



The University of Pennsylvania

Lighting Standardization - Phase I: *Interior Lamps, Ballasts, Kits and Fixtures*

Lighting Upgrade Design Guidelines & Instructions for Use



Submitted by:



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Introduction

Keystone Lighting Solutions (KLS) was engaged by the University of Pennsylvania (Penn) to design and develop lighting standards or guidelines, primarily for use with Century Bond lighting upgrade projects. Standards development will be conducted in multiple phases. This document references standards developed for interior lamps, ballasts, retrofit kits and new fixtures. Future phases will address interior lighting control systems and exterior fixtures & controls.

While the work conducted in this phase of standards development has resulted in recommendations for changes to Penn’s current lighting guidelines, the primary deliverable for this engagement was the creation of a new “Lighting Upgrade Design Guide.” This design guide will be a complimentary supplement to the current Penn lighting guidelines. The remainder of this document focuses on how to use this design guide and its intended role in the project development process.

Lighting Upgrade Design Guide

This section will fully explain the concept, format and utilization of the Lighting Upgrade Design Guide.

Concept

Most lighting upgrade projects include the following upgrade actions:

Upgrade Action	Description
Relamping	Basic relamping of existing fixtures
Retrofitting	Lamp and ballast retrofits of existing fixtures
Retrofitting with Kits	Lamp and ballast retrofits of existing fixtures using kits that provide for new lamp configurations and/or new lensing
New Fixture Replacement	Removal of existing fixtures and addition of new fixtures in the same or new layout
<i>Addition of Lighting Controls</i>	<i>to be discussed in a later phase</i>

The attached Lighting Upgrade Design Guide (Appendix B) has a separate section for each of the above upgrade action categories. Each section of the Lighting Upgrade Design Guide uses a logical starting point identifying the existing technology, fixture or application and directs you (from left to right on the page) to appropriate lighting upgrade solution. This will be discussed further in the following sections.

Format

Each section of the Lighting Upgrade Design Guide is set-up to be a decision matrix that guides a user from an existing condition to the appropriate lighting upgrade solution. Below is a list of each section's starting point and solution mapping approach:

Section	Starting Point	Solution
Relamping Guidelines	Existing Lamping	Map to Preferred Relamping Solution
Retrofitting Guidelines	Existing Technology (Lamps & Ballasts)	Map to Preferred Retrofit Solution (Lamps & Ballasts)
Retrofitting with Kit Guidelines	Existing Fixture Type	Map to Preferred Retrofit Kit Solution (using Preferred Lamps & Ballasts)
New Fixture Replacement Guidelines	Existing Space & Application	Map to Preferred Fixture Solution (using Preferred Lamps & Ballasts)

It should be noted that the preferred lamps and ballasts identified in the Retrofitting Guidelines, define the lamp and ballast specifications to be used on all Penn lighting projects.

The user of this Lighting Upgrade Design Guide will notice in each section that both a fluorescent and LED option is offered. While it is the responsibility of the project design professional to define the solution that best meets the needs of Penn for a given project or program, LED technology continues to improve in performance and efficiency while its relative costs decrease. With LED solutions outlined in this Lighting Upgrade Design Guide we have created future usability of this document.

It should also be noted throughout Lighting Upgrade Design Guide, key design performance requirements are defined appropriate to each section. The following are the performance requirements outlined in each section:

Section	Performance Metrics
Relamping Guidelines	Maintain or Improve Average FC Levels and Uniformity Minimum Lumens or Main Beam Candle Power
Retrofitting Guidelines	Maintain or Improve Average FC Levels and Uniformity System Efficiency (Lumens/Watt)
Retrofitting with Kit Guidelines	Maintain or Improve Average FC Levels and Uniformity Kit Efficiency %
New Fixture Replacement Guidelines	Average Maintained Footcandles (FC) Uniformity Ratio (FC Min to Max) Lighting Power Density (Watts/SF) Fixture Efficiency & % Downlight

While the design matrix will guide the user toward the preferred solution, the above performance metrics will guide the designer to minimally acceptable solutions and for new fixtures the appropriate lighting layout.

Utilization

To illustrate how the Lighting Upgrade Design Guide can be used, we have attached a portion of the New Fixture Replacement section in Appendix A. We are using this section as it is more complicated than the other sections. There are not only decision points for preferred technology (Fluorescent or LED) but also for Ceiling Type & Height as well as the preferred Design Level or Cost. As you will see in Appendix A we show all the possible paths and decision points that a project designer will follow as they move toward a final preferred solution.

General Comments

The following is a list of other general comments that should be considered in the use of the Lighting Upgrade Design Guide:

- These guidelines and solutions should cover the majority of Penn's lighting applications. They were not developed to handle every application. Deviations from these guidelines may be acceptable upon review and approval by Penn especially (but not solely) for major public spaces or historic spaces.
- Project designer must decide what upgrade action is most appropriate for a building or space. Our experience is that most building upgrades will utilize a combination of upgrade actions.
- The provided manufacturer part #'s are representative and not meant to be exclusive specifications.
- Penn can use the identified preferred solutions as a basis for strategic procurement efforts
 - It should be noted that a final sku bid list may include an expanded scope of part #'s and adders.

Conclusion

This effort was intended to create a foundation for lighting upgrade design guidelines and is expected to expand over the coming years. These guidelines should be updated at a minimum every year if not more frequently.

Please feel free to contact Keystone Lighting Solutions with any questions.

Appendix A

New Fixture Application Standards

Function	Average FC	Uniformity (Max/Min)	Watts/SF	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Representative Image	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Office	35-50 FC or Maintain/Improve Existing	5.0	1.20	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers No fixtures > 4' from wall	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers No fixtures > 4' from wall	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						High (9'+)	Architectural	Linear Direct-Indirect		>50% Downlight Maintain Ceiling Uniformity	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements				
					LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers No fixtures > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)	Depreciation Management		
						High (9'+)	Architectural	Linear Direct-Indirect		>50% Downlight Maintain Ceiling Uniformity								
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
				Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
						High (9'+)	Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity								
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
						High (9'+)	Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity							4,500-6,000 Delivered Lumen Package	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	> 85%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		









Office

- 1** Determine Ceiling Type
- 2** Determine Preferred Technology (Fluorescent or LED)
- 3** Determine Ceiling Height
- 4** Determine Design Level & Cost
- >** Follow Path Across Matrix to Preferred Solution

Sample Decision Path Highlighted Above
Office > Grid Ceiling > Fluorescent > Low Ceiling > Professional

Appendix B

Linear Fluorescent Lamp Specifications

Upgrade Representative Image <small>(not to scale)</small>	Proposed Lamp Description	Size	Nominal Length	Color Temperature (CCT)	Minimum Initial Lumens	Minimum Design Lumens	Minimum Rated Lamp Life ¹	Min Color Rendering Index (CRI)	Lamp Standard Specification
	28-watt extra long life T8 lamp, 3500K, 85+ CRI	T8	4'	3500K	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)
	32-watt extra long life T8 lamp, 3500K, 85+ CRI * only for dimming applications requiring full wattage	T8	4'	3500K	2,950	2,800	70,000	80+	Philips F32T8 32W ADV835 2XL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)
	30 or 25-watt long life U-tube T8 lamp, 3500K, 85+ CRI	T8	2'	3500K	2,400	2,330	24,000	80+	Philips FB32T8/25W/ADV835/ALTO (25-watt) GE F32T8/SPX35/U6/WM/ECO (30-watt) (or equal)
	29-watt long life U-tube T8 lamp, 3500K, 85+ CRI	T8	2'	3500K	2,250	1,980	30,000	80+	Sylvania FBO29/835/XP/SS/ECO GE F29T8/SPX35/U/ECO (or equal)
	25-watt long life T8 lamp, 3500K, 85+ CRI	T8	3'	3500K	2,150	2,045	42,000	80+	Philips F25T8/TL841/PLUS/ALTO Sylvania FO25/841/XP/ECO GE F25T8/XL/SPX41/ECO (or equal)
	17-watt long life T8 lamp, 3500K, 85+ CRI	T8	2'	3500K	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)
	51 or 49-watt long life T5HO lamp, 3500K, 85+ CRI	T5	4'	3500K	5,000	4,450	36,000	80+	Philips F54T5HO/49W/835/EA/ALTO (49-watt) Sylvania FP54/50W/835/HO/SS/ECO (50-watt) GE F54T5/835/WM/ECO (51-watt) (or equal)
	25-watt long life T5 lamp, 3500K, 85+ CRI	T5	4'	3500K	2,900	2,600	25,000	80+	Philips F28T5/25W/835/HE/EA Sylvania FP28/26W/841/SS/ECO GE F28T5/841/WM/ECO (or equal)



Notes:

1) Fluorescent Lamp Rated Life based on 12 hours/start on an program start ballast

Linear Fluorescent Ballast Specifications

Upgrade Representative Image <i>(not to scale)</i>	Proposed Ballast Description	Lamp Technology	Efficiency	Starting Method	Lamp Circuitry	Sample Ballast Specification
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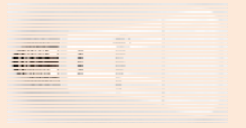












Linear Fluorescent Ballasts

	High efficiency (NEMA premium) program start parallel wired electronic ballast - <i>ballast factor to be determined based on application needs</i>	T8	High Efficiency (NEMA premium)	Program Start	Parallel Wired	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)
	High efficiency (NEMA premium) program start electronic ballast - <i>ballast factor to be determined based on application needs</i>	T5	High Efficiency (NEMA premium)	Program Start		Advance ICN-#S54W GE #54MVPS-D (or equal) # = # of lamps/ballast









Notes:

- 1) Wattage ratings for common ballast factors operating at 120 VAC









Relamping Standards - Mapping from Existing Lamp Types

Existing Lamp Types		Upgrade Solutions									
Existing Representative Image <i>(not to scale)</i>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Proposed Representative Image <i>(not to scale)</i>	Proposed Relamp Description	Min Lumen Output	Main Beam Candle Power (MBCP)	Sample Lighting Specification	Dimming	Variations	Controls
Relamp - Incandescent											
	Fixture using 25 watt A-style incandescent lamp	Maintain or Improve Lumen Output	Compact Fluorescent (with integrated ballast)		9 watt twister style compact fluorescent lamp	450		TCP 4T209 (or equal)	Non-Dimming		Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		A-style omni directional LED lamp	470		Philips 7A19/END/2700 DIM (or equal)	Standard		
	Fixture using 60 watt A-style incandescent lamp	Maintain or Improve Lumen Output	Compact Fluorescent (with integrated ballast)		13 to 16 watt dimmable twister style compact fluorescent lamp	750		Philips EL/mdT 15W 1% DIM (or equal)	Standard		Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		A-style omni directional LED lamp	830		Philips 11A19/END/2700 DIM (or equal)	Standard		
	Fixture using 75 watt A-style incandescent lamp	Maintain or Improve Lumen Output	Compact Fluorescent (with integrated ballast)		20 watt dimmable twister style compact fluorescent lamp	1,000		Philips EL/mdT 20W 1% DIM (or equal)	Standard		Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		A-style omni directional LED lamp	1,145		Philips 15A19/END/2700 DIM (or equal)	Standard		
	Fixture using 100 watt A-style incandescent lamp	Maintain or Improve Lumen Output	Compact Fluorescent (with integrated ballast)		23 or 25 watt dimmable twister style compact fluorescent lamp	1,500		TCP 50123 (or equal)	Standard		Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		A-style omni directional LED lamp	1,620		Philips 19A21/END/2700 DIM (or equal)	Standard		
	Fixture using 150 watt A-style incandescent lamp	Maintain or Improve Lumen Output	Compact Fluorescent (with integrated ballast)		32 watt dimmable twister style compact fluorescent lamp	2,000		Philips EL/dT 32W 1CT (or equal)	Standard		Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		A-style omni directional LED lamp	1,620		Philips 19A21/END/2700 DIM (or equal)	Standard		







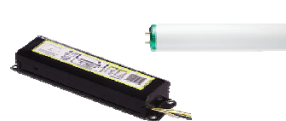





Relamping Standards - Mapping from Existing Lamp Types

Existing Lamp Types		Upgrade Solutions										
Existing Representative Image <i>(not to scale)</i>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Proposed Representative Image <i>(not to scale)</i>	Proposed Relamp Description	Min Lumen Output	Main Beam Candle Power (MBCP)	Sample Lighting Specification	Dimming	Variations	Controls	
Relamp - Incandescent												
The following directional lamp comparisons assume a standard Flood (FL) distribution, but other beam distributions (NFL, SP & NSP) should be used as the application requires Note: As beam patterns tighten MBCP increases												
	Fixture using 50-watt PAR20FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	Compact Fluorescent Technology Not Recommended for Directional Lamps; Use LED Option									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		2,400	Philips 8PAR20/END/F25 3000 DIM (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		
	Fixture using 75-watt PAR30FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	Compact Fluorescent Technology Not Recommended for Directional Lamps; Use LED Option									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		5,300	Philips 12PAR30L/END/F25 3000 DIM RO AF (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		
	Fixture using 75-watt PAR38FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	Compact Fluorescent Technology Not Recommended for Directional Lamps; Use LED Option									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		5,500	Philips 13PAR38/F25 3000 DIM AF SO (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		
	Fixture using 120-watt PAR38FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	Compact Fluorescent Technology Not Recommended for Directional Lamps; Use LED Option									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		7,100	Philips 19PAR38/F25 3000 DIM AF SO (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		

Relamping Standards - Mapping from Existing Lamp Types

Existing Lamp Types		Upgrade Solutions										
Existing Representative Image <i>(not to scale)</i>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Proposed Representative Image <i>(not to scale)</i>	Proposed Relamp Description	Min Lumen Output	Main Beam Candle Power (MBCP)	Sample Lighting Specification	Dimming	Variations	Controls	
Relamp - Incandescent												
	Fixture using 65-watt BR30 halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	Compact Fluorescent Technology Not Recommended for Directional Lamps; Use LED Option									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp	730		Philips 9.5BR30/F90 2200-2700 DIM (or equal)	Standard			
	Fixture using 35-watt MR16FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	No Compact Fluorescent Equivalent									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		1,950	Philips 7MR16/F24 3000 DIM AF (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		
	Fixture using 50-watt MR16FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	No Compact Fluorescent Equivalent									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		2,500	Philips 7MR16/F24 3000 DIM AF HO (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		
	Fixture using 75-watt MR16FL halogen lamp	Maintain or Improve Main Beam Candle Power (MBCP) with Desired Beam Spread	No Compact Fluorescent Equivalent									Confirm Existing Dimmer Compatibility; Controls Preferred if ROI Justified
			LED (with integrated driver)		Directional type LED lamp		2,500	Philips 10MR16/F24 3000 DIM HO (or equal)	Standard	Variations for different beam spreads and neck lengths acceptable with approval		

Retrofitting Standards - Mapping from Existing T12 Lamp/Ballast Systems

Existing Lamp/Ballast Systems		Upgrade Solutions													
Existing Representative Image <i>(not to scale)</i>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Upgrade Representative Image <i>(not to scale)</i>	Proposed Retrofit Description	Proposed Lamp Description	Minimum Initial Lumens	Minimum Design Lumens	Minimum Rated Lamp Life ¹	Color Rendering Index	Lamp Standard Specification	Proposed Ballast Description	Sample Ballast Specification	Dimming	Controls
Retrofit - 4' & U-Tube T12 Linear Fluorescent															
	Fluorescent fixture using (1) 4' T12 lamp and magnetic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (2) 4' T12 lamps and magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (3) 4' T12 lamps and (2) magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (4) 4' T12 lamps and (2) magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (2) 4' U-Tube T12 lamps with 6" spacing and magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	30 or 25-watt long life U-tube T8 lamp, 3500K, 85+ CRI	2,400	2,330	24,000	80+	Philips FB32T8/25W/ADV835/ALTO (25-watt) GE F32T8/SPX35/U6/WM/ECO (30-watt) (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (2) 4' U-Tube T12 lamps with 1-5/8" spacing and magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	29-watt long life U-tube T8 lamp, 3500K, 85+ CRI	2,250	1,980	30,000	80+	Sylvania FBO29/835/XP/SS/ECO GE F29T8/SPX35/U/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified













Retrofitting Standards - Mapping from Existing T12 Lamp/Ballast Systems

Existing Lamp/Ballast Systems		Upgrade Solutions														
Existing Representative Image <small>(not to scale)</small>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Upgrade Representative Image <small>(not to scale)</small>	Proposed Retrofit Description	Proposed Lamp Description	Minimum Initial Lumens	Minimum Design Lumens	Minimum Rated Lamp Life ¹	Color Rendering Index	Lamp Standard Specification	Proposed Ballast Description	Sample Ballast Specification	Dimming	Controls	
Retrofit - 2' & 3' T12 Linear Fluorescent																
	Fluorescent fixture using (1) 3' T12 lamp and magnetic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	25-watt long life T8 lamp, 3500K, 85+ CRI	2,150	2,045	42,000	80+	Philips F25T8/TL841/PLUS/ALTO Sylvania FO25/841/XP/ECO GE F25T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (2) 3' T12 lamps and magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	25-watt long life T8 lamp, 3500K, 85+ CRI	2,150	2,045	42,000	80+	Philips F25T8/TL841/PLUS/ALTO Sylvania FO25/841/XP/ECO GE F25T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (1) 2' T12 lamp and magnetic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (2) 2' T12 lamps and magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (3) 2' T12 lamps and (2) magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (4) 2' T12 lamps and (2) magnetic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	













Notes:

1) Fluorescent Lamp Rated Life based on 12 hours/start on an program start ballast

Retrofitting Standards - Mapping from Existing T8 Lamp/Ballast Systems

Existing Lamp/Ballast Systems		Upgrade Solutions														
Existing Representative Image <small>(not to scale)</small>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Upgrade Representative Image <small>(not to scale)</small>	Proposed Retrofit Description	Proposed Lamp Description	Minimum Initial Lumens	Minimum Design Lumens	Minimum Rated Lamp Life ¹	Color Rendering Index	Lamp Standard Specification	Proposed Ballast Description	Sample Ballast Specification	Dimming	Controls	
Retrofit - 4' & U-Tube T8 Linear Fluorescent																
	Fluorescent fixture using (1) 4' 32-watt standard life T8 lamp and standard efficiency electronic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (2) 4' 32-watt standard life T8 lamps and standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (3) 4' 32-watt standard life T8 lamps and (2) standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (4) 4' 32-watt standard life T8 lamps and (2) standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	28-watt extra long life T8 lamp, 3500K, 85+ CRI	2,675	2,440	52,000	80+	Philips F32T8/28W/ADV835/XLL/ALTO Sylvania FO28/835/XP/XL/SS/ECO3 GE F28T8/XL/SPX35/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (2) 4' U-Tube 32-watt standard life T8 lamps with 6" spacing and standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	30 or 25-watt long life U-tube T8 lamp, 3500K, 85+ CRI	2,400	2,330	24,000	80+	Philips FB32T8/25W/ADV835/ALTO (25-watt) GE F32T8/SPX35/U6/WM/ECO (30-watt) (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	
	Fluorescent fixture using (2) 4' U-Tube 32-watt standard life T8 lamps with 1-5/8" spacing and standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	29-watt long life U-tube T8 lamp, 3500K, 85+ CRI	2,250	1,980	30,000	80+	Sylvania FBO29/835/XP/SS/ECO GE F29T8/SPX35/U/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified	










Retrofitting Standards - Mapping from Existing T8 Lamp/Ballast Systems

Existing Lamp/Ballast Systems		Upgrade Solutions													
Existing Representative Image <small>(not to scale)</small>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Upgrade Representative Image <small>(not to scale)</small>	Proposed Retrofit Description	Proposed Lamp Description	Minimum Initial Lumens	Minimum Design Lumens	Minimum Rated Lamp Life ¹	Color Rendering Index	Lamp Standard Specification	Proposed Ballast Description	Sample Ballast Specification	Dimming	Controls
Retrofit - 2' & 3' T8 Linear Fluorescent															
	Fluorescent fixture using (1) 3' 25-watt standard life T8 lamp and standard efficiency electronic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	25-watt long life T8 lamp, 3500K, 85+ CRI	2,150	2,045	42,000	80+	Philips F25T8/TL841/PLUS/ALTO Sylvania FO25/841/XP/ECO GE F25T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (2) 3' 25-watt standard life T8 lamps and standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	25-watt long life T8 lamp, 3500K, 85+ CRI	2,150	2,045	42,000	80+	Philips F25T8/TL841/PLUS/ALTO Sylvania FO25/841/XP/ECO GE F25T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (1) 2' 17-watt standard life T8 lamp and standard efficiency electronic ballast	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (2) 2' 17-watt standard life T8 lamps and standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (3) 2' 17-watt standard life T8 lamps and (2) standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified
	Fluorescent fixture using (4) 2' 17-watt standard life T8 lamps and (2) standard efficiency electronic ballasts	Maintain or Improve Lumen Output	Fluorescent		T8 lamps and electronic ballasts	17-watt long life T8 lamp, 3500K, 85+ CRI	1,375	1,310	42,000	80+	Philips F17T8/TL841/PLUS/ALTO Sylvania FO17/841/XP/ECO GE F17T8/XL/SPX41/ECO (or equal)	High efficiency (NEMA premium) program start parallel wired electronic ballast - ballast factor to be determined based on application needs	Advance IOP-#PSP32WxxSC GE #32-MVPS-xx (or equal) # = # of lamps/ballast xx = ballast factor (XL, LW, NL, HL)	Non-Dimming	Controls Preferred if ROI Justified















Notes:

1) Fluorescent Lamp Rated Life based on 12 hours/start on an program start ballast













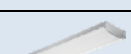

Retrofitting Standards - Mapping from Existing Fixture Types

Existing Fixture Types		Upgrade Solutions											
Existing Representative Image <small>(not to scale)</small>	Existing Description	Upgrade Lighting Performance Goal	Upgrade Technology	Upgrade Representative Image <small>(not to scale)</small>	Proposed Kit Description	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Retrofit Kits													
	2x4 prismatic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		2x4 Retrofit Kit with Volumetric Lens	85%	(2) T8 Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia 2VT8R 2 32 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		2x4 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL4R 45L ADP D49 LP835 NX (or equal)	Light Depreciation Management	Standard	
	2x4 parabolic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		2x4 Retrofit Kit with Volumetric Lens	85%	(2) T8 Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia 2VT8R 2 32 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		2x4 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL4R 45L ADP D49 LP835 NX (or equal)	Light Depreciation Management	Standard	
	1x4 prismatic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		1x4 Retrofit Kit with Volumetric Lens	85%	(1) or (2) T8 Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia VT8R 2 32 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		1x4 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia VTL4R 45L ADP D49 LP835 NX (or equal)	Light Depreciation Management	Standard	
	1x4 parabolic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		1x4 Retrofit Kit with Volumetric Lens	85%	(1) or (2) T8 Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia VT8R 2 32 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		1x4 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia VTL4R 45L ADP D49 LP835 NX (or equal)	Light Depreciation Management	Standard	
	2x2 prismatic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		2x2 Retrofit Kit with Volumetric Lens	85%	(2) T8 or PLL Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia 2VT8R 2 17 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		2x2 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2R 33L ADP D37 LP835 NX (or equal)	Light Depreciation Management	Standard	
	2x2 parabolic fluorescent fixture	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		2x2 Retrofit Kit with Volumetric Lens	85%	(2) T8 or PLL Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia 2VT8R 2 17 ADP BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
			LED		2x2 Retrofit Kit with Volumetric Lens	100% Delivered Lumens	3,000 - 5,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2R 33L ADP D37 LP835 NX (or equal)	Light Depreciation Management	Standard	
	1x8 Strip or Industrial (using 8' lamps)	Maintain or Improve Average FC Levels and Uniformity	Fluorescent		1x8 Retrofit Conversion Kit	N/A	(2) - (4) T8 4' Lamps <i>* Refer to LFL Lamp Standards</i>	(1) Electronic Ballast <i>* Refer to LFL Ballast Standards</i>	Matched to Lighting Level Requirements	Lithonia AGRK8 2 32 CW42 BPxP (or equal)	Ballast Factor	Preferred if ROI Justified	Preferred if ROI Justified















New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions														
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image <small>(not to scale)</small>	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Office		35-50 FC or Maintain/ Improve Existing	@ Work Plane (2.5') = 5	ASHRAE 2007 Office - Enclosed & Open Plan Space Type = 1.1 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 8-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)	80% Maintained Light Levels	Standard	
							High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)	80% Maintained Light Levels		
								Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)	80% Maintained Light Levels		
		35-50 FC or Maintain/ Improve Existing	@ Ceiling (for indirect only) = 5	ASHRAE 2010 Open Office Space Type = 0.98 Enclosed Office Space Type = 1.1 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	80% Maintained Light Levels	Standard	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	80% Maintained Light Levels		
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)	80% Maintained Light Levels		






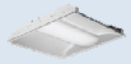








New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions														
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Lab		50-75 FC	@ Work Plane (2.5') = 5	ASHRAE 2007 Laboratory Space Type = 1.4 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)		Standard	
							High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)			
								Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			
		or Maintain/Improve Existing	@ Ceiling (for indirect only) = 5	ASHRAE 2010 Laboratory for Classroom Space Type = 1.28 Laboratory for Medical/Industrial/Research Space Type = 1.81 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			















New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions														
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Classrooms		30-50 FC	@ Work Plane (2.5') = 5	ASHRAE 2007 Classroom/Lecture/Training Space Type = 1.4 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)		Standard	
							High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)			
								Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			
		or Maintain/Improve Existing	@ Ceiling (for indirect only) = 5	ASHRAE 2010 Classroom/Lecture/Training Space Type = 1.24 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			















New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions														
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
 	30 FC or Maintain/Improve Existing = 5	@ Work Plane (2.5') = 5	ASHRAE 2007 Classroom/Lecture/Training Space Type = 1.4 Laboratory Space Type = 1.4 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified	
						High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming			
							Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming			
					LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)				Standard
							Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)				
						High (9'+)	Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)				
				Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified		
							Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming			
						High (9'+)	Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming			
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			Standard
							Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			
						High (9'+)	Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)				














New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions															
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls	
Conference Rooms		30-40 FC	@ Work Plane (2.5') = 5	ASHRAE 2007 Conference/Meeting/Multipurpose Space Type = 1.3 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified		
							High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming			
								Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming			
						LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)				Standard
							High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)				
								Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)				
		or Maintain/Improve Existing	@ Ceiling (for indirect only) = 5	ASHRAE 2010 Conference/Meeting/Multipurpose Space Type = 1.23 Open Office Space Type = 1.1 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified		
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming			
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming			
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			Standard
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)				








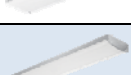
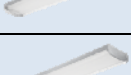
New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function		Performance Requirements			Upgrade Solutions														
		Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Library		30-50 FC	@ Work Plane (2.5') = 5	ASHRAE 2007 Library Card File/Cataloging Space Type = 1.1 Library Card Stacks Space Type = 1.7 Library Reading Area Space Type = 1.2 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)		Standard	
							High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)			
								Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			
		or Maintain/Improve Existing = 5	@ Ceiling (for indirect only) = 5	ASHRAE 2010 Library Card File/Cataloging Space Type = 0.72 Library Card Stacks Space Type = 1.71 Library Reading Area Space Type = 0.93 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming		
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)			


New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function	Performance Requirements			Upgrade Solutions																
	Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image <small>(not to scale)</small>	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls		
<div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 2em; font-weight: bold; color: red; text-align: center;">Corridors</div> 	10 FC or Maintain/Improve Existing	@ Work Plane (2.5') = 10 @ Ceiling (for indirect only) = 10	ASHRAE 2007 Corridor/Transition Space Type = 0.5 Corridor/Transition for Hospital Space Type = 1.0 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified		
						High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming				
							Architectural	Linear Direct-Indirect		Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming				
					LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)				Standard	
						High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)					
							Architectural	Linear Direct		>90% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)					
			ASHRAE 2010	Corridor/Transition Space Type = 0.66 Corridor/Transition for Hospital Space Type = 0.89 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		Preferred if ROI Justified	
							High (9'+)	Professional	1x4 Surface/Pendant Mount		White reflector below 15' mounting height	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia MS8 2 32 SBL WD MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming			
								Architectural	Linear Direct-Indirect		>80% Downlight Maintain Ceiling Uniformity	>80%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Finelite S12-ID-WCB-OPEN-2T8-91W (or equal)	Ballast Factor Step Dimming Full Range Dimming			
						LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			Standard
							High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management			
								Architectural	Linear Direct		>80% Downlight Maintain Ceiling Uniformity	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Ledalite 1201-LLA-Q (or equal)				






New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function	Performance Requirements			Upgrade Solutions														
	Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
<p style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 2em; font-weight: bold; color: red;">Restrooms</p> 	15 FC or Maintain/Improve Existing	@ Work Plane (2.5') = 5	<p>ASHRAE 2007</p> Restrooms Space Type = 0.9 School/University Building Area Type = 1.2	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	Preferred if ROI Justified
						High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)		Standard	
						High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)			
				Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		

New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function	Performance Requirements			Upgrade Solutions														
	Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image (not to scale)	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Stairwells 	10-20 FC or Maintain/Improve Existing	@ Work Plane (2.5') = 5	ASHRAE 2007 Stairwell - Active Space Type = 0.6 School/University Building Area Type = 1.2 ASHRAE 2010 Stairway Space Type = 0.69 School/University Building Area Type = 0.99	Grid	Fluorescent	Low (8-9')	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	2x4 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Lithonia 2VT8 2 32 ADP MVOLT BPxP (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)		Standard	
						High (9'+)	Professional	2x2 Recessed Volumetric		Fixtures spaced on 6-10' centers; Not > 4' from wall	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia 2VTL2 36L ADP D36 LP835 NX (or equal)			
				Open/Hard & Wall-Mount	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Mount to avoid direct eye glare but low enough for easy maintenance	>70%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R5-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Mount to avoid direct eye glare but low enough for easy maintenance	>70%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R5-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Mount to avoid direct eye glare but low enough for easy maintenance	>70%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R5-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Mount to avoid direct eye glare but low enough for easy maintenance	>70%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R5-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
Mechanical/Electrical 	20 FC or Maintain/Improve Existing	@ Work Plane (2.5') = 5	ASHRAE 2007 Electrical/Mechanical Space Type = 1.5 School/University Building Area Type = 1.2 ASHRAE 2010 Electrical/Mechanical Space Type = 0.95 School/University Building Area Type = 0.99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	No Controls in Mechanical or Electrical Areas
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		
Storage 	20 FC or Maintain/Improve Existing	@ Work Plane (2.5') = 5	ASHRAE 2007 Storage - Active Space Type = 0.8 School/University Building Area Type = 1.2 ASHRAE 2010 Storage Room Space Type = 0.63 School/University Building Area Type = .99	Open/Hard	Fluorescent	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming	Preferred if ROI Justified	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	>90%	(1) or (2) T8 Lamps	(1) Electronic Ballast	Matched to Lighting Level Requirements	Kenall R12-48-232-SB-1-DV-KO (or equal)	Ballast Factor Step Dimming Full Range Dimming		
					LED	Low (8-9')	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	3,500-4,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management	Standard	
						High (9'+)	Professional	1x4 Surface/Pendant Mount		Avoid Continuous Run Designs	100% Delivered Lumens	4,500-6,000 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lithonia STL2 40L D40 LP835 NX (or equal)	Depreciation Management		

New Fixture Application Standards - Mapping from Space Application or Function

Existing Application or Function	Performance Requirements			Upgrade Solutions														
	Average FC	Uniformity (Max/Min)	Lighting Power Density (Watts/SF)	Ceiling Type	Technology	Ceiling Height	Design Level	Family	Upgrade Representative Image <small>(not to scale)</small>	Design Considerations	Efficiency	Lamping	Ballast	Starting Ballast Factor	Sample Lighting Specification	Specification Adders	Dimming	Controls
Supplemental Downlighting 	Use to meet light requirements of above spaces to provide accent lighting	N/A	Include load in larger space	Grid	LED	Low (8-12')	Professional	Recessed Can Lights			100% Delivered Lumens	500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lightolier C4L05DL30KCLW/C4L05R1 (or equal)		Standard	Preferred if ROI Justified
				Hard	LED	High (12'+)	Professional	Recessed Can Lights or Pendants			100% Delivered Lumens	1,500 Delivered Lumen Package	(1) Electronic Dimming Driver	N/A	Lightolier C7L15CW30KWCCLU (or equal)		Standard	
Task 	30-50 FC on task	N/A	Include load in larger space	N/A	LED	< 6'	Professional	Task		Avoid Continuous Run Designs	100% Delivered Lumens	200-300 Lumens per foot	(1) Electronic Dimming Driver	N/A	Lithonia RAZ12 (or equal)		Standard	Preferred if ROI Justified

Notes:

1) Average FC requirements include task lighting contribution