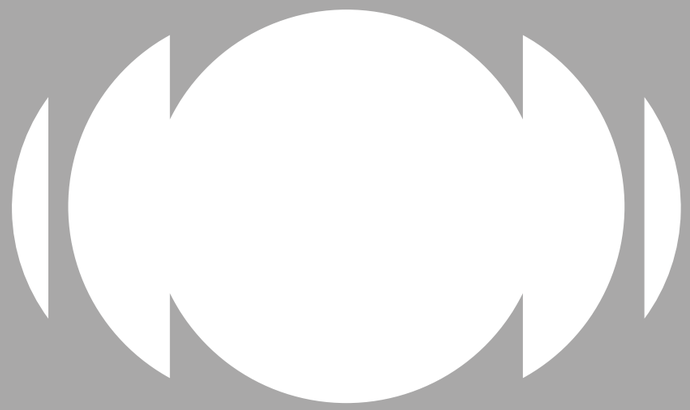
LONDON

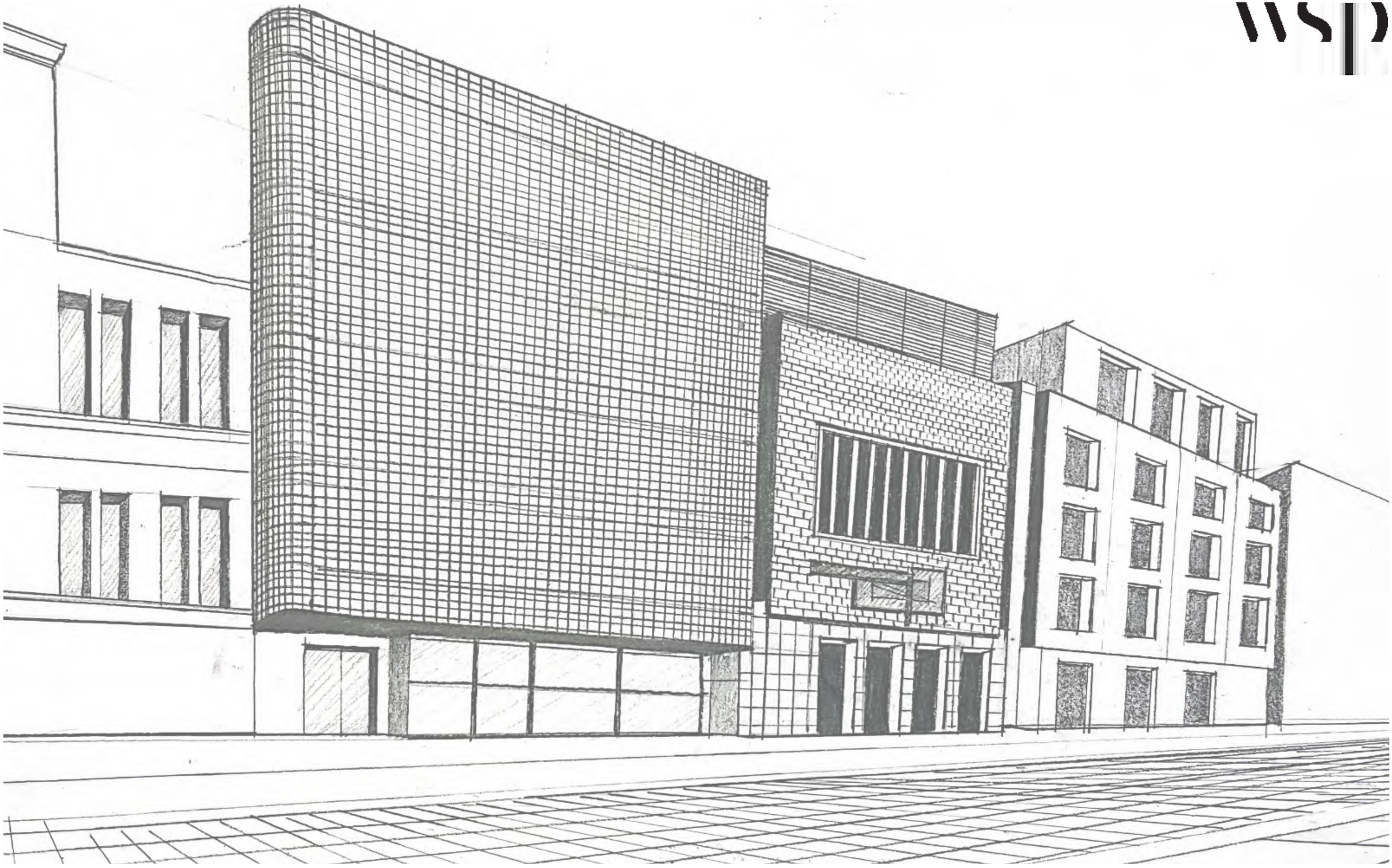


TUNNELS

The London Tunnels

Lighting Strategy Report

12 April 2024



The London Tunnels

CONTENTS

Acronym	Description
BSI	British Standards Institute
CCT	Correlated Colour Temperature
CIBSE	Chartered Institute of Building Services Engineers
Cd	Luminance Unit (Candela)
CRI	Colour Rendering Index
DALI	Digital Addressable Lighting Interface
Eav	Maintained Average Illuminance
ILP	Institution of Lighting Professionals
IK	Impact Resistance
IP	Ingress Protection
K	Colour Temperature Unit (Kelvin)
LED	Light Emitting Diode
Lx	Illuminance Level Unit (Lux)
MF	Maintenance Factor
SLL	Society of Light and Lighting
ULR	Upward Light Ratio
Uo	Uniformity

REVISION	DESCRIPTION	DATE	PREPARED BY	CHECKED BY	AUTHORISED BY
REV P01	Draft The London Tunnels Lighting Strategy Report	04/04/24 **SIGN**	Melissa Kennedy	Baris Gursen	Sacha Abizadeh
REV P02	The London Tunnels Lighting Strategy Report	12/04/24 **SIGN**	Melissa Kennedy	Baris Gursen	Sacha Abizadeh
REV P03		**SIGN**			
REV P04		**SIGN**			
REV P05		**SIGN**			
REV P06		**SIGN**			

REVISIONS

1. Introduction

1.1. The London Tunnels

The Kingsway Tunnels sit below Holborn between Camden Borough and the City of London. The conversion of the Kingsway Tunnel into a cultural venue will offer London a new cultural destination filled with history.

WSP's Architectural Lighting Team will currently focus on the lighting strategy for the redevelopment of 38-41 Furnival Street, particularly on the façade and terrace areas, while making recommendations for the interior lighting of the building. The Team will also develop a lighting strategy for the Alleyway that sites within 31-33 High Holborn.

This lighting report has been developed to present the proposed conceptual design options for the architectural external lighting of the London Tunnels.

The proposed lighting strategy aims to achieve the following objectives:

- Create an appropriate ambiance and mood, providing a safe and pleasing environment for all.
- Provide a lighting scheme that is sensitive and respectful to its surroundings.
- Promote a unique identity for the area after dark.
- Promote and assist in wayfinding through the illumination of key features.
- Provide sustainable lighting solutions that will minimise energy use and be part of the circular economy.
- Promote active travel for everyone.
- Facilitate the connection between people and place through dynamic and creative lighting solutions.

This lighting report incorporates the following information:

- Lighting Requirements and Guidance.
- Lighting Strategy.
- Precedent Imagery.

Furnival Street Indicative Artistic Image by Wilkinson Eyre

31-33 High Holborn Indicative Artistic Image by Wilkinson Eyre

1. Introduction

1.2. Lighting Strategy

The lighting strategy has been designed to provide a dynamic, visually pleasing and unique environment for both Fulwood Place and Furnival Street. Functional and accent lighting, together with feature lighting of key architectural elements within the urban landscape and façade will offer a diverse feel and look to each space.

The functional exterior lighting includes the pedestrian walkway of the Alleyway at Fulwood Place that is necessary to allow people to use the environment safely and efficiently at night. Feature lighting will also develop the lighting scheme in these areas to provide for visual interest and assist in creating a unique identity and character for the planned development.

The interior lighting of Furnival Street will be key to the illumination of the external façade. The careful placement and angling of luminaires within the interior of the building will create a gradient of light illuminating the external façade. Natural light and daylight will also be looked at to create shadow play and textured light within the interior surfaces of the building.

The amount of light within the Terrace Area of Furnival Street will also be looked at so to not over light the small landscaped area. Careful consideration will be taken to integrate luminaires as far as possible while also using light as a wayfinding tool, highlighting the unique textures and foliage of the different planting types to create a relaxing and calming atmosphere for people to enjoy.

All lighting elements will be designed to minimise light pollution as well as being sensitive to the local environment. The lighting for all exterior areas should convey a welcoming atmosphere but also provide suitable lighting levels and uniformity for safe passage to and from each space. Vertical illumination will also be considered to ensure facial recognition is achieved for security.

To give a coherent look to each of the sites, the use of selective lighting colour temperatures and the appropriate use of lighting intensity will be considered when integrating both functional and feature lighting.

Light sources will be selected with adequate colour rendering properties which will also help with facial recognition.

Luminaires with a maximum colour temperature of 2700K would ideally be used for the Terrace Area of Furnival Street, to minimise the blue-light component that can be harmful to ecology. Tunable white light and RGBW luminaires have been suggested to be utilised within the Alleyway at Fulwood Place this will provide for a more dynamic and playful feel to the pedestrian walkway.

Tunable white light, allowing for the change in colour temperature should be used for the illumination of the Furnival Street façade, allowing for the structure to change colour. Thought should also be taken into the possible control of subtle movement to the luminaire illuminating the façade this will create a wow factor from the street scape.

Furnival Street Indicative Artistic Image by Wilkinson Eyre

2. Lighting Design Criteria

2.1. Lighting Levels - 38-41 Furnival Street

Lighting guidelines developed by the British Standards Institute (BSI), the Institution of Lighting Professionals (ILP) and the Society of Light and Lighting (SLL/ CIBSE) ensure that external lighting projects conform to responsible energy use, appropriate light levels, visual comfort and maintenance.

The lighting for 38-41 Furnival Street will be designed using the following documents for guidance and best practice including:

- BS 5489-1:2020 Lighting of Roads and Public Amenity Areas.
- BS EN 12464-2021 Light and lighting - Lighting of Work Places - Part 1: Indoor Work Places
- BS EN 12464-2:2014 Light and lighting - Lighting of Work Places - Part 2: Outdoor Work Places.
- ILP GN01-21 Guidance Notes on Obtrusive Light. .
- SLL Lighting Guide 06. The Exterior Environment (2016)
- SLL Lighting Guide 21: Protecting the Night-time Environment.

All external lighting will be designed to provide illuminance levels enabling people to safely and efficiently use the space at night.

The correct level of lighting must be carefully selected to suit the environment and use of the site, while also ensuring that only the light necessary for the activity of the site is applied. Excessive lighting is not only energy inefficient but can also have a negative impact on the local environment and ecology.

In order to comply with relevant guidance, the proposed lighting scheme shall also comply with the following limitations for luminance in the table provided.

38-41 Furnival Street Interior Lighting				
Area	**Ēm (lx)**	**Uniformity (U_O)**	**Minimum Colour Rendering Index (CRI)**	**LED Colour Temperature (K)**
Entrance/ Exit Lobby	100-200	0.40	90	2700-3500K (To be coordinated with Architects)
Lift Lobby	100-200	0.40	90	2700-3500K (To be coordinated with Architects)
Reception Area	200-300	0.40	90	2700-3500K (To be coordinated with Architects)
Stairs	100-200	0.40	90	2700-3500K (To be coordinated with Architects)
Retail Space	300-500	0.40	90	2700-3500K (To be coordinated with Architects)
Office Areas	300-500	0.40	90	2700-3500K (To be coordinated with Architects)
WC	200-300	0.40	90	2700-3500K (To be coordinated with Architects)
Storage	200-300	0.40	90	2700-3500K (To be coordinated with Architects)
Bicycle Storage	50-100	0.40	90	2700-3500K (To be coordinated with Architects)
38-41 Furnival Street Exterior Lighting				
Area	**Ēm (lx)**	**Uniformity (U_O)**	**Minimum Colour Rendering Index (CRI)**	**LED Colour Temperature (K)**
Terrace Path	5-10	0.25	80	2700K or warmer
Landscape Planting	Feature Lighting	n/a	80	2700K or warmer
Entrance/ Exit Lobby Canopy	20-50	0.40	90	2700K or warmer

Table 1: Lighting Levels

2. Lighting Design Criteria

2.1. Lighting Levels - 31-33 High Holborn Alleyway

Furthermore the lighting for 31-33 High Holborn Alleyway will also be designed using the following documents for guidance and best practice including:

- BS 5489-1:2020 Lighting of Roads and Public Amenity Areas.
- BS EN 12464-2:2014 Light and lighting - Lighting of Work Places - Part 2: Outdoor Work Places.
- ILP GN01-21 Guidance Notes on Obtrusive Light. .
- SLL Lighting Guide 06. The Exterior Environment (2016)
- SLL Lighting Guide 21: Protecting the Night-time Environment.

All external lighting will be designed to provide illuminance levels enabling people to safely and efficiently use the space at night.

The correct level of lighting must be carefully selected to suit the environment and use of the site, while also ensuring that only the light necessary for the activity of the site is applied. Excessive lighting is not only energy inefficient but can also have a negative impact on the local environment and ecology.

In order to comply with relevant guidance, the proposed lighting scheme shall also comply with the following limitations for luminance in the table provided.

31-33 High Holborn Alleyway				
Area	Ēm (lx)	Uniformity (U_O)	Minimum Colour Rendering Index (CRI)	LED Colour Temperature (K)
Pathways	5-10	0.25	80	Tunable White
Pedestrian Passage/ Underpass	20-50	0.40	80	Tunable White

Table 2: Lighting Levels

2. Lighting Design Criteria

2.2. Lighting Levels - Emergency Lighting

Emergency operation lighting levels have been based on the following standard BS 5266-1:2016 Emergency Lighting - Part 1: Code of Practice for the Emergency Lighting of Premises for both Furnival Street and High Holborn Alleyway leading to Fulwood Place.

The standards states that for external areas in the immediate vicinity of exits:

Emergency illumination should be provided outside the building and near to each final exit. If occupants have to travel to reach a place of safety, this route should form an integral part of the escape route.

Note: Illumination of these areas is specified in BS EN 1838:2013 and BS EN 50172.

Existing installations might have used external street lighting to illuminate external exits. These applications should be reassesses to confirm whether the street lighting will still be illuminated at all time that the premises are in use; if not alternative lighting should be considered.

All emergency lighting will be looked at and developed at the next stage of the project as each area should be considered as high risk due to the number of people that will need to evacuate and use the emergency exits if required.

2. Lighting Design Criteria

2.3. Site Classification & Obtrusive Light

The preliminary lighting assessment criteria used for the proposed lighting design of The London Tunnels has been based on the following Institution of Lighting Professionals (ILP) guidance:

- **ILP GN01-21** Guidance Note on Obtrusive Lighting.

Light pollution, or obtrusive light, can create serious physiological and environmental problems. Light pollution can be classified as:

- **Sky Glow:** The brightening of the night sky above the occupied areas. Maximum values of upward light radio can be seen in Figure 2.
- **Glare:** The discomfort created by a light source in contrast to the background.
- **Spill Light:** The spill of light beyond the site boundary on which the light source is intended to be.
- **Light Intrusion:** The passage of light into properties from external light sources.

Obtrusive light can be a problem for both humans and wildlife as well as a waste of energy and a contribution to CO2 emissions. Guidance regarding obtrusive lighting can be found in the SLL/CIBSE Lighting Guide 6: The Outdoor Environment 2021, ILP GN01-21 Guidance Notes on Obtrusive Lighting and CIE 150:2017 guide on the limitation of the effects of obtrusive lighting installations 2nd edition.

The project is classified as environmental zone 4**,** which is described as high district brightness, town/ city with high levels of night-time activity. The lighting parameters associated with environmental zone 4 are outlined in blue on the adjacent tables.

The maximum values allowed of light intrusion into neighbouring buildings is stated pre and post curfew times. Curfew time is defined in GN01:2021 as the time after which stricter requirements will apply, often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23:00hrs.

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

ILP Guidance Notes 01/21 - Environmental Zones

Light technical parameter	Application conditions	Environmental zones				
		E0	E1	E2	E3	E4
Building façade luminance (L_b)	Taken as the product of the design average illuminance and reflectance divided by π	< 0.1 cd/m²	< 0.1 cd/m²	5 cd/m²	10 cd/m²	25 cd/m²

ILP Guidance Notes 01/21 - Maximum permitted values of average surface luminance

Light technical parameter	Environmental zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

ILP Guidance Notes 01/21 - Maximum values of upward light ratio (ULR) of luminaires

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

ILP Guidance Notes 01/21 - Maximum values of vertical illuminance on premises

2. Lighting Design Criteria

2.3. Site Classification & Obtrusive Light

Continuing from the previous page on obtrusive light, here, the first figure shows the different beam spreads that an artificial light can have, highlighting what is usable light distribution required to achieve desired light levels and distributions that need to be avoided in order to minimise any light pollution. The categories of lighting include - 'Useful Light' as required for functional use, spill light and light intrusion as described on the previous page.

During the design phase of a lighting installation, the following measures to reduce the occurrence of obtrusive light should be considered:

- **Over-lighting:** This can be avoided by conducting detail lighting calculations and selecting the right lighting equipment for the right application. The appropriate lighting controls can also ensure that light levels are kept within the desired limits.
- **Luminaire Technology:** Careful consideration in the selection of the luminaires and light sources to minimise any unwanted light. Luminaires with a controlled light distribution will be utilised to ensure they illuminate only the intended areas.
- **Luminaire Aiming:** All lighting equipment will be positioned to avoid uplight and will be carefully aimed towards the task area. This can be ensured during the commissioning stage.

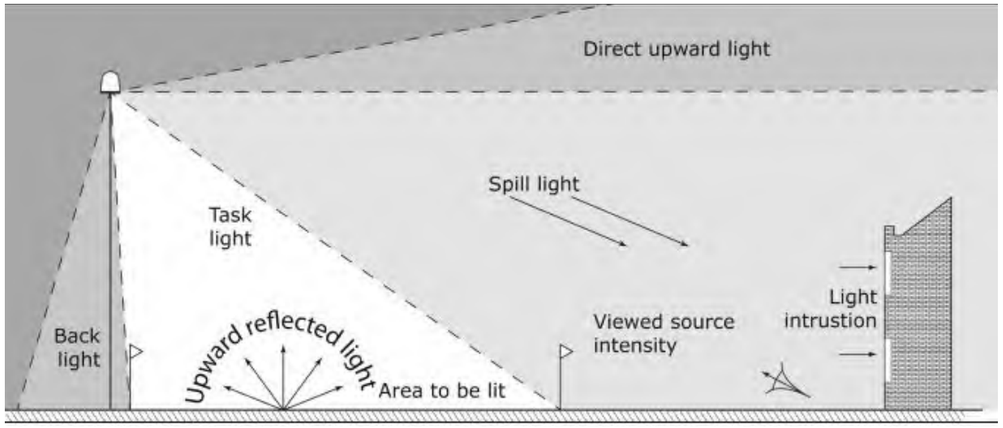
For urban areas with a high district brightness (Environmental Zone E4), the recommended limits are:

- Upward Light Ratio: 15%

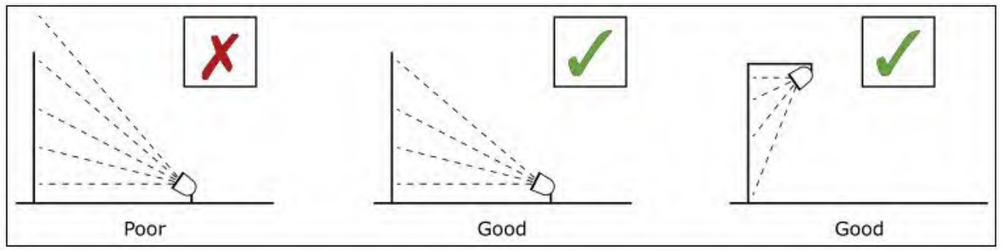
- Light intrusion into windows:
  Pre-curfew: 25 Lux
  Post-curfew: 5 Lux

- Luminaire intensity
  Pre-curfew: 25,000 cd
  Post-curfew: 2,500 cd

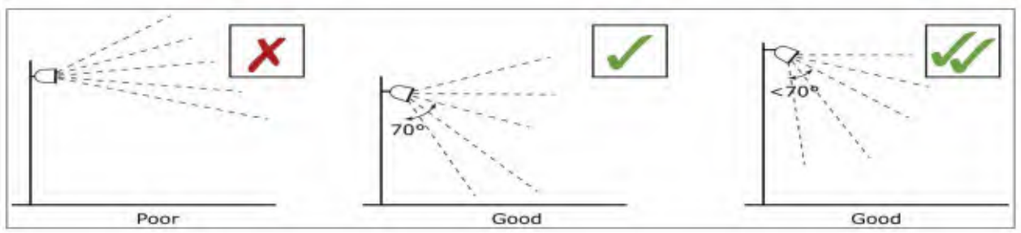
- Average luminance (maximum) 25 cd/m2



ILP Guidance Notes 01/21 - Types of Obtrusive Light



ILP Guidance Notes 01/21 - Façade Illumination



ILP Guidance Notes 01/21 - Luminaire Aiming Angles

2. Lighting Design Criteria

2.4. Colour Temperature

Colour temperature and the quality of light used within the scheme should not only give the illuminance required for navigating the site but also enhance the material and surface quality.

When considering the project as a whole, in terms of its materiality, four key fundamental design decisions were taken into consideration:

- Architecture - Interior.
- Architecture - Exterior.
- Façade.
- Landscape.

Each aspect has its own unique form and appearance and therefore, should be lit to play upon its juxtaposition and material quality but also convey a sense of belonging upon the overall environment.

Architecture Interior - 3000K (To be coordinated with Architects)
Cool white light. To emphasise the form and structure of the interior of the building.

Architecture Exterior 31-33 High Holborn - Tunable White
Dynamic colour change of warm white light to a cool white will transform the alleyway. The lighting can be pre-programmed to change colour throughout the day to night, transforming the space.

Façade Furnival Street- 2700K or warmer
A warm white light. To enhance the glazing of the façade, while also being in keeping with the overall surroundings.

Landscape - 2700K or warmer
Very warm white light. To be kind to the planting by reducing the blue wavelength, while also creating contrast and texture when lighting through the foliage.

Lighting colour temperature chart

2. Lighting Design Criteria

2.5. CCTV & Facial Recognition

Safety and security is crucial to the feeling of well-being and comfort within the site, both during the day and at night. Providing a level of appropriate light and uniformity of light is essential for CCTV at night, this is especially crucial at the Holborn Alleyway and Pathways at the Furnival Street Entrance.

The quality of light used at night is fundamental to the operation of good imagery for CCTV. The following are aspects which will be closely considered for light placement and specification:

- Achieve a minimum illumination level of 5 lux externally.
- High Colour Rendering (CRI) properties, 80 CRI or above.
- Shielded/ deep recessed light sources where possible to minimise glare.
- Avoid direct light adjacent or in direct view of CCTV camera lens.
- Vertical illuminance to provide accurate facial recognition.
- Luminaires mounted at pedestrian scale to provide good facial recognition.
- Ensure good light coverage to the site and avoid areas of darkness.

Good vertical illumination is necessary to give the observer a bright and open spatial impression, to assess the objects in their field of view, allowing their identification, hence increasing the feeling of safety in the external environment at night. A minimum vertical brightness ration of 0.3, or higher, at 1.5m is recommended. This will promote more even illumination which supports consistent focus of cameras.

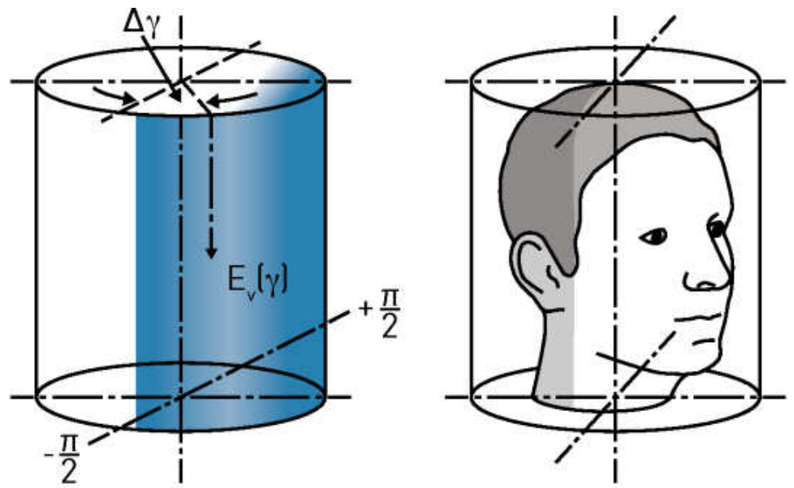
Semi-circular illuminance, is the parameter which, in lighting, assesses the light failing on a semi-circular surface which abstractly represents a persons face. Having an appropriate level of semi-circular illuminance, allows the identification of faces when people approach each other. This parameter is of extreme importance in a higher crime risk area for the identification of people and objects.

All lighting is to be closely coordinated with the project security representatives to ensure all necessary criteria is met and a maintenance strategy is in place to ensure this remains true throughout the life of the project.

The lighting control system will have a dedicated security scene, which will provide a lower consistency of lighting levels throughout non-operational hours to ensure CCTV can still capture accurate images.

As stated it is important that all members of the public should feel safe, confident and comfortable using the site at night. This is particularly true for women and girls who will use the space during the hours of darkness.

All recommendations and guidance will be followed and taken into consideration when developing the lighting scheme, so to not only design a space that is visually pleasing but one that conveys and projects a safe and secure environment for all, with appropriate light levels and uniformity being followed and met.



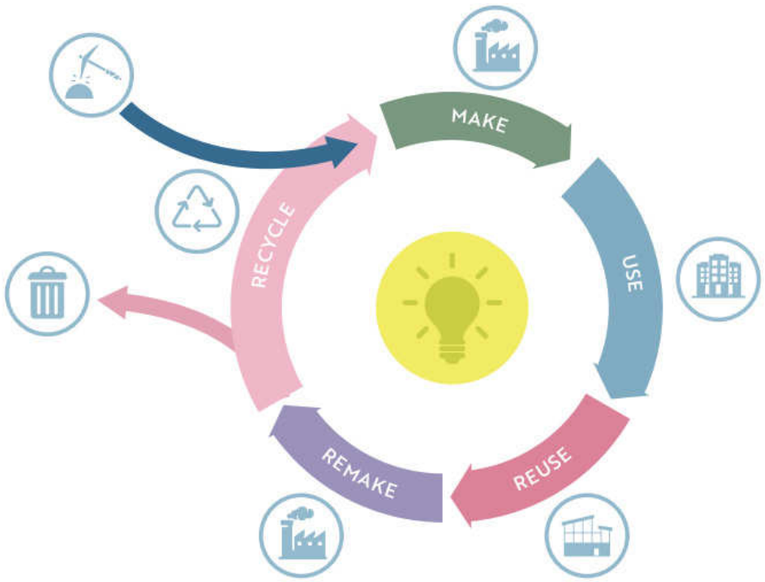
Semi cylindrical illuminance

2. Lighting Design Criteria

2.6. Circular Economy & Sustainability

When selecting luminaires for any lighting scheme, the manufacturers approach to the circular economy and re-purposing of their lighting fixtures should be considered by the lighting designer, including where they source luminaire material, their location, how luminaires are shipped and C02 emissions.

By using criteria set out in CIBSE TM66:2021 the designer can assess the specification for its compliance to the circular economy.



The Circular Economy Model - CIBSE TM66:2021

Utilising the Circular Economy Assessment Method (CEAM) allows specifiers to engage with lighting manufacturers though the Circular Economy Assessment Method for Manufacturing (CEAM-Make) which provides performance information and its supporting ecosystem in terms of circular economy.

The products are given a score from 0-4 (from 'zero' (0) to 'hero' (4) as outlined in the table below, providing a clear assessment for specifiers.

Score	Evidence	Action toward circular economy
0	No evidence	No evidence has been seen. Any product, material or service displaying typical linear economy principles is to be allocated 0 marks.
1	Some positive evidence	Design elements have been considered and evidence provided.
2	Positive evidence	Design elements/ attributes have been incorporated into the product or service offered.
3	Excellent positive evidence	Design elements/ attributes have been incorporated into the product or service offered and services align with circular economy goals.
4	Outstanding	Design elements/ attributes and services align with circular economy goals and deliver ecological regeneration or are regenerative to communities or via social responsibility.

CEAM: Evidence and action towards a circular economy - CIBSE TM66:2021

3. Lighting Control

3.1. Lighting Control Strategy

The lighting control strategy for the London Tunnels is proposed to have the following properties:

- Allow for all luminaires to be individually addressable and dimmable, and for the creation of luminaire groups and zones.
- Allow for luminaires to have constant light output (CLO) control, allowing energy use to be minimised while achieving lighting targets and extending the life of the LED sources.
- Allow for the implementation of daylight-linked dimming, occupancy control and astronomical timeclock control.
- Allow for the control of CCT changing, RGB and dynamic luminaires, where necessary.
- Utilise a standard open protocol to allow for numerous devises such as scenes, presence detectors, photocells and switches from different manufacturers to be networked together and control the lighting.
- Support two-way communications to allow for services such as fault reporting or device self-diagnostics to be undertaken.

All lighting should be dimmable and controllable. A fully coordinated lighting control system is fundamental to a balanced and holistic design but also offers environmental benefits to any lighting scheme. Incorporating innovative control triggers throughout allows for the lighting to be used as when it is required.

By using presence detectors both the interior and exterior lighting can be dimmed/ turned off when the different areas are not occupied and by using photocells the luminaires could directly respond to changes in ambient lighting, increasing or decreasing in luminosity as required. All these approaches will help with reducing power consumption.

The lighting control system shall be fully programmable and have the facility to address and control individually each identified lighting group within the scheme. A DALI interface is advised to be used throughout the building of Furnival Street and within the Alleyway to control luminaires.

38-41 Furnival Street Interior Lighting - Lighting Control Schedule				
Area	**Dimming**	**Daylight Linking**	**Occupancy Control**	**Timeclock**
Entrance/ Exit Lobby	*	*	*	
Lift Lobby	*		*	
Reception Area	*	*	*	
Stairs	*	*	*	
Retail Space	*	*	*	
Office Areas	*	*	*	
WC	*		*	
Storage	*		*	
Bicycle Storage	*		*	
38-41 Furnival Street Exterior Lighting - Lighting Control Schedule				
Area	**Dimming**	**Daylight Linking**	**Occupancy Control**	**Timeclock**
Pathways	*	*		*
Landscape Planting	*	*		*
Entrance/ Exit Lobby Canopy	*	*		*
31-33 High Holborn Alleyway				
Area	**Dimming**	**Daylight Linking**	**Occupancy Control**	**Timeclock**
Pathways	*	*		*
Landscape Planting	*	*		*

Table 3: Lighting Control Schedule

3. Lighting Control

3.1. Lighting Control Strategy

Timeclock, Zoning & Sensing

As the museum will not be operational 24/7 it is advised that coordination should be developed to determine opening, closing and peak hours and times. This will allow for a minimum allowance for the provision of the following typical control scenes controlled via the timeclock, with additional specific scene requirements to be developed at Detail Design.

- General daytime.
- General evening.
- Peak hours.
- Maintenance.
- Curfew.
- Winter months.

Occupancy sensing will be provided by sensors operating in presence or absence detection mode. It will be possible to modify the time delay for the occupancy sensors within the lighting control system.

Public area lighting is also advised to be zoned to allow the lighting to be controlled to assist with indicating areas closed of to the public, while allowing for cleaning and other maintenance tasks that may take placed in closed areas.

Daylight Linking

Daylight linking shall be used in all daylit areas to allow for artificial lighting to be dimmed based on daylight levels measured via photocell sensors.

Time delay and thresholds are programmed into the system to ensure that the lighting is not constantly dimming in quickly changing daylight conditions, such as clouds briefly passing in front of the sun.

Winter Months

During the winter months it will get darker earlier, it is therefore suggested that the lighting can remain switched on later in the evening during these months but be dimmed to a certain levels so to not cause any obtrusive or spill light to neighbouring buildings.

We can coordinate with the Client to determine curfew times for all of the lighting to determine how each lighting area can be grouped, controlled and dimmed so not all lighting is switched off at the same time.

A robust lighting control strategy is suggested both for the winter months and summer months of the year for the main primary areas including:

- Furnival Street Façade.
- Furnival Street - Street Level Entrance.
- Landscape Terrace.
- High Holborn Alleyway.
- Fulwood Place.

Additional Measures

It is also possible to install automated blackout blinds that can be set using an astronomical time clocks and photocell. This would mean that the blinds can be pre-programmed to close during set periods of time during the year. This has to be further investigated during the next stage of the project.

4. Observations

4.1 Current Site Conditions

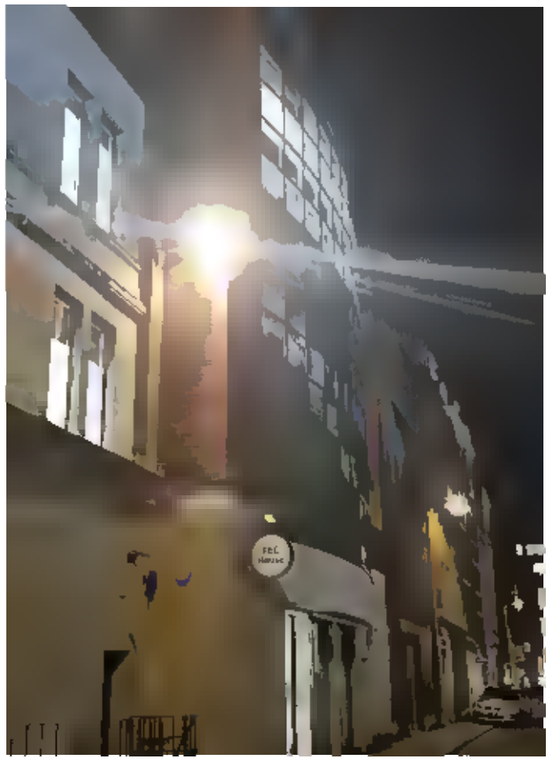
Furnival Street is a narrow one way carriageway and pedestrian walkway leading to and from the A40 and High Holborn. It has been noted that the lighting for illumination onto street level has been mounted to both of the buildings at 40-41 and 38-39 Furnival Street.

Two lighting fixtures have been mounted on the buildings adjoining the two façades, in particular the fitting next to the 40-41 building looks to be in very close proximity to the glass façade .

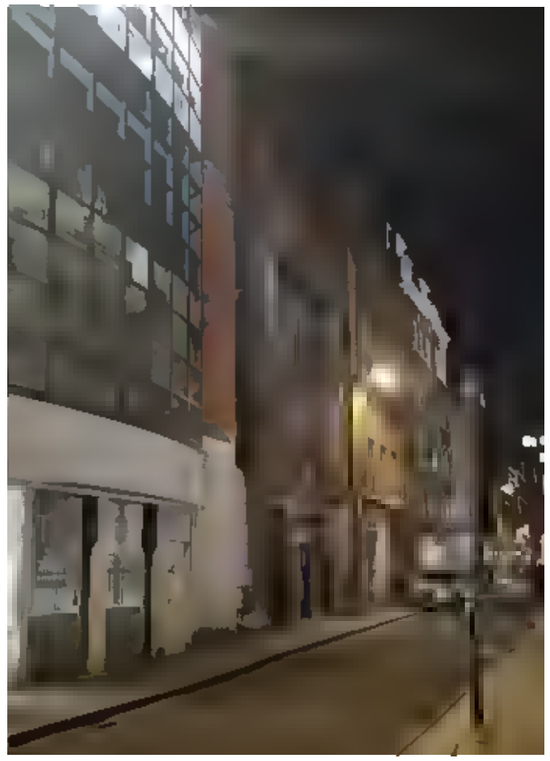
We strongly advise that the positioning of both of the light fittings should be reconsidered and if possible moved to a new location away from the new buildings façades. This will reduce the adverse affects of the street lighting upon the new lighting scheme for Furnival Place, by emitting any light spill from the street lighting into the interiors of the building which in turn will create an undesired lighting effect.

The existing lighting at the High Holborn Alleyway leading to Fulwood Place has also been looked at, the positioning of the light fixtures here may also have to be reconsidered to achieve the new lighting schemes objectives.

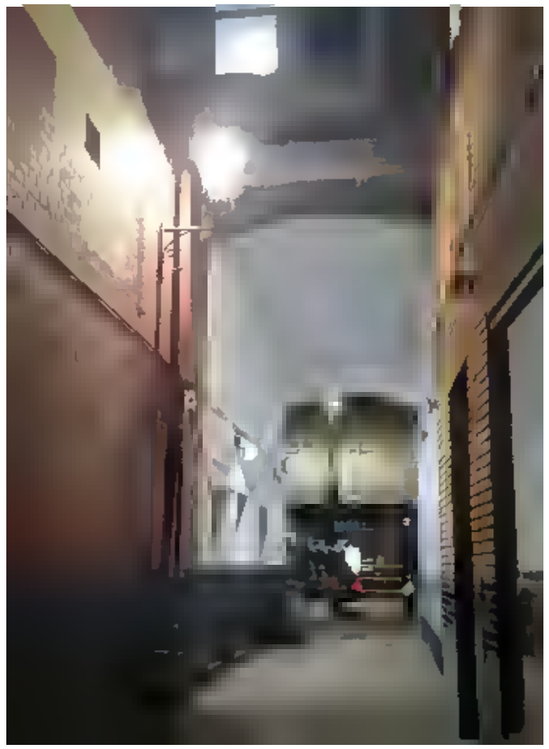
It is advised that early discussions with the Local Authorities should take place to establish if the repositioning and relocation of the street lighting luminaires can be carried out.



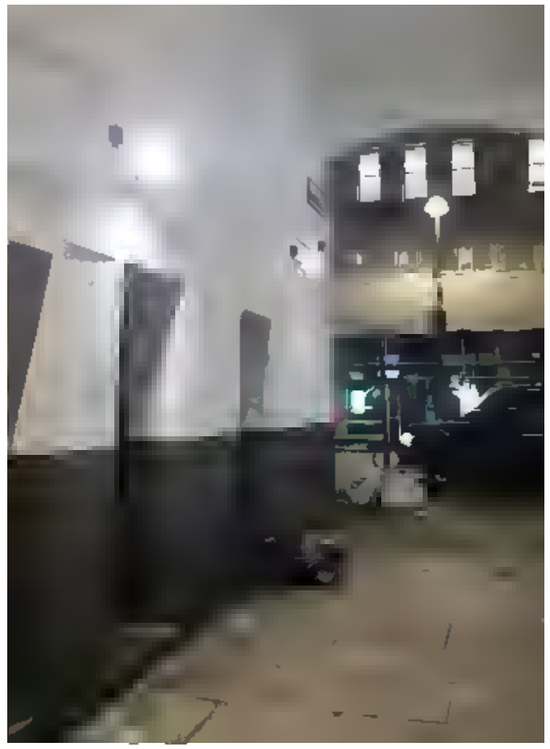
Wall mounted street lights at Furnival Street



Wall mounted street lights at Furnival Street



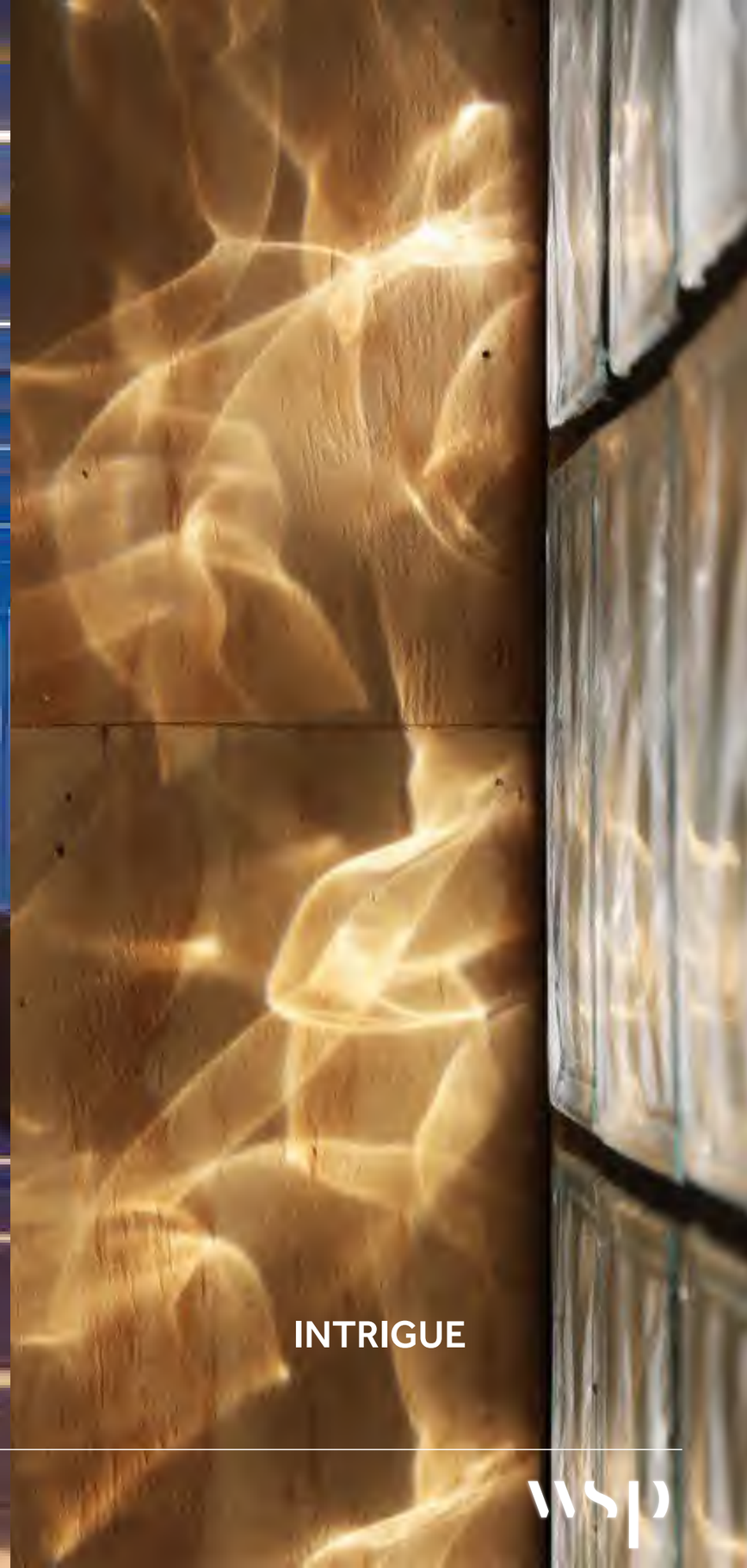
Wall mounted street lights at Fulwood Place



Wall mounted lighting within the Alleyway

ENHANCE

GUIDE



INTRIGUE

5. Lighting Considerations

5.1. Qualities of Light

Lighting has often been seen as a way to extend the day, however, the night-time environment should be considered in its own right for it own unique qualities, which creates opportunities to use light to enhance and inform spaces by using the following tool:

Intensity:
How much light falls on a surface (illuminance) and how bright surfaces appear (luminance) are the main points of measuring within lighting design, so how luminaires are specified for their output is key to the design composition.

Colour:
Light and its colour and how it is used is fundamental, whether it be the hue/ saturation of a coloured light source or even the different tones of white light itself are all key to a successful scheme. It is important to outline the colour throughout and identify how it enhances tone and textures of materials.

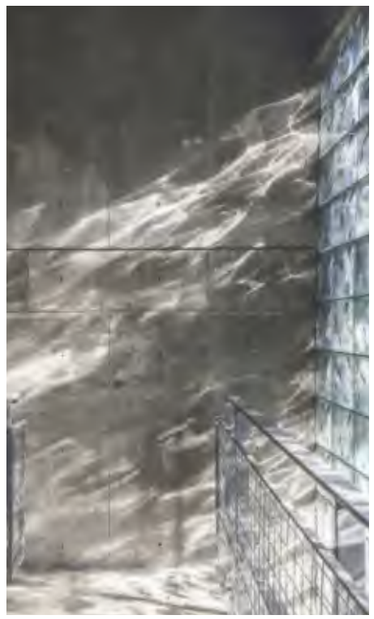
Scale:
Perception of space can be altered through light, spaces can feel smaller or larger dependant on the balance of light within the space, but also the scale and form factor of light fittings should be carefully considered to fit within the overall architecture and the spatial environment.

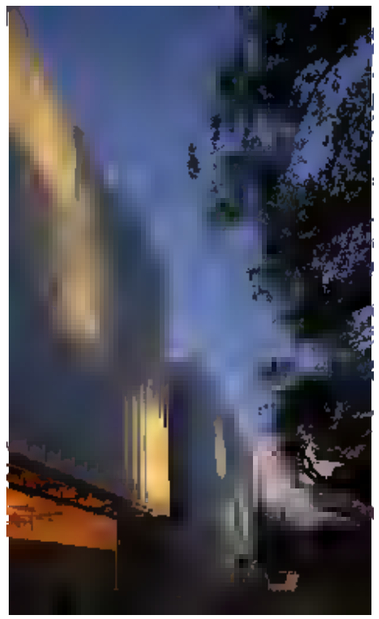
Verticality:
The use of vertically lit surfaces are extremely important and bring together a fully-rounded and positively lit space which offers comfort and enhances the feeling of safety to users.

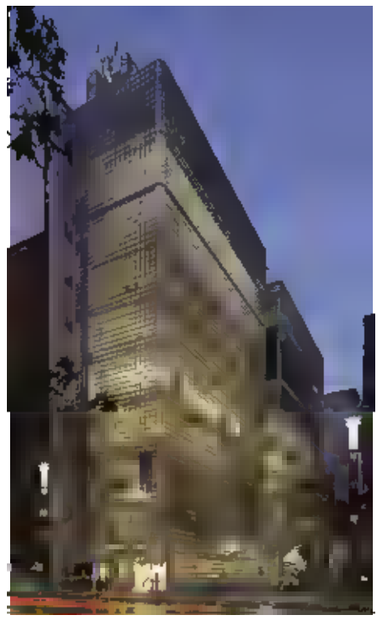
Balance:
Through the careful composition of light, its intensity, contrast, colour and direction all combine to offer exiting and workable spaces.

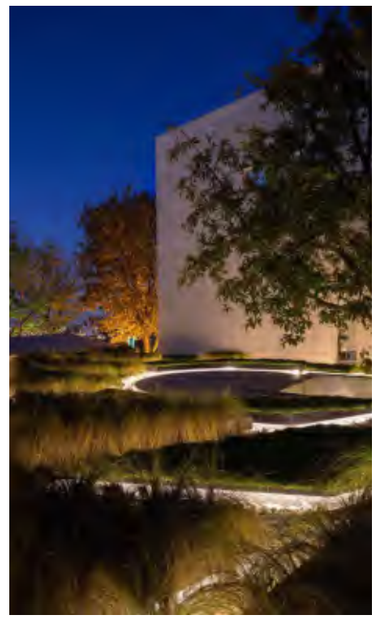
Darkness:
Spaces which are filled with a bright uniform level of light often appear cold and dull. The true balance is that of light and shade. This creates depth, life and tone, it informs nuances within the architectural forms and landscape and provides areas that allow users to feel safe to sit and dwell, creating areas of contemplation.

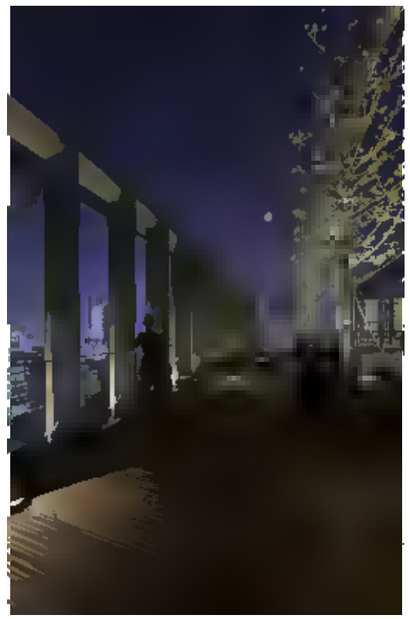

Alleyway, Poland


Private Residence, Columbia


Museum, America


Department Store, Japan


MF Pavilion, Mexico


Fintech Building, Milan

6. Specialist Lighting

6.1. Lighting Layers

A dynamic and coherent lighting scheme will be developed to provide for visual interest.

The lighting design will be carefully considered to allow visitors to appreciate the architecture not just during the day but also at night. Lighting will be used to highlight the façade of the Furnival Street building to enhance its structural features, where a more dynamic style of lighting will be developed for the Fulwood Place Alleyway.

The use of lighting layers is key to creating a successful lighting scheme for the London Tunnels. Five main layers of light are to be taken into consideration for the design which include:

- Functional Lighting.
- Feature Lighting/ Accent Lighting.
- Landscape Lighting.
- Architectural Lighting.
- Interior Lighting.

By combining and utilising these lighting layers a well balanced lighting scheme will be created for both Furnival Street and Fulwood Alleyway.

Both functional and accent lighting will create intrigue within the Alleyway while also offering a safe and functional environment that can be explored and guide people to the entrance/ exit of the museum.

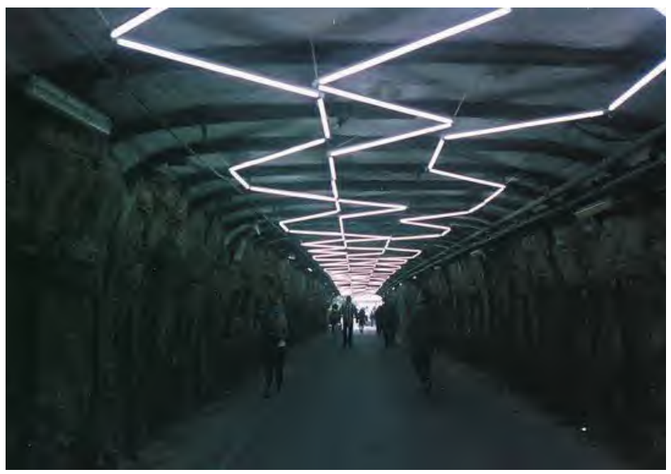
Whereas, the combination of both functional and interior lighting will help to illuminate the façade from within to form a glaze of light projecting out from the Furnival Building.

The landscape elements of the terrace will be discrete and integrated where possible, offering a subtle difference in contrast to the functional lighting.

Architectural lighting will be used to highlight selected building features, structural elements and the alleyway. By doing so, unique viewing points of interest will be created.

Functional and accent landscape lighting for terrace area

Incorporate colour, texture & pattern



Functional and feature lighting combine within the alleyway

Utilise interior lighting to illuminate the façade

Consider the affects of daylight

6. Specialist Lighting

6.2. General Lighting Considerations

The lighting for the London Tunnels project especially within the Fullwood Place and Furnival Street will provide a huge amount of visual interest for visitors to enjoy. Therefore, the illumination of key architectural and structural features will create a pleasing and unique identity to the areas, while also being designed to bring a coherent atmosphere to the site as a whole.

A carefully considered lighting scheme not only helps to make spaces feel safe and comfortable to use at might, but also brings the exterior and interior spaces to life, allowing the development to stamp its own unique identity upon the surrounding environment.

The colour temperatures and light intensity of luminaires will become a key factor in creating a different experience for visitors and people passing through the site, while also being sensitive to the ecology of the site.

The colour temperature of luminaires for the terrace area is advised to be 2700K or warmer. This will ensure that light sources will not have a negative visual effect on the landscape. Whereas the colour temperature of the alleyway could utilise RGBW or tunable white light to have a more playful and dynamic feel.

The interior and architectural lighting within the Furnival Street building will be key to illuminating the façade. A lighting scheme within the interior of the building will be carefully considered to not only safely illuminate the interior but also be positioned to carefully illuminate the large exterior façade.

By utilising the outlined lighting layers described on the previous and following pages, not only will a functional design be created but also one that is comfortable, efficient and inviting for people and visitors to safely enjoy the spaces.

These lighting typologies include:

- Functional Lighting.
- Feature/ Accent Lighting.
- Landscape Lighting.
- Interior Lighting.

Each space within the London Tunnels scheme has been broken down to develop their own individual lighting schemes but all will be designed in such a way that will provide a coherent identity as a whole.

Lights In Alingsås, Sweden

Museum of Art, America

Plaza Gardens, Spain

7. Conceptual Lighting Design

7.1. 38-41 Furnival Street

The façade of the Furnival Street building will create a wow factor for the visitors to the museum as it will be lit in such a way that evokes interest and wonder. The interior lighting will be selectively placed and angled within the interior of the building to illuminate the façade from the inside out, creating tones of shadows, textures and colours.

By lighting the 40-41 Furnival Street building façade from the inside out all light fittings will be hidden from view giving an powerful view and keeping the structure free of unnecessary clutter. A gradient of tones of warm white light will illuminate the entire glazed façade, with darker shadows giving small glimpses of what lies within the building.

The lighting for the façade could also be programmed to change colour or give a subtle shift in movement showcasing the building from the street scape, giving a dynamic feature to the personality of the structure.

It is also advised that attention should be taken to the natural light pouring in through the façade during the day. Textured light, shadow and pattern could be developed on the floors and walls closest to the façade glazing making for ever changing tones of interest being projected onto the surface, ever changing works of art that never stay for long and always take a new form depending on the weather outside.

Integrating and hiding luminaires as far as possible is suggested to light the structural features of the 38-39 Furnival Street building. Washing the replica of the crane with lit will illuminate the artefact from afar and carefully uplighting the concrete louvres will develop a tone of interest to the unique details of the building.

Lighting layers include:

- Interior lighting.
- Architectural lighting to selected areas of the façade.
- Accent/ decorative lighting to the signage.
- Functional lighting to the underside of the canopy.

Illuminating the façade from the interior

Highlighting the texture of the façade

Showcasing the buildings façade

Creating a gradient of light

Creating a depth of interest & textured light

7. Conceptual Lighting Design

7.2. 38-41 Furnival Street - Interior Lighting Considerations

The internal lighting within the 40-41 Furnival Street building should be consistent throughout each of the levels behind the glass façade. The challenge will be to create a coherent look between the double height retail space, plant area and office floor. Luminaires will therefore be installed, angled and tilted at various heights throughout each of the levels but all will create one harmonious, visually pleasing and dynamic façade of light.

The internal glow at the retail floors can be generated by either using frosted light sources (which could also become a decorative luminaire), clustered centrally into the retail area ceiling, or alternatively by carefully uplighting the ceiling to rely on the reflected light to emit the glow. Both these options would have to be tested to visualise the required outcome.

The retail floors require task lighting for all options to enable for direct functional lighting, this will be installed from the ceiling and each luminaire will have tailored beam angles. The track lighting will also be required for the retail/ gallery areas, again installed within the ceiling to provide flexibility for each space.

It must be noted that the chosen ceiling type will have a strong influence in how the desired lighting outcome will be achieved.

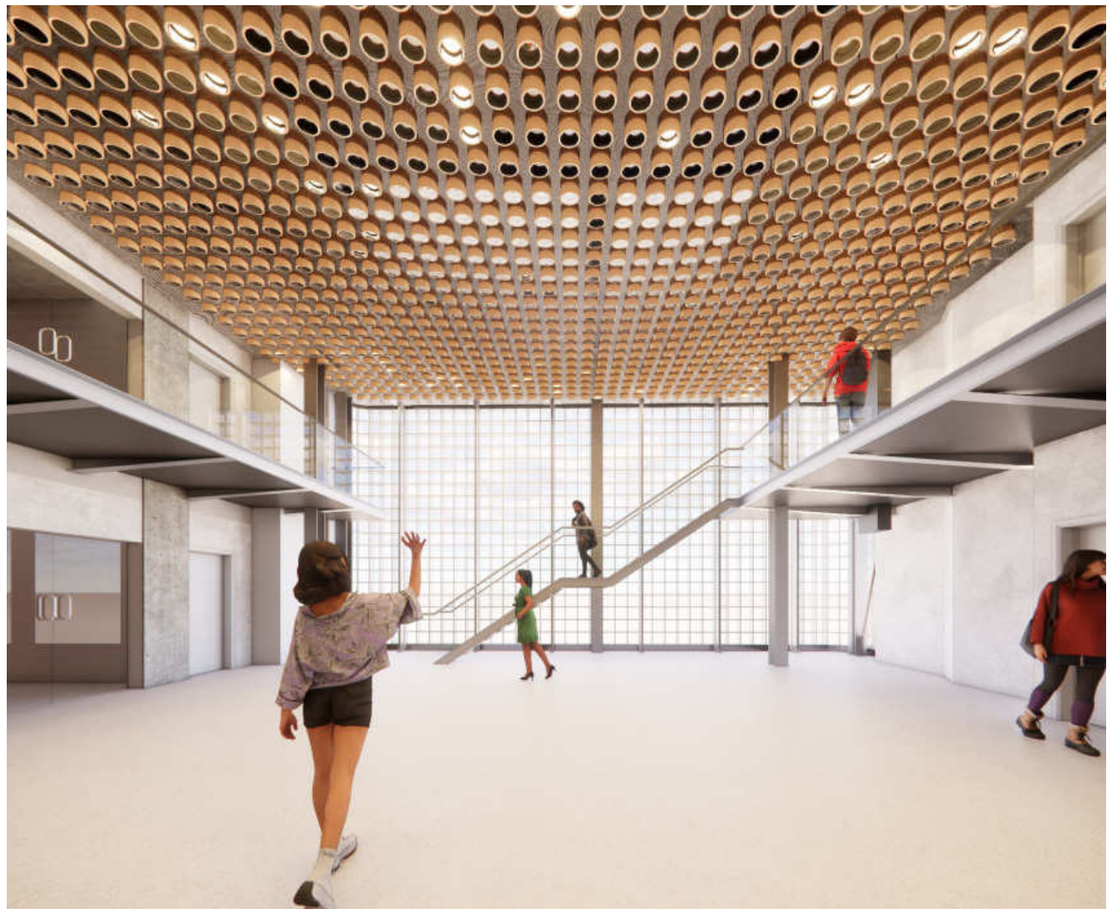
The plant floor at level 03 is recommended to have the vertical surfaces closest to the façade lit with a warm tone that will emit a coherent look to the rest of the façade. Whereas the office lighting should also have indirect elements a like to the internal glow of the retail area for the light to be reflected to create a coherent look upon the top floor.

The ceiling lighting should be considered independently to the task lighting for each area so that the glow of light on each floor can be adjusted separately throughout. Lighting controls will play a vital role in achieving harmony and consistency within the different levels of the building.

It is also important that the luminaires are positioned away from the glass façade (set back at a minimum distance of 1.5 meters away from the glazing) The lighting will require appropriate beam angles to control the light distribution to avoid light spill through the glazed façade.

As stated previously the lighting scheme will follow the ILP GN01-21 Guidance Notes on Obtrusive Light and be positioned, tilted and where necessary have shielded accessories to avoid unnecessary light spill and ingress into adjacent buildings. It is recommended that a light spill study should be undertaken to determine the light output from the new façade lighting.

Tunable white light in particular the warm tones of light is suggested to capture the subtle gradient of light within the façade. This will allow for the consistence of the colour of the light within each level but also help to adjust the colour temperatures of each luminaire to suit the environment of each of the areas of the building interior, giving a unique stand point and viewing of the facade during different times of the day and at night.



Interior Visualisation by Wilkinson Eyre

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 00

Key:

Areas closest to the façade:

Exit Lobby - 100-200lux 0.40Uo

Main Entrance/ Reception Lobby - 200-300lux 0.40Uo

Fire Egress/ Staff Bike Store - 50-100lux 0.40Uo

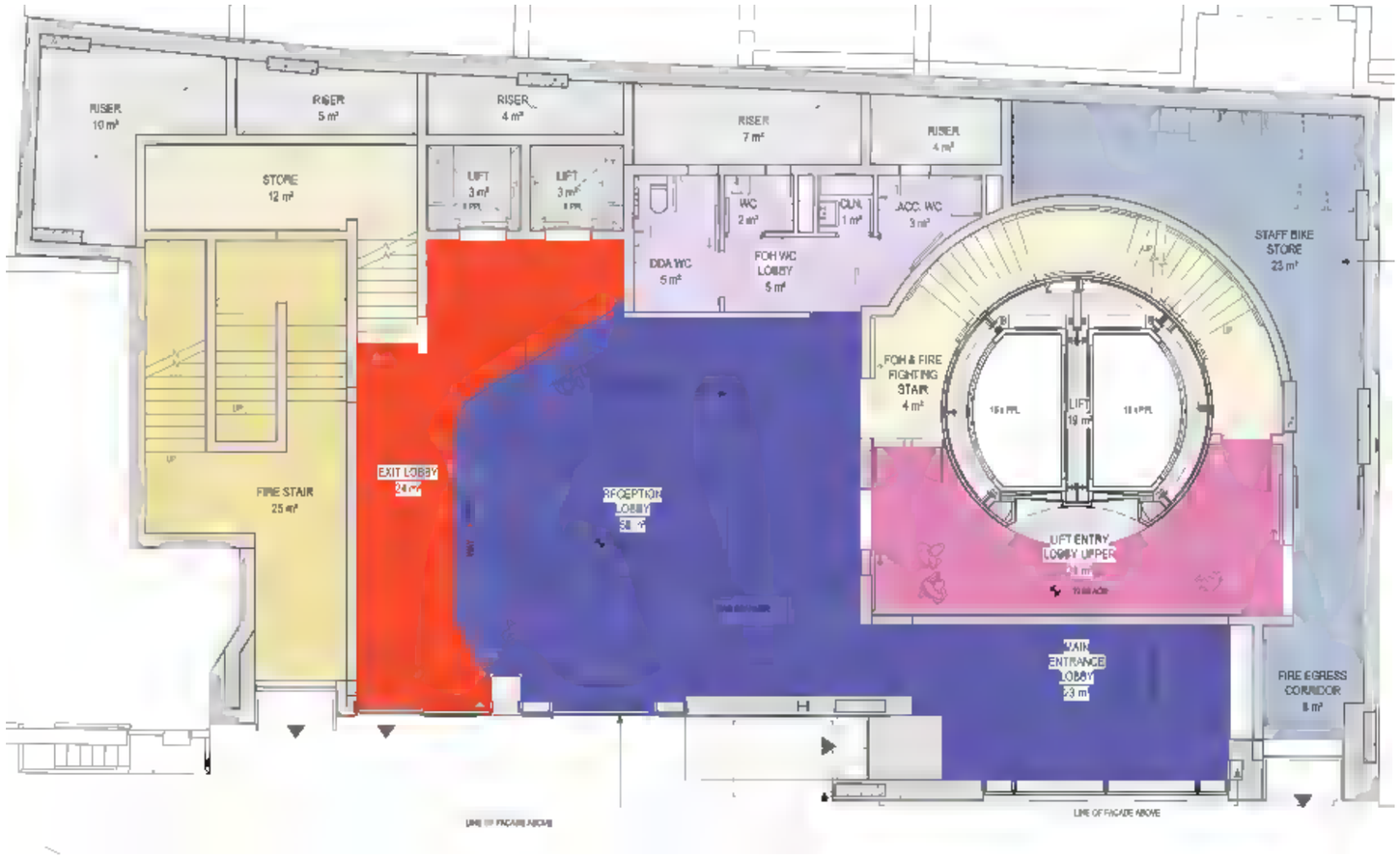
Recommended guidance for all other areas:

Fire Stairs - 100-200lux 0.50Uo

Lift Entry Lobby - 100-200lux 0.40Uo

Stairs - 100-200lux 0.50Uo

WC Facilities - 200-300lux 0.40Uo



Level 00 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 01

Key:

Areas closest to the façade:

Ancillary Retail Space - 300-500lux 0.40Uo

Retail Stairs - 100-200lux 0.50Uo

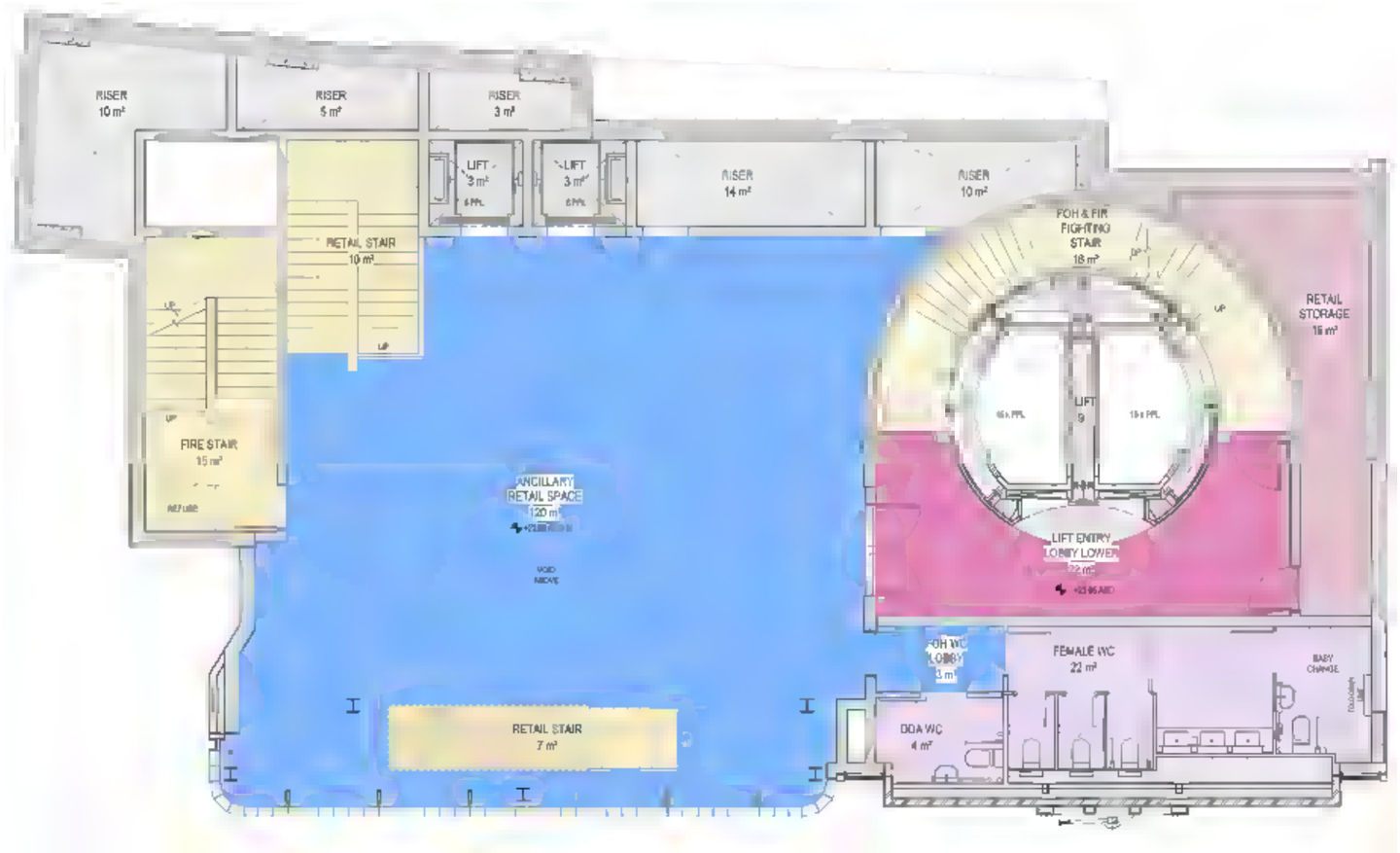
WC Facilities - 200-300lux 0.40Uo

Recommended guidance for all other areas:

Lift Entry Lobby - 100-200lux 0.40Uo

Stairs - 100-200lux 0.50Uo

Retail Storage - 200-300lux 0.40Uo



Level 01 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 02

Key:

Areas closest to the façade:

Ancillary Retail Gallery - 300-500lux 0.40Uo

Retail Stairs - 100-200lux 0.50Uo

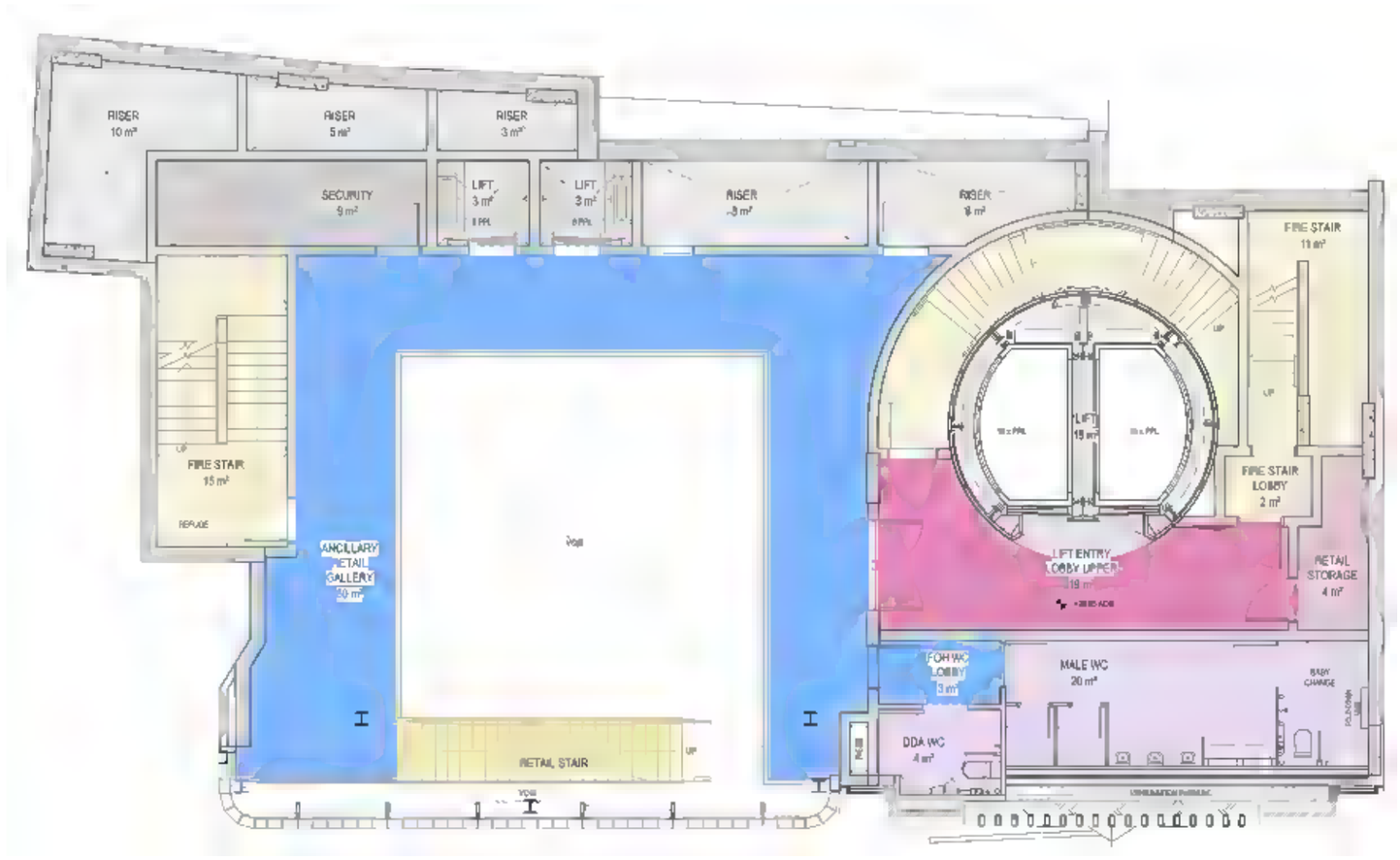
WC Facilities - 200-300lux 0.40Uo

Recommended guidance for all other areas:

Lift Entry Lobby - 100-200lux 0.40Uo

Fire Stairs - 100-200lux 0.50Uo

Retail Storage - 200-300lux 0.40Uo



Level 02 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 03

Key:

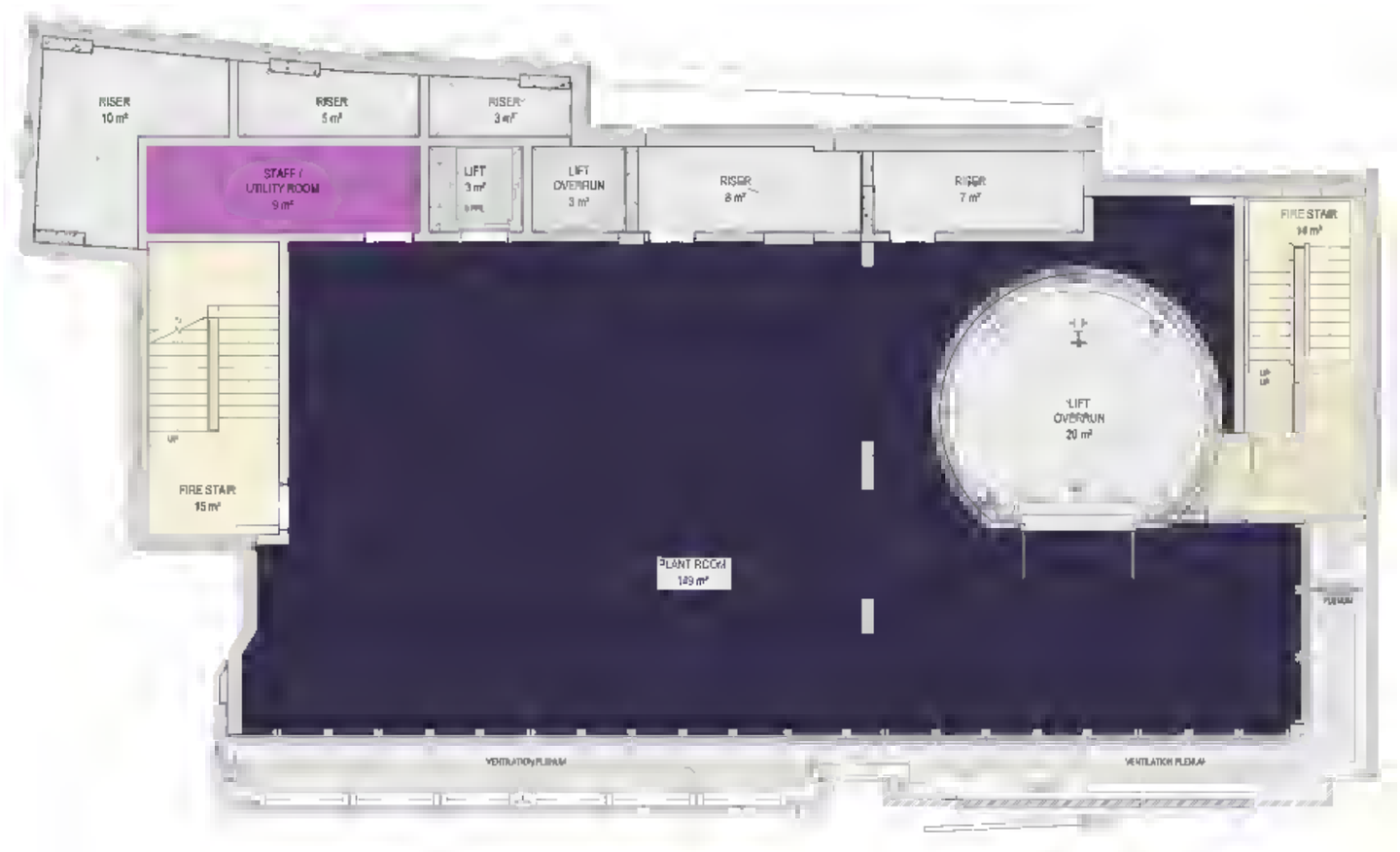
Areas closest to the façade:

Plant Room - 200-300lux 0.40Uo

Recommended guidance for all other areas:

Staff Utility Room - 200-300lux 0.40Uo

Fire Stairs - 100-200lux 0.50Uo



Level 03 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 04

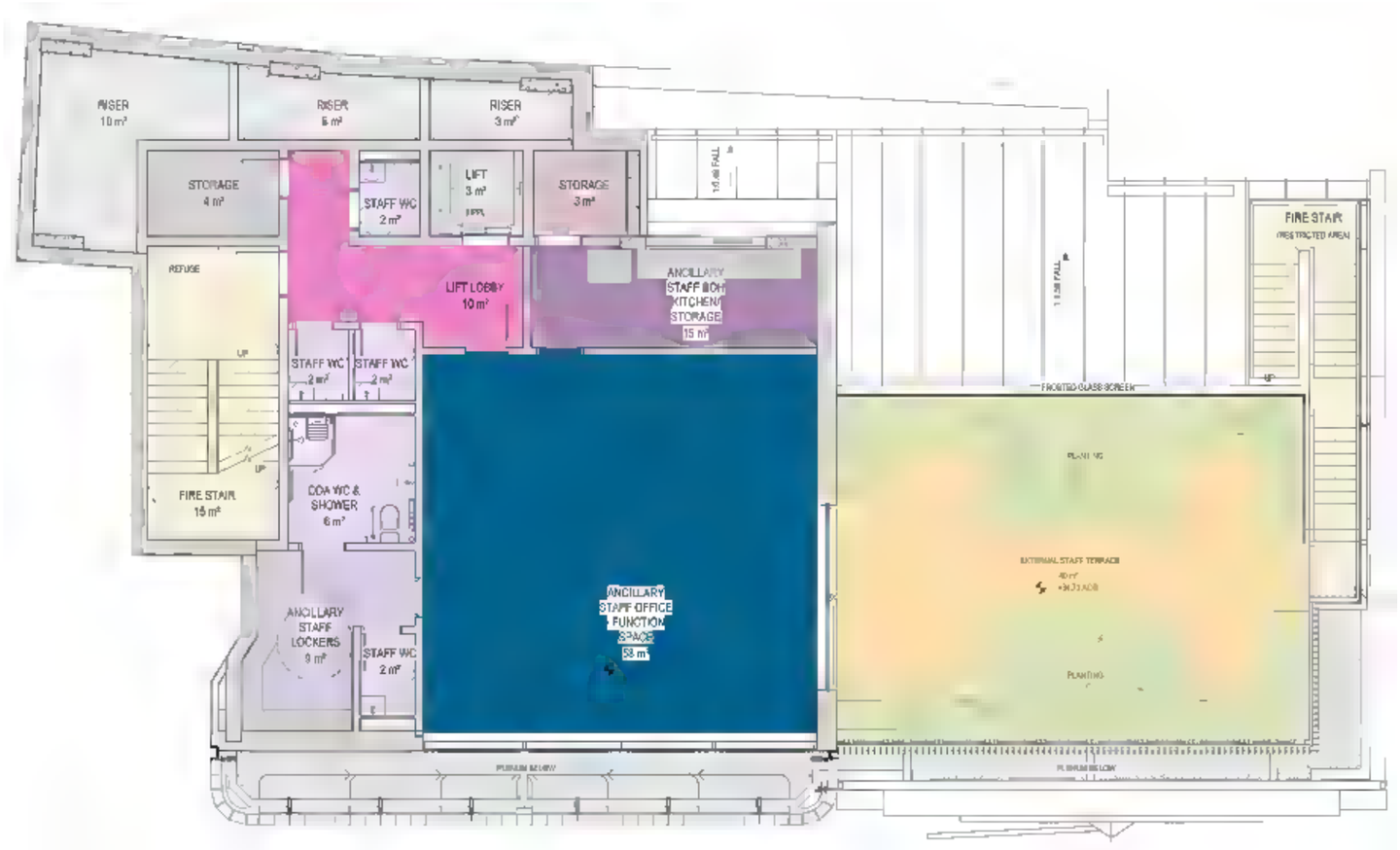
Key:

Areas closest to the façade:

- Ancillary Staff Office/ Function Space - 300-500lux 0.40Uo
- WC Facilities/ Locker Room - 200-300lux 0.40Uo
- External Staff Terrace Pathway - 5lux 0.25Uo
- External Staff Terrace Planting - Feature Lighting
- Fire Stairs - 100-200lux 0.50Uo

Recommended guidance for all other areas:

- Lift Lobby - 100-200lux 0.40Uo
- Storage - 200-300lux 0.40Uo
- Ancillary Staff BOH/ Kitchen/ Storage - 300-500lux 0.40Uo



Level 04 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Level 05

Key:

Areas closest to the façade:

Plant Room - 200-300lux 0.40Uo

Planting & Plant Façade - Feature Lighting

Recommended guidance for all other areas:

Fire Stairs - 100-200lux 0.50Uo

Floor Below - Refer to Level 04

Level 05 Light Level Plan

7. Conceptual Lighting Design

7.3 38-41 Furnival Street Interior - Lighting Criteria - Roof Plan

Key:

Areas closest to the façade:

Plant Room Below - 200-300lux 0.40Uo

Floor Below - Refer to Level 05

Roof Plan

Façade Lighting

Feature/ Indirect Lighting

With the careful integration of the interior lighting the facade will be uniquely illuminated with a gradient of light showcasing the unique textures of the glazing, while also drawing attention to the building from afar.

Canopy Soffit

Functional Lighting

Functional lighting to the canopy will be carefully integrated to allow for sufficient light levels on the paving below. A line of light will be integrated to the canopy soffit, this will subtly create a wash of light which will work in sync with the lighting of the façade.

Interior Spill Light

Indirect Lighting

The spill light from both the windows and façade should be looked at in depth as the lighting spilling out from the building is integral to the lighting scheme as it will add to the feeling and approach to and from the building.

Landscaped Terrace

Feature Lighting

All lighting elements for the terrace area will be integrated as far as possible . This will develop a more personal, and relaxing atmosphere. Discrete low level lighting with a colour temperature of 2700K is recommended.

Façade Structural Features

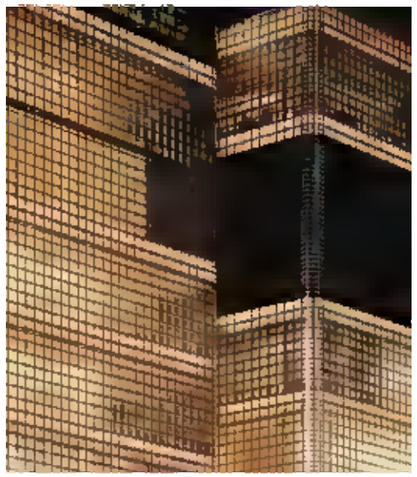
Feature Lighting

Decorative lighting to the structural louvres and crane will also highlight the building from afar. A wash of light will be directed and angled appropriately on the concrete louvres to create a mix of light and shadow. Where a graze of light upon the crane will create interest drawing attention to the unique feature.

Illuminated Signage

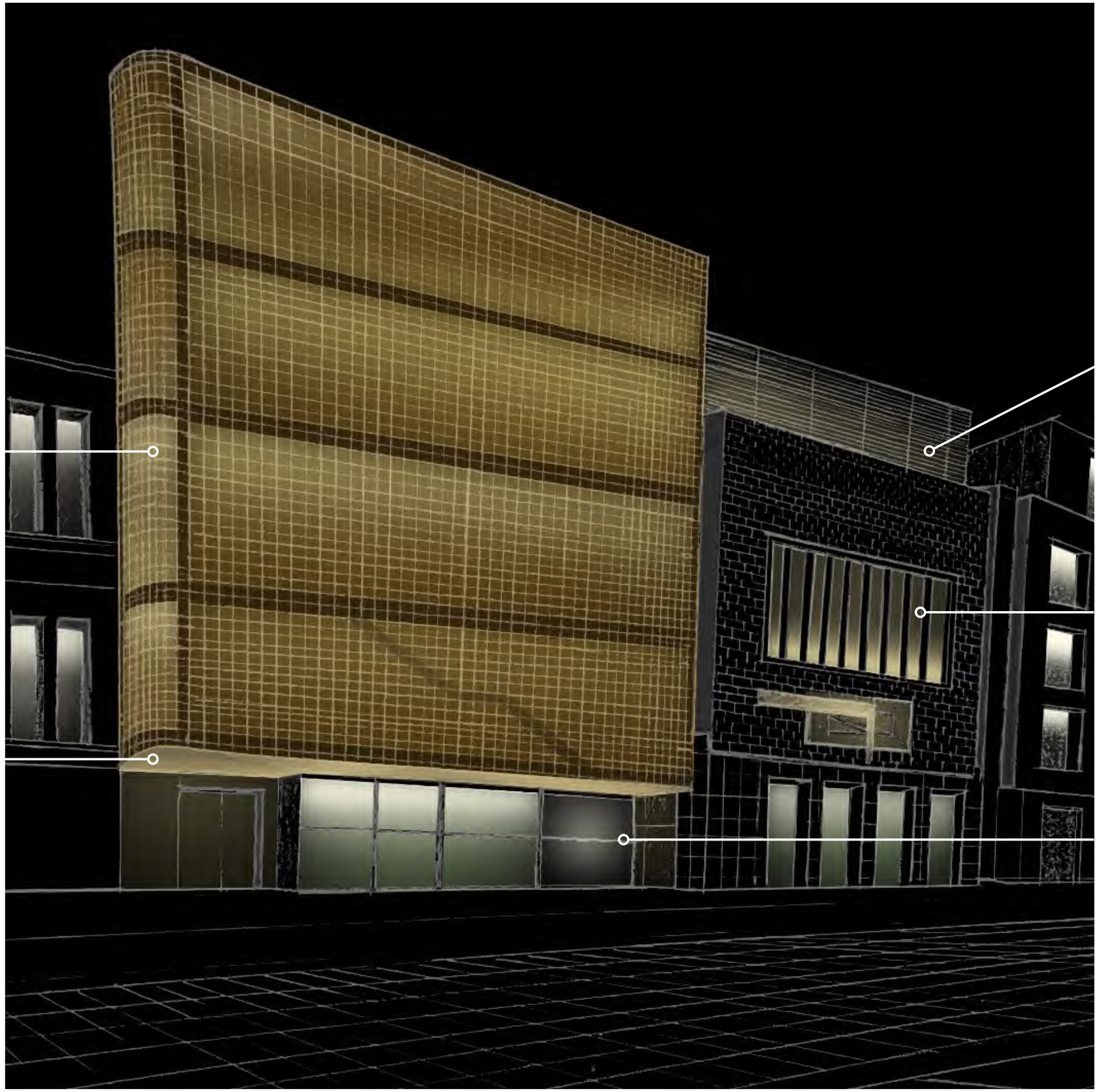
Feature Lighting

It is suggested that the signage for the building should be illuminated in a warm 2700K colour temperature to work in harmony with the rest of the buildings lighting. We can coordinate with the Architects and Sign Manufacturer to incorporate lighting.

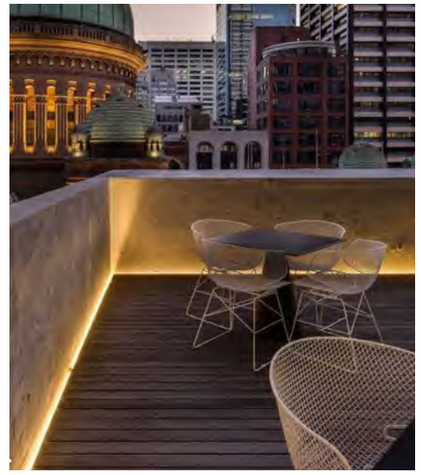


Internally illuminated façade

Create a graze of light on canopy



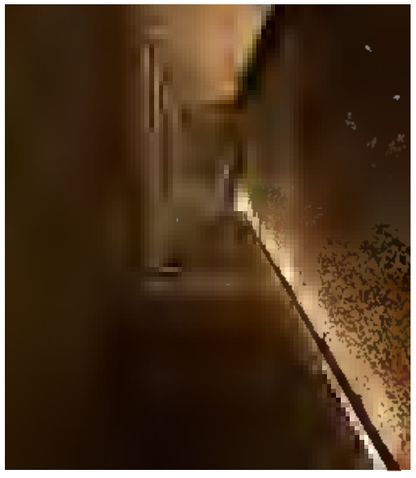
Conceptual Lighting Sketch 38-41 Furnival Street - By WSP Architectural Lighting



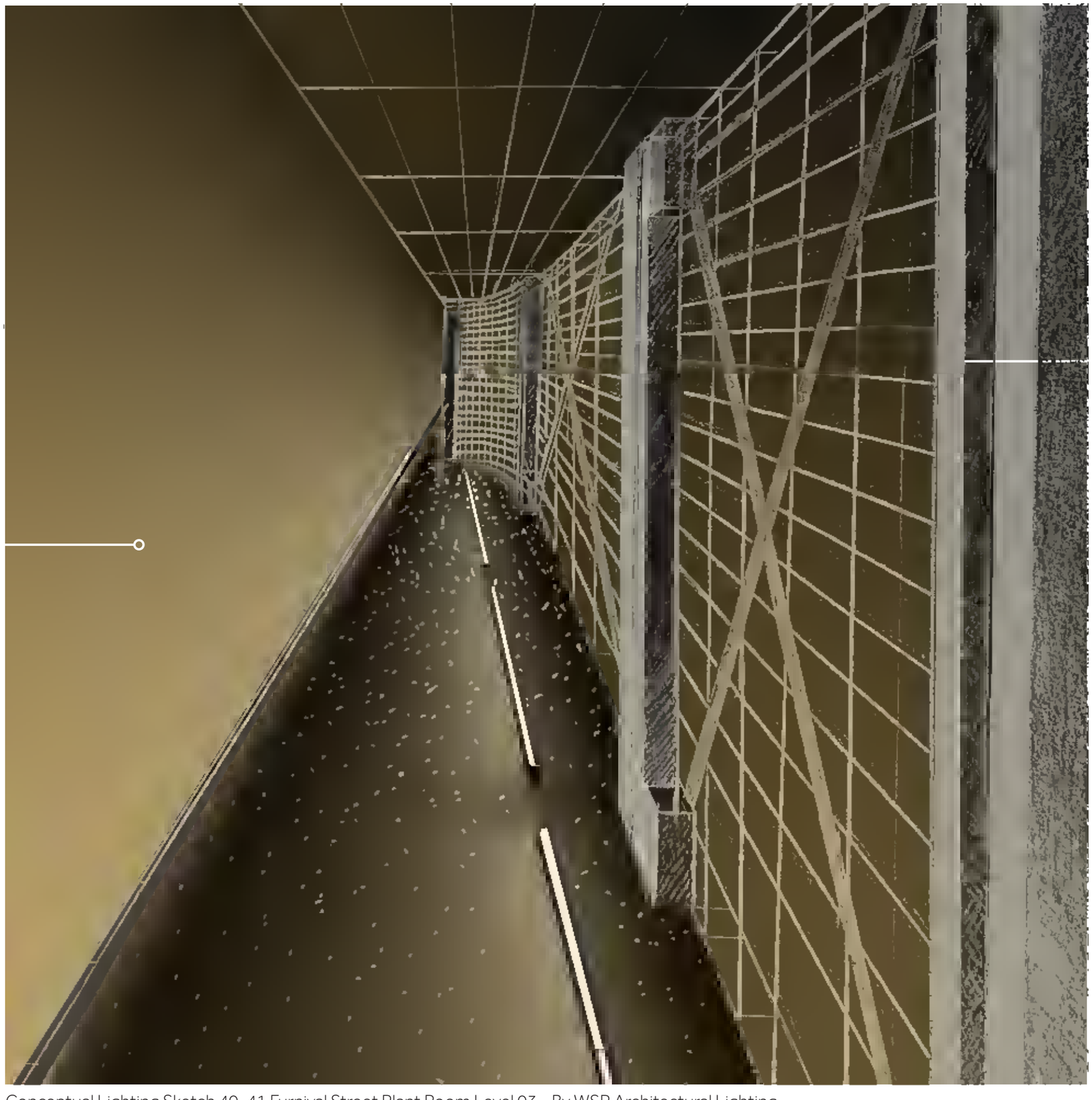
Above landscape terrace lighting

Highlighting structural feature

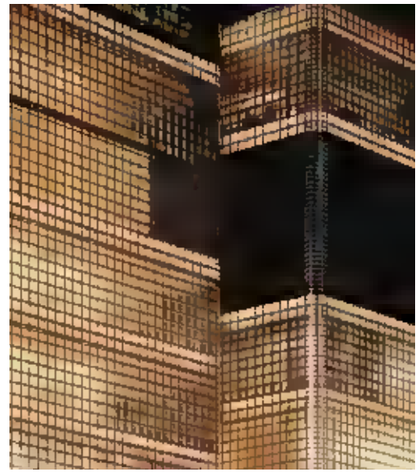
Illuminate signage



Internally illuminate wall to reflect on glazed façade



Conceptual Lighting Sketch 40-41 Furnival Street Plant Room Level 03 - By WSP Architectural Lighting



Internally illuminated façade

7. Conceptual Lighting Design

7.4. 38-41 Furnival Street External Staff Terrace

The landscaped terrace area is a key outdoor space for staff to use at anytime during the day and at night, therefore the lighting design should promote a relaxing and peaceful atmosphere.

Low level lighting will be discretely incorporated into planters. Lighting integrated at low level to both planting brings the space down to a personal level, to feel close to the space and offers spaces to relax. .

Functional decorative bollard lighting will also allow for sufficient lighting levels and uniformity upon the pathway of the terrace allowing people to safely and efficiently use the space during the hours of darkness.

The addition of integrated balustrade lighting will keep the eyes draw to the terrace creating a boundary of light, making the space feel relaxed and calming, making the staff feel in their own private oasis in the city.

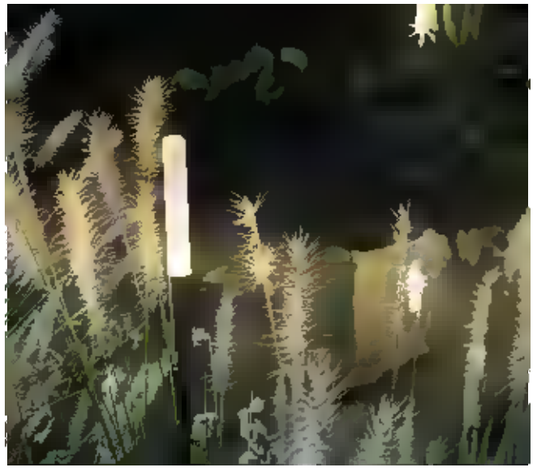
To add a sense of depth and height to the terrace the trees will be carefully moonlit, this will add textured light to the surfaces as well as enhance the textures, colours and patterns of the foliage upon the trees.

The colour temperature of the luminaires is advised to be 2700K or warmer. This will ensure that the colour temperature of the light sources will not have a negative visual effect on the planting, and will also reduce lower levels of light in the blue wavelength that is known to cause harm the ecology of an environment.

Lighting layers include:

- Low level decorative functional bollards.
- Integrated lighting to planters.
- Feature lighting to planting to create textured light.
- Moonlighting to trees.
- Lighting to frosted glass screen.

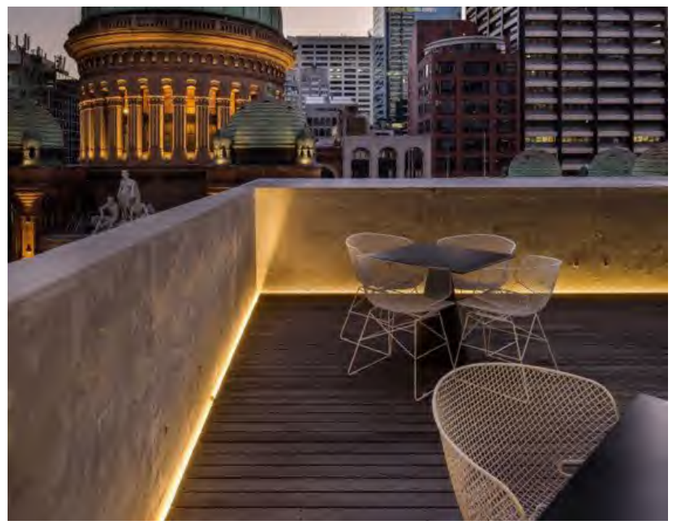
Creating textured light and shadow



Feature lighting to planting

Integrated lighting to planters

Integrated balustrade lighting



Creating a boundary of light

Decorative functional bollard

7. Conceptual Lighting Design

7.5 38-41 Furnival Street External Staff Terrace - Lighting Criteria - Level 04

Key:

Areas closest to the façade Interior & Exterior:

External Staff Terrace Pathway - 5lux 0.25 Uo

External Staff Terrace Planting - Feature Lighting

Ancillary Staff Office/ Function Space - 300-500lux 0.40Uo

WC Facilities/ Locker Room - 200-300lux 0.40Uo

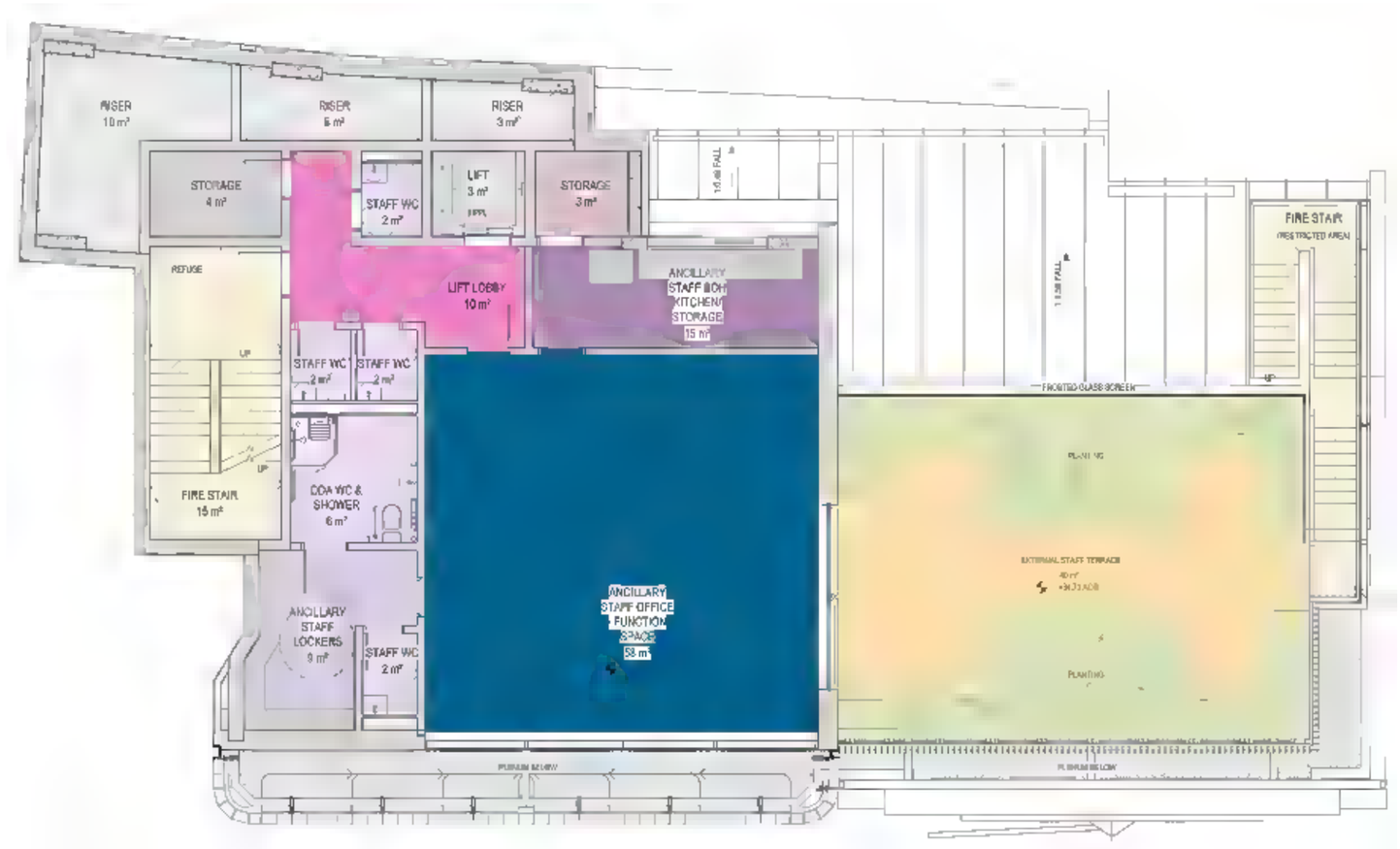
Fire Stairs - 100-200lux 0.40Uo

Recommended guidance for all other areas:

Lift Lobby - 100-200lux 0.4Uo

Storage - 200-300lux 0.40Uo

Ancillary Staff BOH/ Kitchen/ Storage - 300-500lux 0.40Uo



Level 04 Light Level Plan

Plant Area

Functional Lighting

Lighting to the rooftop plant will be controlled to switch on when in use and be switched off when the area is not being used. Presence detectors will help to dim or switch off all luminaires when the lighting is not required.

Wall wash

Feature Lighting

A subtle graze/ wash of light is suggested for the upper wall of the building. This will allow for a subtle graze of light at the top of the building, giving a continuation of the building façade.

Façade Lighting

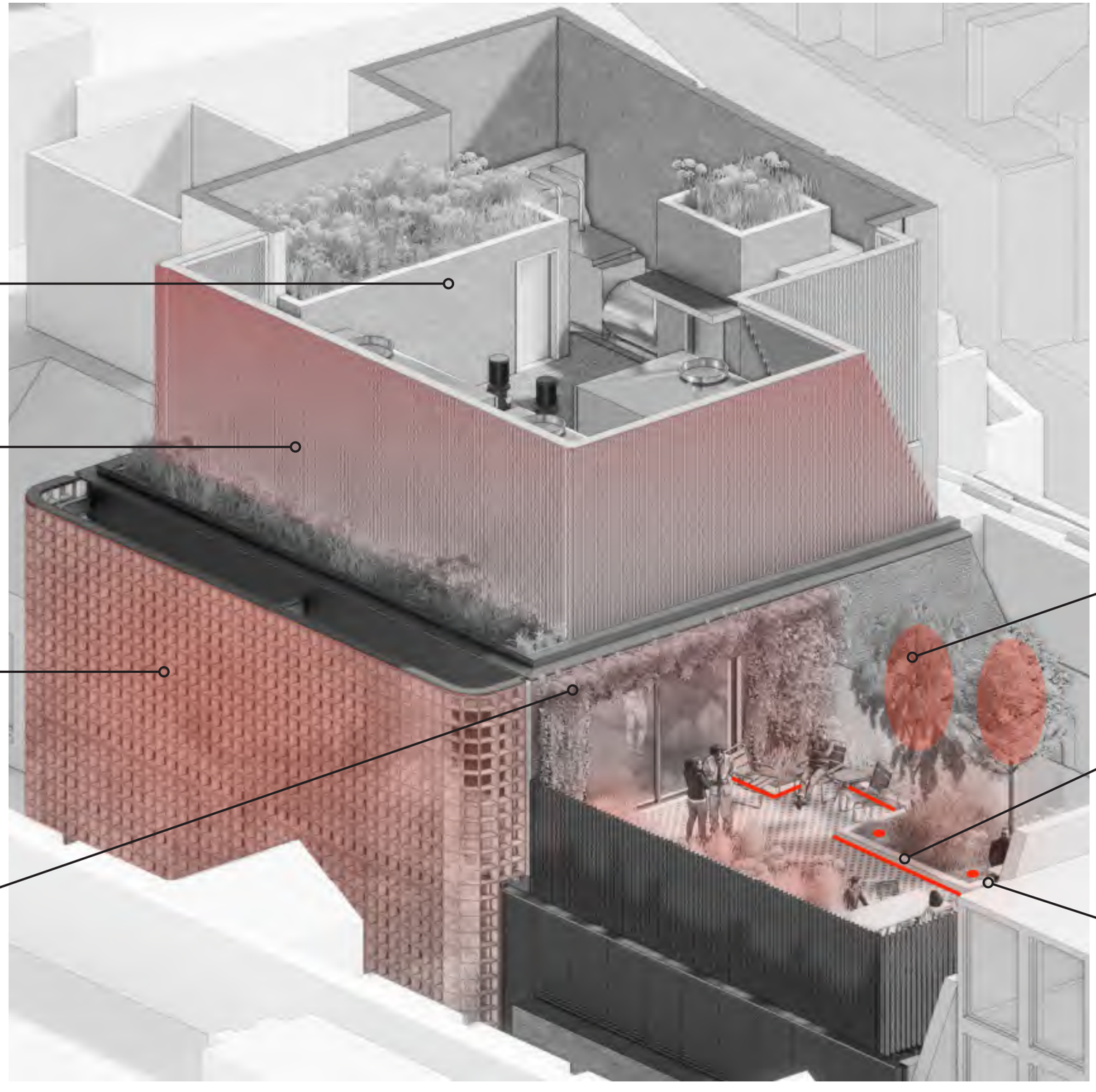
Feature/ Indirect Lighting

With the careful integration of the interior lighting the facade will be uniquely illuminated with a gradient of light showcasing the unique textures of the glazing, while also drawing attention to the building from afar.

Graze of Light

Feature/ Functional Lighting

It is suggested that a wall wash of linear light is integrated above the doorway of the terrace. A subtle wash of light will graze down the wall and planting foliage to create texture while also carefully lighting the entrance/ exit.



Tree Moonlighting

Feature Lighting

The moonlighting of the trees will add a sense of height to the terrace area without causing any light spill or intrusion into the neighbouring properties. Textures of light and shadow will fall upon the surface of the paving from the foliage of the trees creating a relaxing and calming atmosphere.

Low Level Integrated Linear

Feature Lighting

Low level integrated linear luminaires can be integrated into the planting edges this will add additional interest to the terrace area at a personal scale. A glow of light will emit out of this lighting element providing decorative and ambient light upon the paving.

Bollard Lighting

Functional Lighting

Low level bollard lighting is suggested to illuminated the pathway of the terrace area. This will allow for sufficient light levels and uniformity without their being any spill light or light intrusion into the neighbouring properties.

7. Conceptual Lighting Design

7.6. 31-33 High Holborn

The Alleyway at High Holborn is a key pedestrian route and therefore should promote active travel by reassuring people and making them feel safe to walk or cycle through the space during the day or during the hours of darkness.

The Alleyway is one of the main approaches to and from the museum and therefore should develop the main identity and atmosphere for the site. Lighting layers will be creatively used to develop a safe and dynamic environment and give a unique personality to the walkway.

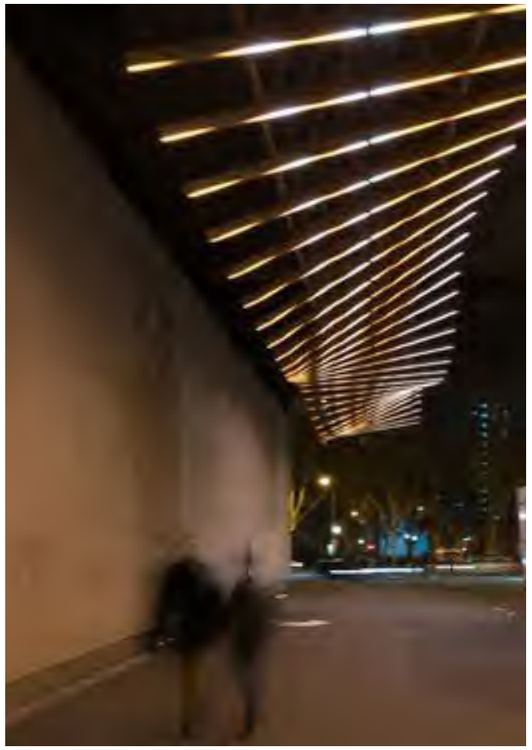
Inspiration from the below tunnels will be taken here from their unique history, the structure of the train tracks to develop a lighting scheme that evokes a connection with the below tunnels and the above Alleyway.

A key focus on the structure of the walkway its soffit and walls will be taken to develop the lighting scheme. By utilising these features key interest from the mix of light, shadow and pattern will be created from the different layers of the lighting scheme.

Lighting layers include:

- High level functional lighting to the soffit to provide sufficient lighting levels.
- Wall or maker lighting to provide sufficient lighting levels to the walkway at a more personal scale.
- Feature/ accent lighting to the soffit in the form of a sculptural lighting piece to draw the eyes through the Alleyway and to provide visual interest.
- Decorative lighting in the form of textured light and shadow to add depth to the lighting scheme.

Create a structure of light



Utilise the soffit of the Alleyway

Utilise the wall of the Alleyway

Create a gradient of light

7. Conceptual Lighting Design

7.7 31-33 High Holborn - Lighting Criteria

Key:

Alleyway to Fulwood Place - 20-50lux 0.40Uo

Fulwood Place - 20-50lux 0.40Uo

Recommended guidance for all other areas:

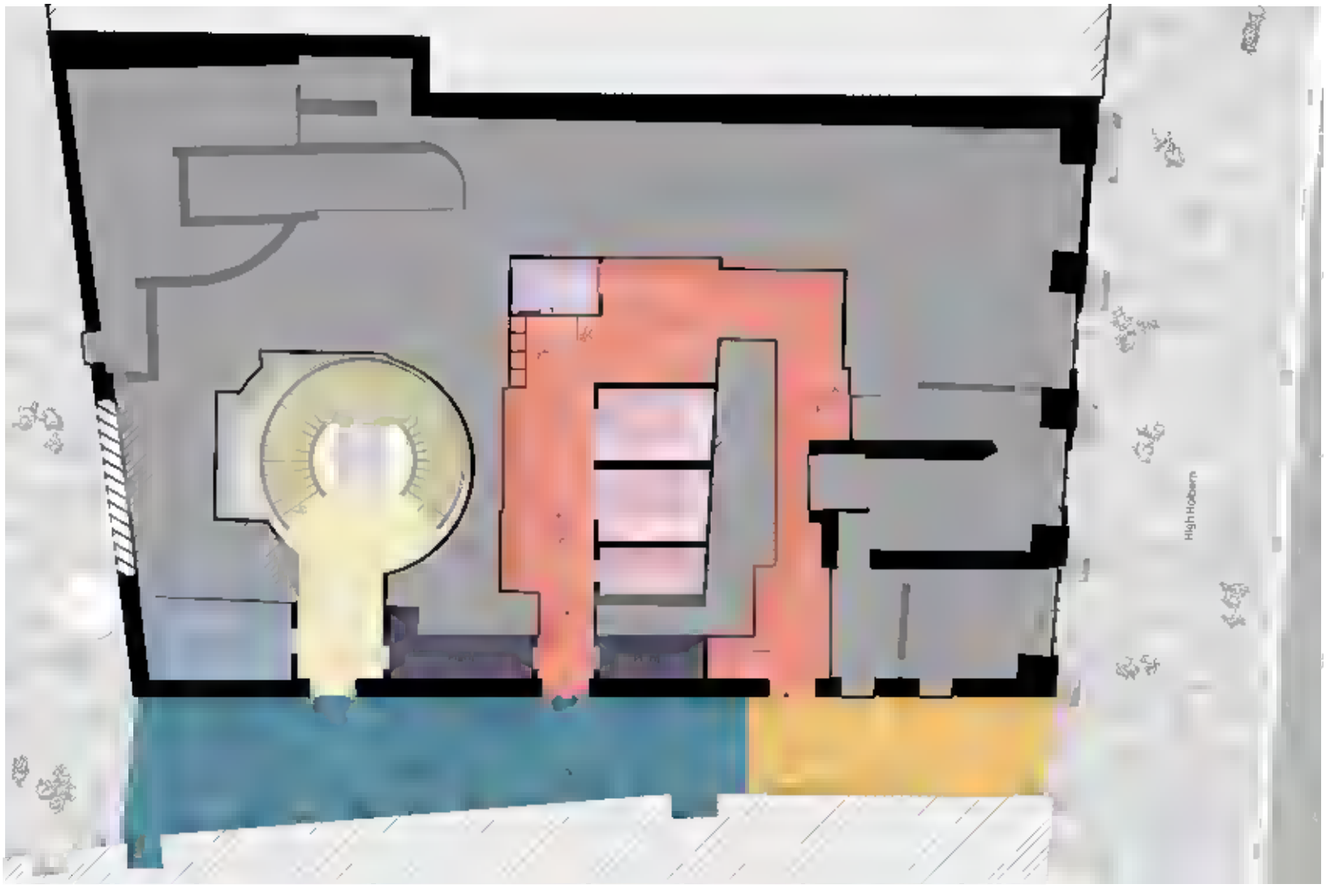
Fire Stairs - 100-200lux 0.40Uo

Recommended guidance for all other areas:

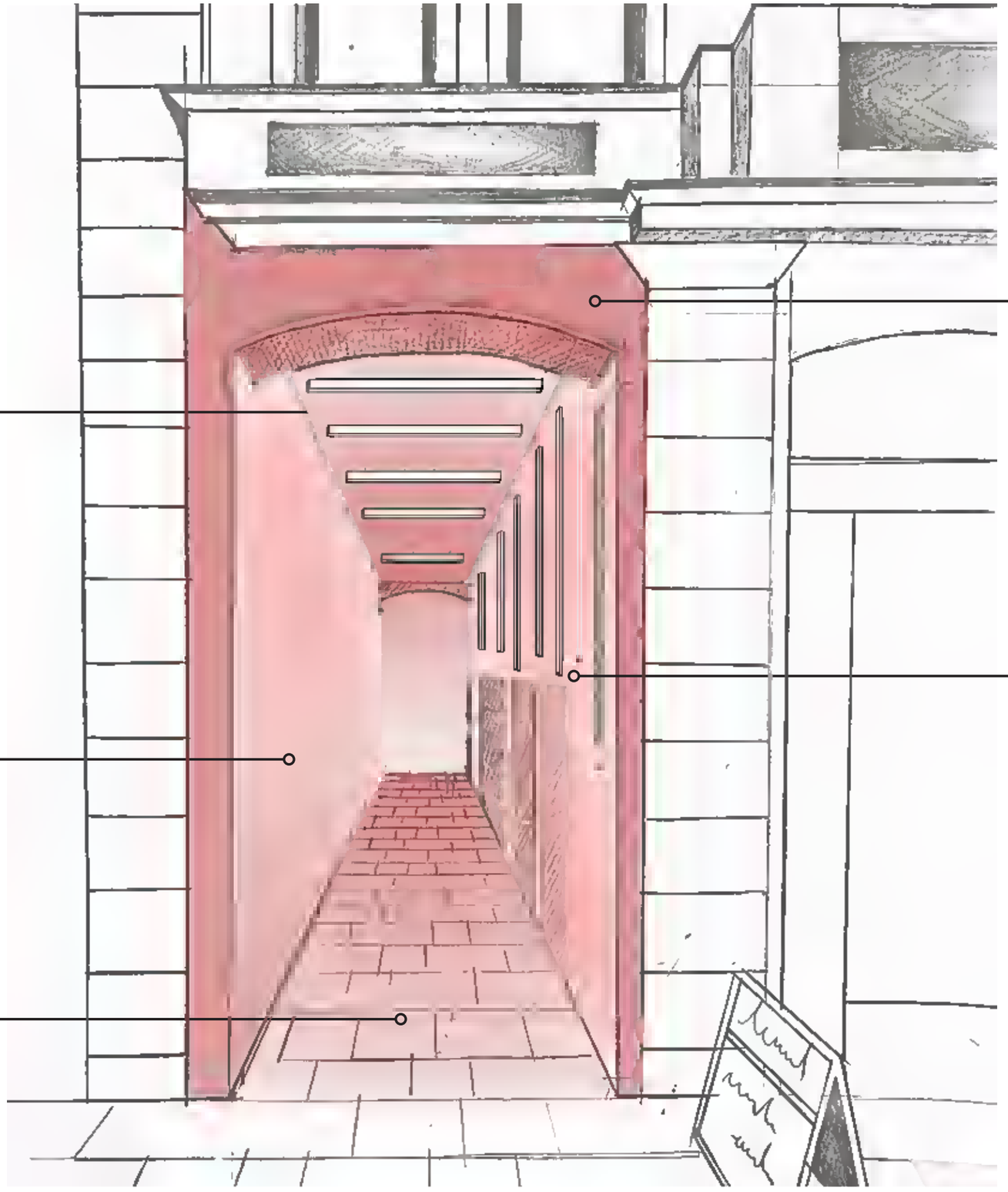
Entrance/ Exit Lobby - 100-200lux 0.40Uo

WC Facilities/ Locker Room - 200-300lux 0.40Uo

Fire Stairs - 100-200lux 0.50Uo



31-33 High Holborn Light Level Plan



Utilise the Soffit

Feature/ Functional Lighting

By utilising the soffit of the Alleyway a more decorative, sculptural source of lighting can be developed. We can work with the Architects to design a unique system that is bespoke to the Alleyway and that will showcase the entrance via the Alleyway and the fire exists at Fulwood Place. The decorative lighting could take inspiration form the tunnels below.

Be respectful of surroundings

All Lighting

Both the functional and feature lighting should be designed respectfully and carefully to consider its surroundings to avoid any spill light or light intrusion into neighbouring properties. Consideration should also be taken into the placement and installation of all luminaires.

Pedestrian Pathway

Functional Lighting

Lighting calculations should be run to determine the light levels and uniformity of the pathway. All lighting should conform to the relevant guidance and regulations to create a safe and welcoming environment.

Graze of light

Feature Lighting

Lighting can be incorporated to work in flow with the structure of the Alleyway, by doing so a graze of light will wash down the walls of the walkway drawing the eyes down towards the entrance of the tunnel shaft.

Utilise the Structure

Feature Lighting

Lighting can be incorporated to work in flow with the structure of the Alleyway, by doing so the lighting can act as a wayfinding tool through to Fulwood Place. By replicating the lighting upon the soffit to the Alleyway wall a coherent look will be achieved. RGBW or tunable white light is suggested here to provide a more dynamic and visually pleasing feel to the small space.

8. Lighting Summary

8.1. To Summarise

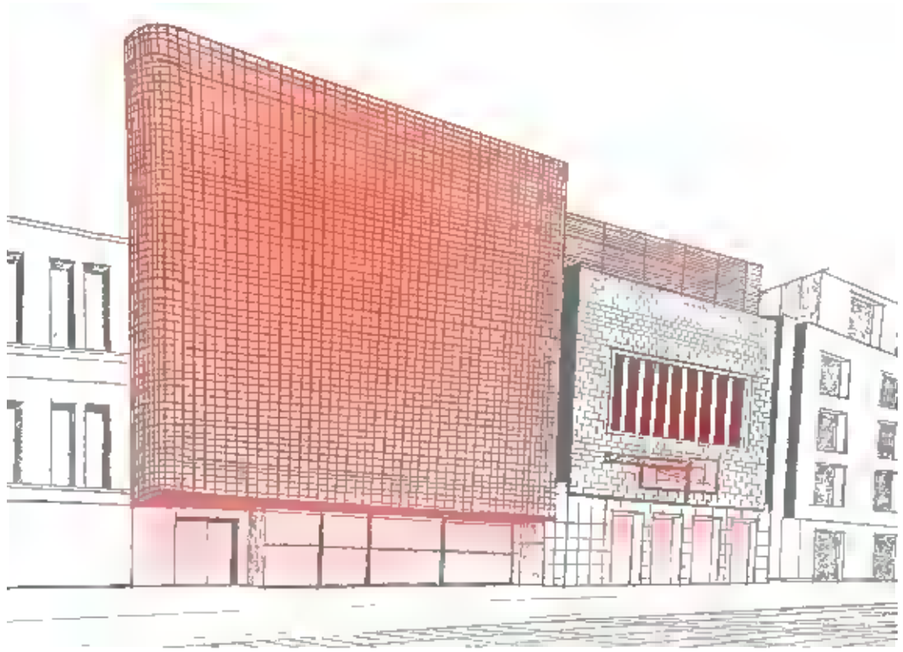
The lighting design for The London Tunnels will therefore, be designed subtly and effectively showcasing and highlighting all areas in a unique, respectful and dynamic way. By utilising the power of light to be both dramatic but also soft and delicate both 38-41 Furnival Street and 31-33 High Holborn Alleyway will stamp their own personalities and stance on the overall environment but will be lit in such a way to project a coherent identity upon the night-time environment.

To summarise:

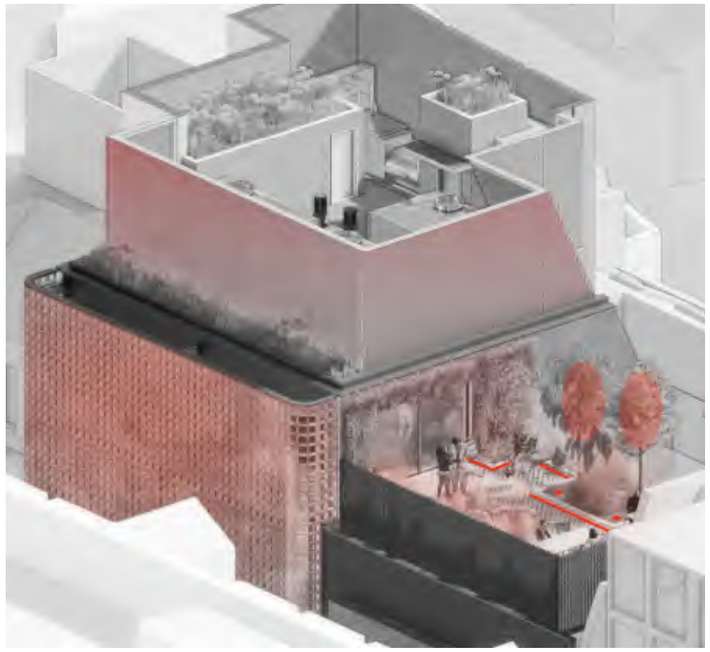
38-41 Furnival Street - will be designed to sufficient lighting levels for safety and security for all to use the interior and exterior spaces at night. The lighting to the façade will be designed to showcase the building from afar but will be delicately detailed with care and attention to the placement and fixing of interior luminaires so to not cause any unwanted spill or obtrusive light. It is important to state that testing of luminaires with the proposed glazing should be carried out at a later stage to determine the crucial placement, material and appropriate luminaires are being used to achieve the desired effect upon the external façade. It should also be noted that lighting calculations should be ran to determine the amount of light and any spill light that may emit from the interior of the building, this can be coordinated at the next stage of the project.

38-41 Furnival Street External Staff Terrace - will be designed to create a relaxing and calming atmosphere for staff to enjoy the space. Lighting will be discretely incorporated to planters with decorative bollards with a downward light distribution used to provide sufficient light levels. Decorative elements to planting along with careful moonlighting of trees will provide ambient lighting to the terrace areas. Careful consideration to the uplighting of the external façade of the plant area will be taken to show a continuation to the main façade, a subtle wash of light will highlight a glow of light eliminating any dark areas at the top of the building.

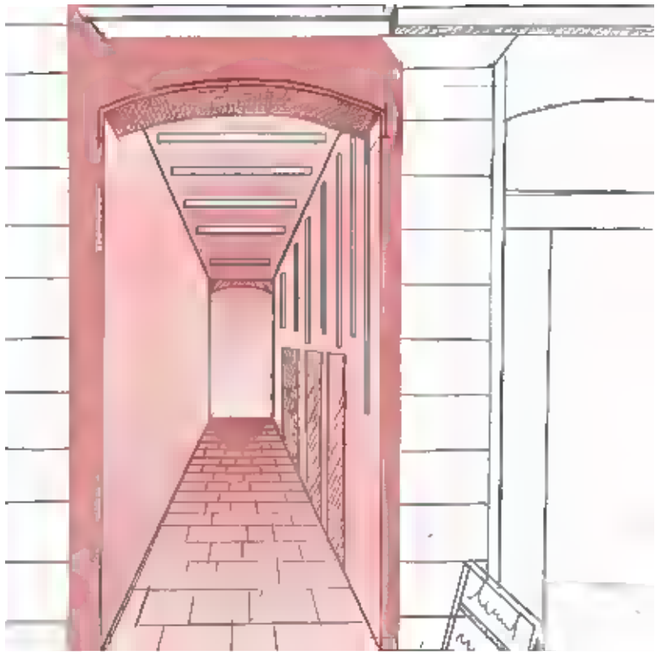
31-33 High Holborn Alleyway - is a more playful and dynamic space. Lighting will take the form of a more sculptural piece within the Alleyway to draw attention and interest. Linear luminaires upon the soffit and wall of the Alleyway will provide not only sufficient lighting levels and uniformity for pedestrians using the space but also convey a unique feeling to the space. Here it is suggested to use RGBW or tunable white luminaires to subtly draw interest towards the Alleyway. The placement of luminaires should also be considered to create a more sculptural piece with higher and lower heights upon the soffit and longer and smaller lengths of luminaires upon the wall. Again it is recommended that lighting calculations should be ran to determine light levels upon the pathway of the Alleyway. Lighting at Fulwood Place should also be considered for safety and security.



38-41 Furnival Street



38-41 Furnival Street - External Staff Terrace



31-33 High Holborn Alleyway

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