Purpose

- Prepare a draft protocol for the testing and assessment of vehicle lighting systems that will:
  - Encourage vehicle manufacturers to provide brake and turn signal lights with photometric performance near the top of the range permitted under the Australian Design Rules and
  - Encourage optional safety-related lighting features such as daytime running lights.
Lighting ADRs

- ADRs permit a large range in photometric performance for compulsory vehicle lights
- Most vehicles appear to have mid-range light performance

Road Design Sight Distances

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Intersection Sight Distance</th>
<th>Overtaking Sight Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>40km/h</td>
<td>80m</td>
<td>160m</td>
</tr>
<tr>
<td>60km/h</td>
<td>120m</td>
<td>220m</td>
</tr>
<tr>
<td>80km/h</td>
<td>170m</td>
<td>340m</td>
</tr>
<tr>
<td>100km/h</td>
<td>230m</td>
<td>480m</td>
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</tbody>
</table>
Road design practices also give us an indication of the required intensity of various lights to achieve a given signal range - that is, the light is significantly more noticeable than the background.

Research conducted for traffic signals revealed:

- Yellow lights needs 3 times the luminous intensity (candela) of red lights for the same signal range.
- Range is proportional to $\sqrt{\text{intensity}}$
- Range is inversely proportional to $\sqrt{\text{background illumination}}$, which can vary by 4 orders of magnitude - a light that is clearly seen at dusk might not be noticeable during a bright day.
- Angle from line of sight affects signal range.

**Signal Range of Vehicle Lights**

![Graph showing signal range vs. light intensity for different types of lights such as white, red, and yellow signals at various signal range (m) and light intensity (cd).]
Room for improvement

- Best performing brake light (520cd day only, 160m) has over three times the signal range of the worst performing light (40cd day/night, 50m).
- Best performing day/night brake light (100cd, 70m) has 50% greater signal range than the worst.
- With a 70m signal range, the brightest allowable day/night brake light is considered to be barely adequate on a bright day.
- Similar concerns apply to turn signals.

Scoring light performance

- Turn signals and brake lights could be tested by a recognised photometric lab. This non-destructive testing can be done in any city.
- Score maximum points if near the maximum intensity permitted by the ADRs.
- Zero points if near the lower limits.
- Very simple and uses limits and test procedures prescribed in the ADRs.
Possible bonus points

- Dual intensity turn signals and brake lights (as allowed by ADR)
- Automatic headlights (turn on when ambient light levels fall)
- Dedicated daytime running lights
- Headlight “on” alarms
- Cornering (adaptive) headlights
- US-style side marker lights

Recommendations

Consider a consumer rating (ANCAP) for vehicle lighting systems that

- Encourages dedicated DRLs
- Encourages better performing brake lights and turn signals (such as dual intensity lights linked to a sensor)