

## Why Is LOR So Important?

To successfully meet the Building Code of Australia (BCA) requirements depends on the following 4 criteria:

1. Light fitting (luminaire) efficiency measured in Light Output Ratio (LOR)
2. Use of lamps with high lumen (lm) output
3. Low total power consumption of a luminaire
4. Reflectance of room surfaces in area to be illuminated



For the subscribers of this magazine who are not lighting experts the following simplified explanations:

**1. What is LOR?** LOR is the % of useful light a luminaire generates. For example, a free burning lamp gives 100% light, by shielding and directing the lamp light with a luminaire some light of the lamp will be lost. The higher the LOR the less light is lost the more efficient the Light fitting is.

**2. Lumen (lm)** is a unit measuring the efficiency of a lamp and is given usually in Lumen per Watt (lm/W). The higher the lm/W the more efficient is the lamp. For example:

- Incandescent lamps are around 13lm/W
- Tungsten halogen lamps 20lm/W
- Compact fluorescent (CF) lamps up to 80lm/W
- Metal Halide (HIT) lamps up to 100lm/W

**3. Total power consumption** of a luminaire is the sum of the lamp wattage and the watt loss of the control gear, like ballasts and transformers.

Conventional iron core ballasts and transformers can have high, double digit watt losses, while good quality electronic ballasts have watt losses as low as 1.5W.

**4. Standard lighting** calculations are based on reflectance of 80% for ceiling (white), 50% for walls (light colour) and 20% for floors (light grey). Dark décor colours on all 3 surfaces can result in requiring double the amount of luminaires to achieve the same light level.



A higher or lower LOR can have a dramatic effect on how many luminaires are required to achieve the same light level in the same area. A simple calculation and a comparison as follows between 2 CF downlighters 2 x 32W of the same type, (3S Lighting model **112300** and a very similar dimensioned 2 x 32W downlighter from another reputable manufacturer), demonstrates this.

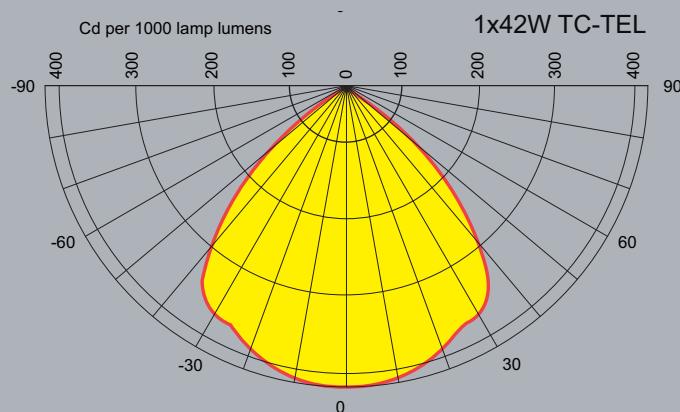
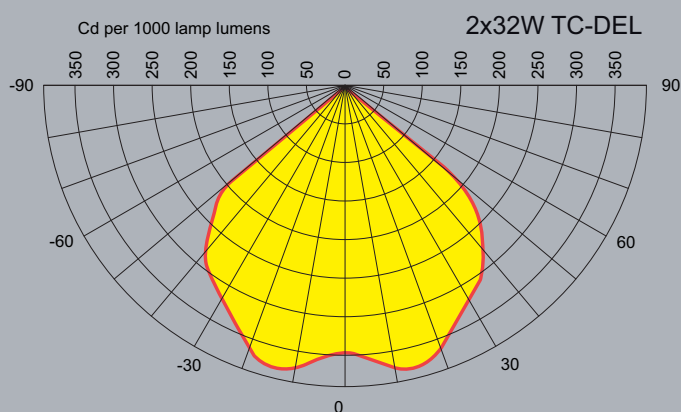
3S Luminaire with **75% LOR** - luminaire from competitor with 46% LOR = 29% difference :  $46\% = 0.63 = 63\%$  more luminaires are required to achieve the same light level in the same area with a luminaire of 46% LOR instead of a luminaire with 75% LOR. In an installation it means 100 fittings instead of only 61.

Over a lifetime (usually 10 years or more) of an installation this multiplies as follows:  $100 \times 67W$



## LOR 75%

## LOR 87.9%



(inclusive watt loss of ballast) x 10 hours per day x 300 days per annum x 10 years (30,000hrs burning time of luminaires) = 201,000 KW/hr compared to 61 x 67 x 10 x 300 x 10 = 122,000 KW/hr, a saving of 79,000 KW/hr. Adding the lesser load on air conditioning and 39% less lamps needing replacing, the savings in financial terms and green house gases are very substantial, on even a small installation of 61 fittings as following calculations proves:

1. Conservatively every extra watt used by a luminaire adds 0.4 W load on to the air conditioning:

$79,000 \times 0.4 = 31,600$  KW/hr, so the total power saving is 110,000 KW/hr. x 12 cents (at a very good commercial rate) = **\$13,200 savings**

2. 78 lamps (at average life of 10,000 hrs) x 2,4 (10 years) = 78 x \$ 15 (inclusive labour cost conservatively) = **\$1,170 savings**

3. Installation cost per fitting plus power point conservatively \$100 x 39 = **\$3,900**

4. 39 x CF downlighters 2 x 32W at \$180 each = **\$7,020**

**Total savings \$25,290**

CO2 emission is 0.9kg for each KW/hr generated, the additional CO2 emission for 110,000 KW/hr is over 99 tons.

Please note that single lamp CF downlighters have a significant higher LOR than 2 lamp CF fittings. So if you have problems meeting BCA requirements, use single lamp luminaires, 3S lighting single lamp CF downlighters have LOR's of up to 89.1%.

So check the LOR before specifying Light fittings.

Please note that BCA <Watts/ per square meter> standards require to calculate lamp wattage only and does not include the watt loss of ballasts.

