lighting components shall be determined in accordance with Title 24, Part 6, § 130(d)(1, 2, 3, 4, or 6) as appropriate.

The light output (luminous flux) of the luminaires and integral trims containing only LED light sources shall be determined in accordance with JA 8.3. For luminaires containing LED light source in addition to one or more other lighting technologies (i.e., Hybrid LED Luminaires), the light output of the LED Light Engine with Integral Heat Sink shall be determined in accordance with JA 8.3.

The efficacy of luminaires and integral trims containing only LED light sources shall be determined in accordance with JA 8. 4. For luminaires containing LED Light Engines with Integral Heat Sink in addition to one or more other lighting technologies, the efficacy of the LED Light Engines with Integral Heat Sink shall be determined in accordance with JA 8. 4, and the efficacy of non-LED lighting components shall be determined in accordance with Title 24, Part 6, § 150(k)(1 and 2).

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### **JA8.2 Determining the Wattage of Light Emitting Diode (LED) Luminaires or LED Light Engine with Integral Heat Sink**

The wattage of LED Luminaire or LED Light Engines with Integral Heat Sink shall be measured as follows, or by a method approved by the Executive Director:

- a. The wattage shall be the maximum rated input wattage of the device under test, including power used by fans, transformers and power supply devices, and
- b. The wattage shall be listed on a permanent, pre-printed, factory-installed label on the luminaire housing, or on the integral LED trim when applicable, and
- c. The device under test shall be tested in a Underwriters Laboratory (UL) 1598 testing apparatus in a testing laboratory accredited to ISO/IEC 17025 by the National Voluntary Laboratory Accreditation Program (NVLAP) or other laboratory accreditation body operating in accordance with ISO/IEC 17011 and produced under an ongoing inspection program carried out by a Type A inspection body in accordance with ISO/IEC 17020, accredited to ISO/IEC 17020 by an accreditation body operating in accordance with ISO/IEC 17011; and
- d. The device under test shall be tested according to all of the following conditions:
  1. The ambient temperature in which measurements are being taken shall be maintained at 25°C ± 1°C.

2. The AC power supply shall have a frequency of 60 Hz, and a sinusoidal voltage wave shape.
3. The voltage of an AC or DC power supply shall be regulated to within  $\pm 0.2$  percent.
4. The device under test shall be burned-in for 100 hours before testing.
5. The device under test shall be operated and stabilized before testing at ambient temperature and burning position as specified until the LED product reaches thermal equilibrium. Stability is reached when the variation of light output remains within 1 percent for a period of 10 minutes at constant ambient temperature and constant electrical input.
6. The device under test shall be measured at the burning position in which it will be installed in the luminaire.
7. The device under test shall be operated at the rated voltage (AC or DC) according to the specification of the LED luminaires or LED Light Engines with Integral Heat Sink for its normal use.
8. Testing using pulsed operation of the LED luminaires or LED light engines with integral heat sink shall not be acceptable

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**JA8.3 Luminous Flux Measurement of LED Luminaires or LED Light Engine with Integral Heat Sink**

The Luminous flux of the LED luminaire or LED Light Engines with Integral Heat Sink shall be measured as follows, or by a method approved by the Executive Director:

- a. Luminous flux shall be measured after the device under test has stabilized in accordance with JA 8.;
- b. The total luminous flux of the device under test shall be measured with an integrating sphere photometer or a goniophotometer by a lab accredited by Underwriters Laboratory (UL) under their Data Acceptance Program (DAP); and
- c. The total luminous flux of the device under test shall be permanently pre-printed on the LED circuit board, on a permanent pre-printed factory installed label on an integral LED trim or luminaire housing, or published in manufacturer's catalogs based on independent testing lab reports.

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**JA8.4 Efficacy Calculation of LED Luminaires or LED Light Engine with Integral Heat Sink**

The efficacy of LED Luminaire or LED Light Engine with Integral Heat Sink shall be determined as follows, or by a method approved by the Executive Director:

- a. The efficacy of the device under test shall be the quotient of measured total luminous flux (lumens) of the device under test when tested in accordance with JA 8.3 and the measured electrical input power (watts) of device under test when tested in accordance with JA8.2; and
- b. The efficacy of the installed luminaire can be assumed to be equal to the device under test.