General requirements for broadcast lighting

SLL Lighting Guide 4
CEN 12193 Light and Lighting - Sports lighting
CIE 83 Guide for the Lighting of Sports Events for Colour Television and Film Systems
CIE 112 Glare Evaluation System for Use within Outdoor Sports and Area Lighting
Athens Olympic Broadcast Specification
Beijing Olympic Broadcast Specification
Light source colour properties

Tk : colour temperature

Ideally around 5500 K
Light source colour properties

Ra : colour rendering index

Ideally > 80
Horizontal illuminance

Visual background
Adaptation state of the eye
Visually uniform
Vertical illuminance

To see objects
Quality of CTV pictures
Every camera location
Vertical illuminance

- Depth of field
- To focus on the action
Creating vertical illuminance

Steep Angle – Poor vertical

Shallow Angle – Good vertical
Vertical illuminance

Camera performance (*manufacturer’s data*)

Standard & High Definition TV: 1000 to 2000 lux
Super Slow Motion SSM: 1500 to 3000 lux

Most common practice

800 to 2000 lux average depending on the activity level
Glare

Players / Cameras
GR 40 – 45

Limiting tilt angle
<65°
No luminaire shall be aimed directly at a stationary camera, and preferably not within a 50° cone centred on the camera (Athens Olympic Broadcast specification)
Flicker

A particular problem for (Super) Slow Motion cameras is 50Hz flicker due to the phasing of the light.

Cameras perceive changes in light levels due to the uneven ratio between the camera scanning frequency and the alternating amplitude of artificial lights powered by mains frequency.

This effect is only visible during slow motion replay.
London 2012 Super Slow motion speed specification: 300 fps
# Velodrome

<table>
<thead>
<tr>
<th>Mode</th>
<th>Average Maintained Illuminance (lux)</th>
<th>Working Plane</th>
<th>Uniformity Ratio</th>
<th>Glare Index</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Events, including Olympic Games</td>
<td>2000</td>
<td>Vertical</td>
<td>0.8h / 0.7v</td>
<td>50</td>
<td>LOCOG, CIBSE</td>
</tr>
<tr>
<td>(with HDTV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Racing</td>
<td>1000</td>
<td>Vertical</td>
<td>0.8h / 0.7v</td>
<td>50</td>
<td>UCI Regulations, CIBSE</td>
</tr>
<tr>
<td>Elite Training</td>
<td>750</td>
<td>Horizontal</td>
<td>0.7h</td>
<td>50</td>
<td>UCI Regulations/British Cycling, CIBSE</td>
</tr>
<tr>
<td>Training</td>
<td>300</td>
<td>Horizontal</td>
<td>0.7h</td>
<td>n/a</td>
<td>UCI Regulations, CIBSE</td>
</tr>
</tbody>
</table>

Illuminance over 1st 12 rows of seats 10%-25% track illuminance
Velodrome

Beijing

London
## Main Stadium

<table>
<thead>
<tr>
<th>Area</th>
<th>Illuminance (lux)</th>
<th>Uniformity minimum with target in brackets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ev-Cam-min</td>
<td>Eh-ave</td>
</tr>
<tr>
<td></td>
<td>(see note 2)</td>
<td></td>
</tr>
<tr>
<td>FOP - total (see note 7)</td>
<td>1,400</td>
<td>(see Ratios)</td>
</tr>
<tr>
<td>FOP - specific grids</td>
<td>1,400</td>
<td>(see Ratios)</td>
</tr>
<tr>
<td>FOP - finish Line</td>
<td>1,400</td>
<td>(see Ratios)</td>
</tr>
<tr>
<td>Warm-up(s); ERC</td>
<td>1,000</td>
<td>(see Ratios)</td>
</tr>
<tr>
<td>Run-off</td>
<td></td>
<td>(see Ratios)</td>
</tr>
<tr>
<td>Spectators &gt; Cam#1 (see note 3)</td>
<td>(see Ratios)</td>
<td></td>
</tr>
</tbody>
</table>

**Ratios**

- Eh-ave-FOP/Ev-ave-Cam: $\geq 0.75$ and $\leq 1.5^*$
- Ev-point-over 4 planes (note 4) $\geq 0.6$
- Ev-ave-spec : Ev-ave-Cam $\geq 0.1$ and $\leq 0.25$
- Eh-ave-Run-off : Eh-ave-FOP $\geq 0.1$ and $\leq 0.33$
Main Stadium

- Lighting too low for broadcast
- No camera flare

20m
Illuminance level in stands

Ev towards main camera

<table>
<thead>
<tr>
<th></th>
<th>Max</th>
<th>Min</th>
<th>Ave</th>
<th>Min/Ave</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>679.8</td>
<td>389.4</td>
<td>508.7</td>
<td>0.77</td>
<td>0.57</td>
</tr>
</tbody>
</table>
Phasing to limit Flicker

Maximum variation between phases
Aquatics
Commissioning
Commissioning Velodrome
Commissioning Velodrome
Commissioning Stadium
Commissioning Stadium
Commissioning Stadium
Commissioning Aquatics
Commissioning Aquatics
Commissioning Aquatics
External Lighting
External Lighting
External Lighting

Halos of Light
External Lighting

Accelerator Mittal Orbit
Lessons

Engage with the Lighting Designer at the earliest possible stage

The requirements for broadcast lighting will affect structural considerations

Broadcast and lighting technology is moving fast, don’t rely on existing guidance to future-proof your facility.