Public Lighting – How and Why

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Introduction

• Lighting for drivers
• Lighting for pedestrians

What are the requirements for each type of road user?
Why have we got these requirements?
Reasons for Lighting for Drivers

• Safety
• Comfort
• Traffic density
How Lighting is Specified for Drivers

- Average Road Luminance ($\bar{L}$)
- Overall Uniformity ($U_O$)
- Longitudinal Uniformity ($U_L$)
- Disability Glare - Threshold Increment (TI\%)
- Surround Ratio (SR)
<table>
<thead>
<tr>
<th>Class</th>
<th>Luminance of the road surface of the carriageway for the dry road surface condition</th>
<th>Disability glare</th>
<th>Lighting of surroundings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$L$ in cd/m² [minimum maintained]</td>
<td>$U_o$ [minimum]</td>
<td>$U_i$ [minimum]</td>
</tr>
<tr>
<td>ME1</td>
<td>2,0</td>
<td>0,4</td>
<td>0,7</td>
</tr>
<tr>
<td>ME2</td>
<td>1,5</td>
<td>0,4</td>
<td>0,7</td>
</tr>
<tr>
<td>ME3a</td>
<td>1,0</td>
<td>0,4</td>
<td>0,7</td>
</tr>
<tr>
<td>ME3b</td>
<td>1,0</td>
<td>0,4</td>
<td>0,6</td>
</tr>
<tr>
<td>ME3c</td>
<td>1,0</td>
<td>0,4</td>
<td>0,5</td>
</tr>
<tr>
<td>ME4a</td>
<td>0,75</td>
<td>0,4</td>
<td>0,6</td>
</tr>
<tr>
<td>ME4b</td>
<td>0,75</td>
<td>0,4</td>
<td>0,5</td>
</tr>
<tr>
<td>ME5</td>
<td>0,5</td>
<td>0,35</td>
<td>0,4</td>
</tr>
<tr>
<td>ME6</td>
<td>0,3</td>
<td>0,35</td>
<td>0,4</td>
</tr>
</tbody>
</table>

¹) An increase of 5 percentage points in $TI$ can be permitted where low luminance light sources are used.

²) This criterion may be applied only where there are no traffic areas with their own requirements adjacent to the carriageway.
Visual Tasks

- Task Size
- Luminance
- Luminous Contrast
Questions about Lighting for Drivers

• Is small target visibility an appropriate criterion?
• What is the impact of colour contrast?
• What is the impact of headlights?
• Is $U_L$ the best measure to control driver comfort?
• What is the impact of mesopic vision?
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Tasks for Pedestrians

- Safe movement
- Orientation
- Visual comfort
- Facial recognition
- A general feeling of safety
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Average recognition distance observers
PLT 827, PLT 840, SON

Graph showing the relationship between recognition distance [m] and semi-cylindrical illuminance [E_{sc}]. The graph includes three lines representing PLT 840, PLT 827, and SON.
Results from the facial recognition experiment with 2 subjects

Recognition distance [m]

- PLT 840
- PLT 827
- SON

Legend:
- PLT 840
- PLT 827
- SON

2 subjects
Change in Recognition Distance with Age

Semi-Cylindrical Illuminance [$E_c$]

Recognition Distance [m]

- 20 - 30
- 45 +
Study by Boyce

- Subjects taken to parking lots in the Albany area
- Rated “Safe to Walk”
- Sites visited by night and by day
Lighting for Pedestrians

- Mainly Specified by $S$ classes – $E_h$
- Other classes available but not generally used
  - $E_{scyl}$
  - $E_{ssph}$
Conclusion

• Lighting for drivers
  – Lighting specification well related to key task
  – Is the task the right one?

• Lighting for pedestrians
  – Good basic understanding of visual needs
  – Lighting specification not well related to tasks