

JCDecaux

LIGHTING IMPACT ASSESSMENT - OUTDOOR SIGNAGE AT
INTERSECTION OF KING ST AND ENMORE RD, NEWTOWN, NSW (OUTBOUND)

10th January 2024
Ref: 3023.8

Lighting Impact Assessment
Outdoor Signage at intersection of King St and Enmore Rd
Newtown, NSW (Outbound)

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1. INTRODUCTION

Electrolight have been appointed by JCDecaux to undertake a Lighting Impact Assessment on the proposed digital signage to be installed at the intersection of King St and Enmore Rd, Newtown, NSW. The objective of the assessment is to report on compliance with the State Environmental Planning Policy (Industry and Employment) 2021, NSW Transport Corridor Outdoor Advertising and Signage Guidelines, and AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting.

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 (E_h) The value of illuminance on a designated horizontal plane

(b) Vertical illuminance (E_v) 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 (E_{ve}).

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 Dynamic content

Where the luminous image, pattern, colour or direction of light changes over an interval of less than 60 seconds.

2.5 Obtrusive Light

Spill light which, because of quantitative or directional attributes, gives rise to annoyance, discomfort, distraction, or a reduction in ability to see essential information such as transport signals.

Note 1 to entry: Obtrusive light includes the impact on humans and environmental receivers.

2.6 Threshold Increment

The measure of disability glare expressed as the percentage increase in luminance contrast threshold required between an object and its background for it to be seen equally well with a source of glare present.

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

2.7 Environmentally Sensitive Area (ESA)

Area of ecological value including, bushland, waterways and marine and coastal areas.

2.8 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 workplane. AGI32 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.

2.9 Upward Light Ratio Luminaire (ULR_L)

The ratio of the luminous flux of a luminaire that is emitted, at and above the horizontal, divided by the total luminaire flux when the luminaire is mounted in its designed position, and excluding reflected light from surfaces or obstructions.

3. SITE DESCRIPTION AND SCOPE

The proposed digital signage is located near the intersection of King St and Enmore Rd, Newtown, NSW. The signage is oriented towards the outbound traffic on King St. The total active display (illuminated) area of the proposed signage is 14.16 m². Refer to Appendix A for proposed signage location plan and elevations.

The proposed digital signage is illuminated using LEDs installed within the front face. The brightness of the LEDs shall be controlled to provide upper and lower thresholds as required as well as automatically via a local light sensor to adjust to ambient lighting conditions. The dwell time of the content displayed on the signage is 60 seconds and it is to operate 24 hours per day.

For the purpose of this report the proposed specification of the digital signage is as outlined in Appendix B. The signage includes baffles which mitigate upward waste light, resulting in an Upward Light Ratio (ULR_L) of not more than 0.45*. Alternative digital sign manufacturers may be used for this installation as long as they have equivalent lighting and performance characteristics and are commissioned as described in this report.

Environmental impact assessments, including the management of artificial light for the protection of specific entities protected by environmental legislation, is beyond the scope of this assessment.

*The signage supplier and/or operator is responsible for complying with the Upward Light Ratio. Electrolight take no responsibility for compliance with this requirement.

4. DESIGN GUIDELINES AND STANDARDS

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

- State Environmental Planning Policy (Industry and Employment) 2021 (Refer Appendix C) (**SEPP Industry and Employment**)
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017 (**Transport Guidelines**)
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting (**AS4282**)

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 1 - MAXIMUM AVERAGE NIGHT TIME LUMINANCE FOR SIGNAGE		
	Description	Max Average Luminance (cd/m2)
A4	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges	350
A3	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas	250
A2	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections	150
A1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas	50
A0	Intrinsically Dark e.g. UNESCO Starlight Reserve, IDA: Dark Sky Parks, Reserves or Sanctuaries, major optical observatories, other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ ecosystem protection, lighting for safe access may be required	0.1

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 350cd/m2.

AS4282 does not include limits for daytime operation of illuminated signage. However, the Transport Guidelines outlines maximum permissible luminance limits for various lighting conditions, including daytime. Under the Transport Guidelines, the proposed signage is classified as being within Zone 4, which is described as an area with generally low levels of off-street ambient lighting e.g. most rural areas, or areas that have residential properties nearby. The maximum luminance limits of digital signage within Zone 4 are: no limit for full sun on face of sign, 6000cd/m2 during the day, 500cd/m2 for twilight and overcast weather and 200cd/m2 for night time.

Table 2 outlines the maximum luminance levels to comply with AS4282 and the Transport Guidelines for the various lighting conditions listed below:

TABLE 2 - LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS		
Lighting Condition	Max Permissible Luminance (cd/m2) [#]	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	500	✓
Night Time	200	✓

[#] The signage is to be dimmed on site to ensure the maximum luminance nominated above is not exceeded.

6. ILLUMINANCE, THRESHOLD INCREMENT & UPWARD LIGHT ASSESSMENT

The proposed signage has been assessed against the lighting criteria and requirements outlined in AS4282.

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 the signage operates all night, the signage will be assessed against 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 3 - MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS			
	Max Vertical Illuminance (lx)		Description
	Pre-curfew	Post-curfew	
A4	25	5	High district brightness e.g. Town and city centres and other commercial areas, residential areas abutting commercial areas, industrial and Port areas and Transport Interchanges
A3	10	2	Medium district brightness e.g. Suburban areas in towns and cities, generally roadways with streetlighting through suburban, rural or semi-rural areas
A2	5	1	Low district brightness e.g. Sparsely inhabited rural and semi-rural areas, generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A1	2	0.1	Dark e.g. Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas), generally roadways without streetlighting through rural areas
A0	0	0	Intrinsically Dark e.g. UNESCO Starlight Reserve, IDA: Dark Sky Parks, Reserves or Sanctuaries, major optical observatories, other accreditations for dark sky places for example astrotourism, heritage value, astronomical importance, wildlife/ ecosystem protection, lighting for safe access may be required

Based on an assessment of the surrounding area, the nearest dwelling/s with potential views to the signage are at the following location/s:

Address	Zone
8 Enmore Rd	A4

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

The proposed signage (and surrounding environment) was modeled 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 provided by the screen manufacturer* with the maximum luminance corresponding to the night time limits outlined in Section 5. Appendix D shows the lighting model and the results of the calculations.

Under AS4282 the signage is defined as displaying “non-dynamic content” (a dwell time of not less than 60 seconds). As such, the maximum allowable illuminance to residential properties is 5 Lux for Zone A4 (as outlined in Table 3). It can be seen from the lighting model that the maximum illuminance for Zone A4 properties is 0.58 lux at 8 Enmore Rd.

The proposed signage therefore complies with the relevant illuminance limits for nearby residential dwellings.

Threshold Increment Assessment

The Threshold Increment was also calculated for the traffic approaches on King St (southbound) and King St onto Enmore Rd (westbound) and Wilson St Left Turn (westbound). The calculation grids were located at 1.5m above ground level, with an approach viewing distance of between 10m to 180m from the signage and a windscreen cutoff angle of 20 degrees (as outlined in AS1158). The calculation results show that the Threshold Increment does not exceed 0.56% for any traffic approach (the allowable maximum under the standard is 20%).

Upward Waste Light Assessment

In order to reduce light pollution and associated environmental impacts, AS4282 includes requirements that limit upward waste light into the night sky from signage. Clause 3.3.3.b) of AS4282 states that digital signage shall have an Upward Waste Light Ratio (ULR_L) of not more than 0.45. The ULR_L of the specified signage is not more than 0.384. The signage therefore complies with this requirement.

Luminous Intensity

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





Summary

It can therefore be seen that the proposed digital signage complies with all relevant requirements of AS4282.

* Electrolight takes no responsibility for the accuracy of third party provided photometric data.

7. SEPP ASSESSMENT

Table 4 below outlines the illumination assessment criteria from the SEPP Industry Employment Schedule 5 - Clause 7 Illumination. While the SEPP only applies to sites located on classified roads, this assessment references the guidelines for all sites as a best practice document in New South Wales. In addition to the criteria, responses have been included demonstrating that the proposed signage is in compliance.

TABLE 4 7. ILLUMINATION ASSESSMENT CRITERIA		
Assessment Criteria	Response	Compliant?
Would illumination result in unacceptable glare?	The proposed signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare.	
Would illumination affect safety for pedestrians, vehicles or aircraft?	The proposed signage complies with the Threshold Increment limits of AS4282, demonstrating that the illumination will not cause unacceptable glare. The small size of the signage and its relatively low intensity limits the risk to pedestrians, vehicles or aircraft.	
Would illumination detract from the amenity of any residence or other form of accommodation?	The proposed signage, when installed according to this report, complies with the illuminance (spill lighting) limits of AS4282, demonstrating that the illumination will not detract from the amenity of any residence or other form of accommodation.	
Can the intensity of the illumination be adjusted, if necessary?	The proposed signage is dimmable and when designed according to this report, includes a light sensor to the front signage that automatically adjusts the brightness of the advertising display to prevailing light conditions.	
Is the illumination subject to a curfew?	The proposed advertising signage, when installed according to this report, complies with the limits required during curfewed operation under AS4282 (nominally between the hours of 11pm and 6am). This means that a curfew is not required.	N/A

8. SUMMARY

- The proposed digital signage to be installed at the intersection of King St and Enmore Rd, Newtown, NSW, shall be commissioned on site to yield the following maximum luminances:

COMPLYING LUMINANCE LEVELS FOR DIGITAL ADVERTISEMENTS		
Lighting Condition	Max Permissible Luminance (cd/m2)	Compliant
Full Sun on face of Signage	No Limit	✓
Day Time Luminance (typical sunny day)	6000	✓
Morning and Evening Twilight and Overcast Weather	500	✓
Night Time	200	✓

- The proposed digital signage has been found to comply with all relevant requirements of AS4282, the Transport Guidelines and SEPP Industry Employment.
- In complying with the above requirements, the proposed digital signage shall not result in unacceptable glare nor shall it adversely impact the safety of pedestrians, residents or vehicular traffic. Additionally, the signage shall not cause any unacceptable amenity impacts to nearby residential dwellings or accommodation.

9. DESIGN CERTIFICATION

The proposed digital signage to be installed at the intersection of King St and Enmore Rd, Newtown, NSW, if commissioned according to this report, complies with the following criteria, guidelines and standards:

- State Environmental Planning Policy (Industry and Employment) 2021
- Transport Corridor Outdoor Advertising & Signage Guidelines 2017
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting



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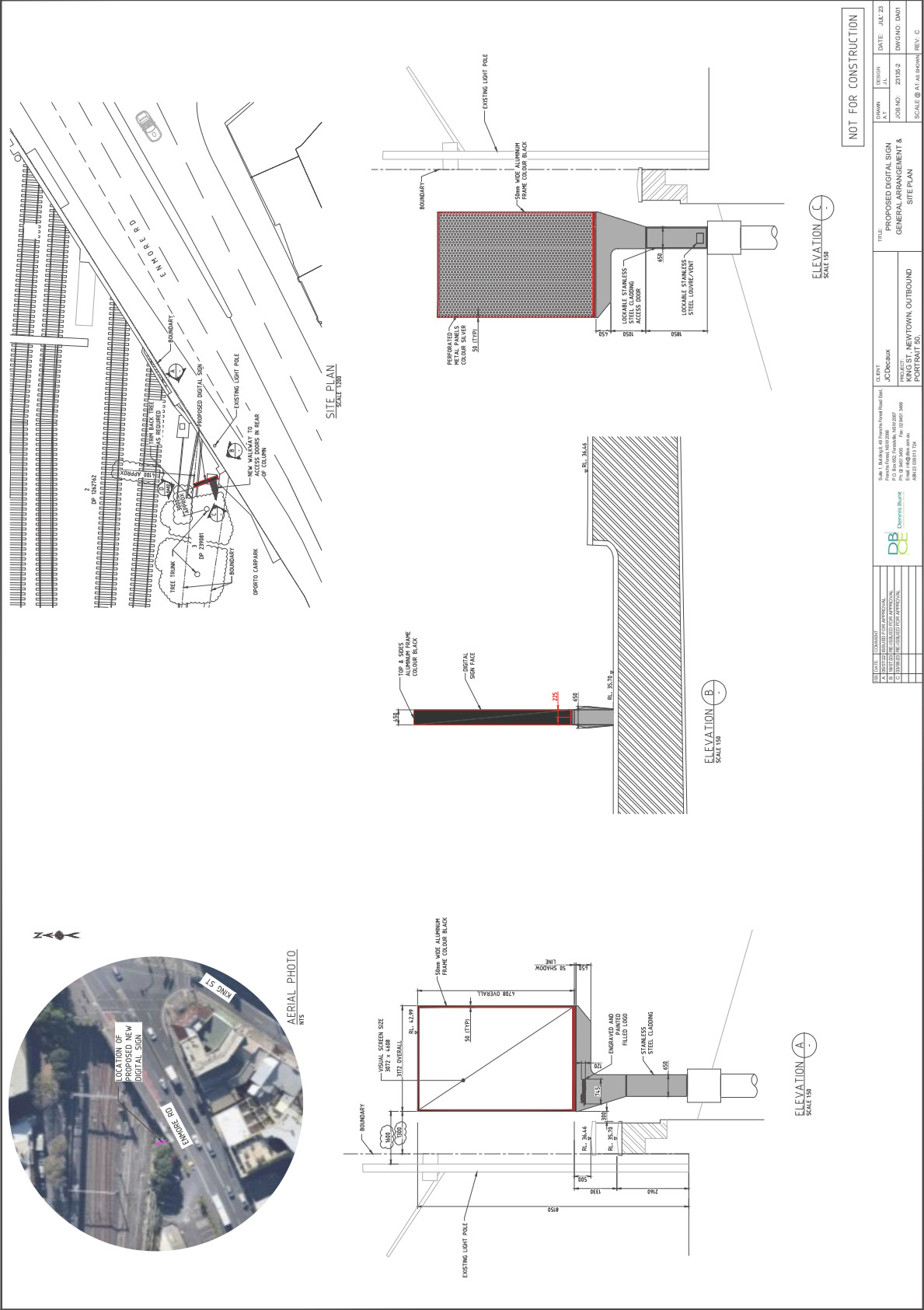
Registered Professional Engineer - New South Wales (PRE0000868)

Senior Lighting Designer

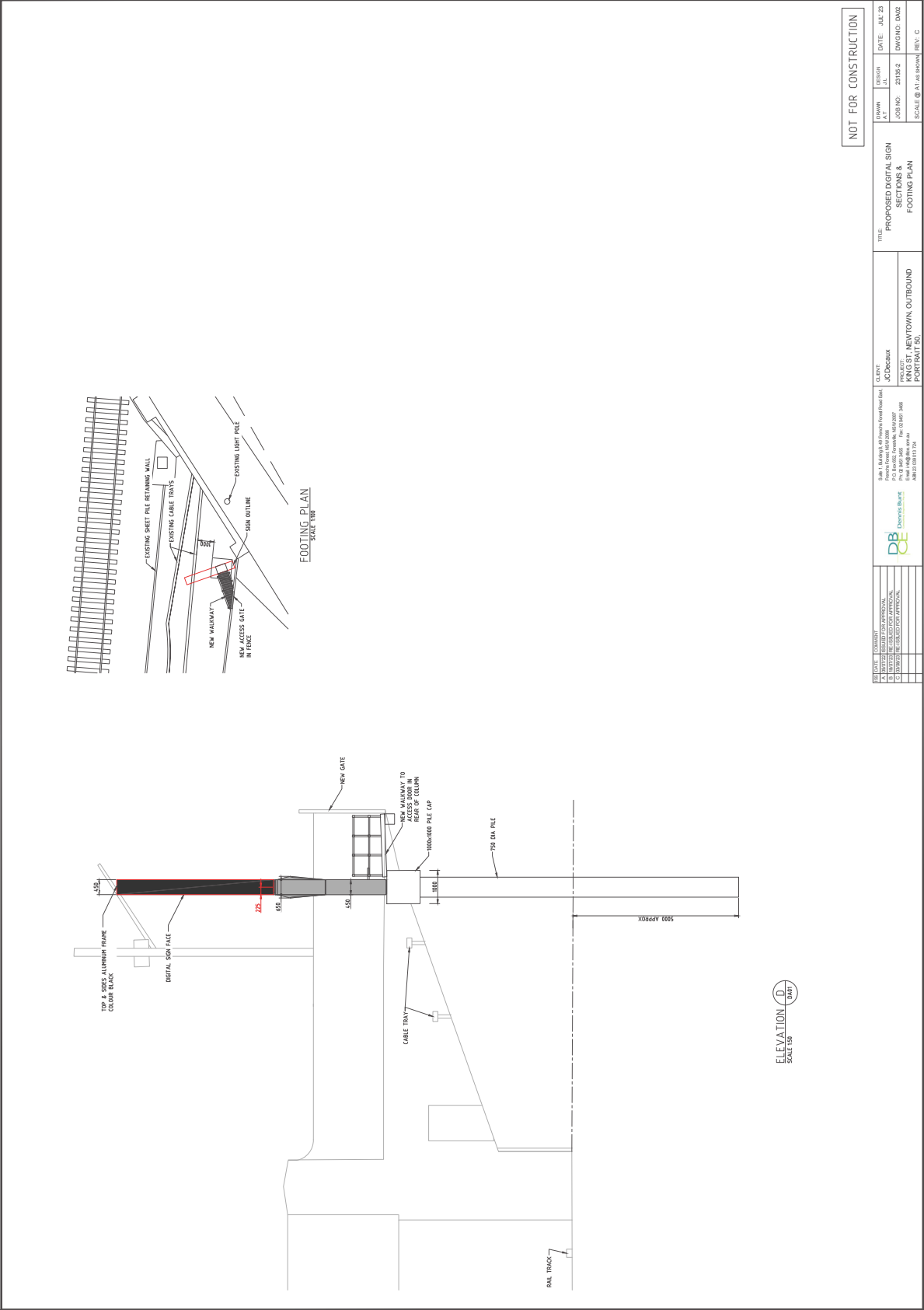
Electrolight Sydney

10/01/24

APPENDIX A
PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES



APPENDIX A
PROPOSED SIGNAGE LOCATION, ELEVATIONS & PHOTOMONTAGES



Big Screen Video

Display Specification

Product Specifications	
Active Screen Size (WxH)	3.072mW x 4.608mH
Active Screen Size (Sqm)	14.16sqm
Matrix Size (WxH)	512 x 768
Aspect Ratio	0.7:1
Display Weight	821kg
Display Weight per Sqm	58kg
Total Avg. Power Consumed	2.97k
Total Max. Power Consumed	8.49kW
Max. Power Consumption per Sqm	0.6kW/m ²
Current Draw	36 amps max load*
Mains Recommendation	Three phase at 20 amps per phase

*Doesn't allow for in-rush current

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APPENDIX B
DIGITAL SIGNAGE SPECIFICATION

Big Screen Video

Specifications: Outdoor 6mm SMD

Product Specifications	
Catalogue no.	YH-DT6-HB1-J
Physical Pitch	6mm, physical
Pixel Density	27,777 pixel/m2
Pixel Configuration	SMD LED
Module Dimensions (WxH)	192mm x 192mm
Module Resolution (WxH)	32 x 32 pixels
Cabinet Material	Steel
Viewing Angle	H 140 Deg. / V 120 Deg.
Best Viewing Distance	6+m
Maintenance	Front access
Protection Degree	IP65 front; IP54 rear

Product Specifications	
Panel Net Weight	approx. 58kg/sqm
Gray Scale	16-bit Color Processing Depth
Refresh Rate	3840+ Hz
Display Control	Synchronous control
Power Supply	220V, 50Hz
Operation Temp.	-20° ~60°
Display Dimming	Auto/Manual, 8~256 Levels
Signal Transfer	Text, image, graphics animations, video
Power Consumption (Max./Avg.)	0.6kw/sqm; 0.2kw/sqm
Lifetime	100,000hrs
Luminance	6000 nits

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APPENDIX C

State Environmental Planning Policy (Industry and Employment) 2021

Schedule 5 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 D

OBTRUSIVE LIGHTING CALCULATIONS

Calculation Summary			
Project: Obtrusive			
Label	CalcType	Units	Max
8 Enmore Rd Ill Seg1	Obtrusive - Ill	Lux	0.58
8 Enmore Rd Ill Seg2	Obtrusive - Ill	Lux	0.00



APPENDIX D

THRESHOLD INCREMENT CALCULATIONS

Calculation Summary			
Project: Ti			
Label	CalcType	Units	Max
King St Bus Ln (westbound)	Obtrusive - TI	%	0.56
King St to Enmore Rd (westbound)	Obtrusive - TI	%	0.54
King St (southbound)	Obtrusive - TI	%	0.04
Wilson St (southbound)	Obtrusive - TI	%	0.27



APPENDIX D

OBTRUSIVE LIGHTING AND THRESHOLD INCREMENT CALCULATIONS

Obtrusive Light - Compliance Report

AS/NZS 4282:2019, A4 - High District Brightness, Curfew
Filename: 3023.8 - King Street Newtown rev H
8/01/2024 5:11:32 PM

Illuminance

Maximum Allowable Value: 5 Lux

Calculations Tested (2):

Calculation Label	Test Results	Max. Illum.
8 Enmore Rd_III_Seg1	PASS	0.58
8 Enmore Rd_III_Seg2	PASS	0.00

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (4):

Calculation Label	Adaptation Luminance	Test Results
King St Bus Ln (westbound)	5	PASS
Wilson St (southbound)	5	PASS
King St (southbound)	5	PASS
King St to Enmore Rd (westbound)	5	PASS