Energy Savings Modeling and Inspection Guidelines for Commercial Building Federal Tax Deductions for Buildings in 2016 and Later

Michael Deru and Kristin Field-Macumber
National Renewable Energy Laboratory

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Executive Summary

The Internal Revenue Code § 179D provides for a federal tax deduction of $1.80 per square foot for installation of energy-efficient technologies in new or existing buildings. The tax deduction is available to building owners for installation of (1) interior lighting; (2) building envelope, or (3) heating, cooling, ventilating, or hot water systems that reduce the building's total energy and power costs equal to the levels presented in Table ES-1 in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1-2007. The energy and power cost savings must be calculated following the guidance provided in this document using qualified software as determined by the U.S Department of Energy.

This document provides updated guidance for modeling and inspecting energy-efficient property in commercial buildings as enacted by the Protecting Americans from Tax Hikes (PATH) Act of 2015. This document applies to buildings placed in service on or after January 1, 2016.

Table ES-1. Summary of Savings Requirements and Tax Deductions

	Fully Qualifying Property	Partially Qualifying Property			
		Envelope	HVAC and SHW	Lighting	Interim Lighting Rule
Savings Requirements[a]	50% energy and power cost savings	10% energy and power cost savings	15% energy and power cost savings	25% energy and power cost savings	25%–40% lower LPD (50% for warehouses)
Tax Deduction	Cost of qualifying property up to $1.80/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2 times applicable percentage[b]

[a] Savings refer to the reduction in the energy and power costs of the combined energy for only the interior lighting, HVAC, and SHW systems as compared to those of a reference building that meets the minimum requirements of Standard 90.1-2007.

[b] The tax deduction varies linearly from $0.30/ft^2 to $0.60/ft^2 with the reduction in LPD from 25% to 40%. See IRS Notice 2006-52 (IRS 2006) for the definition of "applicable percentage."

Table of Contents

List of Tables

1 Introduction

This document provides guidance for modeling and inspecting energy-efficient property in commercial buildings for determining the energy and power cost savings related to § 179D of the Internal Revenue Code (IRC). The tax deduction was enacted in § 1331 of the 2005 Energy Policy Act (EPAct) of 2005, noted in Internal Revenue Service (IRS) Notices 2006-52 (IRS 2006), 2008-40 (IRS 2008) and 2012-26 (IRS 2012), and updated by the Protecting Americans from Tax Hikes (PATH) Act of 2015. Specifically, § 179D provides federal tax deductions for energy-efficient property related to a commercial building's envelope; interior lighting; heating, ventilating, and air conditioning (HVAC); and service hot water (SHW) systems. This document applies to buildings placed in service on or after January 1, 2016. See the Energy Savings Modeling and Inspection Guidelines for Commercial Building Federal Tax Deductions, Second Edition (Deru 2007) for modeling the energy and power cost savings of buildings placed in service before January 1, 2016.

The qualification levels and tax deductions under § 179D are summarized in Table 1. A fully qualifying property saves at least 50% in energy and power costs for improvements in the envelope, lighting, HVAC, and SHW systems compared to a reference building that meets the minimum requirements of ANSI/ASHRAE/IESNA[1] Standard 90.1-2007. The PATH Act of 2015 expresses Standard 90.1-2007 as "Standard 90.1-2007 of ASHRAE and IESNA (as in effect on the day before the date of the adoption of Standard 90.1–2010 of such Societies)." This definition includes 90.1-2007 and the Addenda Supplement Package (Addenda a, b, c, g, h, i, j, k, l, m, n, p, q, s, t, u, w, y, ad, and aw) and Addendum r, plus all published errata. A partially qualifying property saves at least the percentages shown in Table 1 for energy and power costs through efficiency improvements in any one of envelope, lighting, or HVAC and SHW. The energy and power cost savings are determined for the energy use in only the interior lighting, HVAC, and SHW systems (e.g., not for miscellaneous or process equipment savings). An alternative option for partially qualifying buildings is the interim lighting rule, which allows the tax deduction to be based on reductions in the interior lighting power density (LPD).

Additions to existing buildings or alterations to existing buildings can qualify for tax deductions in the new or retrofitted areas of the building only. The savings requirements are relative to a reference building that meets the minimum requirements of Standard 90.1-2007, and they are not relative to the performance of the existing building.

The taxpayer must obtain certification of the savings from the energy-efficient property to qualify for the federal tax deductions. The certification requirements are defined in Section 4 of IRS Notice 2006-52 (IRS 2006). The certification process includes calculation of the energy and power cost savings and inspection of the energy-efficient property by a qualified individual, as defined in Notice 2006-52 (IRS 2006). Use the Performance Rating Method from Appendix G of Standard 90.1-2007 with the additional guidance presented in Section 3 of this document to compute the energy and power cost savings. Section 4 of this document provides guidance for the inspection of the energy-efficient property.

[1] ANSI= American National Standards Institute, IESNA = Illuminating Engineering Society of North America

Table 2. Summary of Savings Requirements and Tax Deductions

	Fully Qualifying Property	Partially Qualifying Property			
		Envelope	HVAC and SHW	Lighting	Interim Lighting Rule
Savings Requirements[a]	50% energy and power cost savings	10% energy and power cost savings	15% energy and power cost savings	25% energy and power cost savings	25%–40% lower LPD (50% for warehouses)
Tax Deduction	Cost of qualifying property up to $1.80/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2	Cost of qualifying property up to $0.60/ft^2 times applicable percentage[b]

[a] Savings refer to the reduction in the energy and power costs of the combined energy for only the interior lighting, HVAC, and SHW systems as compared to those of a reference building that meets the minimum requirements of Standard 90.1-2007.

[b] The tax deduction varies linearly from $0.30/ft^2 to $0.60/ft^2 with the reduction in LPD from 25% to 40%. See IRS Notice 2006-52 (IRS 2006) for the definition of "applicable percentage."

2 Guidelines for the Interim Lighting Rule

This section provides guidance for the tax deduction under the interim lighting rule in § 179D of the IRC. The interim rule states that the LPD must be reduced at least 25% (50% for warehouses) from the values in Standard 90.1-2007, Tables 9.5.1 or 9.6.1. The building-area method or the space-by-space method can be used to determine the LPD reduction in accordance with Standard 90.1-2007 Sections 9.5 or 9.6. The bi-level switching requirement from EPAct 2005 applies to both new and existing building projects.[2]

To qualify for the tax deduction using the interim lighting rule, document the reduction in LPD for each building area and/or space and conduct a physical inspection of the taxpayer's building. The documentation may be completed on any form, spreadsheet, or other software that shows the Standard 90.1-2007 requirements and the reduced LPDs. The mandatory control and minimum illuminance requirements must be documented upon physical inspecting the taxpayer's building following these steps:

1. Document that the taxpayer's building meets or exceeds the mandatory provisions of the Standard 90.1-2007 using the Standard 90.1-2007 Lighting Compliance form or an equivalent form. The Standard 90.1-2007 compliance forms can be downloaded from ASHRAE Standards Forms website (ASHRAE 2016).
2. Document the installed LPD on the Standard 90.1-2007 Lighting Compliance form or equivalent form and ensure the documented LPD is equal to or lower than the allowable LPD per Standard 90.1-2007.
3. Document the IESNA minimum illuminance levels for horizontal surfaces (25–65 years old) from the Illuminating Engineering Society of North America (IESNA) Lighting Handbook Tenth Edition (IESNA 2011) and measured illuminance levels either (1) in Table A-1 (Appendix A), which is reproduced in Appendix A of this document or (2) on an equivalent form. Record the average of measurements taken on the working surfaces or at the locations listed in the IESNA handbook (IESNA 2011). The measured average values must equal or exceed the IESNA-recommended minimum illuminance levels. In addition, no more than 2.5% of the measurements may be below one-third of the IESNA-recommended minimum illuminance levels; this latter requirement assumes a normal distribution of data points, with two standard deviations from the measurements equal to one-third of the recommended illuminance level. Measurements need be completed only once for each unique space and lighting arrangement.
4. Verify that the bi-level switching requirement under the interim rule for lighting systems is met and documented in Table A-4 (Appendix A) or on an equivalent form.

[2] Bi-level switching is defined as some combination of manual control, automatic control, or combination of the two that provides two levels of lighting power (not including off) in a space. Occupancy sensors that turn all the lights off in a space do not qualify as bi-level switching. Occupancy sensors that dim or turn off only some lights in a space do satisfy the bi-level switching requirement.

3 Energy Modeling Guidelines

For tax deductions not using the interim lighting rule, the energy and power cost savings of the taxpayer's building are determined from annual hourly energy simulations of a proposed building model and a reference building model. Table 2 provides descriptions of the building models. The energy modeling must be completed in accordance with the Performance Rating Method presented in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 with the exception noted in this section.

For additions or alterations to existing buildings, model just the portions of the building affected by the changes with appropriate modeling methods to account for connections to the unaltered portions of the building. The envelope, interior lighting, HVAC, and SHW in the reference building model shall meet the minimum requirements of Standard 90.1-2007.

Table 3. Building and Model Descriptions

Building/ Model	Description
Taxpayer's building	Physical building used for the tax deduction
Reference building model	Computer simulation model that matches the taxpayer's building except that the interior lighting systems, HVAC, SHW, and building envelope comply with the minimum requirements of Standard 90.1-2007
Proposed building model	Computer simulation model that is identical to the reference building model except for the systems that are qualifying for the tax deduction[a]

[a] The systems qualifying for the tax deduction shall match the systems in the taxpayer's building. This model might not represent the taxpayer's building exactly because the systems not qualifying for the tax deduction will be compliant with the minimum requirements in Standard 90.1-2007.

3.1 Calculation of the Energy and Power Cost Savings

The energy and peak demand for the interior lighting, HVAC, and SHW systems, as calculated from the hourly annual energy simulations, are used to determine the energy and power cost savings. Receptacle, process, and other loads are included in the energy simulations, but the energy and power costs associated with these loads are not included in the savings calculation. Determining the power cost savings requires knowing the power consumption for the whole building and for the interior lighting, HVAC, and SHW systems at the time of the building peak demand for each month. Power costs are defined as the monthly peak demand charges and associated taxes and fees.

To calculate the annual energy and power costs:

- Use the same utility rate structure for the proposed building and the reference building models.
- Use the utility rate structure that applies to the taxpayer's building or the state average commercial building utility rates published by the Energy Information Administration (EIA 2016). If energy is provided to the building at no cost or the building does not have its own utility billing, use the utility tariffs that would apply if the building were billed independently.

- Include all utility costs in the calculations. Monthly fixed fees should be divided between the energy and power cost totals, based on the ratio of these costs.
- Do not include on-site renewable energy generation of electricity that is connected to the building electrical system in the energy simulations or in the energy and power cost calculations.
- Solar hot water systems can be included as part of the HVAC or the SHW systems. However, if the solar hot water system was used for a different federal tax deduction, it cannot be used again for a tax deduction under § 179D of the IRC.
- If possible, set up the simulation software to calculate energy and power costs for just the interior lighting, HVAC, and SHW systems for all energy types (e.g., electricity and gas) to determine savings.
- If the simulation software cannot calculate energy and power costs separately from the whole building, record the monthly energy and peak demand totals by end use and calculate the energy and power costs for each month. Be sure to include all energy and demand charges that occur due to seasonal rates, ratcheting, block charges, time-of-use rates, or other pricing structures.

3.2 Software Requirements

The same software and version number must be used to model the reference building and the proposed building, and the software must be included (at the time the certification is given) on the list of qualified software published by the U.S. Department of Energy (DOE n.d.). Use the qualified versions of software for buildings placed in service on or after January 1, 2016.

3.3 Weather Data

The energy simulations of the reference building and the proposed building models must use the same annual hourly weather file and the same design day weather conditions. The annual weather file must represent a typical meteorological year (TMY) for the taxpayer's building location. The weather file should be selected from the climate zone that most closely represents the typical weather conditions at the location of the taxpayer's building; this may or may not be the weather file for the location closest to the taxpayer's building. Many simulation programs provide specially formatted versions of the TMY2, TMY3, or other similar weather files for use with their programs. The TMY and California climate zone (CTZ2) weather files are available from the EnergyPlus website (EnergyPlus n.d.).

The design day weather data used for sizing equipment shall represent the 99.6% annual cumulative frequency dry-bulb temperature for heating conditions and the 1% annual cumulative frequency dry-bulb and wet-bulb temperatures for cooling conditions. Design day weather data is available in ANSI/ASHRAE Standard 169-2013 (ASHARE 2013a) and ASHRAE Handbook of Fundamentals 2013 (ASHRAE 2013b).

3.4 Building Model Parameters

As defined in Table 2, the reference building model represents the taxpayer's building except that the envelope, interior lighting, HVAC, and SHW must comply with the minimum

requirements of Standard 90.1-2007. And, the proposed building model is identical to the reference building model, except that the building systems used for the tax deduction must match the taxpayer's building. Table 3 shows the main energy modeling parameters of the two models.

Table 4. Summary of Building Modeling Parameters for a Fully Qualifying Building

Parameter	Reference Building Model	Proposed Building Model
Location	Same as taxpayer's building	Same as reference building model
Utility rate structure	Same as taxpayer's building (see Section 3.1 of this document)	Same as reference building model
Annual weather data	Typical year weather file (see Section 3.3 of this document)	Same as reference building model
Design day weather data	See Section 3.3 of this document.	Same as reference building model
Form (area, shape, floors)	Same as taxpayer's building	Same as reference building model
Envelope	90.1-2007 minimum requirements	Same as taxpayer's building[a]
Interior lighting	90.1-2007 minimum requirements	Same as taxpayer's building[a]
HVAC systems	90.1-2007 minimum requirements	Same as taxpayer's building[a]
SHW systems	90.1-2007 minimum requirements	Same as taxpayer's building[a]
Ventilation requirements	Standard 62.1-2004	Same as taxpayer's building[a]
Receptacle loads	Taxpayer's building or the California Nonresidential ACM[b] Approval Manual Tables N2-2 and N2-3	Same as reference building model
Process loads	Taxpayer's building or the California Nonresidential ACM Approval Manual § 2.4.1.5	Same as reference building model
Exterior lighting	Exclude from the simulations	Exclude from the simulations
Schedules	Taxpayer's building or the California Nonresidential ACM Approval Manual Tables N2-2 and N2-3	Same as reference building model
Infiltration	California Nonresidential ACM Approval Manual § 2.4.1.6 (See Appendix B)	Same as taxpayer's building[a]

[a] For a partially qualifying property, the nonqualifying systems in the proposed building model must match the corresponding systems in the reference building model.

[b] ACM = alternative calculation method

3.5 Internal Loads and Schedules

The internal loads and operating schedules used in the energy simulations shall be the same for the reference building and the proposed building models. Use the internal loads and schedules from the taxpayer's building if they are known or from the California Nonresidential ACM Approval Manual listed in Table 4 and included in Appendix C of this document. The schedules include schedules for occupancy, heating, cooling, fans, lights, equipment, infiltration, and hot water. Document the schedules used in the simulations.

Table 5. Internal Loads and Schedules (Included as Appendix C)

Load/Schedule	Source
Occupancy rates	California Nonresidential ACM Approval Manual Tables N2-2 and N2-3
Occupant loads	California Nonresidential ACM Approval Manual Tables N2-2 and N2-3
Hot water loads	California Nonresidential ACM Approval Manual Tables N2-2 and N2-3
Receptacle loads	California Nonresidential ACM Approval Manual Tables N2-2 and N2-3
Process loads	California Nonresidential ACM Approval Manual Section 2.4.1.5
Occupancy schedules	California Nonresidential ACM Approval Manual Tables N2-4 to N2-9

3.6 Use of Standard 90.1-2007 Appendix G

The Performance Rating Method in Appendix G of Standard 90.1-2007 provides an approach for rating the performance of building designs that exceed the requirements of the standard. IRS Notice 2006-52 (IRS 2006) states that this method shall be used to estimate the energy and power cost savings of the taxpayer's building. However, differences do exist between the Performance Rating Method as stated in Standard 90.1-2007 Appendix G and the requirements for the tax deduction. Table 5 lists these differences.

Table 6. Differences between the Performance Rating Method from Appendix G of Standard 90.1-2007 and the Requirements for the 179D Tax Deduction

Section of Appendix G	Requirement for Tax Deduction
G1.2 Performance Rating	The reference building model shall meet the mandatory provisions of § 5.4, 6.4, 7.4, and 9.4 in Standard 90.1-2007. The proposed building model shall meet the same mandatory provisions, except for the systems applying for the tax deductions, which shall match the taxpayer's building.
G1.2 Performance Rating	Energy performance savings include only the energy and power costs from the interior lighting, HVAC, and SHW systems (see Section 3.1 of this document).
G1.4 Documentation Requirements	The documentation requirements for the tax deductions are defined in IRS Notice 2006-52[a] Section 4.
G2.2 Simulation Program	The simulation program must be on DOE's list of qualified software (see Section 3.2 of this document).
G2.3 Climate Data	The design day data are defined in Section 3.3 of this document.
G2.4 Energy Rates	On-site renewable electricity production shall not be included in the reference building or in the proposed building models. Site-recovered energy is allowed in the models.
G2.5 Exceptional Calculation Methods	Exceptional calculation methods are not allowed per IRS Notice 2006-52 6.01(5)(b)(ii).[a]
Table G3.1(4) Schedules	Use California Nonresidential ACM Approval Manual or the taxpayer's building if they are known (see Section 3.6 of this document).
Table G3.1(6) Lighting	For a fully qualifying property or a partially qualifying lighting property, the proposed building model shall match the taxpayer's building with the following changes: (1) For lighting systems that have been designed, the lighting power shall be determined using luminaire power values from the California Nonresidential ACM Approval Manual Appendix NB (CEC 2004 and Appendix D of this document) or manufacturer's data. (2) Credit may be taken for the use of automatic controls for daylight utilization only if their operation is modeled in the energy simulation software.
Table G3.1(10) HVAC Systems	For a fully qualifying property or a partially qualifying HVAC and SHW property, the proposed building model may use the standard rating conditions in § 6.4.1.1 in Standard 90.1-2007.
Table G3.1(12) Receptacle and Other Loads	The receptacle and other loads for both building models shall be identical (see Section 3.5 of this document).
Table G3.1(13) Modeling Limitations to the Simulation Program	The simulation program must contain calculation methodologies for the building components being modeled per IRS Notice 2006-52 6.01(5)(b)(ii)[a]

[a] IRS 2006

3.7 Model Documentation

The reference building and the proposed building models shall be documented to show that:

1. The reference building model meets the minimum requirements of Standard 90.1-2007.
2. The proposed building model matches the reference building model except for the systems qualifying for the tax deduction, which must match the taxpayer's building.

The models can be documented by (1) using reports generated by the modeling software, (2) manually completing the compliance forms from the Standard 90.1-2007 User's Manual, or (3) using equivalent forms. The list of approved software is available from DOE (n.d.). The Standard 90.1-2007 User's Manual compliance forms can be downloaded from ASHRAE Standards Forms website (ASHRAE 2016). Specific guidance for each system is provided in Sections 3.7.1 through 3.7.3.

3.7.1 Building Envelope

Document that the reference building model meets the Standard 90.1-2007 envelope performance requirements. For a partially qualifying lighting or HVAC and SHW property, document that the proposed building model matches the reference building model. For a fully qualifying property or a partially qualifying envelope property, document that the proposed building model matches the taxpayer's building, which must also meet the mandatory requirements according to the requirements of Section 4.2 of Standard 90.1-2007.

3.7.2 Interior Lighting

1. Document that the lighting power for the reference building model meets the allowable lighting power per Standard 90.1-2007.
2. Document that the lighting power for the proposed building model matches the reference building model for partially qualifying envelope or HVAC and SHW properties. Or, document that the lighting power for the proposed building model matches the taxpayer's building for partially qualifying lighting or fully qualifying properties.
3. Document the lighting controls specified for the proposed building model in Table A-2 in Appendix A or with copies of the building plans and specifications. Include a short description of the controls and set points for each lighting system.

3.7.3 HVAC and SHW Systems

1. Document that the HVAC and SHW systems for the reference building model meets the minimum requirements of Standard 90.1-2007.
2. Document that the HVAC and SHW system for the proposed building model matches the reference building model for partially qualifying envelope or lighting properties. Or, document that the HVAC and SHW system for the proposed building model matches the taxpayer's building for partially qualifying HVAC and SHW or fully qualifying properties, which must also meet the mandatory requirements according to the requirements of Section 4.2 of Standard 90.1-2007.

3. Document systems in the proposed building model that are not covered in the Standard 90.1-2007 mandatory provisions. Include fans and pumps with capacity greater than or equal to 5 horsepower (hp), economizer operation, thermal energy storage systems, energy recovery systems, natural ventilation, demand controlled ventilation, desiccant systems, combined heat and power systems, and other energy systems associated with the HVAC and SHW systems. Also include in the documentation the equipment type, manufacturer model (if available), size, operating conditions, efficiencies, and control sequences. This information can be documented by including copies of the appropriate pages from the building plans and specifications.

4 Inspection Guidelines

This section provides guidelines for inspecting the systems in the taxpayer's building. The inspection must be completed by a qualified individual[3] as defined in IRS Notice 2006-52 (IRS 2006) after the building has been placed in service. Only the systems being used for the tax deductions need to be inspected. There are two objectives for the inspection:

- Verify that the taxpayer's building meets the necessary mandatory provisions of Standard 90.1-2007.
- Verify that the specifications of the energy systems installed in the taxpayer's building used for the tax deductions meet or exceed the performance specifications of the energy systems used in the proposed building model.

The qualified individual shall use the Standard 90.1-2007 compliance forms from the Standard 90.1-2007 User's Manual or equivalent forms to document that the necessary mandatory provisions required by Section 4.2 of Standard 90.1-2007 have been met in the taxpayer's building. Make necessary adjustments to the forms allowed by Section 4.2 of Standard 90.1-2007 for additions or alterations to existing buildings. These forms can be downloaded from ASHRAE Standards Forms website (ASHRAE 2016). The results of the inspection shall be compared with the proposed building model documentation to ensure the systems used for tax deductions in the taxpayer's building meet or exceed the proposed building model performance specifications. Specific guidance for each system is provided in Sections 4.1 through 4.3.

4.1 Building Envelope

For partially qualifying envelope or fully qualifying properties, complete the Standard 90.1-2007 building envelope compliance form or equivalent form to ensure the taxpayer's building meets or exceeds the Standard 90.1-2007 mandatory provisions according to the requirements in Section 4.2 in Standard 90.1-2007 and meets or exceeds the performance of the proposed building model.

4.2 Interior Lighting

For partially qualifying lighting or fully qualifying properties:

1. Complete the mandatory provision checklist on the Standard 90.1-2007 lighting compliance form or an equivalent form to ensure the taxpayer's building meets or exceeds the Standard 90.1-2007 mandatory provisions according to the requirements in Section 4.2 in Standard 90.1-2007.
2. Complete all the connected lighting power tables on the Standard 90.1-2007 lighting compliance form or equivalent form and ensure the total lighting power is less than or equal to the lighting power in the proposed building model.
3. Record the IESNA-recommended minimum and the measured illuminance for each space in Table A-1 (Appendix A) or an equivalent table for the taxpayer's building. Record the average of measurements taken on the working surfaces or at the locations listed by the

[3] A qualified individual is defined as a licensed contractor or engineer in the jurisdiction where the building is located.

IESNA handbook (IESNA 2011). The average shall equal or exceed the IESNA-recommended minimum illuminance levels. In addition, no more than 2.5% of the measurements may be below one-third of the IESNA-recommended minimum illuminance levels; the latter requirement assumes a normal distribution of data points, with two standard deviations from the measurements equal to one-third of the recommended illuminance level. Measurements need to be completed only once for each unique space and lighting arrangement.

4. Verify that the lighting controls match the performance of the controls specified in the proposed building energy model in Table A-2 (Appendix A) or equivalent documentation. If the controls in the taxpayer's building are different from those in the proposed building model, the proposed building model should be changed to match the taxpayer's building and resimulated to ensure the correct energy and power cost savings are achieved.

4.3 HVAC and SHW Systems

For partially qualifying HVAC and SHW or fully qualifying properties:

1. Compete the Standard 90.1-2007 compliance form for HVAC and SHW systems or an equivalent form to ensure the taxpayer's building design meets or exceeds the Standard 90.1-2007 mandatory provisions and the proposed building model according to the requirements in Section 4.2 in Standard 90.1-2007.
2. Verify against the documentation completed during the energy modeling of other systems not covered in the Standard 90.1-2007 mandatory provisions. This verification includes fans and pumps greater than or equal to 5 hp, economizer operation, thermal energy storage systems, energy recovery systems, natural ventilation, demand controlled ventilation, desiccant systems, combined heat and power systems, and other energy systems. Include in the inspection the equipment type, manufacturer model (if available), size, operating conditions, efficiencies, and control sequences.
3. Verify that the HVAC and SHW controls match the performance specifications of the controls specified in the proposed building energy model. If the systems in the taxpayer's building are less efficient than they are in the proposed building model, the proposed building model should be changed to match the taxpayer's building and resimulated to ensure the correct energy and power cost savings are achieved.

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Appendix A. Lighting System Compliance Form

Appendix A provides example tables that can be used to document the lighting systems and controls for lighting systems. These tables do not need to be used, but the information contained in these tables must be documented in some form for the lighting portion of the 179D tax deduction.

Project Name:	Date:
Project Address:	
Building Owner (name and address of all taxpayers claiming a tax deduction):	Telephone:
Energy Modeler (*name and address*):	Telephone:
Energy Inspector (*name and address*): Telephone:	

Tables A-1 through A-4 are Tables LF1 through LF4 from Deru (2007).

Table A-1. Illuminance Levels (Table LF1 from Deru 2007)

Building/Space	IESNA 2000 Minimum (lux)	Taxpayer's Building Measured (lux)

Table A-2. Lighting Controls Description in the Proposed Building Energy Model (Table LF2 from Deru 2007)

Building/Space	Proposed Building Model Control System and Set Points

Table A-3. Lighting Controls Description in the Taxpayer's Building (Table LF3 from Deru 2007)

Building/Space	Taxpayer's Building Control System and Set Points

Table A-4. Additional Lighting Systems Mandatory Provisions Checklist for the Interim Lighting Rule (Table LF4 from Deru 2007)

Provision	Taxpayer's Building
Include provision for bi-level switching in all occupancies	
Exception: hotel and motel guest rooms, store rooms, restrooms, and public lobbies	

Appendix B. Infiltration Modeling Rules

Table B-1 lists the modeling rules from the 2005 California Nonresidential ACM Approval Manual for including infiltration in both the reference building model and the proposed building model unless there is an envelope measure that reduces infiltration in the taxpayer's building and the project team is applying for the whole building or envelope tax deduction (CEC 2004).

Table B-1. Insert Table Caption Here

Design Type	Modeling Rules
Proposed Design	Infiltration shall be modeled as either "ON" or "OFF" for each zone, according to the following: "OFF" if fans are ON and zone supply air quantity (including transfer air) is greater than zone exhaust air quantity. "ON" if fans are OFF. When infiltration is "ON," the reference method calculates the infiltration rate as 0.038 cubic feet per minute (CFM) per square foot of gross exterior partition (walls and windows) area for the zone.
Standard Design (All)	ACMs shall model infiltration for the standard design exactly the same as the proposed design.

Appendix C. Internal Loads and Schedules

Tables C-1 through C-8 are Tables N2-2 through Table N2-9 from the 2005 California Nonresidential ACM Approval Manual (CEC 2004).

Table C-1. Occupancy Assumptions When Lighting Plans are Submitted for the Entire Building or When Lighting Compliance Is Not Performed (Table N2-2 from CEC 2004)

Occupancy Type	People per 1,000 ft2 [a]	Sensible Heat per Person[b]	Latent Heat per Person[b]	Receptacle Load (W/ft^2)[c]	Hot Water (Btu/h per Person)	Lighting (W/ft^2)[d]	Ventilation (CFM/ft^2)[e]
Auditoriums[h]	143	245	105	1.0	60	1.5	1.07
Convention Centers[h]	136	245	112	0.96	57	1.3	1.02
Financial Institutions	10	250	250	1.5	120	1.1	0.15
General Commercial and Industrial Work Buildings, High Bay	7	375	625	1.0	120	1.1	0.15
General Commercial and Industrial Work Buildings, Low Bay	7	375	625	1.0	120	1.0	0.15
Grocery Stores[h]	29	252	225	0.91	113	1.5	0.22
Hotels[f]	20	250	200	0.5	60	1.4	0.15
Industrial and Commercial Storage Buildings	5	268	403	0.43	108	0.7	0.15
Medical Buildings and Clinics	10	250	213	1.18	110	1.1	0.15
Office Buildings	10	250	206	1.34	106	1.1	0.15
Religious Facilities[h]	136	245	112	0.96	57	1.6	1.03
Restaurants[h]	45	274	334	0.79	366	1.2	0.38
Retail and Wholesale Stores[g]	29	252	224	0.94	116	1.5	0.22

Occupancy Type	People per 1,000 ft2 [a]	Sensible Heat per Person[b]	Latent Heat per Person[b]	Receptacle Load (W/ft^2)[c]	Hot Water (Btu/h per Person)	Lighting (W/ft^2)[d]	Ventilation (CFM/ft^2)[e]
Schools[h]	40	246	171	1.0	108	1.2	0.32
Theaters[h]	130	268	403	0.54	60	1.3	0.98
All Others	10	250	200	1.0	120	0.6	0.15

[a] Most occupancy values are based on an assumed mix of sub-occupancies within the area. These values were based on one-half the maximum occupant load for exiting purposes in the California Building Code (CBC). Use full values for design conditions. Full year operational schedules reduce these values by up to 50% for compliance simulations and full-year test simulations.

[b] From Table 1, p. 29.4, ASHRAE 2001Handbook of Fundamentals (ASHRAE 2001)

[c] From Lawrence Berkeley Laboratory study; this value is fixed and includes all equipment plugged into receptacle outlets.

[d] From Table 146-B of the California 2005 Building Energy Efficiency Standards for the applicable occupancy; the LPD of the standard building for areas where no lighting plans or specifications are submitted for permit and the occupancy of the building is not known is 1.2 W/ft^2 (CEC 2006)

[e] Developed from Section 121 and Table 121-A of the California 2005 Building Energy Efficiency Standards (CEC 2006).

[f] Hotel uses values for Hotel Function Area from Table N2-3.

[g] For retail and wholesale stores, the complete building method may only be used when the sales area is 70% or greater of the building area.

[h] For these occupancies, when the proposed design is required to have demand control ventilation by Section 121 (c) 3, the ventilation rate is the minimum that would occur at any time during occupied hours. Additional ventilation would be provided through demand-controlled ventilation to maintain carbon dioxide (CO_2) levels according to Section 121 of the California 2005 Building Energy Efficiency Standards (CEC 2006).

Table C-2. Area Occupancy Assumptions When Lighting Plans are Submitted for Portions or for the Entire Building or When Lighting Compliance is Not Performed (Table N2-3 from CEC 2004)

Sub-Occupancy Type[a]	People per 1,000 ft2 [b]	Sensible Heat per Person[c]	Latent Heat per Person[c]	Receptacle Load (W/ft2)[d]	Hot Water (Btu/h per Person)	Lighting (W/ft25)[e]	Ventilation (CFM/ft2)[f]
Auditorium[g]	143	245	105	1.0	60	1.5	1.07
Auto Repair	10	275	475	1.0	120	1.1	1.50
Bar, Cocktail Lounge and Casino[g]	67	275	275	1.0	120	1.1	0.50
Barber and Beauty Shop	10	250	200	2.0	120	1.0	0.40
Classrooms, Lecture, Training, Vocational Room	50	245	155	1.0	120	1.2	0.38
Civic Meeting Space[g]	25	250	200	1.5	120	1.3	0.19
Commercial and Industrial Storage	3	275	475	0.2	120	0.6	0.15
Convention, Conference, Multi-purpose and Meeting Centers[g]	67	245	155	1.0	60	1.4	0.50
Corridors, Restrooms, Stairs, and Support Areas	10	250	250	0.2	0	0.6	0.15
Dining[g]	67	275	275	0.5	385	1.1	0.50
Electrical, Mechanical Room	3	250	250	0.2	0	0.7	0.15
Exercise, Center, Gymnasium	20	255	875	0.5	120	1.0	0.15
Exhibit, Museum[g]	67	250	250	1.5	60	2.0	0.50

Sub-Occupancy Type[a]	People per 1,000 ft2 [b]	Sensible Heat per Person[c]	Latent Heat per Person[c]	Receptacle Load (W/ft2)[d]	Hot Water (Btu/h per Person)	Lighting (W/ft25)[e]	Ventilation (CFM/ft2)[f]
Financial Transaction	10	250	250	1.5	120	1.2	0.15
Dry Cleaning (Coin Operated)	10	250	250	3.0	120	0.9	0.30
Dry Cleaning (Full Service Commercial)	10	250	250	3.0	120	0.9	0.45
General Commercial and Industrial Work, High Bay	10	275	475	1.0	120	1.1	0.15
General Commercial and Industrial Work, Low Bay	10	275	475	1.0	120	1.0	0.15
General Commercial and Industrial Work, Precision	10	250	200	1.0	120	1. 3	0.15
Grocery Sales[g]	33	250	200	1.0	120	1.6	0.25
High-Rise Residential Living Spaces[h]	5	245	155	0.5	—[i]	0.5	0.15
Hotel Function Area[g]	67	250	200	0.5	60	1.5	0.50
Hotel/Motel Guest Room[h]	5	245	155	0.5	2800	0.5	0.15
Housing, Public and Common Areas, Multi-family	10	250	250	0.5	120	1.0	0.15
Housing, Public and Common Areas, Dormitory, Senior Housing	10	250	250	0.5	120	1.5	0.15
Kitchen, Food	5	275	475	1.5	385	1.6	0.15

Sub-Occupancy Type[a]	People per 1,000 ft2 [b]	Sensible Heat per Person[c]	Latent Heat per Person[c]	Receptacle Load (W/ft2)[d]	Hot Water (Btu/h per Person)	Lighting (W/ft25)[e]	Ventilation (CFM/ft2)[f]
Preparation							
Laundry	10	250	250	3.0	385	0.9	0.15
Library, Reading Areas	20	250	200	1.5	120	1.2	0.15
Library, Stacks	10	250	200	1.5	120	1.5	0.15
Lobby, Hotel	10	250	250	0.5	120	1.1	0.15
Lobby, Main Entry	10	250	250	0.5	60	1.5	0.15
Locker/Dressing Room	20	255	475	0.5	385	0.8	0.15
Lounge, Recreation[g]	67	275	275	1.0	60	1.1	0.50
Malls and Atria[g]	33	250	250	0.5	120	1.2	0.25
Medical and Clinical Care	10	250	200	1.5	160	1.2	0.15
Office	10	250	200	1.5	120	1.2	0.15
Police Station and Fire Station	10	250	200	1.5	120	0.9	0.15
Religious Worship[g]	143	245	105	0.5	60	1.5	1.07
Retail Merchandise Sales, Wholesale Showroom[g]	33	250	200	1.0	120	1.7	0.25
Tenant Lease Space	10	250	200	1.5	120	1.0	0.15
Theater, Motion Picture[g]	143	245	105	0.5	60	0.9	1.07
Theater, Performance[g]	143	245	105	0.5	60	1.4	1.07

Sub-Occupancy Type[a]	People per 1,000 ft2 [b]	Sensible Heat per Person[c]	Latent Heat per Person[c]	Receptacle Load (W/ft2)[d]	Hot Water (Btu/h per Person)	Lighting (W/ft25)[e]	Ventilation (CFM/ft2)[f]
Transportation Function[g]	33	250	250	0.5	120	1.2	0.25
Waiting Area	10	250	250	0.5	120	1.1	0.15
All Other	10	250	200	1.0	120	0.6	0.15

[a] Subcategories of these suboccupancies are described in Section 2.4.1.1 (Occupancy Types) of CEC 2004.

[b] Values are based on one-half the maximum occupant load for exiting purposes in the CBC. Use full values for design conditions. Full-year operational schedules reduce these values by up to 50% for compliance simulations and full year test simulations.

[c] From Table 1, p. 29.4, ASHRAE 2001 Handbook of Fundamentals (ASHRAE 2001).

[d] From Lawrence Berkeley Laboratory study. This value is fixed and includes all equipment that is plugged into receptacle outlets.

[e] From Table 146-C of the California 2005 Building Energy Efficiency Standards for the applicable occupancy. ACMs shall use this value for the standard building design when lighting compliance is performed for the zone or area in question (CEC 2006).

[f] Developed from Section 121 and Table 121-A of the California 2005 Building Energy Efficiency Standards (CEC 2006).

[g] For these occupancies, when the proposed design is required to have demand control ventilation by Section 121 (c) 3, the ventilation rate is the minimum that would occur at any time during occupied hours. Additional ventilation would be provided through demand-controlled ventilation to maintain CO_2 levels according to Section 121 of the California 2005 Building Energy Efficiency Standards (CEC 2006).

[h] For hotel/motel guest rooms and high-rise residential living spaces, all these values are fixed and are the same for both the proposed design and the standard design. ACMs shall ignore user inputs that modify these assumptions for these two occupancies. Spaces in high-rise residential buildings other than living spaces shall use the values for housing, public and common areas (either multi-family or senior housing).

Table C-3. Schedule Types of Occupancies and Sub-Occupancies (Table N2-4 from CEC 2004)

Occupancy or Sub-Occupancy Type	Schedule
Atrium	Table 2-5 Nonresidential
Auditorium	Table 2-5 Nonresidential
Auto Repair	Table 2-5 Nonresidential
Bar, Cocktail Lounge and Casino	Table 2-5 Nonresidential
Barber and Beauty Shop	Table 2-5 Nonresidential
Classrooms, Lecture, Training, Vocational Room	Table 2-5 Nonresidential
Civic Meeting Space	Table 2-5 Nonresidential
Commercial and Industrial Storage	Table 2-5 Nonresidential
Convention, Conference, Multipurpose, and Meeting Centers	Table 2-5 Nonresidential
Corridors, Restrooms, Stairs, and Support Areas	Table 2-5 Nonresidential
Dining	Table 2-5 Nonresidential
Electrical, Mechanical Room	Table 2-5 Nonresidential
Exercise Center, Gymnasium	Table 2-5 Nonresidential
Exhibit, Museum	Table 2-5 Nonresidential
Financial Transaction	Table 2-5 Nonresidential
Dry Cleaning (Coin Operated)	Table 2-5 Nonresidential
Dry Cleaning (Full Service Commercial)	Table 2-5 Nonresidential
General Commercial and Industrial Work, High Bay	Table 2-5 Nonresidential
General Commercial and Industrial Work, Low Bay	Table 2-5 Nonresidential
General Commercial and Industrial Work, Precision	Table 2-5 Nonresidential
Grocery Sales	Table 2-5 Nonresidential
High-rise Residential with Setback Thermostat	Table 2-7 Residential, with Setback
High-rise Residential without Setback Thermostat	Table 2-8 Residential, without Setback
Hotel Function Area	Table 2-6 Hotel Function
Hotel/Motel Guest Room with Setback Thermostat	Table 2-7 Residential, with Setback
Hotel/Motel Guest Room without Setback Thermostat	Table 2-8 Residential, without Setback

Occupancy or Sub-Occupancy Type	Schedule
Housing, Public and Commons Areas, Multi-family with Setback Thermostat	Table 2-7 Residential, with Setback
Housing, Public and Commons Areas, Multi-family without Setback	Table 2-8 Residential, without Setback Thermostat
Housing, Public and Common Areas, Dormitory, Senior Housing with Setback	Table 2-7 Residential, with Setback Thermostat
Housing, Public and Commons Areas, Dormitory, Senior Housing without	Table 2-8 Residential, without Setback Thermostat
Kitchen, Food Preparation	Table 2-5 Nonresidential
Laundry	Table 2-5 Nonresidential
Library, Reading Areas	Table 2-5 Nonresidential
Library, Stacks	Table 2-5 Nonresidential
Lobby, Hotel	Table 2-6 Hotel Function
Lobby, Main Entry	Table 2-5 Nonresidential
Locker/Dressing Room	Table 2-5 Nonresidential
Lounge, Recreation	Table 2-5 Nonresidential
Mall	Table 2-9 Retail
Medical and Clinical Care	Table 2-5 Nonresidential
Office	Table 2-5 Nonresidential
Police Station and Fire Station	Table 2-5 Nonresidential
Religious Worship	Table 2-5 Nonresidential
Retail Merchandise Sales, Wholesale Showroom	Table 2-9 Retail
Tenant Lease Space	Table 2-5 Nonresidential
Theater, Motion Picture	Table 2-5 Nonresidential
Theater, Performance	Table 2-5 Nonresidential
Transportation Function	Table 2-5 Nonresidential
Waiting Area	Table 2-5 Nonresidential
All Other	Table 2-5 Nonresidential

Table C-4 (CEC 2004, Table C-4. Nonresidential Occupancy Schedules (Other than Retail) (Table N2-5 from CEC 2004)

		Hour																							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Heating	WD	60	60	60	60	60	65	65	70	70	70	70	70	70	70	70	70	70	70	65	60	60	60	60	60
(ºF)	Sat	60	60	60	60	60	65	65	65	65	65	65	65	65	65	65	65	60	60	60	60	60	60	60	60
	Sun	60	60	60	60	60	65	65	65	65	65	65	65	65	65	65	65	60	60	60	60	60	60	60	60
Cooling	WD	77	77	77	77	77	73	73	73	73	73	73	73	73	73	73	73	73	73	77	77	77	77	77	77
(ºF)	Sat	77	77	77	77	77	73	73	73	73	73	73	73	73	73	73	73	73	73	77	77	77	77	77	77
	Sun	77	77	77	77	77	73	73	73	73	73	73	73	73	73	73	73	73	73	77	77	77	77	77	77
Lights	WD	5	5	5	5	10	20	40	70	80	85	85	85	85	85	85	85	85	80	35	10	10	10	10	10
(%)	Sat	5	5	5	5	5	10	15	25	25	25	25	25	25	25	20	20	20	15	10	10	10	10	10	10
	Sun	5	5	5	5	5	10	10	15	15	15	15	15	15	15	15	15	15	10	10	10	5	5	5	5
Equipment	WD	15	15	15	15	15	20	35	60	70	70	70	70	70	70	70	70	65	45	30	20	20	15	15	15
(%)	Sat	15	15	15	15	15	15	15	20	25	25	25	25	25	25	20	20	20	15	15	15	15	15	15	15
	Sun	15	15	15	15	15	15	15	20	20	20	20	20	20	20	20	20	20	15	15	15	15	15	15	15
Fans	WD	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off	off	off	off
	Sat	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	off	off	off	off	off	off	off	off	off
	Sun	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off	off
Infiltration	WD	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100	100
(%)	Sat	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	100	100	100	100	100	100
	Sun	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
People	WD	0	0	0	0	5	10	25	65	65	65	65	60	60	65	65	65	65	40	25	10	5	5	5	0
(%)	Sat	0	0	0	0	0	0	5	15	15	15	15	15	15	15	15	15	15	5	5	5	0	0	0	0
	Sun	0	0	0	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	0	0	0	0
Hot Water	WD	0	0	0	0	10	10	50	50	50	50	70	90	90	50	50	70	50	50	50	10	10	10	10	0
(%)	Sat	0	0	0	0	0	0	10	20	20	20	20	20	20	20	20	20	20	10	10	10	0	0	0	0
	Sun	0	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0

Table C-5. Hotel Function Occupancy Schedules (Table N2-6 from CEC 2004)

		Hour																							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Heating	WD	55	55	55	55	55	55	63	68	70	70	70	70	70	70	70	70	70	70	70	70	70	70	55	55
(ºF)	Sat	55	55	55	55	55	55	63	68	70	70	70	70	70	70	70	70	70	70	70	70	70	70	55	55
	Sun	55	55	55	55	55	55	63	68	70	70	70	70	70	70	70	70	70	70	70	70	70	70	55	55
Cooling	WD	95	95	95	95	95	95	95	95	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	95
(ºF)	Sat	95	95	95	95	95	95	95	95	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	95
	Sun	95	95	95	95	95	95	95	95	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	95
Lights	WD	5	5	5	5	5	5	5	5	25	50	90	90	90	90	90	90	75	50	50	50	50	10	5	5
(%)	Sat	5	5	5	5	5	5	5	5	25	50	90	90	90	90	90	90	75	50	50	50	50	10	5	5
	Sun	5	5	5	5	5	5	5	5	25	50	90	90	90	90	90	90	75	50	50	50	50	10	5	5
Equipment	WD	5	5	5	5	5	5	5	5	50	50	50	50	30	50	50	50	30	10	30	30	30	10	5	5
(%)	Sat	5	5	5	5	5	5	5	5	50	50	50	50	30	50	50	50	30	10	30	30	30	10	5	5
	Sun	5	5	5	5	5	5	5	5	50	50	50	50	30	50	50	50	30	10	30	30	30	10	5	5
Fans	WD	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off
	Sat	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off
	Sun	off	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off
Infiltration	WD	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
(%)	Sat	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
	Sun	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
People	WD	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0
(%)	Sat	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0
	Sun	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0
Hot Water	WD	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0
(%)	Sat	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0
	Sun	0	0	0	0	0	0	0	5	35	90	90	90	25	90	90	90	50	25	50	50	50	10	0	0

Table C-6. Residential Occupancy Schedules (Including Hotel/Motel Guest Rooms) with Setback Thermostat for Heating (Table N2-7 from CEC 2004)

		Hour																							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Heating	WD	60	60	60	60	60	60	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	60	60
(ºF)	Sat	60	60	60	60	60	60	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	60	60
	Sun	60	60	60	60	60	60	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	60	60
Cooling	WD	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
(ºF)	Sat	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
	Sun	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
Lights	WD	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
(%)	Sat	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
	Sun	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
Equipment	WD	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
(%)	Sat	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
	Sun	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
Fans	WD	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
	Sat	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
	Sun	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
Infiltration	WD	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
(%)	Sat	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Sun	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
People	WD	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
(%)	Sat	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
	Sun	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
Hot Water	WD	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5
(%)	Sat	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5
	Sun	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5

Table C-7. Residential Occupancy Schedules (Including Hotel/Motel Guest Rooms) without Setback Thermostat (Table N2-8 from CEC 2004)

		Hour																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Heating	WD	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
(ºF)	Sat	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
	Sun	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
Cooling	WD	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
(ºF)	Sat	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
	Sun	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
Lights	WD	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
(%)	Sat	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
	Sun	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
Equipment	WD	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
(%)	Sat	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
	Sun	10	10	10	10	10	30	45	45	45	45	30	30	30	30	30	30	30	30	60	80	90	80	60	30
Fans	WD	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
	Sat	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
	Sun	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
Infiltration	WD	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
(%)	Sat	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Sun	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
People	WD	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
(%)	Sat	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
	Sun	90	90	90	90	90	90	70	40	40	20	20	20	20	20	20	30	50	50	50	70	70	80	90	90
Hot Water	WD	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5
(%)	Sat	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5
	Sun	0	0	0	5	5	5	80	70	50	40	25	25	25	25	50	60	70	70	40	25	20	20	5	5

Table C-8. Retail Occupancy Schedules (Table N2-9 from CEC 2004)

		Hour																							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Heating	WD	60	60	60	60	60	63	65	68	70	70	70	70	70	70	70	70	70	70	70	65	65	65	65	60
(ºF)	Sat	60	60	60	60	60	63	65	68	70	70	70	70	70	70	70	70	70	70	70	65	65	65	65	60
	Sun	60	60	60	60	60	63	65	68	70	70	70	70	70	70	70	70	70	70	70	65	65	65	65	60
Cooling	WD	80	80	80	80	80	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	80	80
(ºF)	Sat	80	80	80	80	80	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	80	80
	Sun	80	80	80	80	80	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	80	80
Lights	WD	20	20	20	20	20	30	40	65	90	90	90	90	90	90	90	90	90	90	90	80	65	50	35	25
(%)	Sat	20	20	20	20	20	30	40	65	90	90	90	90	90	90	90	90	90	90	90	80	65	50	35	25
	Sun	20	20	20	20	20	30	40	65	90	90	90	90	90	90	90	90	90	90	90	80	65	50	35	25
Equipment	WD	20	20	20	20	20	25	30	45	60	75	75	75	70	75	75	75	75	75	65	55	45	35	25	20
(%)	Sat	20	20	20	20	20	25	30	45	60	75	75	75	70	75	75	75	75	75	65	55	45	35	25	20
	Sun	20	20	20	20	20	25	30	45	60	75	75	75	70	75	75	75	75	75	65	55	45	35	25	20
Fans	WD	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off	off	off
	Sat	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off	off	off
	Sun	off	off	off	off	off	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	off	off	off
Infiltration	WD	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
(%)	Sat	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
	Sun	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
People	WD	5	5	5	5	5	5	15	25	40	55	75	75	75	75	75	75	75	75	65	50	35	20	10	5
(%)	Sat	5	5	5	5	5	5	15	25	40	55	75	75	75	75	75	75	75	75	65	50	35	20	10	5
	Sun	5	5	5	5	5	5	15	25	40	55	75	75	75	75	75	75	75	75	65	50	35	20	10	5
Hot Water	WD	0	0	0	0	0	0	10	10	50	50	70	90	90	50	50	70	50	50	50	10	10	0	0	0
(%)	Sat	0	0	0	0	0	0	10	10	50	50	70	90	90	50	50	70	50	50	50	10	10	0	0	0
	Sun	0	0	0	0	0	0	10	10	50	50	70	90	90	50	50	70	50	50	50	10	10	0	0	0

Appendix D. Illuminance Categories and Luminaire Power from the 2005 California Nonresidential ACM Approval Manual

NONRESIDENTIAL ACM MANUAL APPENDIX NB

Appendix NB - Illuminance Categories and Luminaire Power

Illuminance Categories

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

Illuminance Categories and Luminaire Power

Luminaire power shall be taken from the following tables.
Table NB-1 – Fluorescent Circline
Table NB-2 – Compact Fluorescent 2D
Table NB-3 – Compact Fluorescent
Table NB-4 –Long Compact Fluorescent
Table NB-5 – Fluorescent U-Tubes
Table NB-6 – Fluorescent Linear Lamps – Preheat
Table NB-7 – Fluorescent Linear Lamps T5
Table NB-8 – Fluorescent Rapid Start T-8
Table NB-9 – Fluorescent Rapid Start T-12
Table NB-10 – Fluorescent Rapid Start High Output (HO) T8 & T12, 8 ft
Table NB-11 – Fluorescent Instant Start (single pin base "Slimline") T12, 4 ft
Table NB-12 – Fluorescent Instant Start (single pin base "Slimline") T8 & T12, 8 ft.
Table NB-13 – High Intensity Discharge
Table NB-14 – 12 Volt Tungsten Halogen Lamps Including MR16, Bi-pin, AR70, AR111, PAR36

Table NB-1 – Fluorescent Circline

	Lamps		Ballasts			System	
Type	Number	Designation	Number	Designation	Description	Watts	Comment
Rapid Start (22 W)	1	FC8T9	1	MAG STAND.	Mag. Stand.	27	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	41	12" OD
	2	FC12T5	1	ELECT NO	Electronic Normal Light	80	
T5 Rapid Start (55 W)	1	FC12T5HO	1	ELECT NO	Electronic Normal Light	55	12" OD
	2	FC12Tag5HO	1	ELECT NO	Electronic Normal Light	103	
	1	FC12T5HO	1	ELECT DIM	Electronic Dimming	12~59	
	2	FC12T5HO	1	ELECT DIM	Electronic Dimming	24~114	
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 NB-2 – Compact Fluorescent 2D

	Lamps		Ballasts			System	
Type	Number	Designation	Number	Designation	Description	Watts	Comment
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 NB-3 – Compact Fluorescent

	Lamps		Ballasts			System	
Type	Number	Designation	Number	Designation	Description	Watts	Comment
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/GX23	1	MAG STD	Mag. Stand.	17	7.5" MOL
	2	CFT13W/GX23	2	MAG STD	Mag. Stand.	34	
Twin (13 W, 2GX7 Four Pin Base - F13TT)	1	CFT13W/2GX7	1	ELECT	Electronic	17	7.5" MOL
	2	CFT13W/2GX7	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/G24d-1	1	MAG STD 120	120 V Mag. Stand.	18	6.0" MOL
	2	CFQ13W/G24d-1	2	MAG STD 120	120 V Mag. Stand.	36	
	1	CFQ13W/G24d-1	1	MAG STD 277	277 V Mag. Stand.	16	
	2	CFQ13W/G24d-1	2	MAG STD 277	227 V Mag. Stand.	32	
Quad (13 W, GX23-2 Two Pin Base)	1	CFQ13W/GX23-2	1	MAG STD	Mag. Stand.	17	4.8" MOL
	2	CFQ13W/GX23-2	2	MAG STD	Mag. Stand.	34	
Quad (16W GX32d-1 Two Pin Base)	1	CFQ16W/GX32d-1	1	MAG STD	Mag. Stand.	20	5.5" MOL
	2	CFQ16W/GX32d-1	2	MAG STD	Mag. Stand.	40	
Quad (18 W, G24d-2 Two Pin Base - F18DTT Lamp)	1	CFQ18W/G24d-2	1	MAG STD 120	120 V Mag. Stand.	25	6.8" MOL
	2	CFQ18W/G24d-2	2	MAG STD 120	120 V Mag. Stand.	50	
	1	CFQ18W/G24d-2	1	MAG STD 277	227 V Mag. Stand.	22	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	2	CFQ18W/G24d-2	2	MAG STD 277	227 V Mag. Stand.	44	
	1	CFQ22W/GX32d-2	1	MAG STD	Mag. Stand.	27	6.0" MOL
Quad (22W, GX32d Two Pin Base)	2	CFQ22W/GX32d-2	2	MAG STD	Mag. Stand.	54	
Quad (26 W, G24d-3 Two Pin Base - F26DTT Lamp)	1	CFQ26W/G24d-3	1	MAG STD 120	120 V Mag. Stand.	37	7.6" MOL
	2	CFQ26W/G24d-3	2	MAG STD 120	120 V Mag. Stand.	74	
	1	CFQ26W/G24d-3	1	MAG STD 277	227 V Mag. Stand.	33	
	2	CFQ26W/G24d-3	2	MAG STD 277	227 V Mag. Stand.	66	
	1	CFQ26W/G24d-3	1	ELECT 277V	277 V Electronic	27	
	2	CFQ26W/G24d-3	2	ELECT 277V	277 V Electronic	54	
Quad (28W GX32d Two Pin Base)	1	CFQ28W/GX32d-3	1	MAG STD	Mag. Stand.	34	6.8" MOL
	2	CFQ28W/GX32d-3	2	MAG STD	Mag. Stand.	68	
Quad (10 W, G24q-1 Four Pin Base)	1	CFQ10W/G24q-1	1	MAG STD 120	120 V Mag. Stand.	16	4.6" MOL
	2	CFQ10W/G24q-1	2	MAG STD 120	120 V Mag. Stand.	32	
	1	CFQ10W/G24q-1	1	MAG STD 277	227 V Mag. Stand.	13	
	2	CFQ10W/G24q-1	2	MAG STD 277	227 V Mag. Stand.	26	
Quad (13 W, G24q-1 Four Pin Base)	1	CFQ13W/G24q-1	1	MAG STD 120	120 V Mag. Stand.	18	6.0" MOL
	2	CFQ13W/G24q-1	2	MAG STD 120	120 V Mag. Stand.	36	
	1	CFQ13W/G24q-1	1	MAG STD 277	227 V Mag. Stand.	16	
	2	CFQ13W/G24q-1	2	MAG STD 277	227 V Mag. Stand.	32	
	1	CFQ13W/G24q-1	1	ELECT	Electronic	14	
	2	CFQ13W/G24q-1	2	ELECT	Electronic	25	
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/G24q-2	1	MAG STD 120	120 V Mag. Stand.	25	6.8" MOL

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	2	CFQ18W/G24q-2	2	MAG STD 120	120 V Mag. Stand.	50	
	1	CFQ18W/G24q-2	1	MAG STD 277	227 V Mag. Stand.	22	
	2	CFQ18W/G24q-2	2	MAG STD 277	227 V Mag. Stand.	44	
	1	CFQ18W/G24q-2	1	ELECT	Electronic	21	
	2	CFQ18W/G24q-2	2	ELECT	Electronic	38	
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	14	
	2	CFM 13W/GX24q-1	2	ELECT	Electronic	25	
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	55	
	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	CFTR32WGX24q-3	1	ELECT	Electronic	35	
	2	CFTR32WGX24q-3	1	ELECT	Electronic	69	
	1	CFTR32WGX24q-3	1	ELECT DIM	Electronic Dimming	9~38	BF .05~1.05
	2	CFTR32WGX24q-3	1	ELECT DIM	Electronic Dimming	20~76	BF .05~1.05

	Lamps		Ballasts			System	
Type	Number	Designation	Number	Designation	Description	Watts	Comment
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 NB-4 –Long Compact Fluorescent

	Lamps		Ballasts			System	
Type	Number	Designation	Number	Designation	Description	Watts	Comment
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
	1	FT40W/2G11	1	ELECT HO	Electronic High Output	50	BF ~ 1.1
	1	FT40W/2G11	1	ELECT DIM1	Electronic Dimming	10-41	BF .05~1.0
	2	FT40W/2G11	1	ELECT DIM1	Electronic Dimming	17-80	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	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	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
	2	FT55W/2G11	1	ELECT NO	Electronic Normal Output	109	BF~.90
	1	FT55W/2G11	1	ELECT DIM	Electronic Dimming	13-59	BF .03~.90
	2	FT55W/2G11	1	ELECT DIM	Electronic Dimming	24-114	BF .03~.90
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 NB-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	
	4	FB31T8/F32T8U	1	ELECT NO	Electronic Normal Output		
	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	72	
	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 NB-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.	19	18" MOL
Fluorescent Preheat T12 (15W)	1	F15T12	1	MAG STD	Mag. Stand.	19	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

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

Table NB-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	27	
	2	F24T5HO	1	ELECT	Elect. Program Start BF=1	52	
~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	117	

	1	F54T5	1	ELECT DIM	Elect. Dimming	12-63
	2	F54T5	1	ELECT DIM	Elect. Dimming	24-125
~57.5" Fluorescent Program Start T5 High Output (80W)	1	°F80T5	1	ELECT	Elect. Program Start BF=1	89

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

Table NB-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	24	
	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

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	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	
	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	39	
	2	F32T8	1	MAG.	Mag. Energy Efficient	70	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	3	F32T8	1.5	MAG.	Mag. Energy Efficient	105	Tandem wired
	3	F32T8	2	MAG.	Mag. Energy Efficient	109	
	4	F32T8	2	MAG.	Mag. Energy Efficient	140	(2) two-lamp ballasts
4 foot Fluorescent Rapid Start T8 (32W)	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	
	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	1	F40T8	1	MAG.	Mag. Energy Efficient	50	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
Rapid Start T8 (40W)	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.	79	
	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	60	
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 NB-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

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	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
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	ºF40T12	1	MAG ºF FO	Mag. Heater Cutout Full Light	80	
	3	ºF40T12	1.5	MAG ºF FO	Mag. Heater Cutout Full Light	120	Tandem wired
	4	ºF40T12	2	MAG ºF FO	Mag. Heater Cutout Full Light	160	(2) Two-lamp ballasts
	1	ºF40T12	0.5	ELECT	Electronic	36	Tandem wired
	1	ºF40T12	1	ELECT	Electronic	37	
	2	ºF40T12	1	ELECT	Electronic	72	
	3	ºF40T12	1	ELECT	Electronic	107	
	3	ºF40T12	1.5	ELECT	Electronic	108	Tandem wired
	3	ºF40T12	2	ELECT	Electronic	109	
	4	ºF40T12	1	ELECT	Electronic	135	
	4	ºF40T12	2	ELECT	Electronic	144	(2) Two-lamp ballasts
	2	ºF40T12	1	ELECT RO	Electronic Reduce Output (75%)	61	
	3	ºF40T12	1	ELECT RO	Electronic Reduce Output (75%)	90	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
	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-lam 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-lam 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
	4	°F40T12	2	ELECT AO	Elec. Adjustable Output (to 15%)	146	(2) Two-lam 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-lam ballasts

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

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

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
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.	440	

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

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
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	

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Table NB-12 – Fluorescent Instant Start (single pin base "Slimline") T8 & 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.	74	
	2	F96T12/ES	1	MAG STD**	Mag. Stand.	131	
	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.	92	
	2	F96T12	1	MAG STD**	Mag. Stand.	158	
	2	F96T12	1	MAG.	Mag. Energy Efficient	144	
	1	F96T12	1	ELECT	Electronic	85	
	2	F96T12	1	ELECT	Electronic	132	

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Table NB-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.	63	
	1	H75	1	MAG STD	Mag. Stand.	88	
	1	H100	1	MAG STD	Mag. Stand.	119	
	1	H175	1	MAG STD	Mag. Stand.	197	
	1	H250	1	MAG STD	Mag. Stand.	285	
	1	H400	1	MAG STD	Mag. Stand.	450	
	1	H1000	1	MAG STD	Mag. Stand.	1080	
Metal Halide	1	M35/39	1	MAG STD	Mag. Stand.	48	
	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.	92	
	1	M70	1	ELECT	Electronic	86	
	1	M100	1	MAG STD	Mag. Stand.	122	
	1	M100	1	ELECT	Electronic	110	
	1	M125	1	MAG STD	Mag. Stand.	150	
	1	M150	1	MAG STD	Mag. Stand.	186	
	1	M150	1	ELECT	Electronic	168	
	1	M175	1	MAG STD	Mag. Stand.	205	
	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.	365	
	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	

Type	Lamps		Ballasts			System Watts	Comment
	Number	Designation	Number	Designation	Description		
High Pressure Sodium	1	S35	1	MAG STD	Mag. Stand.	44	
	1	S50	1	MAG STD	Mag. Stand.	61	
	1	S70	1	MAG STD	Mag. Stand.	93	
	1	S100	1	MAG STD	Mag. Stand.	116	
	1	S150	1	MAG STD	Mag. Stand.	173	
	1	S200	1	MAG STD	Mag. Stand.	240	
	1	S250	1	MAG STD	Mag. Stand.	302	
	1	S400	1	MAG STD	Mag. Stand.	469	
High Pressure Sodium *cont.*	1	S1000	1	MAG STD	Mag. Stand.	1090	
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	

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Table NB-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	