Lighting Impact Assessment -
Building Identification Signage at 388 George St, Sydney, NSW

<table>
<thead>
<tr>
<th>DATE</th>
<th>REV</th>
<th>COMMENT</th>
<th>PREPARED BY</th>
<th>CHECKED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/10/2019</td>
<td>REV C</td>
<td>For Information</td>
<td>AG</td>
<td>RS</td>
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</table>
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1. INTRODUCTION

Electrolight have been appointed by Diadem to undertake a Lighting Impact Assessment on the building identification signage to be installed at 388 George St, Sydney, NSW. The objective of the assessment is to report on compliance with the State Environmental Planning Policy No. 64 – Advertising and Signage (SEPP 64), NSW Transport Corridor Outdoor Advertising and Signage Guidelines, AS4282-2019 Control of the Obtrusive Effects of Outdoor Lighting, and the Sydney Development Control Plan (Signs and Advertisements) 2012.

2. DEFINITIONS

2.1 Illuminance
The physical measure of illumination is illuminance. It is the luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx); 1 lx = 1 lm/m².

(a) Horizontal illuminance (Eh) The value of illuminance on a designated horizontal plane
(b) Vertical illuminance (Ev) The value of illuminance on a designated vertical plane

Where the vertical illuminance is considered in the situation of potentially obtrusive light at a property boundary it is referred to as environmental vertical illuminance (Eve).

2.2 Luminance
The physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire or reflecting material such as the road surface) when viewed from a specified direction. SI Unit: candela per square metre (cd/m²) – also referred to as “nits”.

2.3 Luminous Intensity
The concentration of luminous flux emitted in a specified direction. Unit: candela (cd).

2.4 Obtrusive Light
Spill Light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information.

2.5 Threshold Increment
The measure of disability glare expressed as the percentage increase in contrast required between a standard object and its background (the carriageway) for it to be seen equally as well with the source of glare present as with it absent, derived in the specified manner. This metric is directly related to Veiling Luminance.

NOTE: The required value is a maximum for compliance of the lighting scheme.

2.6 AGI32 Light Simulation Software
AGI32 (by U.S. company Lighting Analysts) is an industry standard lighting simulation software package that can accurately model and predict the amount of light reaching a designated surface or workplace. AGI32 is a has been independently tested against the International Commission On Illumination (CIE) benchmark, CIE 171:2006, Test Cases to Assess the Accuracy of Lighting Computer Programs.

2.7 Upward Light Ratio (ULR)
The ratio between the luminous flux emitted above the horizontal plane to the total flux emitted by a light source. The ULR is used as a measure to limit direct spill light to the sky.
3. SITE DESCRIPTION AND SCOPE

The proposed building identification signage is located at 388 George St, Sydney, and is situated on the eastern and southwestern facades at high level. For the purposes of the assessment, a rectangular illuminated signage zone has been used, with locations as shown in Appendix A. Any proposed signage installed in the relevant location/s that has an illuminated area equal to (or less than) the nominated illuminated signage zone, and that operates as outlined in this report, will comply with the findings of this assessment. The total area of the eastern illuminated signage zone is 21.05 m², and total area of the southwestern illuminated signage zone is 32.98 m².

The existing area has a high level of illumination, with public lighting, illuminated signage and light from adjacent buildings contributing to the overall night time environment. Given the existing environment and the location of the proposed signs, the impact on the public domain should not be significant. Further assessment of lighting impact can be found in Section 5 and 6 of this report.

The proposed internally illuminated signage utilises dimmable RGB LEDs as the light source. The specification of the LED sources is not known, however, for the purpose of this report, the luminance of the signage is not to exceed the values shown in this report. The light sources are to be dimmable to ensure compliance with this assessment. The colour of the LEDs in the signage will have a minimum dwell time of 24 hours, meaning only one colour will be displayed each evening. The sign will be static colour and will not employ scrolling, flashing or animated effects. The signage must also incorporate upward waste light mitigation, resulting in an Upward Light Ratio (ULR) not more than 50%.

4. DESIGN GUIDELINES AND STANDARDS

The Lighting Impact Assessment will review the proposed signage against the following Criteria, Design Guidelines and Standards.

- State Environmental Planning Policy No. 64 – Advertising & Signage SEPP 64 (Refer Appendix B).
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017
- AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.
- Sydney Development Control Plan (Signs and Advertisements) 2012.
5. LUMINANCE ASSESSMENT

The maximum permissible night time luminance of the signage is determined by the existing lighting environment of its surroundings. AS4282 outlines maximum average luminances for different Environmental Zones as shown in Table 1 below:

<table>
<thead>
<tr>
<th>Environmental Zone</th>
<th>Description</th>
<th>Max Average Luminance (cd/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4</td>
<td>High district brightness e.g. Town and city centres, commercial areas, and residential areas abutting commercial areas</td>
<td>350</td>
</tr>
<tr>
<td>A3</td>
<td>Medium district brightness e.g. suburban areas in towns and cities</td>
<td>250</td>
</tr>
<tr>
<td>A2</td>
<td>Low district brightness e.g. sparsely inhabited rural and semi-rural areas</td>
<td>150</td>
</tr>
<tr>
<td>A1</td>
<td>Dark e.g. relatively uninhabited rural areas. No Road Lighting</td>
<td>0.1</td>
</tr>
<tr>
<td>A0</td>
<td>Intrinsically Dark e.g. Major Optical Observatories. No Road Lighting</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Note: Where the signage is viewed against a predominantly dark background (e.g. night sky) then the maximum applicable environmental zone is A2.

Based on an assessment of the surrounding environment, the proposed signage is located within Environmental Zone A4 under AS4282, therefore the maximum night time luminance is 350 cd/m².

The Transport Corridor Outdoor Advertising & Signage Guidelines outlines maximum permissible luminance limits for different environmental zones. Under the Guidelines, the proposed signage is classified as being within Zone 2, which is described as an area with generally high off-street ambient lighting, e.g. some major shopping/commercial centres with a significant number of off-street illuminated advertising devices and lights. The maximum night time luminance of a non-digital signage within Zone 2, with an illuminated area greater than 10m², is 300 cd/m².

The Sydney Development Control Plan also outlines a maximum night time luminance for illuminated (non digital) signs of 300 cd/m².

Table 2 outlines the maximum luminance levels to comply with AS4282, the Transport Corridor Outdoor Advertising & Signage Guidelines, and the Sydney Development Control Plan for the various lighting conditions listed below:

<table>
<thead>
<tr>
<th>Lighting Condition</th>
<th>Max Permissible Luminance (cd/m²)</th>
<th>Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>OFF</td>
<td>✓</td>
</tr>
<tr>
<td>Night Time</td>
<td>300</td>
<td>✓</td>
</tr>
</tbody>
</table>

# The signage is to be dimmed on site to ensure the maximum luminance nominated above is not exceeded.
It is our opinion that building identification signage that is illuminated to the maximum luminances outlined above would be visually consistent with the existing ambient lighting and suitable for the local area. A more detailed night time lighting assessment is provided in Section 6.0.

6. AS4282 AND SYDNEY DEVELOPMENT CONTROL PLAN ASSESSMENT

The proposed signage has been assessed against AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting and the Sydney Development Control Plan as outlined in Section 4.

AS4282 provides limits for different obtrusive factors associated with dark hours (night time) operation of outdoor lighting systems. Two sets of limiting values for spill light are given based on whether the lighting is operating before a curfew (known as “pre-curfew” operation) or operating after a curfew (known as post-curfew or curfewed operation). Pre-curfew spill lighting limits are higher than post-curfew values, on the understanding that spill light is more obtrusive late at night when residents are trying to sleep. Under AS4282, the post-curfew period is taken to be between 11pm and 6am daily. As it is intended that the building identification signage be illuminated all night, the assessment will review the proposed signage under the more stringent post-curfew limits.

Illuminance Assessment

The AS4282 assessment includes a review of nearby residential dwellings and calculation of the amount of illuminance (measured in Lux) that the properties are likely to receive from the signage during night time operation.

The acceptable level of illuminance will in part be determined by the night time lighting environment around the dwellings. AS4282 categorises the night time environment into different zones with maximum lighting limits as shown in Table 3 below:

<table>
<thead>
<tr>
<th>Environmental Zone</th>
<th>Max Vertical Illuminance (lx)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-curfew</td>
<td>Post-curfew</td>
</tr>
<tr>
<td>A0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A1</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>A2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>A3</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>A4</td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: Table 3.9 of the Sydney DCP regulates maximum illuminance limits for digital signage only, hence it does not apply to building identification signage.
Based on an assessment of the surrounding areas, the nearest dwellings with potential views to the signage are at the following locations:

<table>
<thead>
<tr>
<th>Address</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Martin Pl</td>
<td>A4</td>
</tr>
<tr>
<td>323-325 George St*</td>
<td>A4</td>
</tr>
<tr>
<td>38 York St</td>
<td>A4</td>
</tr>
<tr>
<td>77-79 York St</td>
<td>A4</td>
</tr>
</tbody>
</table>

* Residential property is currently under development. Calculation points for the nominated address are located along the property boundary.

As such, the dwellings above will form the focus of the illuminance assessment.

The proposed signage (and surrounding environment) was modelled in lighting calculation program AGI32 to determine the effect (if any) of the light spill from the proposed signage. Photometric data for the signage was based on a diffused light source (approximating a lambertian emitter) covering the whole illuminated signage zone of the eastern and southwestern sign, with a luminance corresponding to the night time limit outlined in Section 5. Appendix C shows the lighting model and the results of the calculations.

It can be seen from the lighting model that the maximum illuminance to dwellings is 1.75 lux at 1 Martin Place. The illuminance level above complies with the maximum AS4282 limits outlined in Table 3.

Threshold Increment Assessment
As the sign is mounted at a height that is significantly above the nearby traffic approaches, the sign will comply with the allowable maximum Threshold Increment of 20% in AS4282.

Luminous Intensity
The luminous intensity limits nominated in the standard are not applicable for internally illuminated signage.

Upward Waste Light
The signage must incorporate upward waste light mitigation, resulting in an Upward Light Ratio (ULR) not more than 50%.

Additional Requirements
As the colours of the signage can change, the dwell time must be 10 seconds or longer and the average luminance difference between successive colour/image changes does not exceed 30% to ensure compliance with AS4282. The colour of the LEDs in the signage will have a minimum dwell time of 24 hours, meaning only one colour will be displayed each evening. As such, there will be no successive changes and the proposed signage will comply with this requirement.

Summary
It can therefore be seen that the proposed signage complies with all relevant requirements of AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting and Sydney Development Control Plan 2012.
7. SUMMARY

- The proposed building identification signage to be installed at 388 George St, Sydney, shall be commissioned on site to yield the following maximum luminances:

<table>
<thead>
<tr>
<th>Lighting Condition</th>
<th>Max Permissible Luminance (cd/m²)</th>
<th>Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>OFF</td>
<td>✔️</td>
</tr>
<tr>
<td>Night Time</td>
<td>300</td>
<td>✔️</td>
</tr>
</tbody>
</table>

- The final illuminated area of the signage must not exceed 21.05 m² for the eastern sign, and 32.98 m² for the southwestern sign.
- The signage must incorporate upward waste light mitigation, resulting in an Upward Light Ratio (ULR) not more than 50%.
- The proposed signage has been found to comply with all relevant requirements of AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting, SEPP 64 Transport Corridor Outdoor Advertising & Signage Guidelines, and Sydney Development Control Plan (Signs and Advertisements) 2012.
- In complying with the above requirements, the proposed signage should not result in unacceptable glare nor should it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the proposed signage should not cause any reduction in visual amenity to nearby residences or accommodation.
8. DESIGN CERTIFICATION

The building identification signage proposed to be installed at 388 George St, Sydney, NSW, if commissioned according to this report, complies with the following criteria, guidelines and standards:

- AS 4282-2019 Control of the Obtrusive Effects of Outdoor Lighting.
- Sydney Development Control Plan (Signs and Advertisements) 2012
- State Environmental Planning Policy No. 64 – Advertising & Signage SEPP 64 (Refer Appendix B).

Ryan Shamier
Senior Lighting Designer
Electrolight Sydney
25/10/2019
Building location
388 George St, Sydney, 2000

Situated on the predominant corner of George and King Street, the building has three elevations facing highly visible pockets of the city as well as neighbouring high rise buildings.
APPENDIX A
SIGN LOCATION PLAN AND ELEVATIONS
APPENDIX B

State Environmental Planning Policy No. 64 - Advertising and Signage

Schedule 1 Assessment criteria
(Clauses 8, 13 and 17)

1. **Character of the area**
   - Is the proposal compatible with the existing or desired future character of the area or locality in which it is proposed to be located?
   - Is the proposal consistent with a particular theme for outdoor advertising in the area or locality?

2. **Special areas**
   - Does the proposal detract from the amenity or visual quality of any environmentally sensitive areas, heritage areas, natural or other conservation areas, open space areas, waterways, rural landscapes or residential areas?

3. **Views and vistas**
   - Does the proposal obscure or compromise important views?
   - Does the proposal dominate the skyline and reduce the quality of vistas?
   - Does the proposal respect the viewing rights of other advertisers?

4. **Streetscape, setting or landscape**
   - Is the scale, proportion and form of the proposal appropriate for the streetscape, setting or landscape?
   - Does the proposal contribute to the visual interest of the streetscape, setting or landscape?
   - Does the proposal reduce clutter by rationalising and simplifying existing advertising?
   - Does the proposal screen unsightliness?
   - Does the proposal protrude above buildings, structures or tree canopies in the area or locality?
   - Does the proposal require ongoing vegetation management?
5. **Site and building**
   - Is the proposal compatible with the scale, proportion and other characteristics of the site or building, or both, on which the proposed signage is to be located?
   - Does the proposal respect important features of the site or building, or both?
   - Does the proposal show innovation and imagination in its relationship to the site or building, or both?

6. **Associated devices and logos with advertisements and advertising structures**
   - Have any safety devices, platforms, lighting devices or logos been designed as an integral part of the signage or structure on which it is to be displayed?

7. **Illumination**
   - Would illumination result in unacceptable glare?
   - Would illumination affect safety for pedestrians, vehicles or aircraft?
   - Would illumination detract from the amenity of any residence or other form of accommodation?
   - Can the intensity of the illumination be adjusted, if necessary?
   - Is the illumination subject to a curfew?

8. **Safety**
   - Would the proposal reduce the safety for any public road?
   - Would the proposal reduce the safety for pedestrians or bicyclists?
   - Would the proposal reduce the safety for pedestrians, particularly children, by obscuring sightlines from public areas?
APPENDIX C

VEILING LUMINANCE & OBTRUSIVE LIGHTING CALCULATIONS

<table>
<thead>
<tr>
<th>Label</th>
<th>CalcType</th>
<th>Units</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Martin Place SE_1_III_Seg1</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>1.75</td>
</tr>
<tr>
<td>1 Martin Place SE_III_Seg1</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>0.94</td>
</tr>
<tr>
<td>38 York St_III_Seg1</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>1.03</td>
</tr>
<tr>
<td>38 York St_III_Seg2</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>0.43</td>
</tr>
<tr>
<td>77-79 York St_III_Seg1</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>0.10</td>
</tr>
<tr>
<td>77-79 York St_III_Seg2</td>
<td>Obtrusive Light - III</td>
<td>Lux</td>
<td>0.54</td>
</tr>
</tbody>
</table>
APPENDIX C
VEILING LUMINANCE & OBTRUSIVE LIGHTING CALCULATIONS

**Obtrusive Light - Compliance Report**
AS/NZS 4282:2019, A4 - High District Brightness, Curfew
Filename: 2533 - LIA Diadem GBE Signage George St rev C
24/10/2019 10:59:42 am

**Illuminance**
Maximum Allowable Value: 5 Lux

<table>
<thead>
<tr>
<th>Calculation Label</th>
<th>Test Results</th>
<th>Max. Illum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 York St_III_Seg1</td>
<td>PASS</td>
<td>1.03</td>
</tr>
<tr>
<td>38 York St_III_Seg2</td>
<td>PASS</td>
<td>0.43</td>
</tr>
<tr>
<td>77-79 York St_III_Seg1</td>
<td>PASS</td>
<td>0.10</td>
</tr>
<tr>
<td>77-79 York St_III_Seg2</td>
<td>PASS</td>
<td>0.54</td>
</tr>
<tr>
<td>1 Martin Place SE_1_III_Seg1</td>
<td>PASS</td>
<td>1.75</td>
</tr>
<tr>
<td>1 Martin Place SE_III_Seg1</td>
<td>PASS</td>
<td>0.94</td>
</tr>
</tbody>
</table>