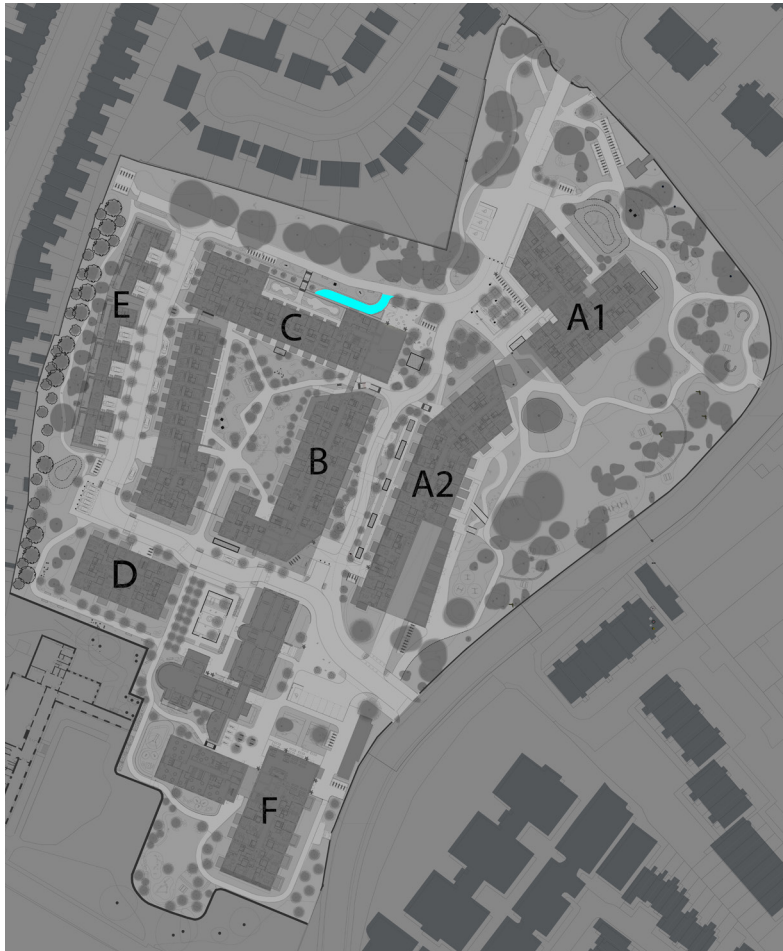
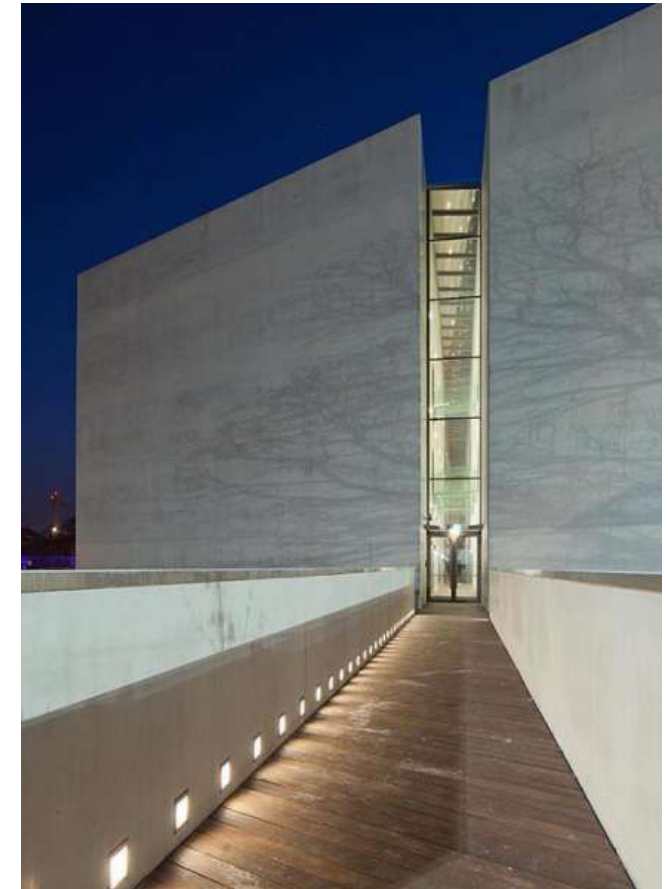


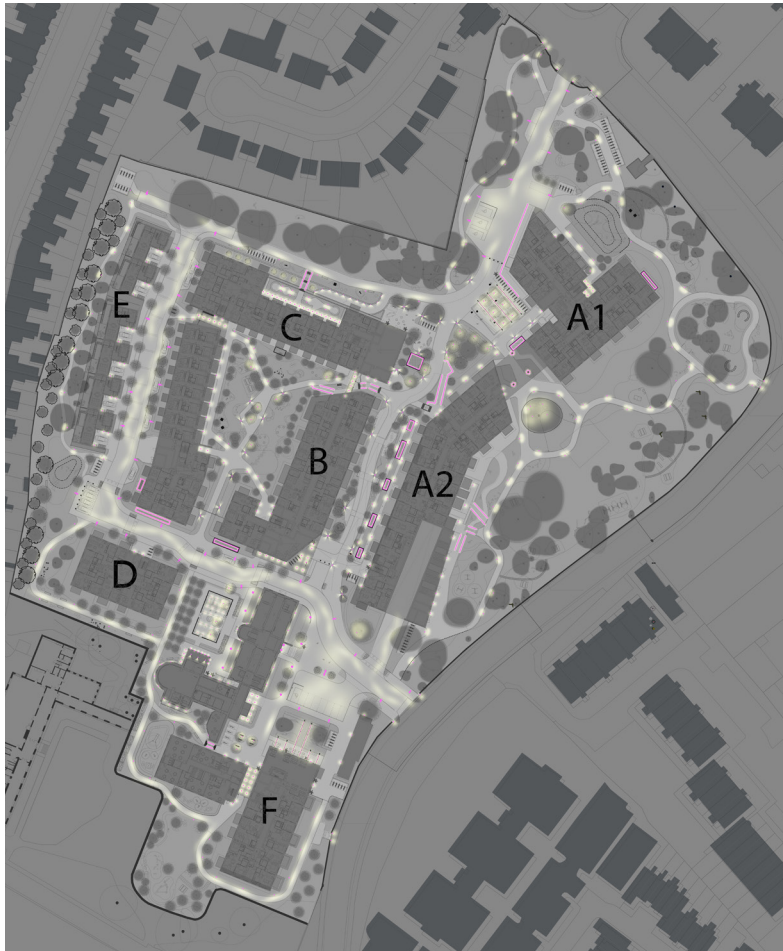
Cycle Ramp



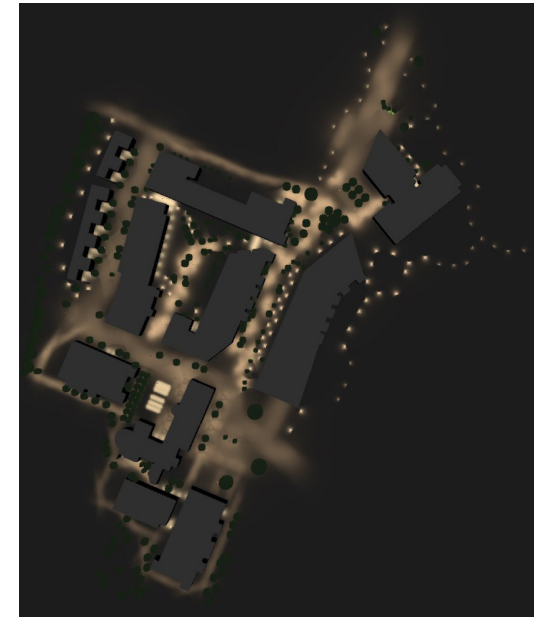
The cycle ramp adjacent to Block C will require a wall mounted light source to illuminate the route and guide cyclists to the underground cycle parking area. These lights will be set low level along a wall with all light direct down to the ground in each instance and again with a warm white 2700 kelvin LED source.



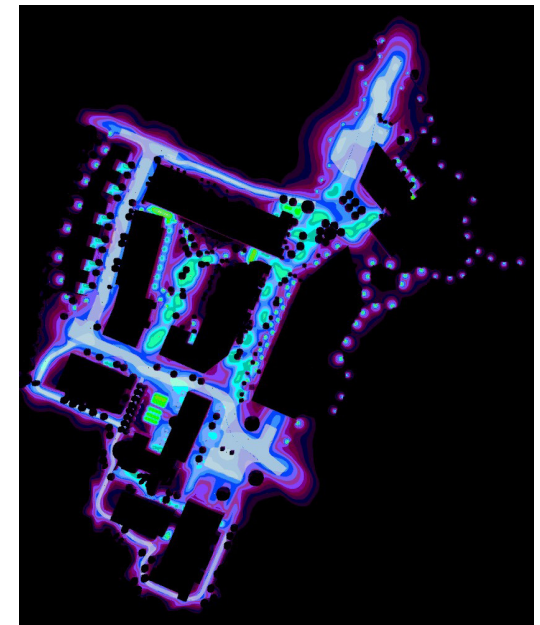
Site-Wide Lighting: Implementation of the Concept



Lighting calculation simulation
Site-wide lighting
True Colour Rendering



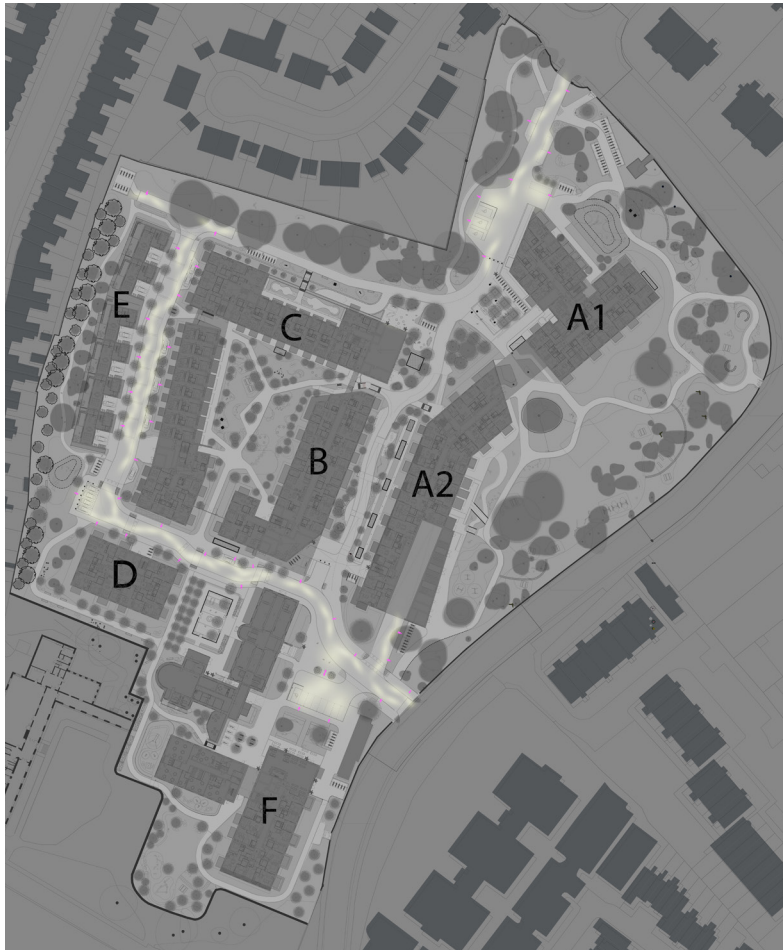
Lighting calculation simulation
Site-wide lighting
False Colour Rendering



Across these next pages we indicate how the concept design fundamentals will be extrapolated across the site using the relevant standards guidance and plot calculations to indicate how light levels will be achieved with ecologically sensitive areas kept dark and how the design will set out brighter zones at the heart of the site and set out more uniform and purposeful levels along roadways.

Lighting has been designed in accordance with the guidelines detailed on the following page, any further certification requirements can be designed into the scheme as part of design development through specification of lighting equipment.

Vehicular Routes - Performance Guidance



Tables from ILPGN01:2011

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, TDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Observational Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light Intrusion (into Windows) E _w [lux] ⁽²⁾		Luminaire Intensity I [candelas] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾ [cd/m ²]
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Tables from European Standard: EN13201-2

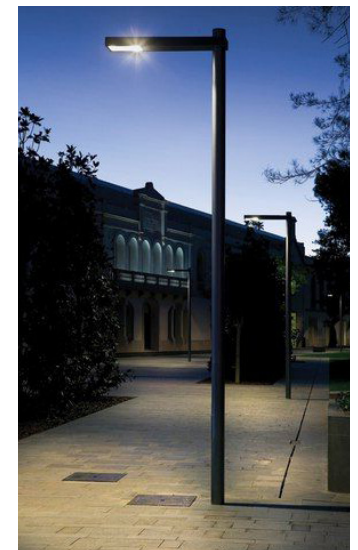
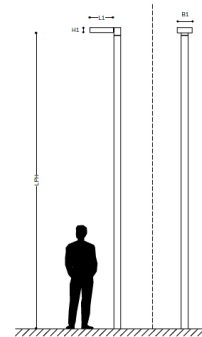
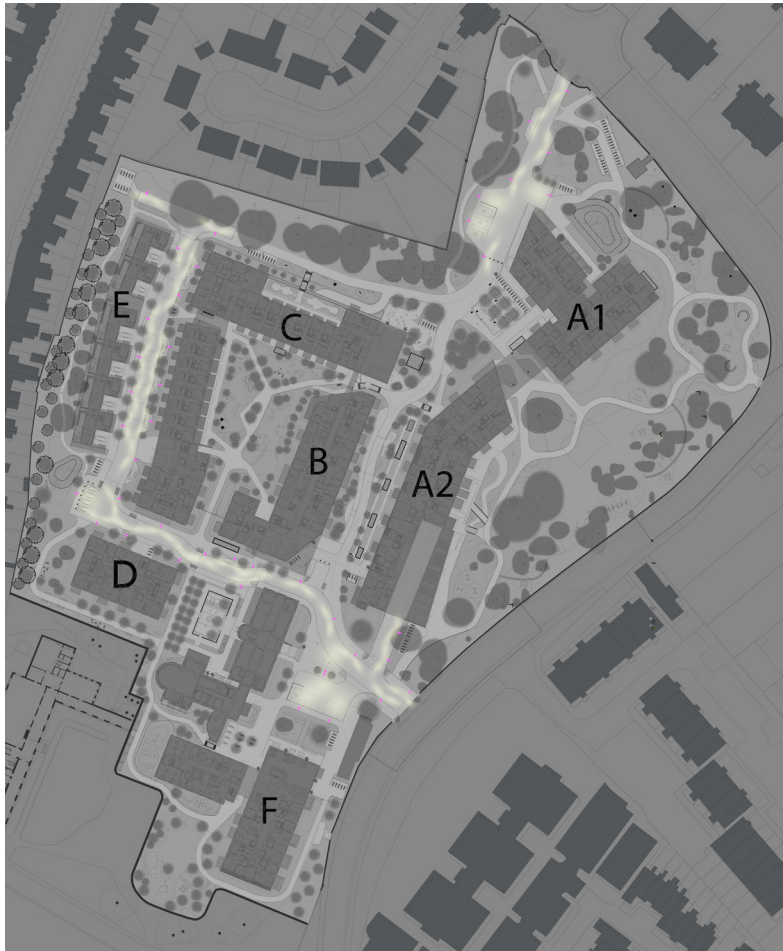
Class	Horizontal illuminance	
	\bar{E} in lx [minimum maintained]	U_0 [minimum]
CE0	50	0,4
CE1	30	0,4
CE2	20	0,4
CE3	15	0,4
CE4	10	0,4
CE5	7,5	0,4

Using the CIBSE guidelines in conjunction with Secure by Design document the parameters for the lighting criteria have determined lighting levels across the site.

Using the guidance of the Institute of Lighting Professionals and using the European Standard EN: 13201-2 we determine that the site will classify as an E3 class zone - Suburban. Any roadways will be designed to provide a minimum average of 15 lux with a 0.4 uniformity and with the appropriate glare control ratings.

Excerpts from the relevant tables are provided on this page.

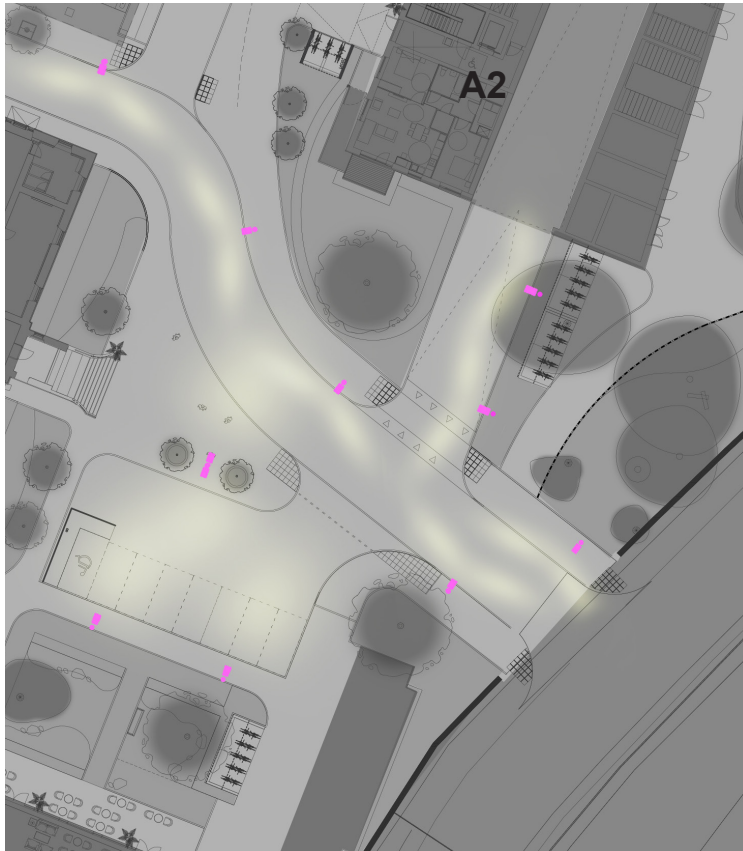
Vehicular Routes - Street Column Locations



Lighting columns will be 6 metres height using a root mounted fixing and a flat glass, full cut-off optic LED lantern with roadway performance, DALI dimmability and no upward light component to reduce nighttime light pollution. Light source will be 2700 kelvin warm white and will be set to soft start at dusk to avoid a sharp and sudden spike in light levels.

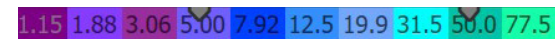
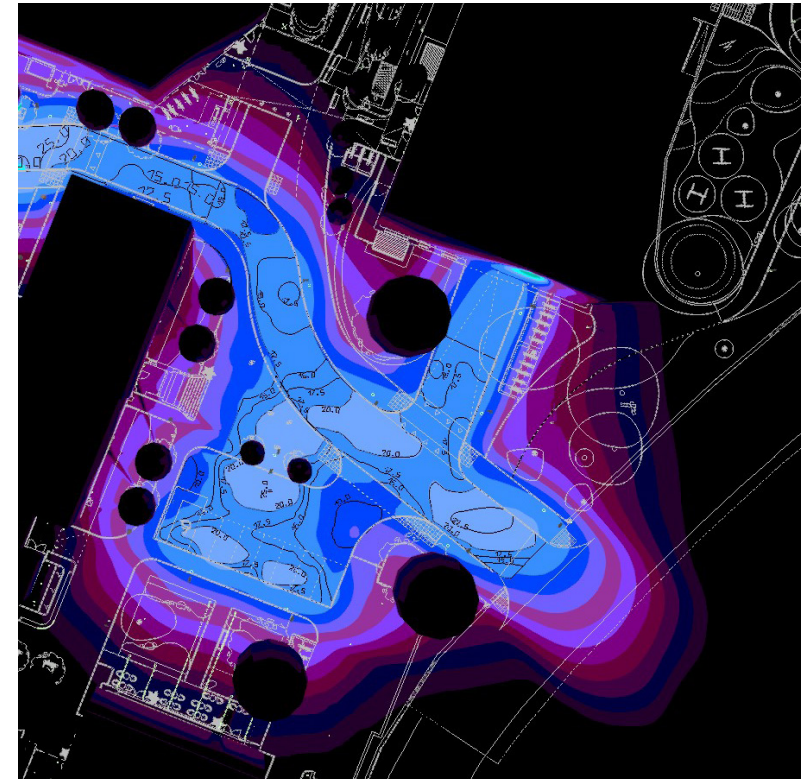
Preliminary calculations have been undertaken to show that we can achieve the 15 lux averages and 0.4 uniformity in the specific road zones of the site. These have been broken down for ease of presentation into four areas on the following pages.

Vehicular Routes - Street Column Location - Area 1



SE Entrance road	19.3 lx	0.67
Tabor House Parking/Drop...	18.6 lx	0.41

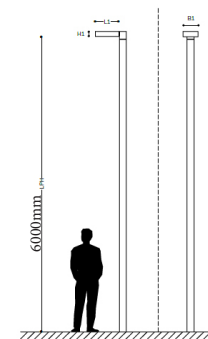
Dialux average lux levels (lx) & Uniformity measures



Key to Lux Level Colours

Area 1 - Milltown Road Entrance

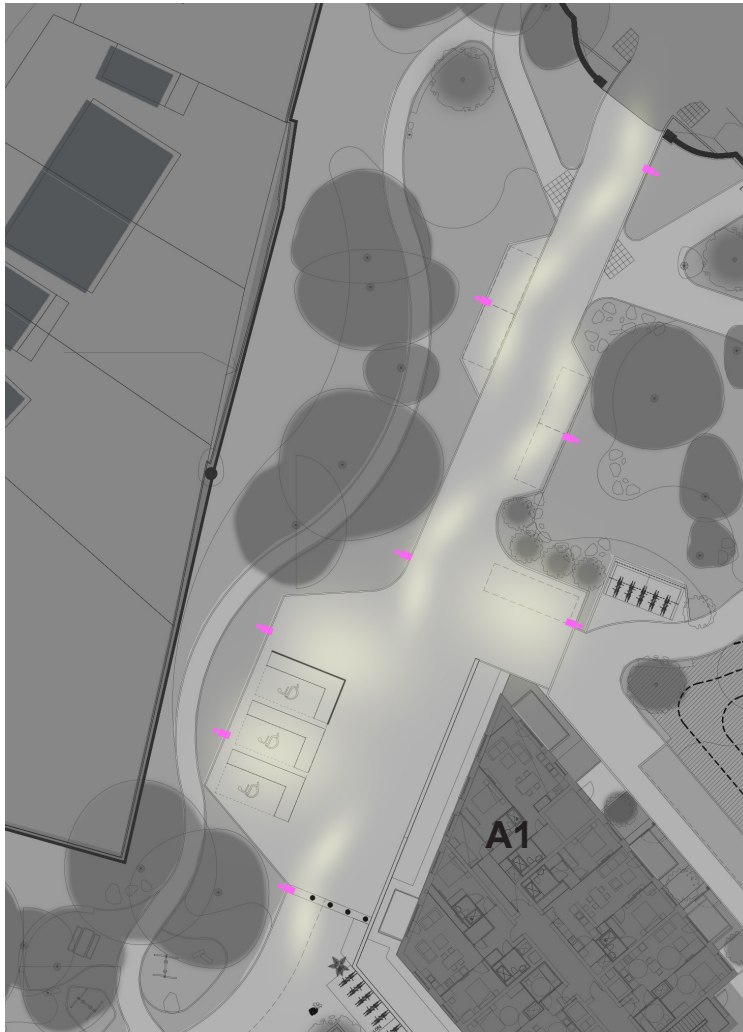
Light levels are higher at the entrance and in this busier road area leading to the car park ramp. Behind the car parking spaces to the south two columns illuminate the parking and the road in front of it but in most instances columns are kept to the north side of the road. Uniformity is above 0.4 and lux average is above 18 lux. Columns along the east boundary of this area, close in to the eastern edge 'Bat Ecology Dark Zone' are fitted with additional light spill baffles to the back of the fitting to minimise light spill.



Additional Light Spill Baffles fixed to eastern flank fittings.



Vehicular Routes - Street Column Location - Area 2

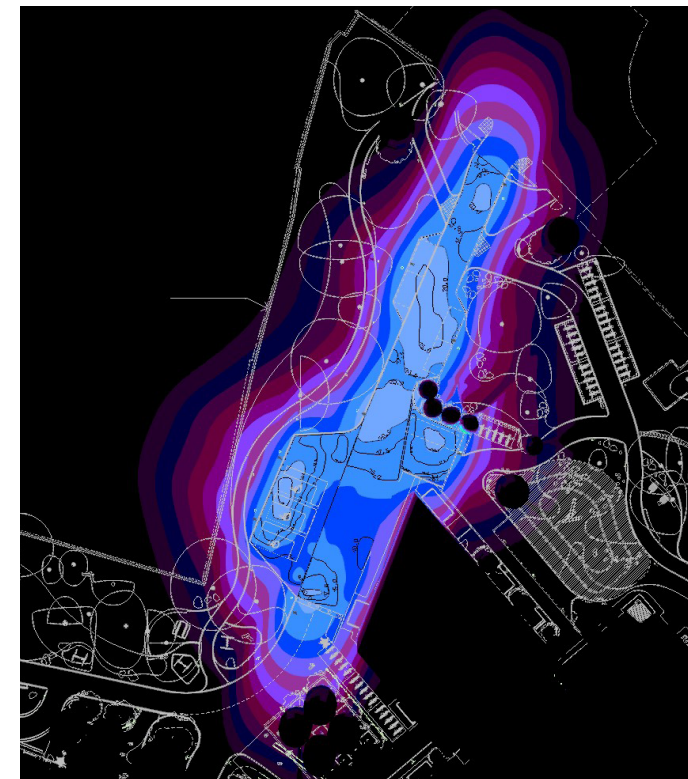


▼	N Entrance Road		
▶		18.2 lx	0.50
▼	N turning area		
▶		18.0 lx	0.67
▼	N accessible parking bays		
▶		15.6 lx	0.52

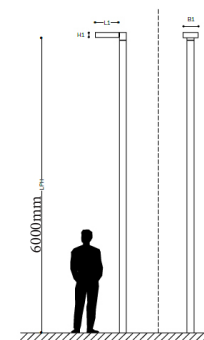
Dialux average lux levels (lx) & Uniformity measures

Area 2 - Sandford Road Entrance

A staggered arrangement of columns along the Sandford Road secondary entrance road leads up to the parking area and taxi turn around zone. Uniformity is above 0.5 and lux average is above 15 lux. Columns along the west boundary of this area, close in to the western edge 'Bat Ecology Dark Zone' are fitted with additional light spill baffles to the back of the fitting to minimise light spill.



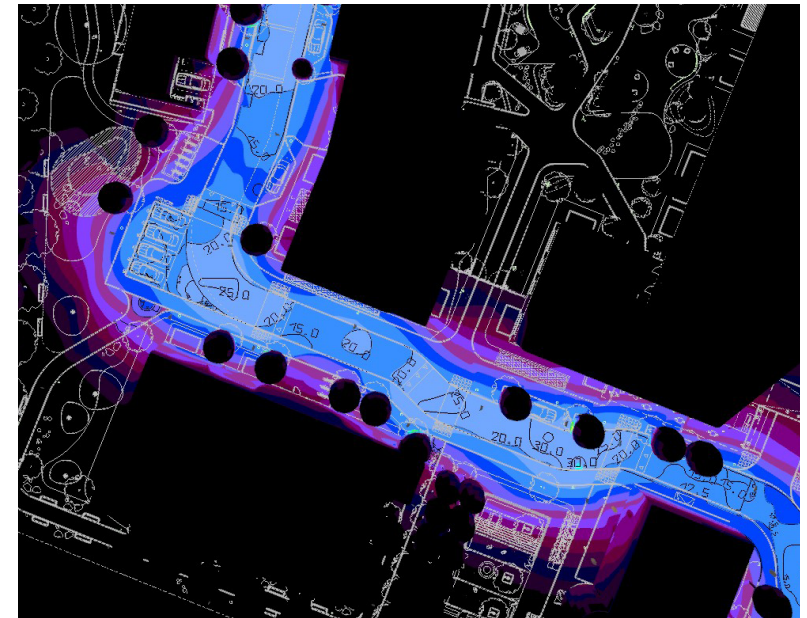
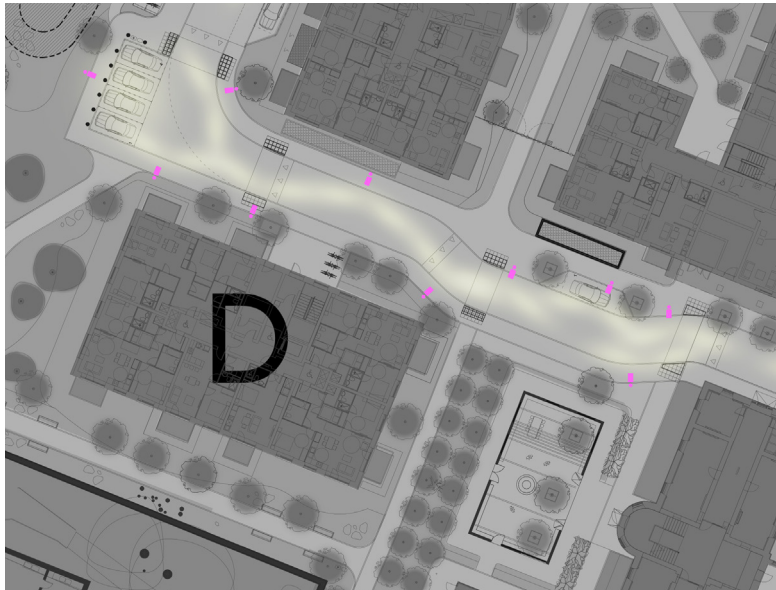
Key to Lux Level Colours



Additional Light Spill Baffles fixed to western flank fittings.

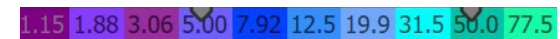


Vehicular Routes - Street Column Location - Area 3



SW parking bays	19.4 lx	0.67
S road	22.7 lx	0.55

Dialux average lux levels (lx) & Uniformity measures

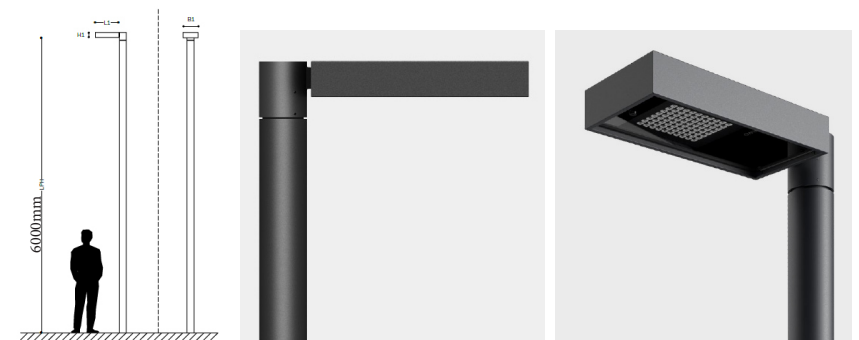


Key to Lux Level Colours

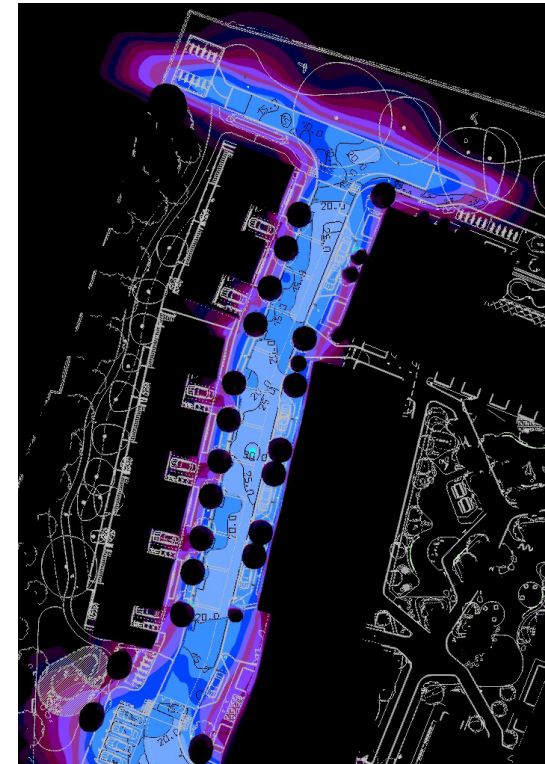
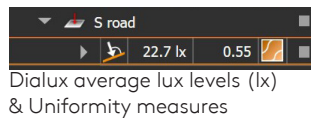
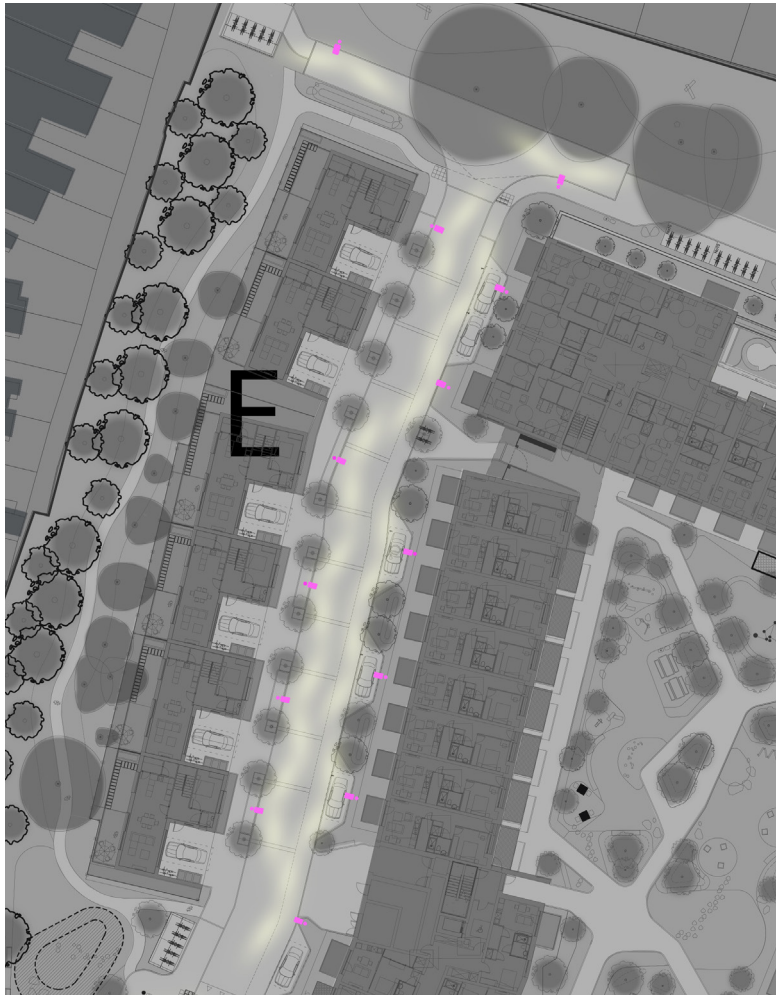
Area 3 - Block B & D Road

A staggered arrangement along this stretch of the road ensure crossing areas can be more evenly illuminated and that pathways on both sides of the road can be well illuminated.

Uniformity is above 0.55 and lux average is above 19 lux.



Vehicular Routes - Street Column Location - Area 4

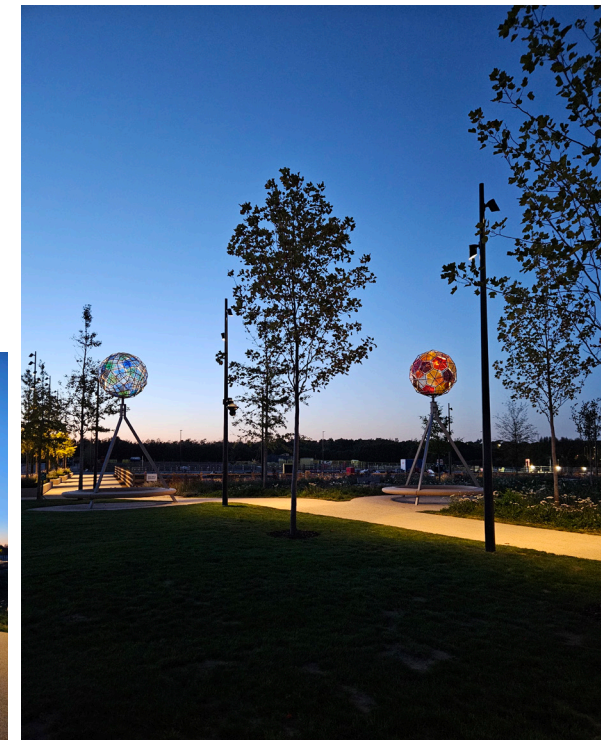
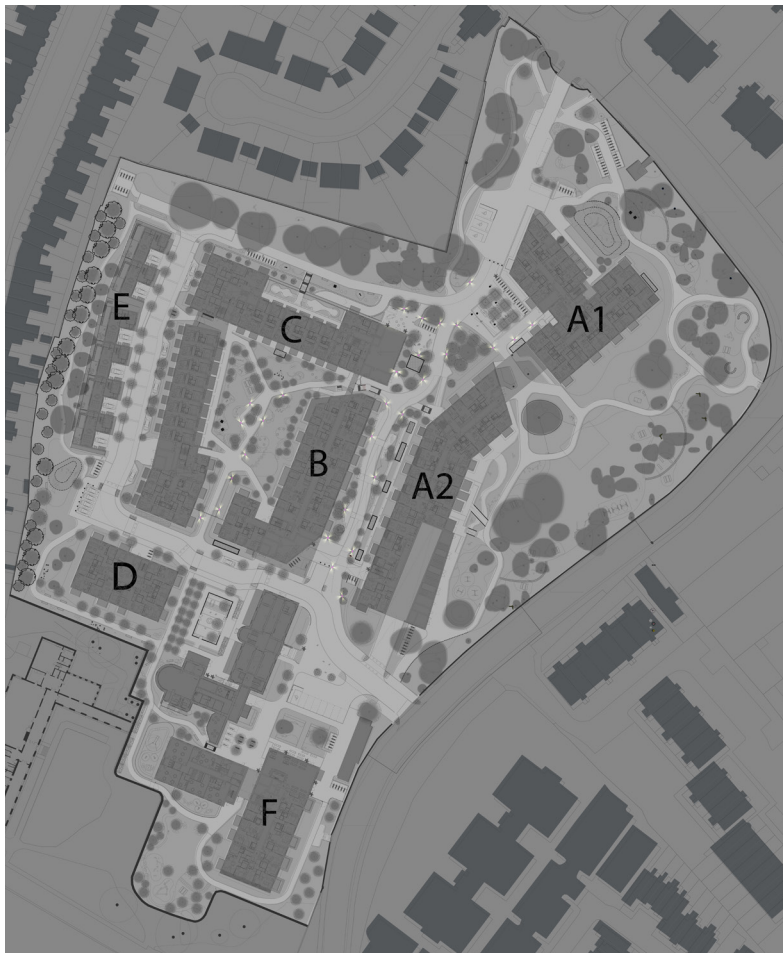


Area 4 - West End Mews Road

Columns are located along the east side of the street, away from the houses themselves. Columns are also set in between trees on the most part to mitigate the risk of glare in this quieter, more residential end of the site - average light level is 22 lux with an 0.55 uniformity down the vehicular route.

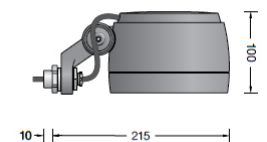


Streets Hierarchy - Pedestrian Routes - Multi Head Columns

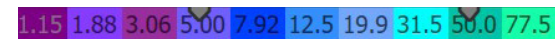
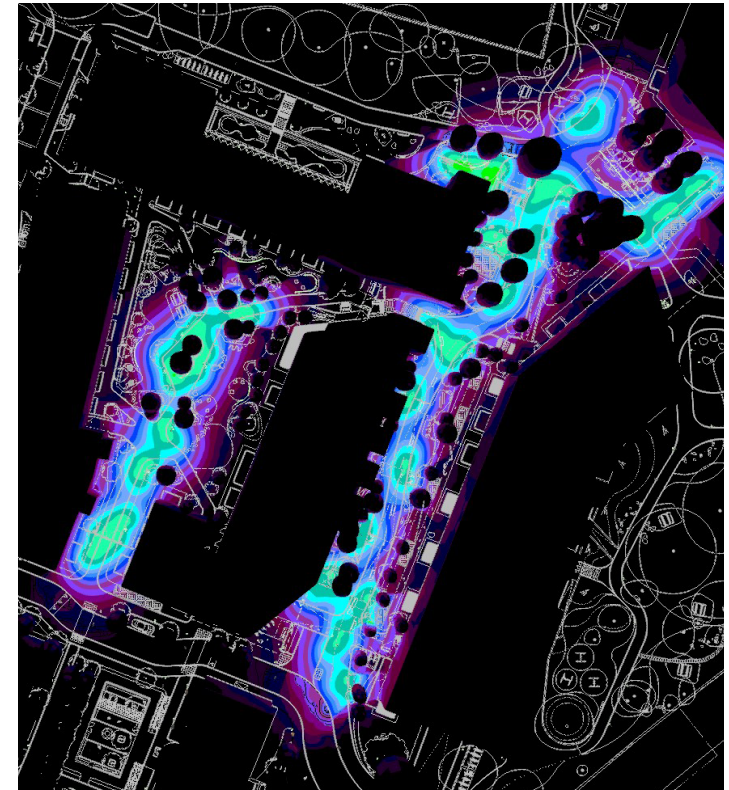
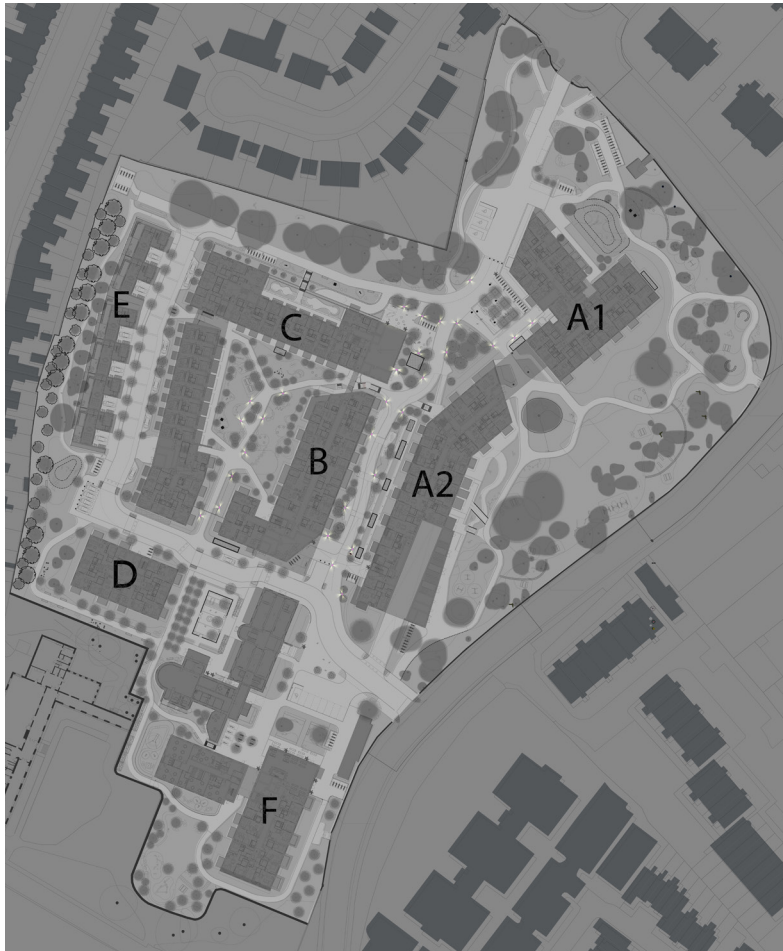


Primary pedestrian routes use a multi-headed column at 6 metres height - some columns with 3no fittings and others with 4no fittings as befits the path layout below them

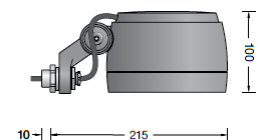
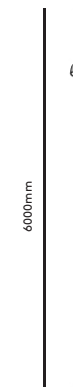
The projector source is cowed and provides a very controlled and defined quality of light. Light colour temperature is again a warm 2700 kelvin.



Primary Pedestrian Routes - Multi-head Columns

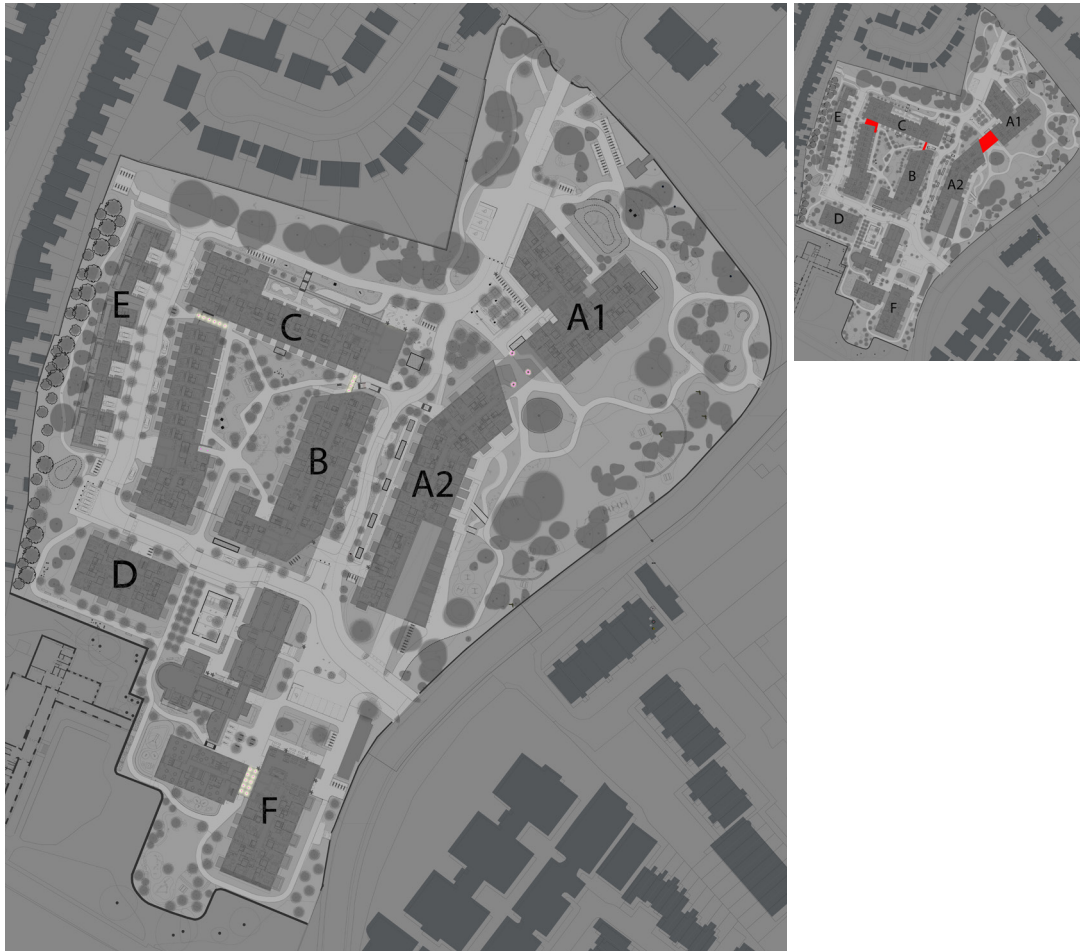


Key to Lux Level Colours



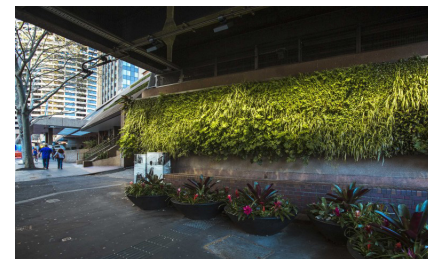
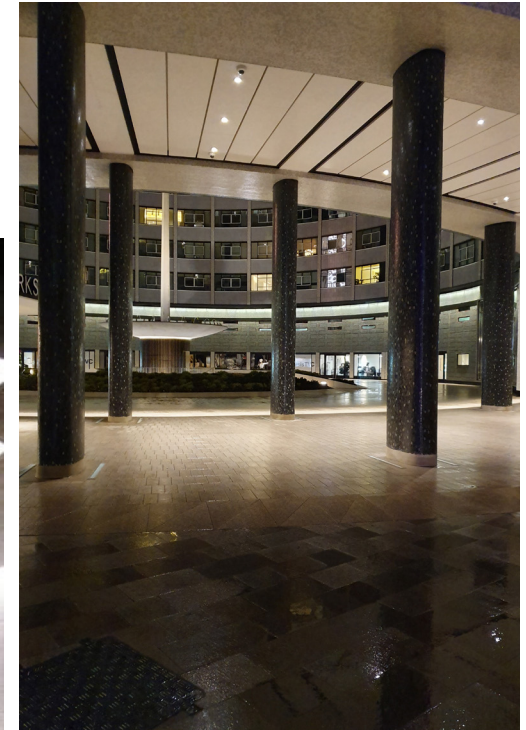
Along the main section of the route the multi-head columns with versions using 3no and 4no projectors depending on the layout of the pathway below. All columns are 6 metres height and all lights are cowled and adjusted on site to light the pathway or incidental resting areas.

Undercrofts - Downlighting

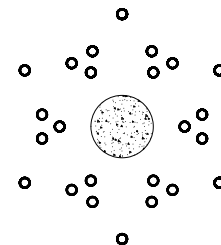
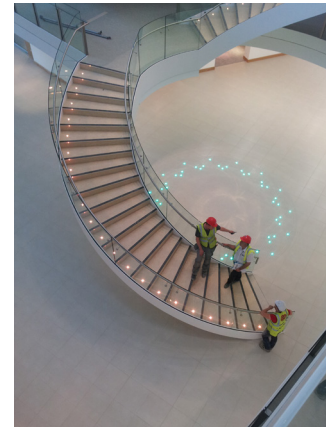


Under the cut-throughs and undercrofts of Blocks A, B, and C a set of downlights are used to provide a higher level of sustained light in these crucial connection areas.

In the Block A zone these downlights are set radially around the columns to both illuminate downwards as well as highlighting the column faces. Under Block C these fittings become washlights, providing a sustained level of light on the living wall as well as good levels down onto the pathway below.

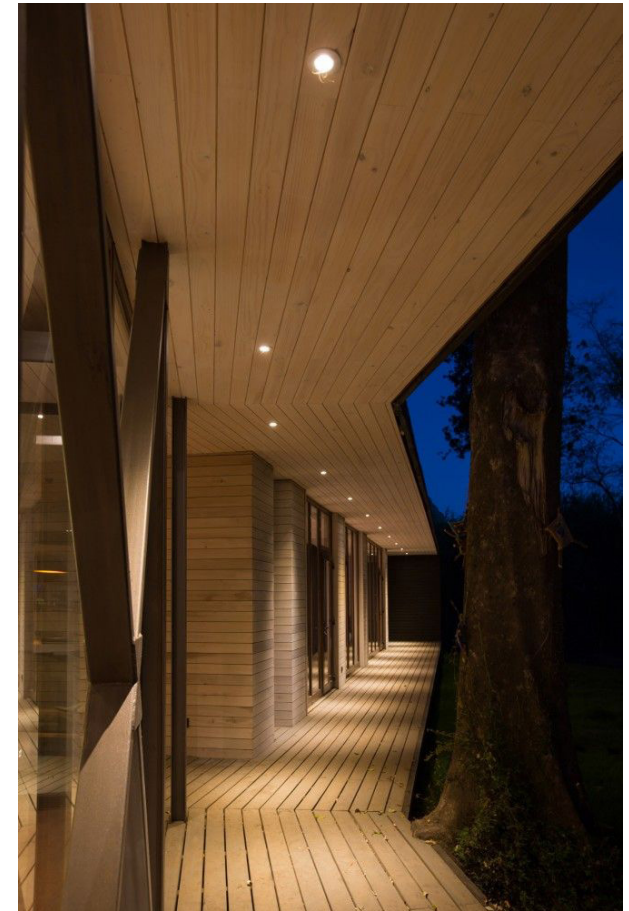
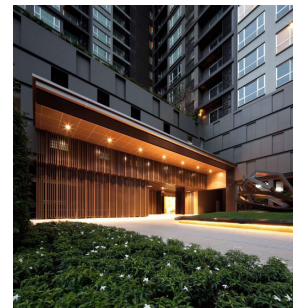
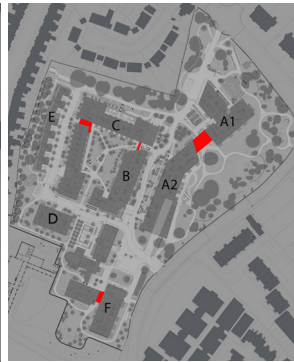
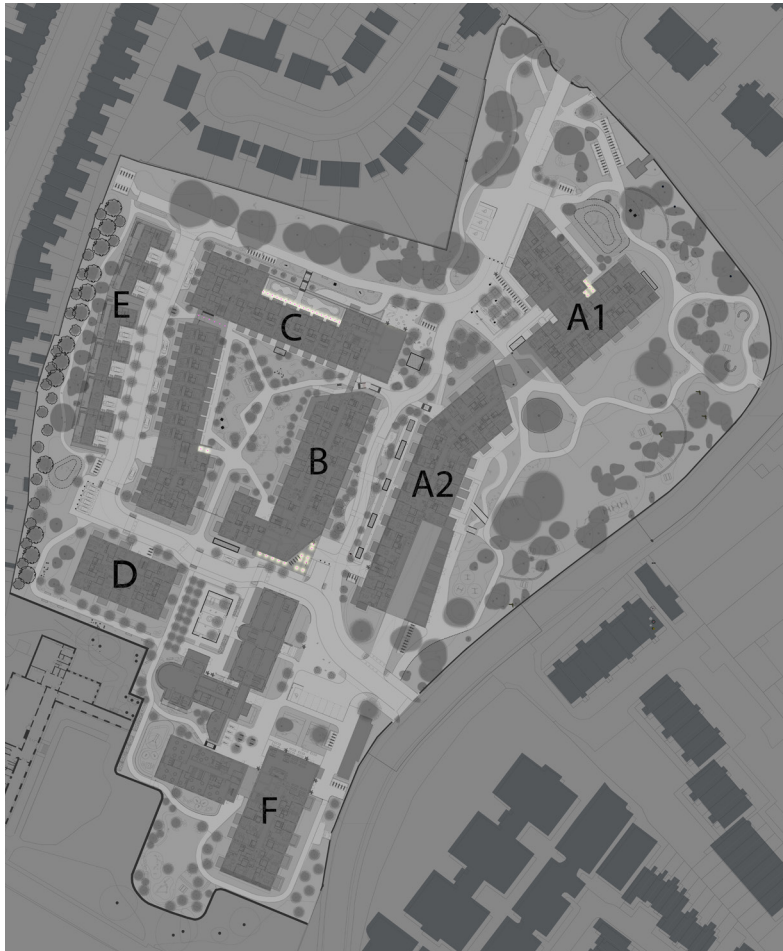


Undercrofts - Uplighting



Uplights are set around the columns in the Block A undercroft. These are multiple arrays of circular RGBW colour changing sources set out in a selected pattern around the base. No one source is too bright but the effect is to produce subtle colour change effects on the soffit by night whilst also creating constant changing patterns in the floor by day.

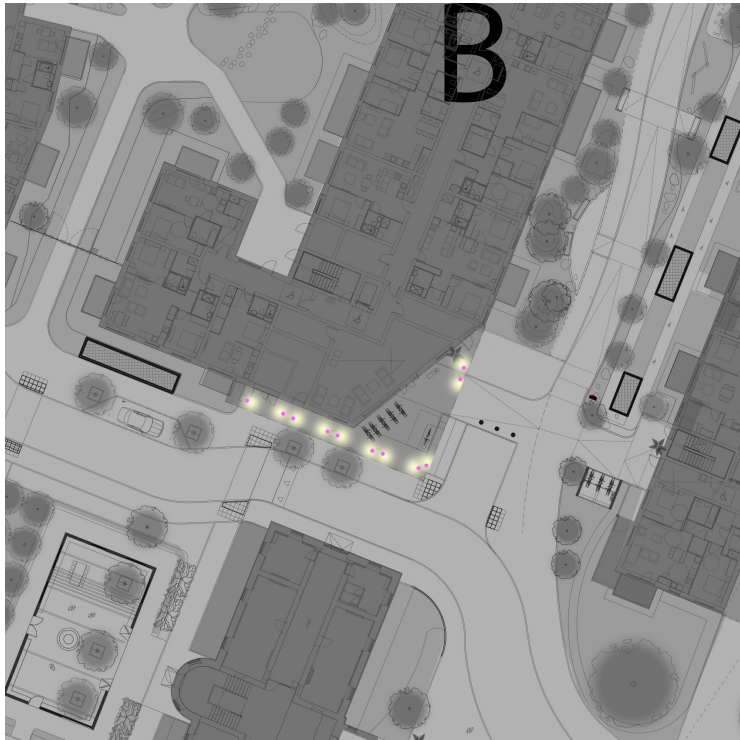
Under Canopy - Downlighting



At points on Buildings A1, B, C and F a set of downlights are used to provide a higher level of sustained light form the entrance area soffits.

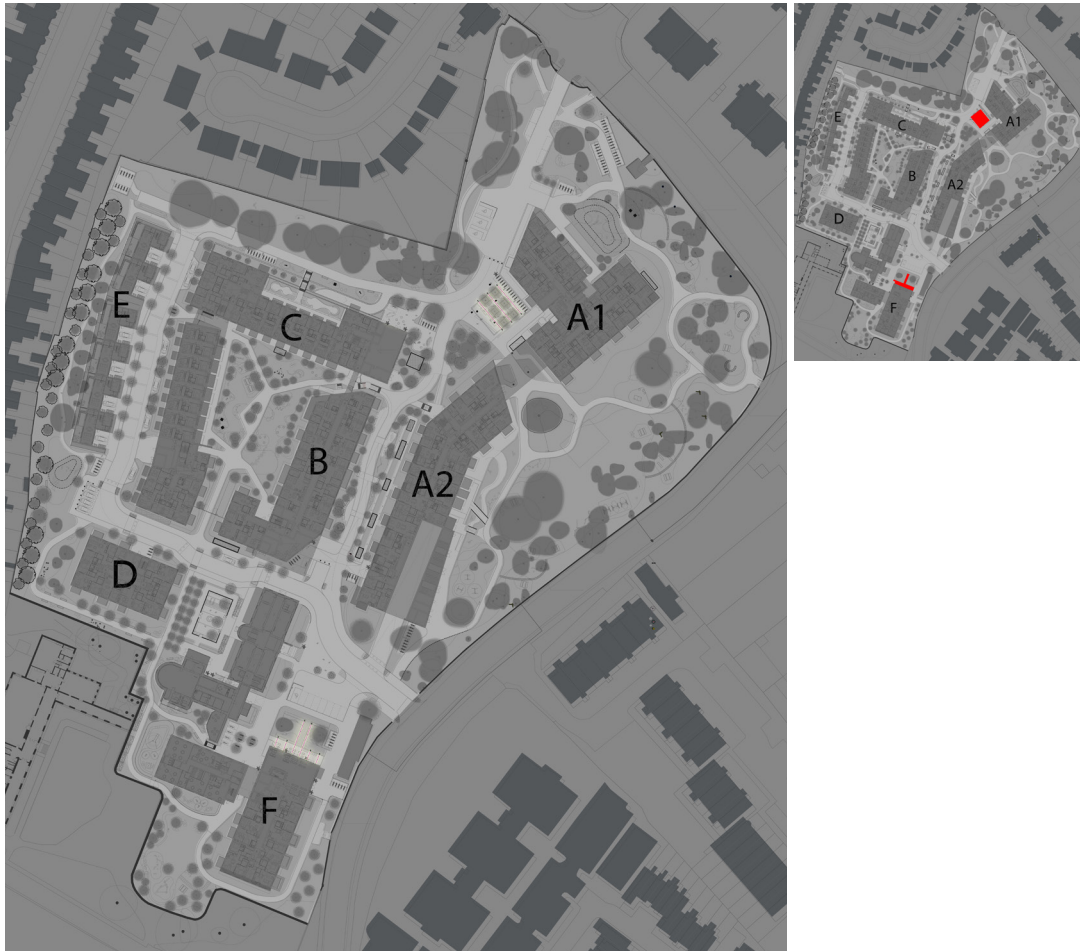
These lights provide a visually quiet but sustained level of warm white light at the entrances to buildings.

Under Canopy - Uplighting



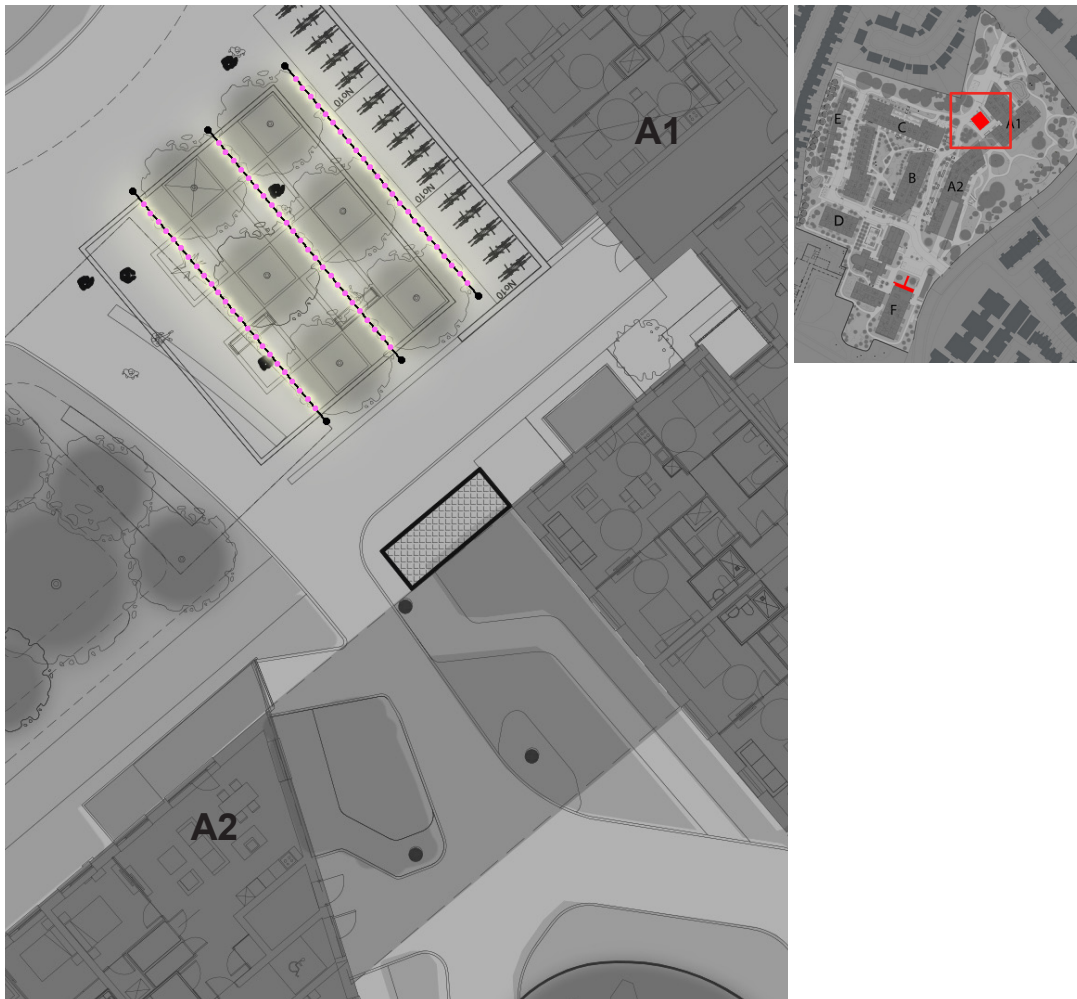
The tall columns under portico at the southern end of Building B are uplit from ground recessed fittings. These lights highlight the columns and the soffit of the Building B entrance to form an anchor to the main pedestrian thoroughfare. Light source is 2700 kelvin warm white and the fittings are controlled beam optics with a good level of internal cowling within the light fittings.

Residents' Outside Areas - Garland Gardens



In two areas of the scheme a festoon light is used as an event focus; areas for occasion and celebration and places where residents can relax. Festoons are strings of low power, very warm white/amber light sources that create a visual draw at night. The light in these areas is fully dimmable and set to not be harsh to the eye. Lighting will dim to off after the selected curfew times with any automated settings.

Residents' Outside Areas - Block A - The Garland Garden



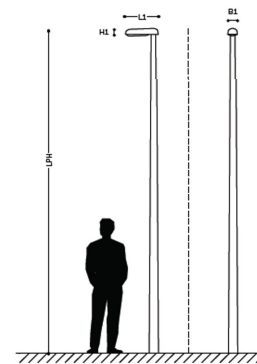
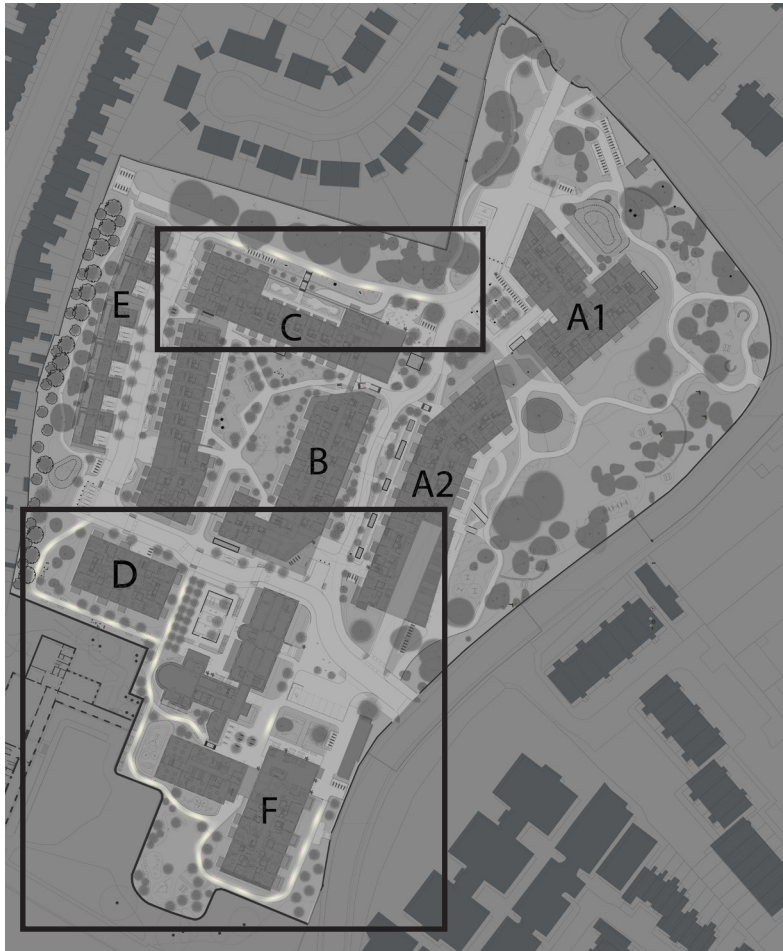
A formal square of trees and benches sits as an extension to the Building A1 community and cultural space. It is provided with an additional feature lighting element - a festoon of lights, set in between the trees. The garland of lights illuminates both the trees and the area around them and will act as a visual focal point to the site.

Residents' Outside Areas - Block F - North Exterior



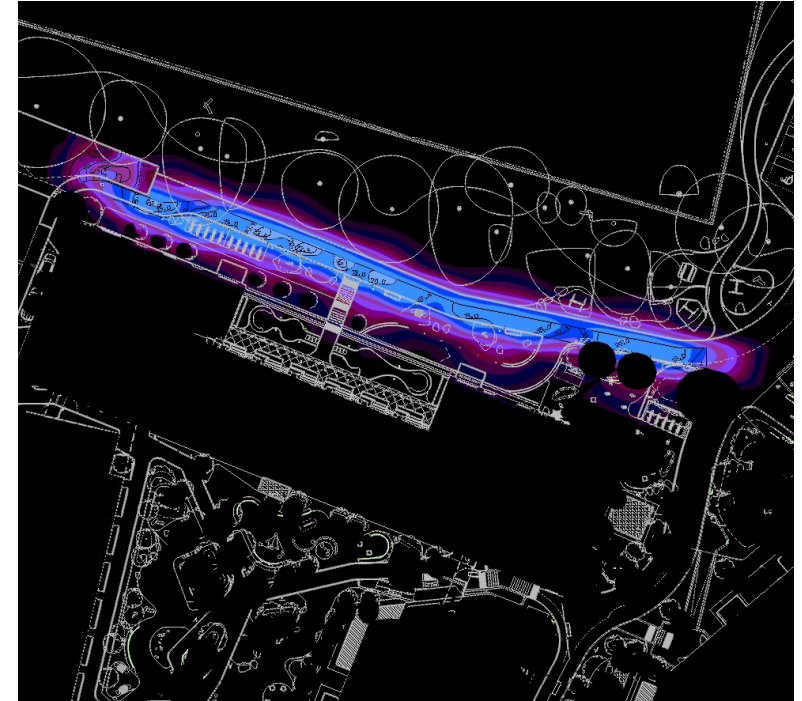
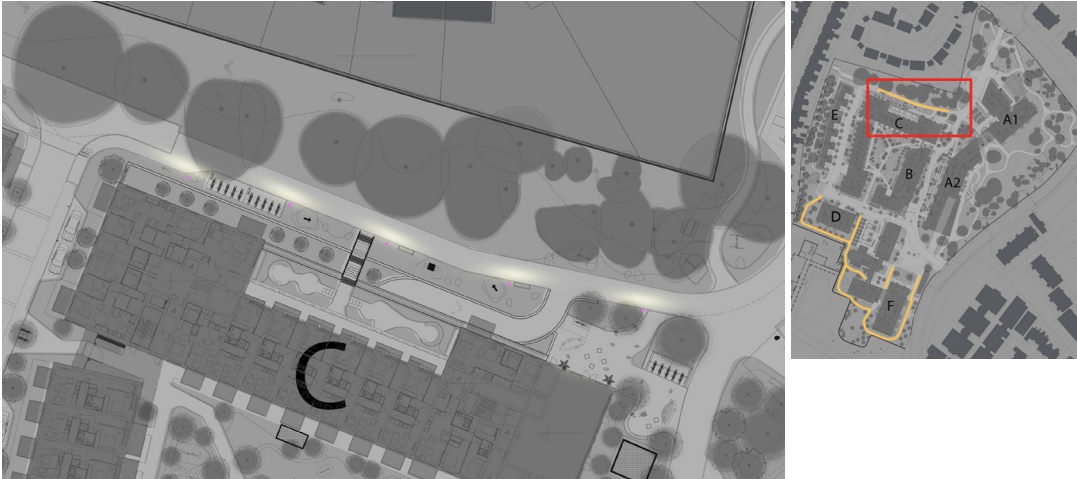
In front of Block F a similar festoon system is used to illuminate the seating areas to the north of the block. Two long and four short rows of festoons, mounted to the Block F building facade at one end and fixed to a pole at the other, extend away from the building and out onto the lawn.

Secondary Pedestrian Routes - Columns - 4 metres

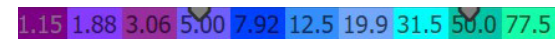


Secondary pedestrian routes require good levels of illumination but at lower levels and at lower height frequencies along pathways. Routes towards the potential future routes to the south and the link pathway across the north of the site have been highlighted with a four metre high lighting post with a small full cut-off lantern with a 2700 kelvin warm white source to provide pathway lighting. In areas where these paths cross ecology buffer zones the luminaires will be restricted in their output by dimming or by the use of down-rated drivers to limit light output in line with the levels required by the EIAR chapter on Biodiversity prepared by environmental consultant.

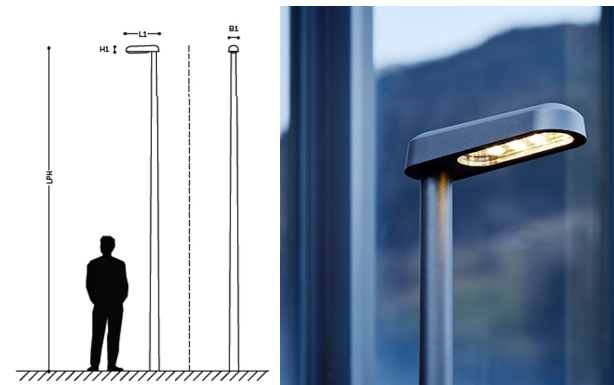
Secondary Pedestrian Routes - Columns - 4 metres - Area 1



Dialux average lux levels (lx) & Uniformity measures



Key to Lux Level Colours



Area 1 consists of the pathway along the north edge of the site running east/west. The four metre column is used to connect the plaza area with the north end of the "Home Zone" street, as well as providing light for residents to guide them to Block C. Light levels rise to 20 lux with an average of 0.53 uniformity - pedestrian routes can reduce to 0.25 uniformity as required.