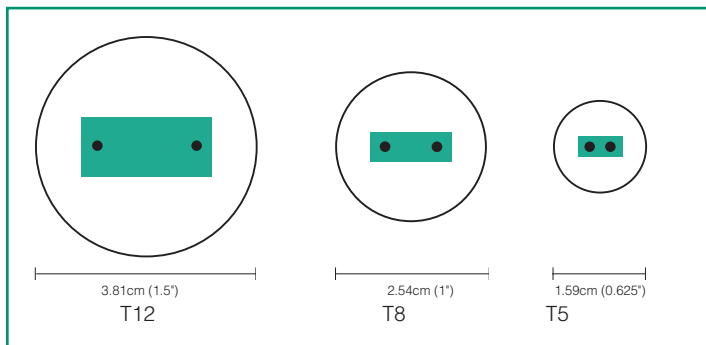


# Linear Fluorescent Lighting

Linear fluorescent lamps are the dominant type of lighting currently used in business applications. Recent advances in fluorescent lamps and electronic ballasts have created the opportunity for significant energy savings when replacing any prior generation of fluorescent lighting. Linear fluorescent lighting systems can be upgraded by installing High Performance T8 lamps and electronic ballasts in the existing fixtures or by installing new T5 or High Performance T8 lighting fixtures.

## Lamp Sizes

Fluorescent lamp diameters are measured in increments of 1/8 of an inch. This number follows the letter “T” which signifies a tubular lamp. Therefore a T8 lamp is a tubular lamp that measures 8/8" (or 1") in diameter.



**Figure 1. The relative diameter of popular linear fluorescent lamps.**

## Lamp Types

### T12 Lamps

These 1.5" diameter lamps were the standard commercial and industrial fluorescent lamps for several decades. They are available in many lengths, including: 1, 2, 3, 4, 6, and 8 foot lengths, and are produced in many variations by numerous manufacturers. Two common versions of 4' T12 lamps are 40-watt lamps, and “energy-saver” 34-watt lamps. Energy-saver T12 lamps reduce energy consumption and light output by about 15%. Although T12 lamps are sometimes powered by electronic ballasts (lighting transformers), they are typically powered by less efficient magnetic ballasts.

### Standard (First Generation) T8 Lamps

Over the last few years, T8 lamps have replaced T12s as the standard fluorescent lamp for commercial lighting, as well as some industrial lighting. Compared with T12 lamps, these 1" diameter lamps offer improved performance including higher efficacy, better lumen maintenance and truer color rendering. Although T8 lamps can be operated on some magnetic ballasts, they are rarely installed with magnetic ballasts as they are designed to be powered by electronic ballasts. Electronic ballasts further enhance the efficiency of T8 lamps and eliminate all lamp flicker.

### High Performance T8 Systems

Often called “Super T8” these recently developed lamp and ballast systems offer performance levels higher than those achieved by standard T8 systems. The lamps offer higher efficacy levels, longer lamp life, and longer warranties than their standard counterparts. High performance T8 systems are available in versions that operate at a variety of system wattages, however, they all operate more efficiently than standard T8 systems. Selected carefully, Super T8 systems can provide dramatic savings when compared with other fluorescent technologies.

### T5 Systems

T5 fluorescent lamps are 5/8" in diameter. They are constructed in metric lengths (45.2" for a nominal 4' lamp) and therefore not designed to directly replace 4' T12 or T8 lamps. T5 systems are often promoted as being the next step up in efficiency from T8 systems. For most applications, this is not true. T5 systems are no more efficient than standard T8 systems and are less efficient than High Performance T8 systems. However, because of the optical advantages obtained when using smaller diameter lamps, T5 lamps are very effectively used in special fixtures that shape light to deliver it greater distances, or to spread light across a surface (a ceiling, for example). T5 systems are available in standard and high output versions, and can be very useful for high ceiling applications such as gymnasium and warehouse lighting. They also work very well in lighting fixtures specially designed to spread light evenly across ceilings and/or throughout a space.

### High Performance T8 Systems Qualifying for Efficiency Maine Incentives

The Efficiency Maine Business Program offers incentives for High Performance T8 (HPT8) lighting systems (sometimes referred to as “Super T8” systems) with electronic ballasts. The incentives are available for participants that are replacing older T12 systems, renovating spaces, or are planning a new construction project.

HPT8 systems offer higher efficiency levels, longer lamp life, and longer lamp warranties than their standard counterparts.

The systems are available in versions that operate at a variety of system wattages, however, they all operate more efficiently than standard T8 systems. Selected carefully, Super T8 systems can provide dramatic savings when compared with other fluorescent technologies.

In order to qualify for an incentive, all HPT8 systems must include both a High Performance ballast and High Performance lamps. The ballasts and lamps must meet the [Consortium for Energy Efficiency \(CEE\) specifications for High Performance Lighting Systems](#).

[For eligible High Performance T8 Lamp click here.](#)

[For eligible electronic ballasts - 1 Lamp Systems click here.](#)

[For eligible electronic ballasts - 2 Lamp Systems click here.](#)

[For eligible electronic ballasts - 3 Lamp Systems click here.](#)

[For eligible electronic ballasts - 4 Lamp Systems click here.](#)


## Incentives for Linear Fluorescent Lighting

Efficiency Maine offers incentives for the following linear fluorescent lighting measures:

### Measure Code L10 – High Performance T8 Relamp and Reballast

If the existing lighting fixtures are in good condition, a good option for T12 fixtures is to retrofit them by replacing the existing T12 lamps and ballasts with qualifying High Performance T8 lamps and electronic ballasts. This measure results in a 25 to 30 percent energy saving, with no reduction in light output.

If the existing light fixtures have degraded reflective surfaces or lenses, it may be more cost-effective to install new fixtures. When replacing existing T12 fixtures with new premium efficiency fixtures, it is often possible to reduce the number of lamps and/or the number of light fixtures.

Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 <p>High Performance T8 Relamp &amp; Reballast</p>	L10	Upgrade an existing T12 fixture with new High-Performance T8 Lamps and Ballasts	\$12 per Fixture	<ul style="list-style-type: none"> <li>Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>1 Unit = 1 to 4 lamps and 1 ballast</li> <li>Must be an upgrade of an existing T12 fixture</li> </ul>


### Measure Code L15 and L16 – New Fluorescent Fixtures

These measures are for the installation of new fluorescent fixtures with linear lamps and electronic ballasts. Qualifying fixtures may be of any style, but must incorporate one of the following lamp/ballast combinations:

- High Performance T8 Lamps and Ballasts (See CEE List)
- T5 Lamps and Electronic Ballasts
- T5 High Output Lamps and Electronic Ballasts

For general office lighting utilizing common recessed and surface mounted lighting fixtures, High Performance T8 systems are usually the best choice. T5 systems are particularly effective if the light needs to be “thrown” a great distance, or spread across a ceiling in indirect lighting.

Before utilizing this measure, please review measures L20 and measures L30 through L41 to see if they are appropriate for your application.

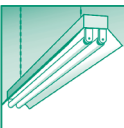
Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 <p>New Fluorescent Fixtures</p>	L15	2 to 4 ft. New Lighting Fixture with T5 or High-Performance T8 Lamps and Ballasts <a href="#">Retrofit</a>	\$25 per Fixture	<ul style="list-style-type: none"> <li>T5 and High Performance T8 Systems are eligible</li> <li>T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>1 unit = 1 new fixture with 1 to 4 lamps and 1 ballast</li> <li>Must be new fixtures replacing existing T12 fixtures</li> </ul>
	L16	Same as L15 Fixture <a href="#">New Construction</a>	\$10 per Fixture	<ul style="list-style-type: none"> <li>T5 and High Performance T8 Systems are eligible</li> <li>T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>1 unit = 1 new fixture with 1 to 4 lamps and 1 ballast</li> </ul>

## Measure Code L20 - Fluorescent Fixtures with Reflectors

This measure is for the installation of new fluorescent fixtures with reflectors, or for the retrofit of existing fixtures with reflector kits. Each new or retrofitted fixture must include a new reflector with a tested surface reflectivity of at least 87%. Fixture and/or reflector manufacturers can supply reflectivity information. Qualifying fixtures must incorporate one of the following lamp/ballast combinations:

- High Performance T8 Lamps and Ballasts (See CEE List)
- T5 Lamps and Electronic Ballasts
- T5 High Output Lamps and Electronic Ballasts

This measure is intended for industrial environments where direct glare from the light fixtures is not a problem. T5 lamps will produce more glare than High Performance T8 lamps, but may be able to “throw” the light further.

Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 <p>Fluorescent Fixtures with Reflectors</p>	L20	8 ft. Open Systems with T5 or High-Performance T8 Lamps and Ballasts	\$25 per 8 ft. Section	<ul style="list-style-type: none"> <li>• T5 and High-Performance T8 Systems are eligible</li> <li>• T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>• 1 Unit = 1 new or retrofitted 8' fixture with 2 to 4 4' lamps</li> <li>• Each unit must include a new white or aluminum/silver integral reflector with a minimum surface reflectivity of 87%</li> </ul>

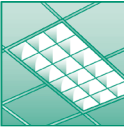
## Measure Codes L30 and L31 – High Efficiency Fluorescent Fixtures

These measures are for the installation of new premium efficiency fluorescent fixtures with linear lamps and electronic ballasts. Qualifying fixtures may be recessed or surface mounted troffer style fixtures, and must incorporate:

- High Performance T8 Lamps and Ballasts (See CEE List)

T5 systems, strip, industrial, wraparound and other non-troffer style fixtures do not qualify under this measure code.

By installing high efficiency fixtures, fewer lamps per fixture, and/or fewer fixtures may be used to achieve similar lighting levels. For example, a high efficiency 3-lamp fixture is often used in place of a less efficient 4-lamp fixture. Consult with your lighting supplier, or Efficiency Maine, for help with efficient lighting layouts.

Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 <p>High Efficiency Fluorescent Fixtures</p>	L30	Recessed or Surface Mounted High Efficiency Troffer Fixture with High-Performance T8 Lamps and Ballast <a href="#">Retrofit</a>	\$35 per Fixture	<ul style="list-style-type: none"> <li>• T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>• 1 unit = 1 new fixture with 2 to 3 lamps and 1 ballast</li> <li>• <b>Overall fixture efficiency must exceed 83% for prismatic lensed fixtures and 75% for parabolic fixtures</b></li> <li>• Must be new fixtures replacing existing T12 fixtures</li> </ul>
	L31	Same as L30 Fixture <a href="#">New Construction</a>	\$20 per Fixture	<ul style="list-style-type: none"> <li>• T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>• 1 unit = 1 new fixture with 2 to 3 lamps and 1 ballast</li> <li>• <b>Overall fixture efficiency must exceed 83% for prismatic lensed fixtures and 75% for parabolic fixtures</b></li> </ul>

## Measure Codes L32 & L33 – New Low Glare High Efficiency Fluorescent Fixtures

Measures L32 & L33 are for the installation of new fluorescent fixtures that incorporate special features designed to limit glare and distribute light evenly while also providing high efficiency. Qualifying fixtures must be selected from the qualifying list below. Fixtures with similar design features and performance

characteristics will be considered on a case-by-case basis. Qualifying fixtures must incorporate one of the following lamp/ballast combinations:

- High Performance T8 Lamps and Ballasts (See CEE List)
- T5 Lamps and Electronic Ballasts

### QUALIFYING FIXTURE LIST\*

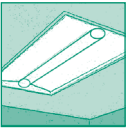
Manufacturer	Model	Eligible Technologies
Columbia	Zero Plenum Troffer	T5, T5 High Output
Ledalite	PureFx	T5, T5 High Output
Ledalite	Vectra	High Performance (Super) T8 T5, T5 High Output
Lithonia	RT5	T5, T5 High Output
Metalux	Accord	High Performance (Super) T8 T5, T5 High Output

\*Please contact Efficiency Maine toll-free at 866-376-2463 with any questions regarding fixture eligibility. Efficiency Maine will consider other fixtures for inclusion on this list.

Excess glare from lighting fixtures can be a problem in office and classroom environments. Parabolic fixtures are commonly used to limit glare in these situations. However, parabolic lighting fixtures have limited overall efficiency levels and focus light downward, “cutting-off” light to surrounding areas and especially to walls. This creates what has become known as the “cave effect.”

The new generation of low-glare fixtures, addressed by this measure, are designed to spread light evenly, reducing glare by eliminating hot spots. They work well in standard office and classroom environments. Parabolic fixtures may still do a

better job of eliminating glare from video display terminals, but modern flat-screen monitors have much better glare control and should be considered if computer screen glare is a major issue.

Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 <p>Low Glare High Efficiency Recessed Fixtures</p>	L32	Recessed High Efficiency T5 or High Performance T8 Fixture with Low Glare Features <a href="#">Retrofit</a>	\$50 per Fixture	<ul style="list-style-type: none"> <li>• T5 and High Performance T8 Systems are eligible</li> <li>• T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>• 1 unit = 1 new fixture with 2 lamps and 1 ballast</li> <li>• <b>Overall fixture efficiency must exceed 80%</b></li> <li>• Must be new fixtures replacing existing T12 fixtures</li> <li>• Must be a new fixture incorporating advanced glare control features</li> </ul>
	L33	Same as L32 Fixture <a href="#">New Construction</a>	\$35 per Fixture	<ul style="list-style-type: none"> <li>• T5 and High Performance T8 Systems are eligible</li> <li>• T8 Lamp and Ballast combination must be listed on the <a href="#">CEE List</a></li> <li>• 1 unit = 1 new fixture with 2 lamps and 1 ballast</li> <li>• <b>Overall fixture efficiency must exceed 80%</b></li> <li>• Must be new fixtures replacing existing T12 fixtures</li> <li>• Must be a new fixture incorporating advanced glare control features</li> </ul>

## Measure Code L35 – New Pendant Mounted Indirect Fluorescent Fixtures

Measure L35 is for the installation of new pendant mounted indirect fluorescent fixtures that are designed to provide low-glare even illumination by bouncing light off the ceiling. Qualifying fixtures must incorporate one of the following lamp/ballast combinations:

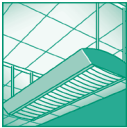
- High Performance T8 Lamps and Ballasts (See CEE List)
- T5 Lamps and Electronic Ballasts
- T5 High Output Lamps and Electronic Ballasts

Indirect pendant mounted lighting fixtures can provide excellent office and classroom lighting when ceiling heights are at least 9'. With most, or all, of the light projected upward, the ceiling becomes a large reflector, spreading light evenly throughout

the space. For this reason, it is imperative that the ceiling be white, or a highly reflective light color. Ceiling tiles and commercial paints are rated for reflectivity, and a reflectivity of 80% must be provided in order to qualify for this incentive.

Although this style of fixture can be an excellent choice, a few limiting factors should be considered:

- The fixtures have the potential to collect dust
- In classroom environments, students may toss objects into the fixtures, or swing them on their pendants
- Hanging fixtures may interfere with media projection or other activities

Measure	Code	Eligible Installations	Unit Incentive	Eligibility Criteria
 Pendant Mounted Indirect Fluorescent Fixtures	L35	Indirect and Direct/Indirect T5 or High Performance T8 Fixtures	\$35 per 4-ft. Section	<ul style="list-style-type: none"> <li>• T5 and High Performance T8 Systems are eligible</li> <li>• T8 Lamp and Ballast combination must be listed on the CEE List</li> <li>• 1 unit = A 4' length (stand-alone or continuous runs) of new fixture with 1 to 3 lamps</li> <li>• <b>Overall fixture efficiency must exceed 80%</b></li> <li>• Pendant length must be a minimum of 12"</li> <li>• Ceiling must have a reflectivity of 80% or greater</li> <li>• Must be a new fixture</li> <li>• Uplight component must be 80% or greater</li> </ul>