The key requirements for a lighting upgrade for NCBA is that it:

- Achieves a reduction in energy consumption without reducing the level of service or output.
- The lighting levels must exceed the relevant recommendations of the AS/NZS 1680, taking into account lumen depreciation over time.
- In addition at a minimum, consideration must be given to:
  - Correlated Colour Temperature\(^1\) and matching existing lighting;
  - Colour Rendering Index\(^2\) in order to accurately portray colour;
  - Glare, in order to avoid ‘disability’ glare and ‘discomfort glare’;
  - Reflectance off surfaces; and
  - Daylight effects.

The first step in providing the correct solution is to identify the needs of the site. Check the Australian Standard for the minimum recommended illumination levels and then the type of luminaire which best suits the glare control limits required can be selected. The Australian Standards recommended illumination levels will permit consistently high task efficiency with comfortable intensity levels. It is accepted that corporate requirements, or unusual circumstances, may require different levels in various situations.

It is important that we provide proof that the minimum ‘maintained luminance’ (lux) levels have been complied with.

1. Use a “reference activity” from AS/NZS 1680, that is at least equivalent to the estimated minimum maintained lighting levels that the upgraded lighting equipment will need to achieve.
2. Take Post Upgrade lux level readings and note on the Lighting Upgrade Performance Report.
3. Locations of LUX levels must be cross referenced and identified clearly on the Lighting Plan.
4. Consider referencing relevant industry standards (i.e. retail premises may define minimum service levels as per recommendations by the Australian Retailer Association) where applicable.

The top 8 items to remember when recording lux levels are: results

* Before taking readings, photocells should be exposed to proximate illuminance to be measured, until reading is stabilised
* Measurement should be taken either after dark or daylight excluded, where possible
* Lighting system should be on for a sufficient time before LUX levels are taken, allowing time to stabilise
* Measurement should be taken on horizontal, vertical or the incline in which the task is performed. In open areas take levels at floor level.
* A series of points, set out in a regular pattern should be used to take LUX levels then apply an average
* A typical space or measurement area should be selected out of a large area, as a representative measurement space.
* Measurement areas should be near to square if possible and cover an entire pattern of array of lighting
* Measurements to be taken 1 metre apart, except in large warehouses where it is more practical to take up to 5 metres apart.
* Measurements should be no closer to the wall than 1 metre.

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\(^1\) Correlated Colour Temperature is a measurement of the apparent colour of the light source.

\(^2\) Colour Rendering Index is a measurement of how accurately a light source can portray the colour of an object in comparison to a reference light source.
<table>
<thead>
<tr>
<th>Class of task</th>
<th>Recommended maintained luminance lx</th>
<th>Characteristics of the activity/interior</th>
<th>Representative activities/interiors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement and orientation*</td>
<td>40</td>
<td>Interiors rarely visited with visual tasks limited to movement and orientation</td>
<td>Corridors; cable tunnels; indoor storage tanks; walkways</td>
</tr>
<tr>
<td>Rough intermittent*</td>
<td>80</td>
<td>Interiors requiring intermittent use with visual tasks limited to movement, orientation and coarse detail</td>
<td>Staff change rooms; live storage of bulky material; dead storage of materials needing care; locker rooms; loading bays</td>
</tr>
<tr>
<td>Simple</td>
<td>160</td>
<td>Any continuously occupied interior where there are no tasks requiring perception of other than coarse detail. Occasional reading of clearly printed documents for short periods.</td>
<td>Waiting rooms; staff canteens; rough checking of stock; rough bench and machine work; entrance halls; general fabrication of structural steel; casting concrete; automated process monitoring; turbine halls.</td>
</tr>
<tr>
<td>Ordinary or moderately easy</td>
<td>240</td>
<td>Continuously occupied interiors with moderately easy visual tasks with high contrasts or large detail (&gt;10 min arc).</td>
<td>School chalkboards and charts; medium woodworking; food preparation; counters for transactions.</td>
</tr>
<tr>
<td>Moderately difficult</td>
<td>320</td>
<td>Areas where visual tasks are moderately difficult with moderate detail (5-10 min arc or tolerances to 125μm) or with low contrast.</td>
<td>Routine office tasks, e.g. reading, writing, typing, enquiry desks.</td>
</tr>
<tr>
<td>Difficult</td>
<td>600</td>
<td>Areas where visual tasks are difficult with small detail (3-5 min arc or tolerances to 25μm) or with low contrast.</td>
<td>Drawing boards; most inspection tasks; proofreading; fine machine work; fine painting and finishing; colour matching.</td>
</tr>
<tr>
<td>Very difficult</td>
<td>800</td>
<td>Areas where visual tasks are very difficult with very small detail (2-3 min arc) or with very low contrast.</td>
<td>Fine inspection; paint retouching; fine manufacture; grading of dark materials; colour matching of dyes.</td>
</tr>
<tr>
<td>Extremely difficult</td>
<td>1200</td>
<td>Areas where visual tasks are extremely difficult with extremely small detail (1-2 min arc or tolerances below 25μm) or low contrast. Visual aids may assist.</td>
<td>Graphic arts inspection; hand tailoring; fine die sinking; inspection of dark goods; extra-fine bench work.</td>
</tr>
<tr>
<td>Exceptionally difficult</td>
<td>1600</td>
<td>Areas where visual tasks are exceptionally difficult with exceptionally small detail (&lt;1 min arc) or with very low contrasts. Visual aids will be of advantage.</td>
<td>Finished fabric inspection; assembly of minute mechanisms, jewellery and watchmaking.</td>
</tr>
</tbody>
</table>

* Refer also to AS/NZS 1680.0 for minimum requirements for safe movement.

NOTE: See the Standards in the AS(/NZS) 1680.2 series for the recommended maintained luminance for specific tasks and interiors.

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