

Project Name: Lighting Sample renovation project (ASHRAE 90.1 – 2010)		
Project Address: 565 Sample St		Date:
Designer of Record:	Email:	Telephone:
Contact Person:	Email:	Telephone:
City:	Exterior Lighting Zone:	

Mandatory Provisions Checklist

- Lighting Control (9.4.1)
 - Automatic lighting shutoff controls are provided based on either a scheduling device or an occupant sensor (9.4.1.1)
 - Each enclosed space has its own control including bilevel or occupancy based where required (9.4.1.2)
 - Controls for parking garages, including bilevel, transition and perimeter control as required (9.4.1.3)
 - Automatic daylighting controls for primary sidelighted areas (9.4.1.4)
 - Automatic daylighting controls for toplighting (9.4.1.5)
 - Additional controls for display/accent, case, guest room, task, nonvisual and demonstration lighting applications (9.4.1.6)
 - Exterior lighting controls including automatic shutoff and bilevel as required (9.4.1.7)
- Exit signs do not exceed 5 W per face (9.4.2)
- Exterior lighting power (9.4.3) — See worksheet
- Functional testing completed on specified controls (9.4.4)

Please check all items that apply to your installation. For new construction and first TI's, all of the above items are mandatory if they apply to your installation. For lighting alterations projects, automatic lighting shutoff is the only required lighting control provision. (Note: 9.4.2, 9.4.3 and/or 9.4.4 may still apply to your project).

The party responsible for the functional testing described in 9.4.4 shall not be directly involved in either the design or construction of the project being tested. Functional testing is only required for installations with an installed Lighting Power (LP) in excess of 3,500W.

Interior Lighting Power Allowance (Building Area Method – 9.5)

Building ID	Building Type (9.5.1)	Lighting Power Density, W/ft ² (W/m ²)	Building Area, ft ² (m ²)	Lighting Power Allowance (W)
1	Retail	1.4	4,738	6,633
Total				6,633

The Building Area Method (above) provides a simple and fast way to calculate allowable lighting power. The building occupancy type is selected from Table 9.5.1, and the corresponding LPD is multiplied by the area under construction.

Interior Lighting Power Allowance (Space-by-Space Method – 9.6)

Space ID	Building Type/Space Type (9.6.1)	Lighting Power Density, W/ft ² (W/m ²)	Room Cavity Ratio	Space Area, ft ² (m ²)	Lighting Power Allowance (W)
1	Sales Area	1.68		3,854	6,474.7
2	Offices (enclosed)	1.11		300	333
3	Conference Room	1.23		200	246
4	Electrical Room	0.95		150	142.5
5	Storage room	0.63		189	189
6	Restroom	0.98		45	44.1
				Subtotal	7,429.3
				Controls Allowance (9.6.2c)	35
				Total	7470.6

The Space by Space Method (above) is shown for the same sample space as used in the Building Area Method above. Using the Lighting Power Density values from table 9.6.1, an alternative overall lighting power allowance is calculated.

Note that both methods can be calculated and that only one need comply to be accepted. In this sample the Space by Space Method allows more lighting power than the Building Area Method meaning the installation is allowed up to 7,470.6W of lighting based on the distribution rules of the Space by Space Method.

Project Name: Sample		
Contact Person:	Email:	Telephone:

Interior Connected Lighting Power

ID	type of ballast, type of fixture) Luminaire Description (including number of lamps per fixture, watts per lamp,	Type					Luminaires Number of	Luminaire Watts/	Watts Total
		Incandescent	Fluorescent	HID	Line-Voltage Track	Low-Voltage Track			
A	8ft Fluorescent Strip 2T8 (tandem)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7	64	448
B	4ft Fluorescent Strip 1T8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	32	96
C	1x4 Fluorescent Luminaire 2T8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	64	64
D	90' Track CMH Lights (64 x 39W = 2,496W)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	90'	30W/ft	2,700
E	50' Track, LED heads, 3A current limiter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	120V x 3A = 360W	360
F	15' Track LED Lights (15' x 30W/ft = 450W)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	16	32	512
G	20' Low Voltage Track Lights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Transformer	100	100
H	4" Recessed Downlights, 9W LED lamp, 50W max fixture wattage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	25	50	1,250
Total									5,530

The next step is to calculate the total Interior (Base) Connected Lighting Power for comparison with both the Building Area Method and Space by Space Method allowances. Base lighting compliance is demonstrated when the total interior connected lighting power is less than or equal to the total interior lighting power allowance of one of the methods.

The lighting power for all fixtures must be calculated using the nameplate input wattage of the fixture (not lamps). The only exceptions are when circuit limiters or breakers dominate the maximum available power, or when track lighting is dominated by the track length calculation method (see below).

Base Lighting - Track Lighting Power Calculation Methods:

The lighting power of line voltage track lighting shall be a minimum wattage of 30W per linear foot (as shown in item D), or the sum of the nameplate wattages of the fixtures in the system (as shown in item F) whichever is greater. Alternatively, the wattage limit of the system's circuit breaker or other permanent current-limiting device may be used (as calculated in E above).

The 90' track (fixture D) has a total connected nameplate wattage of 2,496W, but the 30W per linear foot value gives a lighting power of 2,700W, and so this greater value must be used.

The 50' track (fixture E) has a 3A limiter (360W) regardless of the number of lights installed.

The 15' track example (fixture F) uses the connected lighting power of the track (512W) because it exceeds the power calculated using the wattage per linear foot of track.

Installation G shows the wattage of low voltage track lighting shall be based on the transformer supplying the system.

It is important to note that for all fixture types, wattage is based on the maximum fixture wattage listed on the nameplate, not on the wattage of the lamps installed (see fixture H).

Result for Base Lighting:

This sample shows the proposed installation of Base lighting complies with both the Building Area Method and Space by Space Method.

Additional Interior Lighting Power Allowance—Control Credits

Space ID	Space Name	Control Type (Table 9.6.2)	Control Factor (Table 9.6.2)	Installed Watts (W)	Additional Allowance (W)
3	Conference Room	Manual Dimmer	0.10	200 W	20 W
2	Private Offices x 10	Multi level Occupancy	0.05	300 W	15 W
Total					35 W

The Controls Credits table (above) only applies to installations using the Space by Space method. Refer to 9.6.2 (c) within ASHRAE 90.1 – 2010 for instructions on how to apply the control credits.

Additional Interior Lighting Power Allowance – Decorative and Display

ID Space	Space Name	Type		ft ² (m ²) Area,	(W/m ²) Unit Allowance, W/ft ²	(W) Allowance	ID's Lumin- aire	(W) Installed Power
		Decorative	Display Lighting					
1	Sales Area (lobby art display)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2,354	1	2,354	H	1500 W
1	Sales Area (merchandise display)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1,500	1.4	2,100	I	360 W
	Standard Additional Allowance	<input type="checkbox"/>	<input checked="" type="checkbox"/>			1,000		0 W
		<input type="checkbox"/>	<input type="checkbox"/>					
		<input type="checkbox"/>	<input type="checkbox"/>					
		<input type="checkbox"/>	<input type="checkbox"/>					
		<input type="checkbox"/>	<input type="checkbox"/>					
		<input type="checkbox"/>	<input type="checkbox"/>					

The Decorative and Display table (above) only applies to installations using the Space by Space method and incorporating Decorative or Display lighting systems. This table is to be used to demonstrate the total allowable and total installed Decorative and Display lighting power. Refer to 9.6.2 within ASHRAE 90.1 – 2010 for information about calculating the allowable Decorative and/or Display lighting power for the applicable space(s).

Project Name: Sample		
Contact Person:	Email:	Telephone:

Additional Interior Connected Lighting Power

Space	Luminaire ID	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Type					Luminaires Number of	Luminaire Watts/ Total	Watts Total
			Incandescent	Fluorescent	HID	Line-Voltage Track	Low-Voltage Track			
1	H	Recessed Lighting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30	50 W	1500 W
1	I	12" Track (6 x 39W = 236W)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	12 ft track	30 W/ft	360 W
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

This Connected Lighting Power table (above) only applies to installations using the Space by Space method and incorporating Decorative or Display lighting systems. This table is used to demonstrate the luminaire types used for the Decorative and Display lighting systems, as well as their distribution by Space ID.

Calculation of exterior lighting power allowance is to comply with the ASHRAE 90.1 2010 standard.

Exterior Building Lighting Power Allowance (Tradable Lighting Applications)

Application	Allowance	Area or Length, ft ² or ft (m ² or m)	Tradable Power Allowance
Outdoor Parking area	0.10 W/ft ²	10,000 ft ²	1,000W
Walkway less than 10' wide	0.8 W/ linear foot	60 ft	48 W
Tradable Power Allowance			1,048W

Exterior Building Lighting Power Allowance (Non-Tradable Lighting Applications)

ID	Application	Allowance per Unit	Area or Length or Quantity	Non-Tradable Power Allowance
1	Building Façade	0.15W/ft ²	5,000 ft ²	750 W
2	Single ATM area	270W	1	270 W
Non-Tradable Power Allowance				1,020 W

Exterior Connected Lighting Power (Tradable Applications)

ID	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Number of Luminaires	Watts/Luminaire	Total Watts
J	2 Lamp Parking area flood light	5	175W	875 W
K	Single T8 fluorescent walkway light	4	28 W	112 W
Total				987 W

Exterior Connected Lighting Power (Non-Tradable Applications)

ID	Non-Tradable Application	Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture)	Number of Luminaires	Watts/Luminaire	Total Watts
1	ATM area	2 lamp 28W T8 electronic ballast	2	60	120W
2	Building Façade	LED tape 3 W/ m, magnetic driver	100 meters	3 W/m	300W
Total					420 W

Exterior Lighting Compliance Test

	Tradable Power Allowance (Watts)		Base site allowance	Tradable Connected Lighting Power (Watts)
	1048 W	+	750W	987 W
Non-Tradable Application	Non-Tradable Power Allowance (Watts)			Non-Tradable Connected Lighting Power (Watts)
ATM	270W	+	750W	120 W
Façade	750W	+	750W	300 W
		+		
			Allocated base site allowance	Unallocated base site allowance
			0W	750W

ANSI/ASHRAE/IES Standard 90.1-2010