

## THE SKINNY ON T-5 LAMPS

The newest introduction into the family of linear fluorescent lamps is the T-5. These slender lamps, measuring just 5/8” in diameter, are almost 40% smaller than the familiar T-8. Developed in Europe several years ago, the standard output T-5 lamp was introduced in North America in 1996. About two years later, the high-output (HO) variety was made available. Fixtures with standard T-5 lamps can, in many cases, be used in place of T-8 lamps. Fixtures with T-5 HO lamps may be well-suited for high ceiling applications, such as gymnasiums. However, as T-5 lamps are metric lamps, their actual lengths do not coincide with nominal T-8 lamp lengths. Also, the T-5 is the only lamp made to be operated solely on electronic ballasts. Consequently, existing fixtures cannot be directly retrofitted with T-5s.

Like T-8 lamps the T-5 is available in a range of lengths, wattages, and color temperatures. They are offered in nominal 2-, 3-, and 4-foot lengths. Wattages are 14, 21, 28, and 35 for the standard T-5 and 24, 39, 54, and 80 for the HO variety. The 28-watt standard lamp is comparable to the 32-watt T-8. A 54-watt T-5 HO packs almost as much light as a pair of T-8s. Available color temperatures are 3000K (warm), 3500K (neutral), and 4100K (cool).

| Lamp type ▶<br>Characteristics ▼                     | T-5<br>Standard | T-5 HO | T-8     |
|--|-----------------|--------|---------|
| Initial rated output (lumens <sup>1</sup> )          | 2900            | 5000   | 2950    |
| Lamp watts (Watts)                                   | 28              | 54     | 32      |
| Initial lamp efficacy <sup>2</sup> (lumens per watt) | 104             | 93     | 92      |
| Initial system efficacy (lumens per watt)            | 89              | 85     | 90      |
| Lumen maintenance <sup>3</sup> (%)                   | 97              | 95     | 93      |
| Maintained system efficacy (lumens per watt)         | 86              | 81     | 84      |
| Rated life (hours)                                   | 20,000          | 20,000 | 20,000+ |
| Optimum operating temperature (°F)                   | 95              | 95     | 77      |
| Color Rendering Index (CRI)                          | 82-85           | 82-85  | 75-85   |

<sup>1</sup> Measure of the amount of light per unit area  
<sup>2</sup> “Efficiency”; measure of light output per power input  
<sup>3</sup> Lumen output during lamp lifetime compared to initial output

### Disadvantages of T-5 lamps

- **Non-standard lengths:** Since T-5 lamps are designed in metric lengths, they do not fit traditional 2-, 3-, or 4-foot fixtures. For example, the nominal 4-foot T-5 is 1150mm, or 45.8 inches long (compared to 47.725 inches for the T-8). However, some fixtures can be made to accept T-5 lamps by changing out the sockets and ballasts.
- **Higher price than T-8 lamps:** Because T-5 lamps are a relatively new product in the U.S., they are more expensive than T-8s. As demand and production increase, prices could fall in the future. Currently, as the light output of T-8 and standard T-5 lamps is essentially the same, there is generally no real advantage to using fixtures with the standard T-5 lamp.
- **Potential brightness and glare problems:** T-5 HO lamps have very high tube wall brightness.

Therefore, care must be taken to avoid hot spots on ceilings when using indirect fixtures, which could lead to glare issues. Also, fixtures must be positioned where the lamp itself is not visible as brightness from direct viewing would be potentially irritating. Therefore, use of this lamp should probably be limited to high ceilings and suspended indirect fixtures.

### Advantages of T-5 lamps

- **Higher optimum operating temperature:** The temperature at which T-5 lamps produce maximum light output is 95°F, compared to 77°F for T-8 lamps. This means that T-5 lamps are more suitable in areas with higher ambient temperatures as well as in confined areas where air circulation is poor.

- Low mercury content: T-5 lamps contain about 1/5 the amount of mercury of T-8 lamps. This feature allows the T-5 to have a better lumen maintenance. Less mercury content also facilitates disposal and is more environmentally friendly.
- Better lumen maintenance: The light output of a T-5 lamp degrades by only about 5% during the first 40% of lamp life and 7% throughout its entire rated life. For the T-8, lumen degradation is about 10%.
- Smaller lamp size: With only a 5/8" tube diameter, the T-5 lends itself to low-profile fixtures such as those for coves and display cases. Lay-in and indirect fixtures can also be made thinner.
- Higher indirect fixture suspension heights: Due to lamp characteristics and resulting fixture optics, manufacturers maintain indirect fixtures utilizing T-5 HO lamps can be suspended as little as 15 inches from the ceiling, less than the recommended distance of 24 inches for fixtures with T-8s. Therefore, indirect fixtures with T-5 HO lamps can potentially be used in rooms with lower ceilings.
- Increased spacing for suspended indirect fixtures: Because of the higher light intensities of T-5 HO lamps, rows of indirect fixtures can be spaced further apart. Therefore, fewer fixtures may be needed to achieve the same illumination levels as with T-8 lamps.
- Viable option for high ceilings High bay fixtures using T-5 HO lamps are available for use where ceiling heights exceed 15 about feet. T-5 HO fixtures contain up to six lamps, depending on the illumination levels required. They provide an alternative to maetal halide high bay fixtures. For example, a 6-lamp T-5 HO fixture produces about 28,000 maintained lumens, approximately the same as a 400-watt metal halide high bay fixture. Therefore, roughly the same quantity of fixtures will be needed. The T-5 HO fixtures give the added advantages of lower first cost, lower energy costs, no warm-up or restrike times, and the ability to have bi-level switching to achieve varying light levels.

The T-5 linear lamp is a relatively new introduction to the North American lighting market. Due to their current higher costs, comparable light output, and metric sizes, standard T-5 lamps are not an economical alternative to T-8 lamps in most cases. However, the T-5 HO, with its high lumen output, may well find a place in high bay and high performance suspended indirect fixtures. T-5 HO lamps must be used with caution in all cases to avoid potential brightness and glare issues. To date Estes, McClure & Associates has designed some gymnasiums with T-5 HO high bay fixtures; however, none of these facilities is yet completed. Given the right applications, T-5 lamps may offer lower initial costs, energy savings, better light distribution, or a combination of these.