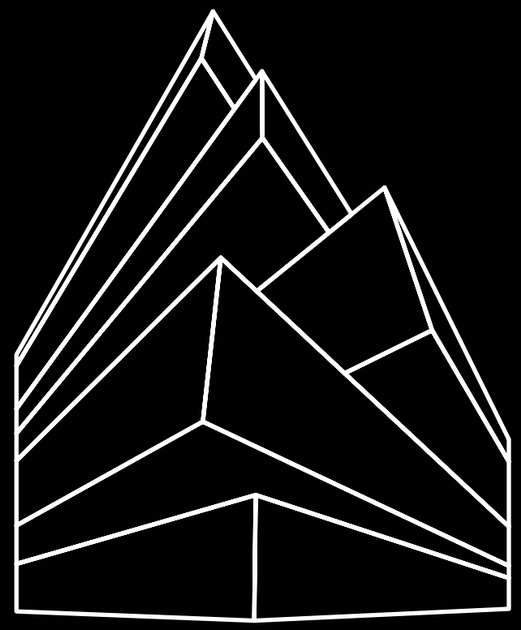
OVG
OAK VIEW GROUP™

OVG MANCHESTER
STAGE 4 DESIGN REPORT

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STAGE 4 DESIGN REPORT

REVISIONS

Revision	**Date**	**Prepared by**	**Approved By**	**Issue status**
00	13/07/2020	MR	DS	Stage 4 Submission

Project Name: **OVG MANCHESTER**
File Number: **BRA-POP-ZZ-ZZ-RP-A-7011**
Document Title: **RIBA STAGE 4**
Status: **Stage 4 Submission**
Revision: **P00**

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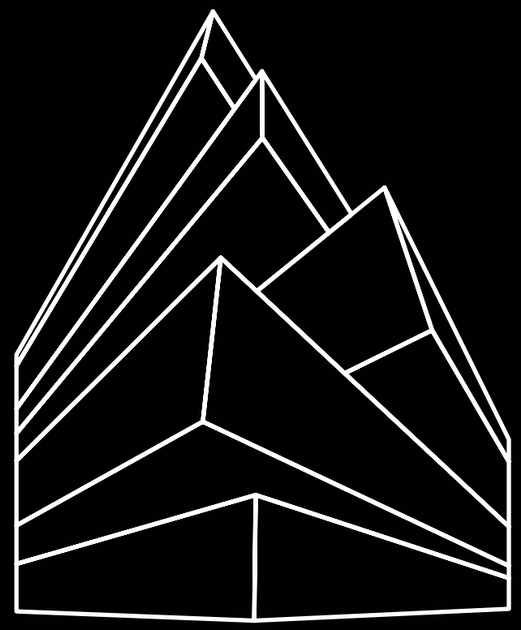
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1.1



OVG MANCHESTER

1.1.1 Introduction

This RIBA Stage 4 Report describes the proposed design of OVG Manchester located in Eastlands, Manchester and all of the associated infrastructure developments required to facilitate the construction and subsequent operation of the venue.

The report has been divided into separate volumes for ease of handling. This is Volume 1 Architecture written by Populous. The reader should also refer to the following volumes of the report:

Volume 1 - Populous
Architecture

Volume 2 - Populous
Landscape Design

Volume 3 - Populous
Wayfinding Design

Volume 4 - Populous
Commercial Activation

Volume 5 - Tricon
Catering Design

Volume 6 - BuroHappold
Multidisciplinary Engineering

Volume 7 - ME Engineers
Servicing Engineering

Volume 8 - Vanguardia
Acoustics AV & Broadcast

Volume 9 - Populous
Addendum

These reports have been compiled by Populous into a single document, the content of the individual chapters remains the responsibility of the consultant who authored the chapter.

The RIBA Stage 4 Report should be read in conjunction with the RIBA Stage 4 consultant drawings, schedules, visuals and specification reference sheets. These documents have been bound together in the Appendices. The reader can also locate the RIBA Stage 4 drawings on the BIM-360 project document control system.

The Principle Designer for the project is Turner & Townsend. No summary report on the status of Health and Safety has been included in this report. Designer Risk Assessments have been provided to OVG under a separate cover by the consultant design team during the Stage 4 design process.

No cost information is contained in this report.



1.1.2 The Team

The client for the OVG Manchester Venue project is the OVG Europe Limited, supported by a multi-disciplinary consultant team.

Populous is the lead consultant and project architect for the new venue, also delivering the interior design, brand and commercial activation elements, wayfinding and landscape design services for a cohesive scheme proposal.

The consultant team comprises engineers and other built environment specialists with international experience of contemporary entertainment venue design and delivery.

BuroHappold
Structural Engineer
Civil Engineer
Facade Engineer
Fire Engineering
Accessibility Consultant
Transportation Consultant / Crowd Movement
Geotechnical Engineers
Security Consultant
Wind Engineer
Waste Consultant
Drainage Engineer
Utilities Engineer
BREEAM

Satore Studio
Architectural Lighting

Deloitte
Planning Consultant

ME Engineers
MEP / Environmental Engineer
Architectural Lighting
Vertical Transportation Consultant
IT / Security Infrastructure

Turner and Townsend
Quantity Surveyor / Employers Agent
CDM Principal Designer
Health and Safety Consultant
Project Management

Vanguardia
Acoustics / Audio - Visual

Tricon
Catering

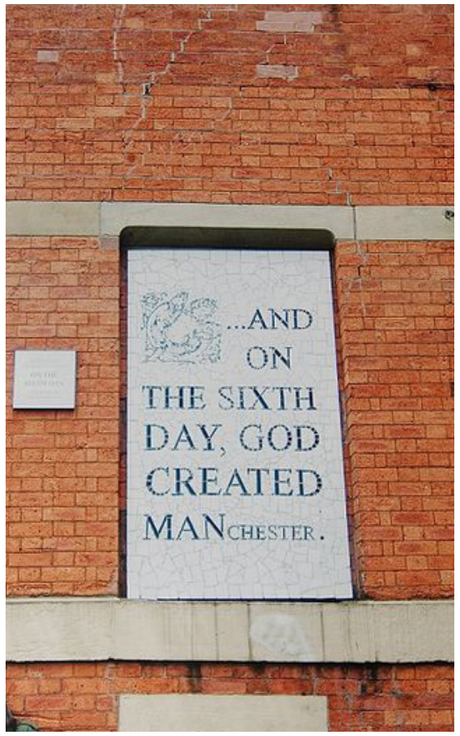
CLIENT

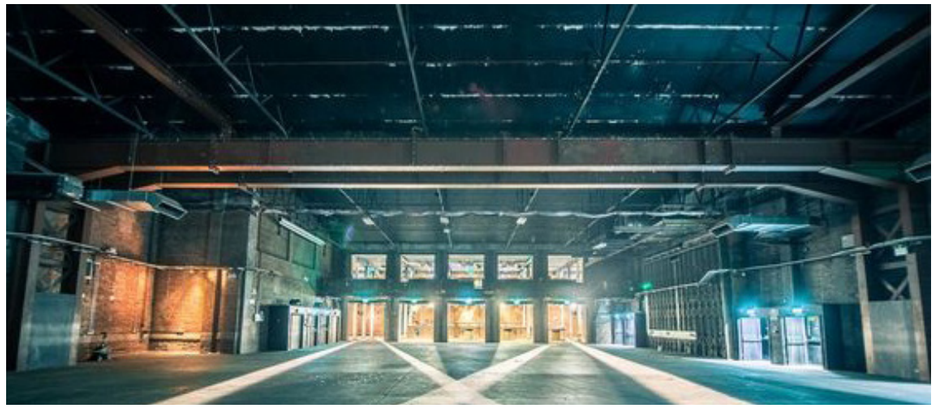
OVG EUROPE LIMITED

LEAD DESIGNER

POPULOUS

LEAD CONSULTANTS


...AND
ON
THE SIXTH
DAY, GOD
CREATED
MANCHESTER.








LONDON
PARIS
NEW YORK
but mainly
MANCHESTER


Pioneer
Pioneer





1.1.3 Project Brief

This document captures both the client and contextual requirements of the Client Brief. It presents a unique and effective architectural form that responds to and integrates with the site parameters, local environment and city cultural context.

The clients' ambition for the new OVG Manchester Venue is to deliver the 'best in class' multi-purpose venue in Europe. To achieve this, the design needs to create a compact, adaptable and acoustically exceptional auditorium for all event configurations. Delivering an exciting and engaging experience for the whole audience before, during and after the act, is the key to making the OVG Manchester Venue the premier destination for all events. Opportunities for experiential touchpoints, such as food and beverage offers or local talent showcase events, will be tailored for the Manchester regional market for both standard fan concourse and premium lounge and suite spaces.

Close seat proximity to the event is essential to creating an intimate and lively experience. In comparison to other flagship venues, the OVG Manchester Venue will express it's musical soul by bringing everyone significantly closer to the act. This original design for a compact auditorium bowl offers greater opportunity for retractable seating units to switch the event configurations between seating and standing on the lower levels.

The 'best in class' brief extends to creating the preferred venue for performers and the touring community. Creating a suite of efficient, generous and visually appealing support spaces back of house will set a new benchmark for the event circuit, ensuring that the OVG Manchester Venue compliments Manchester as a city as a promoters' first choice on tour, every time.

The compact site requires an equally compact and efficient design response, one that respects the surrounding sport and entertainment masterplan parameters, and the existing neighbourhood residential and commercial activities. The venue also needs to become a landmark for the district, with an identity that acknowledges Manchester's rich heritage of live music and nightclub spaces, while bringing new opportunity and energy into the life of the city and music scene. Integration to the Campus requires a sensitive approach to merging the venue's hard and soft landscaped approaches to existing routes, creating new dwell spaces and activation opportunities where they take best advantage of aspect, outlook and connectivity.

The design also identifies opportunities to develop additional uses of the facilities that support the core auditorium, to create more activity and improve visitor experience. The atrium hall, concourses and lounges extend the potential utilisation of the building as a destination to boost tourism, culture, and offer facility, employment opportunity and leisure spaces to the local community.





1.1.4 Venue Naming Conventions

The venue is provided with a series of spaces, which span across different floors. Each area has been given a unique name to define it as a destination. The naming is expressive, yet not too descriptive as to define its purpose.

Where necessary, the areas make direct reference to the level name. This is to aid and support navigation within the Venue.

The spectators have been divided into two designations - User Group One are Fans who have access to the concoure spaces. User Group Two are the Guests who have designated access to the array of premium lounges and suites.

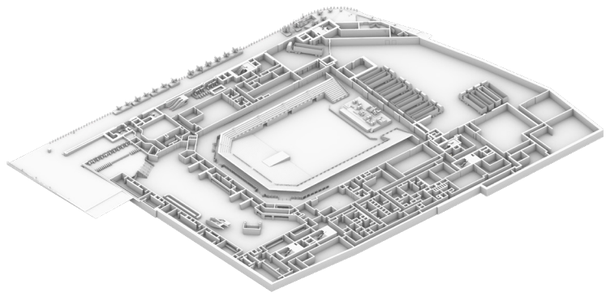
USER GROUP ONE

LEVEL	AREAS
L00 **BASE**	The Floor
	Base Atrium
L01 **DECK**	Deck Suite North
	Deck Suite West
	Canalside
	Backstage Club
L02 **CLUB**	
L03 **LOFT**	
L04	North Hangout
	South Hangout

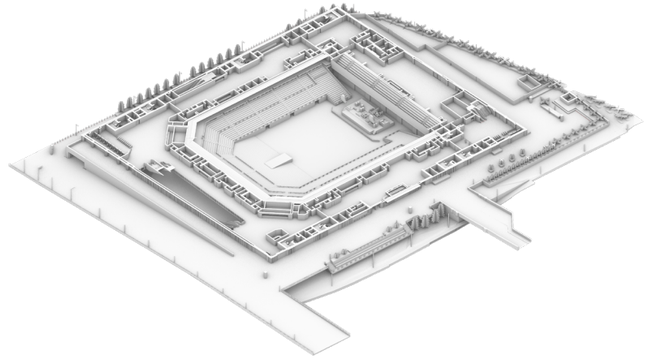
USER GROUP TWO

LEVEL	AREAS
L00 **BASE**	Decibel
	The Record Room
L01 **DECK**	
L02 **CLUB**	Loge North
	Loge East
	Loge South
	Loge West
	Atrium Lounge
	Boxes
L03 **LOFT**	
L04	

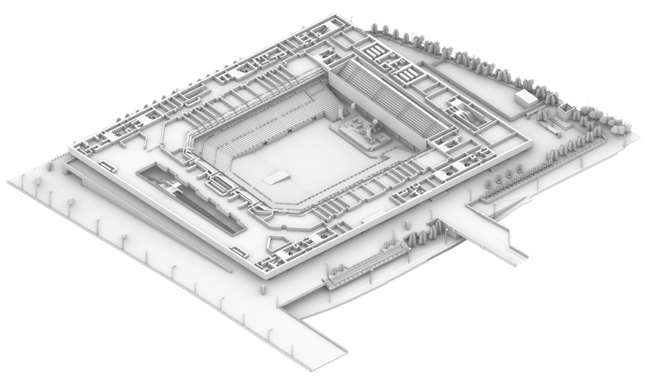
LEVEL 0 **BASE**



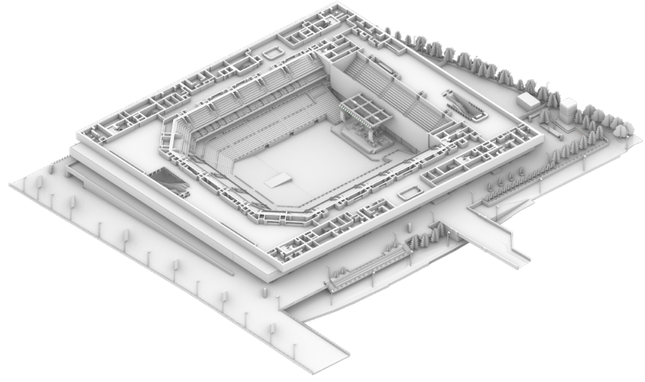
LEVEL 1 **DECK**



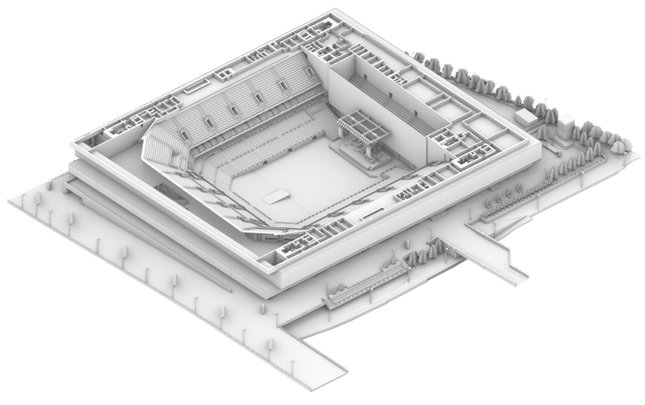
LEVEL 2 **CLUB**



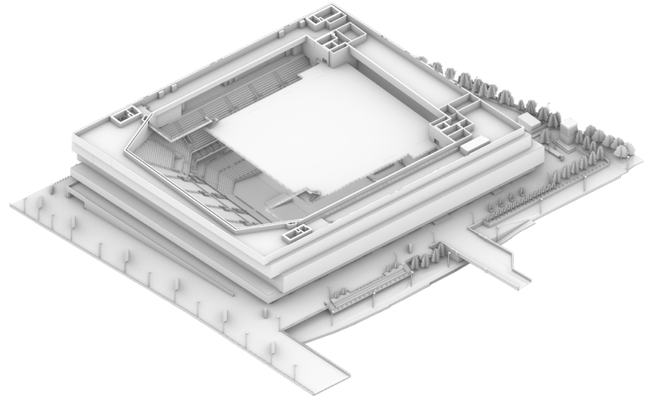
LEVEL 3 **LOFT**



LEVEL 4 **HANGOUT**



LEVEL 5 **PLANT**



1.1.5 Schedule of Accommodation

Area Schedule (GEA)

Name	Use Class	Use Class	Use Class	m²
Level L00				
GEA L00 GF	D2			17,430
GEA L00 GF Base Atrium	A1	A3	A4	3,843
Level L01				
GEA L01	D2			4,569
GEA L01 Atrium	A1	A3	A4	2,203
GEA L01 Canal Popup		A3		41
GEA L01 Canal side		A3	A4	1,177
GEA L01 Back Stage	A1	A3	A4	1,253
Level L02				
GEA 02 Tier	D2			350
GEA L02	D2			2,801
GEA L02 Atrium		A3	A4	3,415
GEA L02 North		A3	A4	1,744
GEA L02 South		A3	A4	1,698
Level L03				
GEA 03 Tier	D2			861
GEA L03	D2			10,626
Level L04				
GEA L04	D2			2,645
GEA L04 North		A3	A4	797
GEA L04 South		A3	A4	864
Level L05 UPPER TIER				
GEA Uper Tier	D2			4,187
Level L05				
GEA L05	D2			5,266
TOTAL GEA				**65,770 m²**

Area Schedule (GIA)

Level	Area (m²)
L00	20,407
L01	8,880
L02	9,467
L03	10,332
L04	4,199
L05	4,810
TOTAL GIA	**58,095 m²**

FRONT OF HOUSE - OCCUPANCY SCHEDULE

Level	Number	Name	Area (m²)	Occupancy
L00	L00-S057	THE RECORD ROOM	225	100
L00	L00-W004	BASE ATRIUM	1735	3792
L00	L00-N019	DECIBEL CLUB	317	200
L01	L01-E001	BACKSTAGE CLUB	770	700
L01	L01-S012 / L01-S002	CANALSIDE / GA CONCOURSE	1115	2975
L01	L01-W002	DECK	1473	1196
L01	L01-W004	DECK SUITE NORTH	102	50
L01	L01-W021	DECK SUITE WEST	103	50
L01	L01-N001/ L01-N034	NORTH FOYER	1084	2796
L01	L01-N026	QUIET ROOM	22	8
L02	L02-W007 - L02-W018	BALCONY CLUB/ ATRIUM BAR LOUNGES	1676	682
L02	L02-N024	BOX 1	31	16
L02	L02-N025	BOX 2	30	16
L02	L02-N026	BOX 3	31	16
L02	L02-N027	BOX 4	30	16
L02	L02-N028	BOX 5	31	16
L02	L02-N029	BOX 6	30	16
L02	L02-N030	BOX 7	31	16
L02	L02-N031	BOX 8	31	16
L02	L02-N032	BOX 9	30	16
L02	L02-N033	BOX 10	43	24
L02	L02-N034	BOX 11	30	16
L02	L02-N035	BOX 12	31	16
L02	L02-N036	BOX 13	30	16
L02	L02-N037	BOX 14	31	16
L02	L02-S043	BOX 15	31	16
L02	L02-S042	BOX 16	30	16
L02	L02-S041	BOX 17	31	16
L02	L02-S040	BOX 18	30	16
L02	L02-S039	BOX 19	31	16
L02	L02-S038	BOX 20	30	16
L02	L02-S037	BOX 21	31	16
L02	L02-S036	BOX 22	31	16
L02	L02-S035	BOX 23	30	16
L02	L02-S034	BOX 24	43	24
L02	L02-S033	BOX 25	30	16
L02	L02-S032	BOX 26	31	16
L02	L02-S031	BOX 27	30	16
L02	L02-S030	BOX 28	31	16
L02	L02-N038	EAST LOGE	83	54
L02	L02-N023	NORTH LOGE	201	122
L02	L02-S007	SOUTH LOGE	75	54
L02	L02-S044	WEST LOGE	201	122
L03	L03-E001	L03 EXPERIENCE - NIGHT MARKET EAST	962	1792
L03	L03-N001	L03 EXPERIENCE - NIGHT MARKET NORTH	824	2018
L03	L03-S001	L03 EXPERIENCE - NIGHT MARKET SOUTH	1074	2018
L03	L03-W001	L3 EXPERIENCE - ATRIUM BAR	1470	3395
L04	L04-N001	NORTH HANGOUT	347	150
L04	L04-S024	PRIVATE LOUNGE	85	
L04	L04-S017	SOUTH HANGOUT	364	150

FoH occupancy for concourses based on available space for maximum capacity events. For arena capacities please refer to Hall section of report and overall capacities please refer to Buro Happold crowd movement and fire reports.

BACK OF HOUSE - OCCUPANCY SCHEDULE

Level	Number	Name	Area (m²)	Occupancy
L00	L00-S034	CREW CATERING	148	100
L00	L00-S082	DRESSING ROOM 01 (TEAM)	65	20
L00	L00-S088	DRESSING ROOM 02	43	6
L00	L00-S087	DRESSING ROOM 03	33	6
L00	L00-S093	DRESSING ROOM 04	24	4
L00	L00-S095	DRESSING ROOM 05	30	6
L00	L00-S094	DRESSING ROOM 06	29	6
L00	L00-S101	DRESSING ROOM 07	26	6
L00	L00-S100	DRESSING ROOM 08	29	6
L00	L00-S108	DRESSING ROOM 09	25	4
L00	L00-S111	DRESSING ROOM 10	32	6
L00	L00-S115	DRESSING ROOM 11	34	6
L00	L00-S117	DRESSING ROOM 12 (TEAM)	68	20
L00	L00-S106	GAMES ROOM	37	10
L00	L00-S050	GREEN ROOM	92	60
L00	L00-S081	LAUNDRY	30	2
L00	L00-S011	OFFICE	7	2
L00	L00-S071	PRODUCTION OFFICE	59	10
L00	L00-S080	PROMOTER OFFICE	63	8
L00	L00-N033	CRISIS ROOM	28	10
L00	L00-N043	RECEPTION OFFICE	20	2
L00	L00-N034	SECURITY CONTROL	40	6
L01	L01-S033	BOX OFFICE	38	8
L02	L02-N053	BRIEFING ROOM	82	60
L02	L02-E008	CANTEEN	106	80
L02	L02-N052	HOT DESK EVENT OFFICE	83	12
L02	L02-E004	LOCKER FEMALE	95	80
L02	L02-E005	LOCKER MALE	91	80
L02	L02-S003	MULTIFAITH ROOM	34	16
L02	L02-N055	NR OFFICE	47	6
L04	L04-N015	ANNOUNCER	5	1
L04	L04-N009	EVENT CONTROL ROOM	32	8
L04	L04-N039	MEETING ROOM	22	8
L04	L04-N044	MEETING ROOM	24	8
L04	L04-N041	MEETING ROOM	39	14
L04	L04-E017	MEETING ROOM	23	8
L04	L04-E009	OFFICE	18	3
L04	L04-E006	OFFICE	13	2
L04	L04-E007	OFFICE	14	2
L04	L04-E008	OFFICE	16	2
L04	L04-E002	OFFICE	20	3
L04	L04-E005	OFFICE	13	2
L04	L04-E016	OPERATING CATERERS OFFICE	145	20
L04	L04-N016	PRODUCTION CONTROL ROOM	21	4
L04	L04-N040	RECEPTION	55	8
L04	L04-E021	STAFF TEA ROOM	70	24
L04	L04-E001	VENUE MANAGEMENT OFFICE	267	40

POS SCHEDULE - FOOD AND BEVERAGE

Level	Number	Name	POS	Area (m²)
L00	L00-S137	L00 F&B 11 - GREEN ROOM BAR		11
L00	L00-E000	EVENT FLOOR POP UP BARS	POS 16	
L00	L00-W015	L00 F&B 01 - LONG BAR	POS 16	53
L00	L00-W008	L00 F&B 02 - VOLUME BAR	POS 10	24
L00	L00-W010	L00 F&B 03 - TIER 3 MARKET	POS 10	91
L00	L00-W013	L00 F&B 04 - VOLUME BAR	POS 8	25
L00	L00-W012	L00 F&B 05 - VOLUME BAR	POS 10	28
L00	L00-S063	L00 F&B 06 - TIER 2 MARKET	POS 4	25
L00	L00-S130	L00 F&B 07 - TIER 3 MARKET	POS 8	49
L00	L00-W014	L00 F&B 08 - VOLUME BAR	POS 10	37
L00	L00-N099	L00 F&B 09 - DECIBEL BAR	POS 4	16
L00	L00-S136	L00 F&B 10 - THE RECORD ROOM BAR	POS 4	23
L01	L01-W003	L01 F&B 01 - VOLUME BAR	POS 8	32
L01	L01-N021	L01 F&B 02 - BELLY UP	POS 6	57
L01	L01-N028	L01 F&B 03 - BELLY UP	POS 6	57
L01	L01-N015	L01 F&B 04 - DESTINATION BAR	POS 8	55
L01	L01-S023	L01 F&B 05 - TIER 2 MARKET	POS 6	41
L01	L01-S024	L01 F&B 06 - VOLUME BAR	POS 8	47
L01	L01-S030	L01 F&B 07 - TIER 3 MARKET	POS 6	43
L01	L01-W023	L01 F&B 08 - VOLUME BAR	POS 8	32
L01	L01-W007	L01 F&B 09 - NORTH DECK BAR	POS 2	21
L01	L01-E006	L01 F&B 10 - BACKSTAGE BAR	POS 12	35
L01	L01-W020	L01 F&B 11 - WEST DECK BAR	POS 2	21
L02	L02-W006	L02 F&B 01 - BAR	POS 8	60
L02	L02-W009	L02 F&B 02 - TIER 1 MARKET	POS 4	23
L02	L02-W014	L02 F&B 03 - VOLUME BAR	POS 6	25
L02	L02-W017	L02 F&B 04 - TIER 1 MARKET	POS 4	23
L02	L02-W020	L02 F&B 05 - BAR	POS 8	59
L02	L02-W011	L02 F&B 06 - DISPENSE BAR	POS 4	18
L02	L02-N059	L02 F&B 07 - NORTH LOGE BAR	POS 4	25
L02	L02-N016	L02 F&B 08 - NORTH BOX BAR	POS 4	17
L02	L02-N060	L02 F&B 10 - EAST LOGE BAR	POS 2	14
L02	L02-S050	L02 F&B 11 - SOUTH LOGE BAR	POS 2	14
L02	L02-S025	L02 F&B 13 - SOUTH BOX BAR	POS 4	21
L02	L02-S051	L02 F&B 14 - WEST LOGE BAR	POS 4	25
L03	L03-W002	L03 F&B 01 - LONG BAR	POS 10	36
L03	L03-W004	L03 F&B 02 - TIER 1 MARKET	POS 4	30
L03	L03-W003	L03 F&B 03 - BELLY UP	POS 6	26
L03	L03-N014	L03 F&B 04 - TIER 3 MARKET	POS 12	82
L03	L03-N021	L03 F&B 05 - VOLUME BAR	POS 10	27
L03	L03-E006	L03 F&B 06 - BELLY UP	POS 12	63
L03	L03-S002	L03 F&B 07 - DESTINATION BAR	POS 10	45
L03	L03-S029	L03 F&B 08 - TIER 3 MARKET	POS 12	113
L03	L03-S031	L03 F&B 09 - VOLUME BAR	POS 8	24
L03	L03-W013	L03 F&B 10 - BELLY UP	POS 6	26
L03	L03-W012	L03 F&B 11 - TIER 1 MARKET	POS 4	30
L03	L03-W011	L03 F&B 12 - LONG BAR	POS 16	55
L03	L03-E004	POP UP F+B	POS 3	18
L04	L04-N002	L04 F&B 01 - NORTH HANGOUT BAR	POS 6	25
L04	L04-S021	L04 F&B 02 - SOUTH HANGOUT BAR	POS 6	25

POS SCHEDULE - MERCHANDISE

Level	Number	Name	POS	Area (m²)
L00	L00-N026	MERCHANDISE	POS 2	2
L00	L00-W016	MERCHANDISE SHELL UNIT	POS 8	53
L01	L01-W025	MERCHANDISE	POS 8	31
L01	L01-E010	MERCHANDISE	POS 4	21
L01	L01-N011	MERCHANDISE	POS 8	24
L03	L03-N036	MERCHANDISE	POS 8	22
L03	L03-W007	MERCHANDISE	POS 8	27

SANITARY FACILIITES - L00 BASE FLOOR

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
96	49	11	24	47	6	6	1	1		

SANITARY FACILIITES -L00 DECIBEL

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					1	1			8	8

SANITARY FACILIITES -L00 THE RECORD ROOM

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					1	1			5	5

SANITARY FACILIITES -L01 DECK

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
76	38	10	20	36	8	8	2	2		

SANITARY FACILIITES -L01 BACKSTAGE CLUB

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					2	2			19	12

SANITARY FACILIITES -L02 CLUB

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					4	4			47	26

SANITARY FACILIITES -L03 LOFT

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
129	72	13	34	68	6	6	2	2	4	4

SANITARY FACILIITES -L04 NORTH HANGOUT

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					1	1			7	7

SANITARY FACILIITES -L04 SOUTH HANGOUT

FEMALE		MALE			ACCESSIBLE		PARENT		UNGENDERED	
WC	HWB	WC	HWB	UR	WC	HWB	WC	HWB	WC	HWB
					1	1			7	7

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SITE AND SITE CONSTRAINTS

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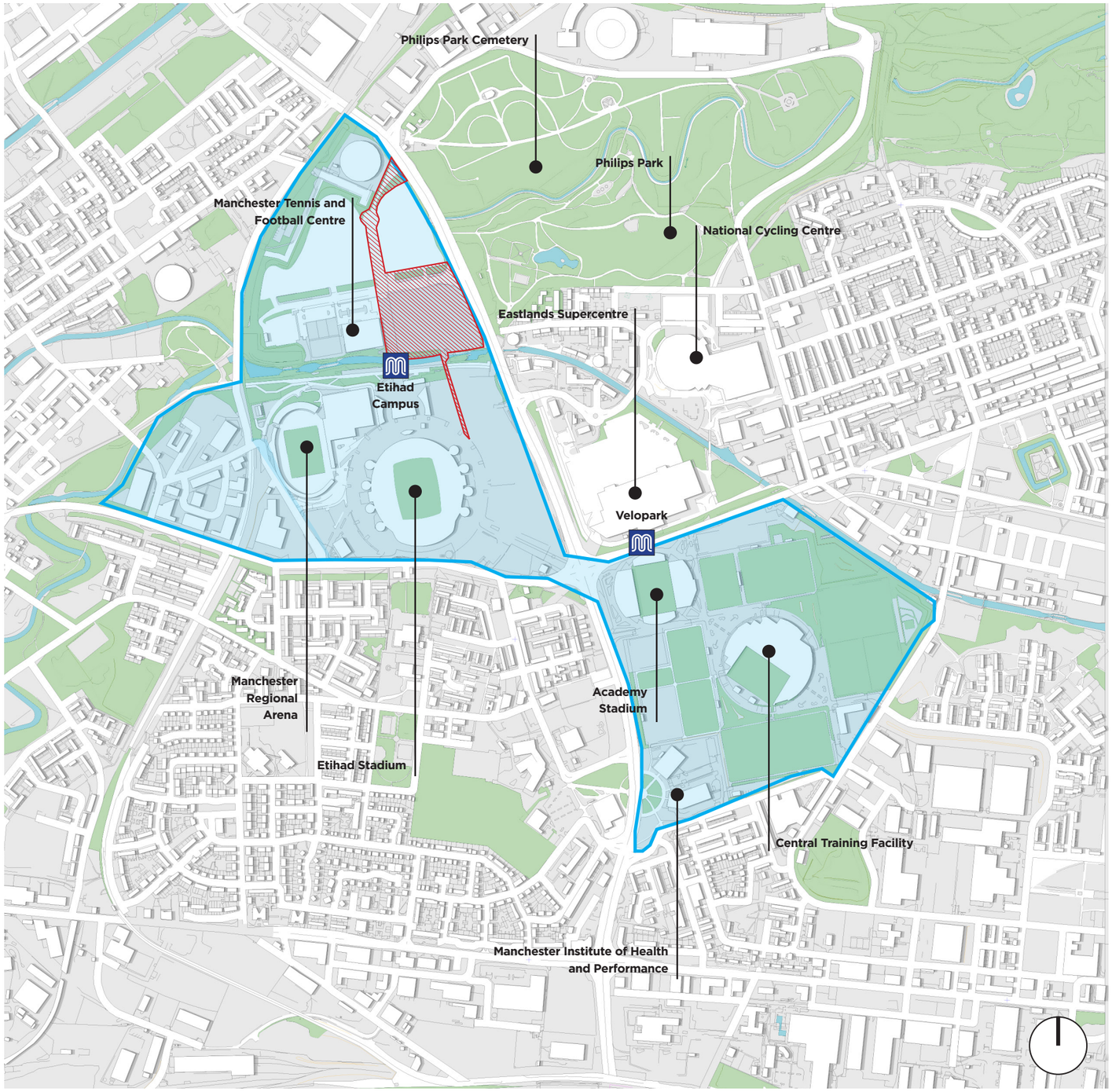
1.2

1.2.1 Site Location

The site for the new OVG Mancherster Venue is located in East Manchester, an area that has been a long-term regeneration priority and has witnessed significant positive physical, economic, social and environmental transformation over the last three decades.

At the heart of the renaissance of East Manchester has been the Etihad Stadium (formerly City of Manchester) and the range of sporting facilities on the Etihad Campus which were developed for the 2002 Commonwealth Games. Since this time, the Etihad Campus has consistently acted as a major economic driver and successive regeneration frameworks have identified it as a place to drive forward the development of a globally competitive sport, entertainment, leisure and recreation offer.

Etihad Stadium is set within the Etihad campus. To the north of the Stadium is City Square, Manchester City Football Club's (MCFC's) Spectator zone, and immediately beyond this is the Metrolink line. The Metrolink connects the site to the city centre and extends out to Ashton-under-Lyne. To the east of the Stadium is a site, beyond which is a dual carriageway. On the opposite side of the road is a large supermarket with associated car parking. Immediately to the south of the Campus is Ashton New Road (A662). To the South East of the stadium site is the City Football Academy youth development and first team training facility.



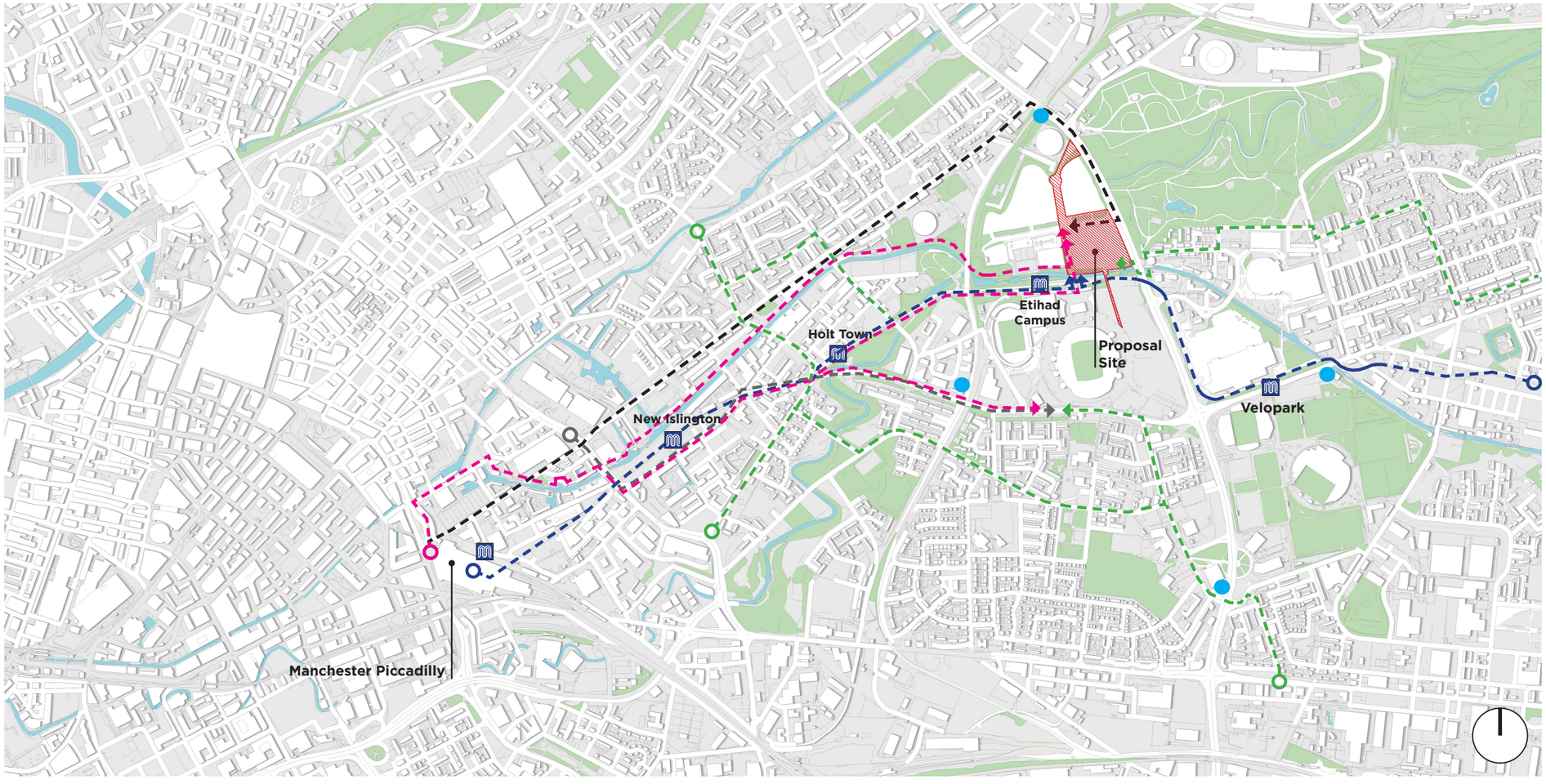
1.2.2 Public Transport

The proposed Venue site and existing Etihad campus are well served by both rail and road based public transport routes.

The most attractive public transport to the area is the Etihad Campus Metrolink (tram) stop, located in immediate proximity to the venue. This Metrolink stop is served by the Ashton Line (Eccles to Ashton-under-Lyne) and provides a direct route to Manchester Piccadilly station in twelve minutes. Currently, this line has a frequency of 10 trams per hour providing a six-minute headway per direction. It is to be noted that currently on match days or other stadium events, Holt Town and Velopark stations, which are the next closest stops, are closed for at least an hour after an event at the stadium. This is to avoid trams filling up before arriving at Etihad Campus, which would create additional queuing and safety issues.

Multiple bus routes also serve the Etihad Campus, all within 10 minutes' walk to the venue.

Public Transport and related Crowd Movement is addressed in more detail within Section 6 of this Stage 4 Report Document.



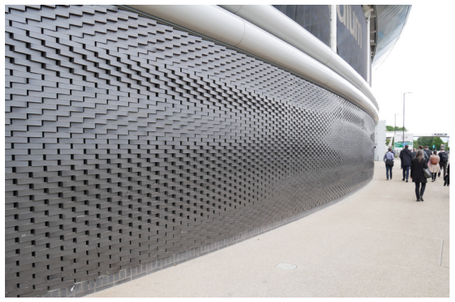
1.2.3 Site Context



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1.2.4 Local Amenities

The OVG Manchester Venue contains a variety of spaces and amenities inside and outside the building to attract a diverse range of visitors, increase dwell times and create memorable and positive experiences.

In order to fulfil the client's vision of a next generation venue we have identified the following aspirations:

- Optimise utilisation of food courts, bar and concessions before, during and after events / throughout the day (i.e. not just for event intervals).
- Activate the canal frontage.
- Create attractive retail spaces for event and non-event times.
- Explore opportunities to balance Etihad Stadium and venue facilities to optimise campus utilisation.
- Uplift spectator comfort and satisfaction and increase chances for re-visit.

Our crowd flow study concluded that the following design considerations will help achieve the above aspirations:

- Activation of concourses to increase utilisation, footfall and comfort around bars and concessions, and likely increase in dwell times and revenue.
- Optimal access and visibility to food and beverage (F&B) offerings during events and non-event times, resulting in increased numbers of spectators and site visitors wanting and able to use the facilities.
- Optimal provision of concessions vs. toilets to ensure minimal queues and increased opportunities for spectators to make purchases during event intervals.
- Slowing down mass egress by encouraging spectators to stay post-show and spend time at F&B outlets. Slowing down egress alleviates pressure on adjacent egress routes and transport nodes as well as improving event experience and generating additional income.
- Improvement in site visitor comfort and delight with increased diversity of facilities through opening up direct canal frontage.

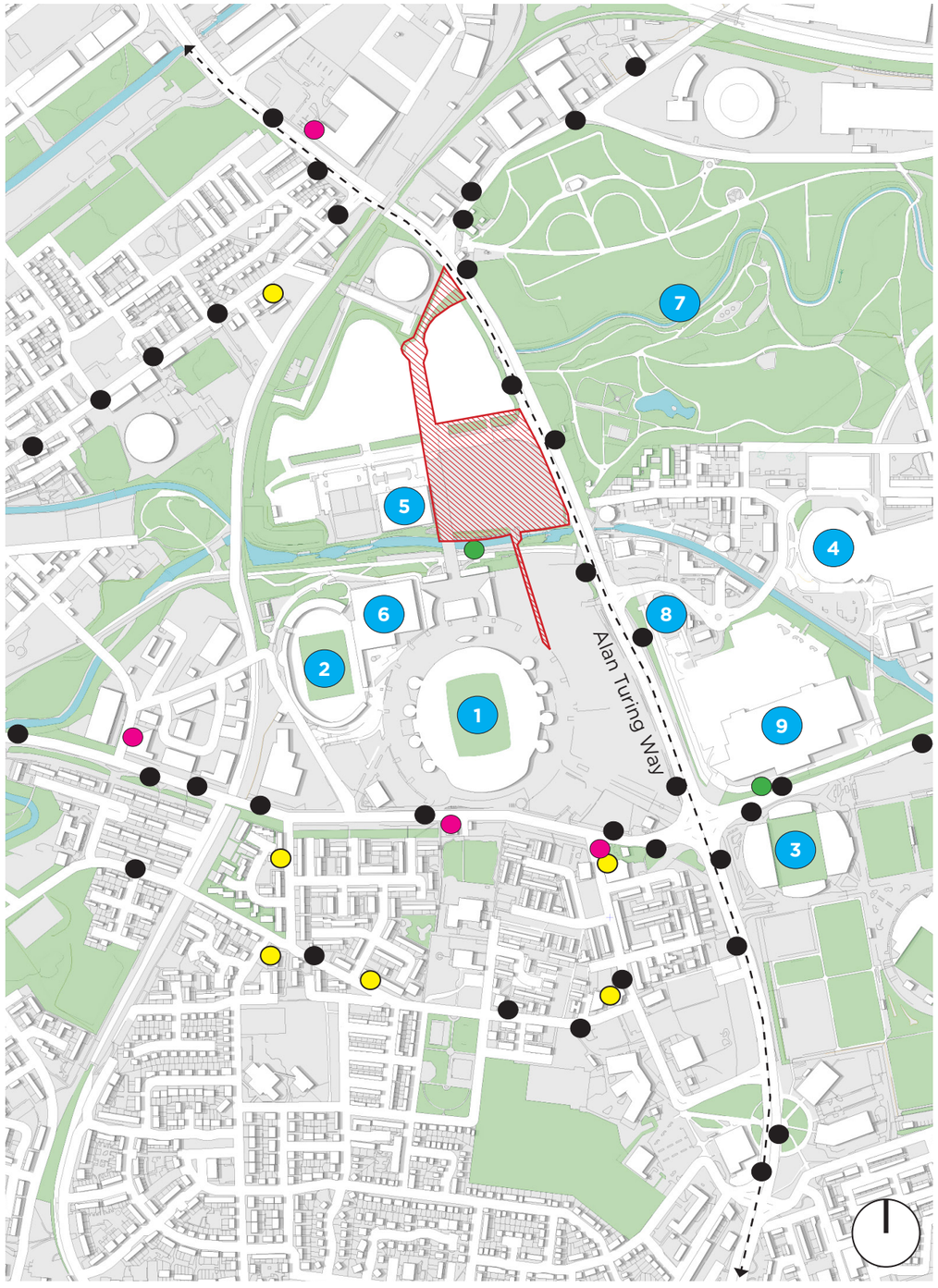
1. Etihad Stadium
2. Manchester Regional Arena
3. Academy Stadium
4. National Cycling Centre
5. Manchester Tennis and Football Centre
6. National Squash Centre
7. Philips Park and Cemetery
8. Local F&B Amenity
9. Eastlands Supercentre

Public Houses / Bars

Restaurants

Bus Stops

Tram Stops



1.2.5 Site Constraints

The site for the new venue is located within the Etihad Campus Framework Plan. To accord with the principles of the masterplan there were several site constraints that had to be addressed to maintain the existing access and egress routes to and from the existing stadium.

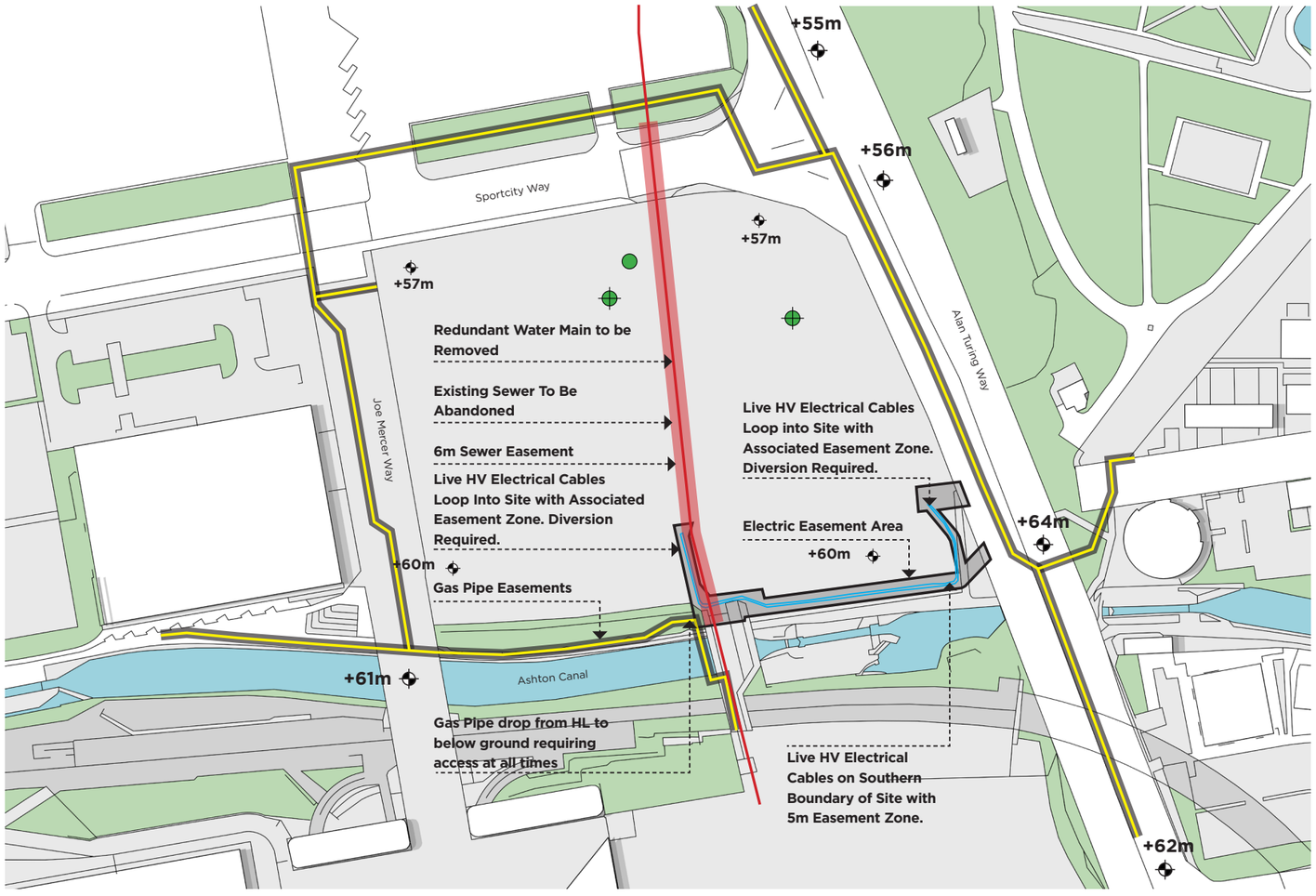
These included:

- Retention of the existing pedestrian boulevard Joe Mercer Way which connects the visitor car parks to the north to the stadium and runs along the west boundary of the site.
- During development of Stage 4a, surveys were received identifiying the location of the existing foundations, with the impacts listed in the following section.
- Retention of the main access road to the visitor car parks, Sportcity Way, which also serves the Tennis Centre and runs along the north boundary of the site.
- The dual carriage way, Alan Turing Way, that runs along the east boundary of the site was to have minimal interventions to maintain access and avoid incurring additional expense with the Highways Authority.
- Protecting the Ashton Canal that runs along the south boundary of the site and provides a walking route to the campus along the tow path.

There were also a number of existing below ground services infrastructure and wayleaves easements that had to be maintained:

- Existing services in the south-west corner - 5m easement.
- Existing water main running along the canal tow path – 3m easement.
- Land Registry easement in the south-east corner which inhibits any build over.
- The existing Forge Lane Bridge needed to be retained for access and egress onto the site.

All of the above constraints influenced the design of the building and its location within the site.



1.2.6 Joe Mercer Way

The existing structure of Joe Mercer Way consists of a crib wall with a concrete foundation running parallel to the building's west facade.

Whilst the rough location of the footprint was known from as-built drawings, extensive surveys were undertaken during Stage 4a and the base exposed in various locations to ensure the design would not impact existing elements, whilst still having the optimum footprint to maximize the capacity.

The survey revealed that the base was closer to the building than initially anticipated and therefore adjustments to the west contig-wall and, subsequently, the building's footprint had to be made.

Joe Mercer Way not only influences the design on Ground Floor, where the exiting footing defines the building boundary, but also above on Level 01. The overall capacity of the venue is highly reliant on ensuring sufficient space is provided for safe egress and evacuation of spectators along the west.

To meet above criteria, even with a slightly reduced ground floor footprint, the podium edge has been kept predominantly in initial, pre-survey position, overhanging the crib wall foundation and GF building outline.

Respecting the different ownership conditions, the arena not only remains completely detached from Joe Mercer Way, but the design also ensures the current effective width is maintained. The only modification undertaken to JMW is the removal of the existing balustrade, replacing it with a new kerb to close the varying gap between the arena and the existing walkway and to provide wheel-protection for the adjacent facade.

Concerns raised about the provision for maintenance and inspection access to the crib wall have been addressed by providing access hatches through the boundary wall from the arena into the void at regular intervals as well as access from the south side. Consideration has been given for a partial backfill with loose gravel or similar up to the capping beam to provide a better, albeit still confined walking space.



NORTHERN END OF JOE MERCER WAY



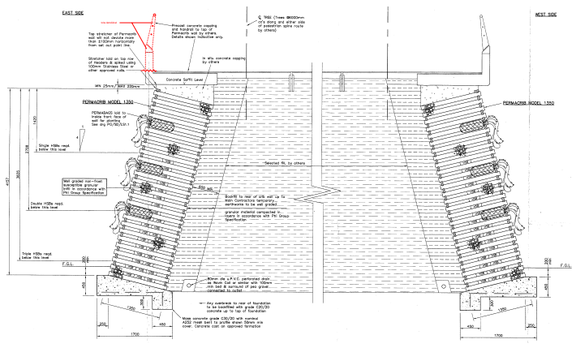
SOUTHERN END OF JOE MERCER WAY



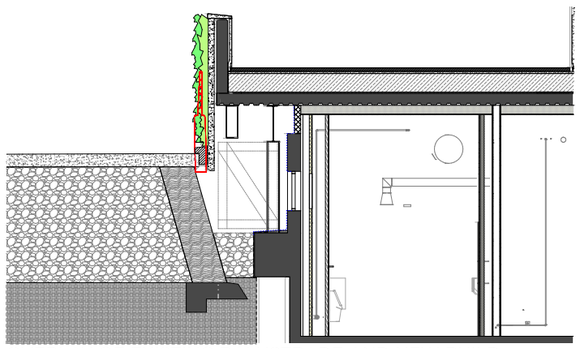
EXPOSED CRIB WALL



EXPOSED FOOTING

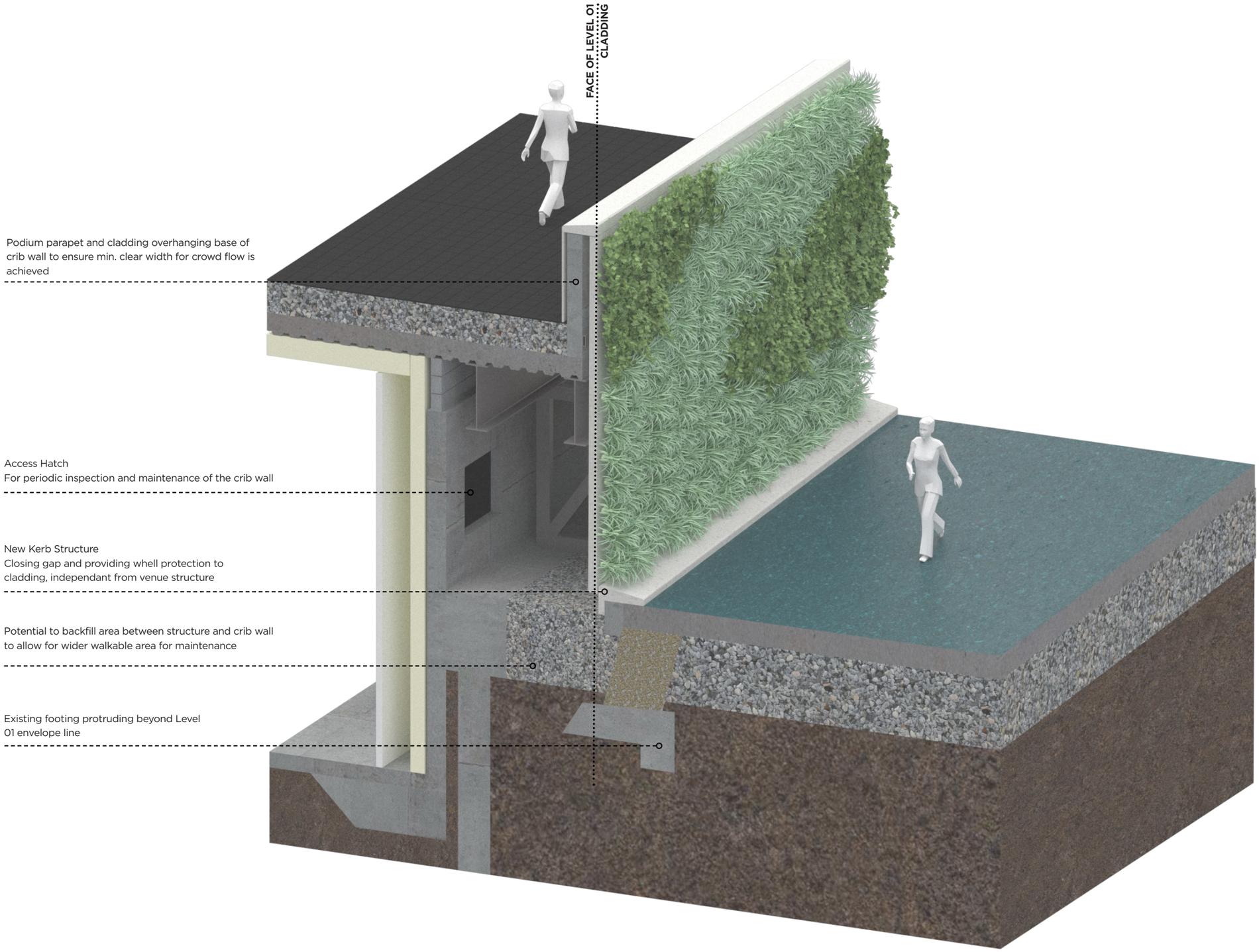


AS-BUILT DRAWING INDICATING EXTENT OF MODIFICATION



OVERLAY OF EXISTING BALUSTRADE AND NEW BUILD

1.2.7 Joe Mercer Way Crib Wall



1.2.8 Environmental Site Analysis - Wind Exposure

A Computational Fluid Dynamics (CFD) wind assessment was undertaken by BuroHappold for the proposed development. This assessment reviews the impact of the proposed development on pedestrian comfort and safety in terms of wind microclimate effects, in relation to the proposed site and immediately surrounding areas of public realm. Scenarios were assessed for the existing site, the proposed development, the proposed development with mitigation measures, and the proposed development with future scenarios taking into account other committed developments within an agreed vicinity of the site. Below is a summary of the key findings of the assessment.

The results of the proposed development determined various areas of wind acceleration around the level 01 Podium, specifically at the south east corner and north west entrance. Conditions could be uncomfortable for pedestrians at these locations during winter months.

Mitigation measures were deployed to improve the conditions on parts of the Level 01 podium area. Additional landscape areas and trees were included on the southern elevations to increase shelter around entrances and exits of the building. The entrance doors on the level 01 north east were recessed into pockets to reduce the impact of the strong winds. These measures formed part of the technical submission to Manchester planning department. The mitigation measures and existing surrounding landscape were shown to improve conditions significantly, and remove all safety issues raised in the studies, ensuring that all areas of the proposed development and its immediate surroundings are considered suitable for intended pedestrian use.

Comfort Category on Imported Annual Wind Conditions

10 Pedestrian Business Walking

9 Pedestrian Walking Around Buildings

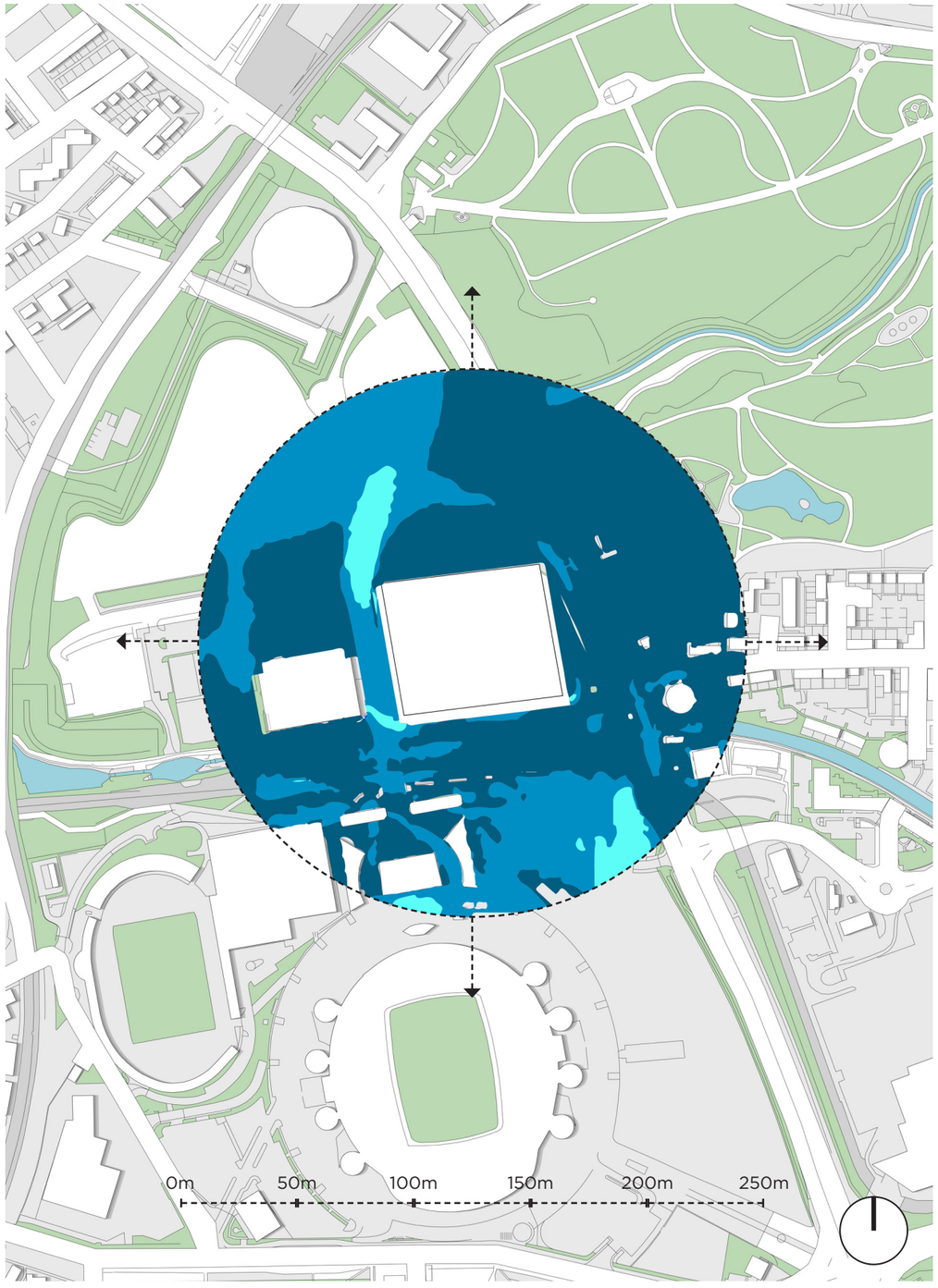
8 Pedestrian Walkthrough

7 Pedestrian Walkthrough

6 Standing / Entrances

5 Sitting

4



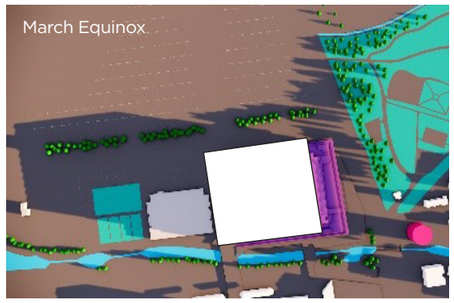
1.2.9 Environmental Site Analysis - Solar Exposure

The assessment of the impact of the proposed OVG Manchester Venue development on existing adjacent dwellings and amenity spaces concluded it will have a negligible detrimental effect on access to daylight and sunlight.

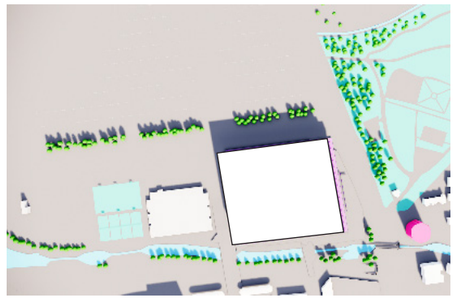
Overshadowing from the proposed development is transient with adjacent buildings and amenity spaces remaining generally unshaded with the proposed development in place.

The cumulative impact of the proposed Venue development in combination with committed future developments will also be negligible due to separation distances between the sites.

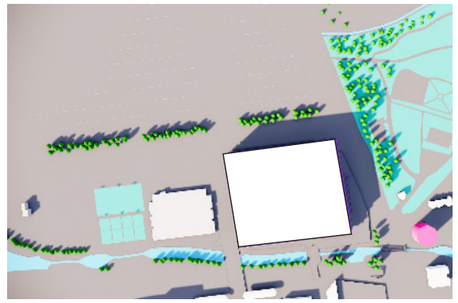
The hours of assessment reflect the methodology of BR209 for the assessment of sunlight on the ground, which considers only sunlight at solar altitudes of above 10°, on the basis that lower angle sunlight is likely to be blocked by low level planting.



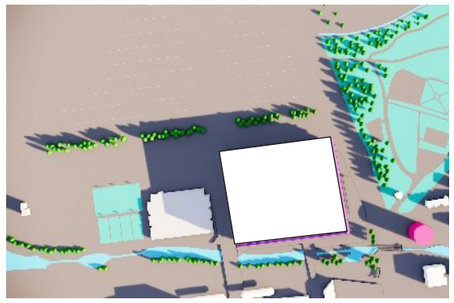
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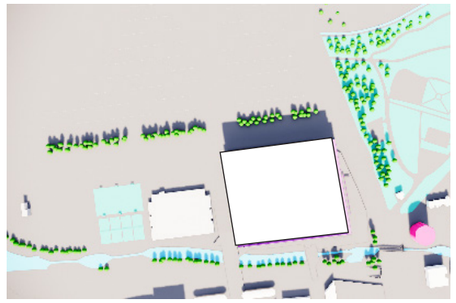
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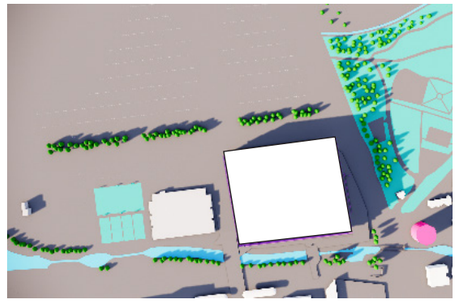
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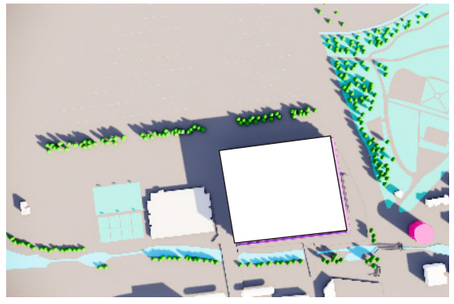
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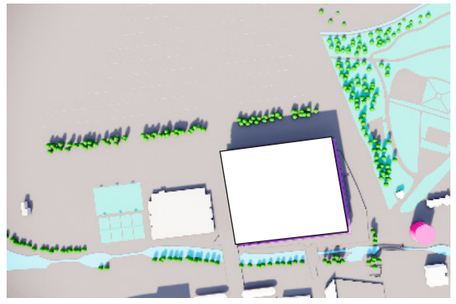
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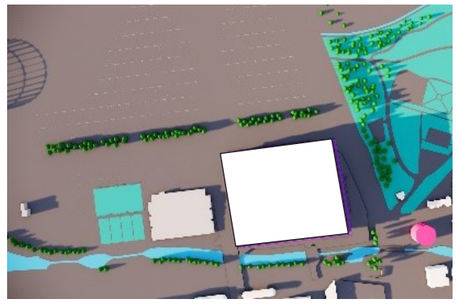
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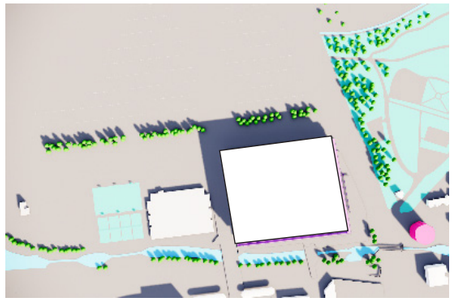
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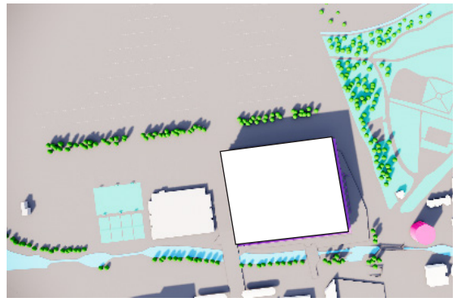
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THE HALL

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1.3.10 HALL FINISHES 66

1.3

1.3.1 The Hall

The aim of OVG Manchester is to deliver the best performer and spectator experience of any large-scale venue in the world and to have maximum flexibility in order to host performances and events of all types.

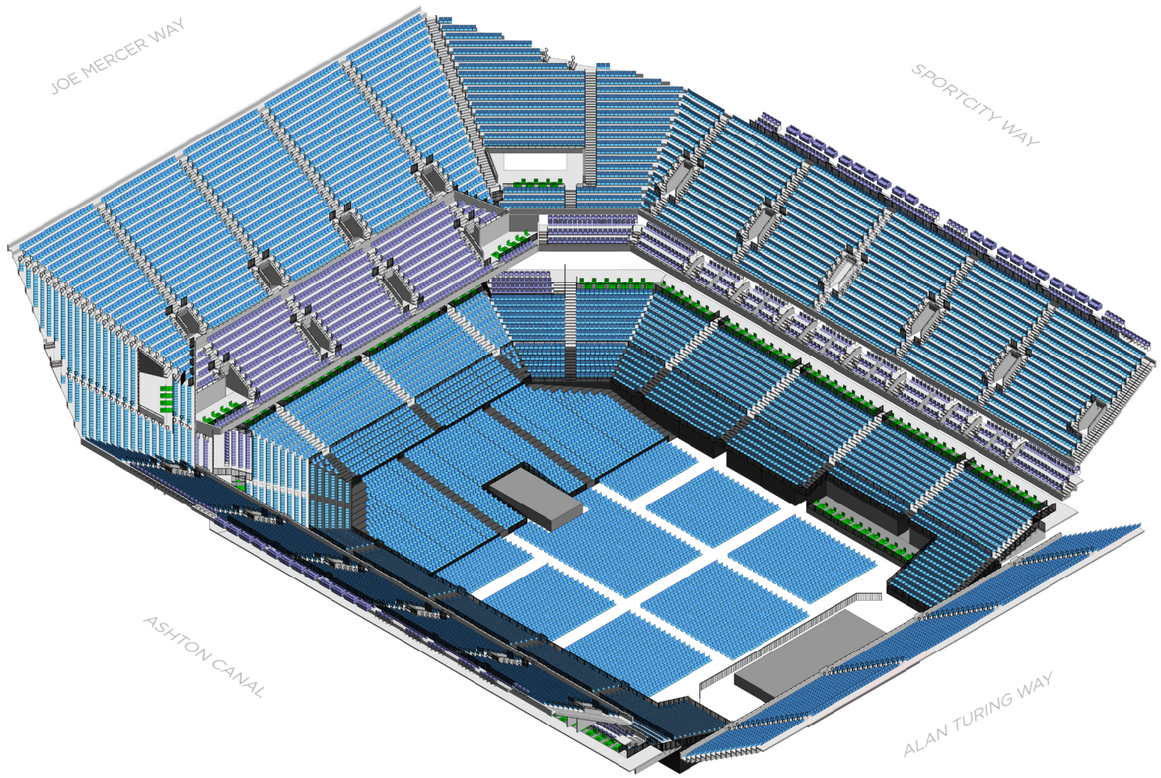
The compact seating bowl brings spectators closer to the performance, while the design of the lower tier and floor seating eliminate the majority of seat kills due to essential production overlay, maintaining high capacities in a bowl footprint area much smaller than comparable traditional arenas.

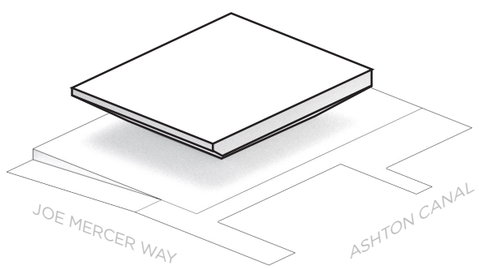
Extensive use of mobile retractable seating creates a very large event floor with standing capacities larger than any other venue in the UK.

An open colonnade concourse and in-bowl bars at the auditorium floor level reduce the distances to food and beverage facilities, ensuring spectators do not miss part of the performance. Seating for premium guests is designed to be within the main seating area, minimising the disconnect between 'Premium' and 'general admission' fans that is often seen in traditional arenas.

A small tier positioned behind the stage increases the capacity and feeling of enclosure for sports and centre stage performances. Positioned low over the stage and with a relatively steep angle, this tier can also be used for end stage concerts that utilise seating behind the stage, offering higher seating capacities.

The acoustics in the bowl will be designed to avoid any audible reflections from surfaces into any audience areas. This will include the use of absorptive and diffusive materials lining the hall. The materials will provide a tonal balance in the bowl to ensure minimum setup times and quality of sound. The rear of the venue will incorporate deep bass traps to control any excessive low frequency reverberation and the sound system design will be coordinated to allow maximum flexibility of the arena.





User Group One
User Group Two
Accessible Seating

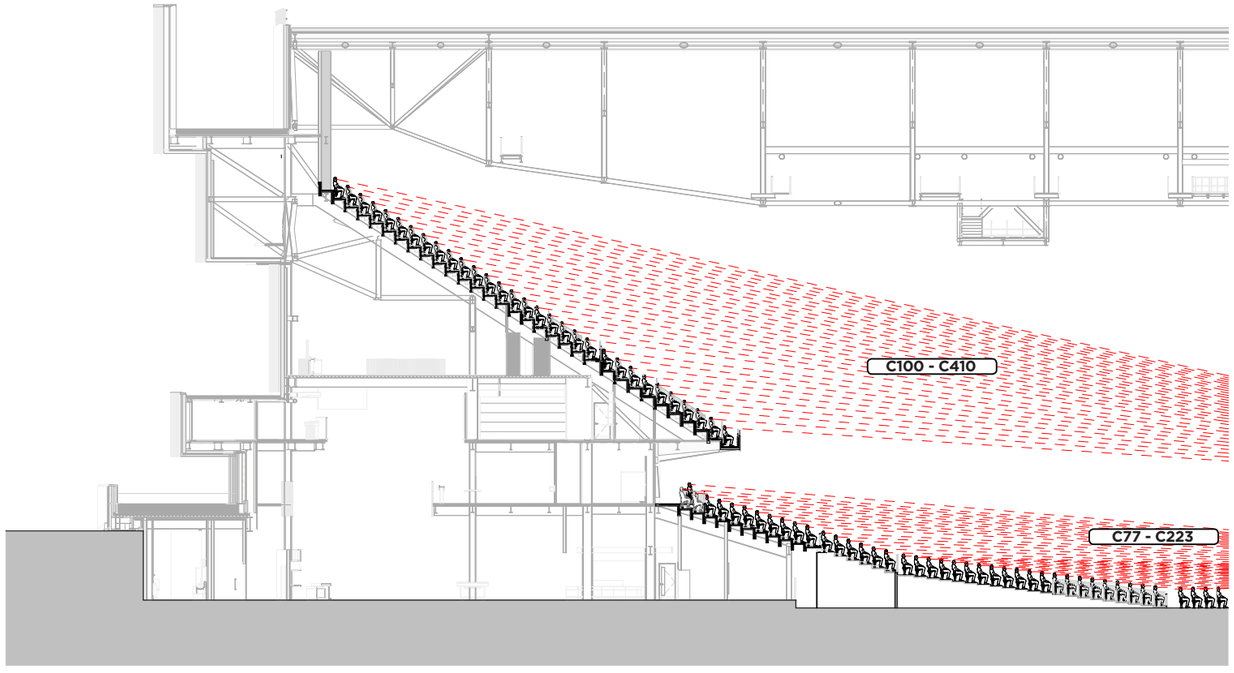
1.3.2 Sightlines to the Performance Area

The sightlines for the venue have been designed to meet or exceed current best practice, statutory requirements and guidelines for the main event types likely to be held in the venue.

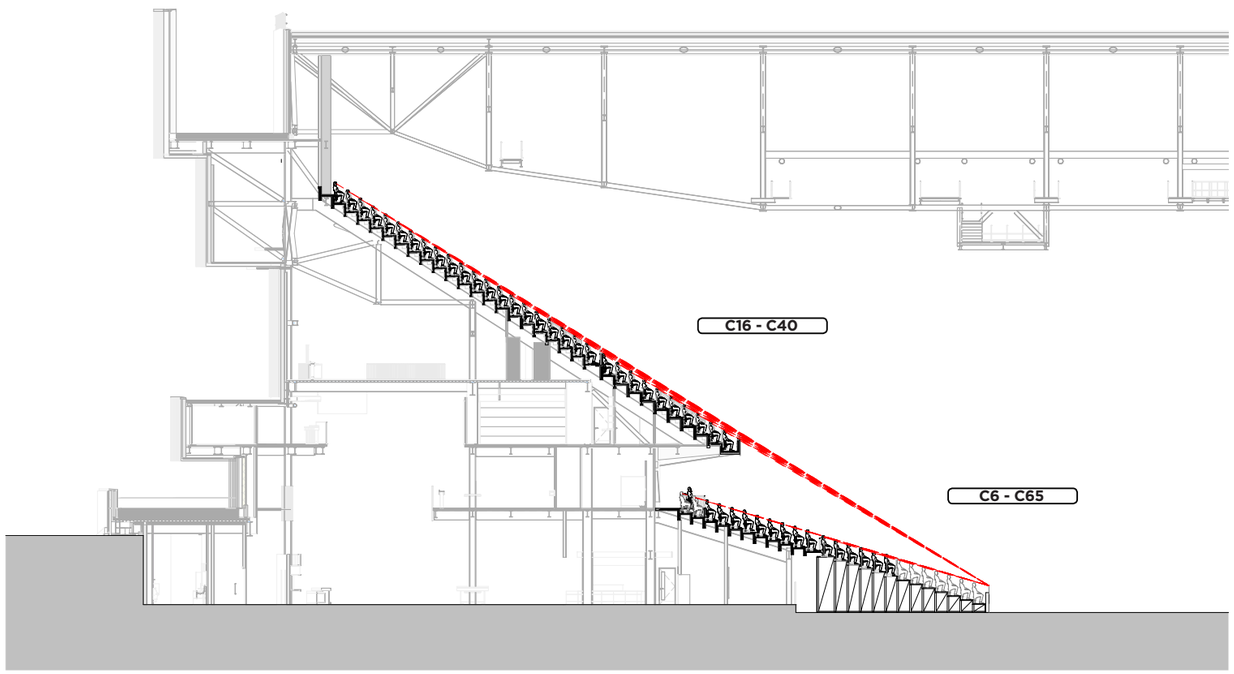
Due to the requirements of creating the world's greatest music venue and the relative lack of importance of ice hockey as a an event type for the venue, the sightlines for ice hockey have been slightly compromised. The C-values for ice hockey are below the normal standards. Ice hockey sightlines range between C06 and C65 with the Premium seating being C40. The sightline focal point is taken at 1.5m above the ice at the internal face of the dasherboard.

The C-values for other event types are in excess of the normal requirements. End stage concert sightlines range between C78 and C100 at the side of the stage and C77 and C410 opposite the stage. Premium seating to the side of the stage has a minimum C-value of C157. The reduced depth of the flat floor seating improves the view quality for those seats significantly.

The seating bowl has also been designed with the aim of reducing the number of handrails and barriers due to their potential for obstructed views, seat kills and impact on sightlines. The Lower Tier is entirely back fed removing all vomitories and their associated handrails. The Suite Tier has minimal handrails, those required will be designed to be unobtrusive. The Upper Tier vomitory and gangway design reduces the number and impact of handrails significantly.



Sightline to End Stage



Sightline to Ice Hockey Dasher

1.3.3 Auditorium Capacities

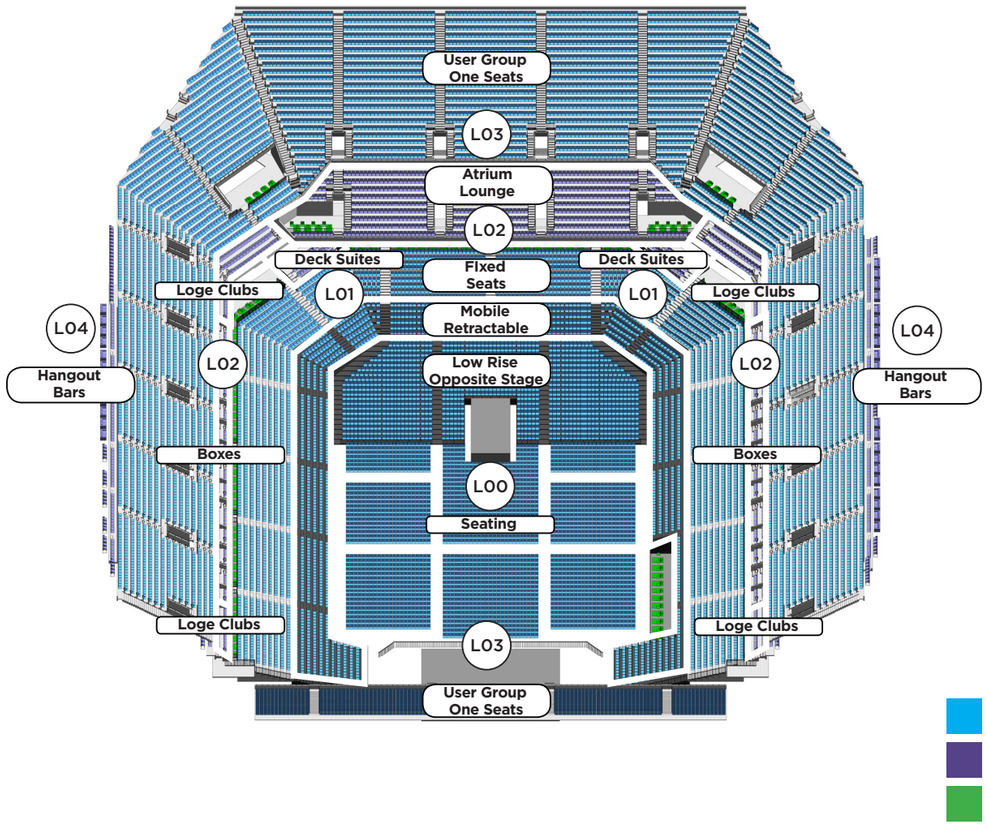
The OVG Manchester Venue seating hall has been designed for maximum flexibility to allow for all popular configurations to suit the needs of artists' creative shows and the touring event community.

The auditorium capacities have been reviewed during stage 4a and have been calculated with input from both crowd flow and fire consultants to define maximum safe capacities for the key event modes within the arena hall. The main event mode capacities are summarised in the table (see next page) with specific breakdowns shown in the following pages of the next section.

The lower bowl and event floor can be adapted, by use of retractable and relocatable seating units and loose seating, into the different modes described in the adjacent concert mode diagrams. The upper tier can be screened using black out drapes stored in and hung from the all roof rigging grid.

The auditorium capacities have been calculated at both 0.4m2 per person and 0.36m2 per person for standing spectators on the arena floor. This exercise has been undertaken so that ingress, egress and evacuation routes are calculated at the larger capacity derived from the 0.36m2 per person, to allow the capacity to be increased if future negotiations with the local authority allow for this higher density of spectators on the arena floor.

With the introduction of demountable wheelchair platforms to the rear of the lower tier, the option of increasing venue capacity is possible. If tickets are not sold for these wheelchair platforms they can be removed and standard seats fitted in these locations. The maximum number of seats with all the demountable wheelchair platforms removed (referred to as 0%) has been used in the capacity calculations to ensure that safe egress and evacuation is achieved in this seating format.



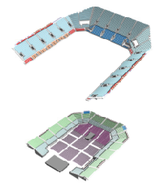
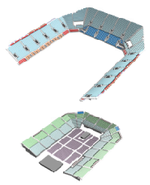
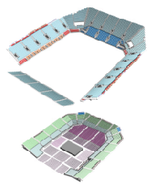
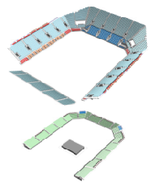
*The Capacities are calculated assuming 0% of wheelchair platforms in Level 01. Wheelchair platform number is likely to increase following the "Designing for Accessibility" rules and standards.

**300 seats required for Decibel and The Record Room guests - exact seating location subject to event stage design and floor seating layout - to be agreed between Client and Promoter.

Capacity Table with Specific Breakdowns

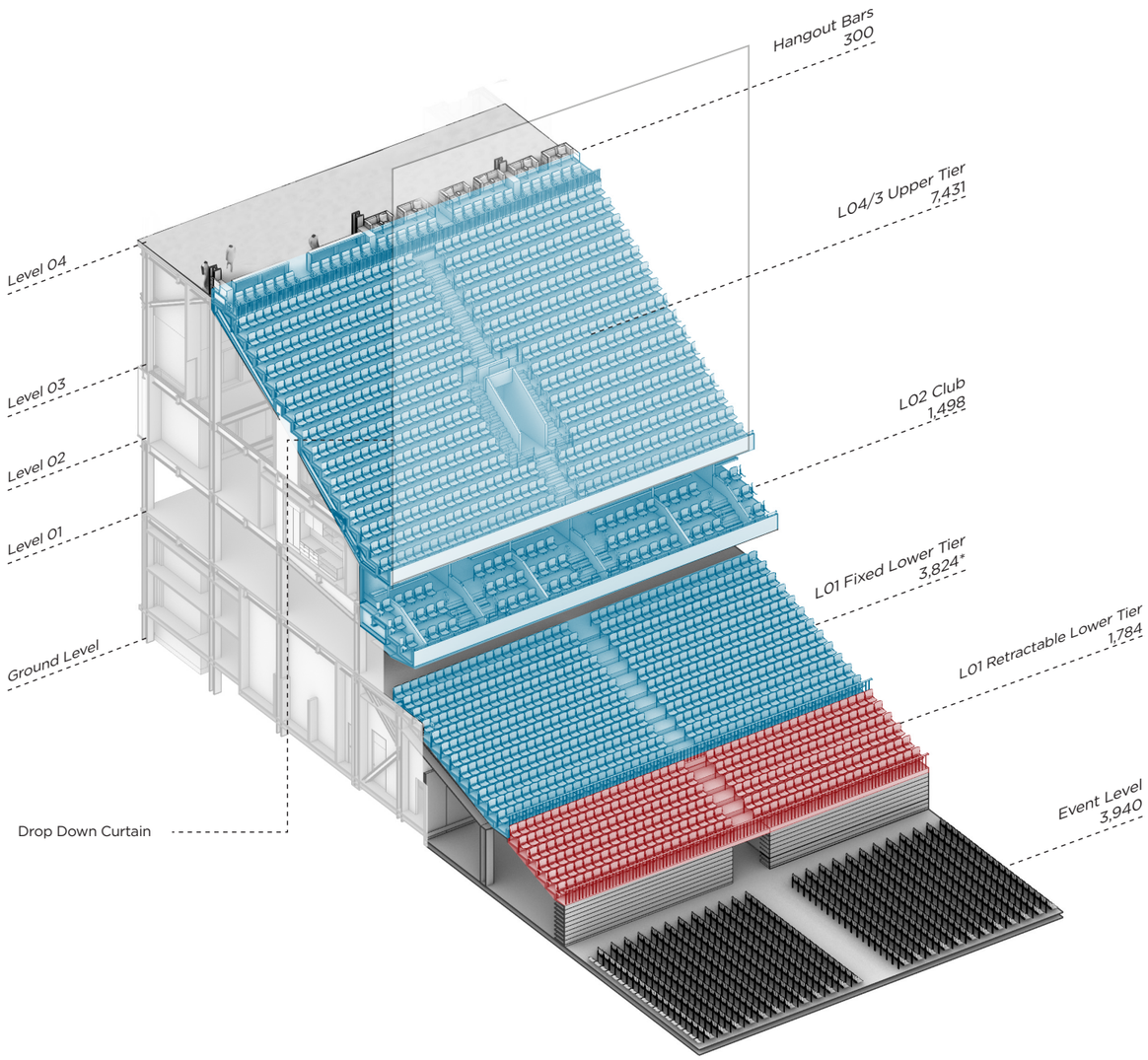
	End Stage Seated	Centre Stage Standing
Level 04 Hangout		
Hangout Bars	300	300
Level 03/4 Upper Tier		
User Group One Seating	7415	7415
Wheelchair Users	8	8
Companion Seats	8	8
Behind Stage Fixed Tier	-	1792
Level 02 Club		
Atrium Lounge	666	666
Boxes	464	464
Loge Clubs	352	352
Wheelchair Users	8	8
Companion Seats	8	8
Level 01 Deck		
Mobile Retractable	1784	-
Fixed Seating*	3824	3824
Wheelchair Users*	-	-
Companion Seats*	-	-
Level 00 Base		
Seating	2670	-
Low Rise Opposite Stage	1246	-
Standing	-	9200
Wheelchair Users	12	34
Companion Seats	12	34
TOTAL	**18,777**	**24,113**

Capacity Table of main Event Modes

	End Stage Seated	End Stage Ice TerraceSeated	Centre Stage Seated	End Stage Standing		Centre Stage Standng	
							
				0,4m² pp	0,36m² pp	0,4m² pp	0,36m² pp
LEVEL 04 HANGOUT	300	300	300	300	300	300	300
LEVEL 03 UPPER TIER	7431	7431	9223	7431	7431	9223	9223
LEVEL 02 CLUB	1498	1498	1498	1498	1498	1498	1498
LEVEL 01 DECK	5608*	6732*	5608*	3824*	3824*	3824*	3824*
LEVEL 00 BASE	3940	2420	4104	7566	8381	9268	10168
TOTAL	18777	18381	20733	20619	21434	24113	25013

*The Capacities are calculated assuming 0% of wheelchair platforms in Level 01. Wheelchair platform number is likely to increase following the "Designing for Accessibility" rules and standards.

End Stage Seated Mode



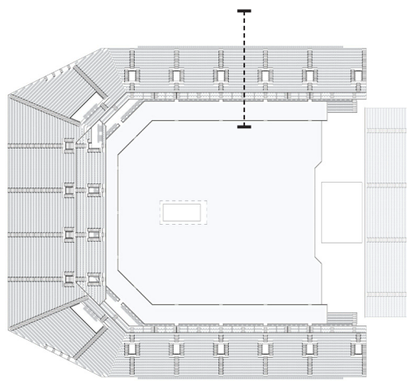
Fixed Seating

Retractable Seating

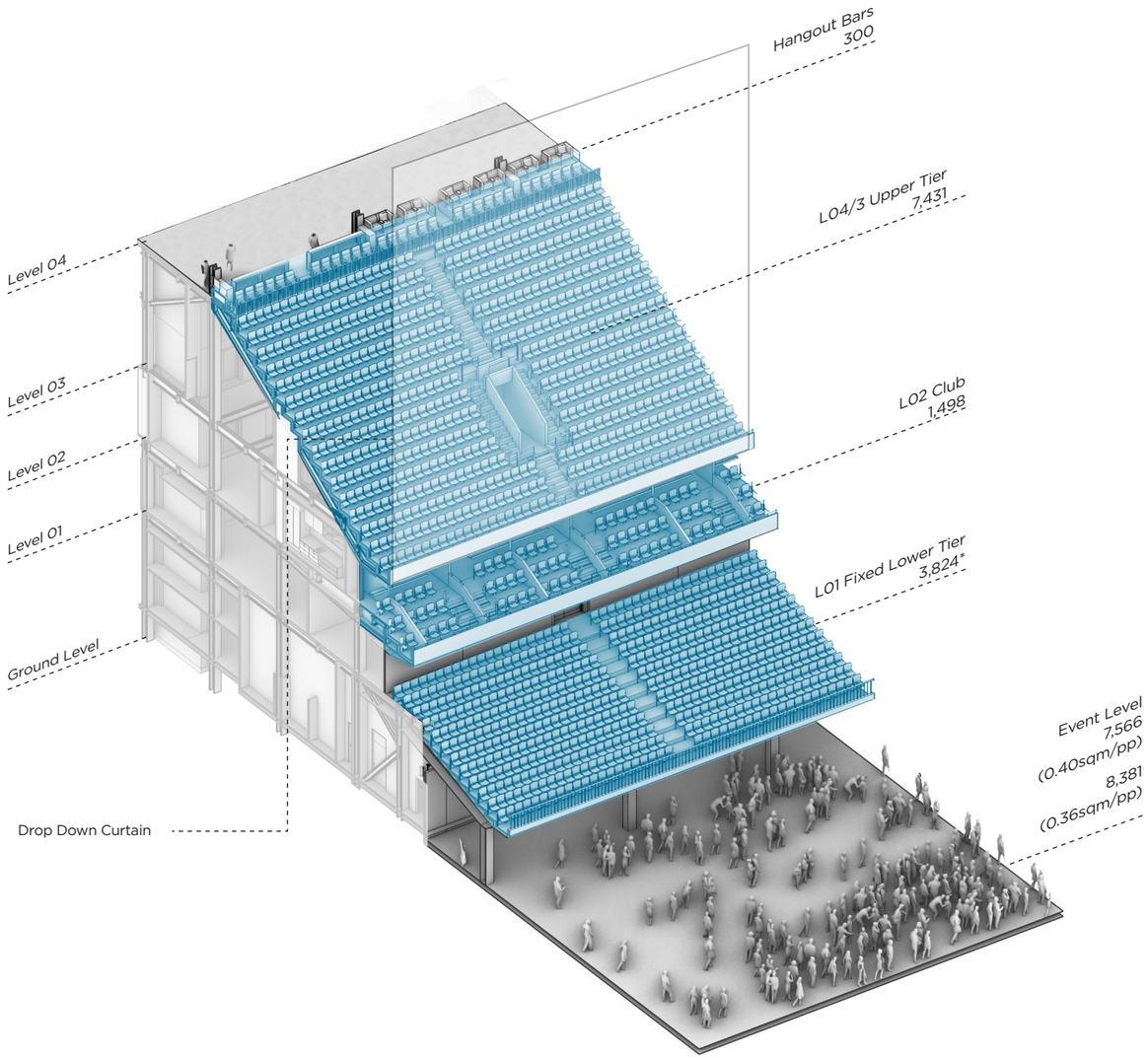
Total Capacity

End Stage Seating	**18,777***
Brit Awards Mode (140 Tables)	**1,400**

*The Capacities are calculated assuming 0% of wheelchair platforms in Level 01. Wheelchair platform number is likely to increase following the "Designing for Accessibility" rules and standards.



End Stage and Centre Stage Standing Mode



Fixed Seating

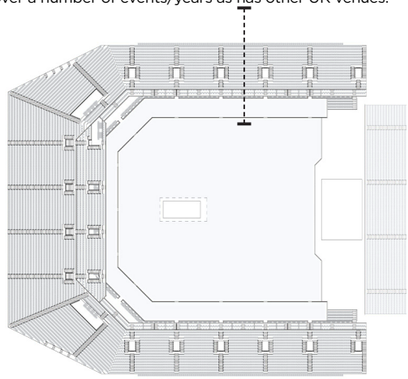
Retractable Seating

Total Capacity

End Stage Standing (0.40 sqm/pp)	**20,619***
End Stage Standing (0.36 sqm/pp)	**21,434***
Centre Stage Standing (0.40 sqm/pp)	**24,113***
Maximum Standing On Event Level (0.4 sqm/pp)	**9,268**
Centre Stage Standing (0.36 sqm/pp)	**25,013***
Maximum Standing On Event Level (0.36 sqm/pp)	**10,168**

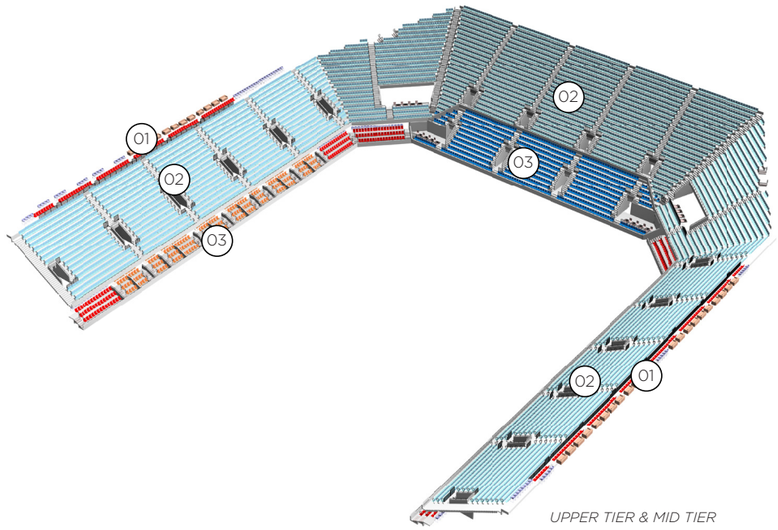
*The capacities are calculated assuming 0% of wheelchair platforms in Level 01. Wheelchair platform number is likely to increase following the "Designing for Accessibility" rules and standards.

**0.36m2 pp on the event floor would not be considered for day one scenario but might be pursued by the client group in agreement with licensing authority as the building is proven safe over a number of events/years as has other UK venues.

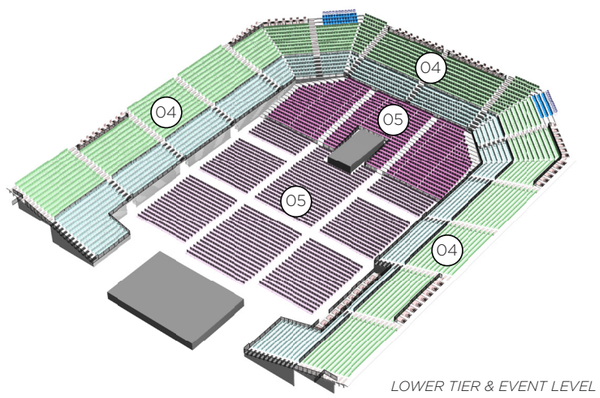


1.3.4 End Stage Seated Mode

The End Stage Seated Mode has a potential maximum capacity of 18777*. Likely to be a very regular event configuration, with a maximum capacity 5608 on Level 1.



UPPER TIER & MID TIER

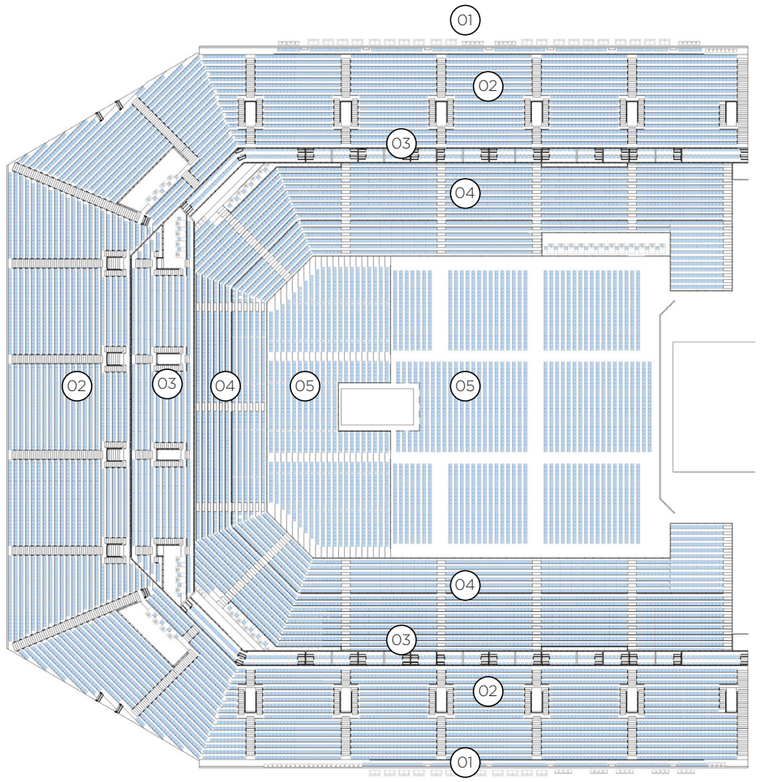


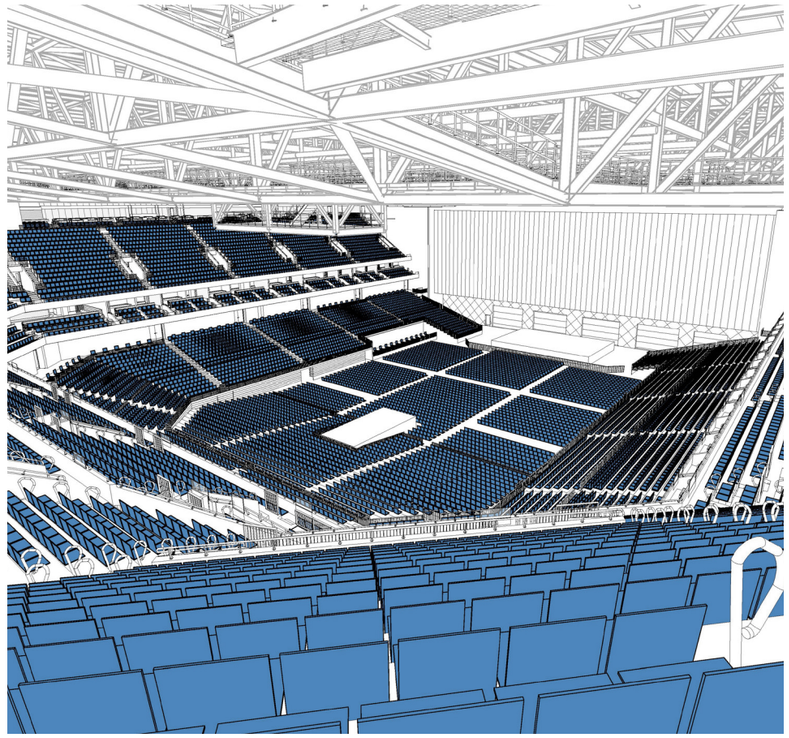
LOWER TIER & EVENT LEVEL

		MAXIMUM TOTAL CAPACITY		End Stage Concert Seated Mode with 0% Wheelchair positions in L01	End Stage Concert Seated Mode with 50% Wheelchair positions in L01	End Stage Concert Seated Mode with 100% Wheelchair positions in L01
					BRA-POP-ZZ-XX-DR-A-6051	
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**7431**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA			
				7431	**7431**	**7431**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**5608***	Mobile retractable	1784	1784	1784
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				5608	**5540**	**5158**
05	LEVEL 00 BASE	**3940**	Floor Seating	2370	2370	2370
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace	1246	1246	1246
			Standing (no Record Room or Decibel)			
			Standing (no Record Room or Decibel)			
			Wheelchair users	12	12	12
			Companion seats	12	12	12
				3940	**3940**	**3940**
	TOTAL	**18777**		**18777**	**18709**	**18327**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**7431**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**5608***
05	LEVEL 00 BASE	**3940**
	TOTAL	**18777**

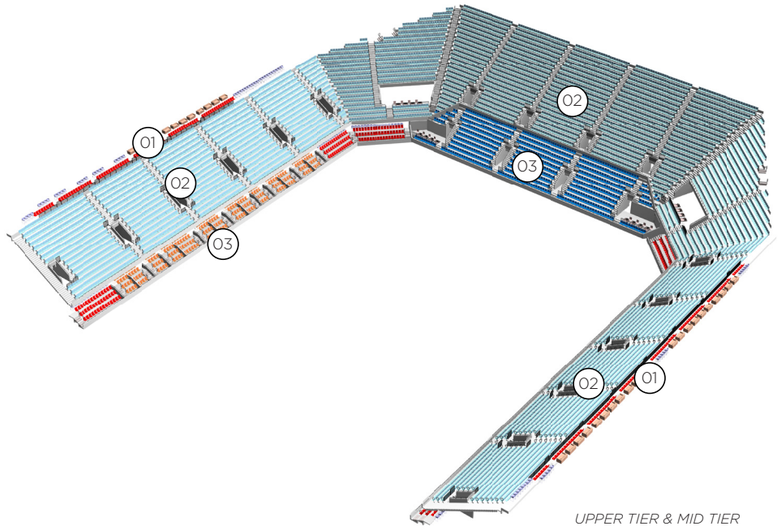




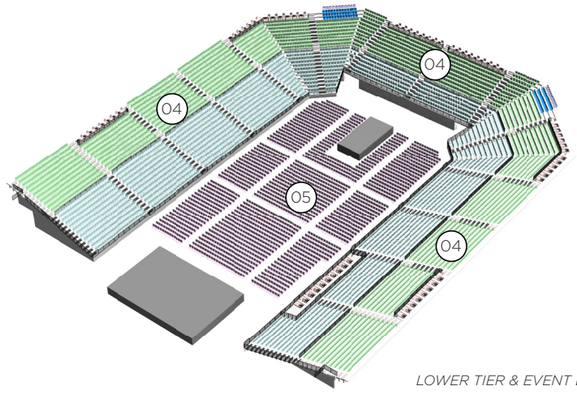
** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.5 End Stage Ice Terrace Seated Mode

The End Stage Ice Terrace Seated Mode has a potential maximum capacity of 18381*.Likely to be a rare event configuration, but it sets the maximum capacity at Level 1 with 6732 spectators, as the retractable tiers of the lower tier are fully installed.



UPPER TIER & MID TIER

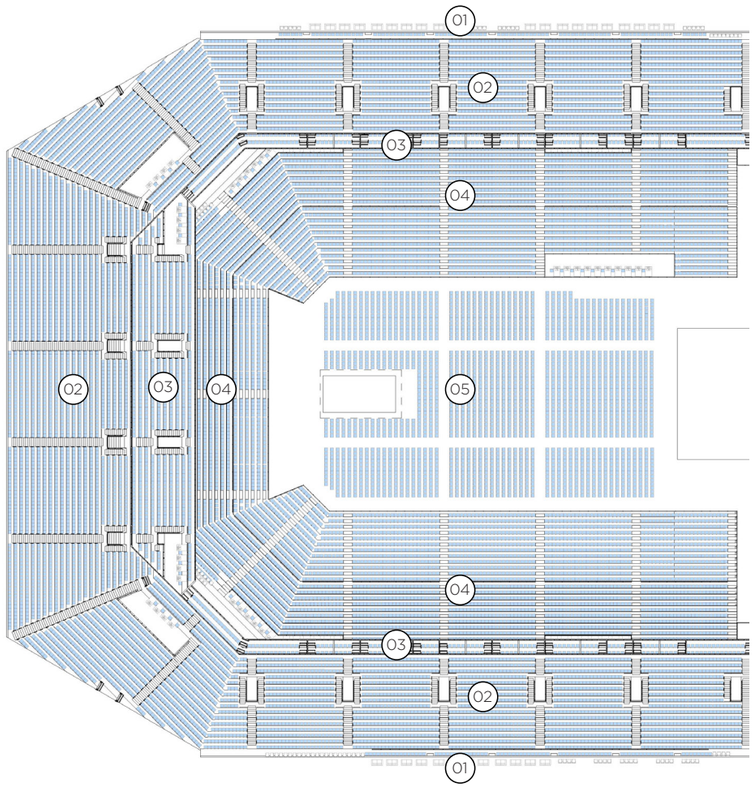


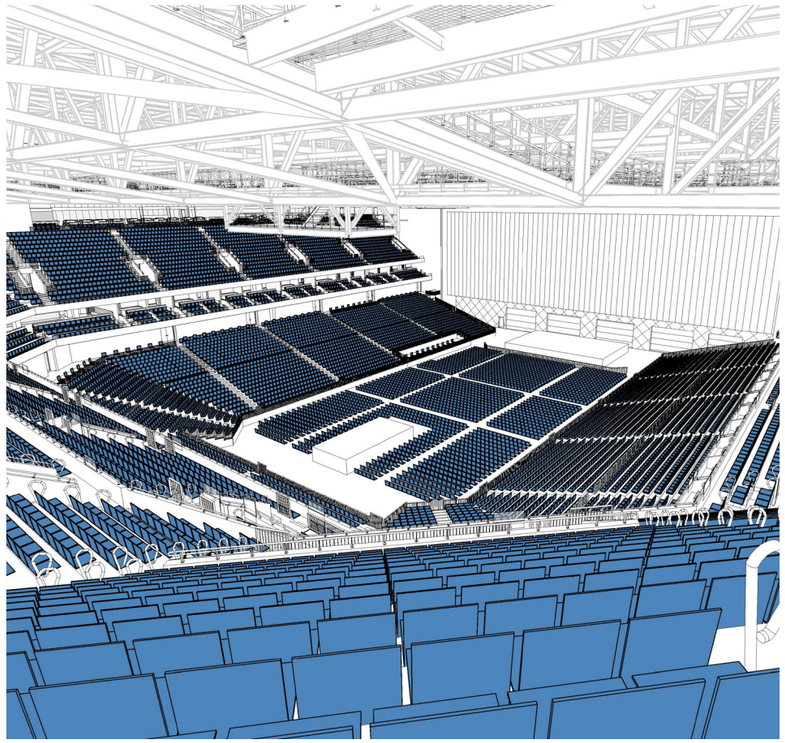
LOWER TIER & EVENT LEVEL

		MAXIMUM TOTAL CAPACITY		End Stage Concert Ice Terraces Seated Mode with 0% Wheelchair positions in L01	End Stage Concert Ice Terraces Seated Mode with 50% Wheelchair positions in L01	End Stage Concert Ice Terraces Seated Mode with 100% Wheelchair positions in L01
					BRA-POP-ZZ-XX-DR-A-6060	
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**7431**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA			
				7431	**7431**	**7431**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**6732***	Mobile retractable	2908	2908	2908
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				6732	**6664**	**6282**
05	LEVEL 00 BASE	**2420**	Floor Seating	2100	2100	2100
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace			
			Standing (no Record Room or Decibel)			
			Standing (no Record Room or Decibel)			
			Wheelchair users	10	10	10
			Companion seats	10	10	10
				2420	**2420**	**2420**
	TOTAL	**18381**		**18381**	**18313**	**17931**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**7431**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**6732***
05	LEVEL 00 BASE	**2420**
	TOTAL	**18381**

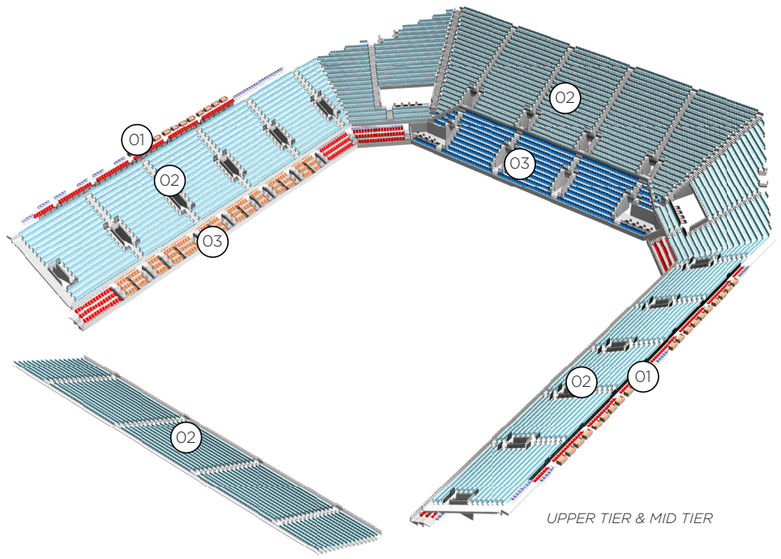




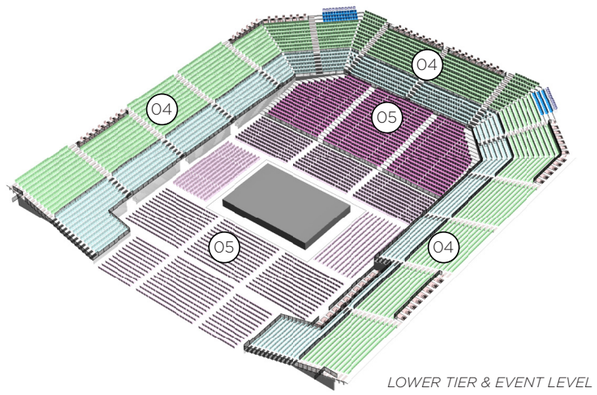
** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.6 Centre Stage Seated Mode

The Centre Stage Seated Mode has a potential maximum capacity of 20733*. This mode is similar to the End Stage Seated mode but with a different seat layout to the Event Floor.



UPPER TIER & MID TIER

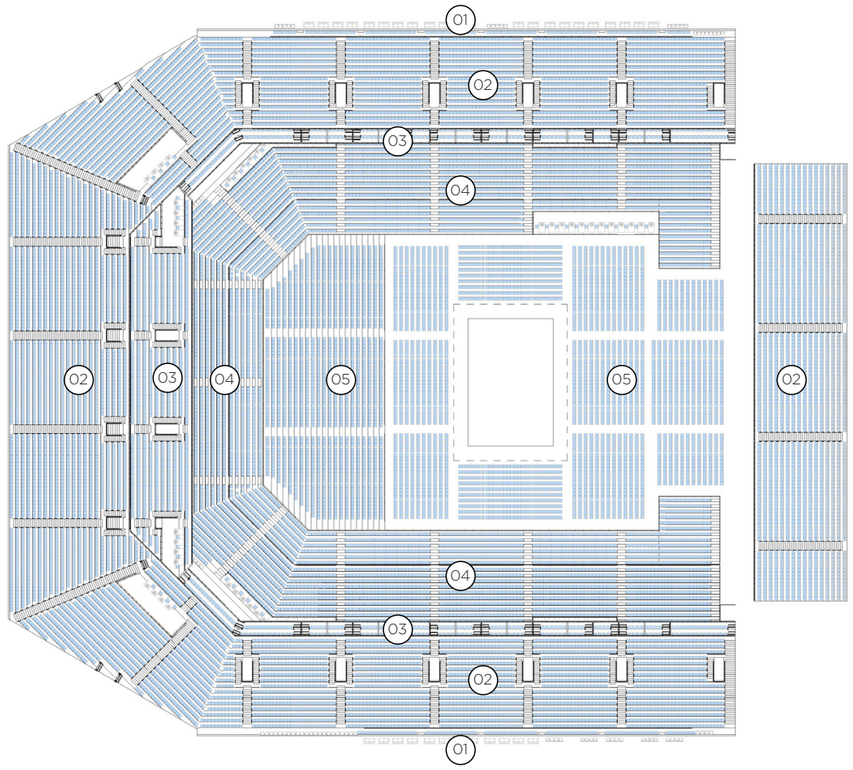


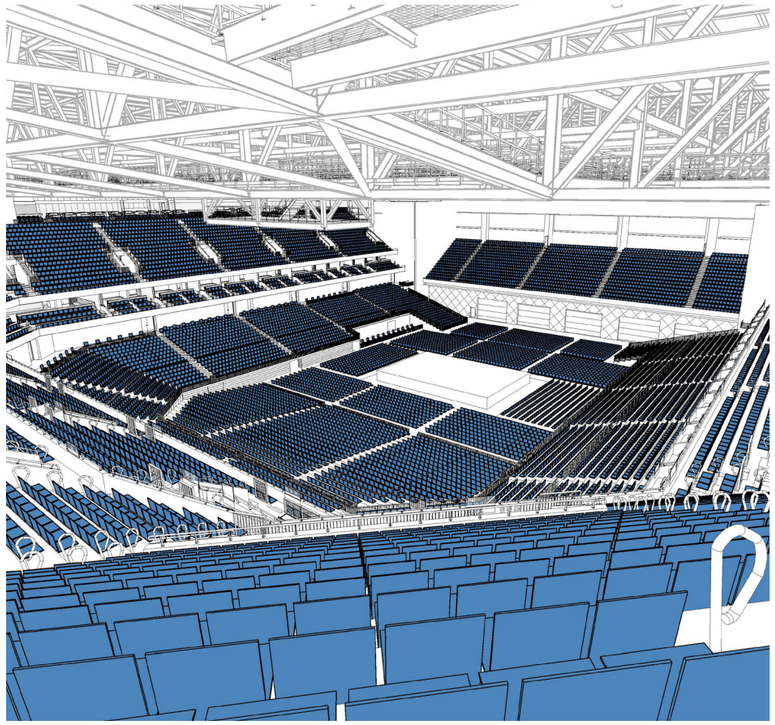
LOWER TIER & EVENT LEVEL

		MAXIMUM TOTAL CAPACITY		Centre Stage Concert Seated Mode with 0% Wheelchair positions in L01	Centre Stage Concert Seated Mode with 50% Wheelchair positions in L01	Centre Stage Concert Seated Mode with 100% Wheelchair positions in L01
					BRA-POP-ZZ-XX-DR-A-6058	
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**9223**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA	1792	1792	1792
				9223	**9223**	**9223**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**5608***	Mobile retractable	1784	1784	1784
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				5608	**5540**	**5158**
05	LEVEL 00 BASE	**4104**	Floor Seating	2459	2459	2459
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace	1321	1321	1321
			Standing (no Record Room or Decibel)			
			Standing (no Record Room or Decibel)			
			Wheelchair users	12	12	12
			Companion seats	12	12	12
				4104	**4104**	**4104**
	TOTAL	**20733**		**20733**	**20665**	**20283**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**9223**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**5608***
05	LEVEL 00 BASE	**4104**
	TOTAL	**20733**

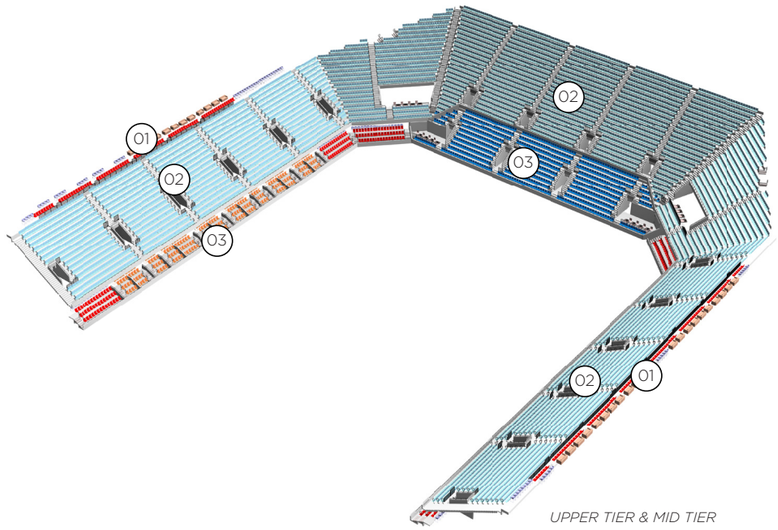




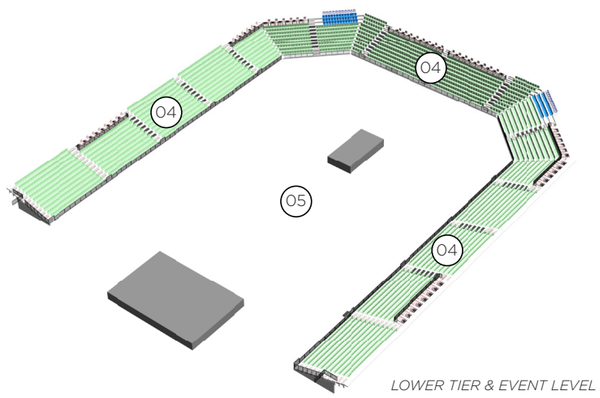
** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.7 End Stage Standing Mode (0.4m² pp)

The End Stage Standing Mode has a potential maximum capacity of 20619* with 0.4m2 per person. The retractable tiers are completely retracted and stored, freeing up the Event Floor Level to provide space to accommodate 7500 standing spectators.



UPPER TIER & MID TIER

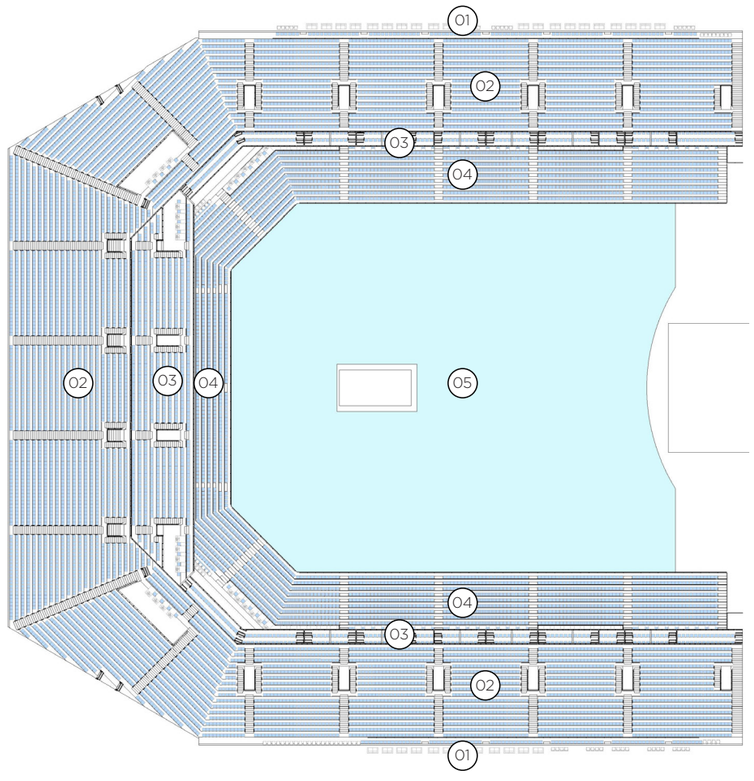


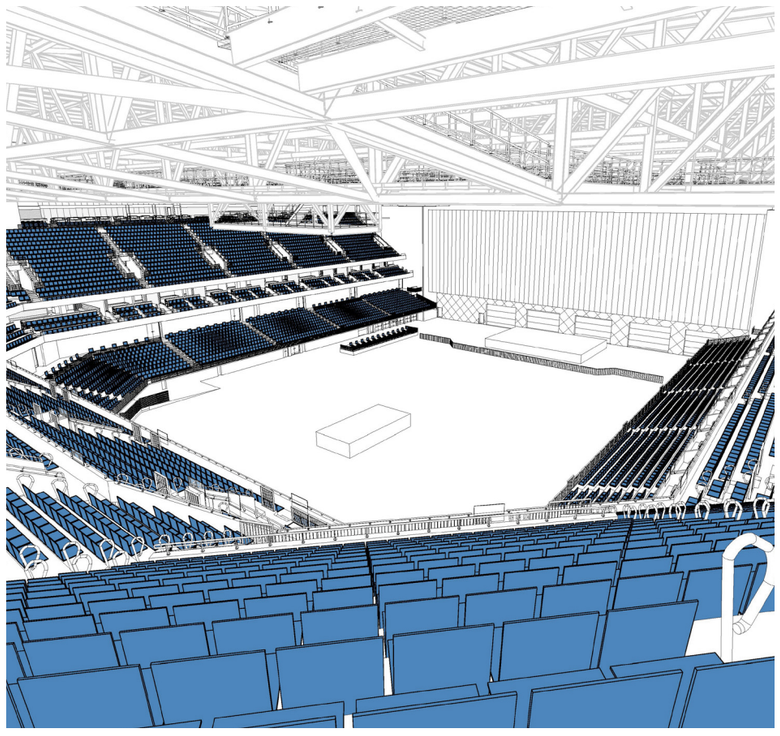
LOWER TIER & EVENT LEVEL

		MAXIMUM TOTAL CAPACITY		End Stage Concert Standing Mode @0.4m2/pp with 0% Wheelchair positions in L01	End Stage Concert Standing Mode @0.4m2/pp with 50% Wheelchair positions in L01	End Stage Concert Standing Mode @0.4m2/pp with 100% Wheelchair positions in L01
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**7431**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA			
				7431	**7431**	**7431**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**3824***	Mobile retractable			
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				3824	**3756**	**3374**
05	LEVEL 00 BASE	**7566**	Floor Seating			
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace			
			Standing (no Record Room or Decibel)	7200	7200	7200
			Standing (no Record Room or Decibel)			
			Wheelchair users	33	33	33
			Companion seats	33	33	33
				7566	**7566**	**7566**
	TOTAL	**20619**		**20619**	**20551**	**20169**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**7431**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**3824***
05	LEVEL 00 BASE	**7566**
	TOTAL	**20619**

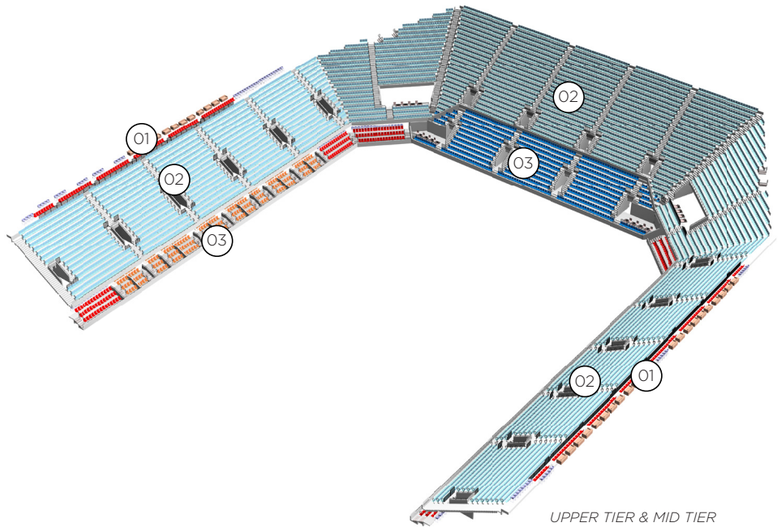




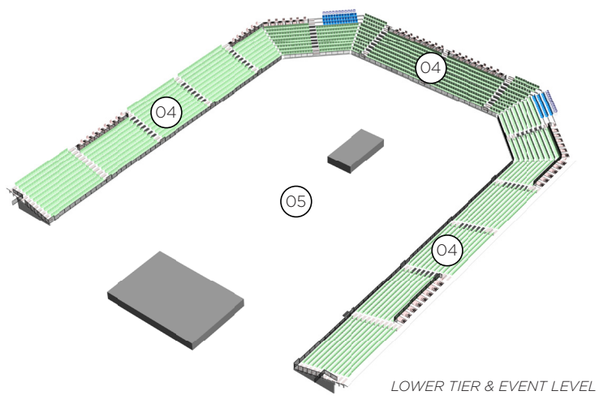
** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.8 End Stage Standing Mode (0.36m² pp)

The End Stage Standing Mode has a potential maximum capacity of 21434* spectators with 0.36m2 per person. The retractable tiers are completely retracted and stored, freeing up the Event Floor Level space to provide space for more than 8300 standing spectators.



UPPER TIER & MID TIER



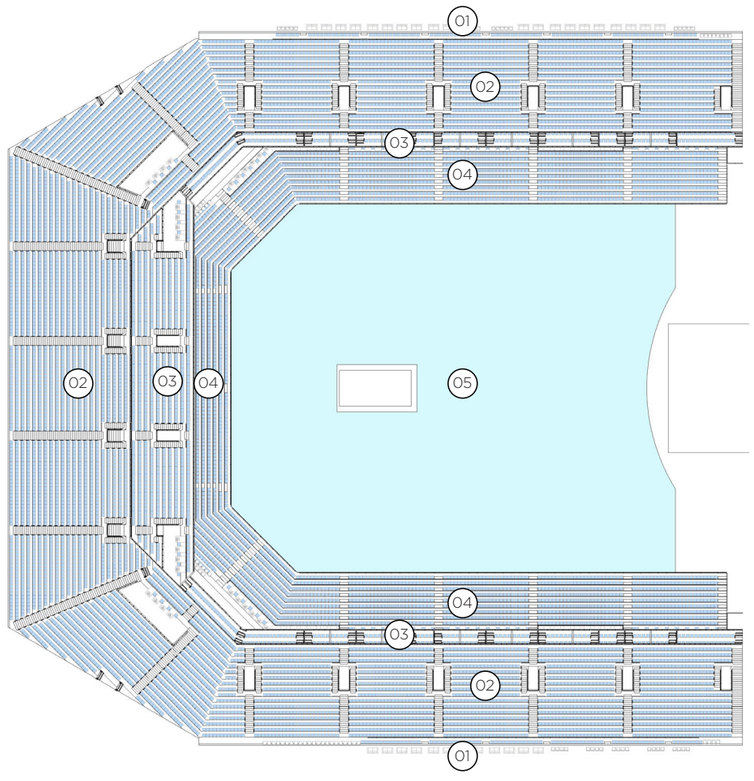
LOWER TIER & EVENT LEVEL

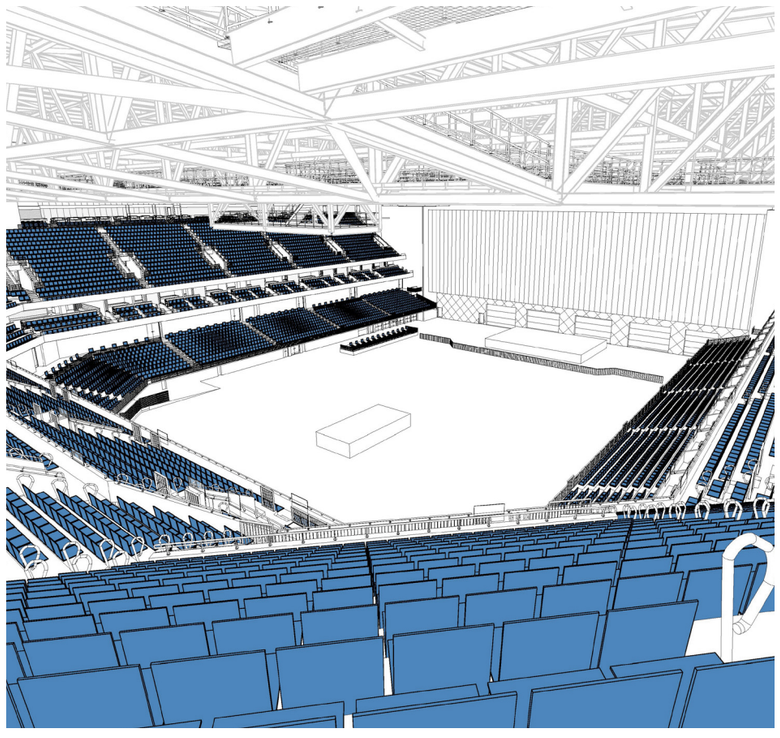
		MAXIMUM TOTAL CAPACITY		End Stage Concert Standing Mode @0.36m2/pp with 0% Wheelchair positions in L01	End Stage Concert Standing Mode @0.36m2/pp with 50% Wheelchair positions in L01	End Stage Concert Standing Mode @0.36m2/pp with 100% Wheelchair positions in L01
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**7431**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA			
				7431	**7431**	**7431**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**3824***	Mobile retractable			
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				3824	**3756**	**3374**
05	LEVEL 00 BASE	**8381**	Floor Seating			
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace			
			Standing (no Record Room or Decibel)			
			Standing (no Record Room or Decibel)	8015	8015	8015
			Wheelchair users	33	33	33
			Companion seats	33	33	33
				8381	**8381**	**8381**
	TOTAL	**21434**		**21434**	**21366**	**20984**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

***0.36m2 pp on the event floor would not be considered for day one scenario but might be pursued by the client group in agreement with licensing authority as the building is proven safe over a number of events/years as has other UK venues.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**7431**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**3824***
05	LEVEL 00 BASE	**8381**
	TOTAL	**21434**



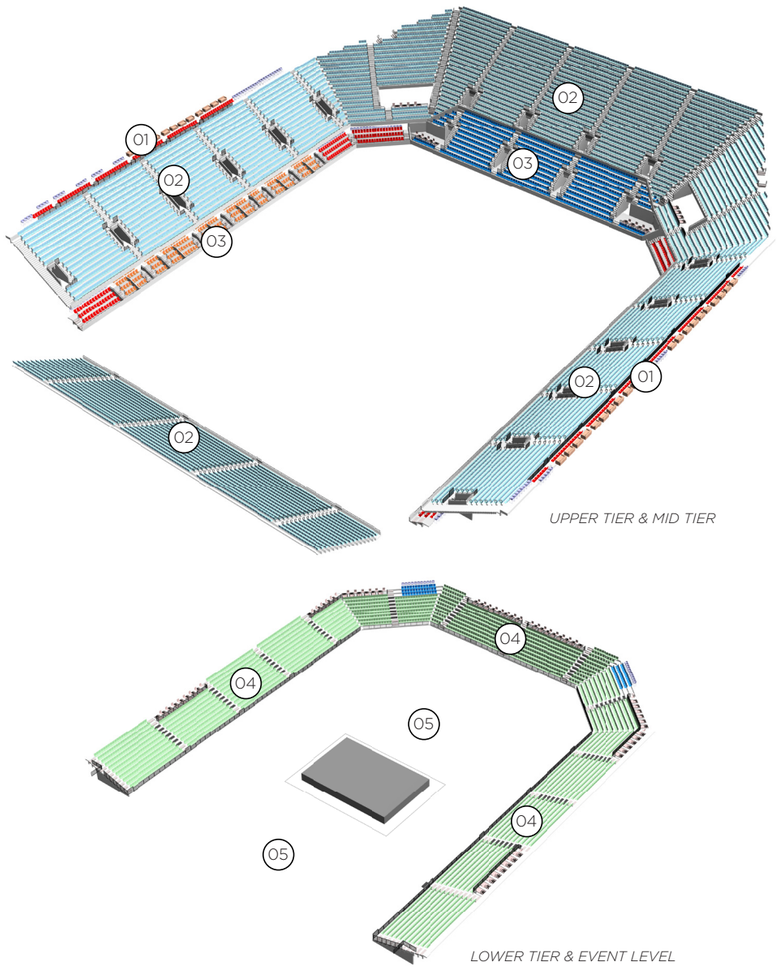


** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

***0.36m2 pp on the event floor would not be considered for day one scenario but might be pursued by the client group in agreement with licensing authority as the building is proven safe over a number of events/years as has other UK venues.*

1.3.9 Centre Stage Standing Mode (0.4m² pp)

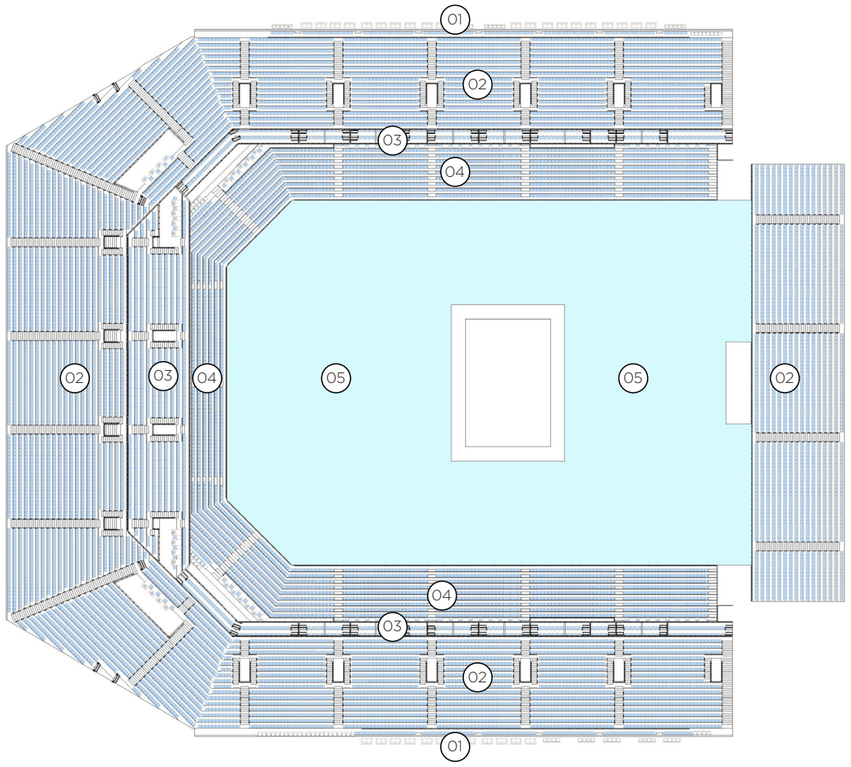
The Centre Stage Standing Mode has a potential maximum capacity of 24113* spectators with 0.4m2 per person. This is the event option that accommodates the largest number of spectators within the arena with the event floor providing space for 9200 standing spectators.

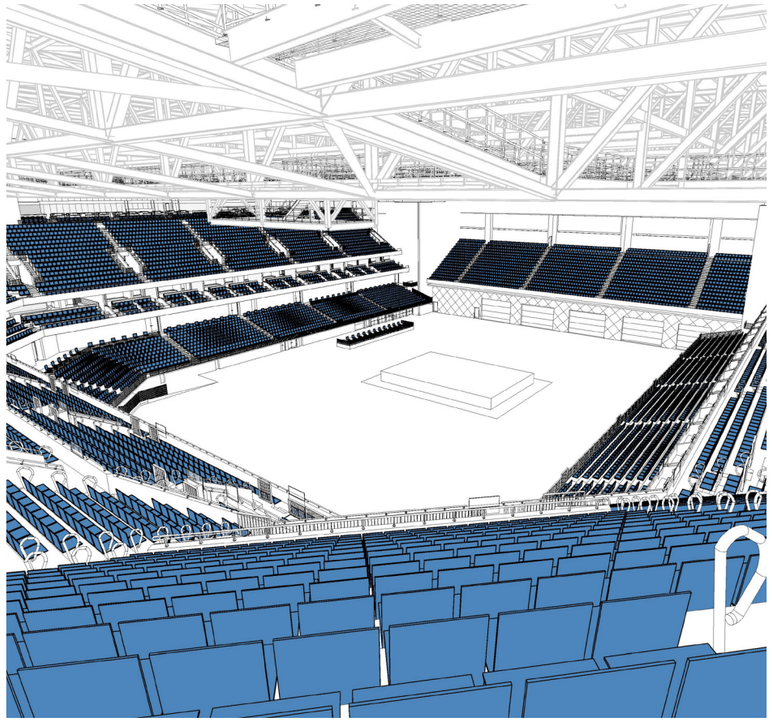


		MAXIMUM TOTAL CAPACITY		Centre Stage Concert Standing Mode @0.4m2/pp with 0% Wheelchair positions in L01	Centre Stage Concert Standing Mode @0.4m2/pp with 50% Wheelchair positions in L01	Centre Stage Concert Standing Mode @0.4m2/pp with 100% Wheelchair positions in L01
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**9223**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA	1792	1792	1792
				9223	**9223**	**9223**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**3824***	Mobile retractable			
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				3824	**3756**	**3374**
05	LEVEL 00 BASE	**9268**	Floor Seating			
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace			
			Standing (no Record Room or Decibel)	8900	8900	8900
			Standing (no Record Room or Decibel)			
			Wheelchair users	34	34	34
			Companion seats	34	34	34
				9268	**9268**	**9268**
	TOTAL	**24113**		**24113**	**24045**	**23663**

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**9223**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**3824***
05	LEVEL 00 BASE	**9268**
	TOTAL	**24113**

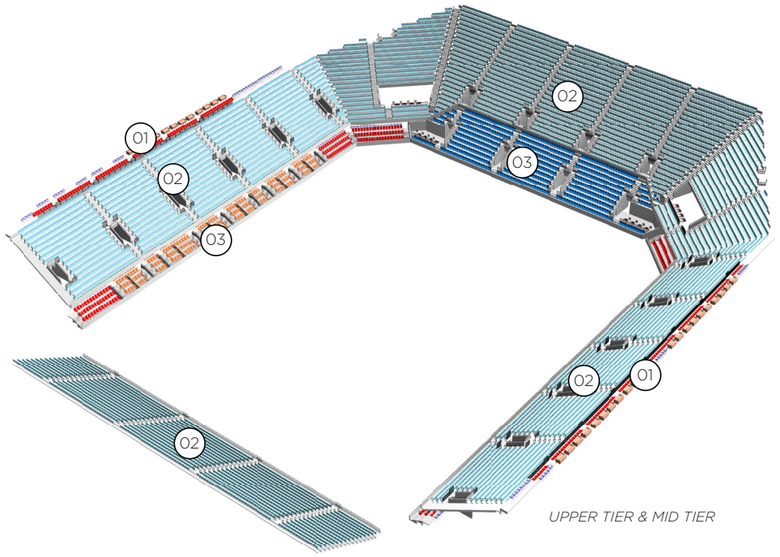




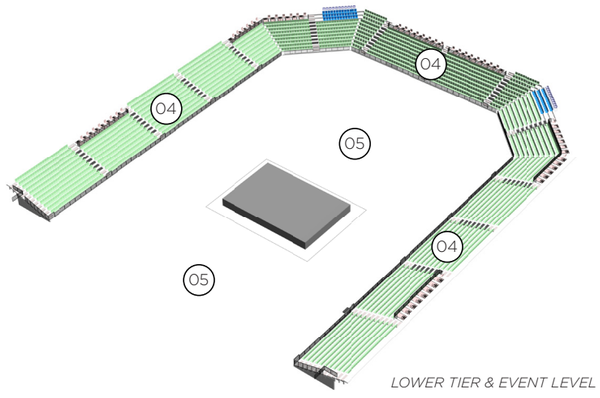
** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.10 Centre Stage Standing Mode (0.36m² pp)

The Centre Stage Standing Mode has a potential maximum capacity of 25013* spectators with 0.36m2 per person. This event option would provide an even larger maximum venue capacity if the increased density of standing spectators is agreed with the local authority in the future with the event floor providing space for 10100 standing spectators.



UPPER TIER & MID TIER



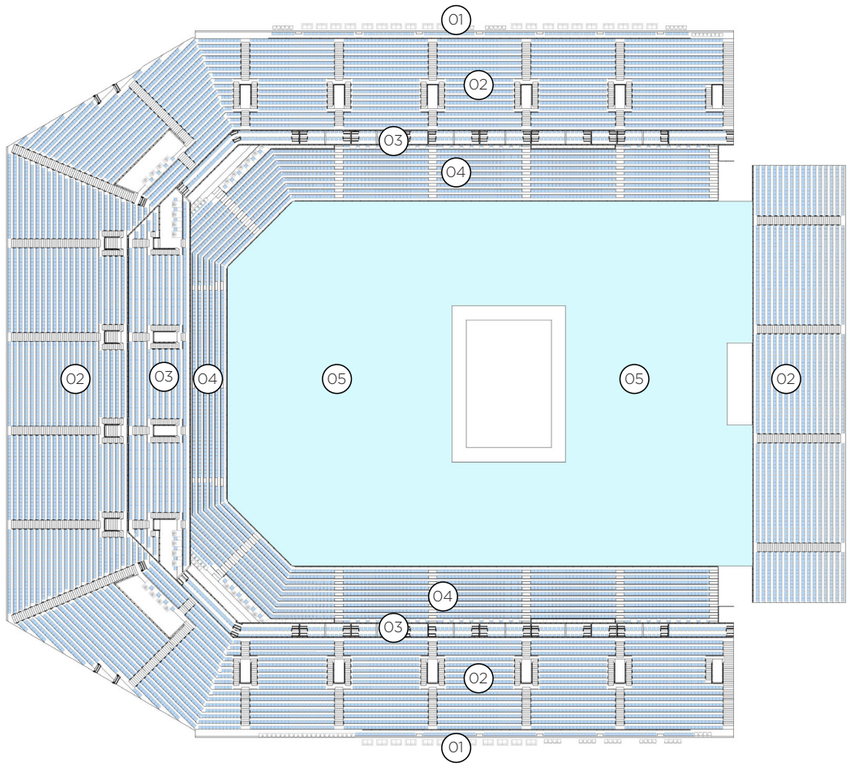
LOWER TIER & EVENT LEVEL

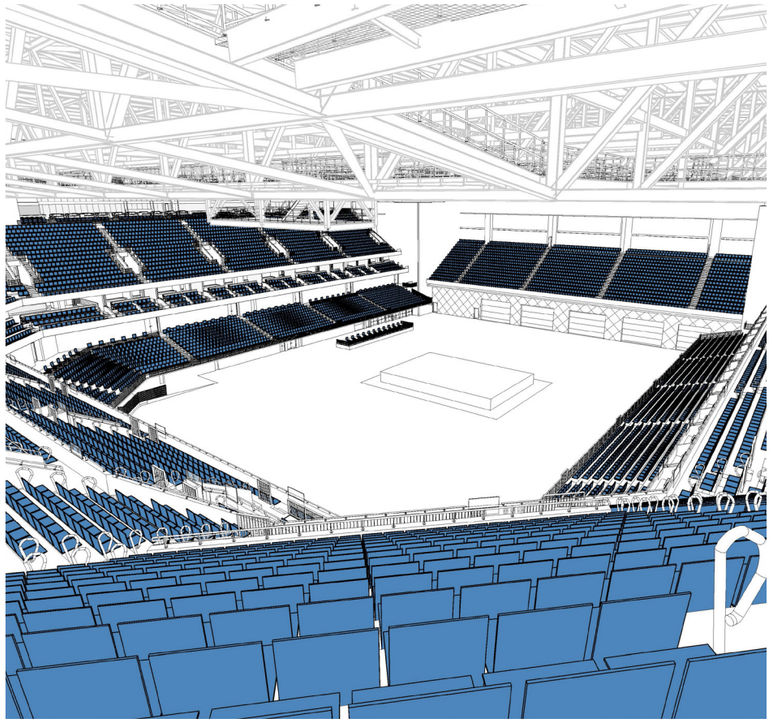
		MAXIMUM TOTAL CAPACITY		Centre Stage Concert Standing Mode @0.36m2/pp with 0% Wheelchair positions in L01	Centre Stage Concert Standing Mode @0.36m2/pp with 50% Wheelchair positions in L01	Centre Stage Concert Standing Mode @0.36m2/pp with 100% Wheelchair positions in L01
01	LEVEL 04 HANGOUT	**300**	Hangout Bars	300	300	300
				300	**300**	**300**
02	LEVEL 03 UPPER TIER	**9223**	GA seating	7415	7415	7415
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Upstage GA	1792	1792	1792
				9223	**9223**	**9223**
03	LEVEL 02 CLUB	**1498**	Atrium Lounge	666	666	666
			Wheelchair users	8	8	8
			Companion seats	8	8	8
			Boxes	464	464	464
			Loge clubs	352	352	352
				1498	**1498**	**1498**
04	LEVEL 01 DECK	**3824***	Mobile retractable			
			Recessed retractable (on Mezz)			
			Backstage Club	700	700	700
			Deck Suites	100	100	100
			Fixed seating	3024	2844	2354
			Standing Mezz deck (inc L01)			
			Wheelchair users		56	110
			Companion seats		56	110
				3824	**3756**	**3374**
05	LEVEL 00 BASE	**10168**	Floor Seating			
			Record Room	100	100	100
			Decibel	200	200	200
			Floor Terrace			
			Standing (no Record Room or Decibel)			
			Standing (no Record Room or Decibel)	9800	9800	9800
			Wheelchair users	34	34	34
			Companion seats	34	34	34
				10168	**10168**	**10168**
	TOTAL	**25013**		**25013**	**24945**	**24563**

This is the maximum capacity agreed with BH crowd movement.
22031 general spectators + 2882 hospitality spectators + 50 Wheelchair users + 50 companion seats.

** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

		MAXIMUM TOTAL CAPACITY
01	LEVEL 04 HANGOUT	**300**
02	LEVEL 03 UPPER TIER	**9223**
03	LEVEL 02 CLUB	**1498**
04	LEVEL 01 DECK	**3824***
05	LEVEL 00 BASE	**10168**
	TOTAL	**25013**





** This number is reflecting the maximum capacity with 0% of wheelchair platforms. It is used to calculate the worst case scenario for safety purposes. It has to be assumed that this number would decrease to increase the number of wheelchair platform.*

1.3.11 Event Modes

More Concert Related Event Modes

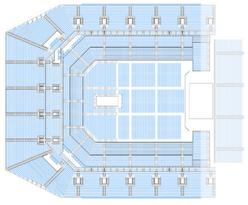
The OVG Manchester Arena seating hall has been designed for maximum flexibility to allow for all popular configurations to suit the needs of artists' creative shows and the touring event community.

The lower bowl and event floor can be adapted by use of retractable and relocatable seating units and loose seating into different modes described in the adjacent concert mode diagrams.

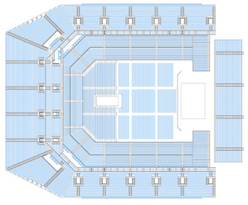
The upper tier can be screened with the use of drapes hung from the roof rigging grid.

Non-Concert Related Event Modes

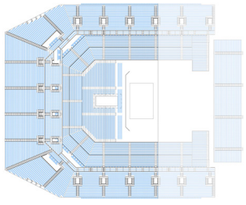
To ensure full event flexibility, the compact music venue auditorium design has also been tested against likely sport, family entertainment and banquet or awards ceremony type event configurations, as shown in the adjacent diagrams.



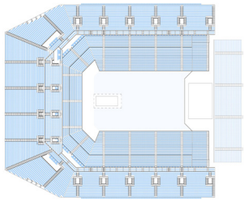
End Stage Concert 180°



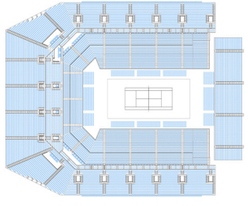
End Stage Concert 360°



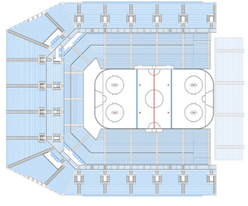
End Stage Short Hall



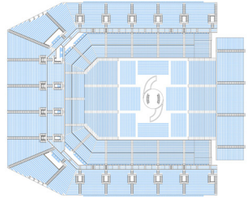
Ice Terrace Standing



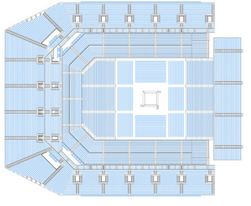
Tennis



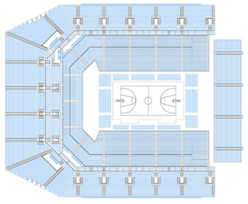
Ice Hockey



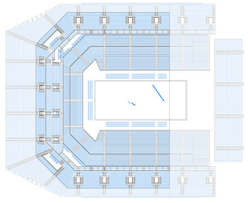
Esports



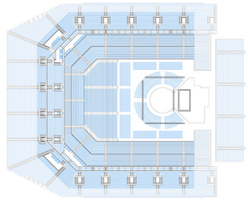
Boxing



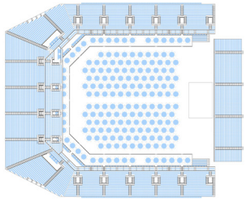
Basketball



Disney on Ice



Cirque du Soleil



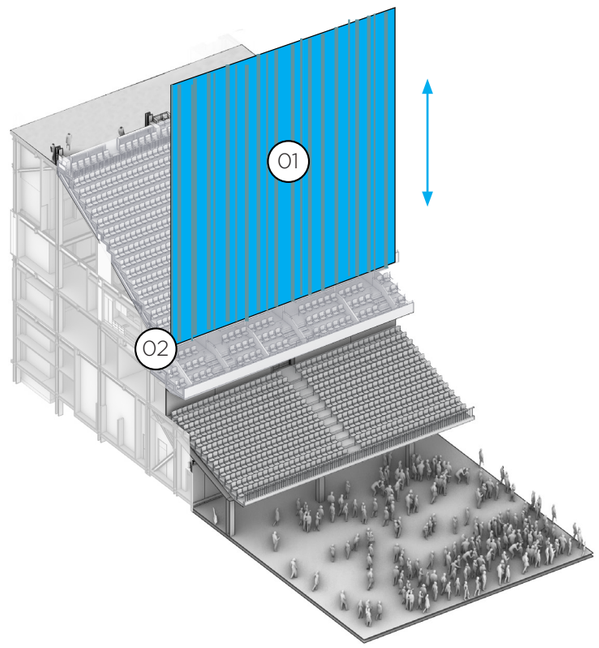
Banquet

1.3.12 Motorized Performance Drape

Two systems of drapes are also required to achieve the required flexibility when transforming the arena hall in different layouts for the different event modes.

The first is static and is placed just above the front edge of the Upper Tier. The drapery fabric descends to the front parapet of the Upper TIer when the tier is not used in the event mode.

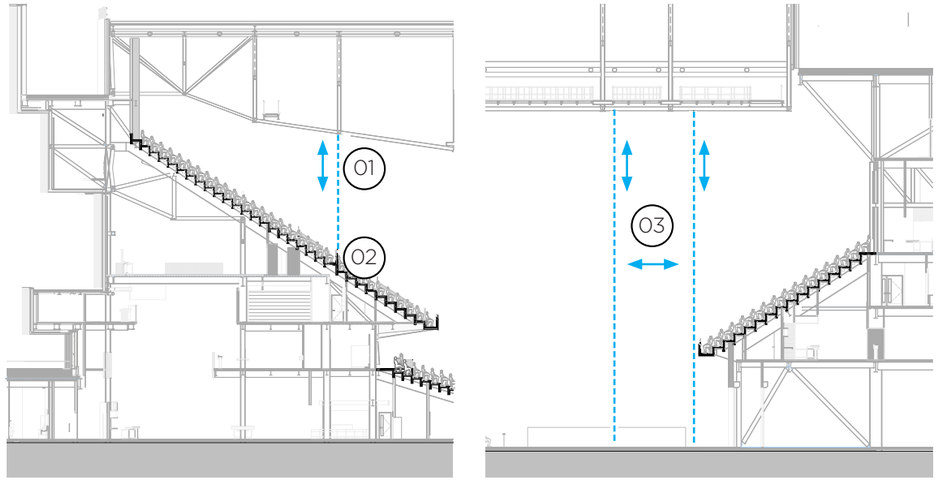
The second drape is in the East, where the End Stage is located. This drape reaches the Event Level floor and is capable of horizontally sliding to adapt the ideal position. It is used to hide the East Tier in end stage concert mode or to decreases the size of the event floor, when the event requires it.

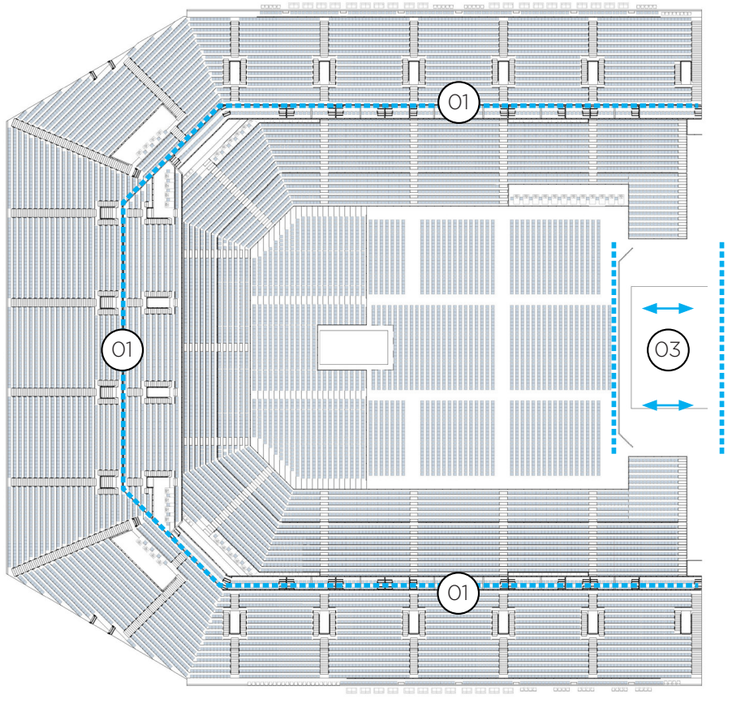


01 Motorised Performance Drape [FX-101]

02 Upper Tiers' front parapet

03 Motorised Performance Drape with horizontal sliding system [FX-101]





1.3.13 Retractable Seating

Flexibility

Retractable seating is used throughout the lower tier to maximise the venue's flexibility. A number of different types of retractable seating units have been used to optimise the viewing experience.

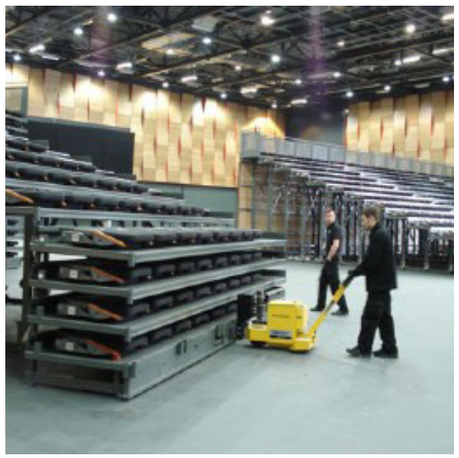
The rear section of the lower tier is fixed terracing, with the front of this tier formed in retractable units. These retractable units can be stored under the front of the fixed lower tier if required. When these retractable units are removed from the auditorium, they can be stored in the onsite bulk storage areas.

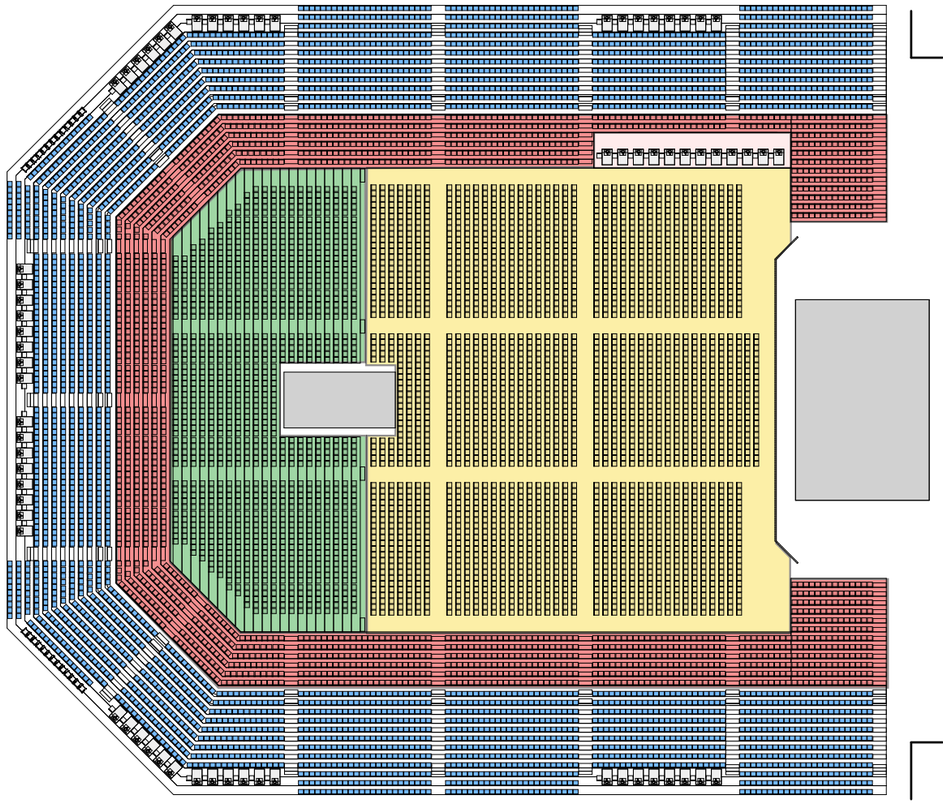
The low rise mobile retractable units located to the west of the auditorium, opposite the end stage, have been included in the design to reduce the number of flat floor seats and to minimise seat kills due to production overlay. These retractable seating units will also be stored in the onsite bulk storage areas when not required for an event.

The design of the retractable seating allows for the venue to adapt to accommodate several different configurations required for all the event modes covered in the previous section of this report.

Further design development will need to be progressed with the client to ensure that the final design meets all of their requirements, particularly in relation to the seat type to be provided for the venue.







Seat Types

All seats will be part of the same design family to give a clear visual continuity and impact in the arena bowl. There will be differing grades of seating depending where spectators are located.

Premium seats used in the boxes and loge clubs will be high quality seats, spaced at a minimum 530mm centres and in the Atrium Lounge spaced at a minimum 515mm centers. All these seats would be fully upholstered with high backs, separate arms and cup holders.

Standard Fan seats will be fully upholstered seats with shared arms minimum 495mm centres and mounted to fixed terraces [FX-541 & FX-542] and retractable terrace units [FX-511 & FX-521].

Floor seating [FX-551] will match the tier Fan seating, maintaining continuity throughout the arena seating.

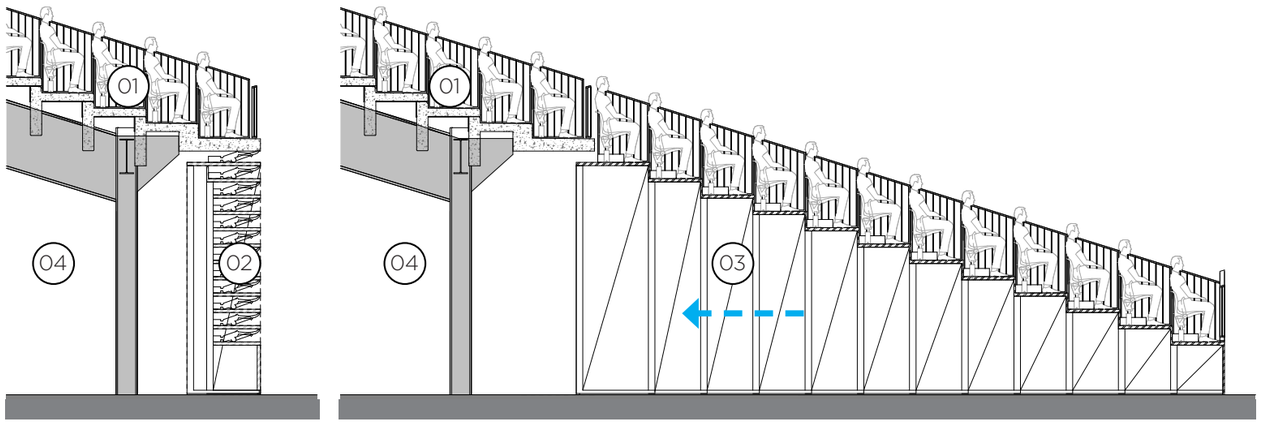
Retractable Tier in different Modes

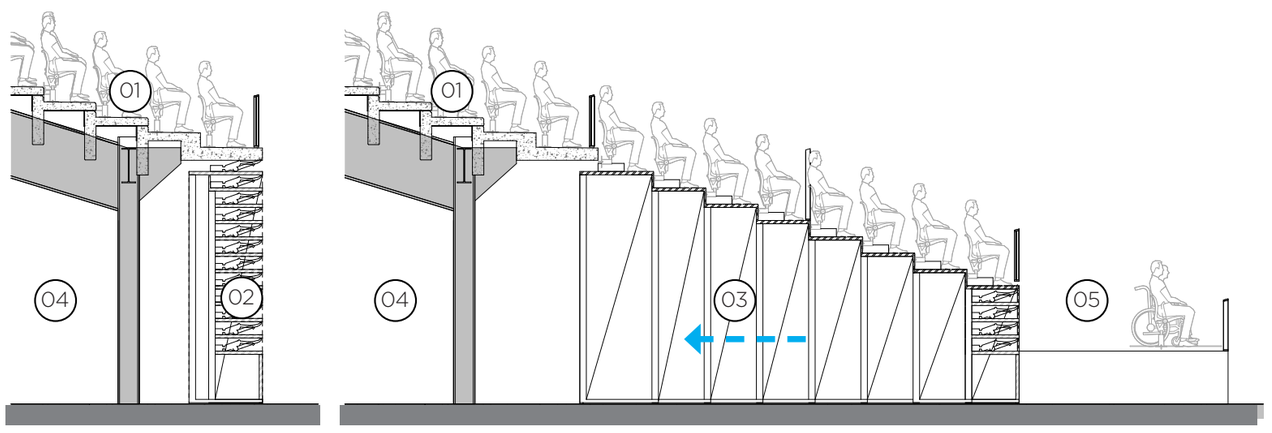
The retractable seating system enables the venue to achieve the required flexibility of seating configurations in the arena hall for all event modes.

As shown in these detail drawings, the retractable tier and seat system is formed of 12 rows that can be part retracted or fully retracted under the first row of the of the fixed lower tier. Locating the retractable units here allows for the arena hall floor to be freed up for standing spectators without relocating the units in the bulk storage area. Small sections of these retractable units will need to be removed to allow for spectator access to the arena floor for some of the standing concert event modes or fully seated modes. These smaller units will need to be stored in the bulk storage areas.

The section opposite shows the retractable units fully extended with the wheelchair platform incorporated. When this tier is fully extended it increases the capacity of the lower tier by 2908 seats providing a total capacity in the lower tier of 6732 seats which is referred to as the Ice Terrace Seated Mode.

The lower section shows the configuration of the retractable tier required to accommodate the wheelchair platform (AM-321). This is achieved by retracting the first four rows to create space for the wheelchair platform. The location of the wheelchair platform allows the ambulant spectators to be integrated with the other spectators in this stand. Access to this wheelchair platform is provided via a compliant ramp from the arena floor to the rear of the retractable tier.





01 Fixed part of Lower Tier (Precast)

02 Retractable Tier (in retracted position) [FX-511]

03 Retractable Tier (in extended position) [FX-511]

04 L00 Circulation

05 Demountable Wheelchair platform [AM-123]

Retractable Tier in End Stage Seated Mode

As shown in the view in the right, the retractable tier [FX-511] is part extended, part retracted.

This configuration increases the lower tier capacity by 1784 seats to a total maximum capacity of 5608 seats, but it also gives floor space to 2670 arena floor seats [FX-551]. When part retracted the retractable seating design is required to accommodate six pedestrian routes to provide spectator access to the arena floor seats.

The low riser retractable stand is also part retracted in this mode to provide space to provide production space for the mixing desk location. This tier has a reduced capacity of 1246 seats [FX-521].

01 Fixed Tier (Precast)

02 Retractable Tier (Expanded Units) [FX-511]

03 Retractable Tier (Retracted Units) [FX-511]

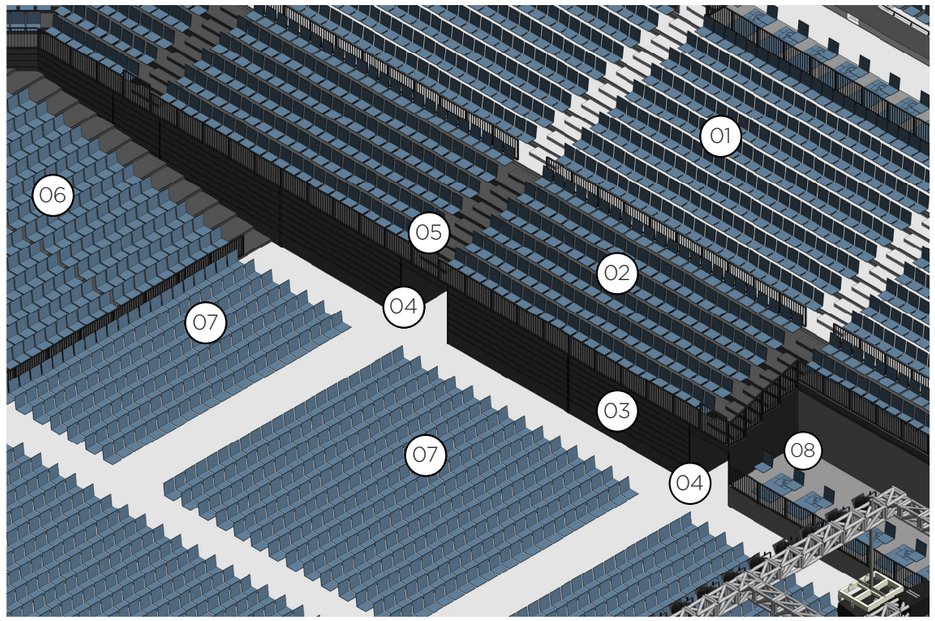
04 Vomitory (Underneath Expandend Units of Rectractable Tier) [FX-511]

05 Demountable Crush Barrier [BAL-123]

06 Low Riser Retractable Tier with removable seats [FX-521]

07 Removable Track Mounted Arena Floor Seating [FX-551]

08 Demountable Wheelchair Platform [AM-321]



Retractable Tier in Centre Stage Seated Mode

The retractable tier [FX-511] retains the same configuration in Centre Stage Seated Mode as in End Stage Seated Mode.

The floor area remaining is configured with an alternate seating layout to the centre stage for the arena floor seats [FX-551].

The low riser retractable stand is completely extended in this mode and provides a capacity of 2459 seats [FX-521] in this stand.

01 Fixed Tier (Precast)

02 Retractable Tier (Expanded Units) [FX-511]

03 Retractable Tier (Retracted Units) [FX-511]

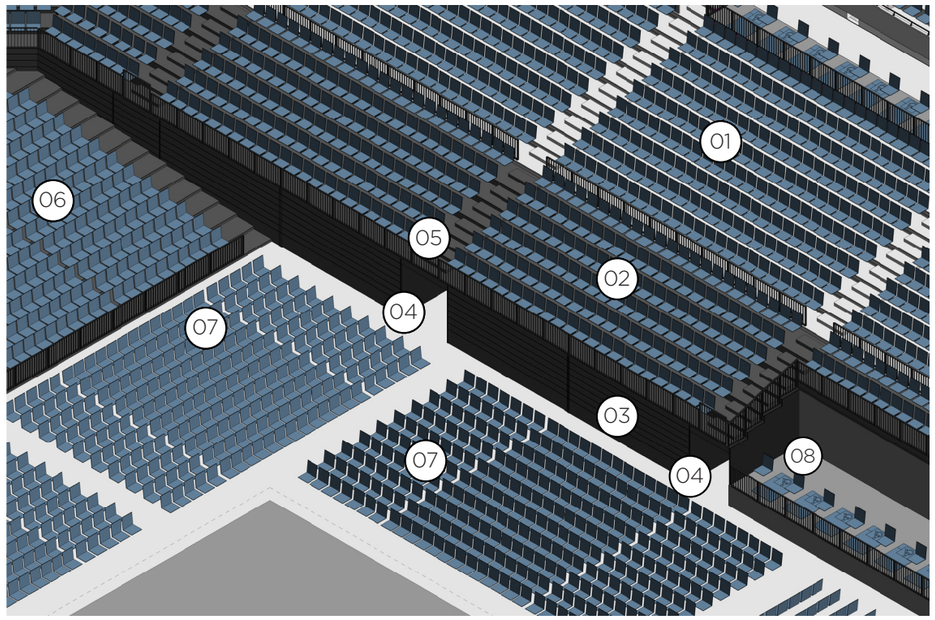
04 Vomitory (Underneath Expandend Units of Rectractable Tier) [FX-511]

05 Demountable Crush Barrier [BAL-123]

06 Low Riser Retractable Tier with removable seats [FX-521]

07 Removable Track Mounted Arena Floor Seating [FX-551]

08 Demountable Wheelchair Platform [AM-321]



Retractable Tier in End Stage Ice Terrace Seated Mode

The Ice Terrace Seated Mode sets the maximum total capacity at Level 01 with 6732 spectators, as the Retractable Tier [FX-511] is completely extended which adds further 2908 seats to the lower tier in this mode.

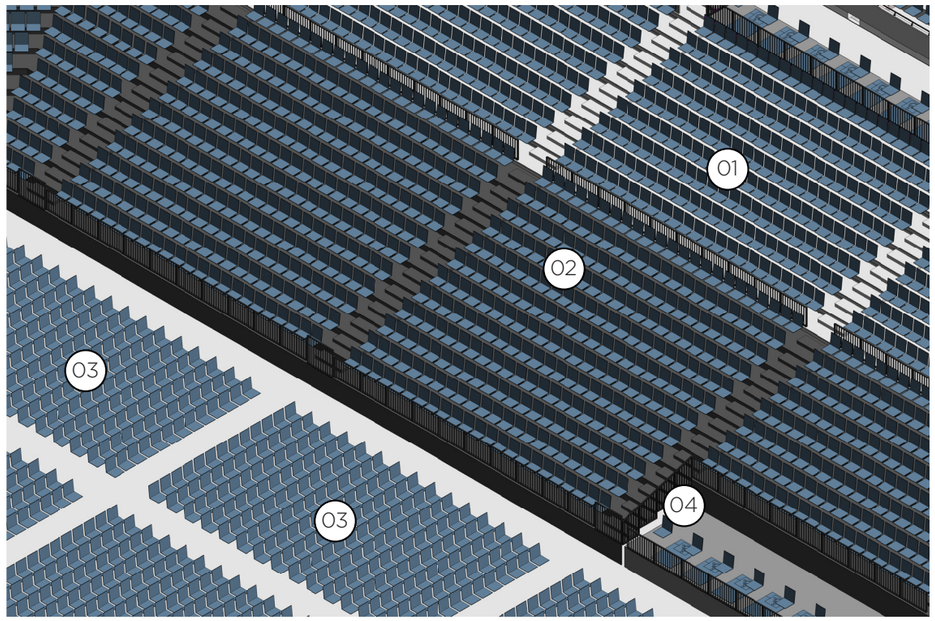
The seating capacity at L00 is therefore smaller with 2420 seats [FX-551] and the Lower Riser Retractable Stand is completely retracted and stored.

01 Fixed Tier (Precast)

02 Retractable Tier (Extended Units) [FX-511]

03 Removable Track Mounted Arena Floor Seating [FX-551]

04 Demountable Wheelchair Platform [AM-321]



Retractable Tier in Standing Mode

Both retractable tier systems [FX-511] & [FX-521] are completely retracted and stored in this mode.

The arena standing floor, is completely cleared of the retractable seating systems, which provides floor space for a maximum capacity of 10100 standing spectators.

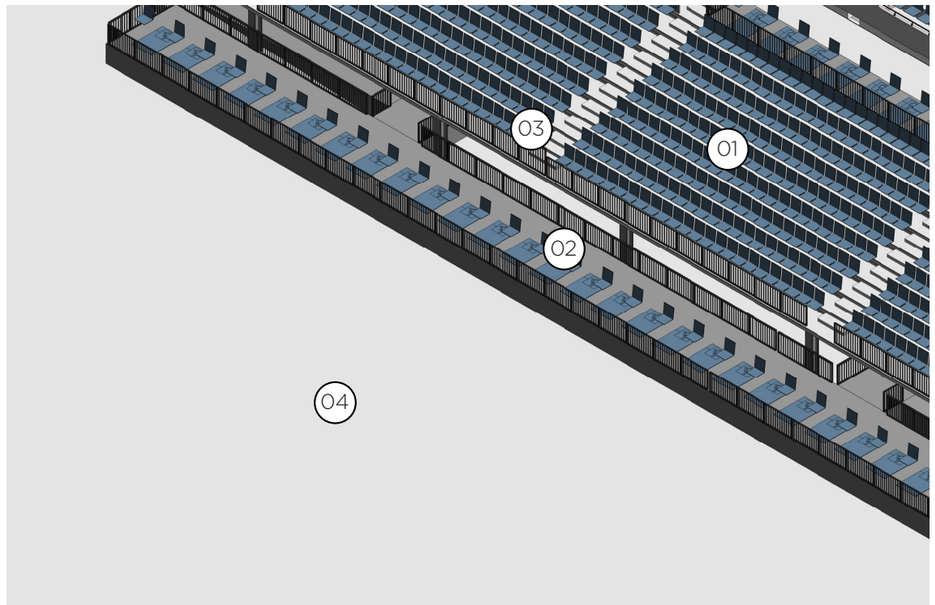
The Demountable Wheelchair platform (see point 02) provides locations for 34 wheelchairs and 34 companion seats and is positioned adjacent to the West Raised Platform to the North of the arena.

01 Fixed Tier (Precast)

02 Demountable Wheelchair Platform [AM-321]

03 Demountable Crush Barrier [BAL-123]

04 Standing Area



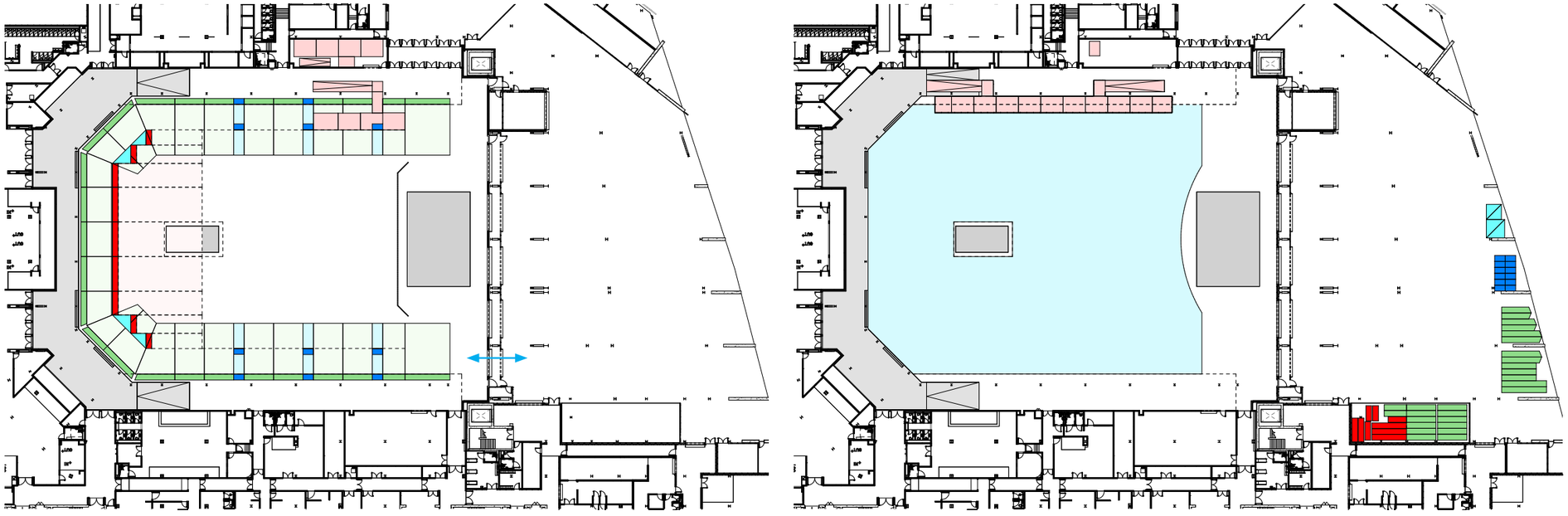
Storage

Both types of retractable seating systems can be easily and quickly retracted and stored in the back of house onsite bulk storage areas by loading them through the roller shutter doors underneath the East Stand..

These access doors have been specifically sized at 4.5m high and 7m wide to allow for these units to be moved in and out of the arena hall.

Input from the client and their operations team will be required to discuss and agree the final locations for the storage of these retractable tier units.

From review with suppliers it can be assumed that it is possible to install the retractable seating from the bulk storage area into their locations in the arena in less than 5 hours.



Footprint of retractable lower tier when extended [FX - 511]

Stored bay of retractable tier[FX - 511]

Footprint of low riser retractable tier when extended [FX - 521]

Stored bay of retravtable tier [FX - 521}

Footprint of stair infills when extended [FX - 511]

Stored stair infills [FX - 511]

Demountable Wheelchair platforms and ramps [AM - 321]

Demountable Wheelchair platforms and ramps [AM - 321]

Primary route for arena build

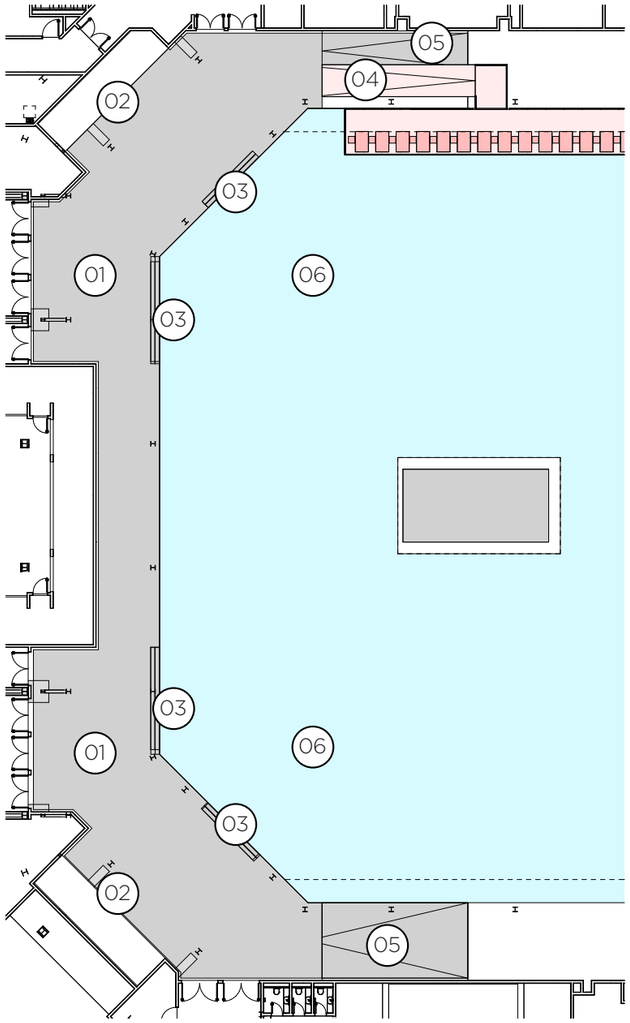
1.3.14 West Raised Platform

The West Raised Platform provides a raised entry lobby to the hall and Event Floor standing area. This platform is elevated 0.5 meters from the Event Floor Level and allows spectators to understand the size and shape of the venue and orientate themselves when they enter the hall. It also enhances the visitor experience by creating a sense of drama for spectators as they enter and move onto the Event Floor.

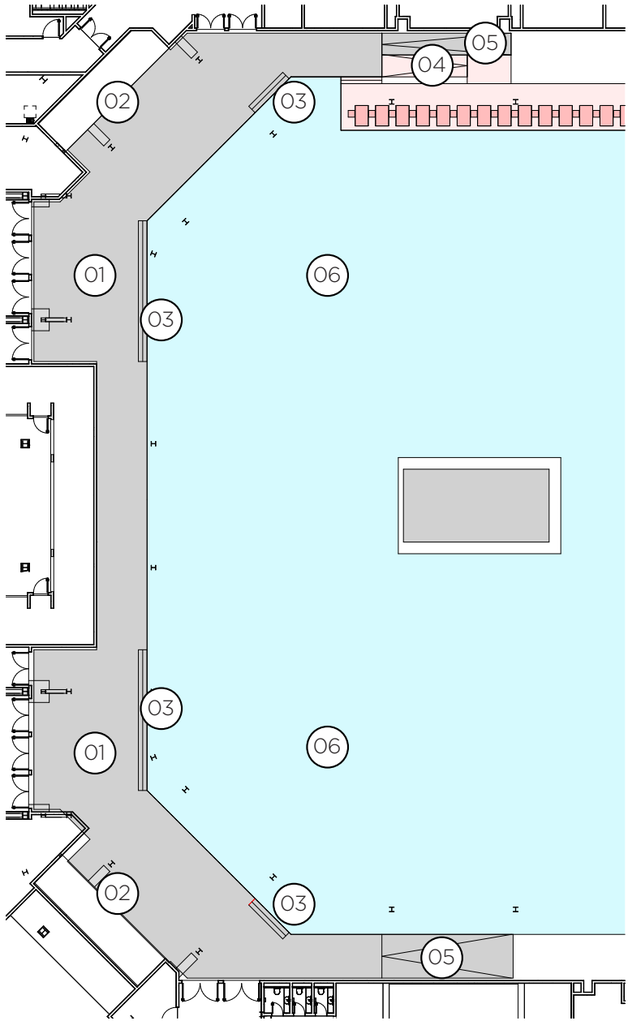
This raised area contains 2 concessions at the north and south. This platform also allows access to the arena floor via stairs and ramps at the north and the south for spectators in wheelchairs.

The final configuration of this platform and stairs may be reviewed to provide a more optimal solution after discussion with the client, consultants and contractor.

01 West Raised Platform
02 Bar / Kiosk
03 Steps to Event Level
04 Access to Wheelchair Users Platform
05 Ramps to Event Level
06 Standing Area / Event Level



Current West Raised Platform



Potential Amendment of West Raised Platform

1.3.15 Bowl Metalwork

The metalwork and barriers within the seating bowl are designed to follow the same architectural language of the metalwork in the interiors of the building. All these metal elements are designed to be in steel with black powder coated finish (RAL 9005) maintaining the strong modern industrial feeling as a continuation of the interiors into the bowl.

The bowl metalwork within the seating bowl is designed to maximise the overall viewing quality and spectator experience. In conjunction with the inset step detail on the upper tier, the barrier heights are kept as low as possible ensuring that restricted views within the seating bowl are reduced as far as practically possible. The lower tier feeds spectators to the bowl from the rear, thus removing vomitories and significantly reducing any barriers to this tier.

A combination of glass and metalwork barriers are used in the bowl to enhance the viewing experience, whilst also providing the appropriate metalwork barriers and handrails to be compliant with the Guide to Safety at Sports Grounds (The Green Guide). These barriers are split into three main types: metalwork barriers, glass barriers and metalwork handrails.

These metalwork barrier types are configured into four further types and follow the same design rules to maintain a uniform style, only differing in their height, loading, and fixing solutions.

The glass barriers are cantilevered from the precast front parapets and rear walls of the vomitories. These are detailed to provide a neat flush finish and conceal the mechanical fixings to the precast units. Reflections from the glass will need to be assessed to ensure that this will not detract from the spectator viewing quality.

Metalwork handrails are provided to the front parapets and vomitories generally. The handrails to the gangways on the upper tier are configured as ‘P rails’ to allow access to seating while still providing the appropriate hand holds on the gangway.

The design of the bowl metalwork for both the permanent, retractable and demountable areas of the bowl, including wheelchair platforms, is coordinated to achieve a uniform design approach for all metalwork within the arena hall.

Storage will be required within close proximity for all demountable barriers within the arena hall.

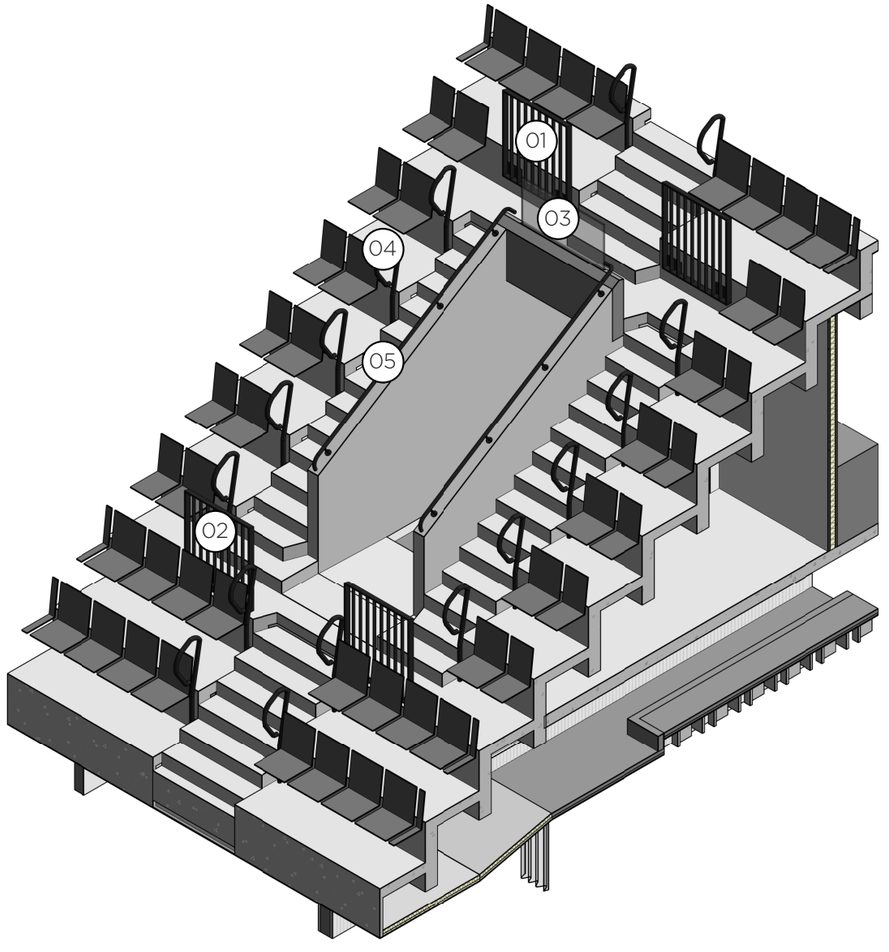
01 BAL-121 (Mild steel barrier with h=800mm, RAL-9005)

02 BAL-123 (Mild steel barrier with h=1100mm, RAL-9005)

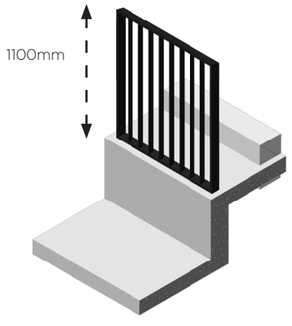
03 BAL-103 (Glass barrier with h=1100mm, RAL-9005 in steel plate)

04 BAL-325 (Mild steel handrail "P" rail, with h=900mm, RAL-9005)

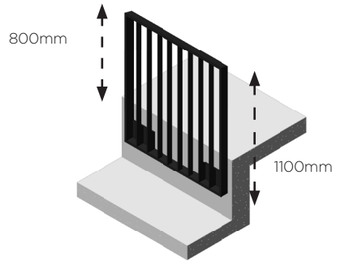
05 BAL-321 (Mild steel handrail at top of vomitory, with h=900mm, RAL-9005)



BAL-123 (Pocket and epoxy mortar fixed)



BAL-121 (Riser fixed with Backplate)



1.3.16 Demountable Wheelchair platforms

There are a combination of permanent and demountable wheelchair platforms integrated into the design of the seating bowl. The upper tier platforms are designed as a permanent fixture within the bowl, while the wheelchair platforms to the rear of the lower tier are designed to be demountable. The wheelchair platforms to the arena floor are designed to integrate with the retractable seating system and to be a stand-alone system when the arena floor is configured for standing spectators.

Rear of the lower tier

All wheelchair platforms to the rear of the lower tier can be demounted and removed to allow for standard seats to be installed on the terracing in these locations. This design approach to the seating bowl offers the possibility of removing or adding wheelchair capacity as and when required, dependant on sales of specific events.

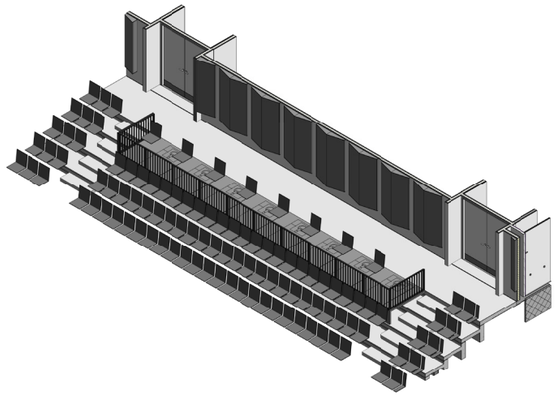
One bay of demountable wheelchair platform accommodation can be removed and fitted in most locations with 48 seats. There are 14 of these platforms to the lower tier. The lower tier seating capacity can be increased by 450 seats if all the demountable platforms are removed for an event. This number is based on 670 additional seats that can be installed when the wheelchair platforms are demounted minus the 220 wheelchair and companion viewing positions that are removed.

Arena floor wheelchair platforms

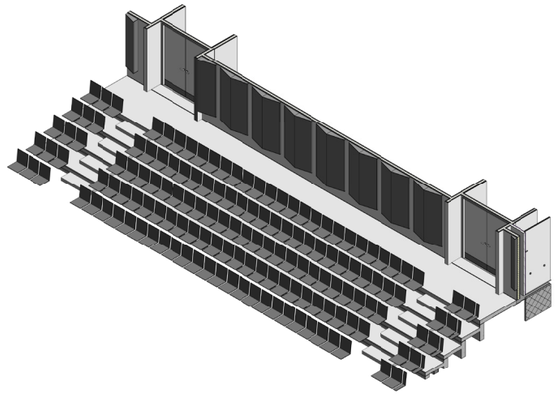
The arena floor wheelchair platforms are designed to be a modular system to allow different configurations dependant on the event and the configuration of the lower tier. There are two configurations of the arena floor platform.

When the modular system is integrated at the front of the lower tier retractable system it provides positions for 12 wheelchairs and their companions that is approximately 18 meters long. The second configuration is for the spectator standing mode and is positioned to the north of the arena floor with access from ramps to the rear. This platform is 45 meters long and provides positions for 34 wheelchairs and their companions.

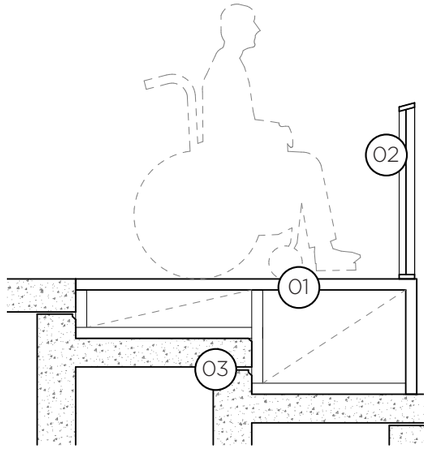
Both demountable systems are formed in aluminium to aid the process of removal and installation. The design of the platforms will allow the easy removal and installation of metalwork barriers.

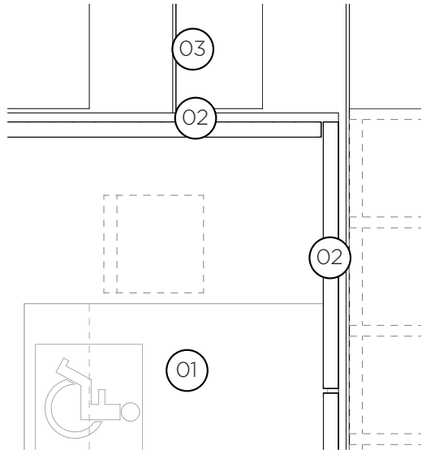


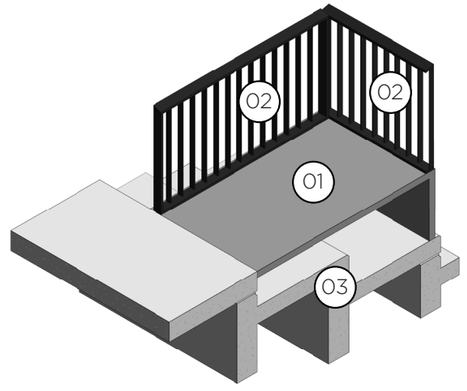
Rear of Lower Tier with Wheelchair platform



Rear of Lower Tier without Wheelchair platform







01 AM-321 (Demountable Aluminium Wheelchair Platform)

02 BAL-122 (Demountable mild steel barrier with h= 800, RAL-9005)

03 Fixed Precast Tier

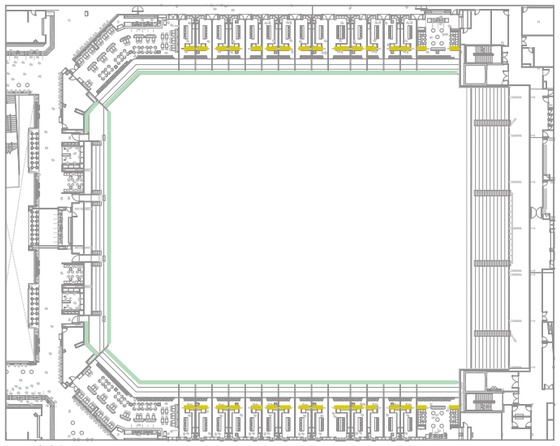
1.3.17 Hall Finishes

Careful thought was taken when integrating the acoustic treatments into the bowl in order to align with the holistic approach to the Hall design. This overall intent involved creating a minimal and dark environment in order to draw full attention to the stage and exaggerate the lively ways in which the bowl and performance areas are inhabited.

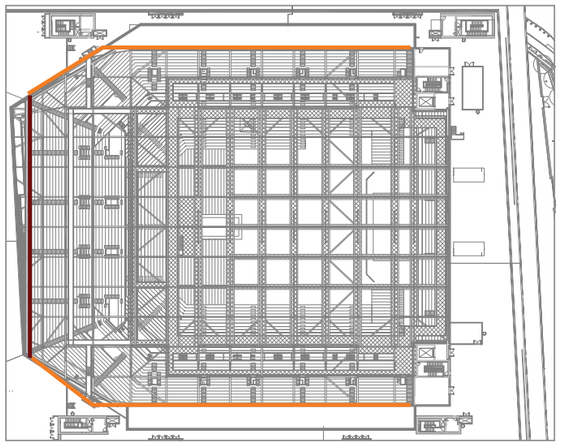
A collaborative process between ourselves and Vanguardia has created a resolution that offers optimal acoustic conditions for the bowl whilst aligning to the overall building design. Some areas introduce a panelling system that responds to the structural grid and reflects the approach taken on the facade.

A further choice made in streamlining the wall conditions here involved the consistent use of the acoustic wall treatment 'Troldtekt.' A cement-bonded wood wool panel provides a sustainable and strong material with unique sound absorbing properties, available in a range of profiles.

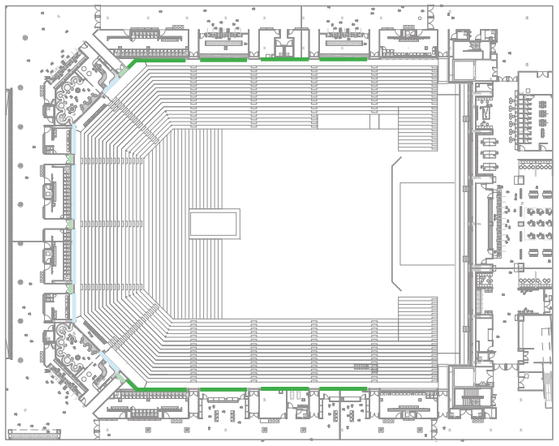
The varied treatments for each level are designed specifically for the acoustic treatment required in those locations and have been arranged into a series of 'types.'



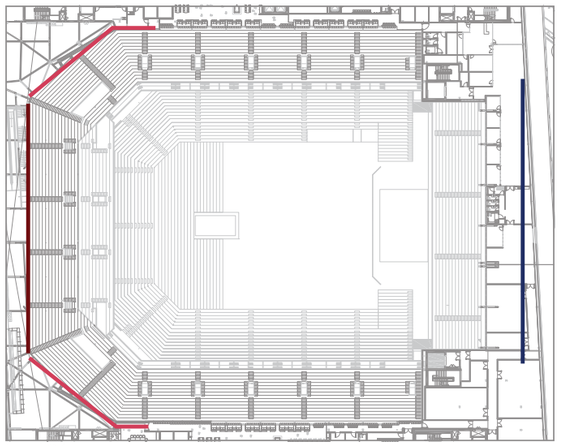
Level 02



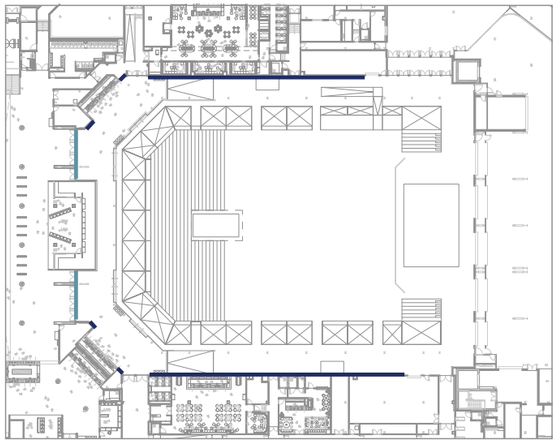
Level 05



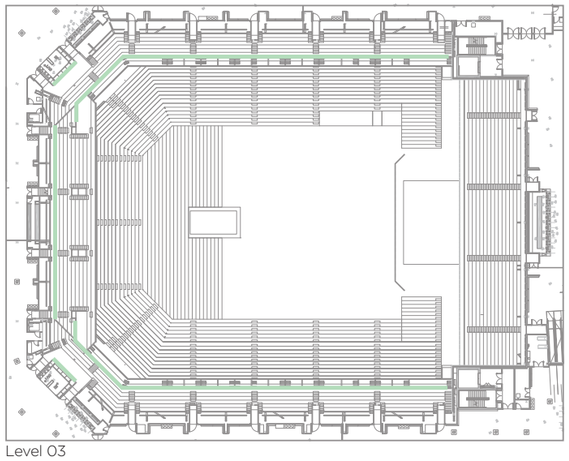
Level 01



Level 04



Ground Floor



Level 03

DRS-901 (Troldtekt flush flat profile)

LIN-911 (Troldtekt Plus panel flat profile)

LIN-912 (Troldtekt angled panel flat profile)

LIN-913 (Troldtekt concertina panel flat profile)

LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)

LIN-915 (Troldtekt Plus flush flat profile)

LIN-916 (Troldtekt faced bass trap)

LIN-917 (Steel resonant panel)

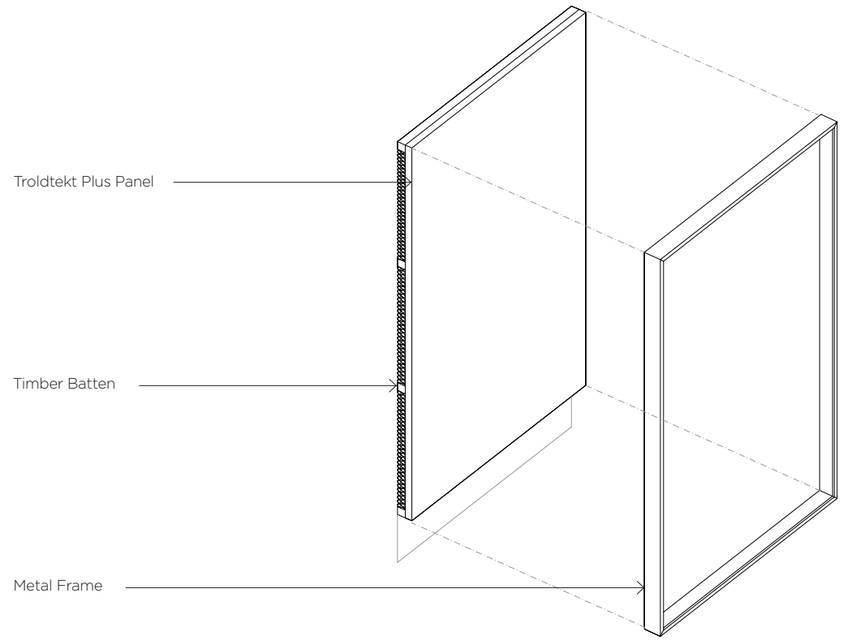
LIN-918 (Black acoustic curtain)

Ground Floor

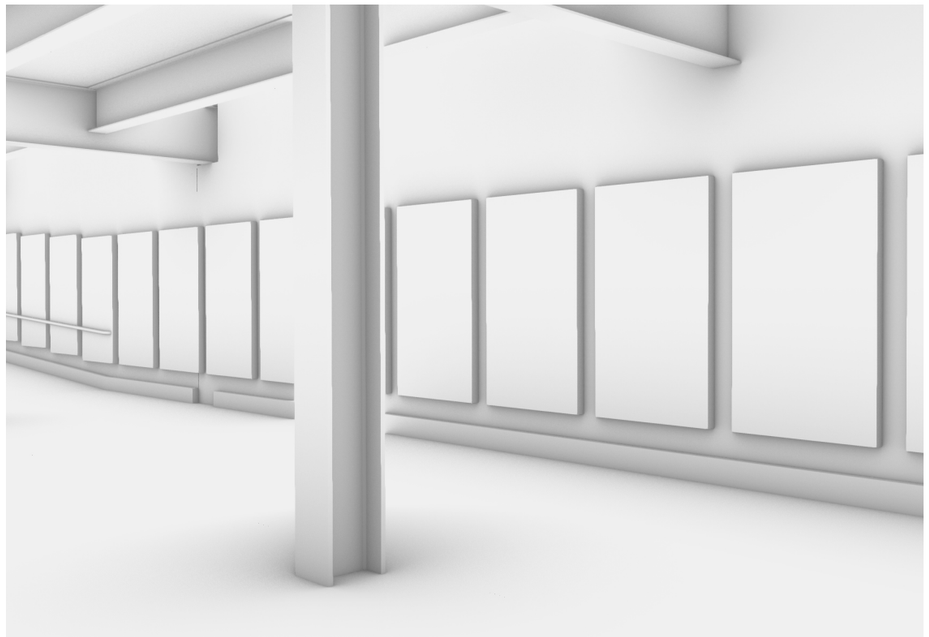
A panel system provides acoustic diffusion and scattering and is used at the ground floor to reduce the reflection and reverberation of the sound from this wall. The panel set-out reduces the material usage therefore reducing the cost. The panel set-out is based upon the structural grid in order to align to the other elements of the architecture and offer a consistent pattern for other areas.

These will be pre-fabricated and later mounted to the wall with all relevant acoustic material within the build up of the panel. Each panel contains a flat profile Troldtekt Plus panel, consisting of a 35mm Troldtekt panel and 40mm of mineral fibre, wrapped in a metal frame.

The same panel type can also be found on the east wall that passes through Level 03 and Level 04.



- DRS-901 (Troldtekt flush flat profile)
- LIN-911 (Troldtekt Plus panel flat profile)
- LIN-912 (Troldtekt angled panel flat profile)
- LIN-913 (Troldtekt concertina panel flat profile)
- LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)
- LIN-915 (Troldtekt Plus flush flat profile)
- LIN-916 (Troldtekt faced bass trap)
- LIN-917 (Steel resonant panel)
- LIN-918 (Black acoustic curtain)



Flat Profile Wall Panel Visual

Level 01

There is a requirement for more elaborate acoustic treatment across Level 01 which has been streamlined into a similar panel system utlisiing the same Troldtekt material for consistency throughout.

The first of these panel types sits on the west wall, facing the stage, and reduces direct sound reflection using a 4 degree angle to the panel front. The panel consists of a 35mm Troldtekt panel and 95mm of insulating material. This angle and depth of material build up creates a protrusion of 300mm at the base, which is accounted for by 300mm flank walls extending from the vomitories. In order to have sufficient angled coverage these panels are over doubled in width from the other acoustic panels whilst still responding to the same grid.

DRS-901 (Troldtekt flush flat profile)

LIN-911 (Troldtekt Plus panel flat profile)

LIN-912 (Troldtekt angled panel flat profile)

LIN-913 (Troldtekt concertina panel flat profile)

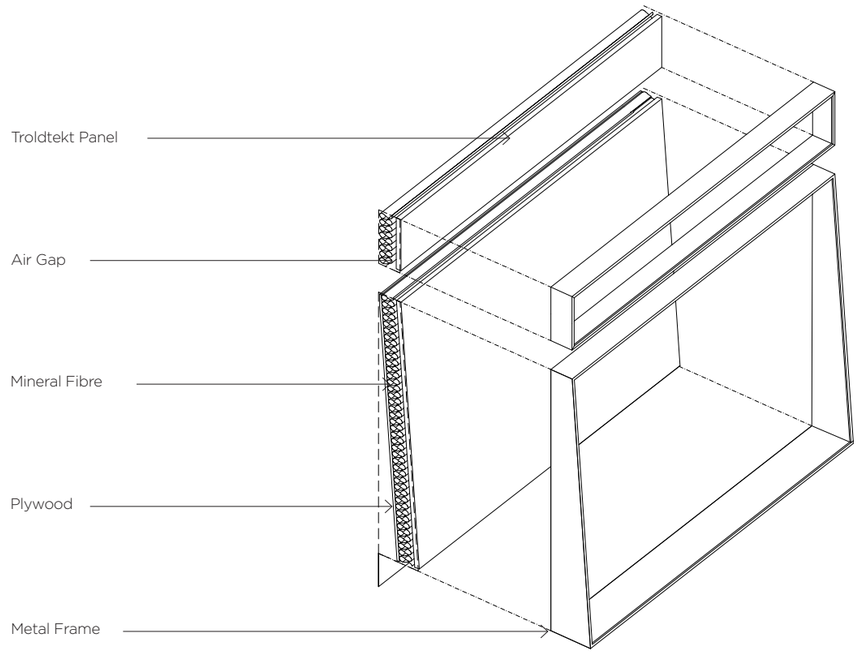
LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)

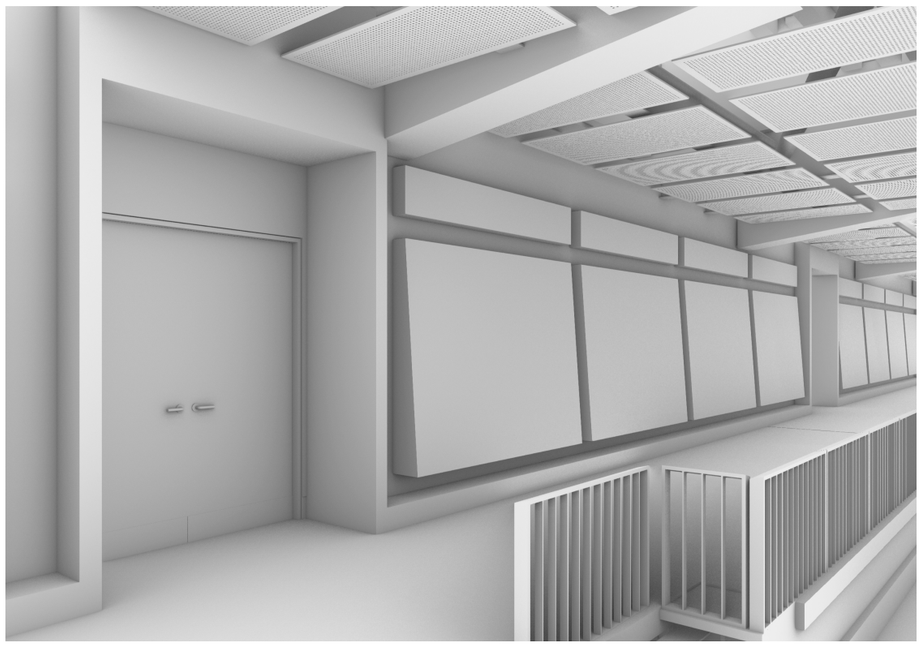
LIN-915 (Troldtekt Plus flush flat profile)

LIN-916 (Troldtekt faced bass trap)

LIN-917 (Steel resonant panel)

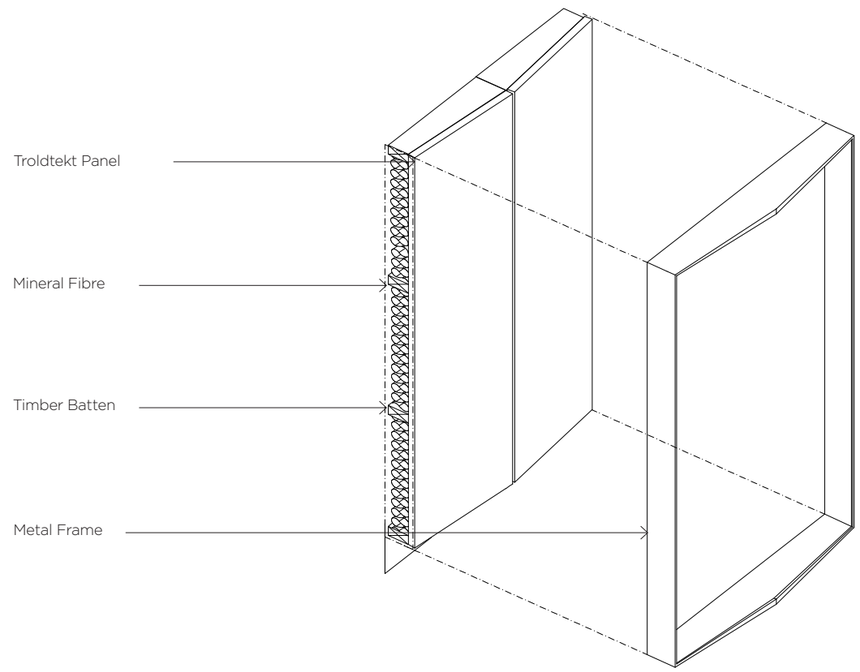
LIN-918 (Black acoustic curtain)





Angled Wall Panel Visual

The next panel creates a concertina effect to the wall condition along the north and south of this level. Containing a 35mm Troldtekt panel backed with 100mm of mineral fibre, these follow the same set-out as the panels on ground floor level below.



DRS-901 (Troldtekt flush flat profile)

LIN-911 (Troldtekt Plus panel flat profile)

LIN-912 (Troldtekt angled panel flat profile)

LIN-913 (Troldtekt concertina panel flat profile)

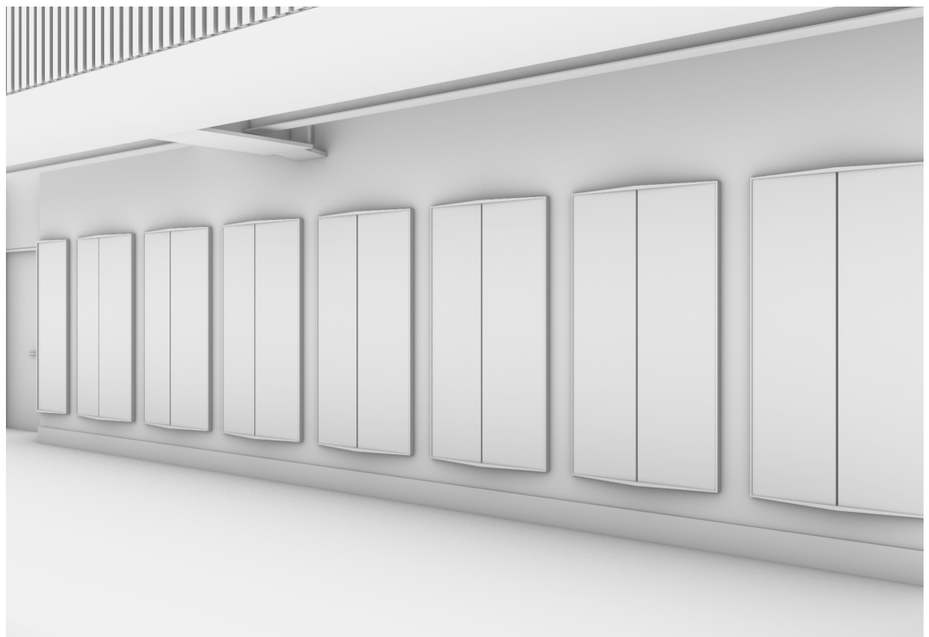
LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)

LIN-915 (Troldtekt Plus flush flat profile)

LIN-916 (Troldtekt faced bass trap)

LIN-917 (Steel resonant panel)

LIN-918 (Black acoustic curtain)



Concertina Wall Panel Visual

Level 02 & 03

Throughout the Hall, certain faces create small areas that require acoustic treatment in order to cover any exposed concrete which could compromise the bowl atmosphere.

These areas include parapet edges spanning the entirety of the tier and walls in the corners of Level 02 and Level 03. The treatment here consists of a flush profile Troldtekt plus panel with a corrugated profile. This corrugation touches upon the other utilitarian materials used within the building and continues the linerality of the panel systems existing on the levels below.

At Level 02, the bowl-facing wall will be dressed in the acoustic curtain that is used to separate the interior from its bowl seating by extending it across. The layering of fabric here achieves the acoustic properties required whilst also giving a sense of tasteful exclusivity without boasting to ticket holders below.

DRS-901 (Troldtekt flush flat profile)

LIN-911 (Troldtekt Plus panel flat profile)

LIN-912 (Troldtekt angled panel flat profile)

LIN-913 (Troldtekt concertina panel flat profile)

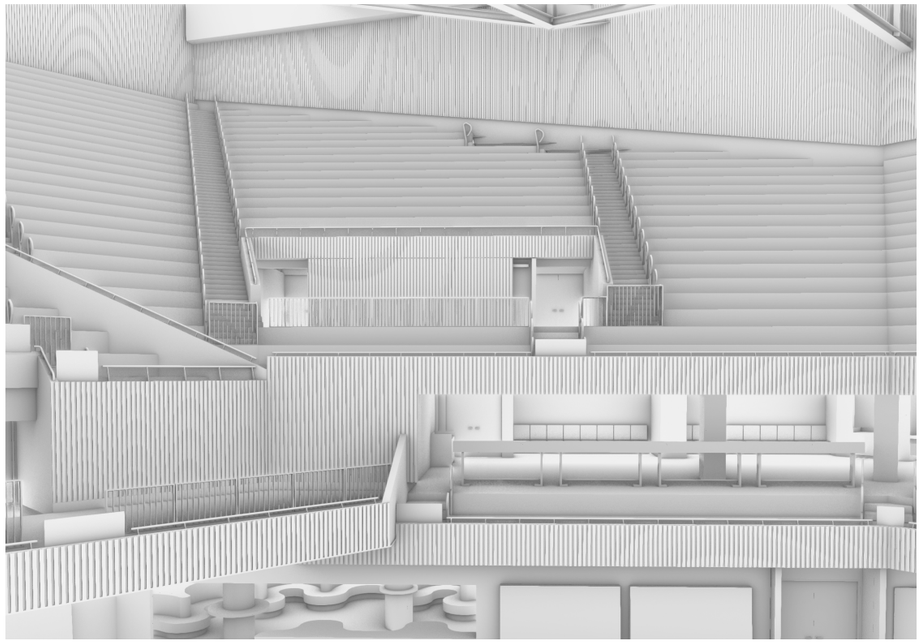
LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)

LIN-915 (Troldtekt Plus flush flat profile)

LIN-916 (Troldtekt faced bass trap)

LIN-917 (Steel resonant panel)

LIN-918 (Black acoustic curtain)



Parapet Edges and Wall Condition Visual

Level 04 & 05

A small area of wall on L04 lines the back of the upper tier with a corrugated Troldtekt profile and tapers up into the west wall condition.

A bass trap is required on the west wall opposite the stage, spanning Level 04 and Level 05. This has been clad with a 25mm corrugated profile Troldtekt panel in order to continue the materiality from lower levels. Behind this sits 600mm of mineral fibre which is designed to damp low frequency sound energy.

Lining the north and south of Level 05 is a steel resonant panel, the only acoustic finish in the bowl to not be clad Troldtekt. This thin steel plate encompasses a 270mm cavity and 100mm mineral fibre that absorbs low frequency and sits with the roof truss.

DRS-901 (Troldtekt flush flat profile)

LIN-911 (Troldtekt Plus panel flat profile)

LIN-912 (Troldtekt angled panel flat profile)

LIN-913 (Troldtekt concertina panel flat profile)

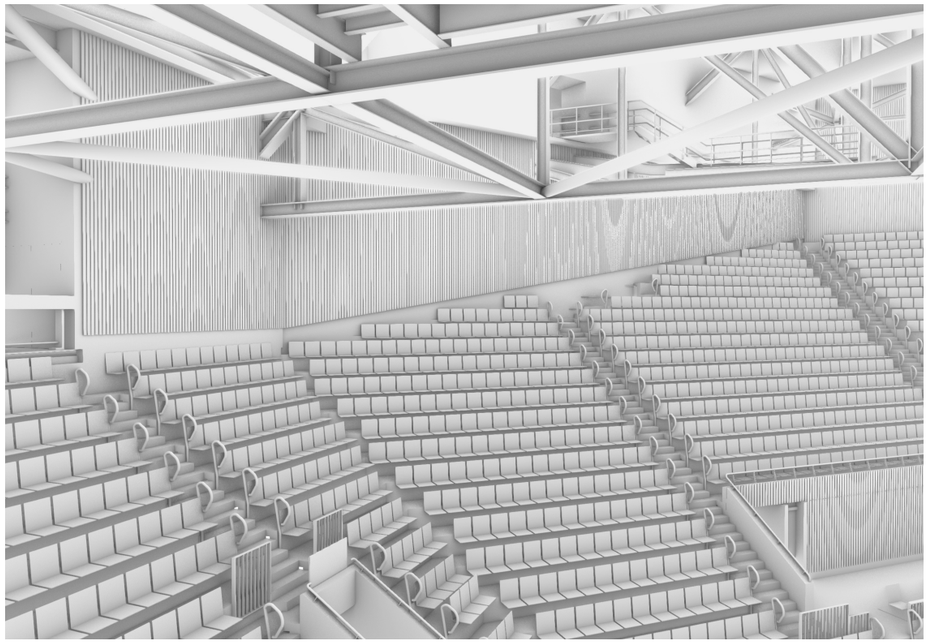
LIN-914+DRS-905 (Troldtekt Plus flush corrugated profile)

LIN-915 (Troldtekt Plus flush flat profile)

LIN-916 (Troldtekt faced bass trap)

LIN-917 (Steel resonant panel)

LIN-918 (Black acoustic curtain)



Back Wall Conditions Visual


BAR
BAR
DECK
BASE
THE FLOOR
THE CHEMICAL BROTHERS

USER GROUP ONE

1.4.1 USER GROUP 01 - THE FANS 74

1.4.2 USER GROUP 01 OVERVIEW 75

1.4.3 BASE ATRIUM ££££ 76

1.4.19 LEVEL 01 DECK ££££ 92

1.4.33 LEVEL 03 LOFT ££££ 106

1.4.45 MERCHANDISE DESIGN ££££ 118

1.4

1.4.1 User Group 01 - The Fans

Concept / Approach

The conceptual approach for the interior spaces within the venue all consist of three key components: authenticity; atmosphere; and intimacy.

The three levels of entertainment for *The Fans* express an honest and industrial look: exposing the structure and using everyday utilitarian materials found in the urban environment such as OSB, concrete and corrugated metal. This creates a contemporary and urban environment which provides a backdrop for the key features such as bars and markets which, in contrast, have a more refined palette.

On the ground floor, Base Atrium is seen as the heart of the building, a key space which allows for interaction across three levels creating an unparalleled atmosphere. The adjacent food court represents the heart of Manchester.

The first floor Deck has views down into the atrium on the west side, with food and beverage units animating the north and south spaces. On the south, the Canalside creates a key destination with the potential to open the facade, creating a link to the canal and public realm for non-event day activities.

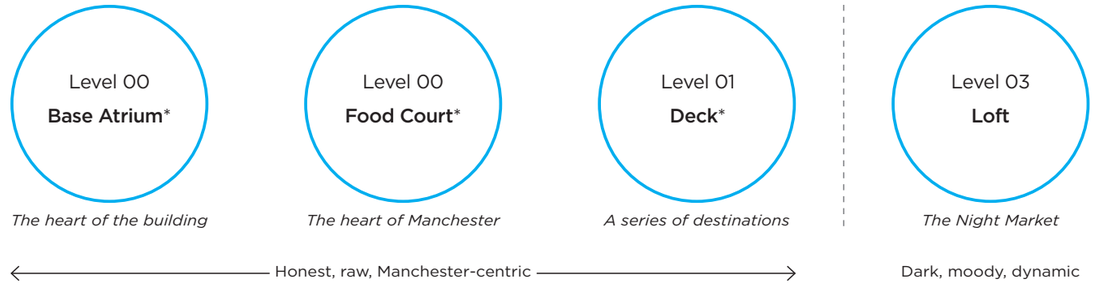
The third floor Loft is a unique destination, perceived conceptually as a departure from the ground floor and level 01 aesthetic, taking the fans into an edgy and dynamic space. We intend to create a unique upper tier experience to create a true destination - The Night Market. The space is very dark with neon lighting and bright colours used at F&B destinations which helps pull the users through the space.

User Group 01: The Fans

Level	Price Tier	Club Name	Vibe/Tone	Offer Type	Area	Capacity
Ground Floor	£	Base Atrium	Authentic & Raw	Cash Bar & Food	1735 sqm	3640
Level 01	£	The Deck	Authentic & Raw	Cash Bar & Food	3672 sqm	4740
Level 03	£	The Loft	The Night Market	Cash Bar & Food	4330 sqm	7415

**capacity mode dependant on mode, above based upon End Stage Seated Mode with 50% wheelchair positions L01*

User Group 01: Creating Identity



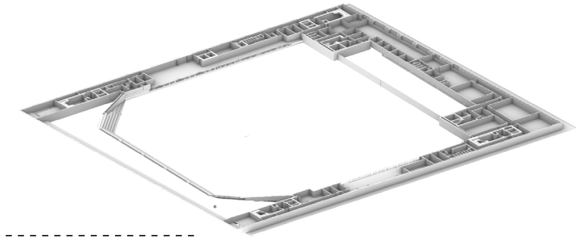
**visual links - one space over two floors*

1.4.2 User Group 01 Overview

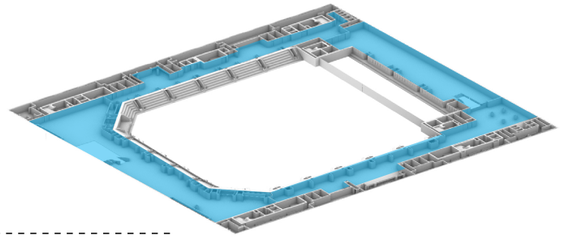
Multi Experience Venue

Within the venue, the Fans have access to multiple different F&B outlets, with a range of feature markets, craft bars, cocktail bars, grab-and-go outlets and theatre cooking.

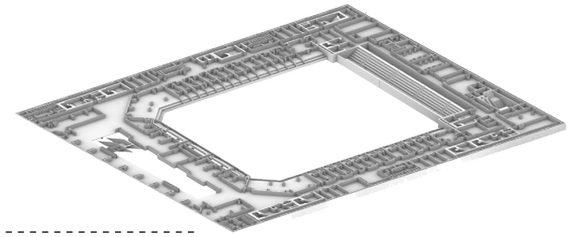
Each of the fan levels are easily accessible from one another via the stairs and escalators, allowing for multiple experiences across each visit.



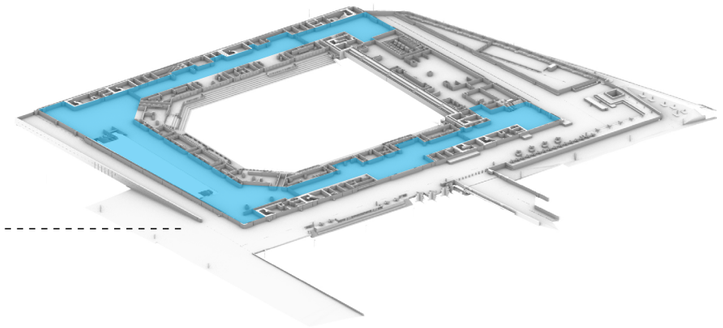
L04
Hangout



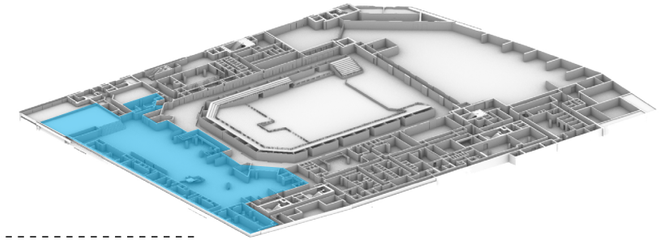
L03
Loft



L02
Club



L01
Deck



GF
Base Atrium

1.4.3 Base Atrium ££££

The Heart of the Building

The Base Atrium is perceived as the heart of the building, it has visual interaction with levels one and two, and is a key driver in breaking down the barriers of what is traditionally viewed as isolated general admission and premium experiences.

Upon arrival, the fans will walk through the foyer which is a darkened threshold space. As the fans descend onto the base atrium floor, the double height space will reveal itself.

Often, large open spaces can feel flat so we have purposely added the corrugated metal to not only unify the space(s) but to create some texture and depth. The materials used are honest and robust, exploring everyday utilitarian finishes such as concrete, OSB, metals, metal meshes – all to create a space that feels urban and unexpected.

Adjacent to the arrival point is a merchandise area. The units have been designed on castors so that the operators can be flexible in the layout depending on the time of a show or even remove when not required.

The space offers the fans a wide range of amenities ranging from the central feature bar, through to the markets and volume bars. The space also offers not only a range in food and beverage, but service style. The markets have been created to all be self-checkout, reducing queue times.

The food court area to the south links visually to the base atrium. We continued the corrugated metal at high level and accented this with an OSB bulkhead. Changes in the style of lighting and the introduction of more drink shelves should give the space a more relaxed vibe, encouraging longer dwell.

Our intention for the belly up units found throughout was to move away from the traditional concept of the ‘hole in a wall’ and develop a language that feels more current, linking to the industrial urban aesthetic of the Base Atrium and creating a more rustic ‘craft bar’ look and feel. The smaller markets accent this approach well, having a cleaner and streamlined finish using simple and robust materials such as satin brushed stainless steel and tile which is punctuated with coloured grouts.

The space holistically can operate differently depending on the event, from pre-and post-show through to non-event day opportunities.

1.4.4 Base Atrium - Overview

SPACE CAPACITY

Area: 1735 sqm
Up to 4,000 fans at 0.43 sqm / Person

LOCATION

Ground Floor South West

VIP PARKING

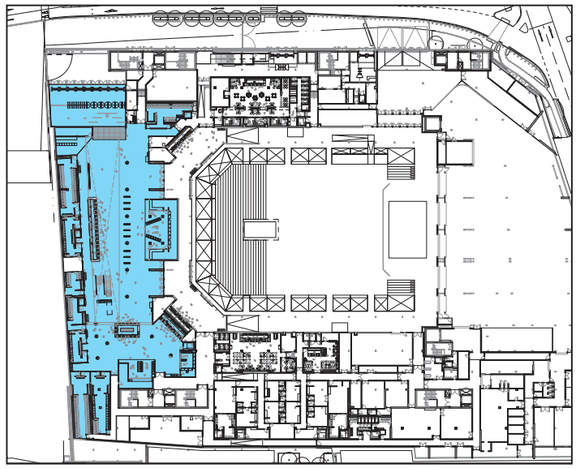
N/A

ACCESS

Door C - L00 North Entrance

FAN JOURNEY

Arrival: GF North Entrance adjacent to Sports City Way
Experience: pre-show with food and drink
Post-show: entertainment and party space



CATERING

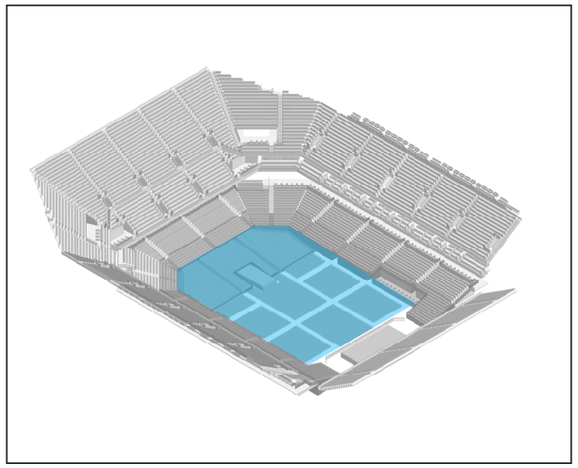
Concept: Market Hall





BOWL SEATING

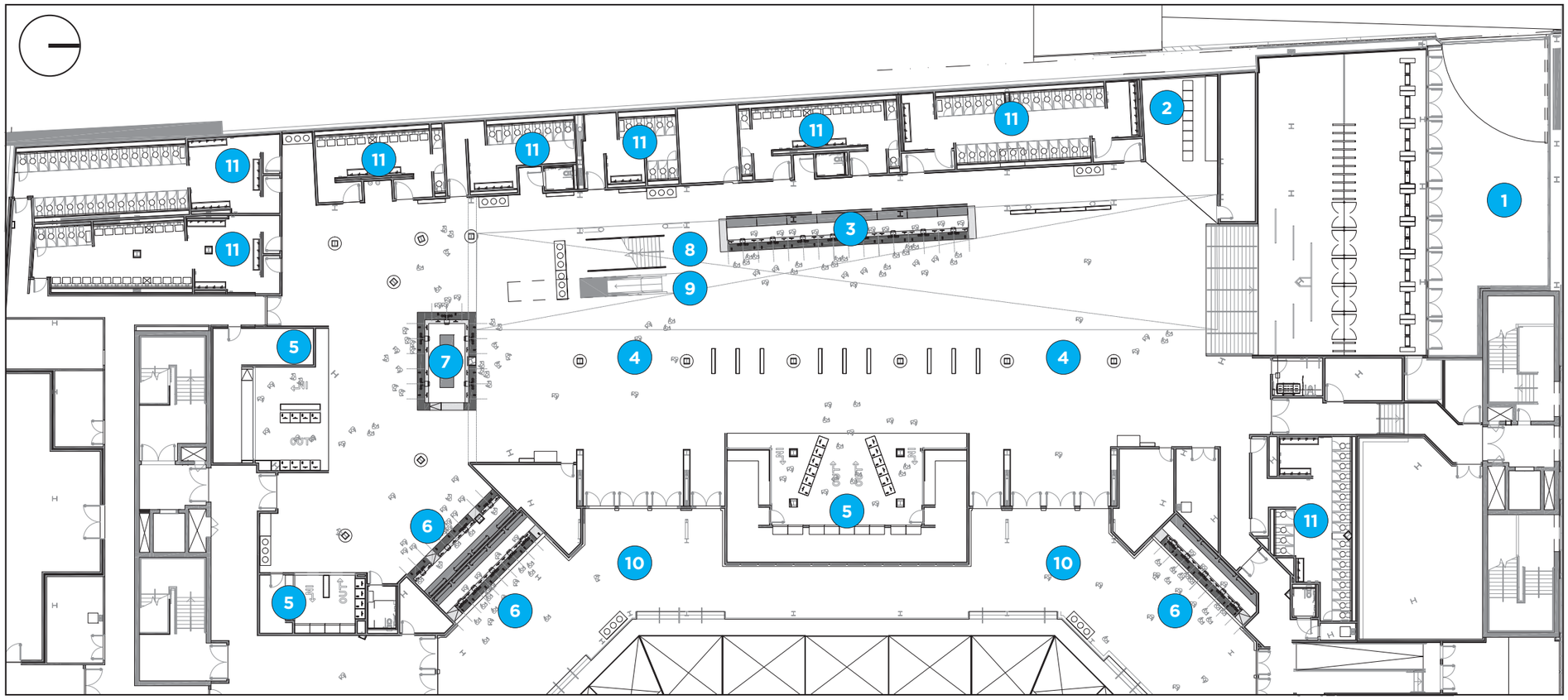
Floor (Seated / Standing)



COMMERCIAL OPPORTUNITY



1.4.5 Base Atrium - Event Day Plan



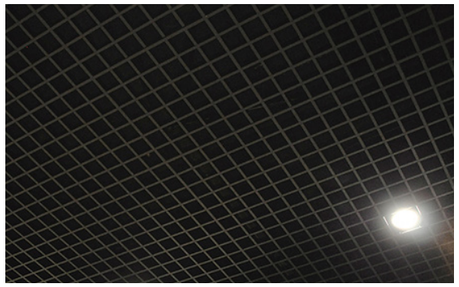
KEY:

1. Entrance
2. Merch.
3. Main Bar
4. Dwell
5. Market
6. Bar
7. Bar & Food
8. Stairs
9. Escalator
10. The Hall
11. WCs

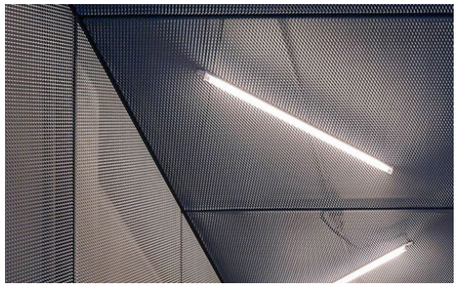
1.4.6 Base Atrium - Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



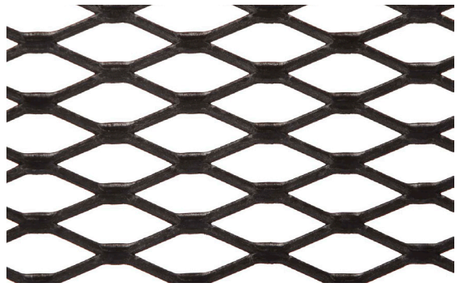
ENTRANCE SOFFIT - CLG-521



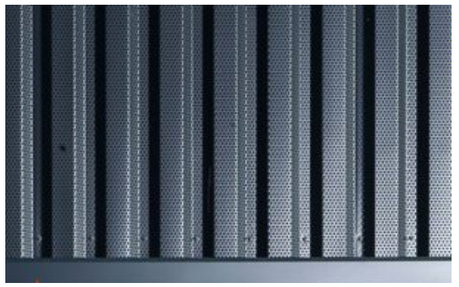
FEATURE SOFFIT - CLG-545



FEATURE BULKHEAD - LIN-501



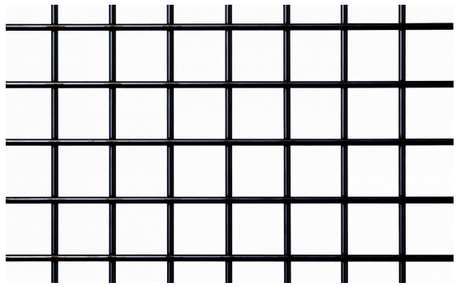
EXPANDED METAL - AM-209



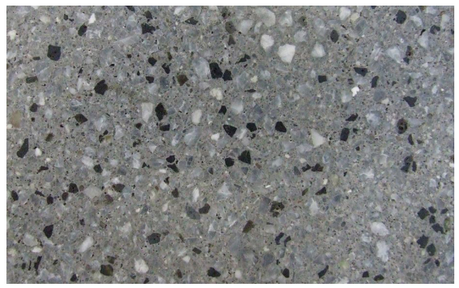
CORRUGATED METAL - LIN-303



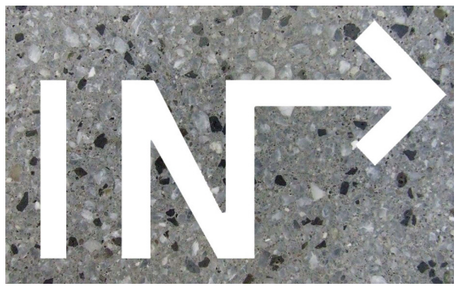
CORRUGATED METAL - LIN-301



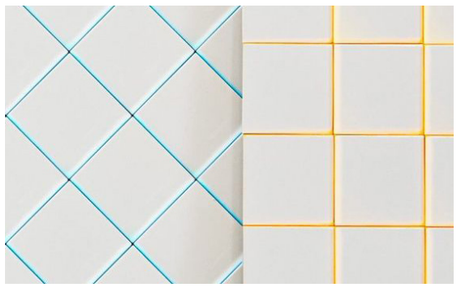
SQUARE WIRE WELDED MESH - LIN-331



CONCRETE FLOOR - CON-201



APPLIED VINYL FLOOR GRAPHICS - SGN-501



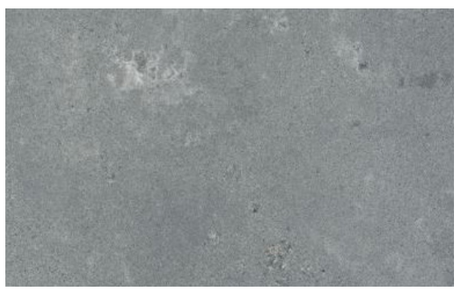
TILE - LIN-603



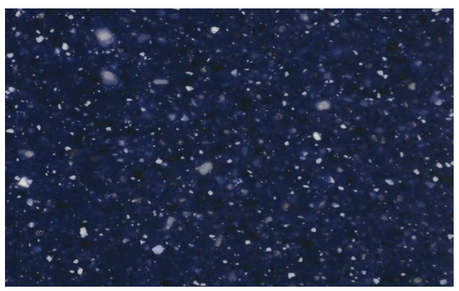
BRUSHED STAINLESS STEEL - VARIOUS CODES



STONE COUNTER TOPS - VARIOUS CODES



STONE COUNTER TOPS - VARIOUS CODES



DRINK SHELVES - VARIOUS CODES



APPLIED VINYL ARTWORK - SGN-511

1.4.7 Base Atrium - Entrance View



1.4.8 Base Atrium - Pre-Show



1.4.9 Base Atrium - Post-Show



1.4.10 Base Atrium - Post-Show Overlay



1.4.11 Base Atrium - Market

1.4.12 Base Atrium - Market



1.4.13 Base Atrium - Food Court

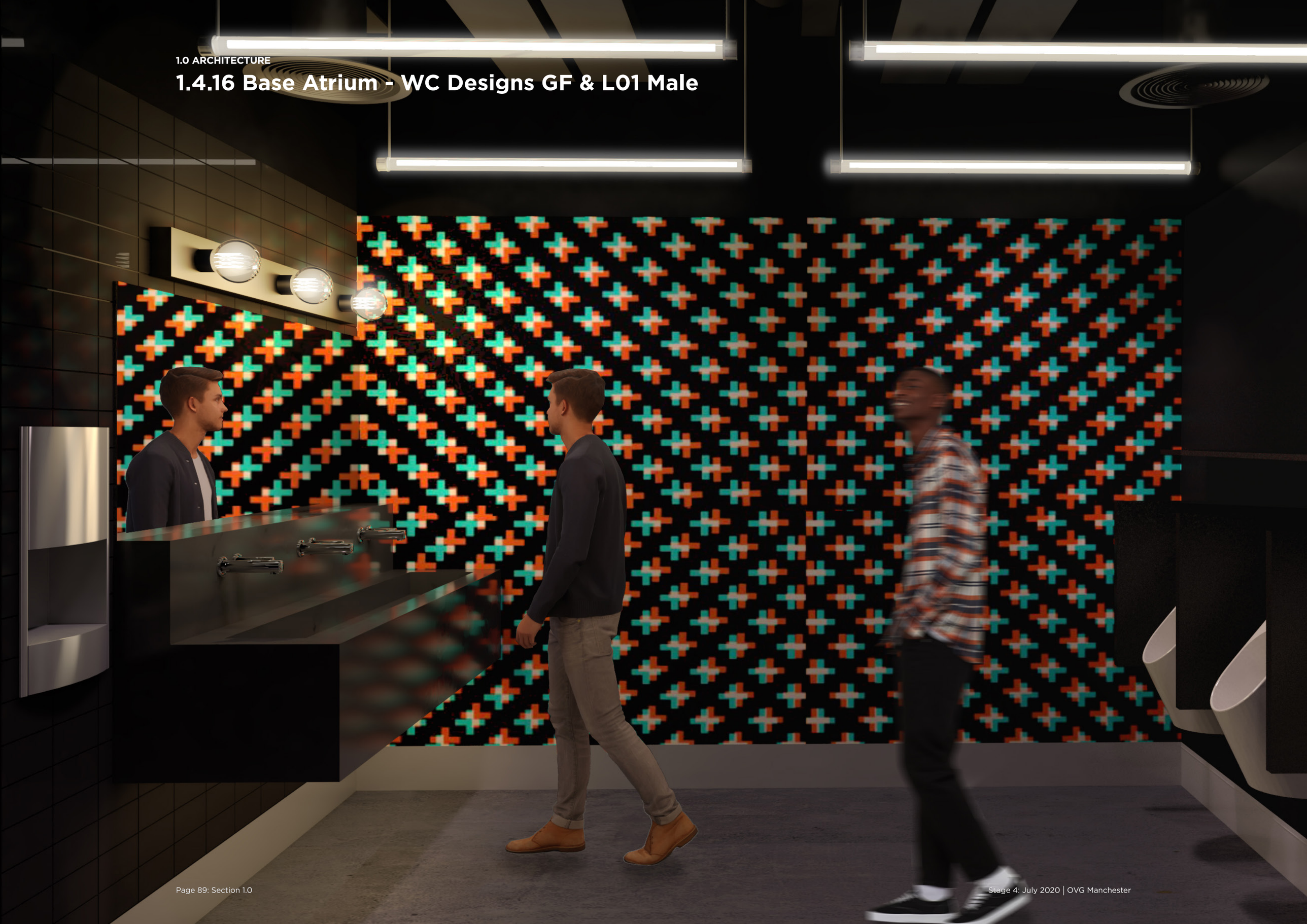


1.4.14 Base Atrium - Food Court Market



1.4.15 Base Atrium - WC Designs GF & L01 Female

1.4.16 Base Atrium - WC Designs GF & L01 Male



1.4.17 Base Atrium - Non Event Day

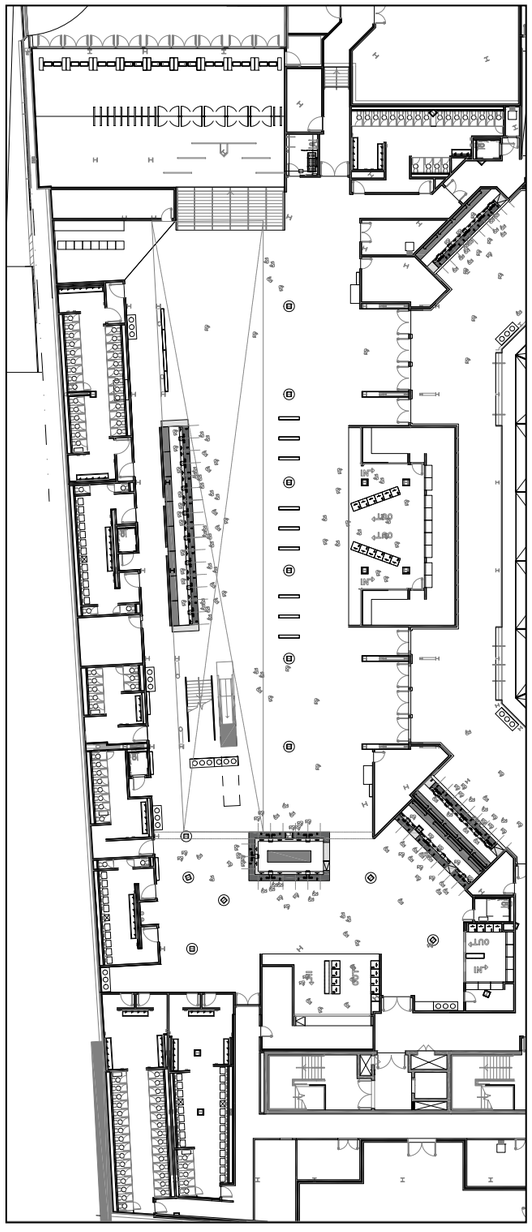
Non-Event Day Brief: 365-day venue

The new Venue has been perceived as a 365-day facility which creates opportunity for multiple revenue streams.

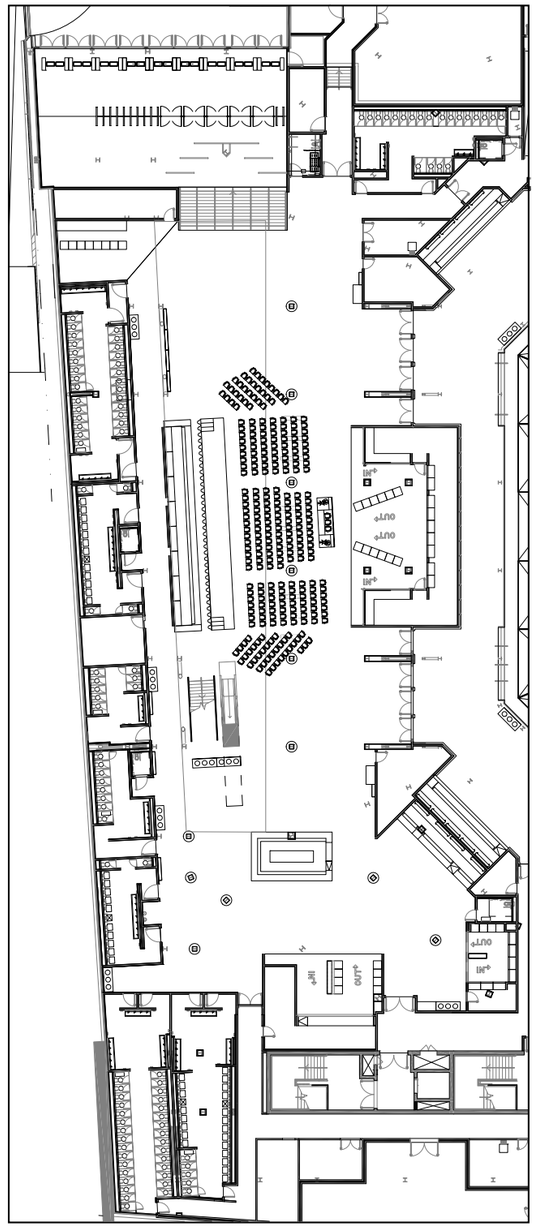
The venue-in-a-venue concept has been applied to several key spaces, one being the ground floor atrium.

The Base Atrium is a truly impressive space. We have looked at various opportunities for activating it on non-event day. The adjacent drawings illustrate the initial studies of layout and capacity, ranging from a post-show/private party, conference space, exhibition hall and banquet style dining.

These layouts can be accommodated, subject to developed design to assess the value of incorporating addtional elements such as plug-in PA and AV infrastructure and acoustic dampening for keynote speakers for conferencing, floor box or column mounted power and data (or even wet services) for exhibition stands; flexible lighting for mood changes between event, party, exhibition and banquet modes.

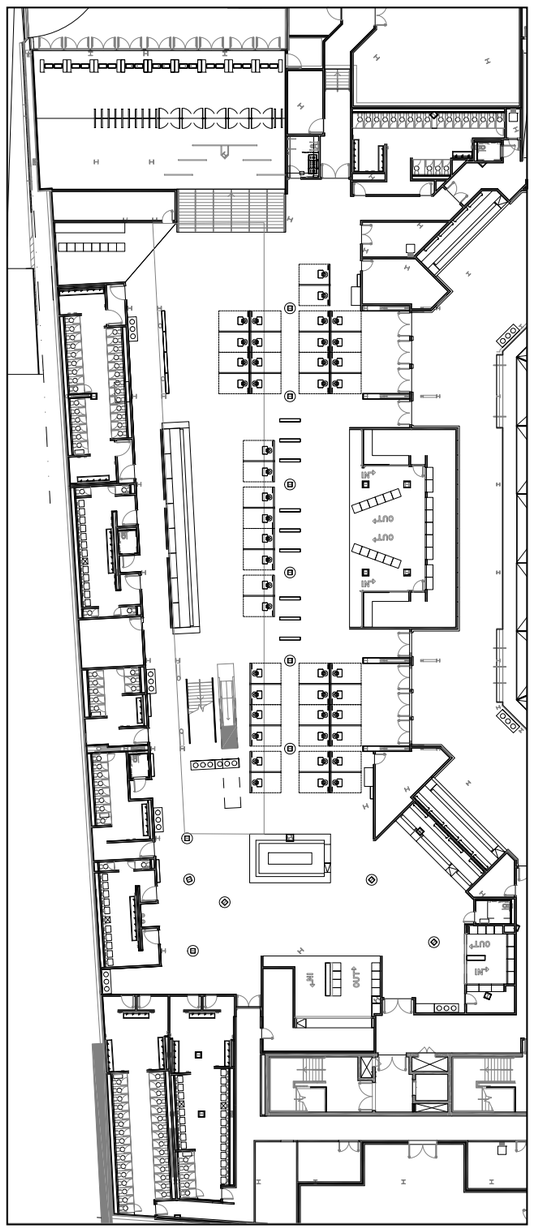


POST SHOW / PRIVATE PARTY

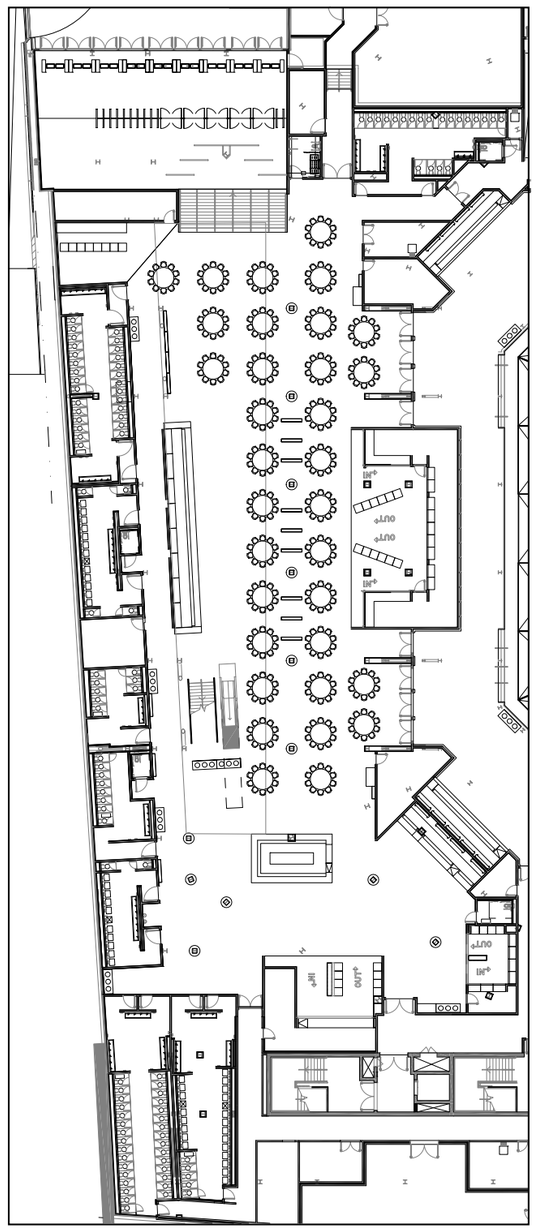


AGM/CONFERENCE: 270 GUESTS

1.4.18 Base Atrium - Non Event Day



EXHIBITION: 44 STANDS



DINING: 330 GUESTS

1.4.19 Level 01 Deck ££££

A Series of Destinations

Upon initial design studies for level 01, we intended to create a series of destinations dispersed throughout the North Deck and the South Deck to encourage fans to interact with the other spaces rather than limiting their experience to only their ‘assigned concourse’. Both North and South Deck lead towards the West Deck which has visual connectivity to both the Base Atrium and the level 02 Club.

Collectively, the spaces host an assortment of food and beverage facilities ranging between self-service markets, destination bars, belly-up food units and volume bars. Much of the design statements from the Base Atrium are continued on the Deck level to create a cohesive series of spaces.

The North Deck has two feature belly-up food concessions. We have purposely set the counters back from the main wall line to create a more defined portal. The material palette is warmer toned compared with the bar areas to create contrast.

Within the South Deck, the Canlaside offers a large feature bar and areas for fans to dwell in. Brighter colours and soffit zones lift the overall appearance of the space.

On non-event day the intention is to activate this bar and serve out into the public realm using the bi-fold doors and sliding windows within the façade.

1.4.20 Level 01 Deck - Overview

SPACE CAPACITY

Area: 3672 sqm
Capacity: 4,740 fans at 0.77 sqm / Person
(based upon End Stage Seated Mode)

LOCATION

Level 01 North, South & West

VIP PARKING

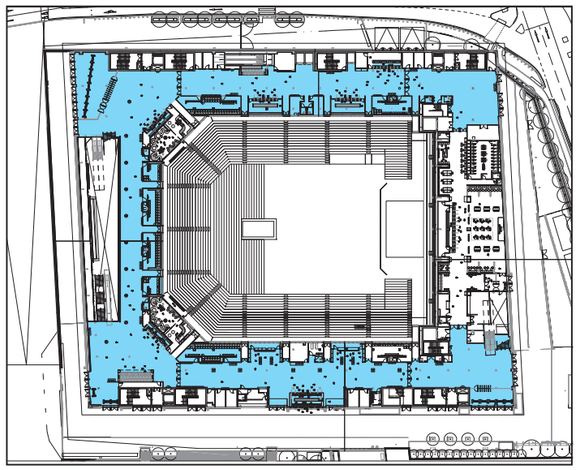
N/A

ACCESS

Doors D, E & F - Level 01 Entrances

FAN JOURNEY

Arrival: L01 entrance, canal adjacent
Experience: pre-show with food and drink
Post-show: entertainment and party space



CATERING

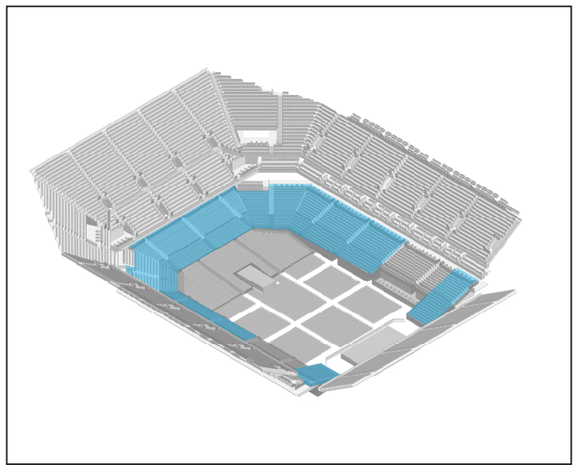
Concept: Feature Market and Destination Bar





BOWL SEATING

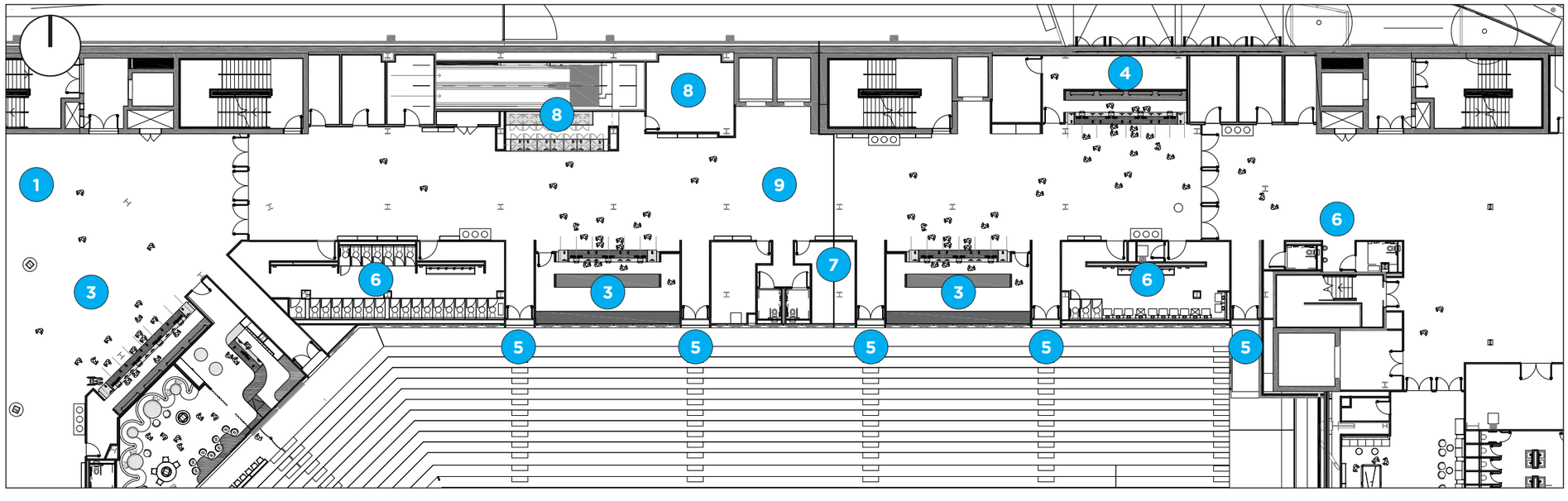
Lower Tier



COMMERCIAL OPPORTUNITY



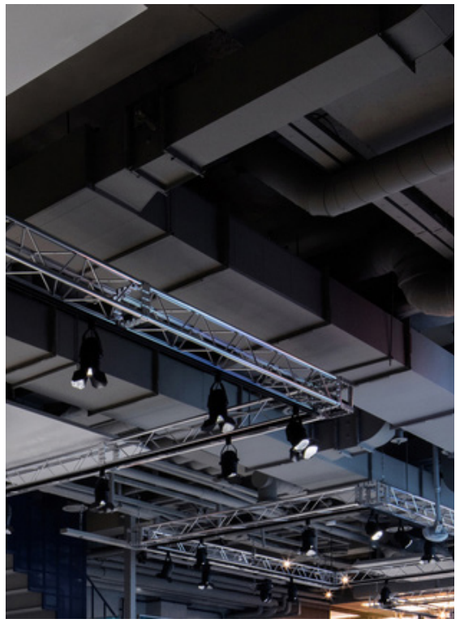
1.4.21 Level 01 Deck - North Deck Plan



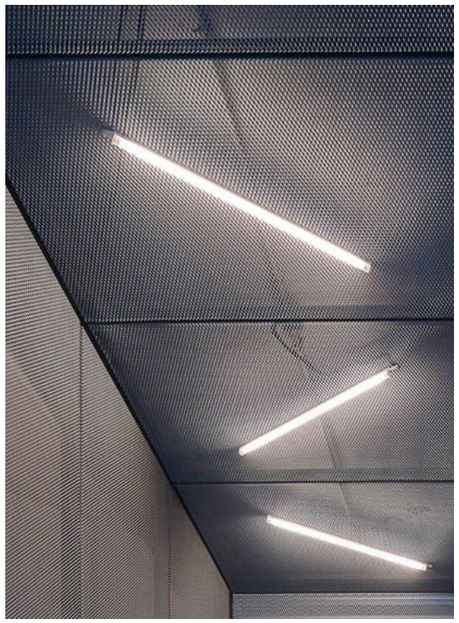
KEY:

1 Entrance - Event Day
2 Destination Bar
3 West Deck
4 Volume Bar
5 Vomitory
6 WC
7 Quiet Room
8 Merchandise & Store
9 North Deck

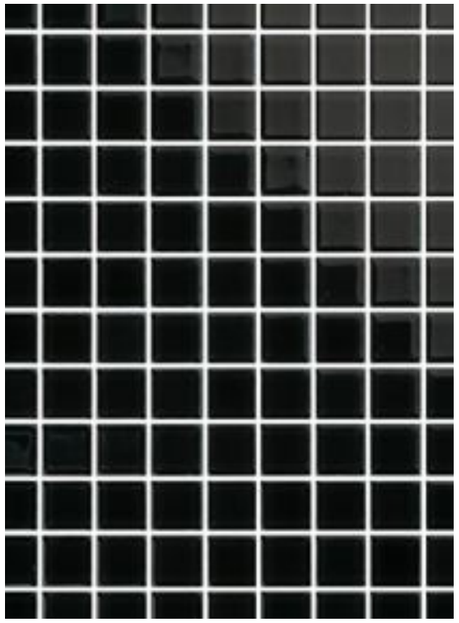
1.4.22 Level 01 Deck - North Deck Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



FEATURE SOFFIT - CLG-545



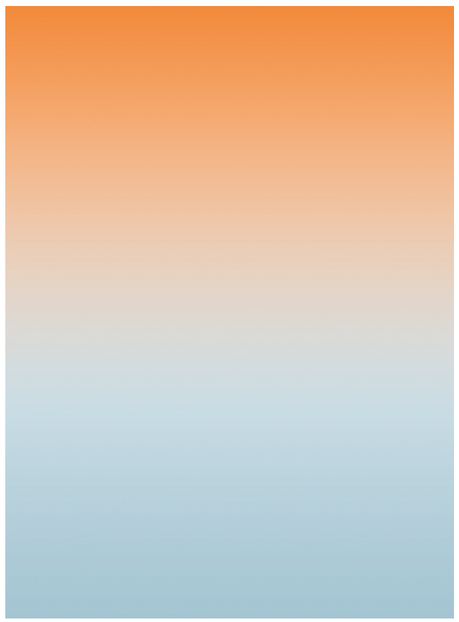
TILE - LIN-615



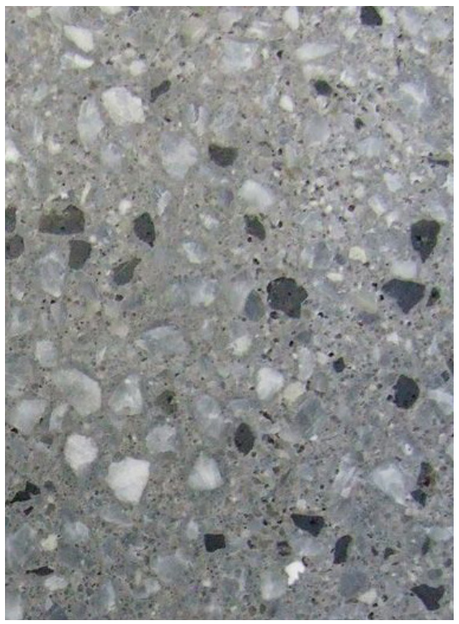
TILE - LIN-603



OSB BOARD - LIN-501



APPLIED VINYL GRAPHICS - SGN-511



CONCRETE FLOOR - CON-201



BRUSHED STAINLESS STEEL - VARIOUS CODES

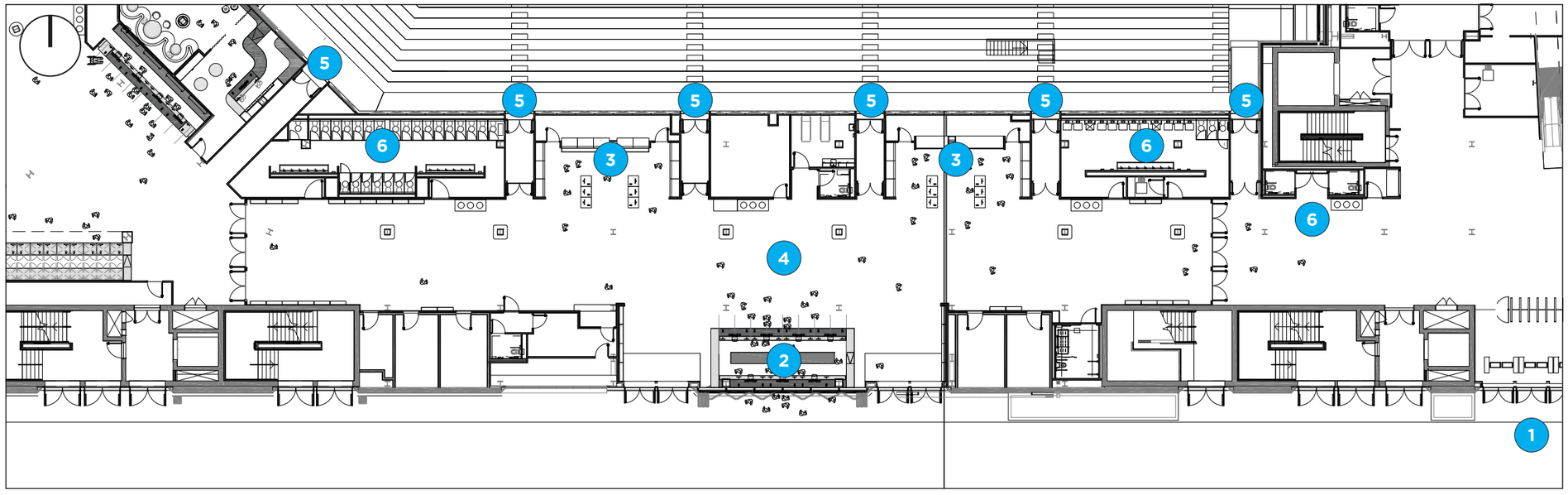
1.4.23 Level 01 Deck - North Deck Belly Up Design



1.4.24 Level 01 Deck - North Deck Bar Design



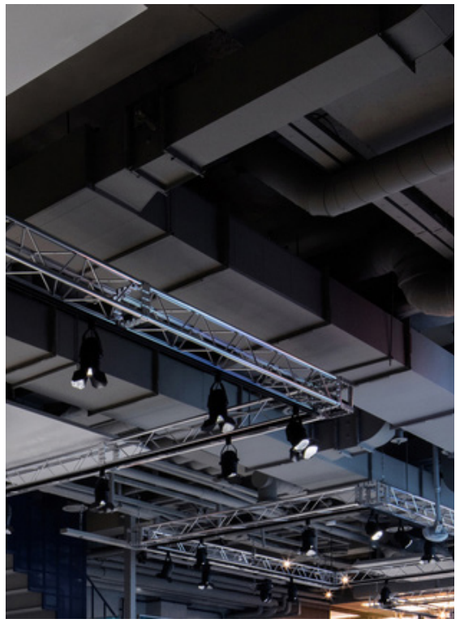
1.4.25 Level 01 Deck - Canalside Plan



KEY:

1. Entrance - Event Day
2. Destination Bar
3. Feature Market
4. South Deck
5. Vomitory
6. WC

1.4.26 Level 01 Deck - Canalside Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



CORRUGATED METAL - LIN-301



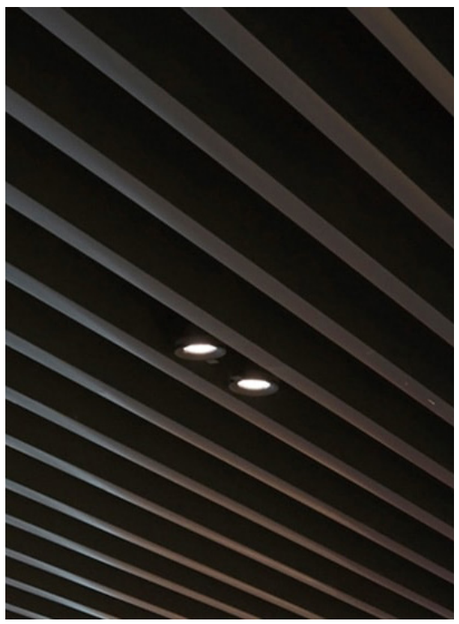
CORRUGATED METAL - LIN-305



SLATTED TIMBER - LIN-121



FLUTED GLASS - AM-211



SLATTED SOFFIT - CLG-603



GREEN TERRAZZO - FX-431



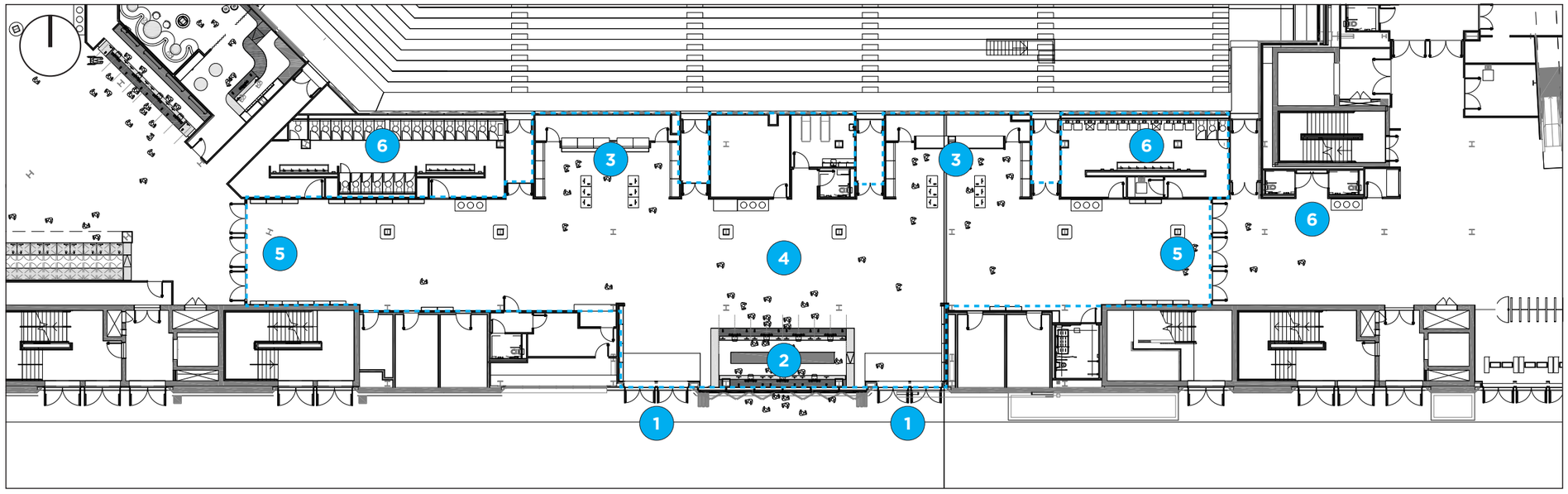
TILE - FX-431

1.4.27 Level 01 Deck - Canalside Event Day

1.4.28 Level 01 Deck - Canalside Event Day



1.4.29 Level 01 Deck - Canalside Non Event Day Plan



KEY:

1. Entrance Non-Event Day
2. Destination Bar
3. Feature Market
4. South Deck
5. Secure Line
6. WC

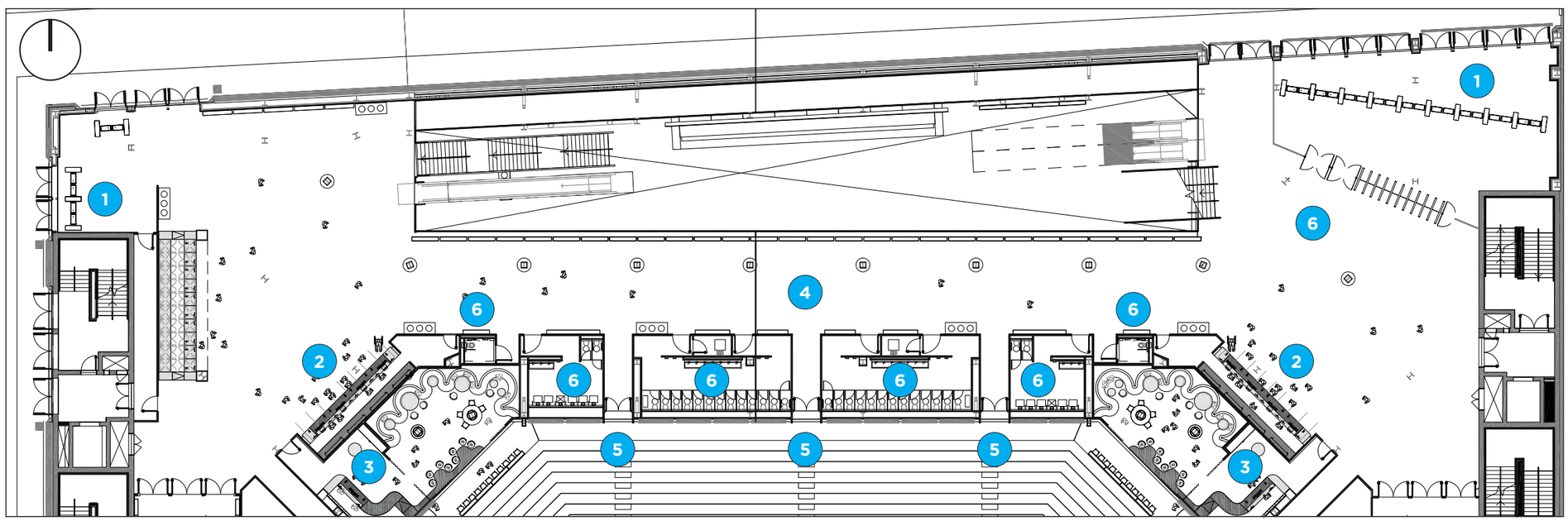
The Canalside has been designed to operate independently on non-event day. The facade line at the feature bar has been designed to include bi-fold doors to open up the bar to the public realm. Once the doors are pushed back, we have sliding glass screens which are to be opened to serve directly out to guests.

The plan diagram above illustrates the secure line (blue dashed line) which shows that the south can be locked off from the remainder of the building.

1.4.30 Level 01 Deck - Canalside Non-Event Day



1.4.31 Level 01 Deck - West Deck Plan



KEY:

1 Entrance - Event Day
2 Volume Bar
3 Deck Suites
4 West Deck
5 Vomitory
6 WC

1.4.32 Level 01 Deck - West Deck



1.4.33 Level 03 Loft ££££

The Night Market

Conceptually we wanted to create a unique upper tier experience, defining a real destination which is a visual departure from what is happening at the ground floor and level 01. Level 03 is unique in that the fans can walk all the way around it. This journey became important to our concept, creating destinations along the way. We have proposed the 'Night Market' – a darker toned space which utilises lighting and brighter colours at the food, beverage and activation touchpoints to draw the fans to them.

Again, we have utilised utilitarian materials and brighter colours to create the look and feel - simple materials, maximum impact.

The fans have access to a multitude of destination bars, volume bars, markets, full cook markets and the island bar on the south-east corner.

We have created allowances for two pop-up activation areas which can be used for DJ's, live music etc to enhance the fan experience.

1.4.34 Level 03 Loft - Overview

SPACE CAPACITY

Area: 4330 sqm
Capacity: 7,415 fans at 0.58 sqm / Person
(based upon End Stage Seated Mode)

LOCATION

Level 03 North, East, South & West

VIP PARKING

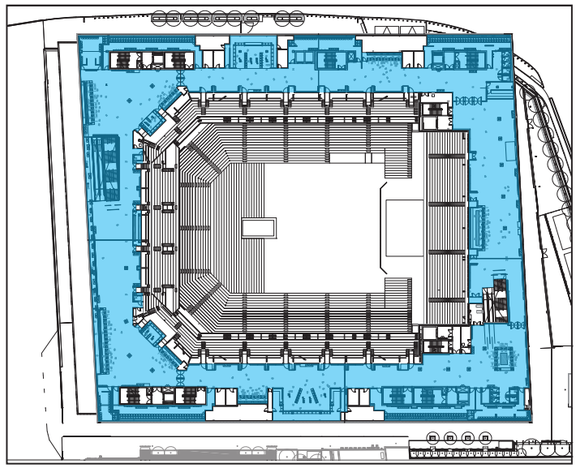
N/A

ACCESS

Doors D & F - Level 01 Entrances

FAN JOURNEY

Arrival: L03 East / L03 West
Experience: pre-show with food and drink
Post-show: entertainment and party space



CATERING

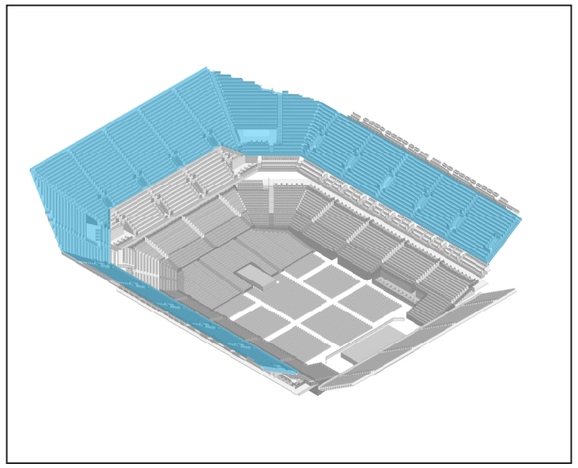
Concept: Fan Favourites





BOWL SEATING

Upper Tier

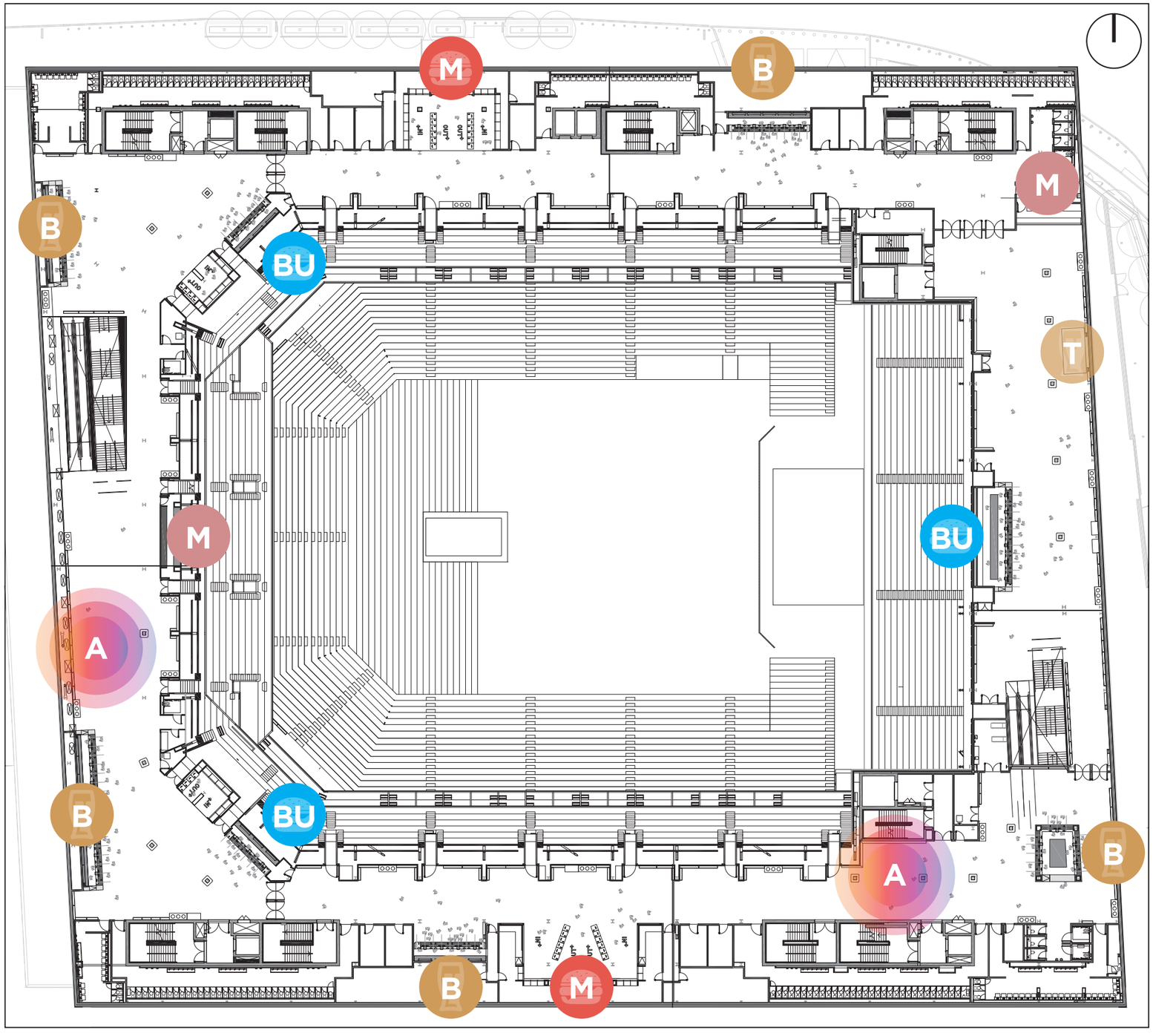


COMMERCIAL OPPORTUNITY



1.4.35 Level 03 Loft - Plan

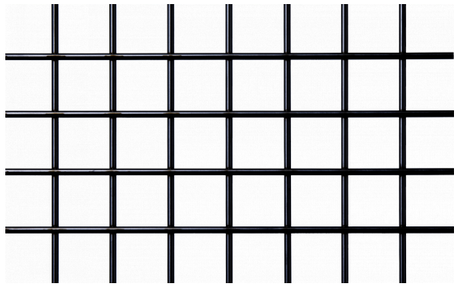
- B Bar
- M Market
- BU Belly Up
- T Temp. Bar
- A Activation
- M Merch.



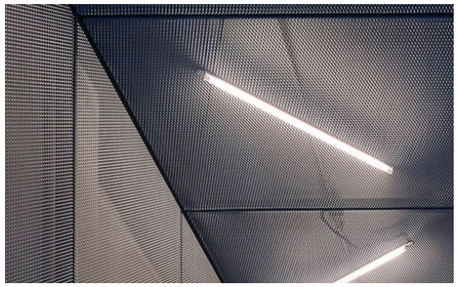
1.4.36 Level 03 Loft - Material Palette



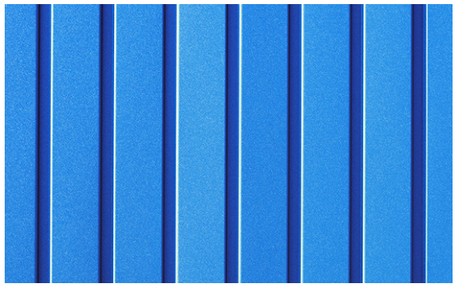
BLACKED OUT EXPOSED SOFFIT - PT-141



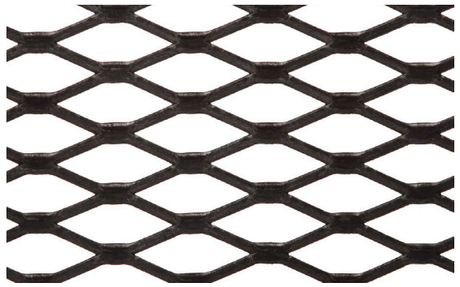
SQUARE WIRE WELDED MESH - AM-217



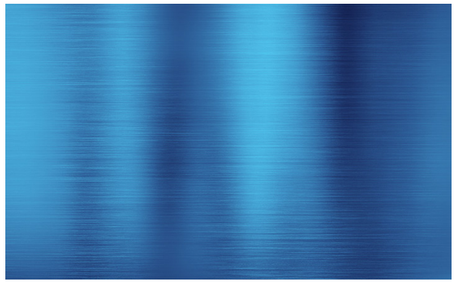
FEATURE SOFFIT - CLG-545



FEATURE BULKHEAD - LIN-303



EXPANDED METAL - AM-209



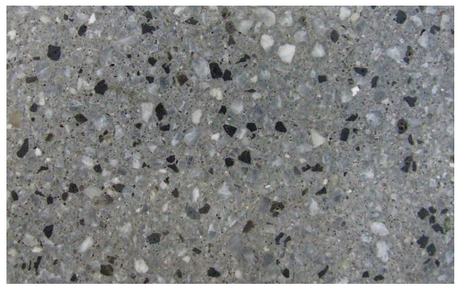
BLUE STAINLESS STEEL - LIN-307



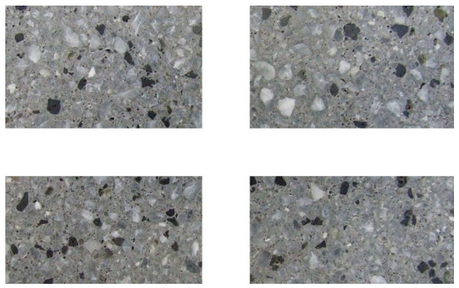
CORRUGATED METAL - LIN-301



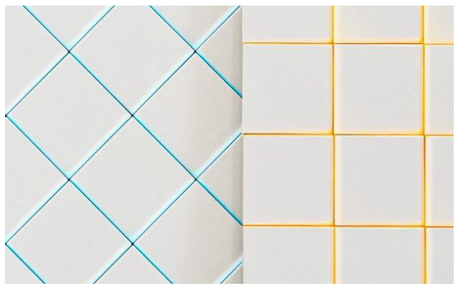
BRUSHED STAINLESS STEEL - VARIOUS CODES



CONCRETE FLOOR - CON-201



APPLIED VINYL FLOOR GRAPHICS - SGN-501



TILE - LIN-603



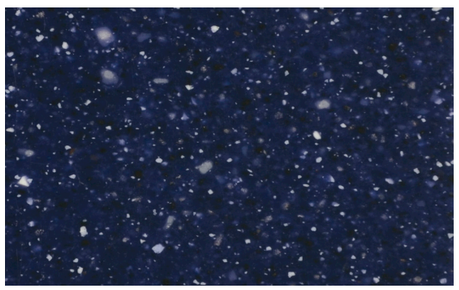
TILE - LIN-603



STONE COUNTER TOPS - VARIOUS CODES



PAINT FINISH - PT-103



DRINK SHELVES - VARIOUS CODES



DISCO BALL

1.4.37 Level 03 Loft - West Feature Bar



1.4.38 Level 03 Loft - Belly Up Unit



1.4.39 Level 03 Loft - South Transition



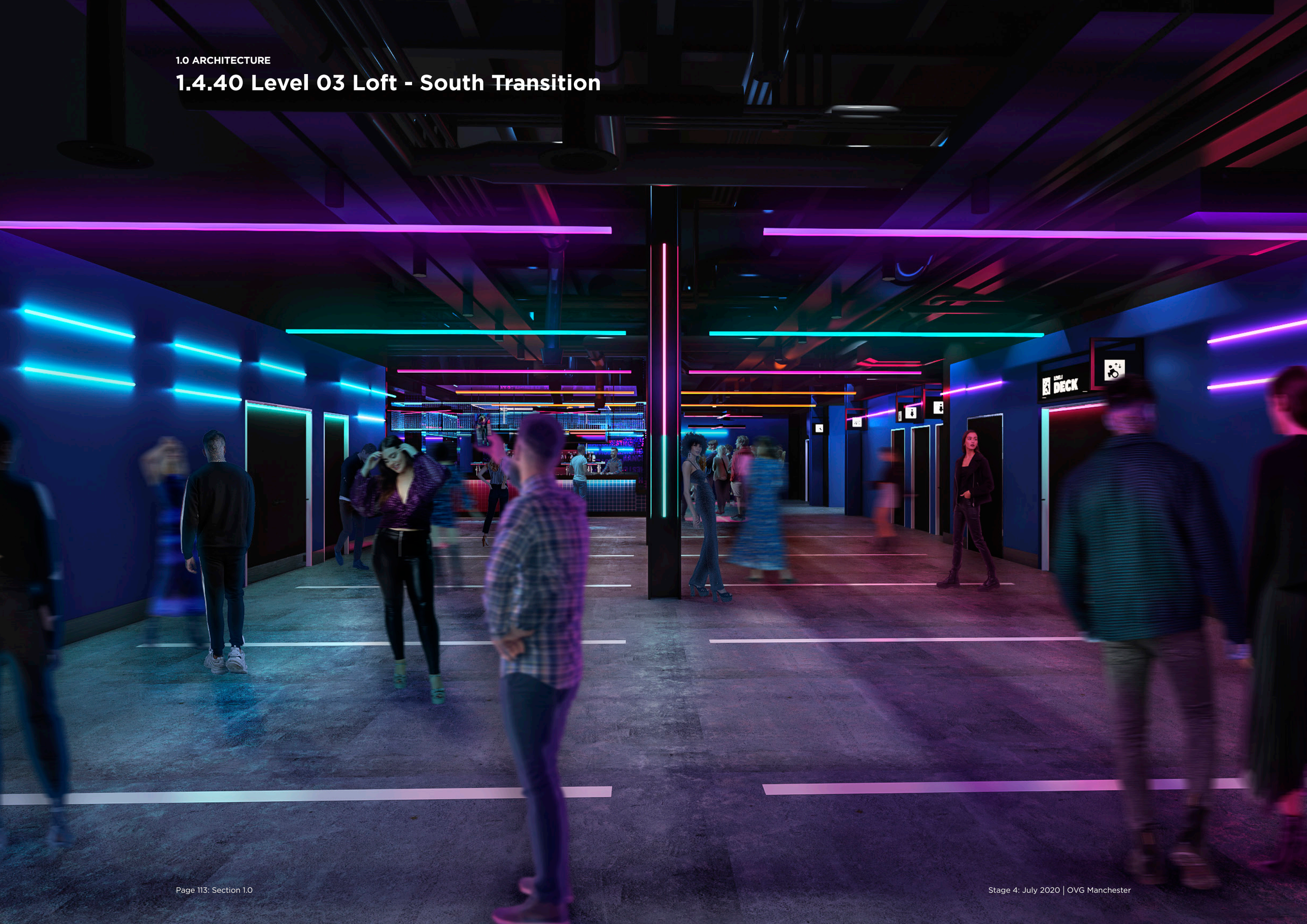


The conceptual approach for level 03 was to create a series of destinations connected through lighting.

The challenge is to make the design comfortable and appropriate for a wide range of shows - catering to all ages, times of the day, was well as respond to the needs of the staff servicing the venue outside of show time.

The images above and to the right illustrate the south approach to the destination bar. We have utilised wall and soffit lighting in linear bands to create a tunnel effect, drawing the user to the destination bar and the adjacent activation zone. Using RGBW lighting and additional can-lighting creates a dynamic lighting solution which is suitable for all uses.

1.4.40 Level 03 Loft - South Transition



1.4.41 Level 03 Loft - South Destination Bar



1.4.42 Level 03 Loft - South Destination Bar



1.4.43 Level 03 Loft - Female WC Design



1.4.44 Level 03 Loft - Male WC Design

1.4.45 Merchandise Design ££££

Within the building, we have numerous merchandise touch points as illustrated on the adjacent diagram.

The brief was to create a series of simple counters with storage to the front and rear.

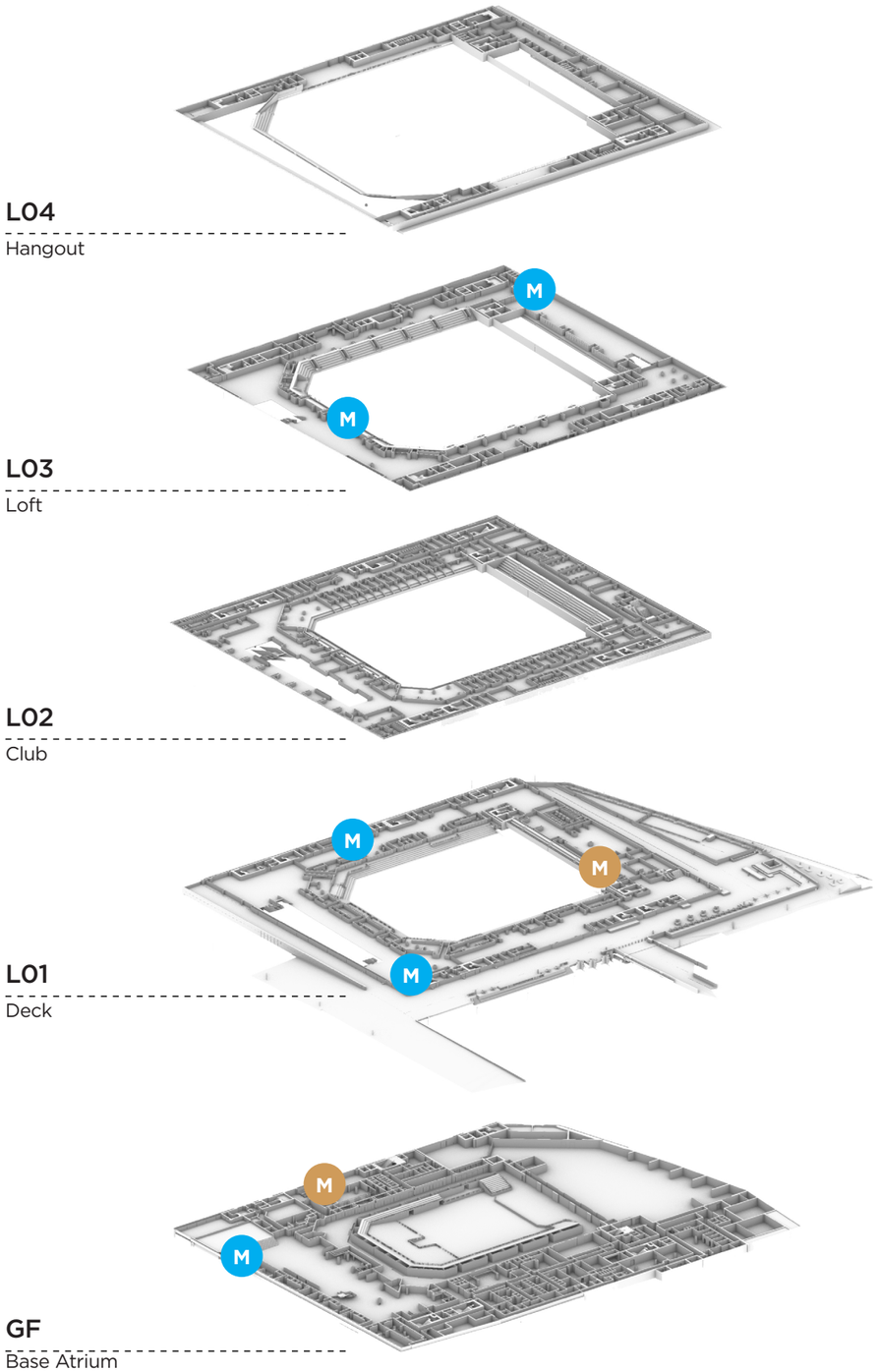
The rear walls utilise cork finishes (for pinning) overlaid with square welded wire mesh (for hanging).

The front counters have glass displays designed into the counter top for displaying smaller items such as key rings.

Level 01 Deck and Level 03 Loft have fixed counters whereas Ground Floor Base Atrium and Level 01 Backstage Club utilise mobile merchandise to maximise on flexibility.

The Ground Floor VIP entrance contains a large fixed display case for the premium guests to view upon arrival.

The adjacent visualisation shows the design for the fixed merchandise.



1.4.46 Merchandise Design



1.4.47 User Group 01 - Experience Overview















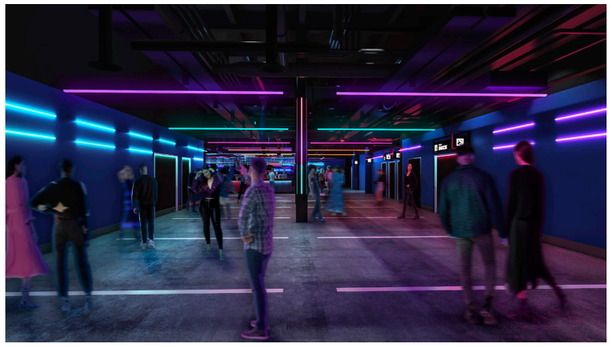




1.4.48 User Group 01 - Experience Overview







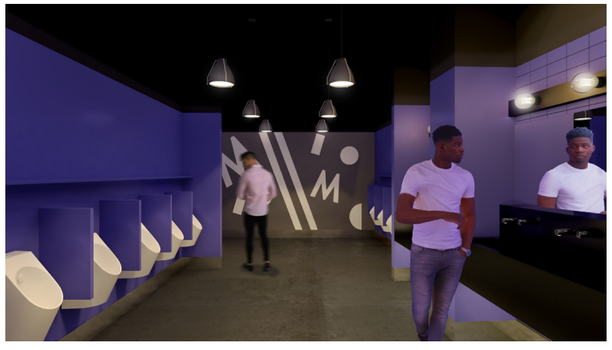













SONOS

USER GROUP TWO

1.5.1 USER GROUP 02: THE GUESTS 124

1.5.2 USER GROUP 02 OVERVIEW 125

1.5.5 BACKSTAGE CLUB ££££ 128

1.5.23 HANGOUT ££££ 146

1.5.39 DECK SUITE ££££ 162

1.5.49 CLUB ££££ - ££££ 172

1.5.51 ATRIUM LOUNGE ££££ 174

1.5.61 LOGE EAST AND LOGE SOUTH ££££ 184

1.5.69 LOGE NORTH AND LOGE WEST ££££ 192

1.5.79 BOXES ££££ 202

1.5.89 DECIBEL ££££ 212

1.5.97 THE RECORD ROOM ££££ 220

1.5

1.5.1 User Group 02: The Guests

Concept / Approach

The conceptual approach for the interior spaces within the venue all consist of three key components: authenticity; atmosphere; and intimacy.

We have arranged a series of spaces across the ground floor, L01, L02 and L04 which can be viewed as a series of clubs with access and upgrades available to all.

Each club has a different vibe and tone - unique to the space. The spaces range from smaller, more intimate Suites and Loges, through to large lounges which are broken up into a series of upgrades and offers to play with the idea of public, semi-private and exclusive space.

All of this is accessed from the ground floor Premium entrance on Sports City Way, with VIP drop off available.

User Group 02: The Guests

Level	Price Tier	Club Name	Vibe/Tone	Offer type	Area	Capacity
Level 01	££	Backstage Club (L01 E)	Elevated Dive Bar	Cash Bar & Catering	770 sqm	700
Level 04	££	North Hangout (L04 N)	Trendy Club	Cash Bar & Catering	347 sqm	150
	££	South Hangout (L04 S)	Trendy Club	Cash Bar & Catering	449 sqm	150
Level 01	£££	Deck Suite North (L01 N)	Satellite Club	Cash Bar & Catering	102 sqm	50
	£££	Deck Suite West (L01 W)	Satellite Club	Cash Bar & Catering	103 sqm	50
Level 02	£££	Atrium Lounge		Club Seats	1676 sqm	682
	£££+	Loge East		Private Club	83 sqm	54
	£££+	Loge South	Members Club	Private Club	75 sqm	54
	££££	Loge North		Private Club	201 sqm	122
	££££	Loge West		Private Club	201 sqm	122
	££££	Boxes (L02 N+S)		Box Seating	880 sqm	464
Ground Floor	££££	Decibel (GF N)	Trendy Club	Mixology & Bowl Food	317 sqm	200
Ground Floor	££££	The Record Room (GF S)	Relaxed Club	Informal Dining & Bar	225 sqm	100
				Total Guests:		**2898**

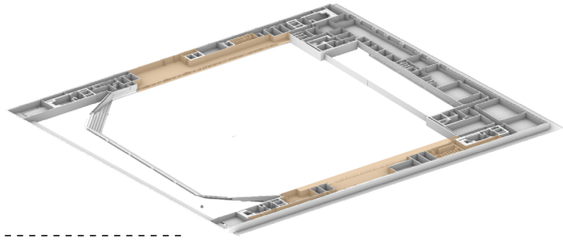
1.5.2 User Group 02 Overview

Multi Experience Venue

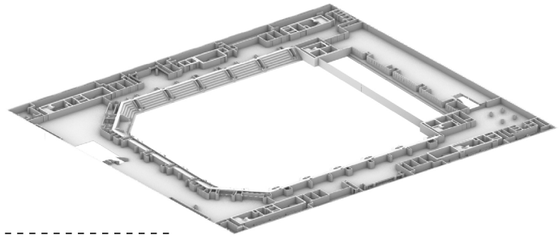
Within the venue, we have created nine distinct premium offers across four floors, catering to approximately 2,900 guests.

The guests have access to a full range of offers and experiences within the spaces which include theatre cooking, casual dining, fine dining and mixology bars – all allowing for a more memorable experience.

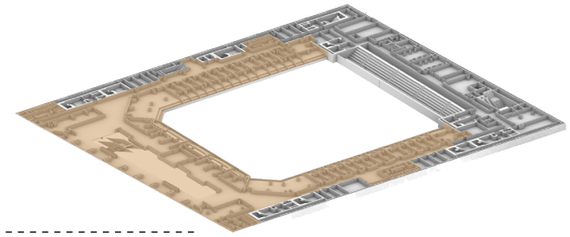
Each of the levels are easily accessible from one another allowing for multiple experiences across each visit, both pre and post-show.



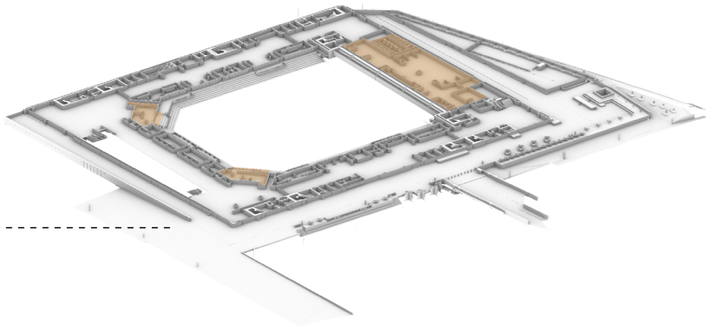
L04
Hangout



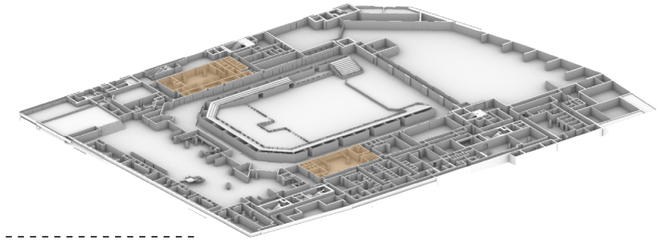
L03
Loft



L02
Club



L01
Deck



GF
Base Atrium

1.5.3 User Group 02: Entrances

We have created two dedicated entrances for user group 02. The primary entrance is accessed via Sports City Way on the north at ground level.

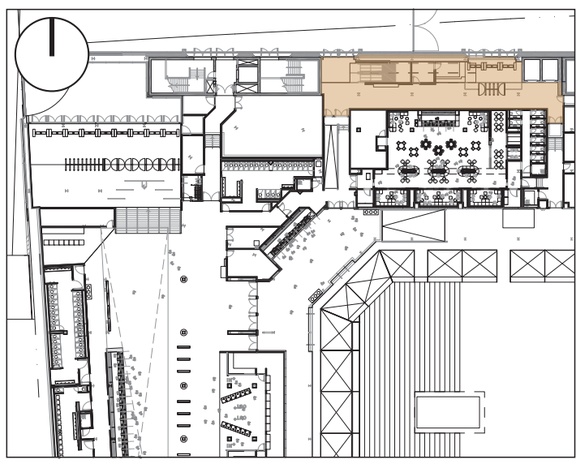
Conceptually we wanted to move away from the preconceptions of 'corporate hospitality' and create a space more like that of a trendy nightclub, with light spilling from inside the space into the public realm.

The space is the first impression of the interior experience so we looked towards some of the key themes explored across the nine club spaces - live music, a raw urban edge and a darkened space which is animated through lighting.

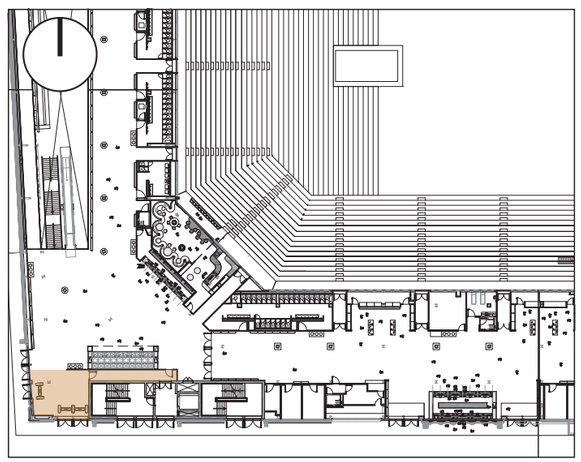
Guests will enter under a lighting rig which contains gobo projectors which can be utilised for sponsorship and activation.

Two large 86" screens are incorporated into the welded wire mesh wall treatment which contains LED battens. These will gently pulsate to guide the guests towards either the entrance to Decibel or the escalator to club level.

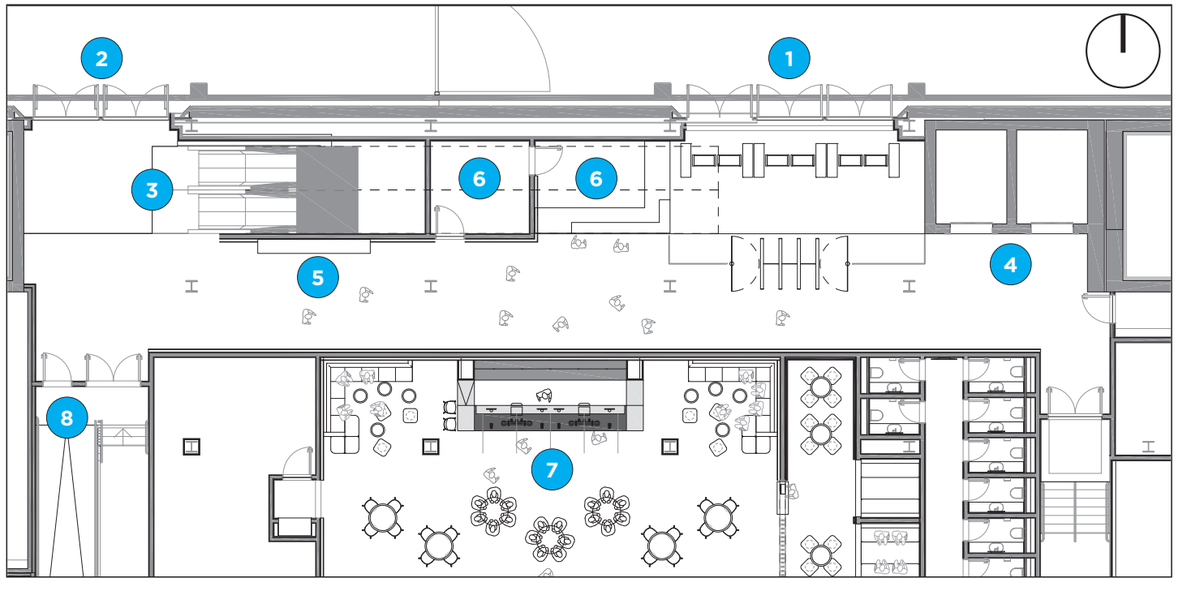
On the South-West Corner at level 01 we have created a secondary entrance. This entrance will primarily be used for the Deck Suite West, The South Hangout and The Record Room. The entrance is much more discreet and has a 'secret door' concept.



Ground Floor Plan



Level 01 Plan



Ground Floor Plan - Entrance A & B

KEY:

1 Entrance
2 Accessible Entrance
3 Escalator to Club level
4 Lift to all levels
5 Merchandise
6 Reception Office & Desk
7 Decibel
8 To the Hall

1.5.4 User Group 02: GF VIP Entrance



1.5.5 Backstage Club ££££

ELEVATED DIVE-BAR FOR THE MILLENNIAL MARKET

The Backstage Club was designed as part of our 'venue-in-a-venue' concept – creating a mixed-use space that can be operated as an independent live music club. In terms of hospitality offers, the space bridges the gap between the traditional general admissions and premium price point.

Conceptually we created an elevated version of a dive-bar – taking a lot of the design touch points from dive-bars and smaller 'intimate gig' clubs. We have created an ever-growing mural which references flyposting and band advertisements. The idea being whenever an artist plays either the Hall or the Backstage Club, their artwork can be added to the wall.

Guests enter from Door G on the East and we have created a small foyer to reduce any noise spill towards the adjacent properties. The entranceway has been designed to encourage light spill on the public realm so that guests can see the club upon arrival and create an allure.

Once you arrive into the club, there is a pop-up merchandise area and cloakroom adjacent. The merchandise area has been designed so that the units are mobile and can be removed when not needed, creating another activation and pop up touchpoint within the club.

The finishes are dark and a little grungy – the exposed MEP and polished concrete floor are carried through the space to create a visual link to the Deck level. The utilitarian materials such as the expanded and corrugated metals are carried into the space and finished in brighter colours. The space provides the backdrop for neon-LED branding, relating to Manchester, to engage with the millennial market and the social media conscious. This is to create a strong digital presence for the club, competing with the wider Manchester market.

The club has a large feature bar with the stage and dancefloor adjacent, like that of a small live music club. The club also has an open kitchen with a pizza oven.

We have created two areas for pop-up and activation towards the north which we have visualised indicatively as ping pong and a gaming arcade. The idea is to create a space that can host a whole multitude of interventions to keep the spirit of the space dynamic and fresh.

The toilets are ungendered which sends a message of equality and inclusion. The 'dive-bar' aesthetic is carried through into here also.

If for any reason the Hall is not ready for guests pre show, the intention is that the 300 guests from the level 04 Hangouts will be catered for within the Backstage Club.

On non-event day, we have illustrated multiple potential events that can happen within. Any large objects (including cars) can be brought into the Club via the east exit doors (adjacent to Gate F).

1.5.6 Backstage Club - Overview

SPACE CAPACITY

Area: 770 sqm
Capacity: 700 guests at 1.1 sqm / Person

LOCATION

Level 01 East

VIP PARKING

N/A

ACCESS

Door G - Level 01 East Entrance

GUEST JOURNEY

Arrival: L01 East VIP entrance
Experience: pre-show with food and drink
Post-show: entertainment and party space

CATERING

Concept: Pizza and Salads



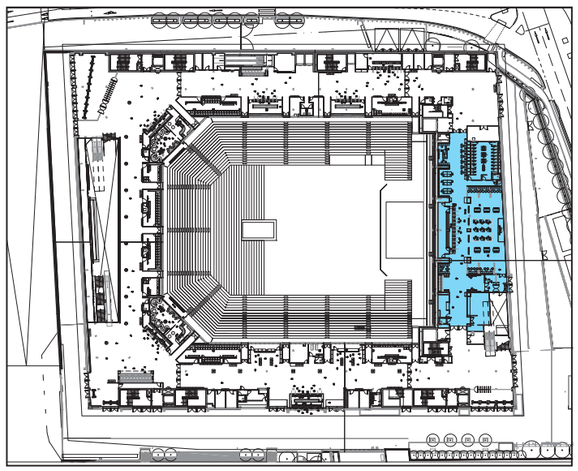


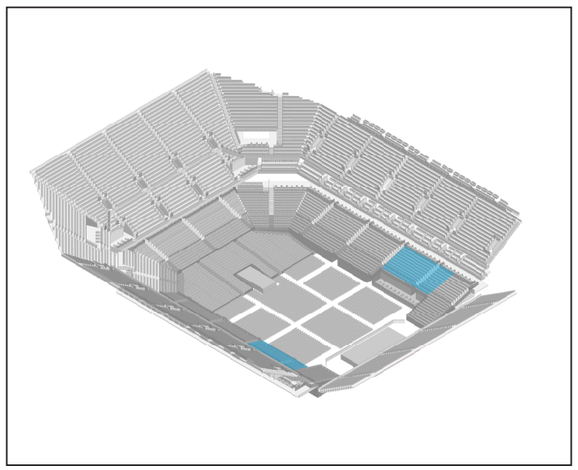
BOWL SEATING

Lower Tier

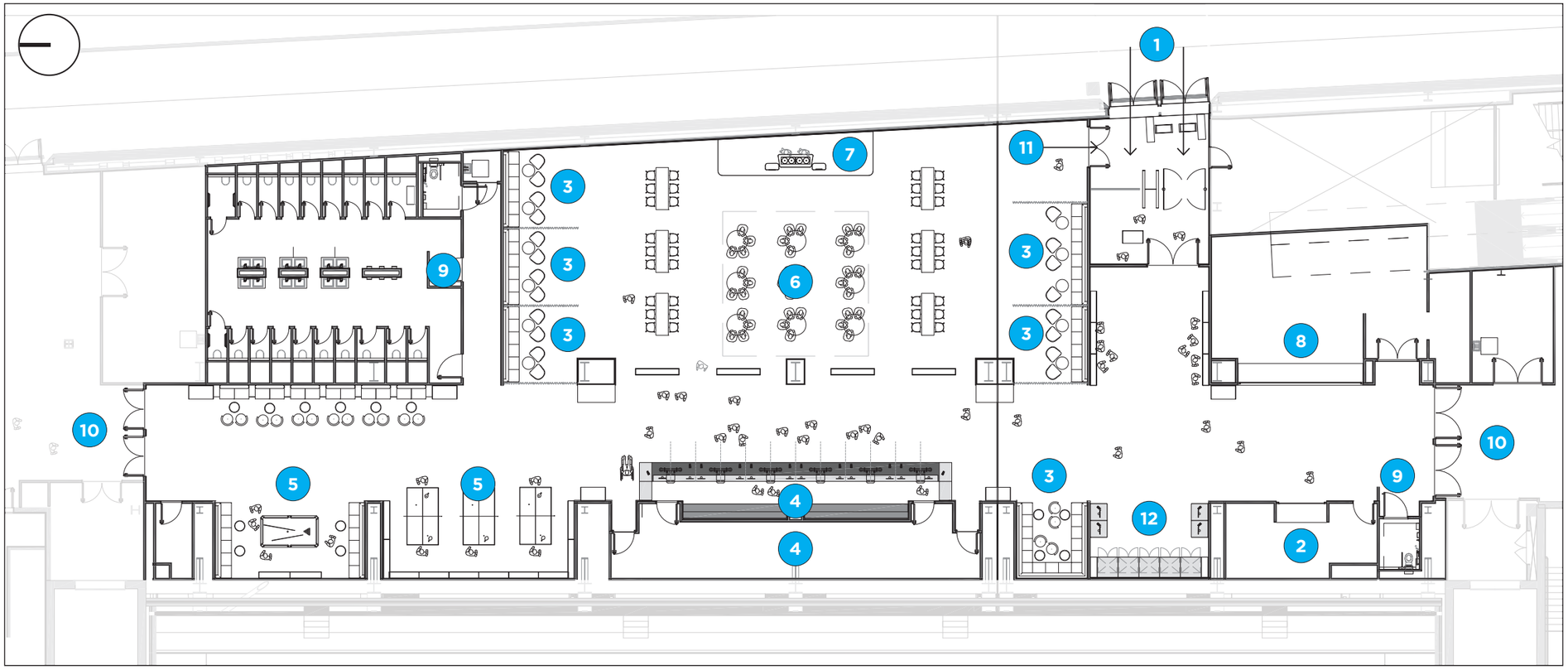
COMMERCIAL OPPORTUNITY







1.5.7 Backstage Club - Plan



Event Day Plan

KEY:

1. Entrance & Lobby
2. Coat Storage
3. Semi-Private Booth
4. Bar & Cellar
5. Activation Area
6. Club Space
7. Stage / DJ / Activation
8. Kitchen
9. WC
10. Access to the Hall
11. Exit
12. Pop-Up Merch.

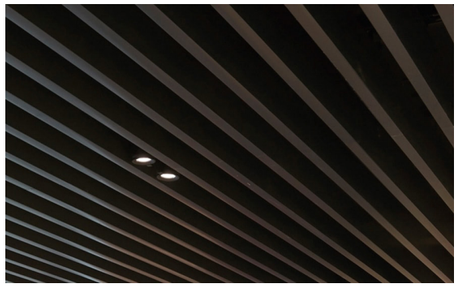
Club Overview:

	area	capacity	area / P
LOUNGE (inc FFE)	770m²	700	1.1m² / P

1.5.8 Backstage Club - Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



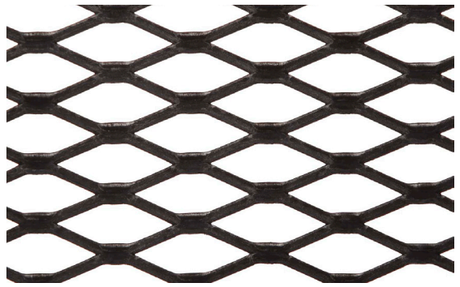
SLATTED SOFFIT - CLG-603



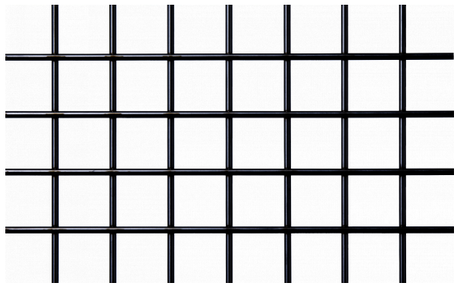
BRUSHED STAINLESS STEEL SOFFIT - CLG-845



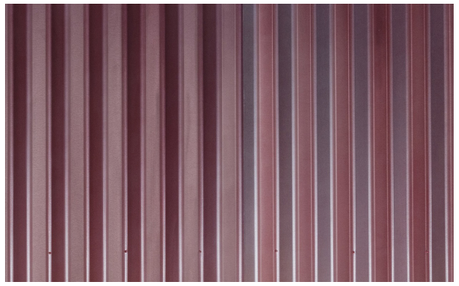
OSB SOFFIT - LIN-501



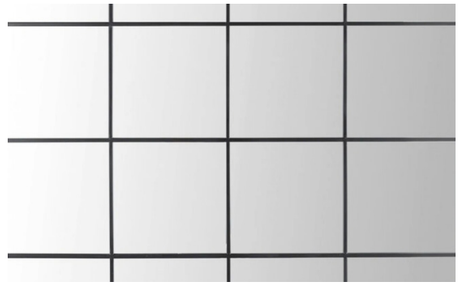
EXPANDED METAL - LIN-321



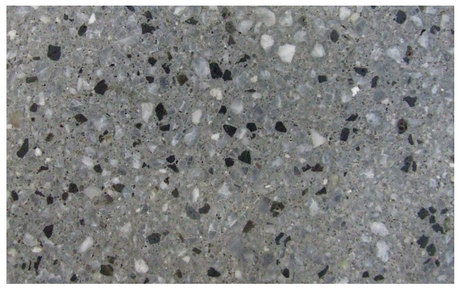
SQUARE WELDED WIRE MESH - LIN-331



CORRUGATED METAL - LIN-305



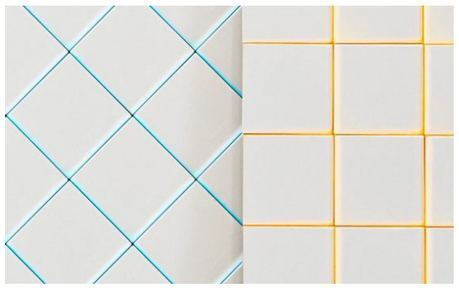
MIRROR TILE - LIN-211



CONCRETE FLOOR - CON-201



APPLIED VINYL FLOOR GRAPHICS - SGN-501



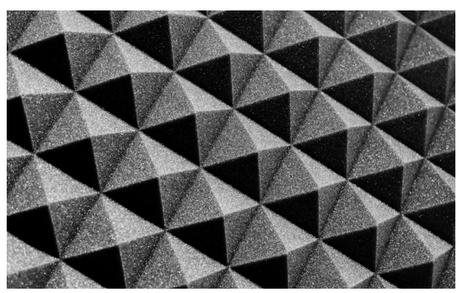
TILE - LIN-603



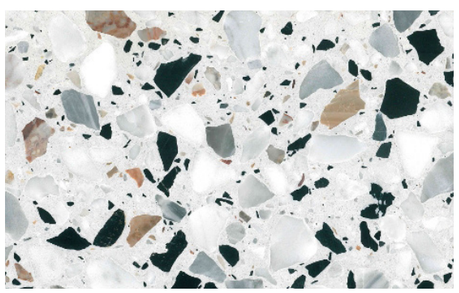
TILE - LIN-603



FLY POSTERING - SGN-511



ACOUSTIC TREATMENT - LIN-921



TERRAZZO COUNTER TOP - FX-446



LEATHER - VARIOUS CODES

1.5.9 Backstage Club - Entrance



1.5.10 Backstage Club - Pop Up Merchandise



1.5.11 Backstage Club - RGB Lighting to Bar

1.5.12 Backstage Club - RGB Lighting to Bar



1.5.13 Backstage Club - Activation



1.5.14 Backstage Club - Activation



1.5.15 Backstage Club - Pre-Show



1.5.16 Backstage Club - Post-Show



1.5.17 Backstage Club - Post-Show

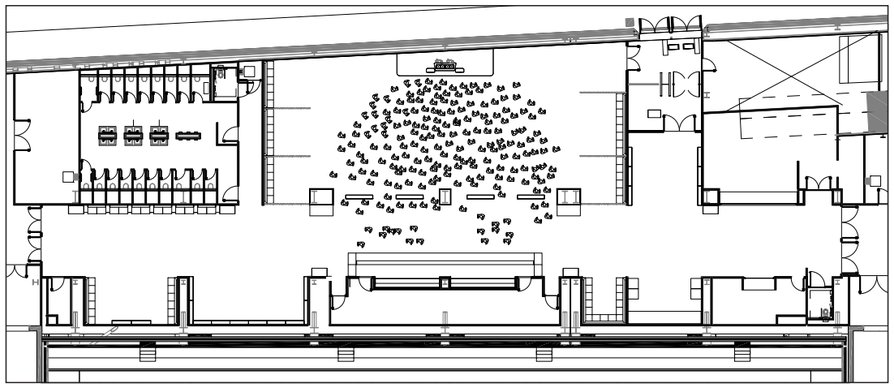
1.5.18 Backstage Club - Social Media Moments

1.5.19 Backstage Club - Ungendered WC Design

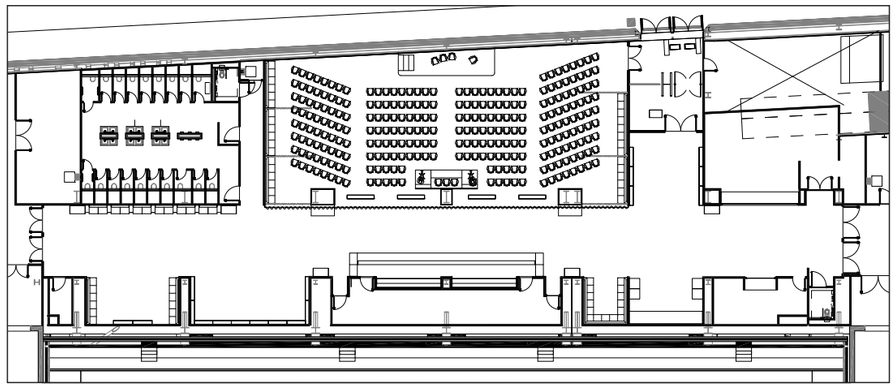


1.5.20 Backstage Club - Ungendered WC Design

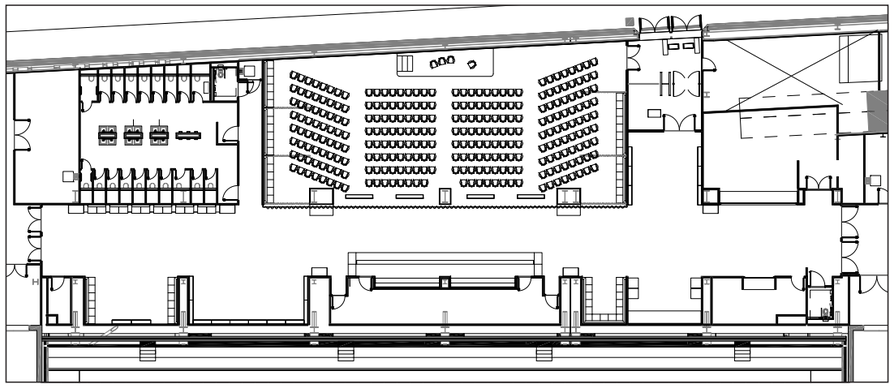
1.5.21 Backstage Club Non-Event Day



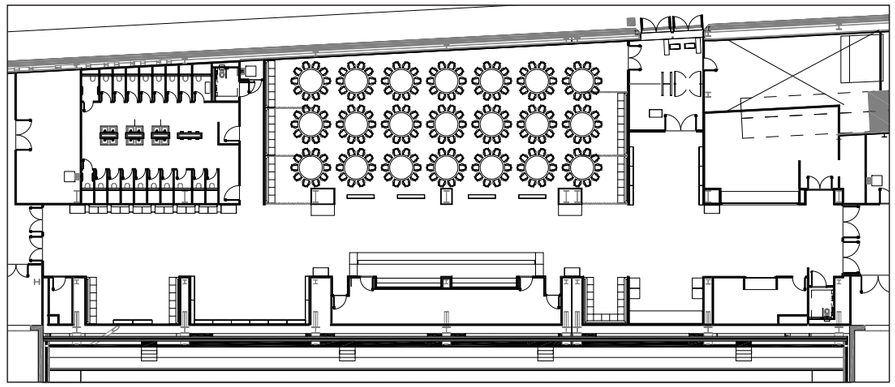
POST-SHOW / PRIVATE PARTY: 700 GUESTS



CONFERENCE: 264 GUESTS



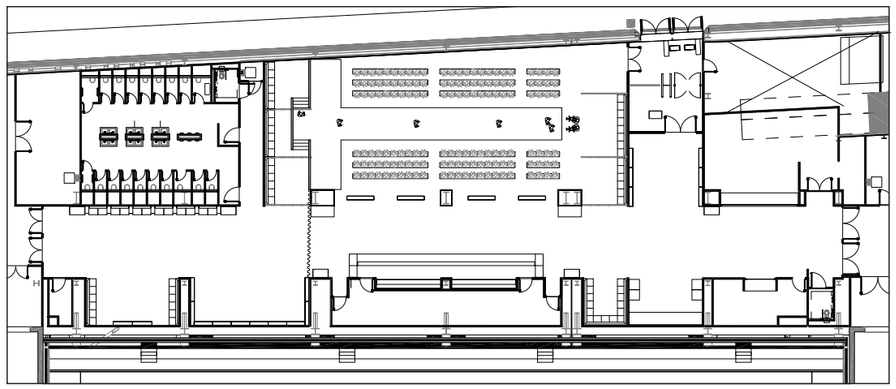
AGM: 278 GUESTS



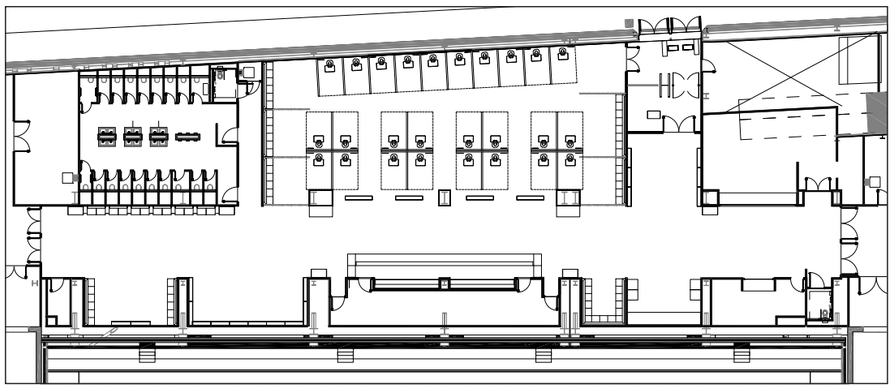
BANQUET: 210 GUESTS

The Backstage Club has been designed as a 'venue within a venue' which allows the space to operate independently on non-event day. The diagrams above illustrate some of the key activities which may occur within the space. Additional power and data provisions should be made at stage 04 to capture the requirements in the layouts above.

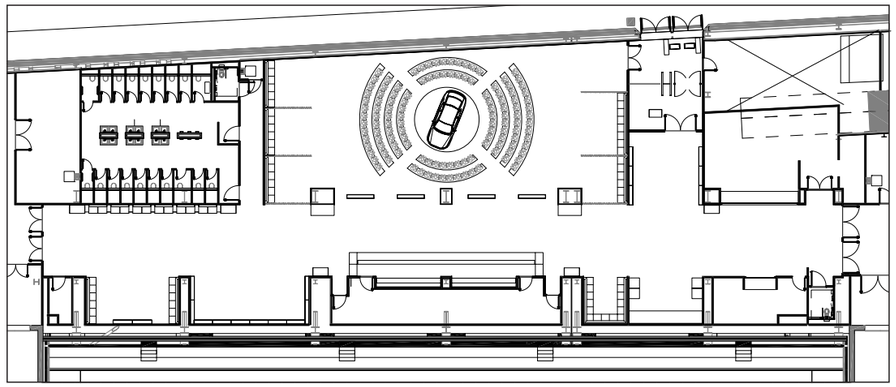
1.5.22 Backstage Club Non-Event Day



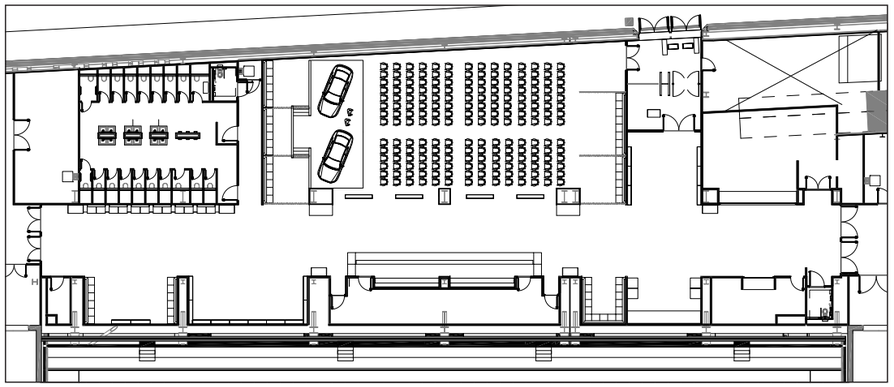
FASHION SHOW: 148 SEATED GUESTS (ADDITIONAL 68 STANDING GUESTS)



EXHIBITION: 26 STANDS



PRODUCT LAUNCH: 124 GUESTS



PRODUCT LAUNCH: 196 GUESTS

1.5.23 Hangout ££££

MANCHESTER-CENTRIC PARTY HANGOUT ABOVE THE EVENT FLOOR

The North and South Hangouts are located on level 04 above the upper tier. The clubs offer a unique take on what is considered 'corporate hospitality' and how guests can enjoy live music. Guests can enter from either the Door A for the North hangout and Door E for the South hangout.

A key driver for the space is creating the black-box environment which is required for live performances. We have utilised low-level skirting illumination to provide necessary lighting to allow the guests to navigate the space. All other lighting and illumination will be turned off during a show.

Conceptually we wanted to create a space that was Manchester-centric – a space that celebrates the city, *a love letter to Manchester*. We created a tapestry of some of the key moments in the city's history and heritage, set against a selection of the amazing graffiti and street art that the city hosts.

The artwork will be printed onto an acoustic fabric, with 50mm insulation behind to incorporate the acoustic needs of the space. The panels will sit behind square welded wire mesh panels which are top and bottom lit.

The space is perceived as informal, which is captured within the seating types. Rather than relying on drinks rails and stools alone, we have created an assortment of seating types. The first being a row of fixed seating, similar to the upper tier which guests can step down onto. Secondly, we have created a series of raised podiums with comfier sofas to relax in. Finally, we have the drink shelves and stools (with sufficient space around to dance!) The drink shelves have been designed with a retractable leg and demountable top so any wheelchair users can equally enjoy the show from level 04.

Both Hangouts have a feature bar within the main lounge space and a dedicated kitchen. The toilets are ungendered which sends a message of equality and inclusion. The darker aesthetic is carried through into here also.

If for any reason the Hall is not ready for guests pre show, the intention is that the 300 guests from the level 04 Hangouts will be catered for within the Backstage Club.

1.5.24 Hangout - Overview

SPACE CAPACITY

North Hangout: Area: 347 sqm (2.3 sqm / Person)
South Hangout: Area: 449 sqm (2.9 sqm / Person)

LOCATION

Level 04 North and Level 04 South

VIP PARKING

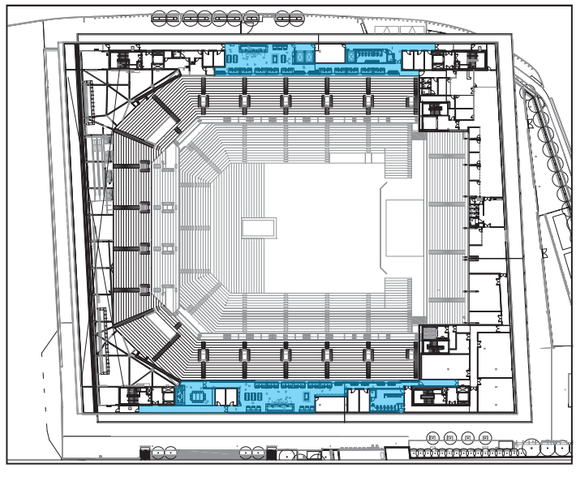
N/A

ACCESS

North Hangout: Door A - GF VIP North entrance
South Hangout: Door E - Level 01 South East Entrance

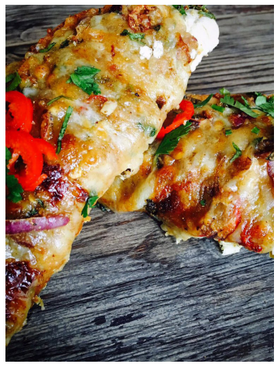
GUEST JOURNEY

Arrival: Lift and stair access from GF / Level 01
Experience: pre-show with food and drink
Post-show: entertainment and party space



CATERING

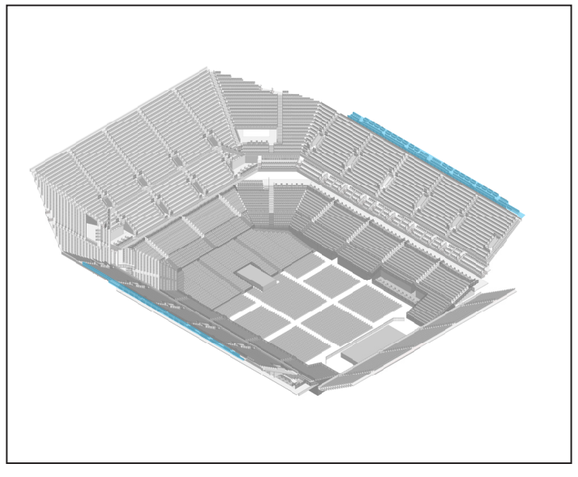
Concept: Bar Bites





BOWL SEATING

A variety of seating is provided within the space



COMMERCIAL OPPORTUNITY

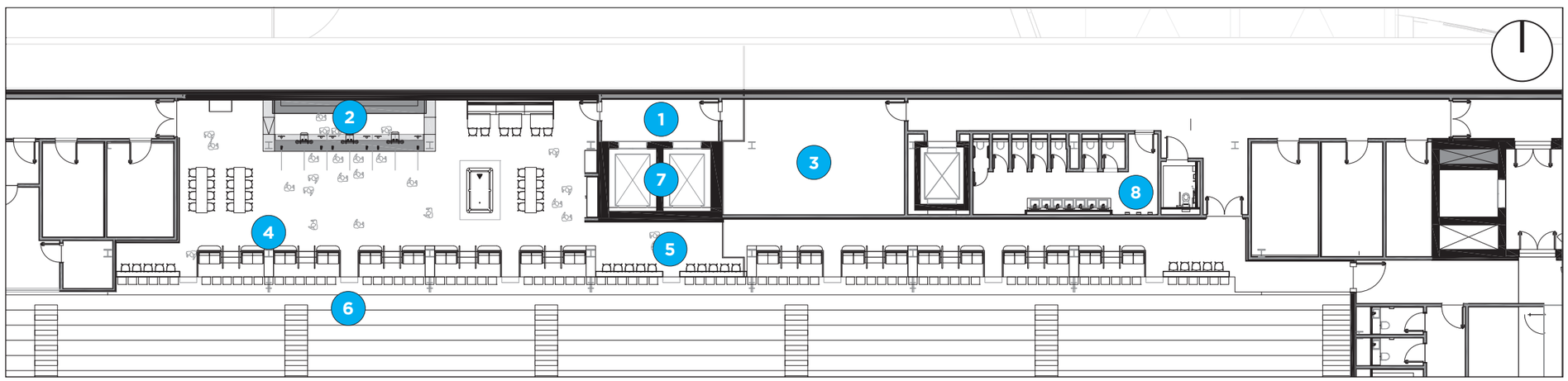


Hangout North

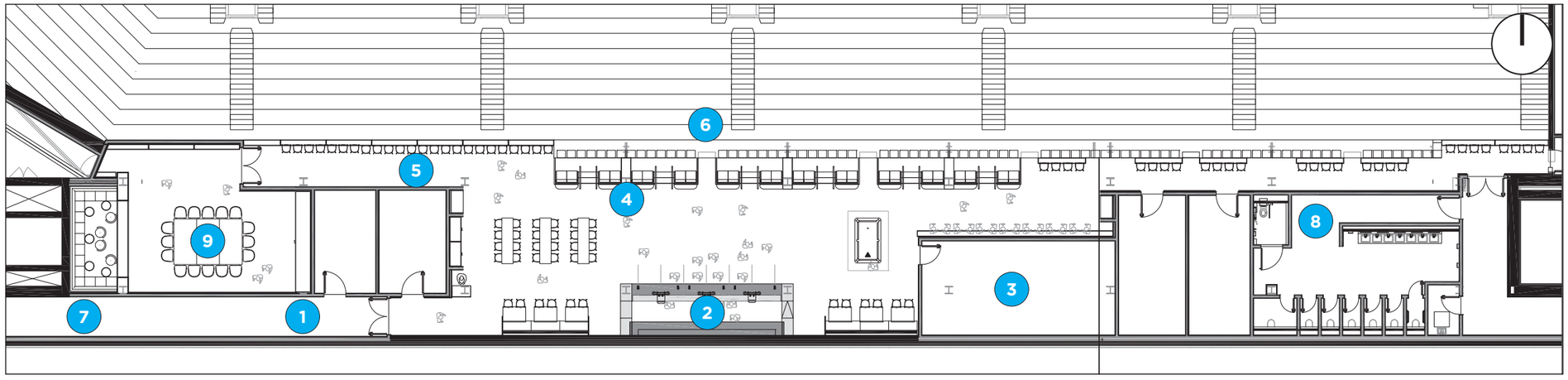


Hangout South

1.5.25 Hangout - Plan



North Hangout Plan



South Hangout Plan

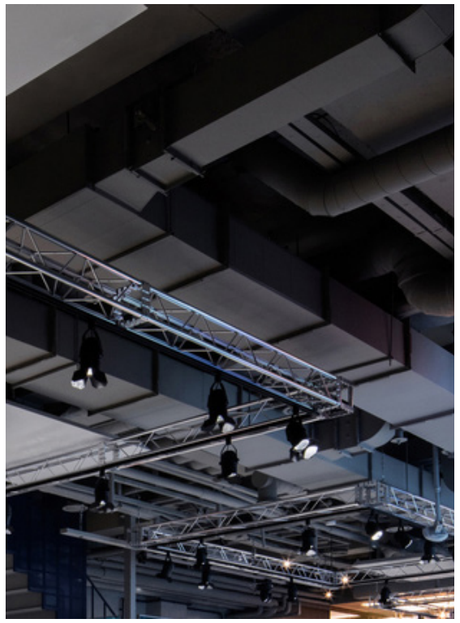
KEY:

1. Entrance - Event Day
2. Bar
3. Kitchen
4. Raised Podium
5. Seating & Drinks Rail
6. Bowl Seating
7. Lifts
8. WC
9. Private Board Room

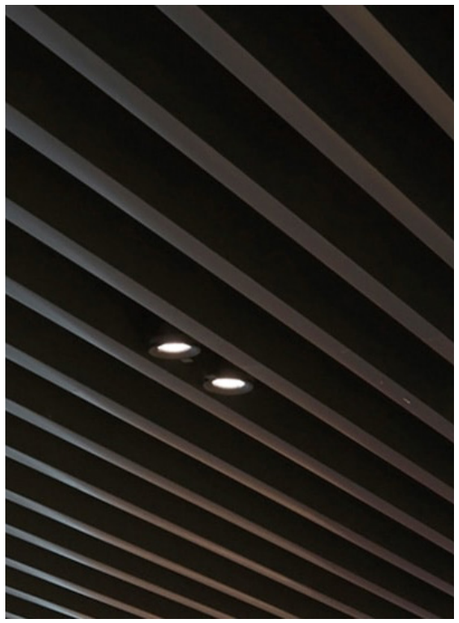
Club Overview:

	area	capacity	area / P
HANGOUT NORTH (inc FFE)	347m²	150	2.3m² / P
HANGOUT SOUTH (inc FFE)	449m²	150	2.9m² / P

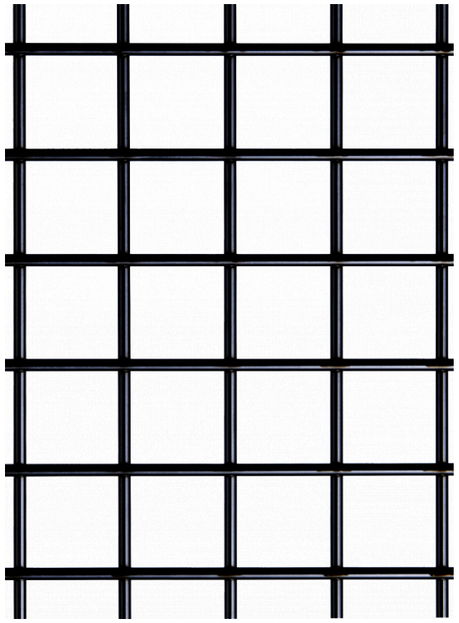
1.5.26 Hangout - Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



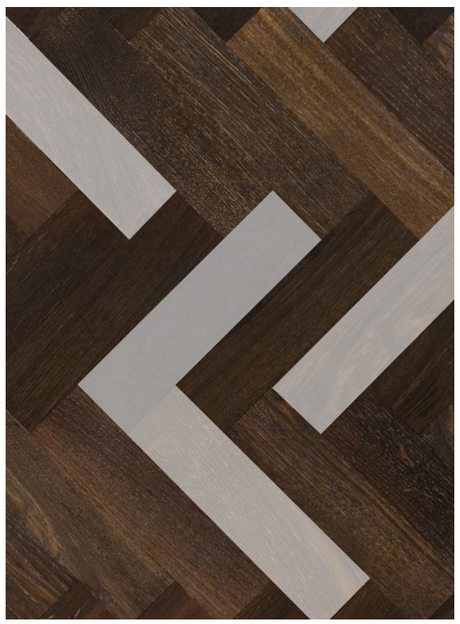
SLATTED SOFFIT - CLG-603



SQAURE WIRE WELDED MESH - LIN-331



PRINTED FABRIC - LIN-923



TIMBER FLOOR - FL-805 & SGN-501



DARK STAINED TIMBER - FX-481

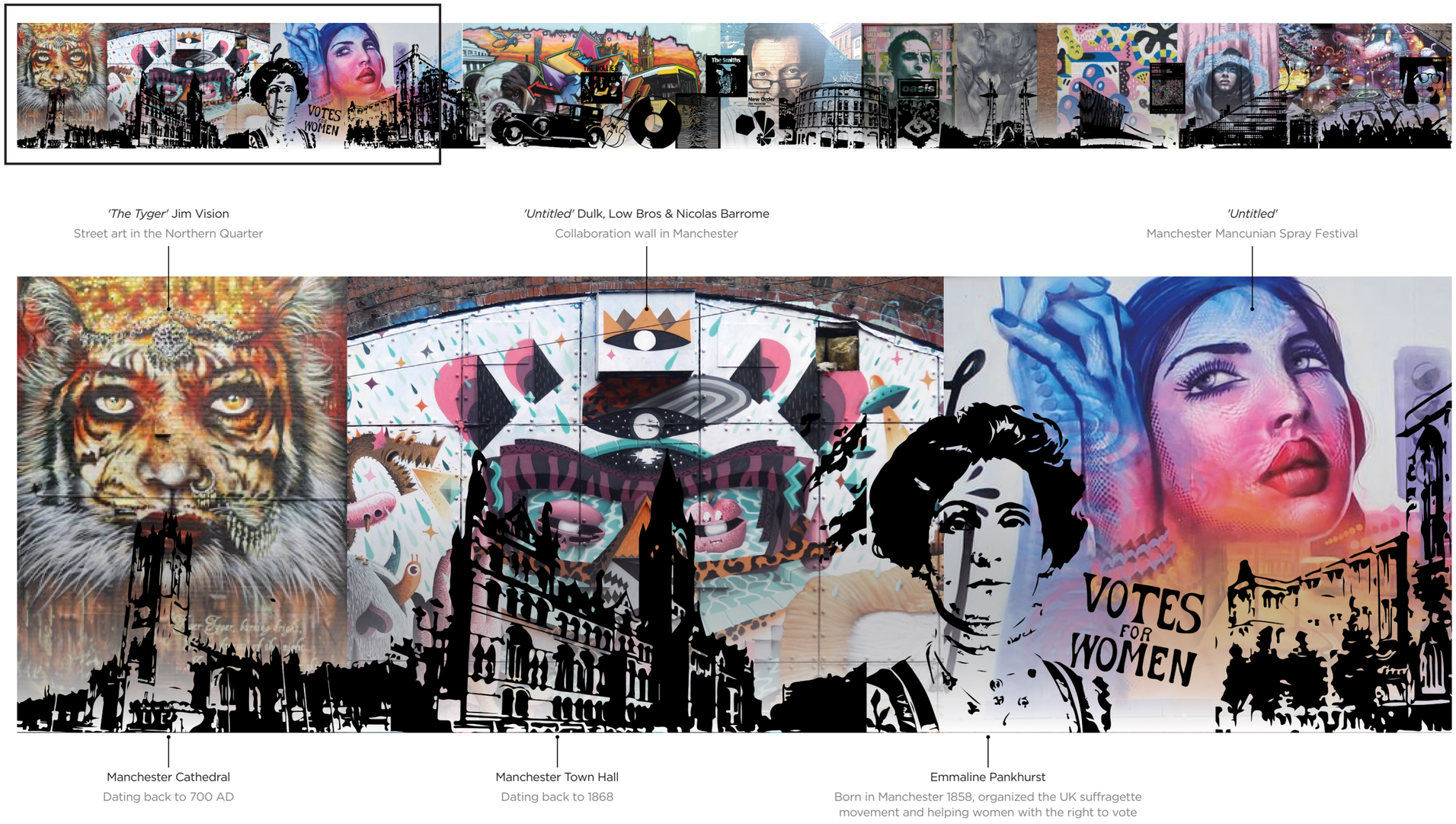


LEATHER - VARIOUS CODES



APPLIED VINYL - SGN-511

1.5.27 Hangout - Concept



'The Tyger' Jim Vision
Street art in the Northern Quarter

'Untitled' Dulk, Low Bros & Nicolas Barrome
Collaboration wall in Manchester

'Untitled'
Manchester Mancunian Spray Festival

Manchester Cathedral
Dating back to 700 AD

Manchester Town Hall
Dating back to 1868

Emmaline Pankhurst
Born in Manchester 1858, organized the UK suffragette movement and helping women with the right to vote

The Hangout's offer a unique, more relaxed take on enjoying live music. The space is completely open to the seating bowl and we have created a variety of seating types which include raised podiums with sofas and drink shelves with stools.

Conceptually, the space is a love letter to Manchester - to celebrate the key moments within the city's history and overlaying them against some of the incredible graffiti and street art found within the city. The artwork will be printed onto fabric (covering acoustic insulation) to create an acoustic finish to ensure the quality of the live performances.

1.5.28 Hangout - Concept



Street Art by kELzO

Boxwork Apartments, Castlefield, Manchester - May 2017



John Ryland Library
1900

First Rolls Royce manufactured in Manchester
1904

The Hollies
1960s - Mid '70s

Joy Division
1976

The Smiths
1982

1.5.29 Hangout - Concept



'Tony Wilson' by Akse
Mr Manchester on the corner of Tib Street and Thomas Street

'Liam Gallagher' by Akse
1991

'722 - 841 BC' by Faith 47
Street art representing human intimacy and support to LGBT rights

New Order
1980

The Hacienda
1980 - 1990

Oasis
1991

The Lowry
2000

1.5.30 Hangout - Concept





Unknown
Northern Quarter Graffiti

Artwork by Nomad Clan
Manchester based street artist

Collaborative Graffiti by Dreph, Aryz and Roid
Artwork on New Wakefield Street

Imperial War Museum by Daniel Libeskind
2000

The 1975
2002

The National Football Museum
2002

Live music and nightlife continue to flourish
Today

The Courteeners
2006

1.5.31 Hangout - Pre Show



1.5.32 Hangout - During Show



1.5.33 Hangout - Pre Show



1.5.34 Hangout - During Show



1.5.35 Hangout - Seating



1.5.36 Hangout - Unique Space



1.5.37 Hangout - Ungendered WC Design



1.5.38 Hangout - Ungendered WC Design



1.5.39 Deck Suite ££££

THE SATELLITE CLUB

The Deck Suites, North and West, are conceptualised as satellite clubs – small, independent clubs which link directly to the hall. Each space has a series of areas which flow into one another: a bar, a lounge, a private terrace and seating areas.

Conceptually we wanted the suites to feel intimate and informal, like a VIP bar. For the look and feel of the spaces, we looked towards the spirit of the city to create a dynamic and vibrant response.

A key driver for the space is creating the black-box environment which is required for live performances. We have utilised low-level skirting illumination to provide the necessary lighting to allow the guests to navigate the space. All other lighting and illumination will be turned off during a show.

The acoustic treatment of the spaces is very important as we were at risk of the sound bouncing back towards the mixing desk. The soffit and some walls utilise a rounded timber finish and other walls have a gradient effect printed onto acoustic fabric, with 50mm insulation behind to incorporate the acoustic needs of the space.

The space provides the backdrop for neon-LED branding and convex mirrors - to engage with the social media conscious. This is to create a strong digital presence for the club.

The drink shelves within the terrace have been designed with a retractable leg and demountable top so any wheelchair users can equally enjoy the show from level 01.

1.5.40 Deck Suite - Overview

SPACE CAPACITY

North Deck Suite: Area: 102 sqm (2.0 sqm / Person)
West Deck Suite: Area: 103 sqm (2.1 sqm / Person)

LOCATION

Level 01 North and West

VIP PARKING

N/A

ACCESS

Doors D & E - Level 01 Entrances

GUEST JOURNEY

Arrival: Level 01 Deck West
Experience: pre-show with food and drink

CATERING

Concept: Bar Bites



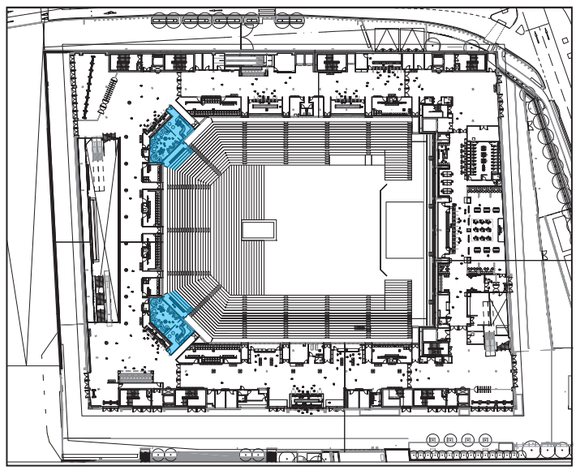


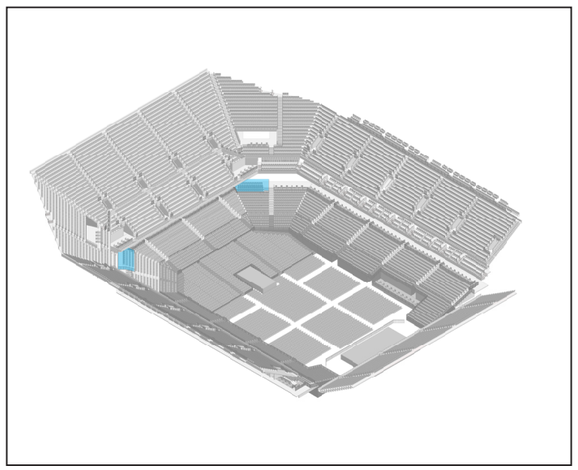
BOWL SEATING

Back of Lower Tier

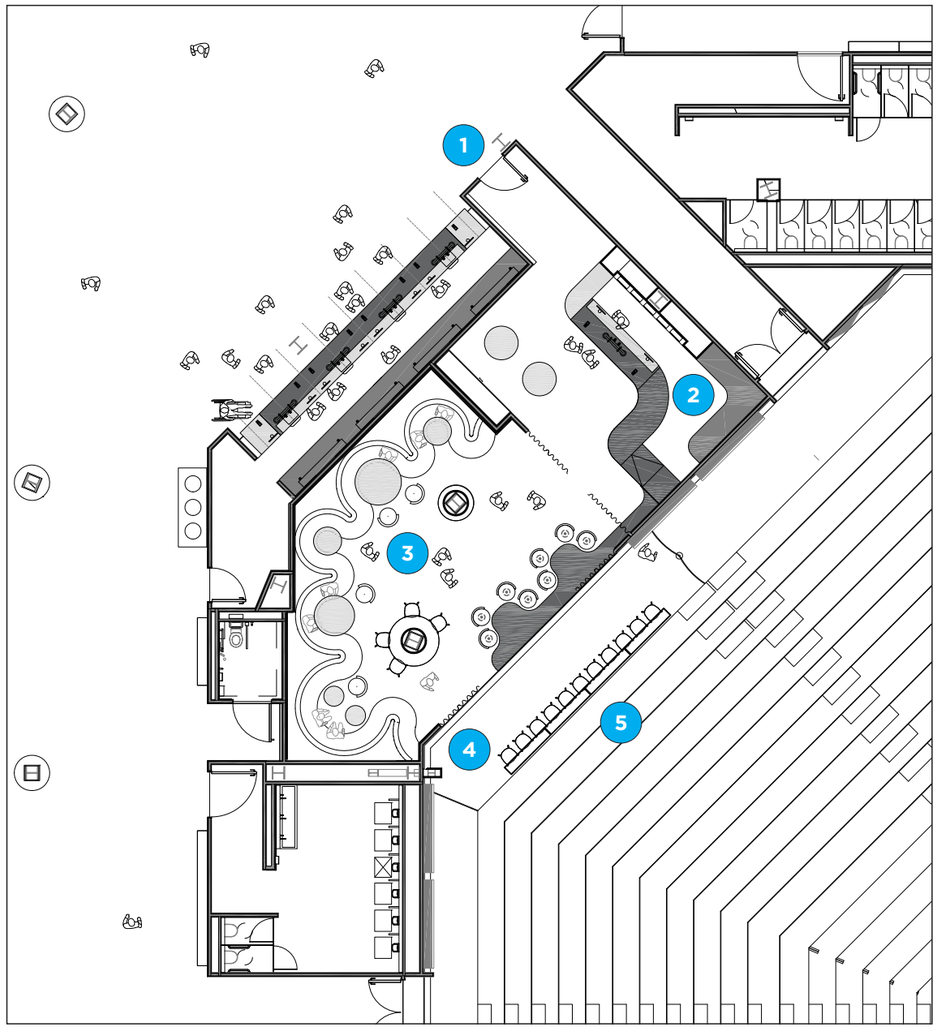
COMMERCIAL OPPORTUNITY



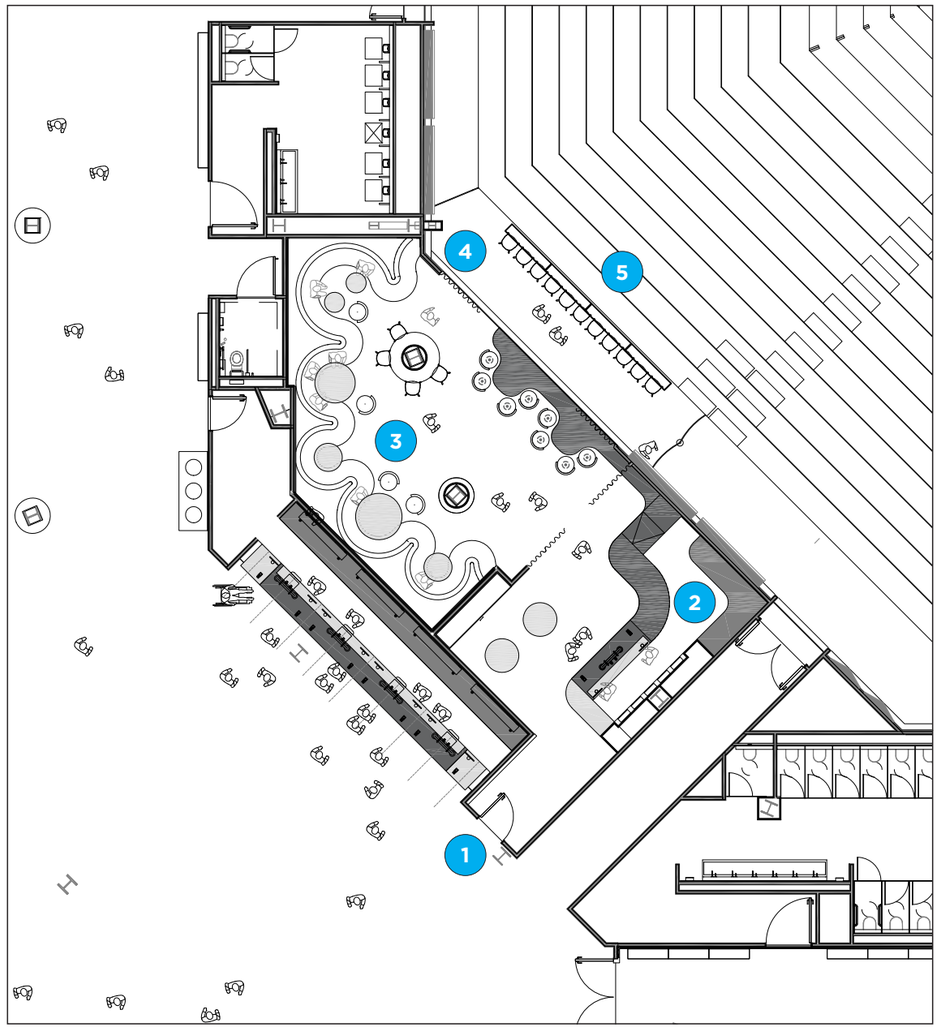




1.5.41 Deck Suite - Plan



Deck Suite North Plan



Deck Suite West Plan

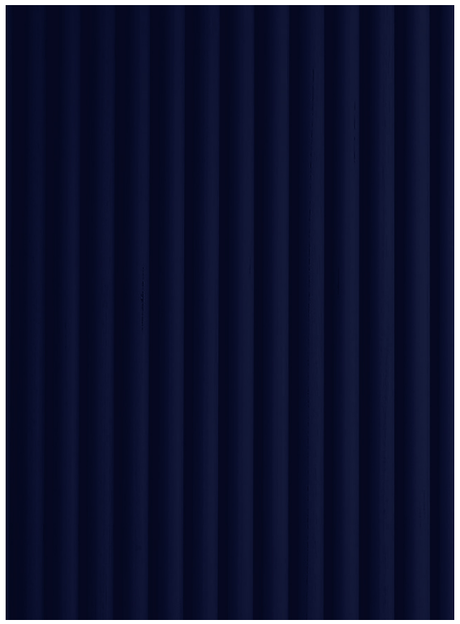
KEY:

1. Entrance - Event Day
2. Bar & Catering
3. Lounge Space
4. Private Terrace
5. Bowl Seating

Club Overview:

	area	capacity	area / P
DECK SUITE NORTH (inc FFE)	102m²	50	2.0m² / P
DECK SUITE WEST (inc FFE)	103m²	50	2.1m² / P

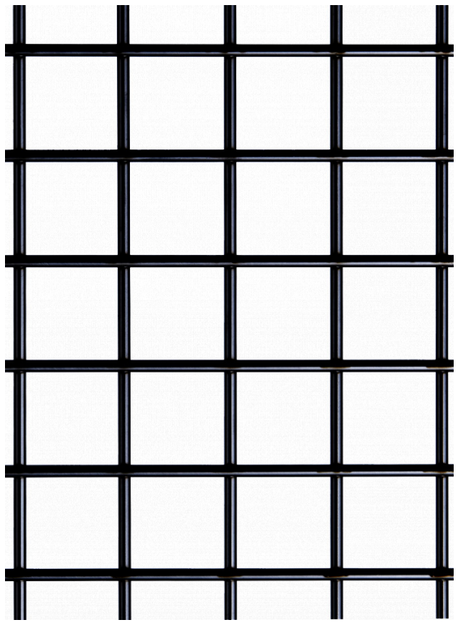
1.5.42 Deck Suite - Material Palette



SOFFIT & WALL - CLG-719 & LIN-125



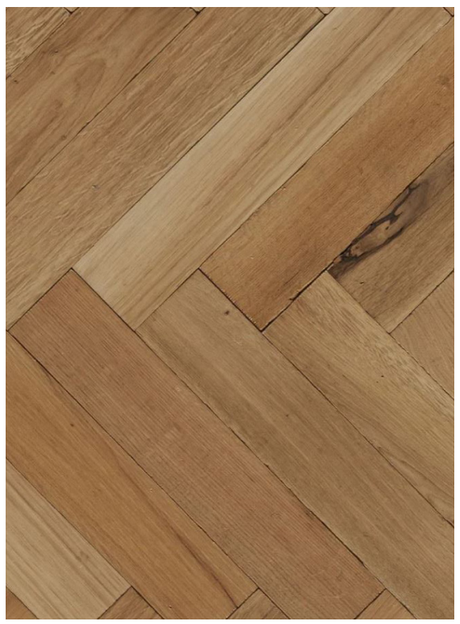
PAINT FINISH - PT-103



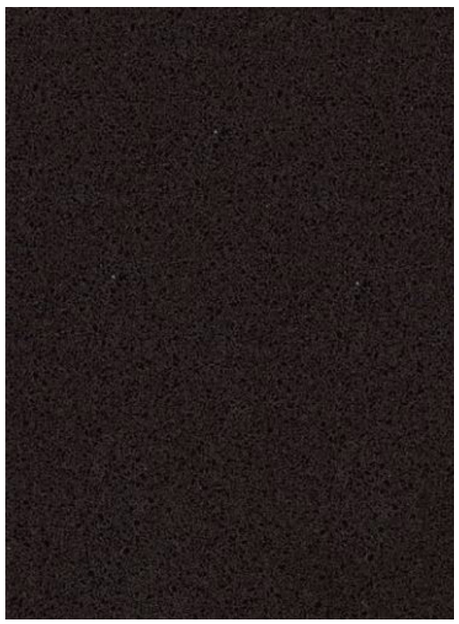
SQUARE WIRE WELDED MESH - LIN-331



PRINTED FABRIC - LIN-923



TIMBER FLOOR - FL-801



STONE COUNTER TOP - FX-443



LEATHER - VARIOUS CODES



MIRROR - VARIOUS CODES

1.5.43 Deck Suite - Pre-Show



1.5.44 Deck Suite - During Show



1.5.45 Deck Suite - Pre-Show



1.5.46 Deck Suite - During Show



1.5.47 Deck Suite - Social Media Moments



1.5.48 Deck Suite - Private Terrace

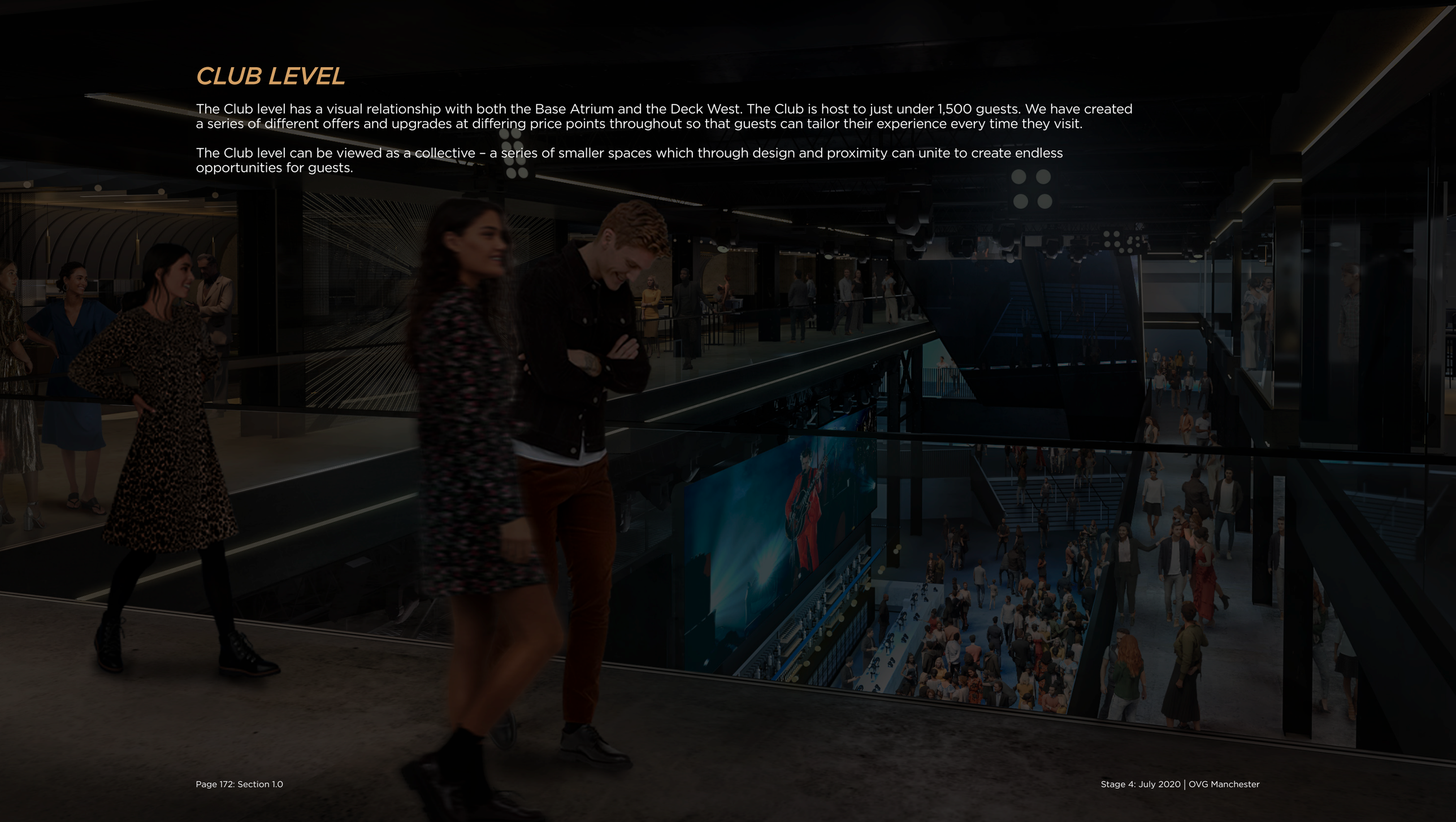


1.5.49 Club ££££ - ££££

CLUB LEVEL

The Club level has a visual relationship with both the Base Atrium and the Deck West. The Club is host to just under 1,500 guests. We have created a series of different offers and upgrades at differing price points throughout so that guests can tailor their experience every time they visit.

The Club level can be viewed as a collective – a series of smaller spaces which through design and proximity can unite to create endless opportunities for guests.



1.5.50 Club - Overview

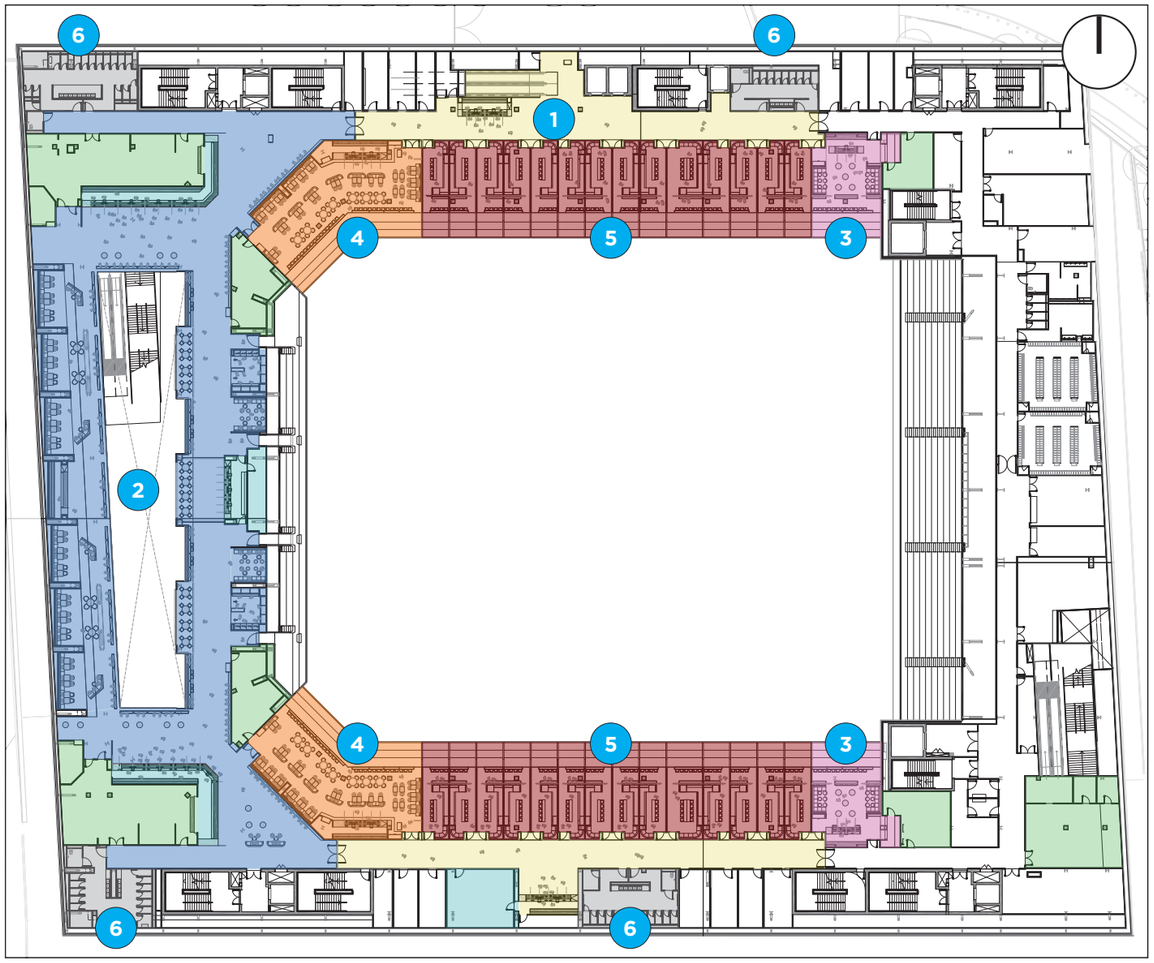
Concept / Approach

The Club space re-imagines existing connotations of hospitality – previously solitary spaces which did not allow for much socialising or progression within the level.

Level 02 is envisaged to operate as a collection of clubs. We have created a series of destinations within Level 02 – the large Atrium Lounge, four Loge Clubs and variety of sizes of private boxes.

Within the Atrium Lounge, we offer a wide variety of bars, grab-and-go outlets and four catering options at entry level. Upgradeable elements, such as casual dining, allow club members the ability to tailor their experience on an event-by-event basis, creating more destinations and driving more revenue.

Pre and post-show, all Level 02 guests will have access to the Atrium Lounge.



KEY:

1. Entrance - Event Day
2. Atrium Lounge (£££)
3. Loge East & South (£££+)
4. Loge North & West (££££)
5. Boxes (££££)
6. WC

CLUB OVERVIEW:

	area	capacity	area / P
ATRIUM LOUNGE	1676m²	682	2.4m² / P
LOGE EAST & SOUTH	158m²	108	1.5m² / P
LOGE NORTH & WEST	402m²	244	1.6m² / P
BOXES	880m²	464	1.9m² / P
BOX LOBBY	625m²	--	--
WC	297m²	--	--

1.5.51 Atrium Lounge ££££

THE CLUB

The Atrium Lounge in the West is the largest club space within the building. Guests will arrive via door A & B and take lift/escalator up to level 02. Conceptually, the space was conceived to be a lively lounge with multiple food and beverages available.

The floor and soffit finishes from the Base Atrium are continued here to create visual cohesion, and help to contrast some of the more higher-end finishes used at the bar areas. At entry level, the space has two large bars and kitchens as well as two self-checkout markets and a volume bar. The markets and volume bar are adjacent to the vomitories on the eastern side of the void, to allow guests quick access to drinks during a show.

The two large bar and kitchens on the northern and southern side of the void will provide guests with cocktails and fresh cooked food. Fans can order food at the bar and collect from the collection point. Similarly, an ordering app will be developed for food.

We have concentrated drink shelves and high tables with stools around the void to encourage interaction. Drink shelves have a modesty screen within the design.

On the western side of the void we have created a series of spaces for upgrade dining. This will allow guests to pre-book tables in advance of a show and provide a designated seating area. All food will come from the north and south kitchens and drinks will be table service for a dispense bar in the west.

The toilets are ungendered which sends a message of equality and inclusion. The darker aesthetic with green accents is carried through into here.

1.5.52 Atrium Lounge

CAPACITY

Overall Level 2 Capacity: 1498 guests
Atrium Lounge Capacity: 682 guests at 2.4 sqm / Person

LOCATION

Level 02 West

VIP PARKING

N/A

ACCESS

Door A & B - Ground Floor North VIP Entrance

GUEST JOURNEY

Arrival: GF North VIP Entrance adjacent to Sports City Way
Arrival: Escalator to Level 02 north, escorted to Atrium Club.

CATERING

Concept: Plates to Share and Feature Bar(s)



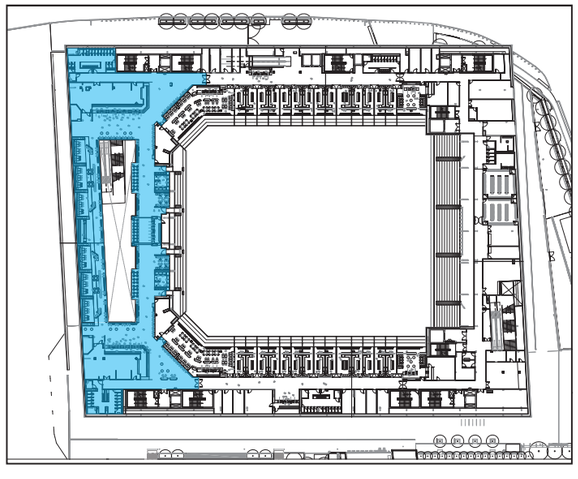


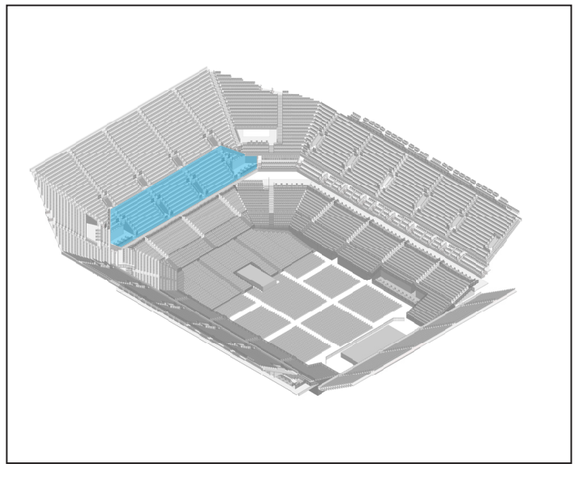
BOWL SEATING

Front of Upper Tier

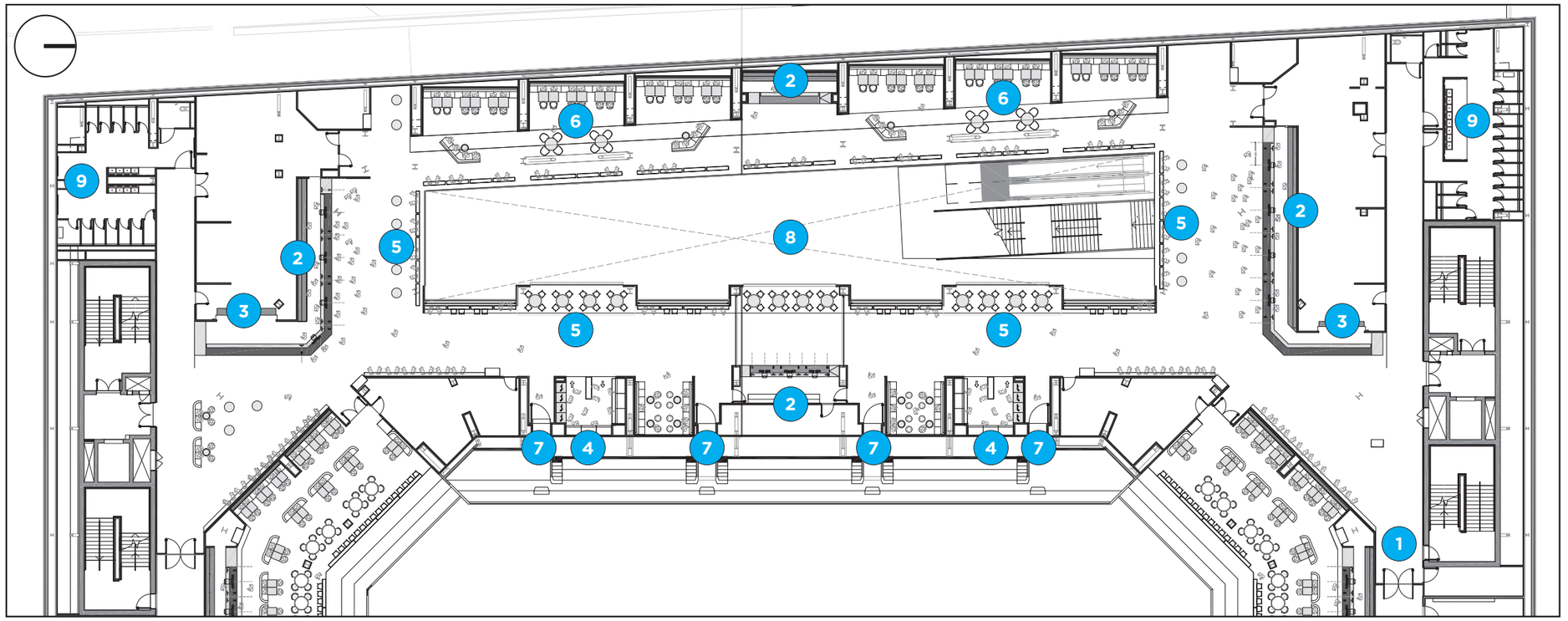
COMMERCIAL OPPORTUNITY







1.5.53 Atrium Lounge - Plan



KEY:

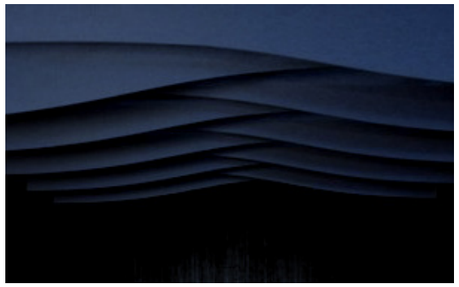
1. Entrance - Event Day
2. Bar
3. Kitchen & Collect
4. Grab & Go Market
5. Standing / Dwell
6. Upgrade Dining
7. Vomitory
8. Void Space
9. WC

Club Overview:

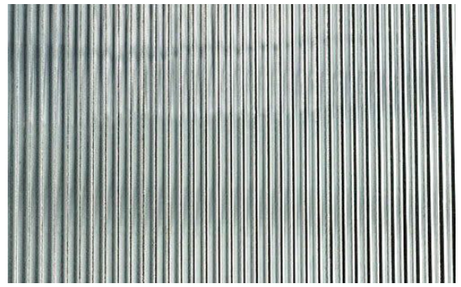
	area	capacity	area / P
LOUNGE (inc FFE)	1676m²	578	2.5m² / P
UPGRADE DINING	--	104	--

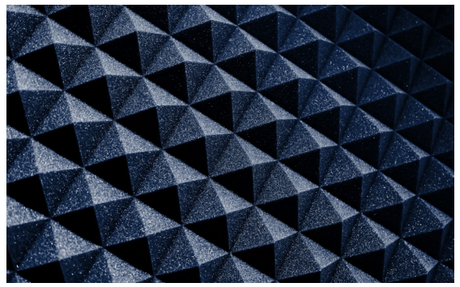
1.5.54 Atrium Lounge - Material Palette

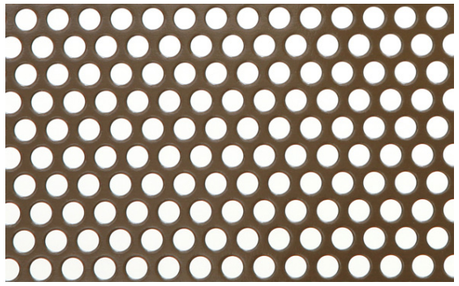

BLACKED OUT EXPOSED SOFFIT - PT-141


SLATTED SOFFIT - CLG-601


MIRROR - CLG-843

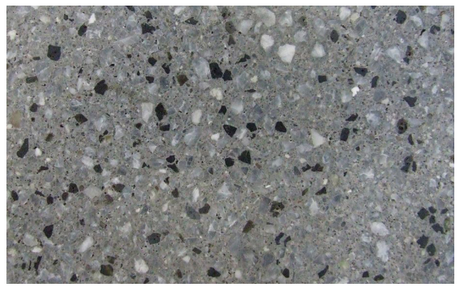

FLUTED GLASS GANTRY - AM-213


ACOUSTIC TREATMENTS - LIN-921

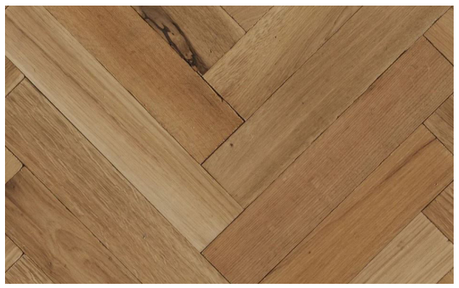

PERFORATED METAL - LIN-335


TIMBER PANELLING - LIN-107


TERRAZZO - LIN-635


CONCRETE FLOOR - CON-201


HERRINGBONE TILE - FL-731


TIMBER FLOORING - FL-801


CARPET - FL-651


STONE COUNTER TOPS - VARIOUS CODES


SATIN BRASS ACCENTS -VARIOUS CODES


LEATHER - VARIOUS CODES


LEATHER - VARIOUS CODES

1.5.55 Atrium Lounge - Looking North



1.5.56 Atrium Lounge - East Side



1.5.57 Atrium Lounge - East Side Lounge and Market



1.5.58 Atrium Lounge - Market Design



1.5.59 Atrium Lounge - Bar and Kitchen



1.5.60 Atrium Lounge - West Side Upgrade Dining



1.5.61 Loge East and Loge South ££££

THE VIP BAR

The Loge East and Loge South are viewed as an extension of the Atrium Lounge, conceptually as a VIP bar. The spaces are smaller and intimate with 54 guests in each. The space visually looks like a VIP bar with a feature bar, dramatic illuminated back bar display, catering area for food preparation and a sociable mixing space within.

The space has two banquette seating areas which are lined on three sides with lighting and mirrors to create an infinity mirror effect. This is to engage with the guests and potential sponsorship opportunities with social media.

Unlike other spaces which have designated seating on the mid-tier, these Loge clubs are not open to the hall. This is to encourage the constant use of the space pre and post-show, and to allow the club space to be fully operational during a show.

The drink shelves within the terrace have been designed with a retractable leg and demountable top so any wheelchair users can equally enjoy the show from level 02.

1.5.62 Loge East and Loge South - Overview

CAPACITY

Overall Level 2 Capacity: 1498 guests
Loge East & South Capacity: 108 guests at 1.5 sqm / Person

LOCATION

Level 02 East & South

VIP PARKING

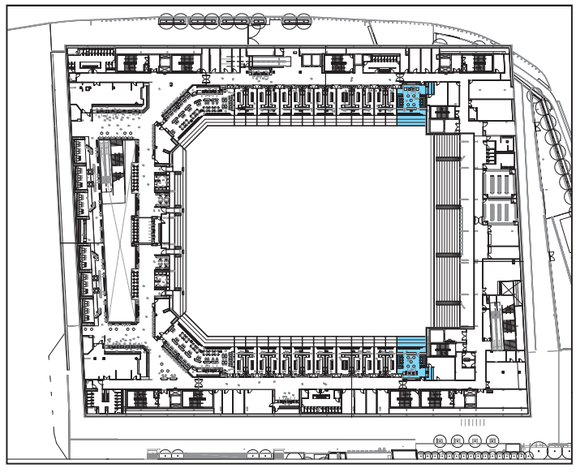
N/A

ACCESS

Door A & B - Ground Floor North VIP Entrance

GUEST JOURNEY

Arrival: GF North VIP Entrance adjacent to Sports City Way
Arrival: Escalator to Level 02 north, escorted to Loge Club.



CATERING

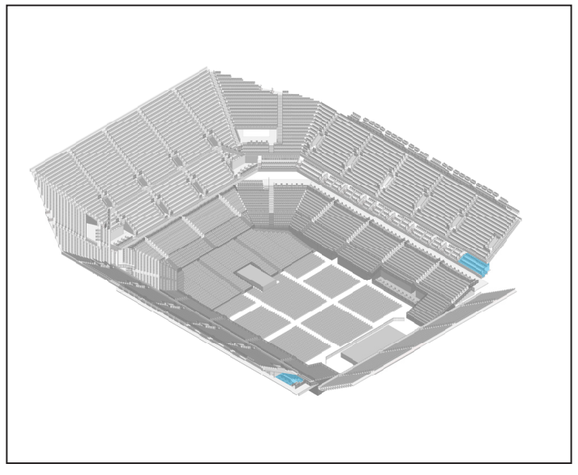
Concept: Plates to Share and Feature Bar(s)



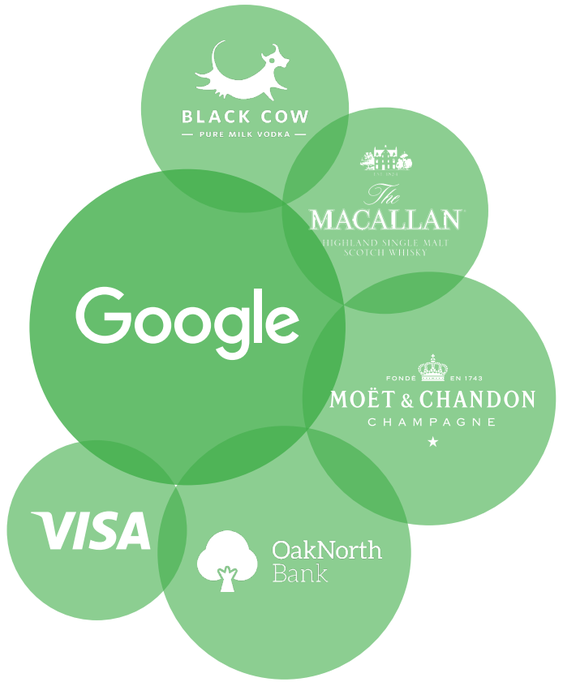


BOWL SEATING

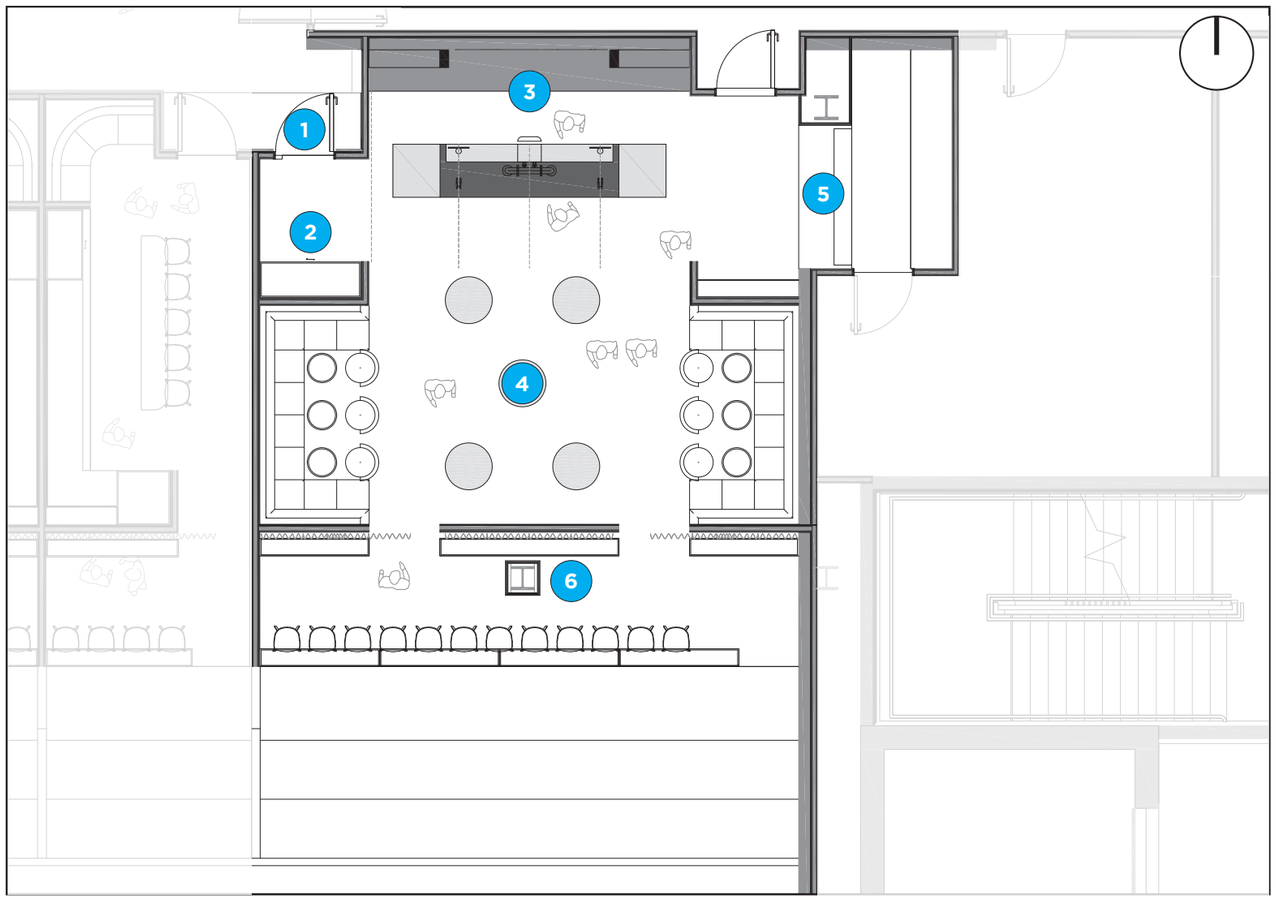
Mid Tier



COMMERCIAL OPPORTUNITY



1.5.63 Loge East and Loge South - East Plan



Plan Loge East

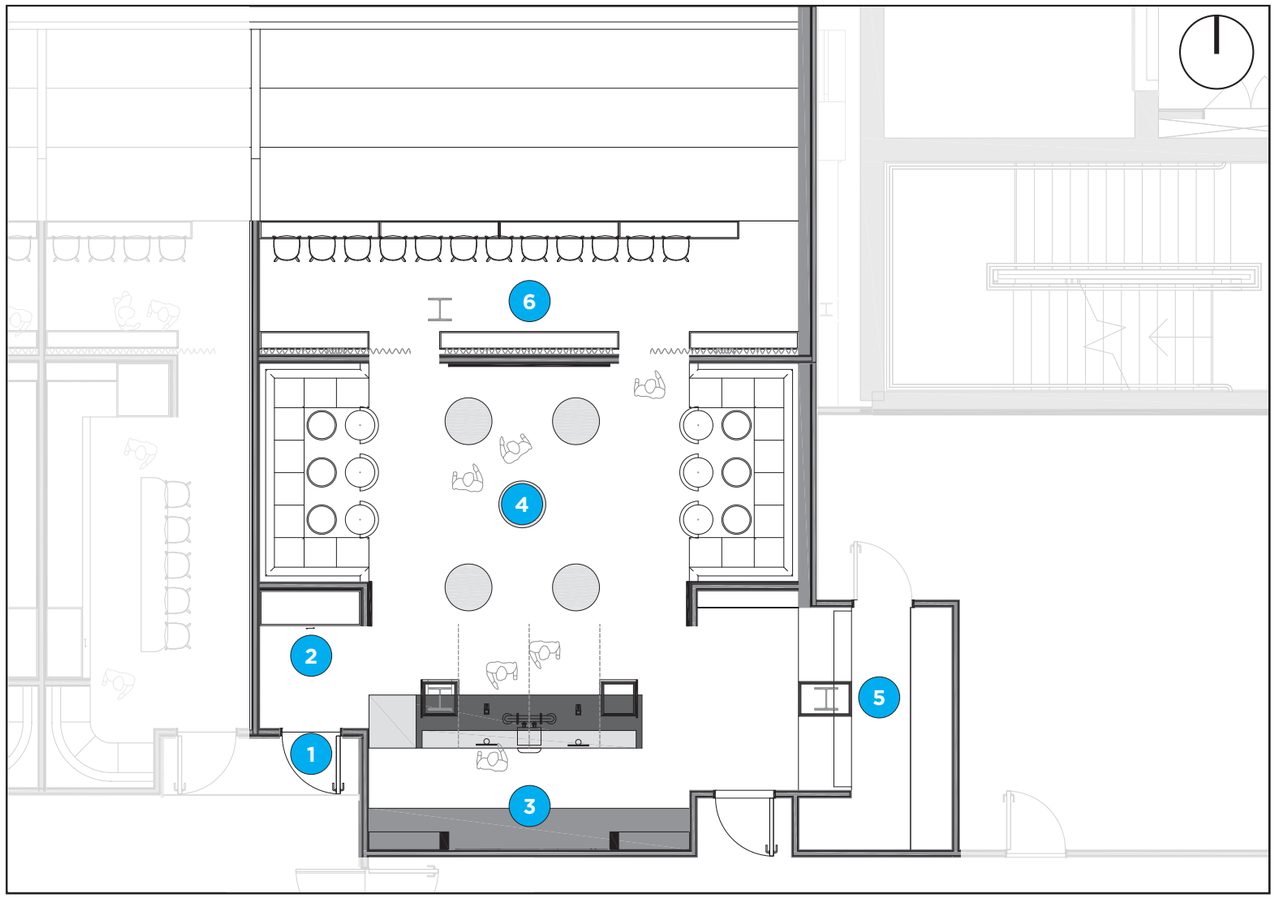
KEY:

1. Entrance - Event Day
2. Coat Storage
3. Bar
4. Lounge
5. Catering Support
6. Terraced Seating

Club Overview:

	area	capacity	area / P
LOGE EAST (inc FFE)	83m²	54	1.5m² / P

1.5.64 Loge East and Loge South - South Plan



Plan Loge South

KEY:

1. Entrance - Event Day
2. Coat Storage
3. Bar
4. Lounge
5. Catering Support
6. Terraced Seating

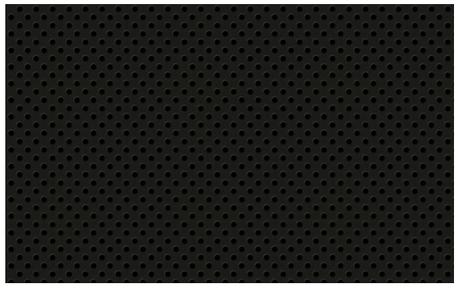
Club Overview:

	area	capacity	area / P
LOGE SOUTH (inc FFE)	75m²	54	1.4m² / P

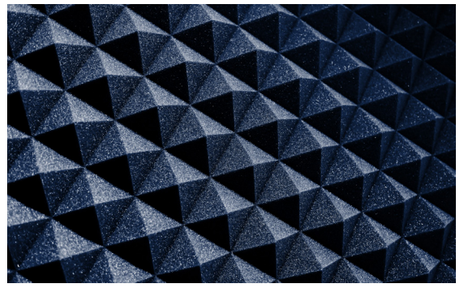
1.5.65 Loge East and Loge South - Material Palette



BLACKED OUT EXPOSED SOFFIT - PT-141



PERFORATED PLASTERBOARD - CLG-611



ACOUSTIC TREATMENTS - LIN-921



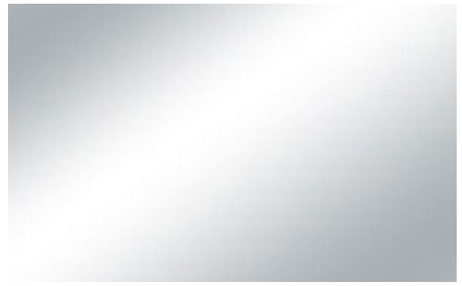
PAINT FINISH - PT-103



MIRROR TILE - LIN-211



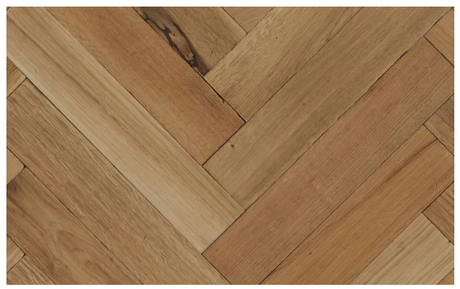
LEATHER PANELLING - LIN-931



MIRROR - LIN-205



SKIRTING - TRM-601



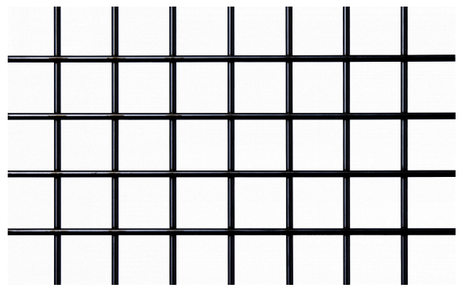
TIMBER FLOORING - FL-801



STONE COUNTER TOP - FX-458



LAMINATE COUNTER FRONT - FX-458



SQUARE WELDED WIRE MESH PANEL - FX-458



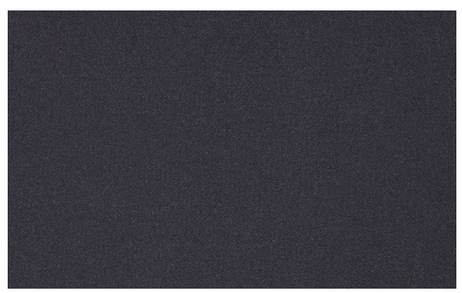
TILE - FX-463



FABRIC UPHOLSTERY - VARIOUS CODES



LEATHER - VARIOUS CODES



CURTAINS - FX-115

1.5.66 Loge East and Loge South - Bar View



1.5.67 Loge East and Loge South - Lounge View



1.5.68 Loge East and Loge South - Infinity Mirror



1.5.69 Loge North and Loge West ££££

THE 'ANTI RESTAURANT' RESTAURANT

The Loge North and Loge West are viewed as an extension of the Atrium Lounge, functioning as a dining and restaurant space. The spaces are smaller and intimate with 122 guests in each. This is the only offer within the building where dining is the primary driver - by comparison to other arena's, this is our 'traditional' high end dining restaurant within the building.

We began by imagining how the space could work, as a contemporary take on a 'supper club' which is all about social interactions.

We wanted to move away from the preconceptions of what this would typically look like and take the palette of materials found within a traditional gentleman's clubs and use them in a different way. We wanted to give the space an irreverent personality – making it more fun and quirkier, harnessing the 'northern charm' into something that was tangible, creating a little anarchy along the way.

This became the 'anti restaurant' restaurant.

The interior space is completely open to the Hall so we are using perforated plasterboard throughout, with a dark paint finish. This creates a calming backdrop for the dramatic fresco-style backlit soffit, complete with golden-gilded frames and mirrors. The soffit is accented by pink up-lighting to create the true feature in the space. Informal dining on sofas and banquettes are found throughout.

The space is was not perceived to compete with other arena and stadia hospitality, but rather as a destination that rivals the best restaurants found within the city centre.

The drink shelves within the terrace have been designed with a retractable leg and demountable top so any wheelchair users can equally enjoy the show from level 02.

1.5.70 Loge North and Loge West - Overview

CAPACITY

Overall Level 2 Capacity: 1498 guests
North & West Loge Capacity: 244 guests at 1.6 sqm / Person

LOCATION

Level 02 North & West

VIP PARKING

Yes

ACCESS

Door A & B - Ground Floor North VIP Entrance

GUEST JOURNEY

Arrival: GF North VIP Entrance adjacent to Sports City Way
Arrival: Escalator to Level 02 north, escorted to Loge Club.

CATERING

Concept: Plates to Share and Feature Bar(s)

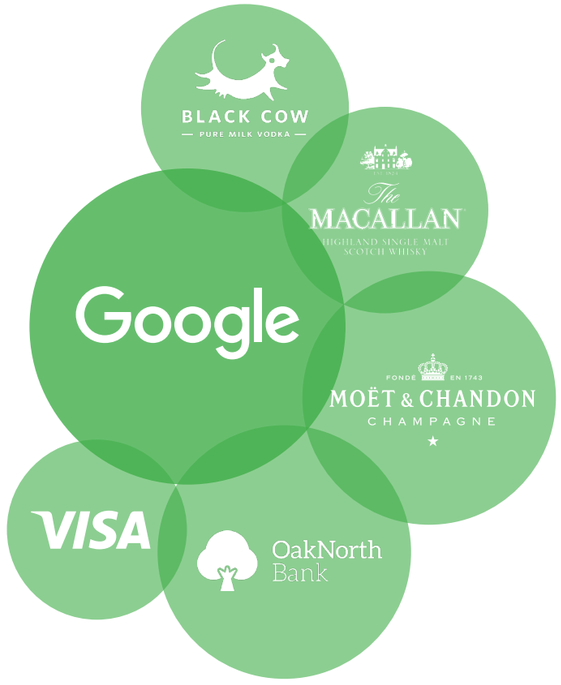


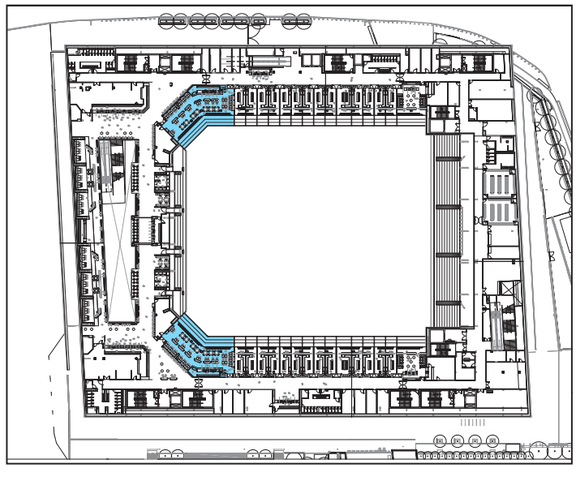


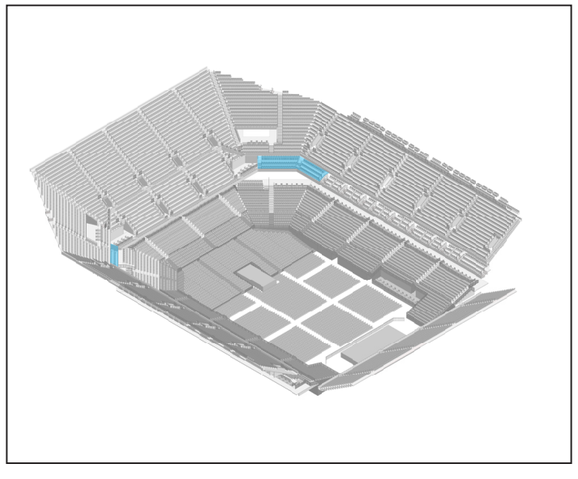
BOWL SEATING

Mid Tier

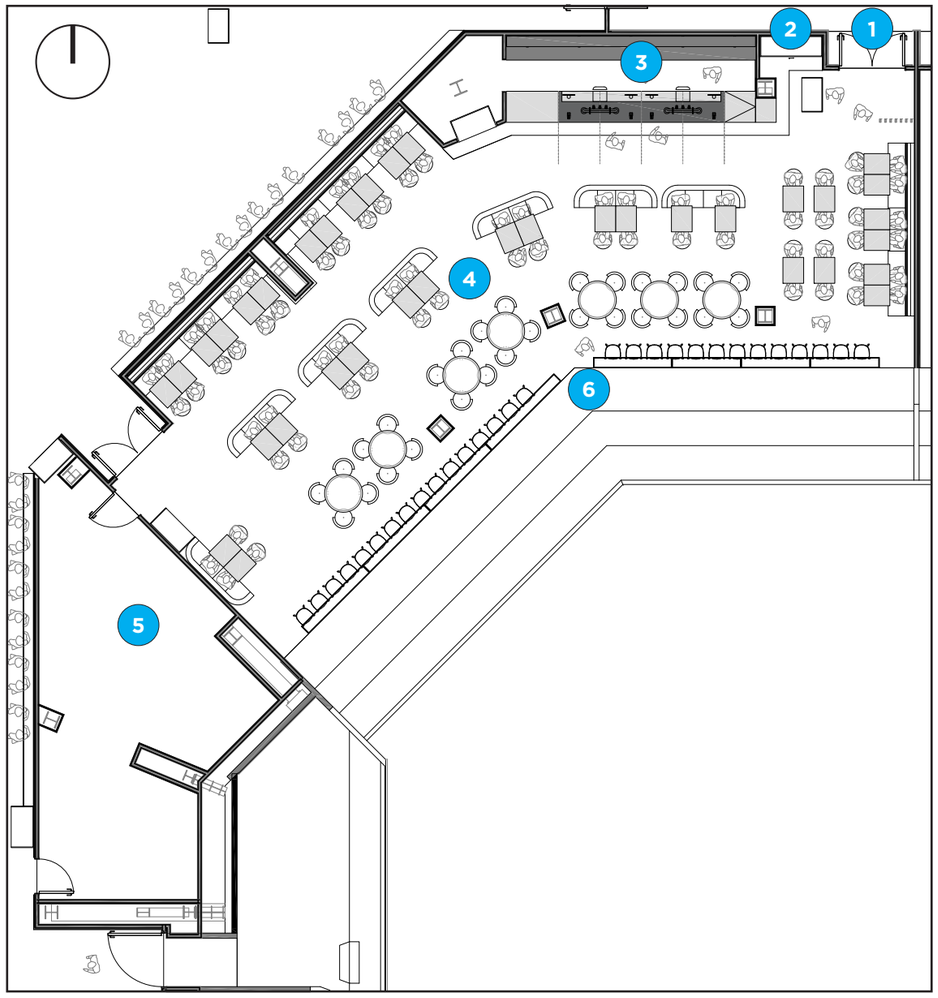
COMMERCIAL OPPORTUNITY



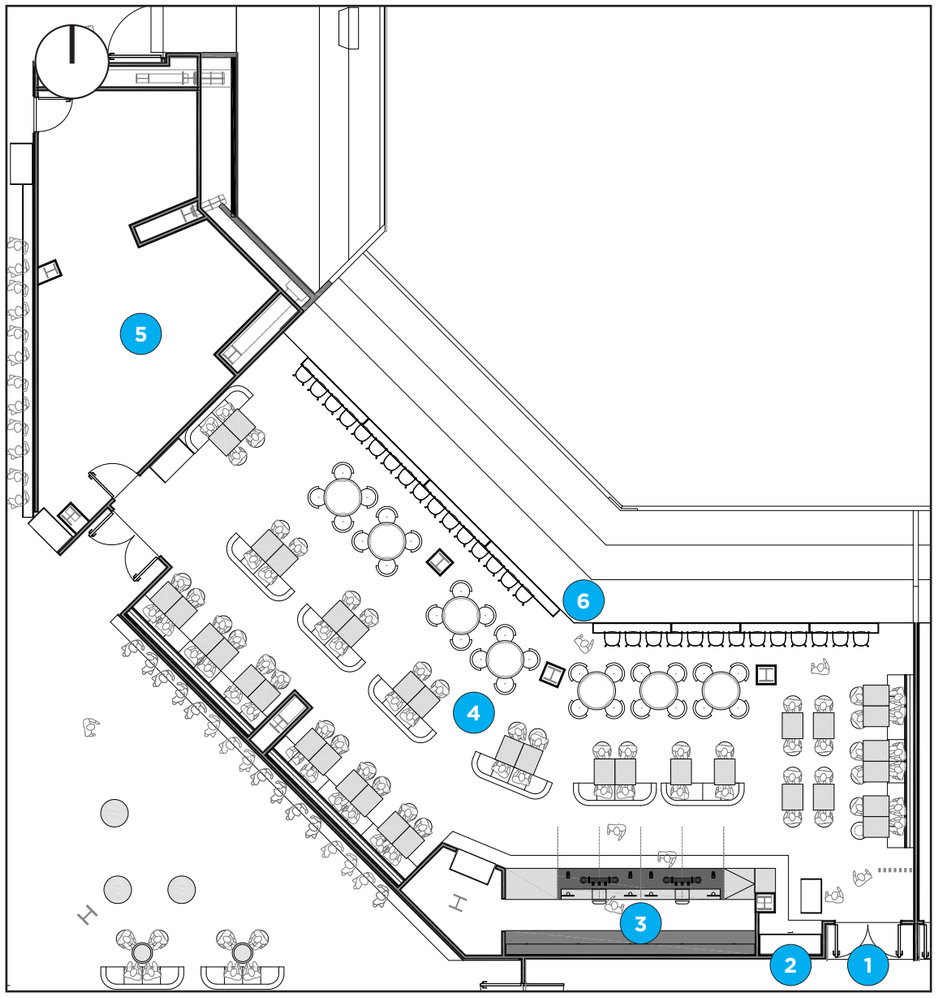




1.5.71 Loge North and Loge West - Plan



Plan above is Loge North



Plan above is Loge West

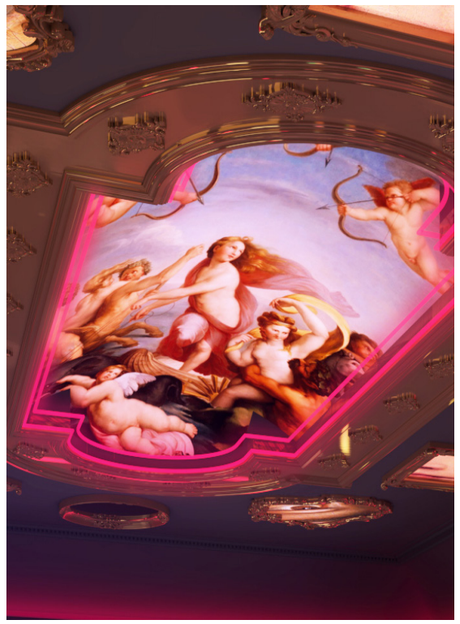
KEY:

1. Entrance - Event Day
2. Coat Storage
3. Bar
4. Lounge
5. Catering Support
6. Terraced Seating

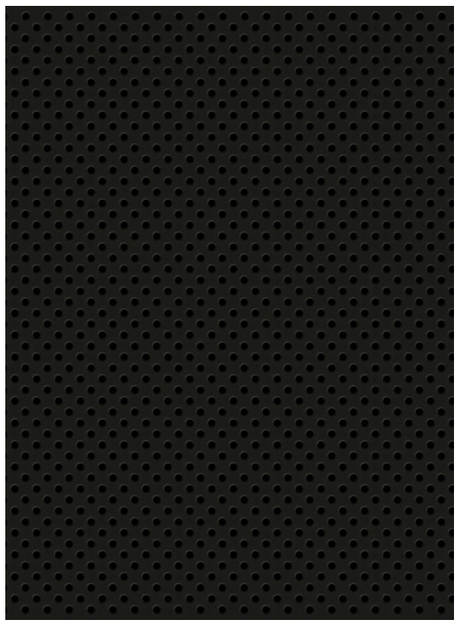
Club Overview:

	area	capacity	area / P
LOGE NORTH (inc FFE)	201m²	122	1.6m² / P
LOGE WEST (inc FFE)	201m²	122	1.6m² / P

1.5.72 Loge North and Loge West - Material Palette



FEATURE SOFFIT - CLG-851



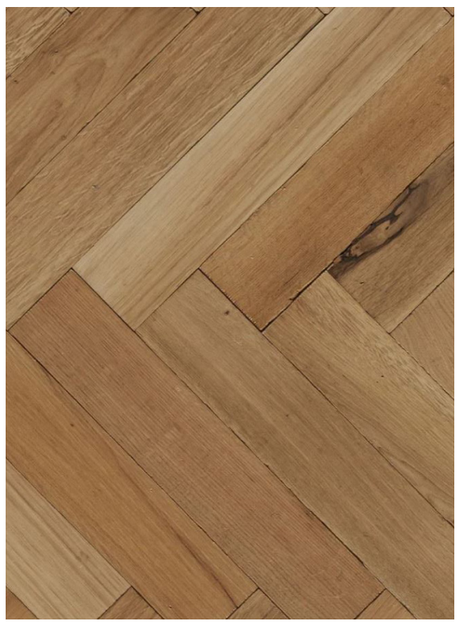
ACOUSTIC PLASTERBOARD - CLG-111



PROVOCATIVE ARTWORK



PAINT FINISH - PT-103



TIMBER FLOOR - FL-801



STONE COUNTER TOP - FX-456

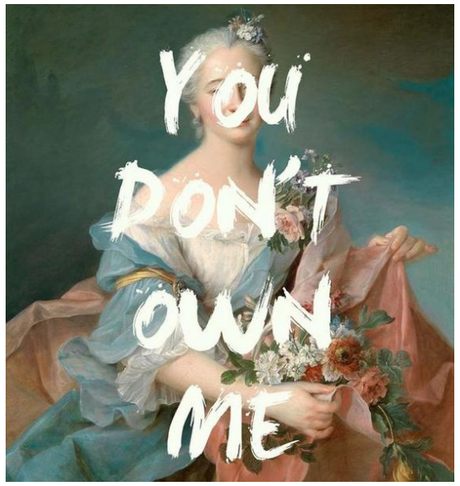


LEATHER - VARIOUS CODES



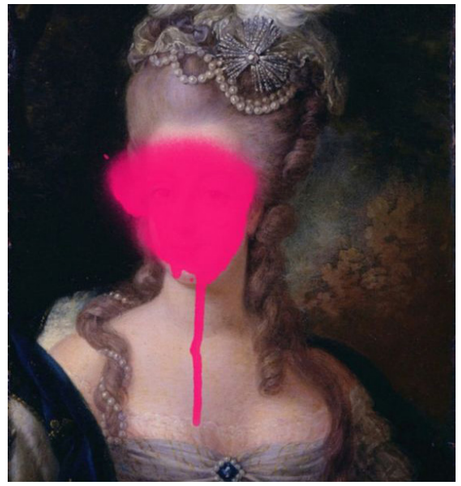
SATIN BRASS ACCENTS - VARIOUS CODES

1.5.73 Loge North and Loge West - Concept



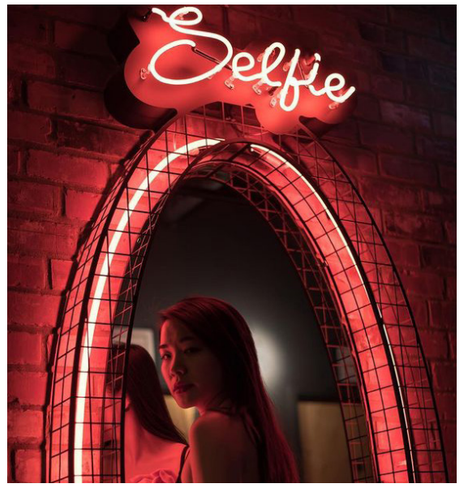














Moving away from the preconceptions of premium hospitality and create a space with an cheeky and irreverent personality

1.5.74 Loge North and Loge West - Terrace View

1.5.75 Loge North and Loge West - Pre-Show

1.5.76 Loge North and Loge West - During Show



1.5.77 Loge North and Loge West - Pre-Show

1.5.78 Loge North and Loge West - During Show



1.5.79 Boxes ££££

THE PRIVATE CLUB

Throughout the north and south we have a total of 28 boxes: 26no. are 16-person capacity and 2no. are 24-person capacity. Guests have access to the Atrium Lounge pre and post-show, with both the north and south having a dedicated bar for early/first arrivals.

Conceptually, we wanted the boxes to read as private clubs for friends and colleagues alike to enjoy. At an early stage we purposely moved away from what is common on the market – boxes fully open to the seating bowl and stage. We gave more space behind the drink shelves within the mid-tier (for socialising and dancing) and created a wall between the Hall and the Box. This is to encourage guests to use the Box throughout the show and create more social interactions rather than sitting in your seat waiting for a show to start.

Now when guests enter the Box they see the 'booze wall' – glass fronted fridges and display. The finishes are simple with a feature timber soffit and a terrazzo splashback and counter top. Catering will be delivered to the Boxes and displayed on the counter.

The drink shelves within the terrace have been designed with a retractable leg and demountable top so any wheelchair users can equally enjoy the show from level 02.

1.5.80 Boxes - Overview

CAPACITY

Overall Level 2 Capacity: 1498 guests
Total Box Capacity: 464 guests at 1.9 sqm / Person

LOCATION

Level 02 North and South

VIP PARKING

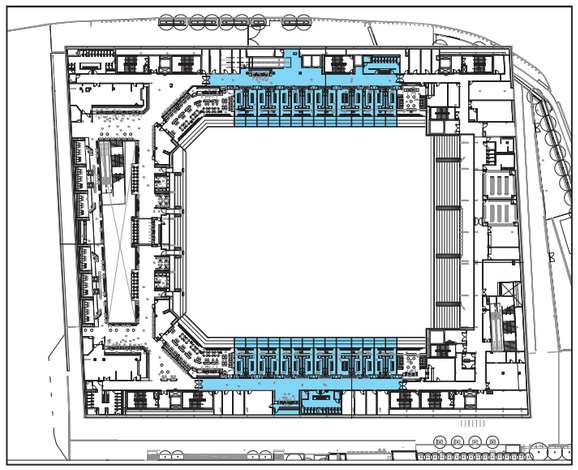
Yes

ACCESS

Door A & B - Ground Floor North VIP Entrance

GUEST JOURNEY

Arrival: GF North VIP Entrance adjacent to Sports City Way
Arrival: Escalator to Level 02 north, escorted to Boxes.



CATERING

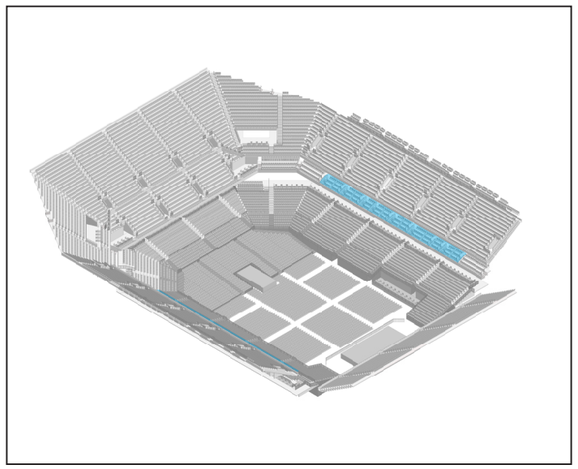
Concept: Plates to Share and Feature Bar(s)





BOWL SEATING

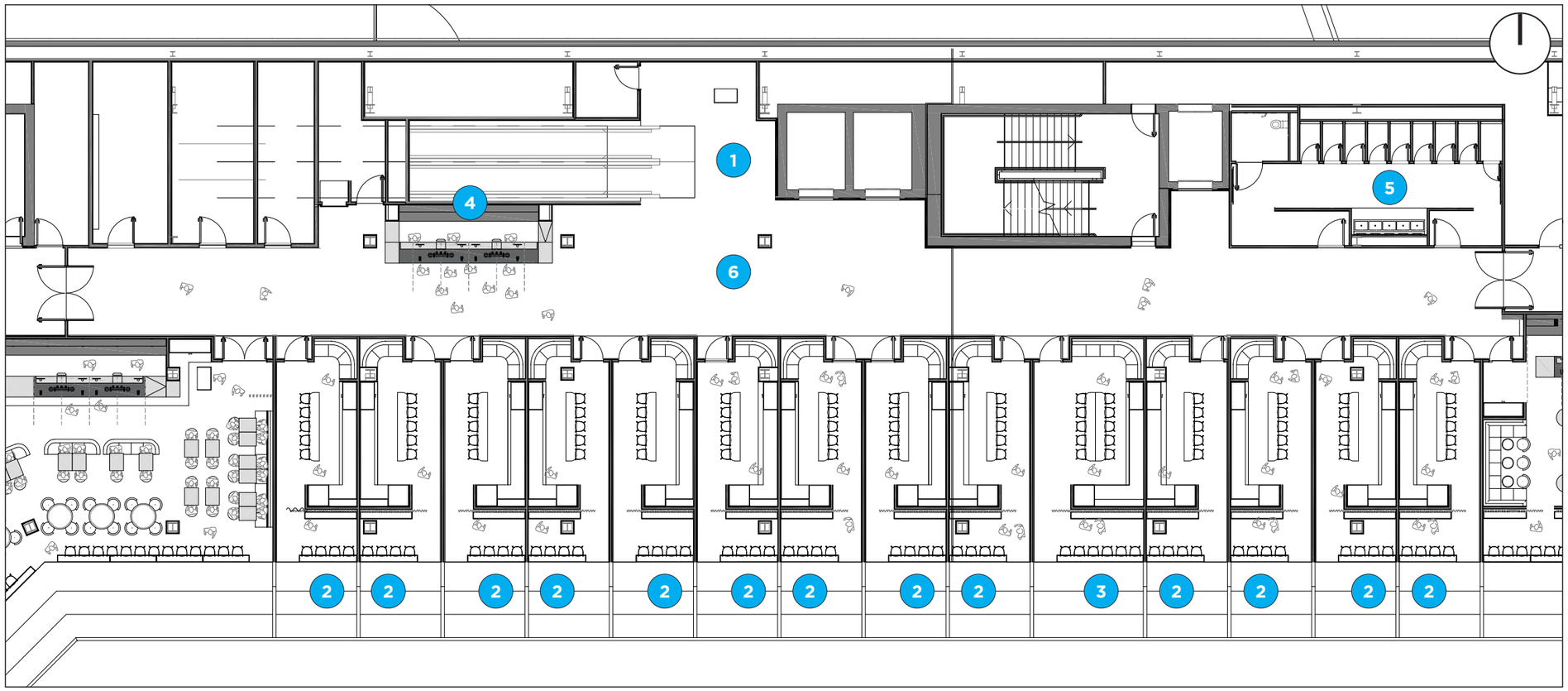
Mid Tier



COMMERCIAL OPPORTUNITY



1.5.81 Boxes - North Plan



North Box Plan

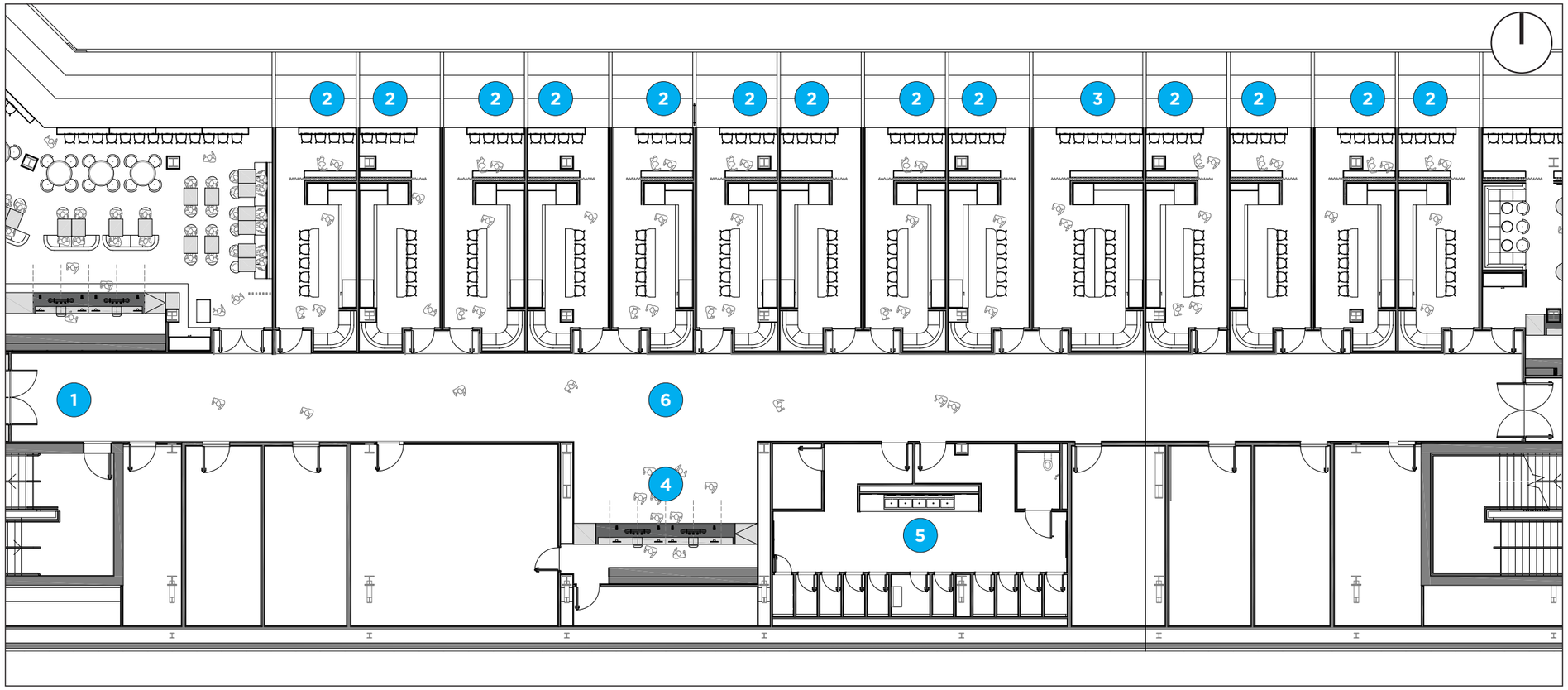
KEY:

1 Entrance - Event Day
2 Small Box
3 Large Box
4 North Box Bar
5 WC
6 North Lobby

North Box Overview:

	area	capacity	area / P
SMALL BOX (13NO.)	30m²	16	1.9m² / P
LARGE BOX (1NO.)	43m²	24	1.8m² / P

1.5.82 Boxes - South Plan



South Box Plan

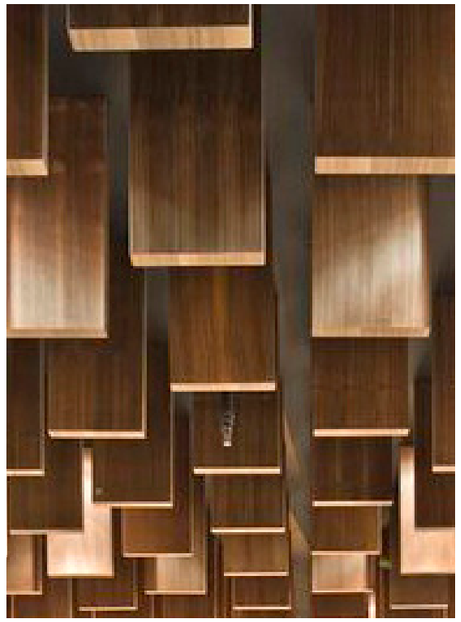
KEY:

1. Entrance - Event Day
2. Small Box
3. Large Box
4. South Box Bar
5. WC
6. South Lobby

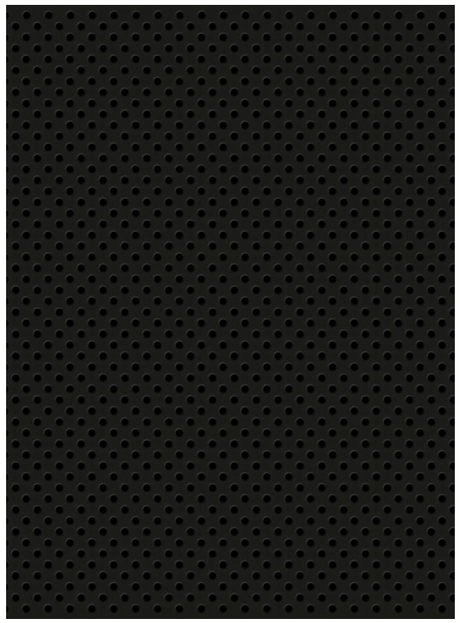
South Box Overview:

	area	capacity	area / P
SMALL BOX (13NO.)	30m²	16	1.9m² / P
LARGE BOX (1NO.)	43m²	24	1.8m² / P

1.5.83 Boxes - Material Palette



FEATURE SOFFIT - CLG-715



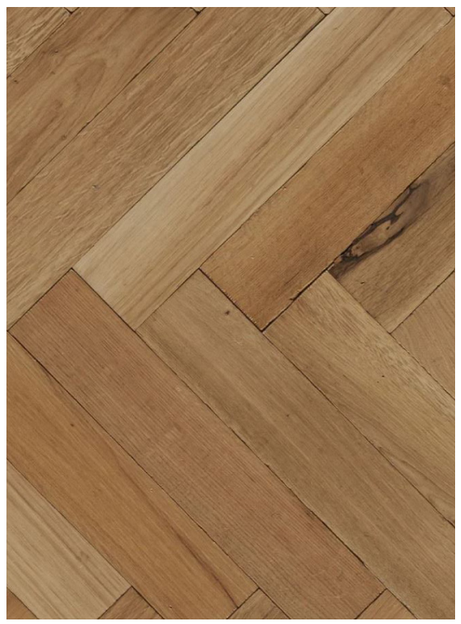
ACOUSTIC PLASTERBOARD - CLG-111



PAINT FINISH - PT-103



ROUNDED TIMBER - LIN-111



TIMBER FLOOR - FL-801



TERRAZZO FLOOR TILE - FL-505



LEATHER - VARIOUS CODES



SATIN BRASS ACCENTS - VARIOUS CODES

1.5.84 Boxes - North Bar Arrival



1.5.85 Boxes - Small Box



1.5.86 Boxes - Large Box

1.5.87 Club - Ungendered WC Design



1.5.88 Club - Ungendered WC Design



1.5.89 Decibel ££££

THE AFTER PARTY

Decibel is perceived as the ultimate after party hot spot within the building. 200 guests will enter via entrance A & B and step down into the club. The concept was to create a club space that has a distinctive pre and post-show transition. Pre-show the space is likened to a trendy bar with semi-private rooms, lounge space, fully stocked bar and small bites available from the adjacent kitchen. Post-show, the space will transform into a club setting complete with a DJ. The freestanding furniture in front of the bar will be removed to create a dance floor. The look and feel is that of a bunker club with strong red accents throughout.

Within the design we have created contrast by fusing together the industrial finishes found throughout the building with higher-end finishes to make the club feel cool and contemporary. Many of the finishes are darkened and have texture to pick up the light spill.

For the booths and semi-private lounges, we have lowered the soffit height to play with the overall proportions of the space.

The club provides the backdrop for neon-LED branding and mirrors - to engage with the social media conscious guests within.

The washrooms have been designed as ungendered individual WC's complete with terrazzo vanity and illuminated mirrors.

1.5.90 Decibel - Overview

SPACE CAPACITY

Option 01: 200 guests @ 1.6 sqm / Guest
Option 02: 250 guests @ 1.3 sqm / Guest

LOCATION

Ground Floor North

VIP PARKING

Yes

ACCESS

Door A & B - Ground Floor North VIP Entrance

GUEST JOURNEY

Arrival: VIP drop off available, GF North VIP Entrance
Welcome: Escorted to the Decibel Club
Experience 01: Bar, Lounge & Private Seating Areas
Post-Show: Music and Dancing within Decibel

CATERING

Concept: Bowl Food



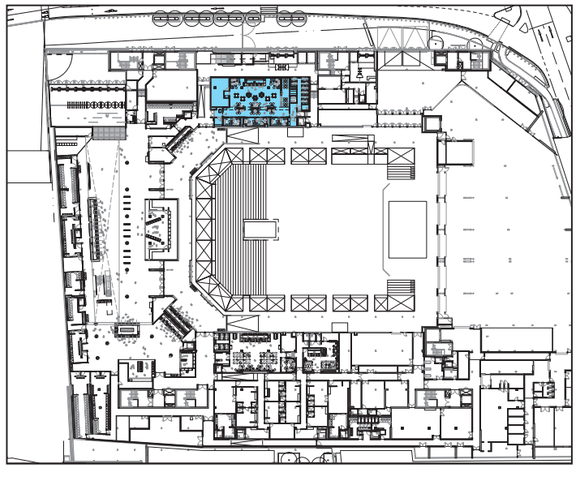


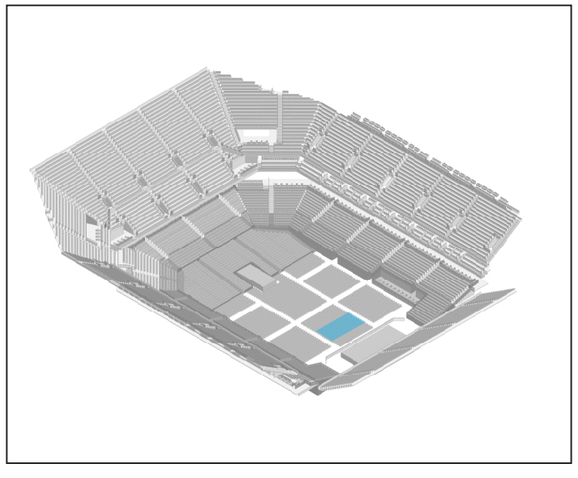
BOWL SEATING

Floor (Seated / Standing) - exact seating location subject to event stage design and floor seating layout - to be agreed between Client and Promoter.

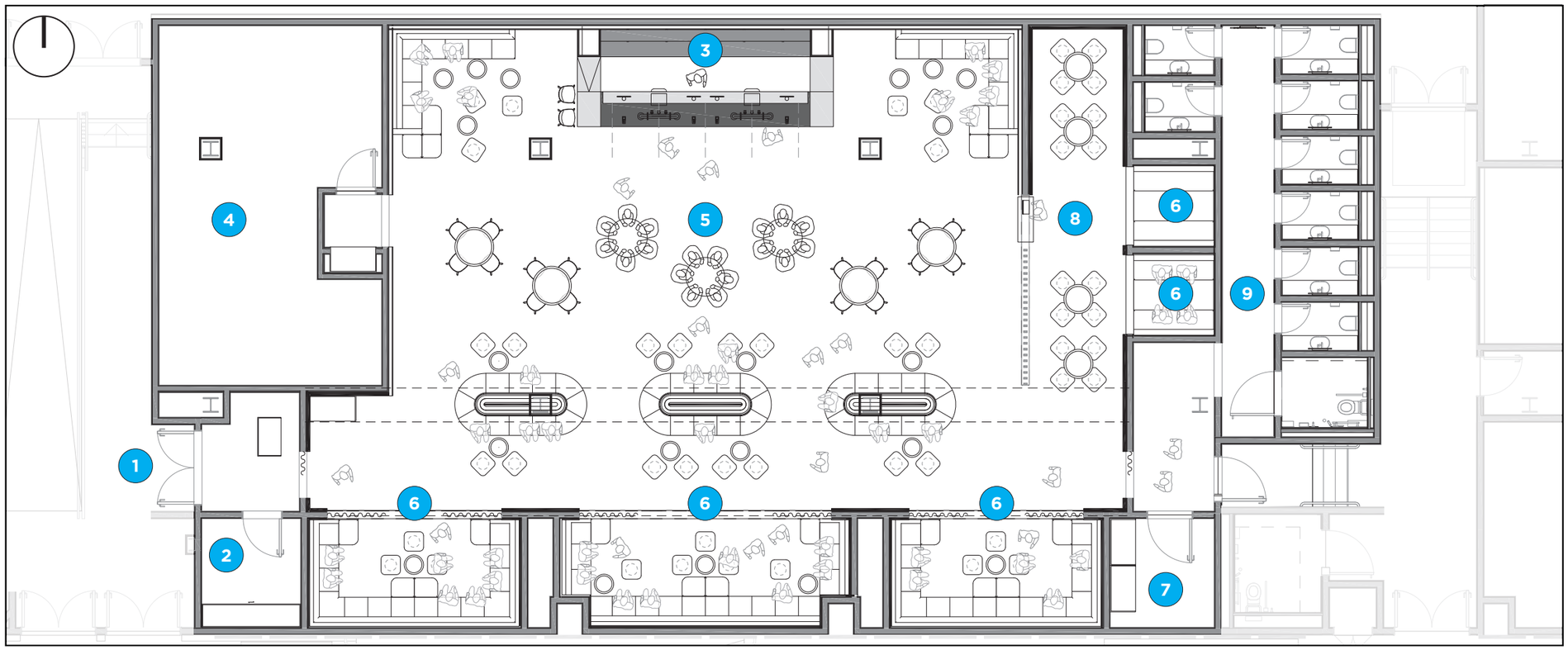
COMMERCIAL OPPORTUNITY







1.5.91 Decibel - Plan



Plan

KEY:

1 Entrance
2 Cloak Room
3 Bar
4 Kitchen
5 Lounge / Flexible Space
6 Semi Private Booth
7 Storage
8 DJ
9 WC

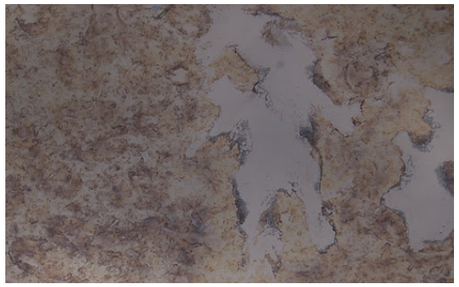
CLUB OVERVIEW:

	area	capacity	area / P
LOUNGE (inc FFE)	317m²	200	1.6m² / P
KITCHEN	49m²	--	--
WC	35m²	--	--

1.5.92 Decibel - Material Palette



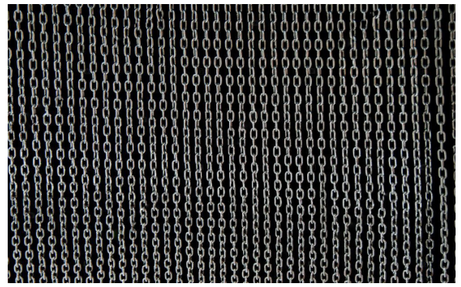
BLACKED OUT EXPOSED SOFFIT - PT-141



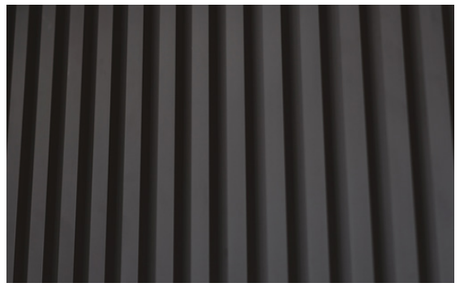
ANTIQUE MIRROR - CLG-841



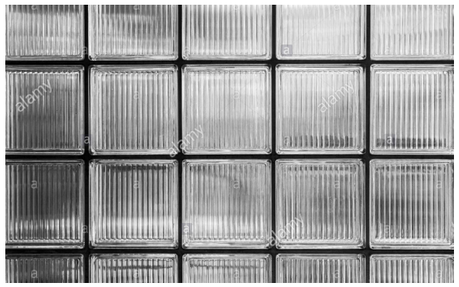
PAINT FINISH - PT-103



GALVANISED CHAIN - AM-505



SLATTED TIMBER - LIN-105



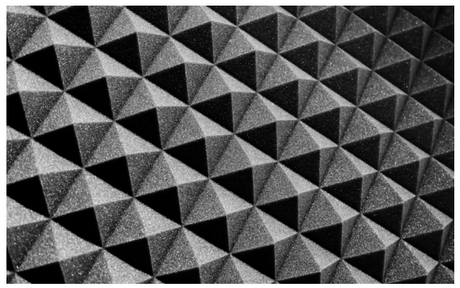
GLASS BRICKS - IWS-801



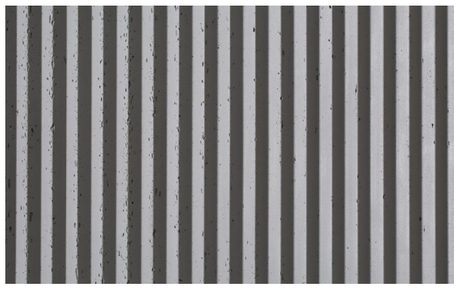
TIMBER PANELLING - LIN-121



MIRROR - LIN-205



ACOUSTIC TREATMENTS - LIN-921



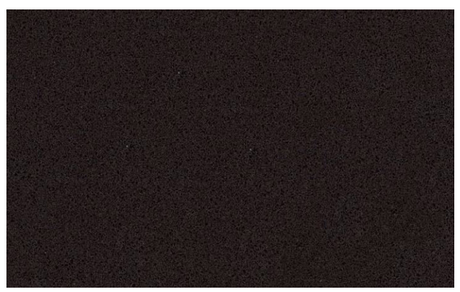
GRC PANEL - LIN-941



TIMBER FLOORING - FL-809



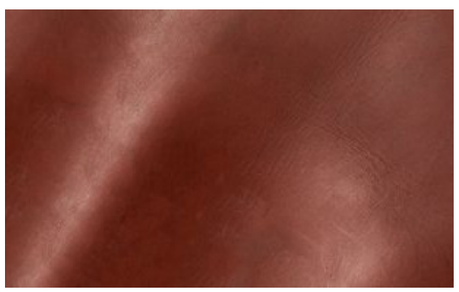
CARPET - FL-651



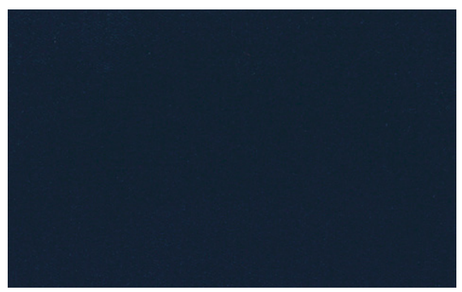
STONE COUNTER TOPS - FX-421



SATIN BRASS ACCENTS -VARIOUS CODES



LEATHER - VARIOUS CODES



VELVET - VARIOUS CODES

1.5.93 Decibel - Post-Show Club



1.5.94 Decibel - Pre-Show Lounge

1.5.95 Decibel - WC Corridor



1.5.96 Decibel - Ungendered WC Design



1.5.97 The Record Room ££££

THE PROMOTER'S AFTER-HOURS LOUNGE

The Record Room is perceived as a small, intimate club predominantly used by the promoters and their invited guests. The design of the space came from the idea of being lost in the music, going so far as to be inside the speaker - the belly of the beast.

Guests can access via door A, but we have also created an alternative route for entry via door E. Guests will be guided down through the back of house areas from level 01 and emerge within the ground floor back of house artist's area. This journey through the back of house will give the invited guests the sense that they have entered an exclusive club, entering through the back. The Green Room, the Hall and the Artist's Dressing Rooms are all within close proximity.

Upon approach, the club is hidden behind a Record Shop. Guests will enter in to the Record Shop where the 'shopkeeper' is actually the maître d' who will take your coat and escort you through the door – conveniently hidden amongst the shelving and display.

The space itself is open with a large bar and lounge area. The finishes are lighter toned compared to the other spaces within the building, reflecting typical finishes found within speakers.

The open-plan space allows for flexibility, with lounges like this often needing to accommodate 3 or 4 larger groups rather than groups of 2's and 4's. The flexibility also allows for a stage to be added for the possibility of an artist's private encore. This space is also part of the 'venue-in-a-venue' concept which allows for a private showcase and intimate album release parties on non-event day.

1.5.98 The Record Room - Overview

SPACE CAPACITY

Guest Area: 225 sqm
Capacity: 100 guests at 2.2 sqm/Person

LOCATION

Ground Floor South

VIP PARKING

Yes

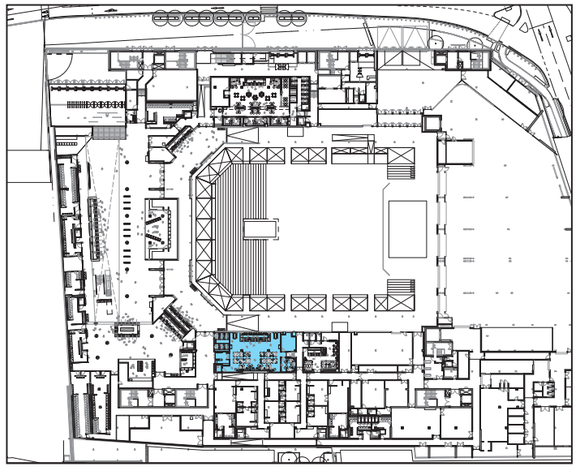
ACCESS

Door A & B - Ground Floor North VIP Entrance, or

Door E - Level 01 South West Entrance

GUEST JOURNEY

Arrival: VIP drop off available, L01 South Entrance
Welcome: Escorted to The Record Room
Experience 01: Arrival at The Record Shop
Experience 02: Club, Informal Dining & Live Music
Post Show: Encore



CATERING

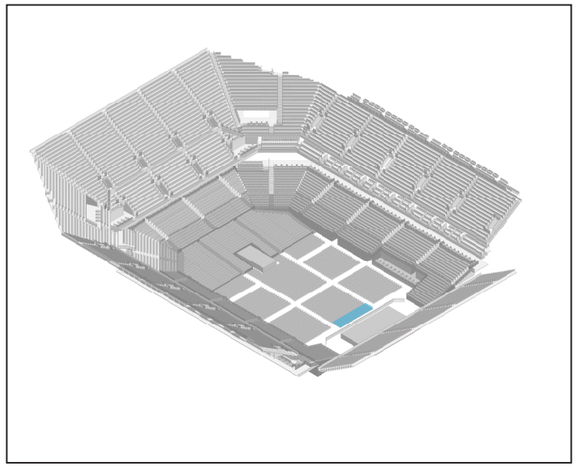
Concept: Trendy Street Food & Sharing Plates (Flexible)





BOWL SEATING

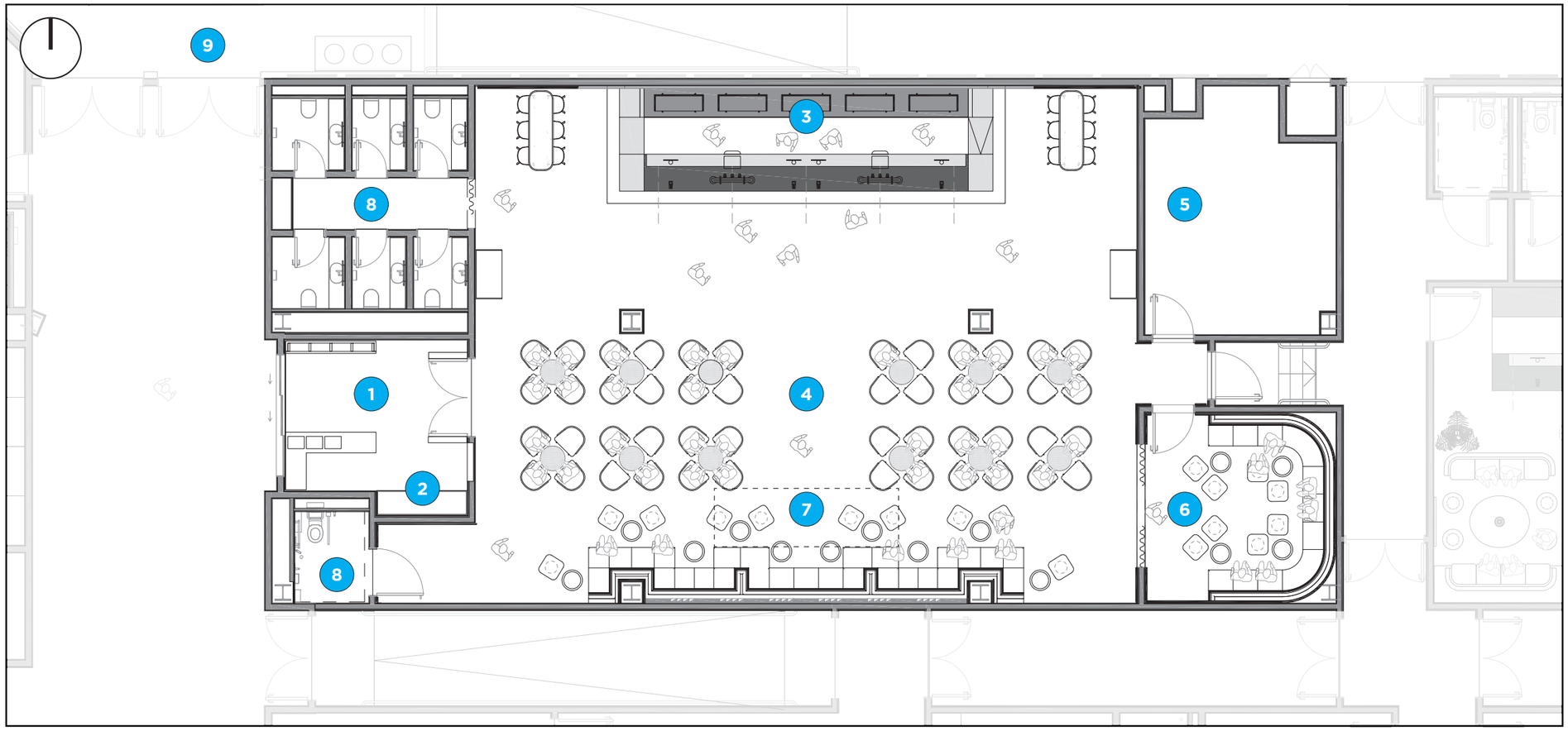
Floor (Seated / Standing) - exact seating location subject to event stage design and floor seating layout - to be agreed between Client and Promoter.



COMMERCIAL OPPORTUNITY



1.5.99 The Record Room - Plan



Plan

KEY:

1. Entrance
2. Cloak Room
3. Bar
4. Lounge
5. Kitchen
6. Semi-Private Booth
7. Temp. Stage Location
8. WC
9. The Hall

CLUB OVERVIEW:

	area	capacity	area / P
LOUNGE (inc FFE)	225m²	100	2.2m² / P
KITCHEN	25m²	--	--
WC	17m²	--	--

1.5.100 The Record Room - Material Palette



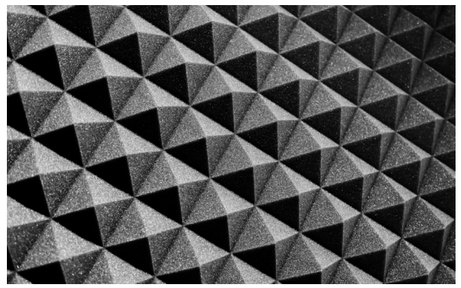
BLACKED OUT EXPOSED SOFFIT - PT-141



FEATURE SOFFIT - CLG-545



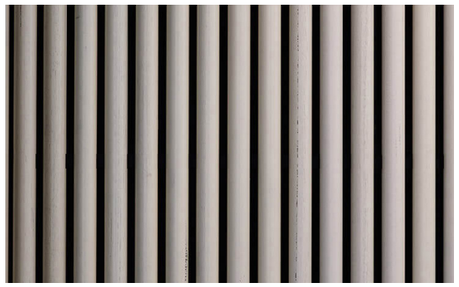
PAINT FINISH - PT-103



ACOUSTIC TREATMENTS - LIN-921



TIMBER SOFFIT - CLG-721



ROUNDED TIMBER SLATS - LIN-155

PLYWOOD PANELLING - LIN-131



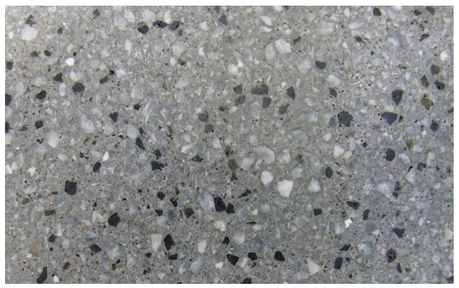
APPLIED VINYL ARTWORK - SGN-511



LEATHER PANELLING - LIN-931



TIMBER WALL LINING - LIN-101



CONCRETE FLOOR - CON-201



WIDE PLANK TIMBER FLOOR - FL-807



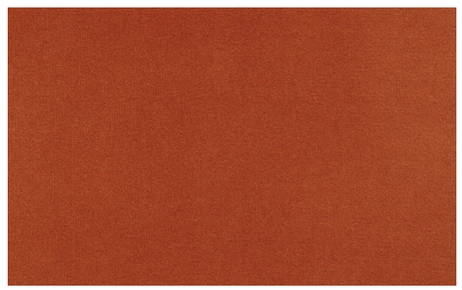
STONE COUNTER TOPS - FX-425



SATIN BRASS ACCENTS -VARIOUS CODES

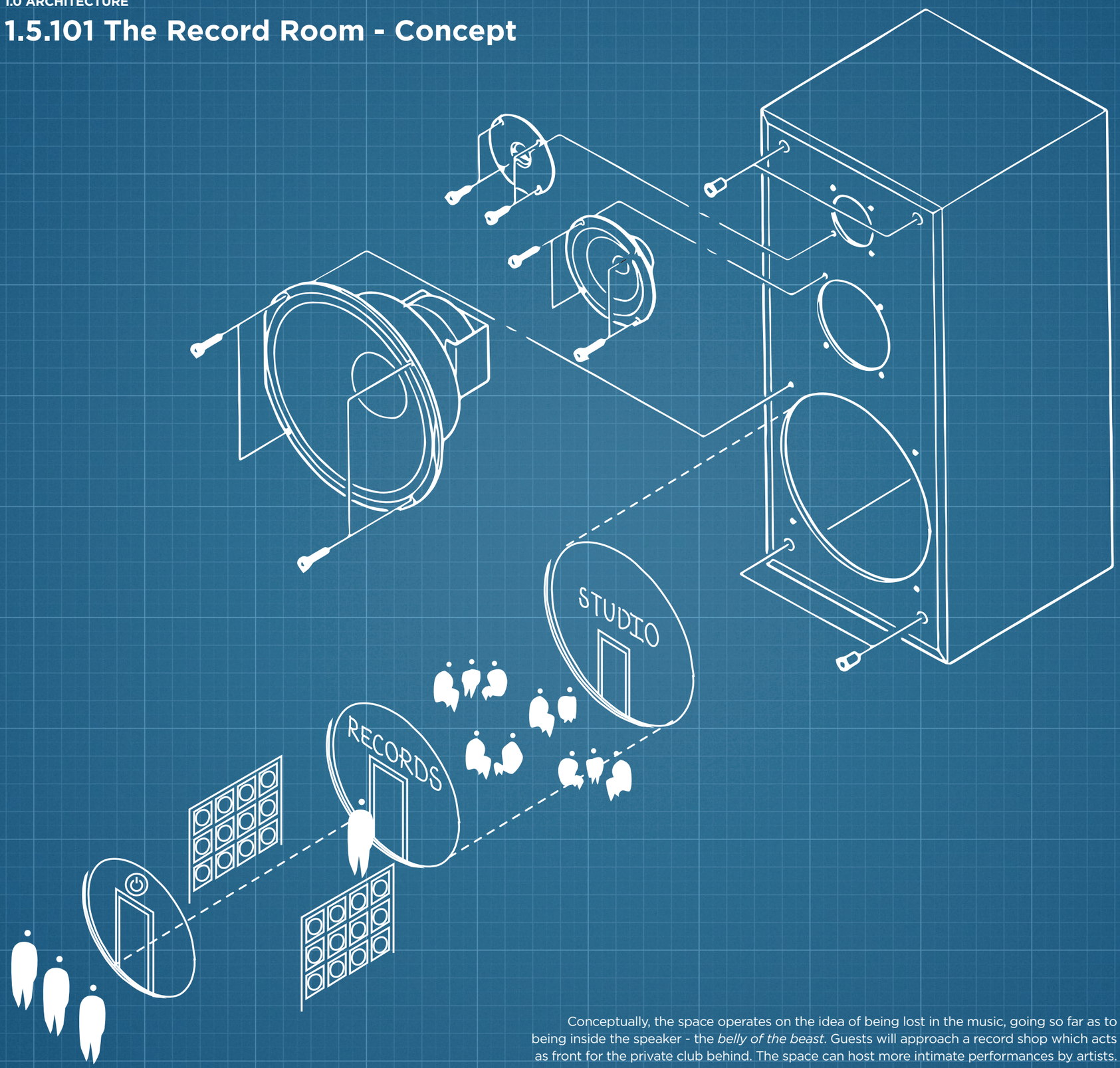


LEATHER - VARIOUS CODES



VELVET - VARIOUS CODES

1.5.101 The Record Room - Concept



Conceptually, the space operates on the idea of being lost in the music, going so far as to being inside the speaker - the *belly of the beast*. Guests will approach a record shop which acts as front for the private club behind. The space can host more intimate performances by artists.

1.5.102 The Record Room - The Record Shop



1.5.103 The Record Room - Bar Pre-Show



1.5.104 The Record Room - Bar Post-Show



1.5.105 The Record Room - Lounge Pre-Show

1.5.106 The Record Room - Lounge Post-Show Encore



1.5.107 User Group 02 - Club Overview

























1.5.108 User Group 02 - Club Overview



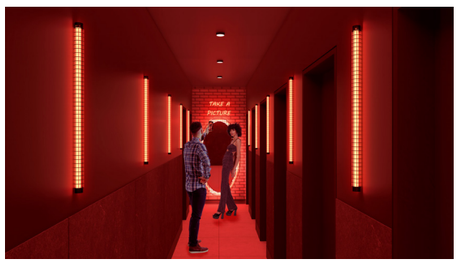
















VENUE FORM AND FACADE

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1.6

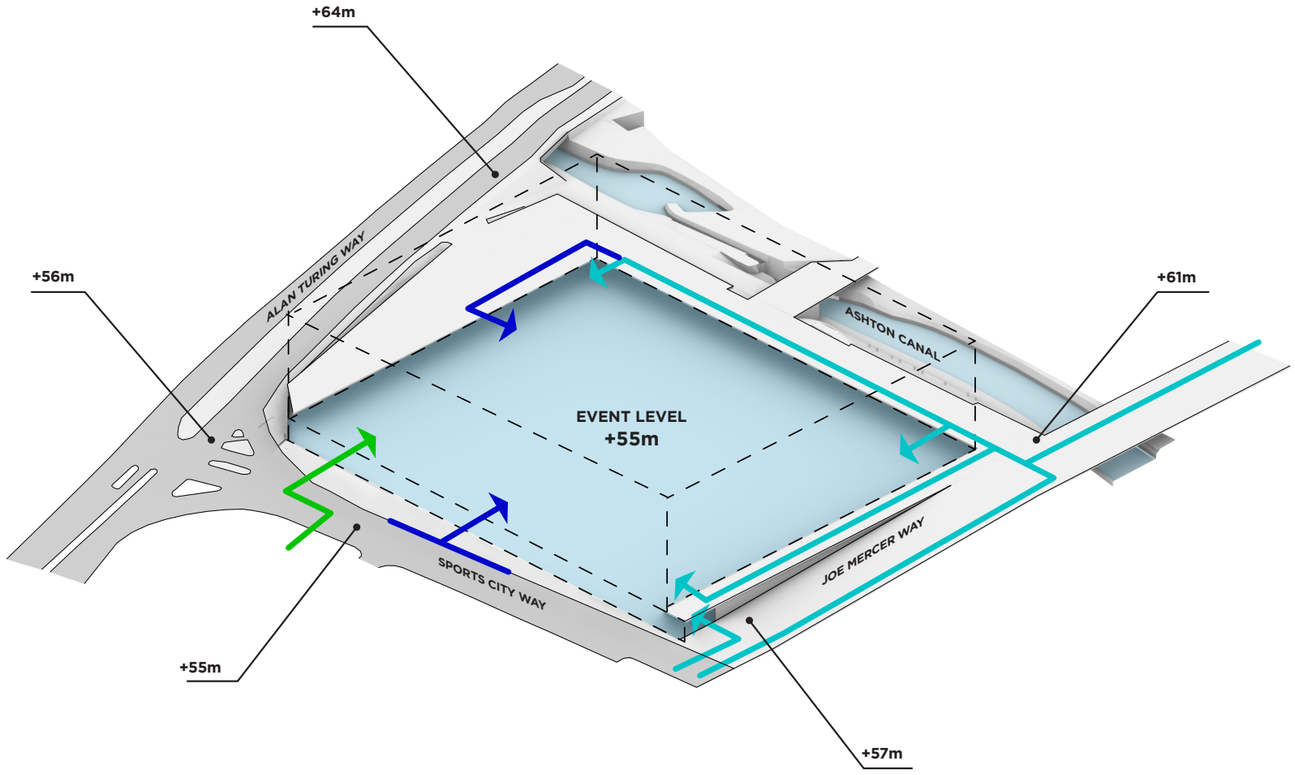
1.6.1 Site Context Response

The arrival experience of each visitor was a major influence on the design of the venue. The primary arrival points are the car park north of Joe Mercer Way and the tram stop south of Joe Mercer Way. Joe Mercer Way is the main route between these two arrival points and therefore becomes the key frontage of the building. The design had to carefully consider how the upper and lower concourses connect to this route to allow for smooth level access for people into the building.

The design adjusts to the varying levels across the boundary by using internal split levels, thus allowing to maintain Joe Mercer way as not only the main access route to the stadium but also directly linking the lower concourse level (Level 01 +61.620m) with its highpoint. A similar approach has been taken for connectivity to Sportscity Way in the north, where the event floor level and the loading bay have been set to +55.000m.

Special consideration has been given to the loading bay access, which not only acts as the only vehicle route in and out of the building but also as a key egress and evacuation route from The Hall and major air-intake for the loading bay all without compromising the varying, but consistently high security requirements. The design responds to this challenge with 2 large, louvred Hydroswing doors, each with 3 sets of integrated double leaf egress gates which provide safe and effective egress without having to open up vehicle access to the loading bay.

The louvred finish provides sufficient free area, to maintain the secure envelope during loading and unloading of trucks inside the loading bay. The positioning of the building within the site was driven partly by the site constraints and partly by the crowd flow requirements of the building. Buildings of this type are required to be a certain size to be viable in terms of the events that they must attract. The venue capacity of the building has to be large enough to compete with the existing venues on the touring route within the UK.



The venue capacity determines the size of the concourses and the User Group Two spaces. These spaces in turn drive the requirements of plant, catering and staff facilities for the building. The capacity and resulting crowd movement is also what sets the distance between external envelope and site boundary, as well as the width of Level 01 Podium areas.

1.6.2 Key Functional Requirements

The base level of the venue, Level GF , is broadly divided into three functions;

- To the east and south sides are the essential back of house support spaces for event activities.
- On the north and west are the main public and service entrances to this level and the front of house facilities.
- All of these essential functions support the main auditorium hall floor in the centre on the building.

The base of the venue is vital to ensuring effective event operation. To the rear (east) of the building, the Level GF east service yard manages all the preparation and staging for touring events. This yard has level access from Sportcity Way in the north eastern corner of the building. It also allows vehicles to drive straight in and back up to the stage area, and also access the bulk storage facilities and main kitchen loading dock spaces in a generous, discrete and secure area.

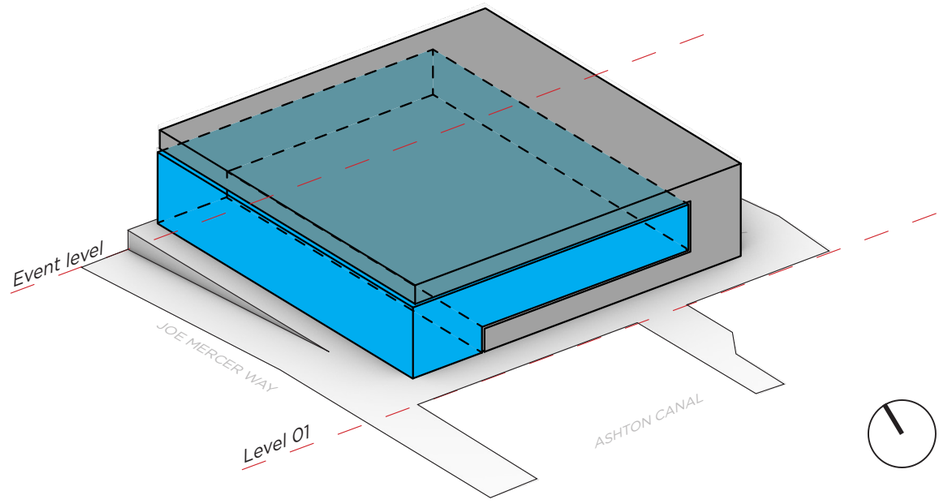
Event performers and teams can also be driven into this service area and dropped off discretely, adjacent to the internal entrance to the back of house suite of dressing rooms and event support spaces on the south side of Level GF. The service yard, auditorium floor, storage, support and dressing room spaces all have level access for ease of operation and management.

On the north side is the main Premium VIP guest entrance, with internal links to the floor level premium spaces and provides a link utilising lifts and escalators to the upper levels. A designated accessible entrance is situated at one end of this entrance space, connected to a priority route to the auditorium floor and through to both internal standard guest and premium guest facilities on the upper levels via the main lift cores. The main Base Atrium floor entrance is located on the northwest corner, from Joe Mercer Way. This entrance brings people directly into the main atrium base concourse space and then through to the auditorium floor.

At Level 01, primary User Group One entrance is on both the south east and north west corners. The northwest entrance is accessed via a level platform route parallel to Joe Mercer Way, and the south east entrance has level access from the Canalside podium space. The south concourse has the capability to open to the landscaped Canalside podium, creating additional opportunity for waterside activation.

Both Level 01 entrances allow visitors to circulate to all sides of the building to access the back of the lower tier and to rise to Level 03 via escalator and lift links to access the upper concourse and related seating areas in the upper tiers. In addition to this, compartment enclosures through the concourse and lounge levels allow for sectors of the building to be activated for non-event use, whilst allowing the auditorium to be set-up for the next event, at the same time, maximising the venue use without compromising on guest experience during changeover.

Back of house provisions are to be provided on the same basis as front of house provisions, ensuring that there are accessible facilities including sanitary accommodation.



Front of House

Back of House

1.6.3 Redefining the Arena Approach

The building design responds to a multi-layered brief which requires the venue to operate in a variety of different modes, both for event and non-event activities.

The standard approach to arena design centres the auditorium to the volume of the building. Audience concourses and lounges are plugged into the auditorium bowl at different levels, creating a series of spaces that are very similar in terms of shape, proportion and scale. The visitor experience can be quite monotonous, with little expression of spatial hierarchy and unique spaces.

To address the brief to create a 'best in class' multi-purpose venue, we have reconsidered the design norm to create unique spaces which provide more entertainment, and build on the gradient of expectation leading to the auditorium event. This encourages spectators to arrive earlier and enjoy the range of facilities, food and beverage offers available at the venue. Increased dwell time is an important factor in boosting quality of experience and revenue.

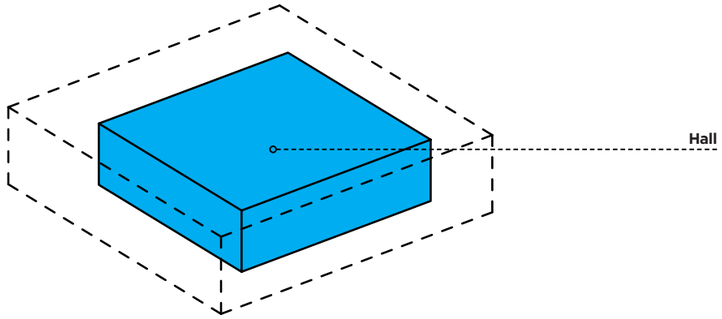
The auditorium or 'Hall' has been custom designed for a much more compact, flexible and intimate configuration compared to comparable capacity venues. The seating bowl has been designed with the lower tier having a series of retractable seating units that can be configured in many ways facilitating a broad and varied event schedule.

The upper tier has been brought forward and lowered to provide a much more intimate environment. The effects that separate bands of User Group Two suites have on the cohesion of the auditorium has been kept to a minimum, increasing spectator engagement and involvement. This combined with the minimal seat losses due to production overlay provides a visually unbroken wall of spectators when viewed from the stage, with the tiered seating being up to 20m closer to the performers than comparable sized traditional multi-purpose arenas. This is an auditorium design that puts the Spectators first.

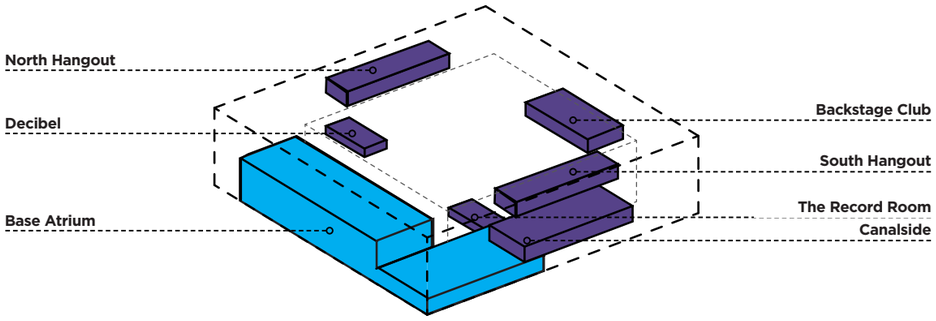
The auditorium has been pulled away from the western side of the building to enable a generous atrium space to be inserted from Level GF to Level 02, linking all three floors and their front of house spaces. Connected by open escalators and stairs, this atrium space is the heart of the building for the Spectators, with feature bars and a food court overlooked by concourses and lounges on the upper levels of the building.

Level 02 comprises a full level of premium suites and lounges, which either have excellent and close proximity views to the auditorium stage, or dramatic views down into the main atrium foyer space.

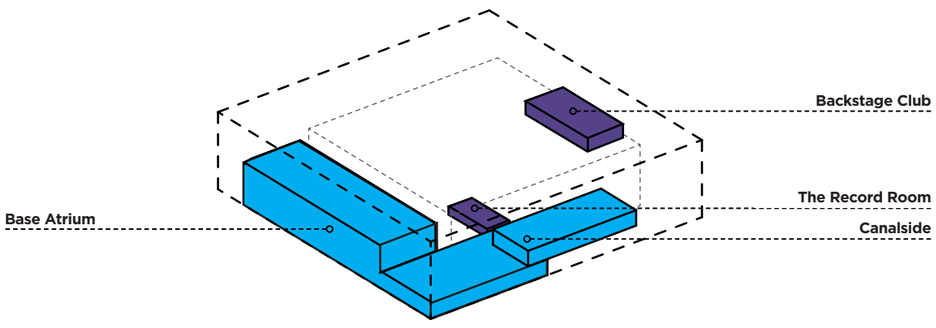
The upper tier is surrounded by double height concourse spaces at Level 03 creating the spacious and airy 'Loft' experience, finally, the slim open Hangout lounges on the north and south sides of Level 04 are set at the back of the upper tier for dramatic 'in the gods' views down to the stage.



The Hall
Ultimate Spectator Experience



Event Day
Multi-Experience Venue



Non-Event Day
A New Destination

User Group One
User Group Two

1.6.4 Design Development

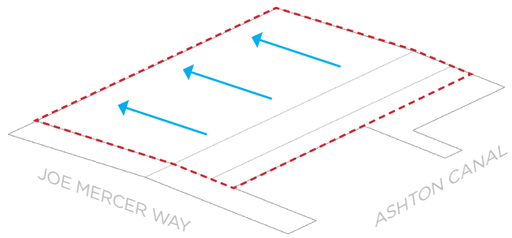
The shape of the site is orthogonal and has tight constraints on all sides. As a result every square metre of the site has to be optimised for the proposed development, whether for internal accommodation or emergency egress.

A benefit of the site is that it slopes from the South (Level 01) down to the North (Level GF). This affords the opportunity to provide ingress and access on two levels making for a more efficient venue design, including direct access for service vehicles from Sportcity Way to the north.

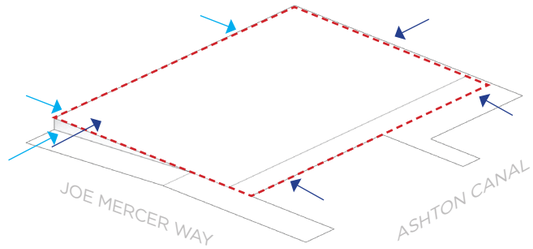
A series of form studies to determine the best venue design for the site, beginning with a traditional European seating bowl design.

A traditional bowl designed is curved with the building accommodation and circulation offsetting it. We found that to get the minimum requirements of a venue of this size, this traditional shape would create problems with circulation for both internal and external spaces, creating wasted floor area on podium level.

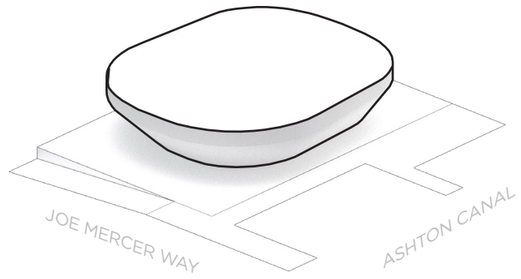
After various iterations it became apparent that a bespoke linear bowl design would suit the site much better, with most of the building accommodation in the east and west and access/egress and internal circulation situated in the corners of the building.



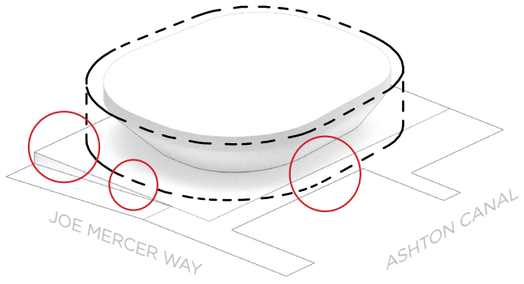
Existing Site Downhill Slope on Linear Site



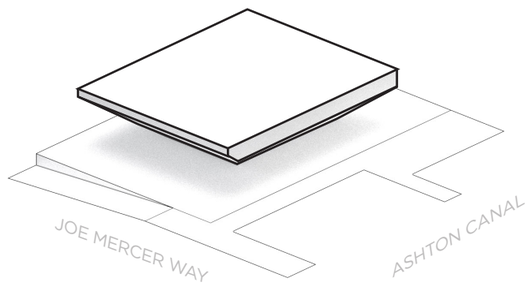
Create Podium for Public and Service Entrances at Two Levels



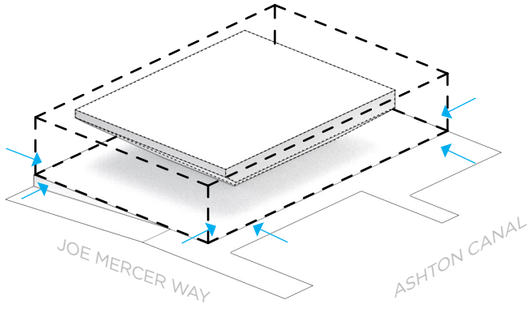
Siting a Traditional European Seating Bowl



Adding Internal Requirements to a Traditional European Seating Bowl to this Site Creates an Inefficient Design



Siting a Bespoke Linear Bowl to Align with Site Form



Adding Internal Requirements to Fit Linear Site Form

A variety of responses were investigated to test the relationship with the site constraints, views of the building, programme efficiency and cost plan of the venue's design.

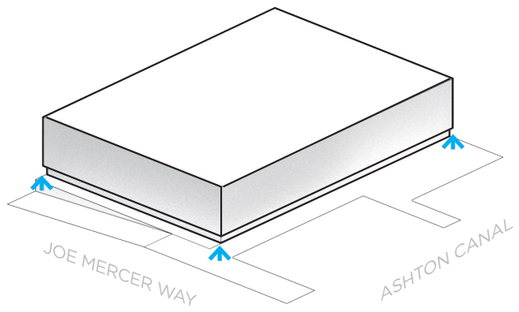
The initial form of the building was kept very simple and linear to create a strong identity. The 'linear box' concept was lifted above the main pedestrian routes around the lower concourse level giving a dramatic contrast in scale between the figure and form.

The large flat facade surfaces are intended to be a viable display area for potential sponsors, brand activation, information and event activation. The linearity of the design acts as an ideal canvas for such activation.

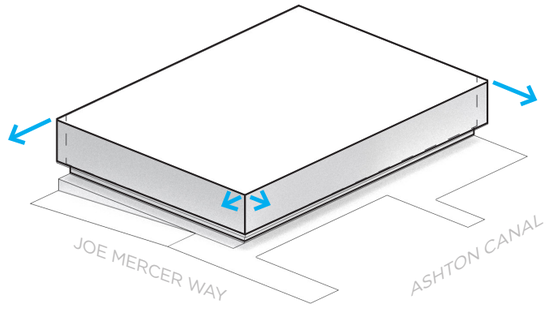
The form of the box was then pushed out and up to respond to some of the pragmatic needs of the building, also creating partial canopies over external pedestrian spaces where event goers would be queuing. This will give prominence to the main entrance of the building adjacent to Joe Mercer Way, the central boulevard linking the Campus and the car parks.

The building form was pushed to respond functionally to the interior spaces. In turn, the form steps in or out responding to where space is required inside the building therefore creating a stacked box aesthetic.

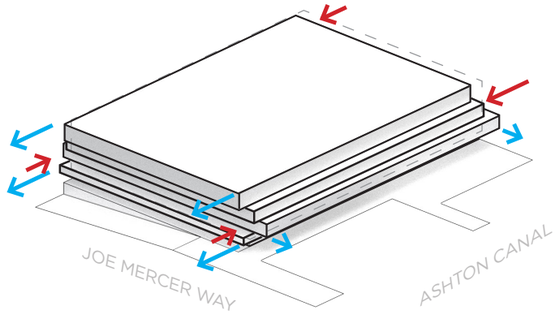
The stacked box form has a strong relationship with the interiors of the building, whilst also providing shelter, a unique identity and allowing for dynamic facade activation. The horizontal layering of the stacked form contrasts strongly with the solid form of the plinth that grounds the building to the site.



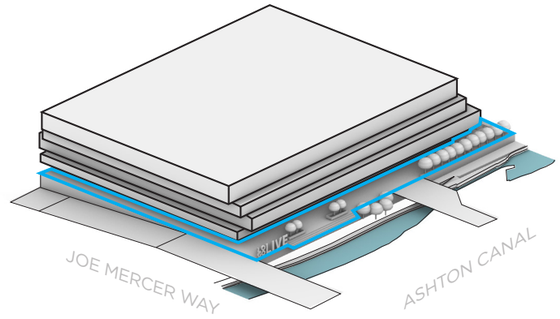
Lifted Mass to Define Venue Entrance



Covered Area for Visitors



Venue Functions Create Identifiable Form



Activated Public Realm

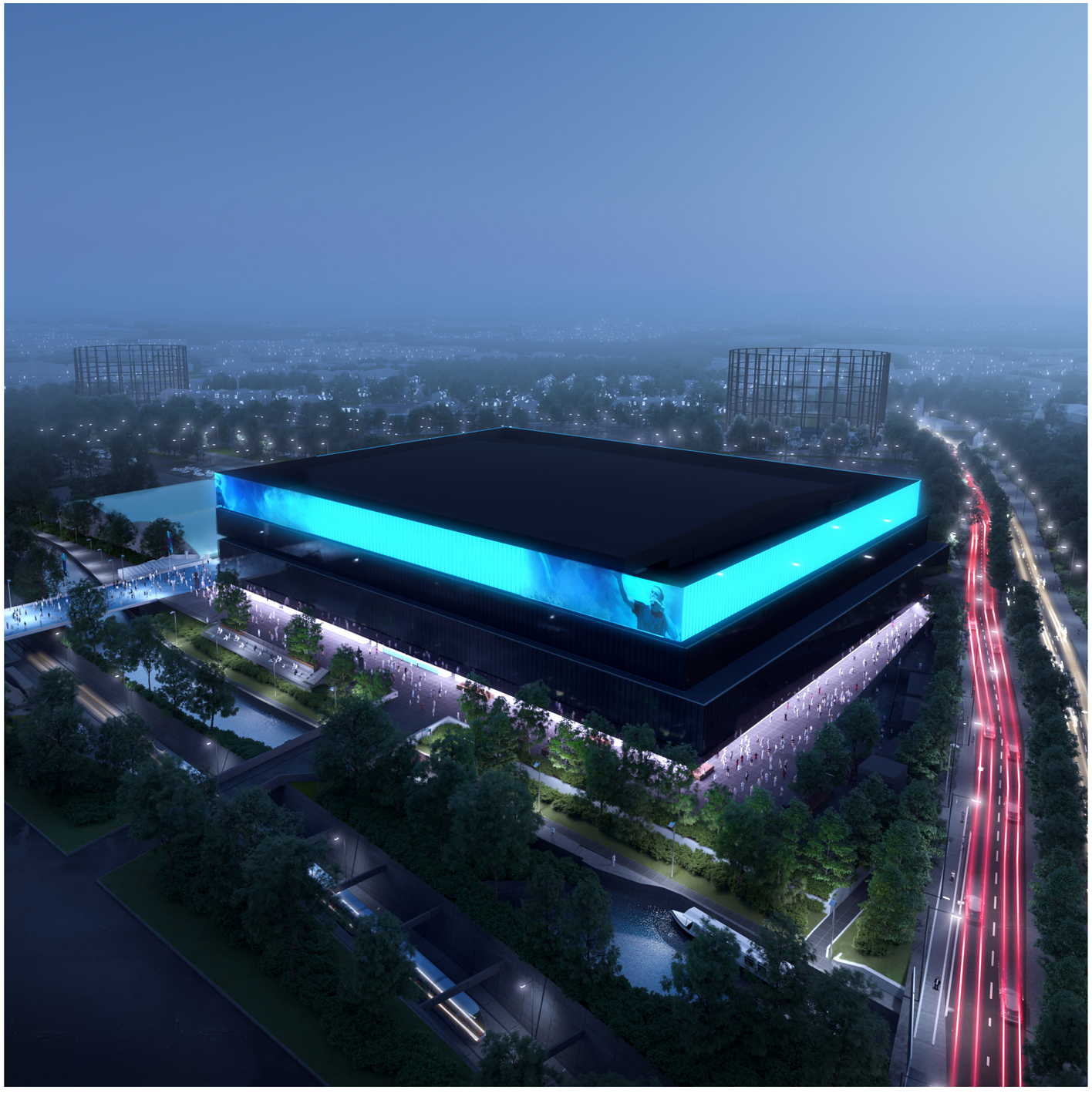
1.6.5 Venue Form

The form of the OVG Manchester Venue has been designed to suit the city - as a modern, cosmopolitan and vibrant urban environment that has seen a wave of bold architecture emerge in the early 21st century.

One of the architectural responses to the client's brief of the 'best in class' venue in Europe was to create a building form that provided a key identity to the venue. The venue's functional requirements were one of the key drivers for the form of the venue.

Our architectural response has been to curate the arrival sequence and consider views on approach. The event experience relies on the smooth ingress and egress from the venue, people need to easily find their way and without long and slow queues. To combat this, the team has undertaken extensive crowd modelling studies to ensure that people flow easily into and out of the venue.

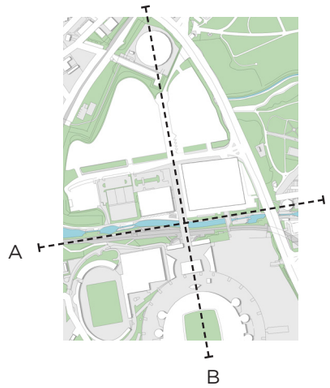
The venue requires large volumes of pedestrian access and vehicle services access. Event production trucks need to be able to quickly leave the venue after an event. Pedestrians need to be able to access and egress the building smoothly. These crowd flow requirements were another key driver for the design of the venue.



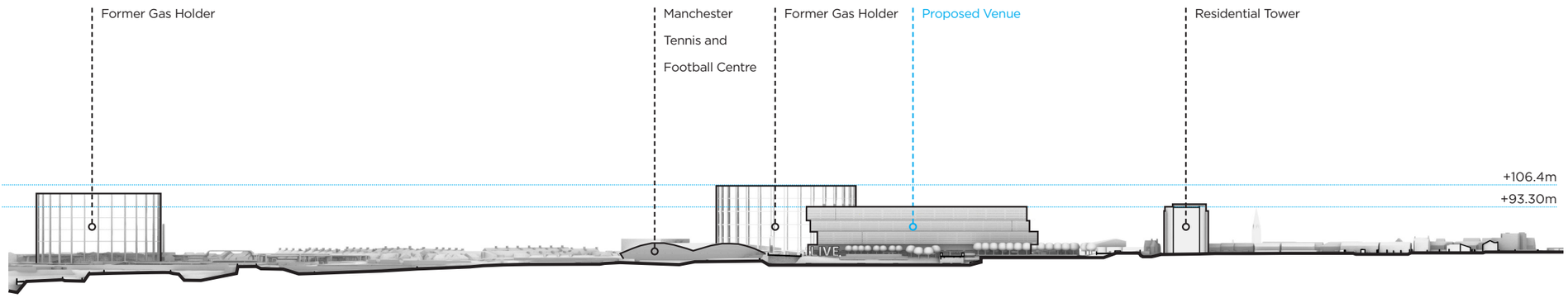
1.6.6 Scale

The proposed development sits within the framework plan for the Etihad Campus.

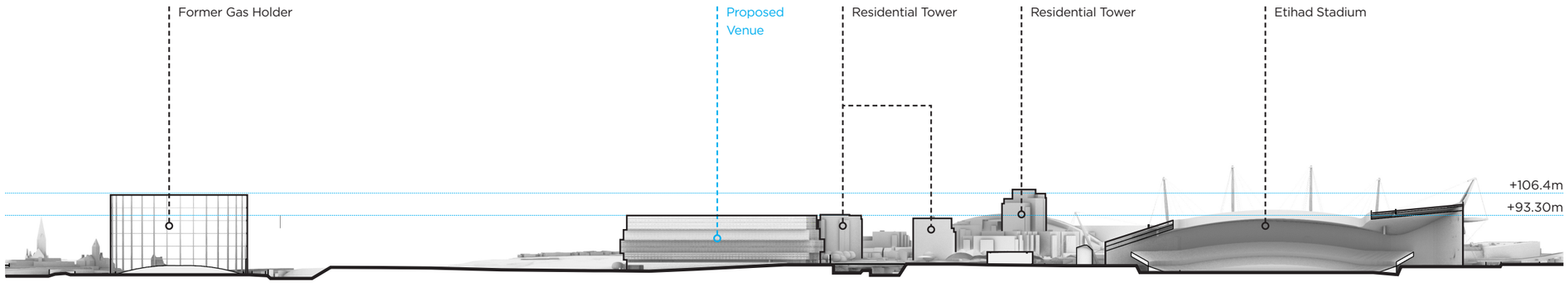
The size of the venue responds directly to the site context by ensuring it does not exceed the height of the existing surrounding buildings and respects its neighbours, whilst maintaining a strong identity within Manchester and the UK.



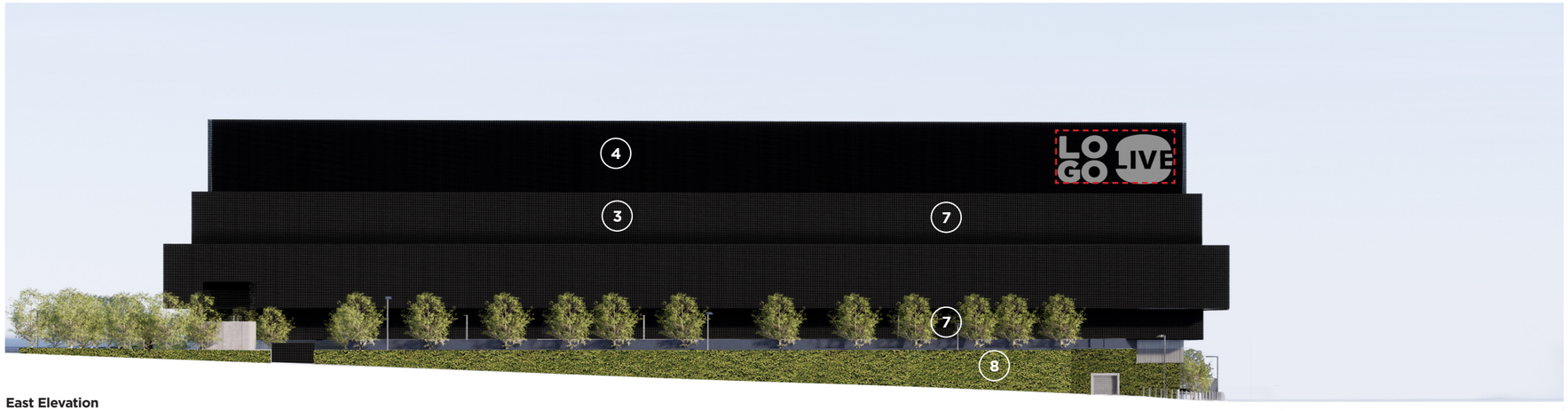
A. East to West Site Section



B. North to South Site Section



1.6.7 North and East Elevations



East Elevation

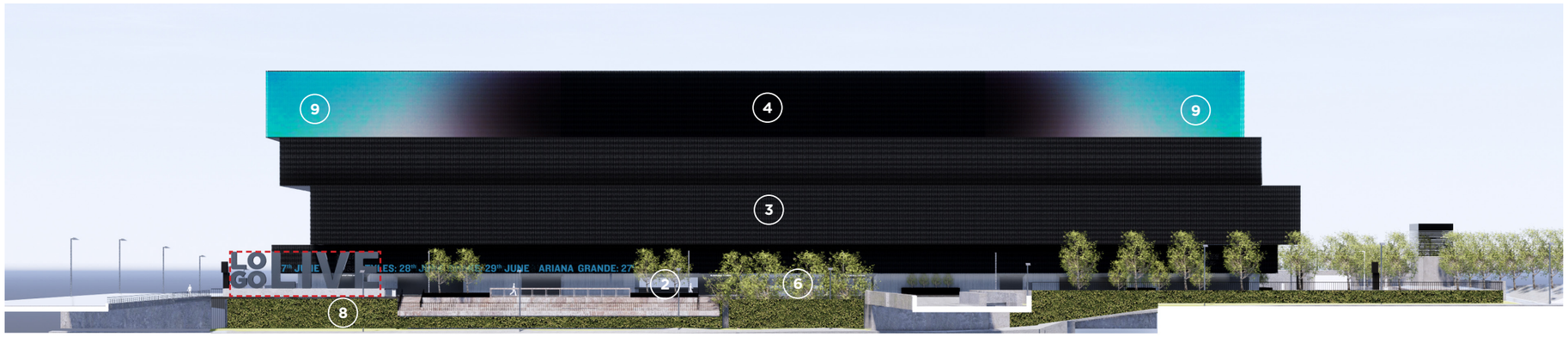


North Elevation

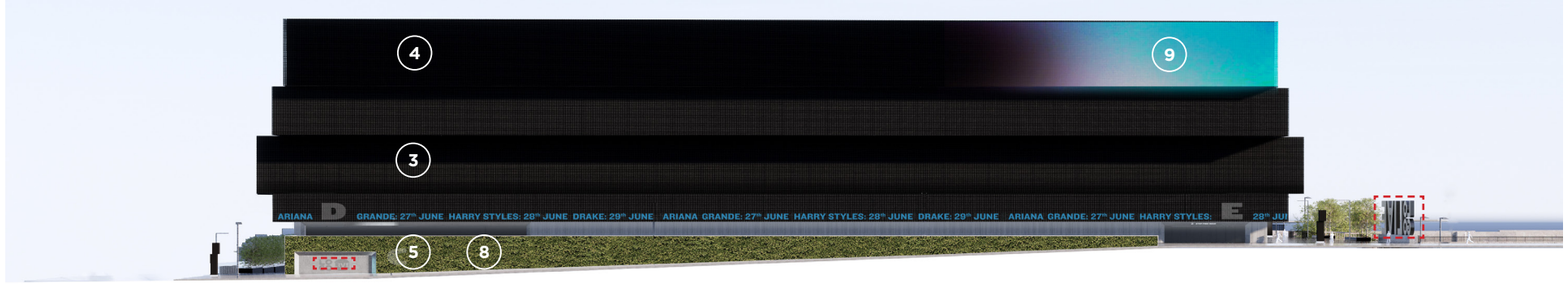
1. Precast Concrete Facade Panel EWS-451 / EWS-453
2. Box Office Windows EWS-245
3. Black Perforated Aluminium Panel EWS-302
4. Black Perforated Aluminium Panel LED EWS-304
5. Green Living Wall EXT-543
6. Canalside Door DRS-281
7. Office Windows EWS-241
8. Green Screen and Living Wall EXT-541 and EXT-543
9. Media Wall Facade Zone

Naming Rights Signage

1.6.8 South and West Elevations



South Elevation



West Elevation

1. Precast Concrete Facade Panel EWS-451 / EWS-453
2. Box Office Windows EWS-245
3. Black Perforated Aluminium Panel EWS-302
4. Black Perforated Aluminium Panel LED EWS-304
5. Living Wall EXT-543
6. Canalside Door DRS-281
7. Office Windows EWS-241
8. Green Screen and Living Wall EXT-541 and EXT-543
9. Media Wall Facade Zone

Naming Rights Signage

1.6.9 Design Principles

Design Form and Massing

The venue design comprises of two principal elements, a grounded lower concrete plinth and upper lightweight stepped boxes. The lower plinth connects to Sportcity Way and Alan Turing Way and forms a series of terraces along Joe Mercer Way and the canal edge.

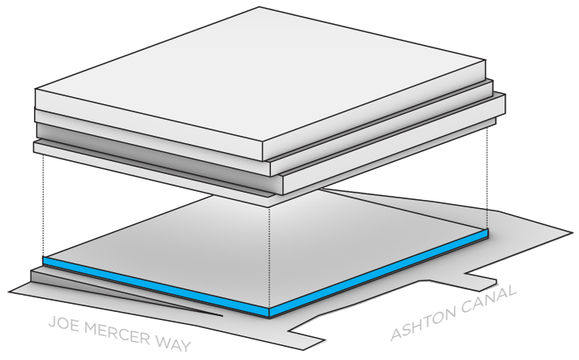
The stacked boxes are enveloped in a black semi gloss reflective perforated metal to mirror it's surroundings, both at day and night, highlighting the adjacent greenery, lights, people and weather conditions, ensuring the building will never twice look the same.

The aforementioned stacked reflective forms sit on a seemingly solid concrete plinth which gives an element of weightlessness to the forms above.

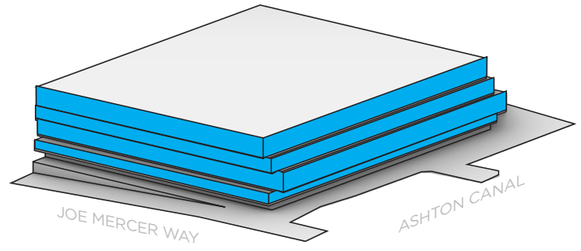
There is no desire to provide glazed views out of the building or allow daylight into the internal spaces since these are essentially sound proof boxes that are designed to create an immersive experience. However, a slim band of discrete window panels are provided behind the perforated facade to the venue management offices on the east side of L04 and the ticket office on the south side of L01. Additionally, the Canalside folding doors are opened to reveal the Canalside bar on non-event days, also on the south side of L01.

The form of the building is simplistic, yet iconic, giving the venue a strong identity.

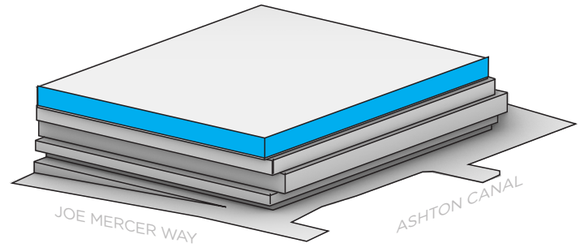
Stacked Boxes On Activated Plinth



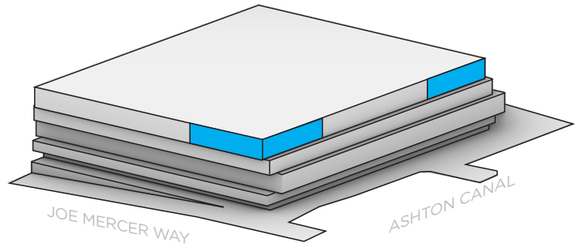
Uniform Facade Materiality Which Creates an Architecturally Compelling Design



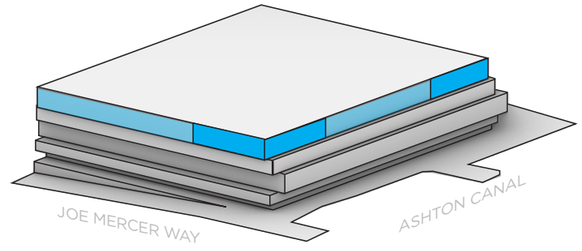
Architectural Lighting Gives the Top Box An Identity



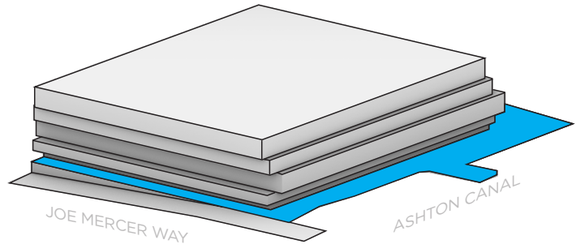
Led Screens For Event Activation And Naming Rights Strategically Located



Architectural Lighting And Led Screens Integrated For Seamless Effect



Public Realm Designed To Compliment Building



1.6.10 Facade Modes

The facade design brief highlighted two criteria relating to the venue as a place of entertainment. These criteria were to bring the building to life by considered use of architectural lighting and incorporating large format screens to showcase the events.

Researching current technology identified that ‘big screens’ could be seamlessly integrated into the facade of a dark material palette. This would mean that in daylight hours the black LED panels and elements would merge discreetly into the facade system and the building would present a simple and contemporary identity to the neighbourhood. The LED system could also include a programmable architectural lighting concept to cast a glow across the top stacked box, bringing the venue alive in the evening. The lighting will then merge into the screen activation to bring the dynamic imagery and information to the fore in key locations.

In principle, there are four modes of activation for the building facades:

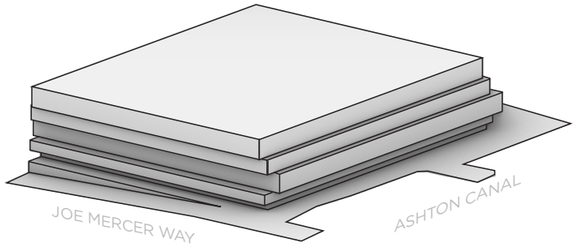
- **LED screens and architectural lighting switched off –** This mode is the standard daytime configuration, without utilising either the facade lighting or screen elements, leaving the facade as a series of black stacked boxes wrapped with a universal reflective skin to all sides which mirror the adjacent environment.

- **Architectural lighting activated –** The architectural lighting within the facade panelling is switched on, casting a glow across the backing panel of the top box, creating a "halo" effect. The lighting system will have dynamic control of light intensity and colour, which allows the system to be programmed to pulsate and shift, introducing a fluid and visually engaging animation to the simple box forms.

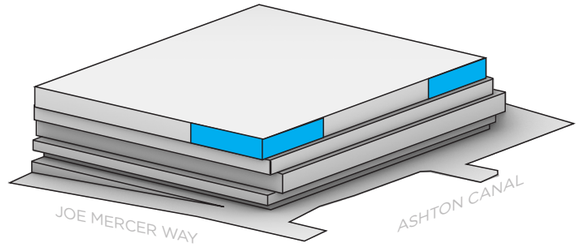
- **LED Screens activated –** The three LED screens will have the capability to be bespokely programmable to enhance the visitor experience, promote current or upcoming events and provide the visitor with information. Each screen is 33m x 9.4m and are located in key positions on the building to allow for maximum engagement from both visitors and passers by. The pixel pitch (62.5mm x 50mm) of the LED screens has been carefully considered to ensure the screens can be seen at all times of the day.

- **Architectural lighting and LED screens activated** – Or otherwise known as "event mode", best seen after dusk, this mode builds on the anticipation of event commencement. The lighting and big screens can be programmed across the facade to seamlessly merge the pulsing illumination and colour to the content of the big screens, drawing the audience in from all approaches.

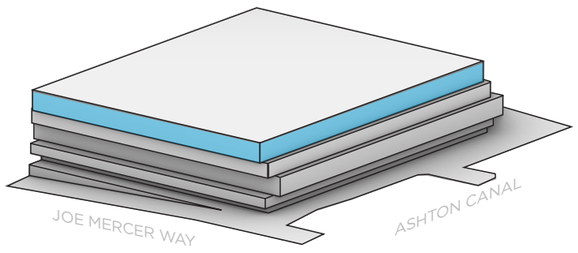
LED Screens Off



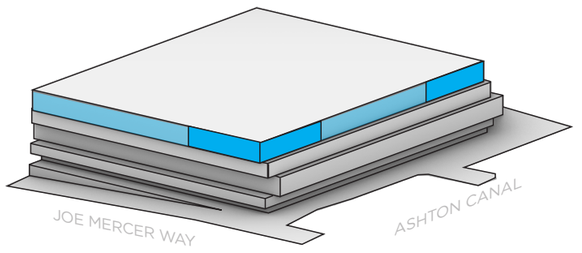
LED Screens On



Architectural Lighting On



Architectural Lighting and LED Screens On




EXPERIENCE
CANAL
SIDE
A-E
CANALSIDE
COFFEE

1.6.11 Facade Material Locations

In keeping with the simple massing of the venue into a series of stacked boxes, a controlled palette of materials is proposed to unify the four elevations that the venue presents to the adjacent neighbourhood.

The base of the building is considered in the context of the existing public realm and landscaped approach, with light coloured, ribbed and plain smooth concrete panelling. The entrances and exits are framed with angled architrave returns that match the materiality of the walls and give the impression that the entrances have been carved out of a solid concrete plinth. What is revealed are hot rolled steel door sets which add an element of tactility and modernity to the entrances, but also reflect Manchester's industrial nature.

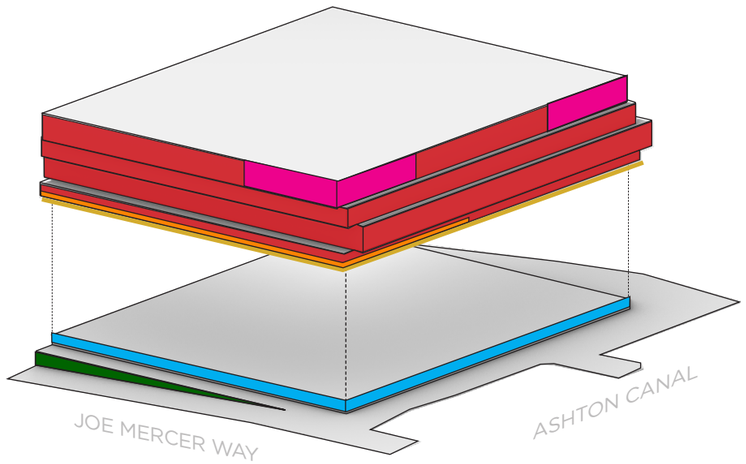
A series of green screens and living walls line the site boundaries to Joe Mercer Way, Ashton Canal and Alan Turing Way. With the living wall acting as a unique design feature, each greening element will provide the area with an increase in biodiversity. Using input from expert horticultural designers this creates additional green corridors between Ashton Canal and Philips Park.

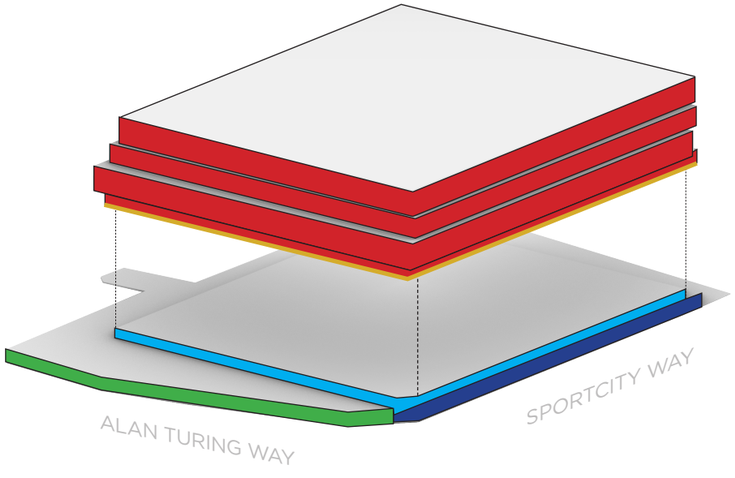
The upper facades of the building are clad in a regular array of perforated black metal panels, so that the stacked boxes appear to float above the solid concrete base. To aid in this illusion, the base concrete panelling is capped by a reflective soffit installed to the base of the lowest of the boxes. This further animates the event arrival ambiance and boosts illumination as guests approach the entrances.

The architectural lighting system is proposed to be installed on all sides of the venue and to the top stacked box. The LED screens and ticker tape are proposed in locations that will attract the highest level of visitor engagement – relating to the primary audience pedestrian approaches across the wider Campus site.

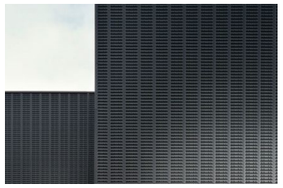
The roof of the building and terraces are proposed to be a combination of black single ply and hot melt roofing systems, sympathetic to the dark box cladding concept.

Please refer to the Facade Types Matrix for more detailed facade material information.
Schedule: BRA-POP-ZZ-ZZ-SH-A-7400





Polyester Powder Coated Perforated 3mm Aluminium Panel Semi Gloss RAL 9005



Plain Precast Concrete and Black Patinated Hot Rolled Steel Door Sets

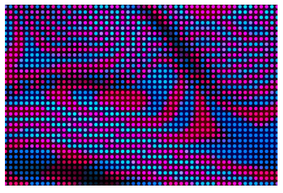


Ribbed Pre-Cast Concrete, Ribbed GRC and Black Patinated Hot Rolled Steel Door Sets



Facade Integrated LED Screen Location

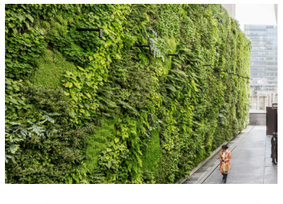
Facade Integrated LED Ticker Tape



Rimex Soffit



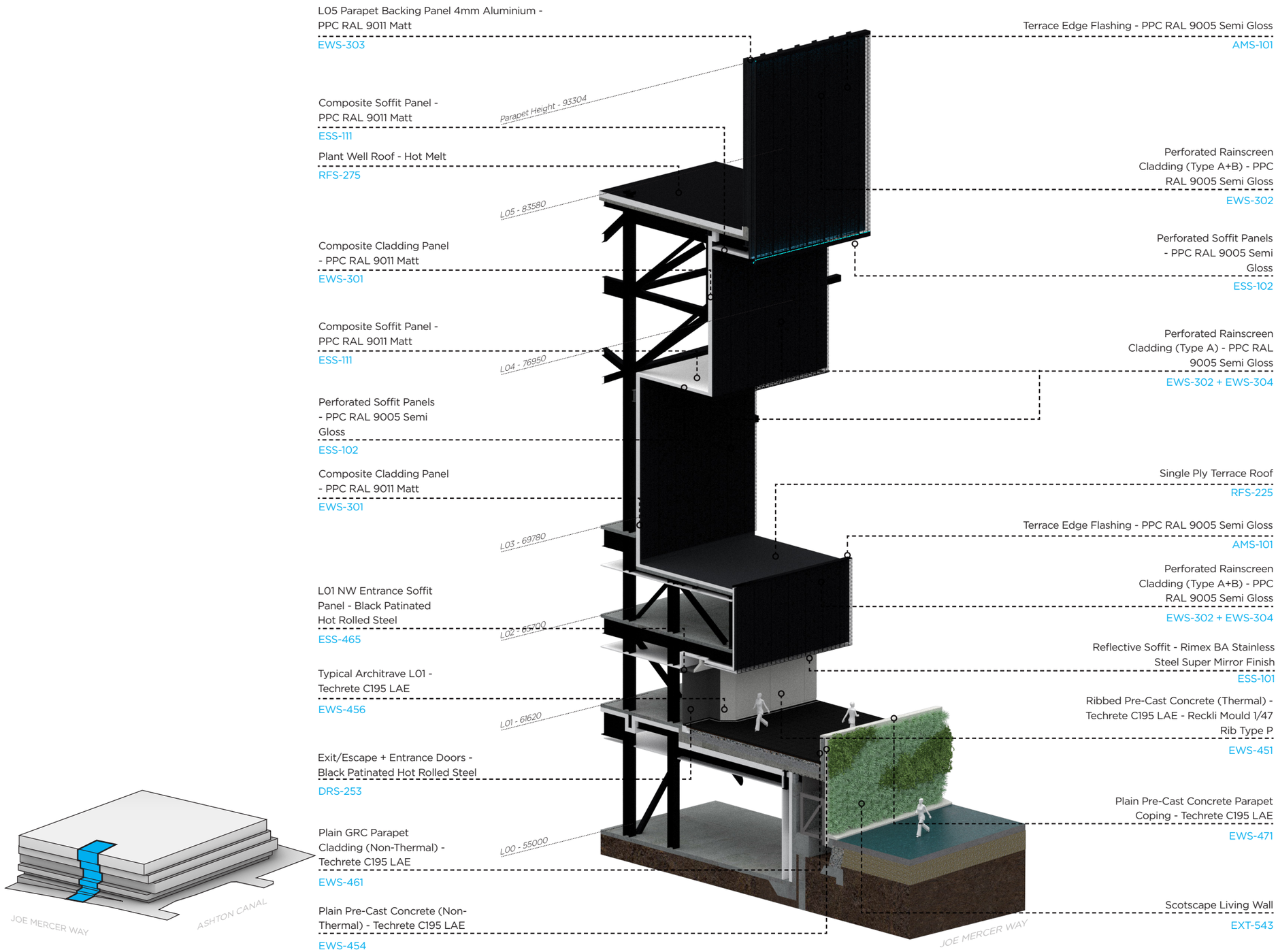
Precast Concrete and Living Wall



Precast Concrete and Green Screen



1.6.12 External Appearance



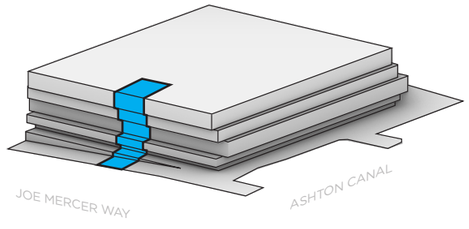
1.6.13 Facade Panelisation

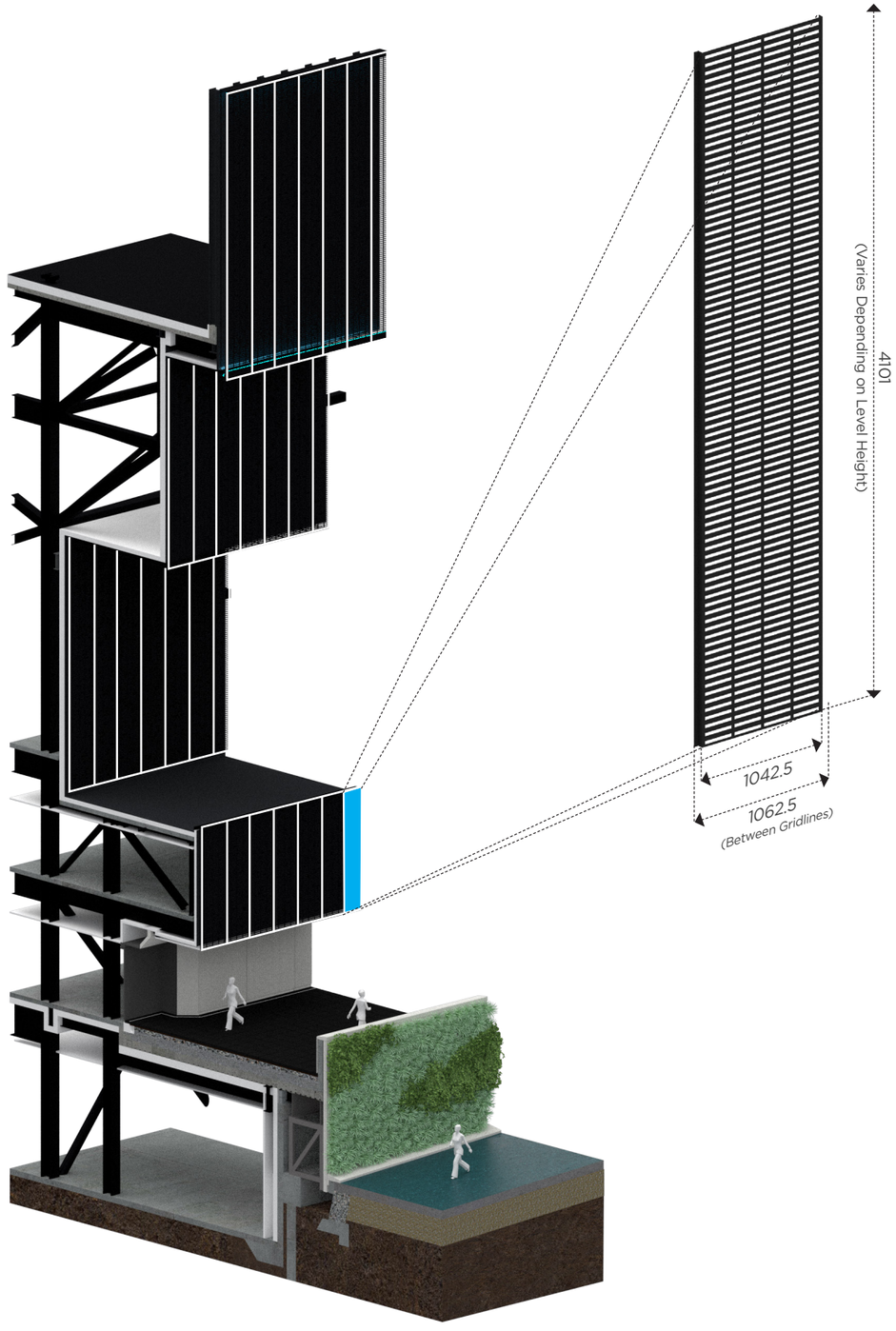
When viewed at a distance, the perforated black metal facade unifies the simple stacked boxes of the venue. Upon approach to the building, this facade is revealed in more detail and the pattern of the perforation becomes apparent as one moves toward the venue. These elements are complemented by the panelisation grid that emphasises the verticality of the facade against the length of each elevation, heightening the dramatic overhangs of the stepped boxes.

Studies were undertaken in design development to consider the modularity and scale of the upper metal panelling and the lower concrete panelling. The studies concluded that the tonal contrast of the two materials, along with the dark external paving, emphasises the entrance levels to approaching visitors.

Working with the set-out efficiency parameters of both the main auditorium structure and the arrayed banks of entrance doors, a structural grid of 8.5m is used throughout the building, which has created a more flexible building design compared to the previous building grid of 6.6m. This primary grid subdivides into a width of 2125mm for the concrete plinth panels, and a narrower width of 1062.5mm for the perforated metal panels, with 20mm subtracted from these figures for the joints.

The narrow format of the metal panel module suits the nature of the material, improving the stability of each unit when considered against the efficient thickness of the metal and the extent of the perforation cut-out required to enable the facade to meet all of the pragmatic requirements for incorporation of the lighting and LED screen systems, as well as achieving the necessary open area for ventilation and similar functions.





1.6.14 Soffits

The L01 podium soffit, is lined with mirror reflective panelling and edged against the building with recessed colour change linear lighting that has colour change ability to emphasise the flow of visitors arriving and circulating around the building and accentuate the ribbed panel facade. As the venue opens, light spills out from the entrances adding more colour and movement to the space, drawing visitors into the carved out door recesses and into the venue.

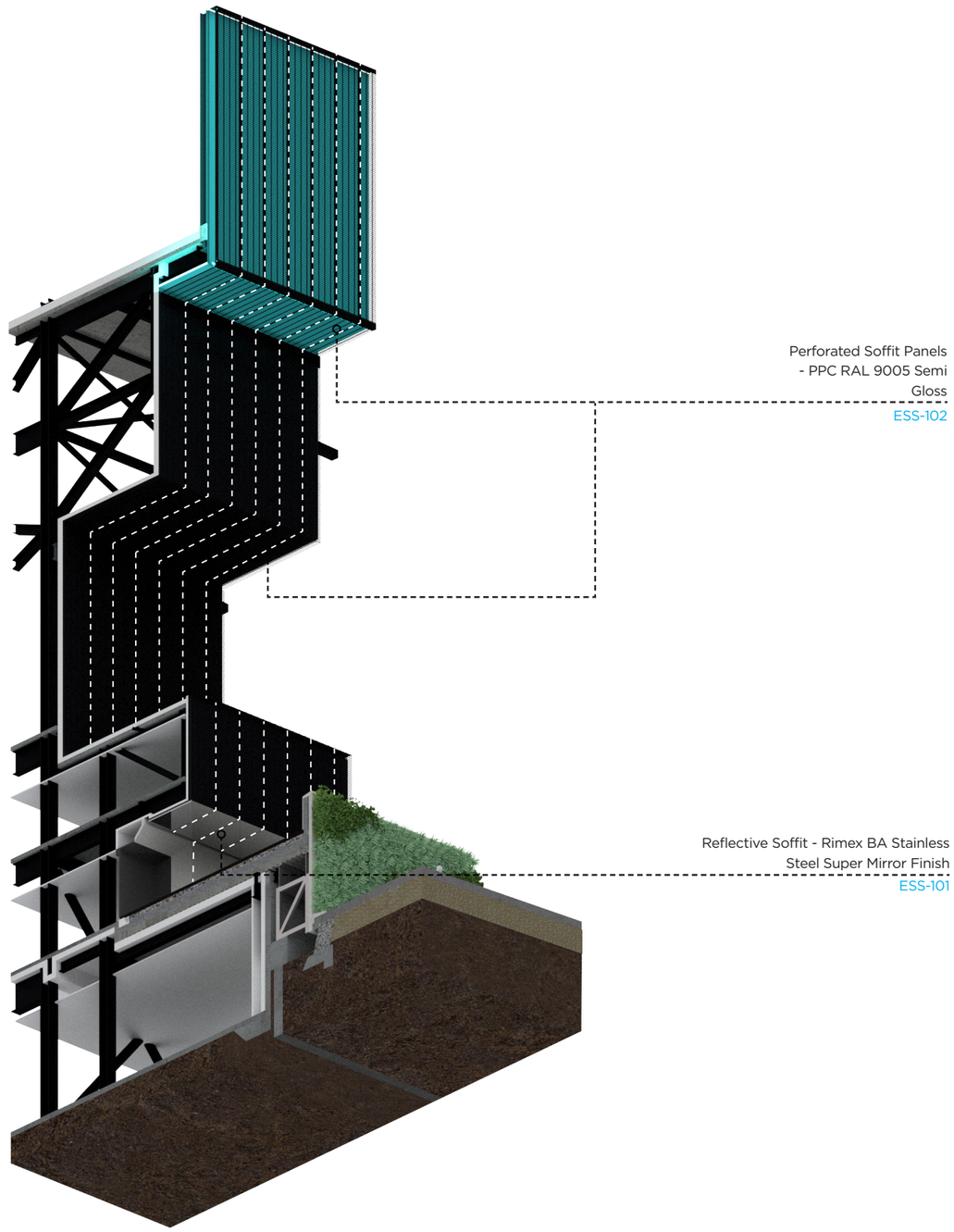
The soffits of the upper facade boxes from Level 03 to Level 05 are clad in the same perforated black metal panelling as the vertical surfaces to complete the concept of independent, yet unified image of the box enclosures. These also have a jet black semi gloss finish which will reflect the surrounding environments activity.

Architectural lighting to both the soffit and vertical facade transforms the top box into the beacon of the venue, elegantly topping the series of stacked boxes.

The programmable, pulsating lighting can adjust to its surroundings, depending on time and occasion, allowing for a unique appearance 365 days a year, without loosing its identity. The facade has been set out to ensure panel joints line through down the entire building on both soffits and vertical panels of al materialities. Overlapping folds in the metal panels conceal the necessary support structure behind, ensuring planning requirements are met. There are 2 perforated panel gridlines per 1 precast concrete panel.

Maximizing capacity without compromising spectator safety has led to a set back entrance to the north west Level 01 entrance, where the bank of entrance doors set back. In line with the overall concept of carving out the entrances, drawing spectators in, the hot rolled steel finish of the door-recess is returned up along the soffit.

A small section of GRC soffit in the north east corner blends in with the solid design of the plinth, where the plinth needed to step back to respect ownership boundaries.




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1.6.15 Typical Facade Build Up

The stacked boxes have been designed to add depth, activity and a sense of weightlessness to the building. The perforated rainscreen cladding is a 3mm aluminium panel which is polyester powder coated (PPC), with a semi gloss, jet black (RAL 9005) finish.

Due to the reflective nature of the PPC, the material mirror its environment, meaning the building will never twice look the same and will change identity throughout the day as the weather, light levels, and surrounding activity changes. The perforation pattern brings additional variety to the facade, breaking up the reflections animating the building further. The perforations also hide the louvres that are dotted across the facade, whilst allowing for the required free area for ventilation.

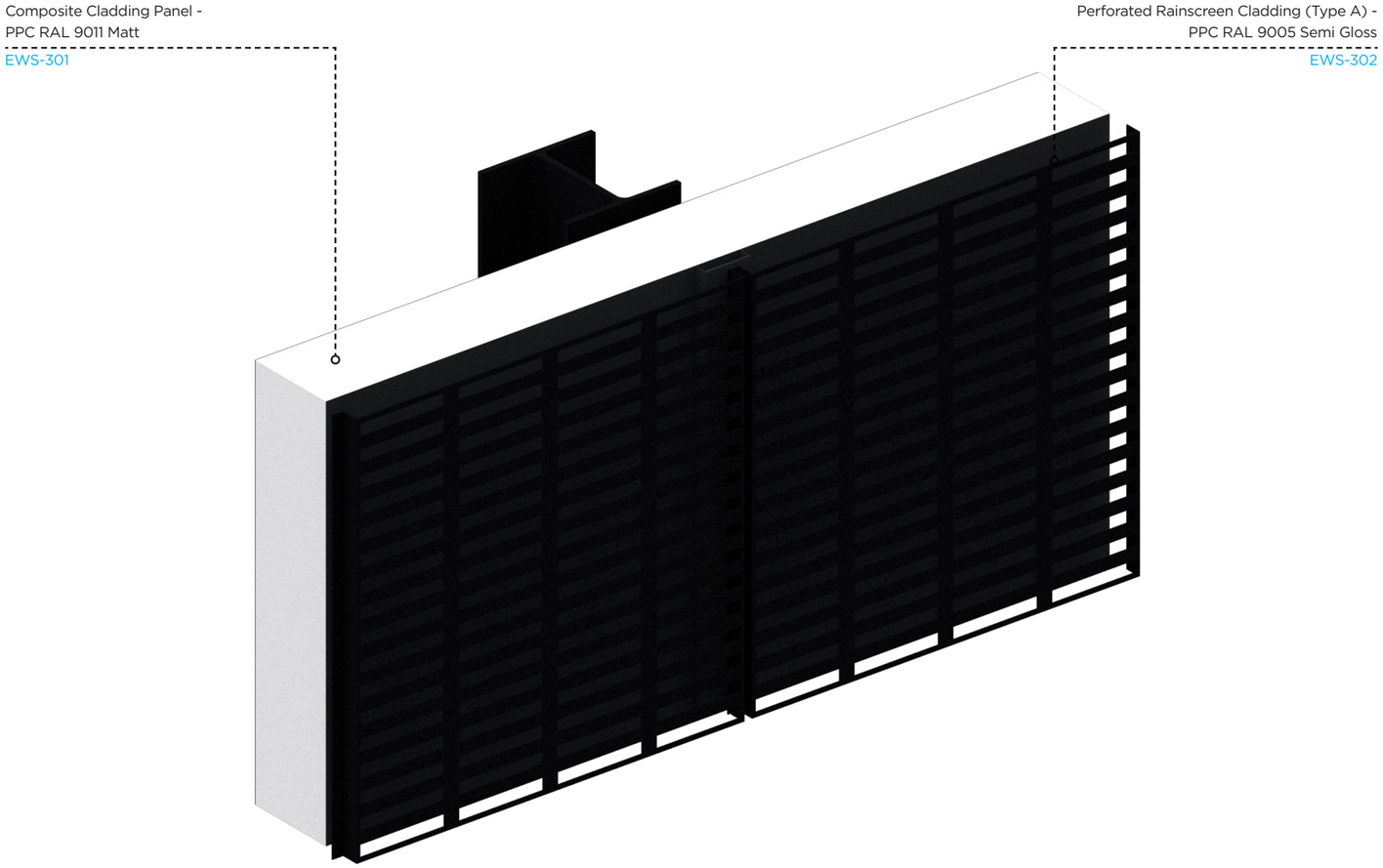
The Level 02, 03 and 04 'stacked boxes' are all comprised of the same typical build up. A 240mm composite panel chosen for it's thermal performance and a 3mm perforated aluminium panel, separated by a 100mm cavity.

To achieve a sleek aesthetic, it was important to minimise the number of fixings for the perforated panels back to the subframe, thus simplifying construction. The offset distance of the perforated panels to the composite panel surface has been standardised to facilitate the lighting system and improve performance in relation to wind loads.

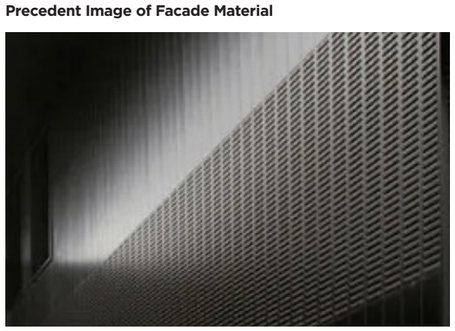
The facade system addresses multiple performance criteria:

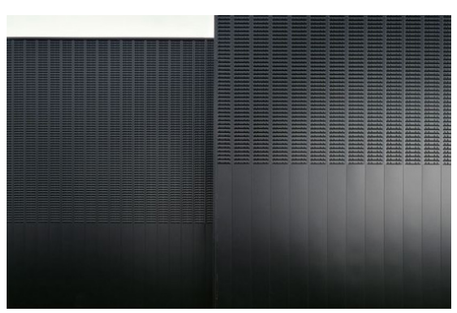
- A1 Non-cobustable
- Acoustic enclosure for the venue
- Thermal enclosure
- Weather tightness
- Blast resistance
- Ease of construction and maintenance

The composite panel system is the primary element to meet the required standards for the majority of the above criteria. This highly functional layer of the building, has limited visibility as it is clad with perforated, vertical metal panels, giving the finishing touch to the otherwise very basic appearance. The composite panel is PPC with a matt, graphite black (RAL 9011) finish to match the top box backing panel which has been designed to best suit the architectural lighting requirements.



Precedent Image of Facade Material





Sample Image of Level of Reflectivity



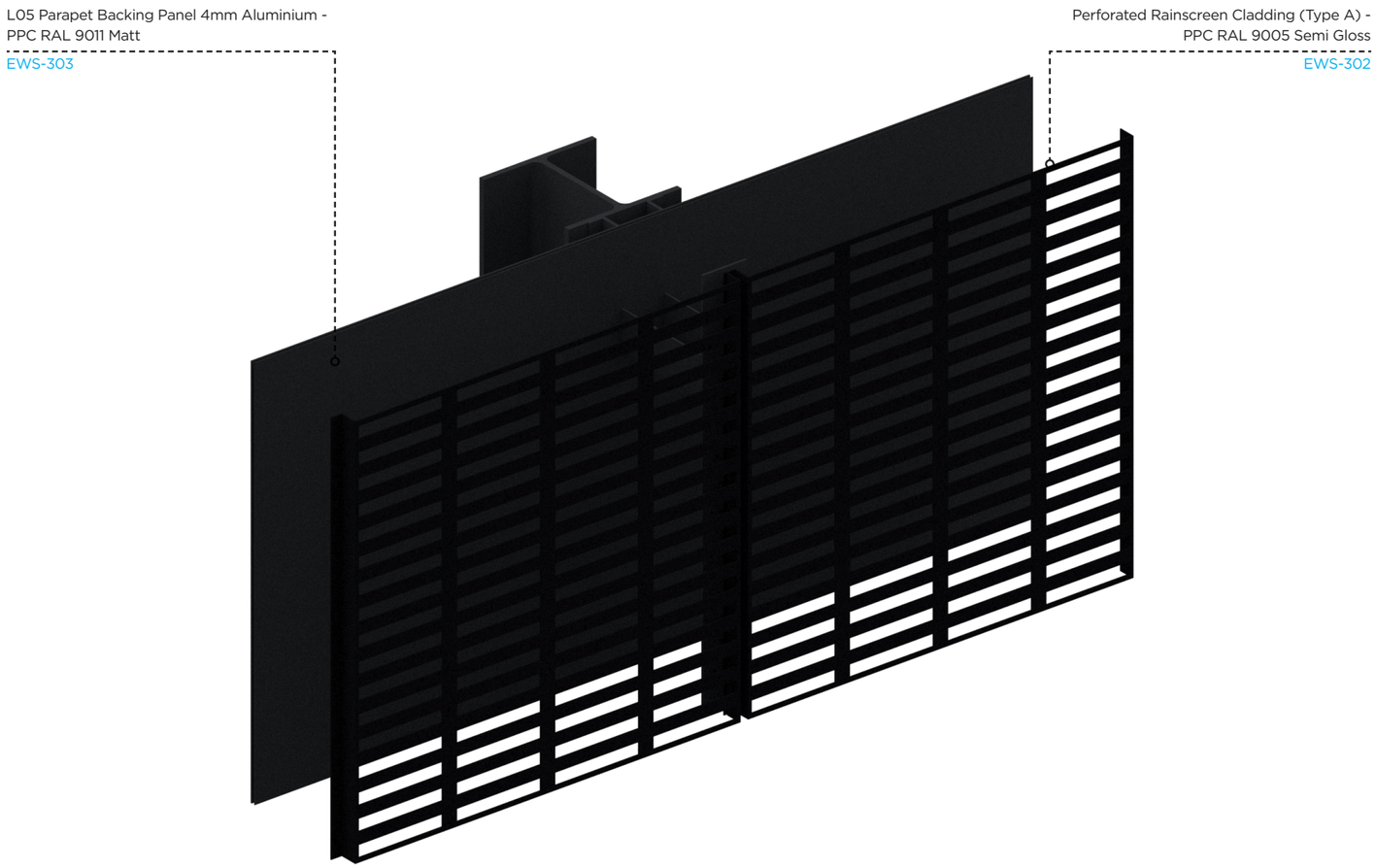
1.6.16 Top Box Facade Build Up

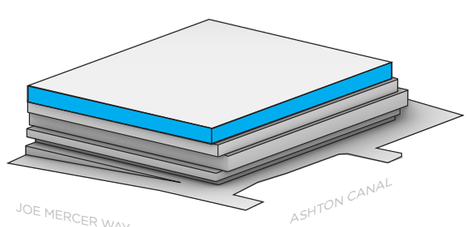
The build up of the top box has a much more simplified materiality compared to the other three stacked boxes as there is not the same thermal and weatherproofing requirements.

Through a series of digital lighting design studies, it was concluded that the parapet backing panel would be placed at a 350mm offset from the rainscreen cladding to ensure for an even spread of light onto the backing panel, providing the highest quality finish.

Simultaneously to the aforementioned studies, analysis was undertaken to study what RAL colour of the backing panel would achieve the finest architectural quality and spread of architectural lighting. A matt 9011 RAL colour was chosen, which can be seen repeated on the composite panel of the three other stacked boxes.

The driver behind the materiality of the parapet backing wall was to ensure a weight of 10kg/m^2 was achieved for acoustic performance reasons and as a result a 4mm aluminium panel has been specified which achieves 10.84kg/m^2.





1.6.17 Typical Facade Perforations

The facade design has evolved to address a uniform and seamless aesthetic across the facade, with a simple material palette, providing the highest quality of concealed facade fixings and a creative and appealing architectural lighting solution for the venue.
To achieve this, the facade perforations have been set out accordingly to address three key parameters.

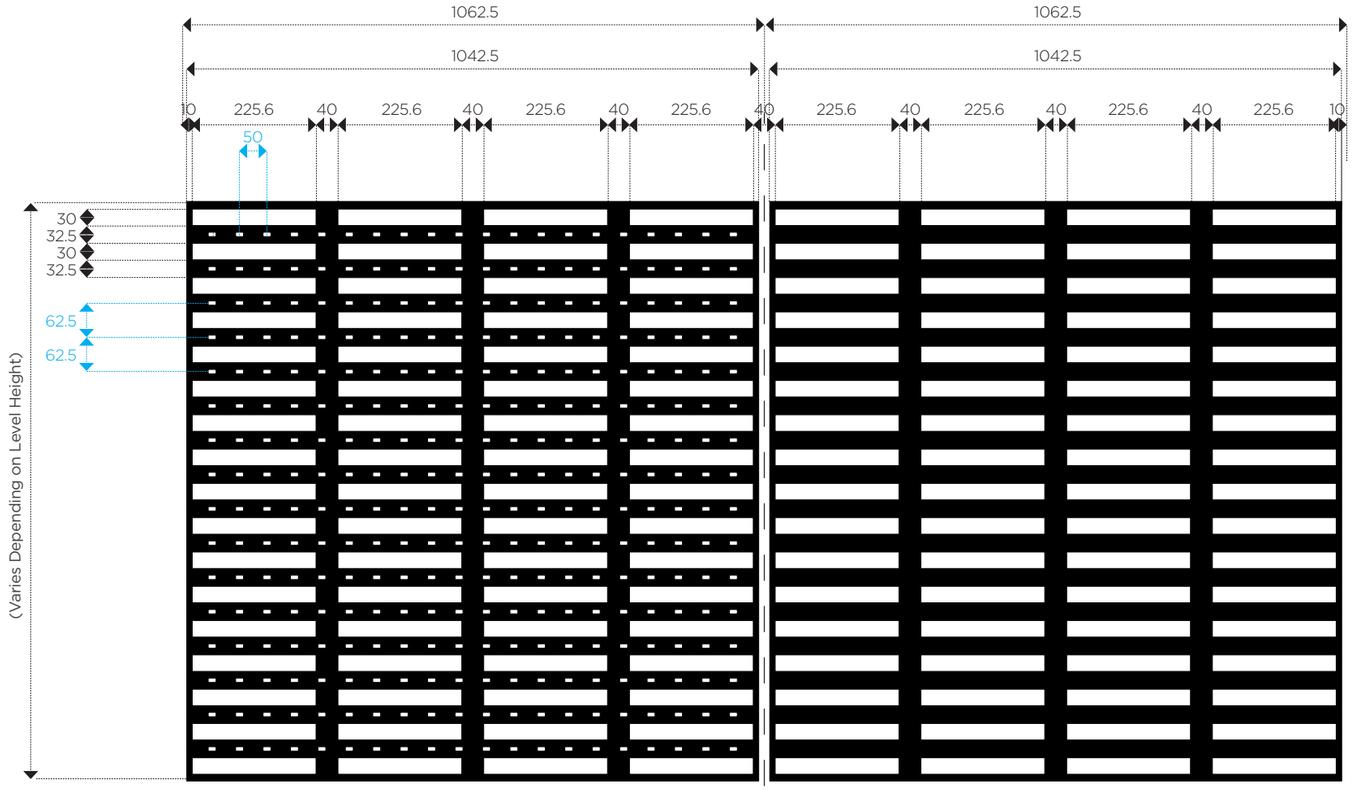
- LED integration
- Free area for ventilation
- Panel joints

Working closely with specialist facade and lighting consultants, as well as leaders in the big screen industry, the integrated LED system has been developed to work seamlessly with the paneled facade proposal. The intention is for the screens to 'disappear' within the facade appearance when not in use and to not sit as 'postage stamps' on the corners of the building.

The pattern and spacing of the perforations on the facade panels has been informed by the pragmatic criteria for the effective installation of screens. This includes the open area for the architectural lighting visibility and the pixel pitch (62.5mm x 50mm). This determines the resolution of the image at a given distance range, and open area for the architectural lighting visibility have informed the pattern and spacing of the perforations on the facade panels.

This system was then tested against the ventilation requirements for air intake and exhaust, which sits within the composite panel facade. The required free area for ventilation is approximately 40% and the proposed free area is designed at 41.8%.

Additionally, the joints between perforated panels are 20mm wide, with the first perforation starting at 10mm from the panel edge for panel strength. As a result, the perforations have been designed with a 40mm strip arrayed across each panel without perforation, to give the appearance that the panel joints are part of the perforation setting out, making them disappear from the spectators eye.



Typical LED Integration Facade Panel Perforation (62.5mm x50mm PP)

Perforated Rainscreen Cladding (Type B) - PPC RAL 9005 Semi Gloss
EWS-304

Typical Facade Panel Perforation

Perforated Rainscreen Cladding (Type A) - PPC RAL 9005 Semi Gloss
EWS-302

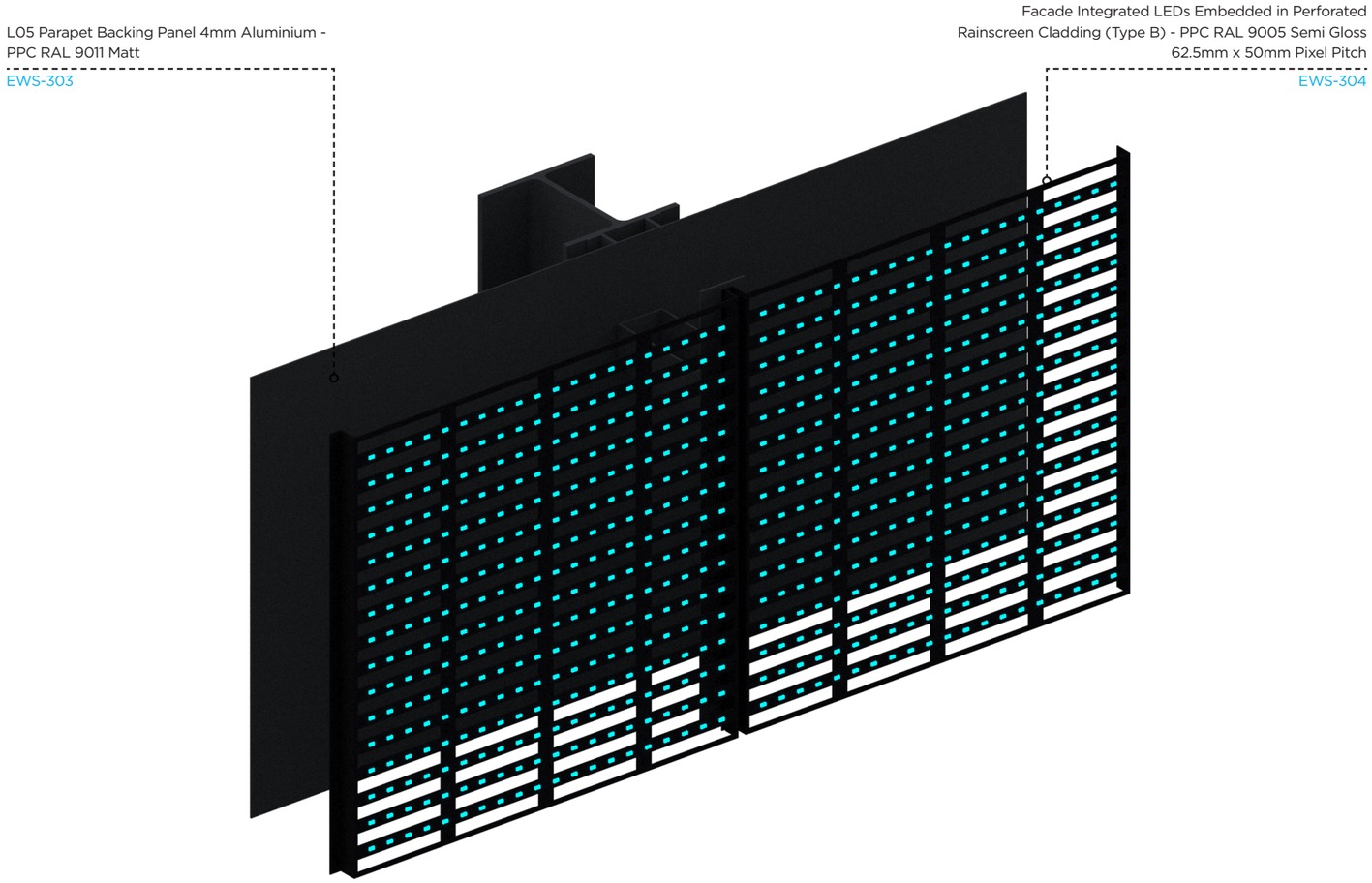
1.6.18 LED Integration

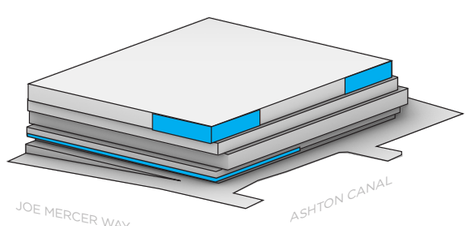
The facade has been meticulously designed to ensure the building has a seamless aesthetic, both on event day and non-event day, to be a responsible neighbour and come to life when necessary through facade lighting. To avoid 'postage stamps' on the corners of the facade when the screens are switched off, we have developed, alongside various specialists, a facade integrated lighting system that allows the screens to 'disappear' when switched off.

Vantage point studies have been conducted to determine the most appropriate locations for LED screens, ensuring there is valuable coverage for both visitors to the venue, and passers by. As a result, three, 33m (w) x 9.4m (h) screens have been located on the top box, with two being in the south west, the approach from the Etihad and tram station, and the third in the south east, addressing those on Alan Turing Way.

To ensure that the proposed lighting and LED screen do not adversely affect the neighbouring developments, in particular the residential blocks on the east side of Alan Turning Way, the venue has been located as close to Joe Mercer Way as possible, creating a 100m offset distance to the residents.

The LED lighting will be sympathetic to it's surroundings, with the top box not being lit between midnight and 7am and only taking on a more dynamic lighting expression during pre and post-show periods.



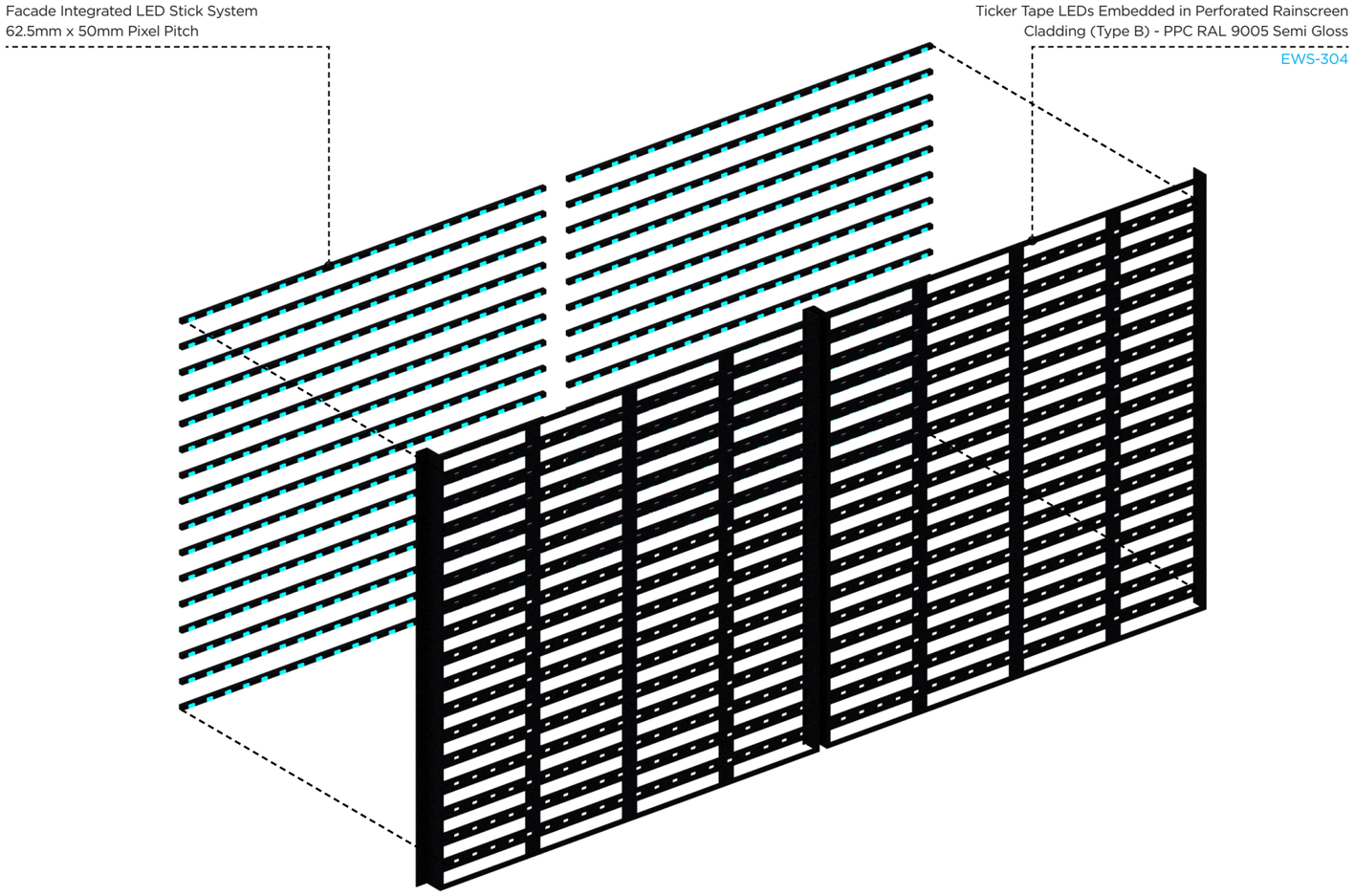


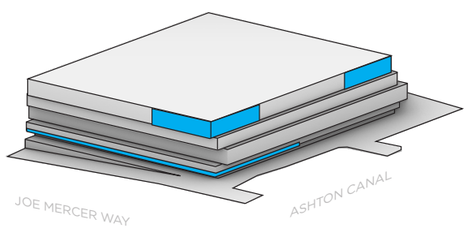
The seamless LED facade integration is achieved by fixing a LED stick system to the perforate cladding with a perforation in the facade at the location of each LED pixel.

After extensive research, the specialist lighting designer has recommended a product suitable for OVG Manchester, achieving appropriate visual quality, day time visibility and facade integration.

The PSX-50 product manufactured by Daktronics is an LED stick system that spans 1 metre in length, and is home to 20 pixels, with 6 LED diodes per pixel, improving brightness and visibility. Each pixel is evenly spaced across the LED stick at 50mm centres.

The depth of the pixels are 3.5mm, thus protruding further than the 3mm aluminium panel thickness and as a result improving viewing range, angle and increasing visibility.







1.6.19 Architectural Lighting

The architectural lighting proposal has been developed in collaboration with a specialist lighting design team that has considerable experience in the entertainment industry.

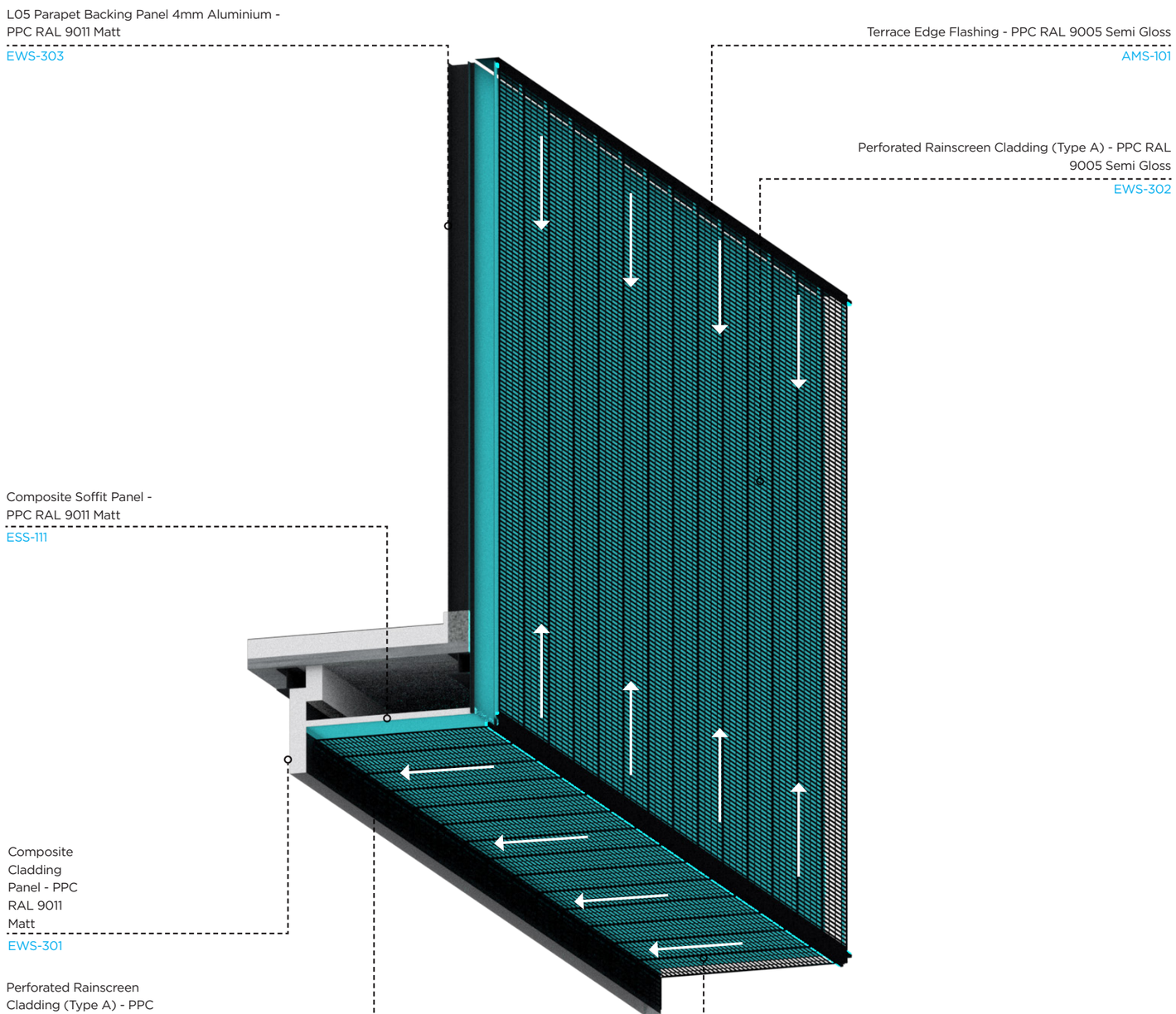
The top box and west Level 05 soffit are architecturally lit with programmable lighting that can pulsate and change depending on the event and time of day. As a result of this, the top box takes on it's own identity and acts as a beacon for the venue that rests delicately on top of the other stacked boxes.

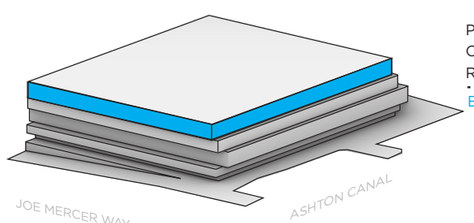
To achieve a seamless wash across the facade, Chauvet LED strip lights have been proposed to sit at both the top and bottom of the facade panel to wash onto the backing panel, and just one light to wash onto the soffit composite panel.

Through a series of digital lighting design studies, it was concluded that the parapet backing panel would be situated at a 350mm offset from the rainscreen cladding, with the centre of the LED strip light at a 300mm offset from the backing panel, providing the highest quality finish.

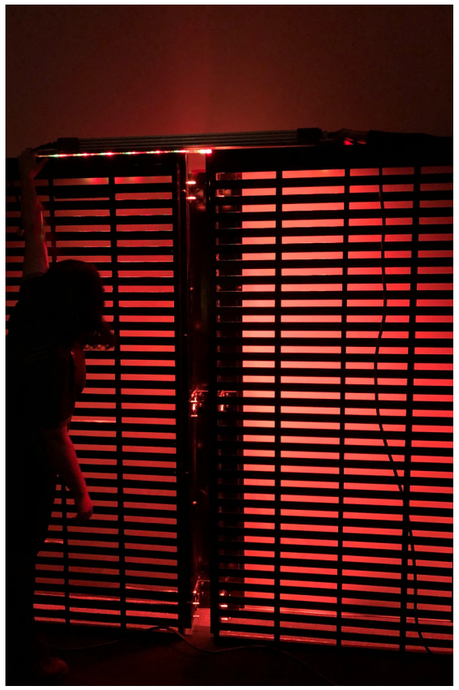
Simultaneously to the aforementioned studies, analysis was undertaken to study the most appropriate RAL colour of the backing panel to achieve the finest architectural quality and efficient spread of architectural lighting. A matt 9011 RAL colour was chosen with a 5% reflectivity.

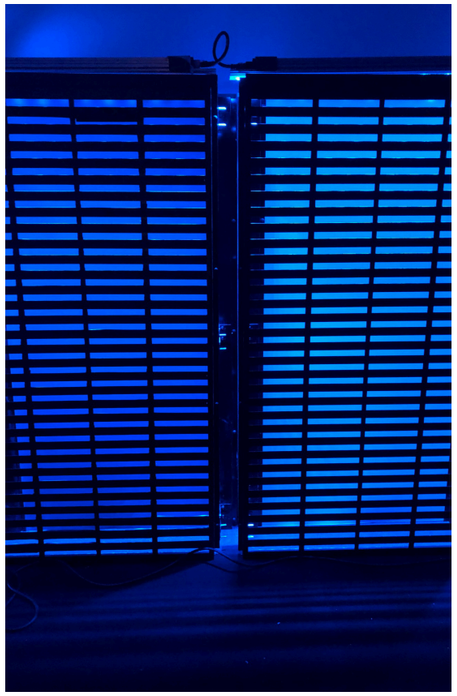
To ensure the light offset distance and parapet backing panel colours are appropriate, a full scale, 9.4m mock up is recommended to ensure accuracy.

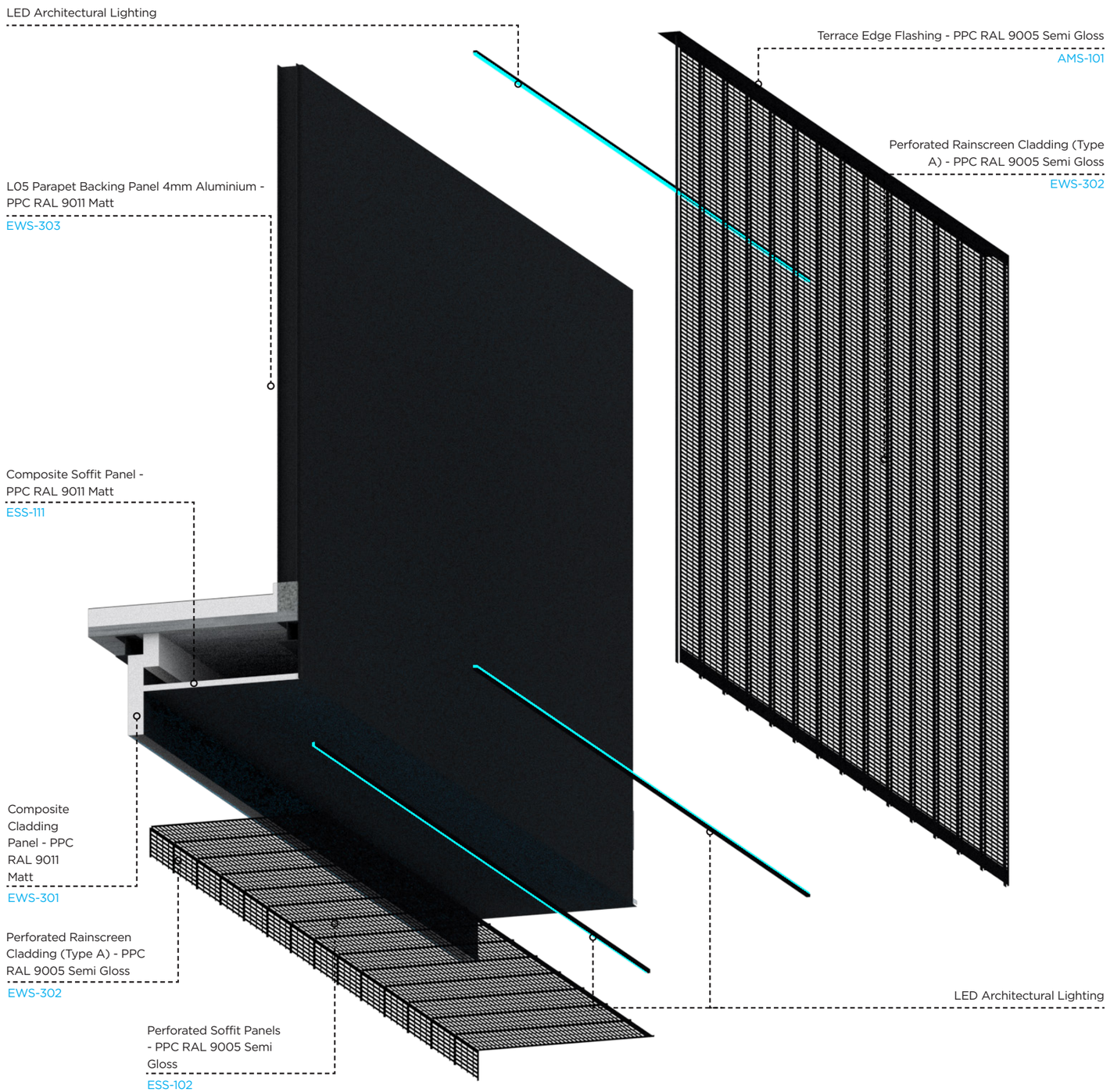


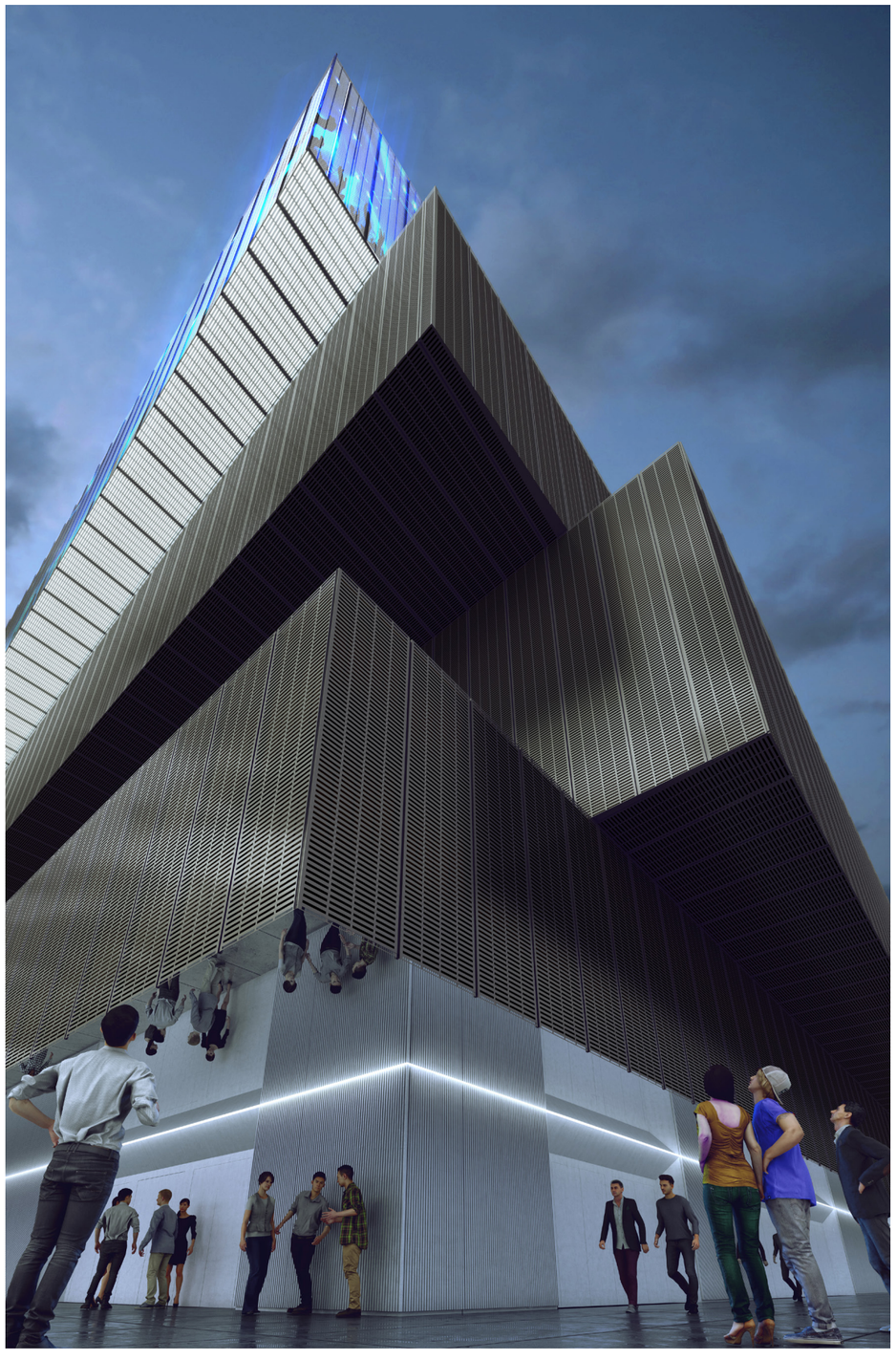


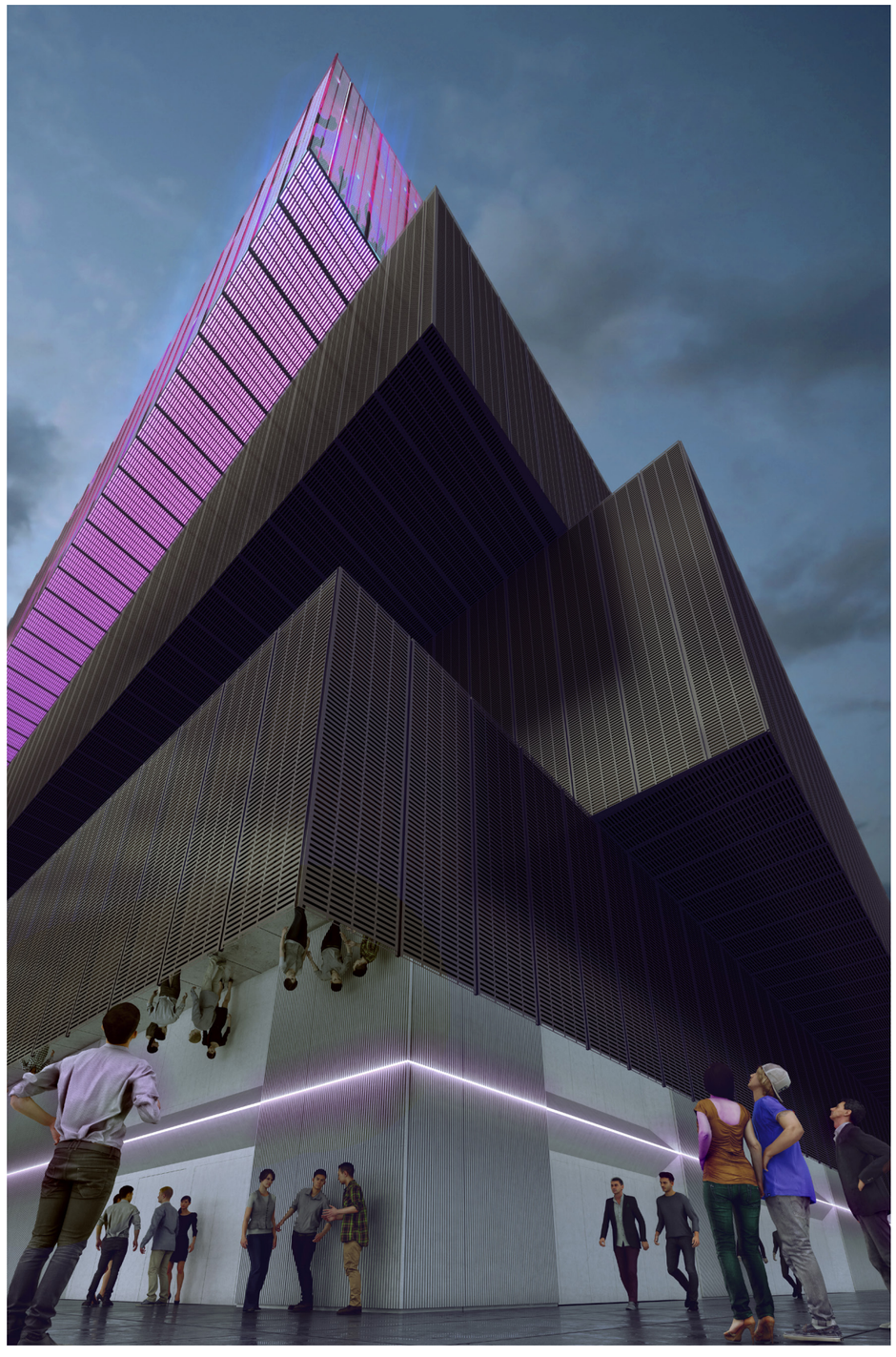
1.6.20 Architectural Lighting

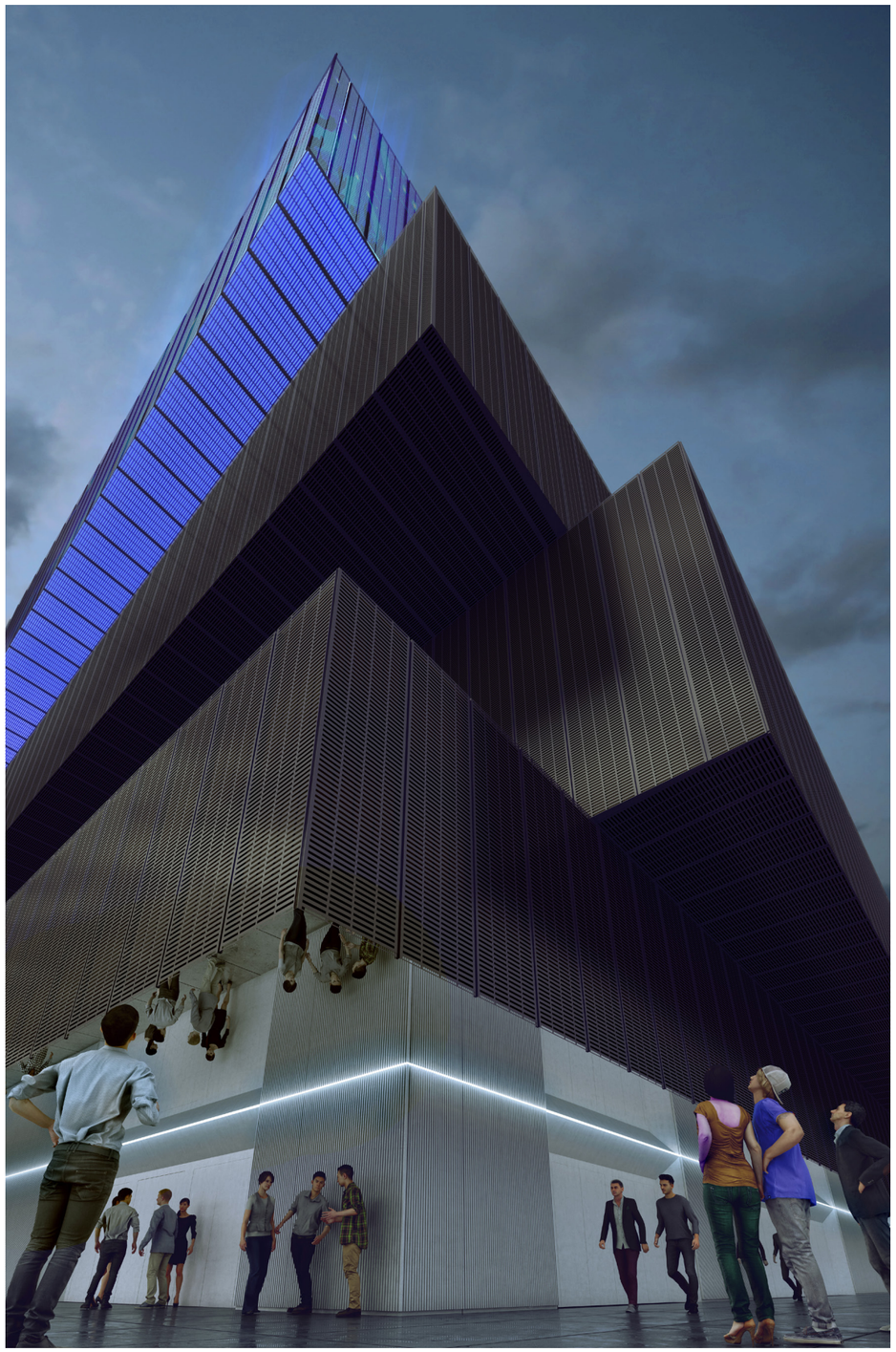


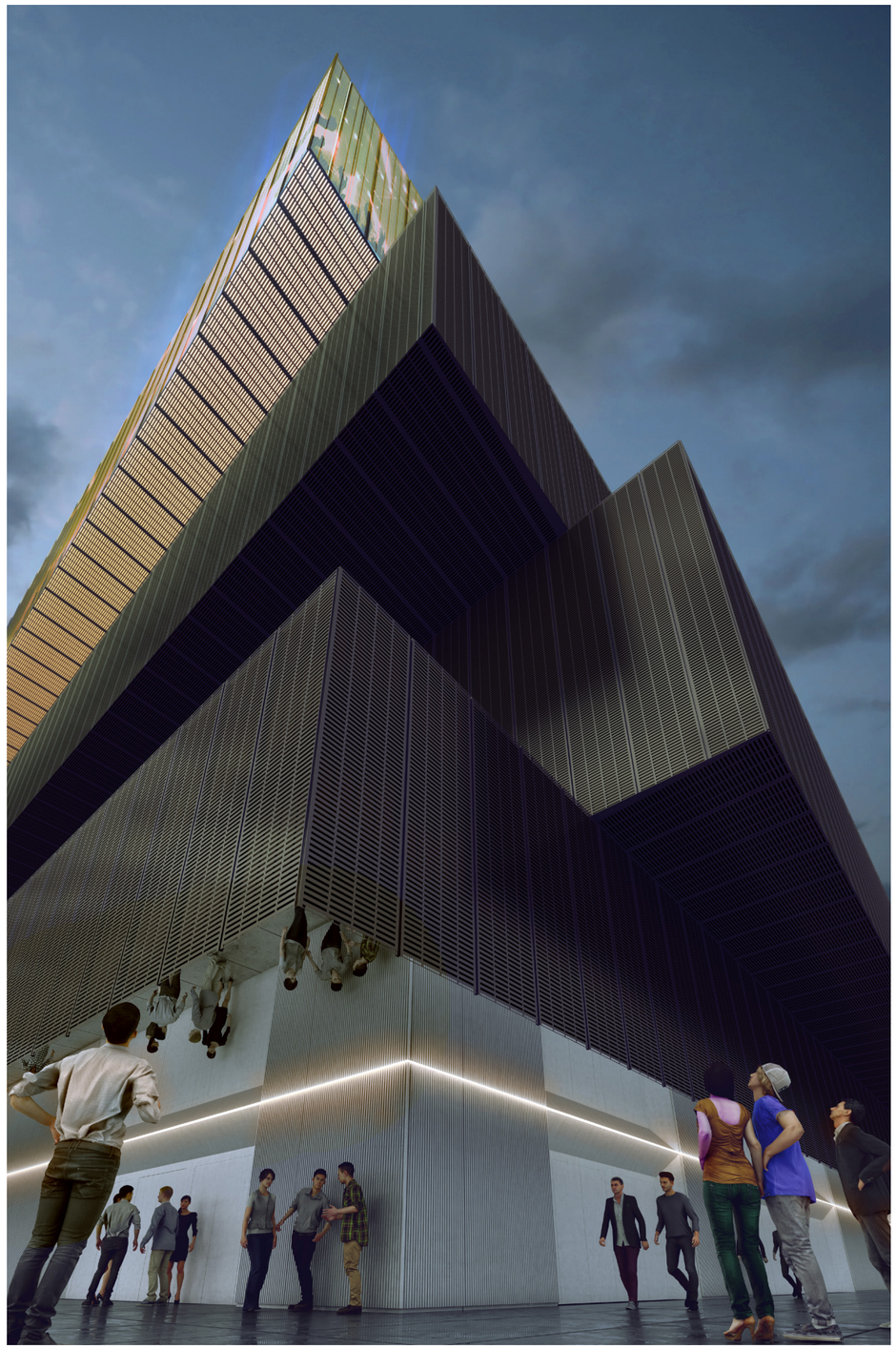












1.6.21 Ticker Tape

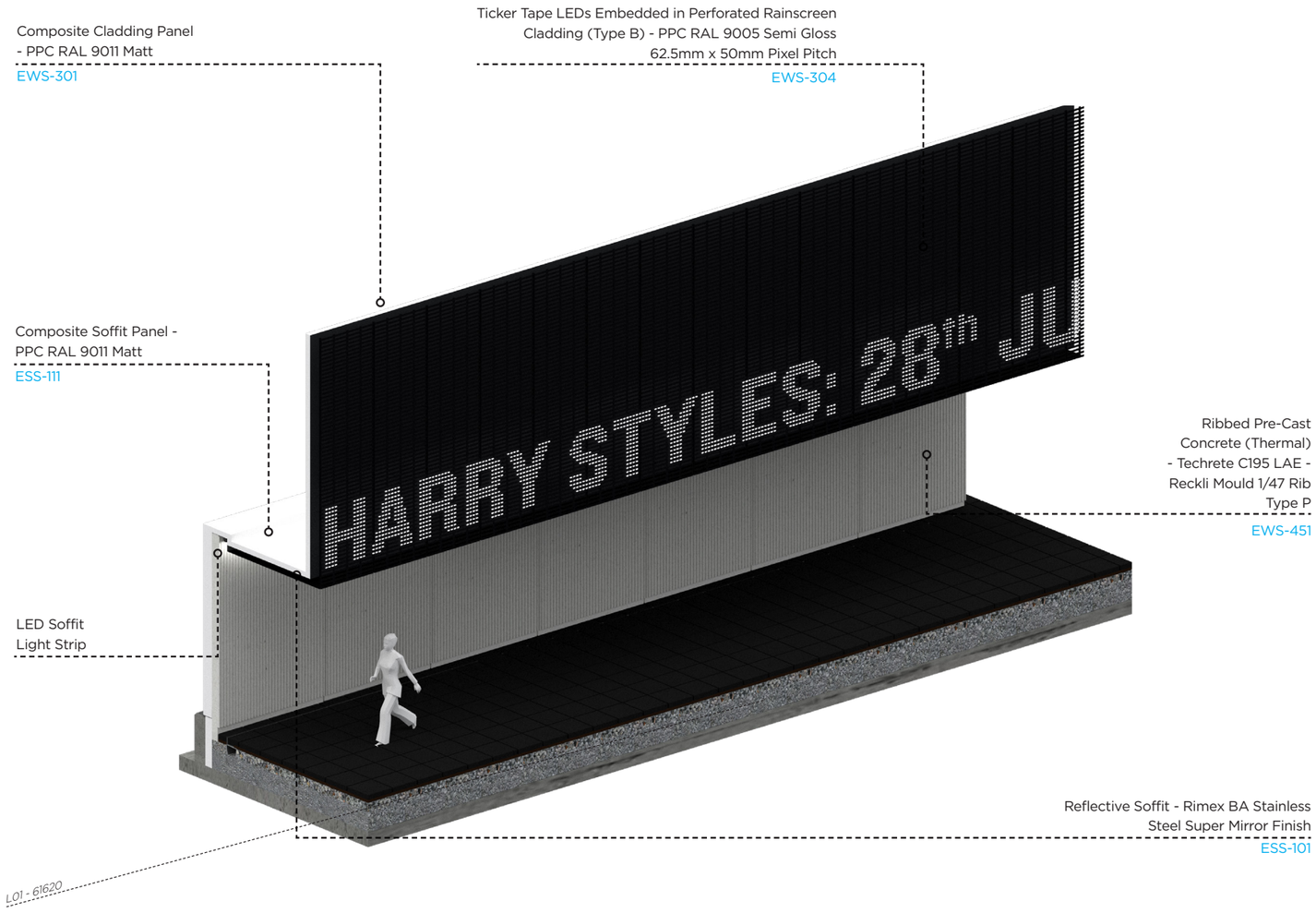
The ticker tape is a programmable variable information system, that not only increases the level of information to venue visitors and passersby, but also provides the building with an elevated level of visual and architectural balance.

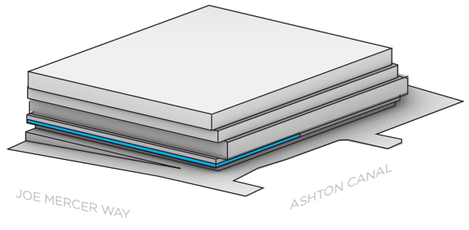
Additionally, the ticker tape offers the possibility for additional sponsorship and advertisement partners due to it's optimum visibility as visitors approach the venue with the highest footfall from both the south and north entrance points.

The variable ticker tape display allows the venue to present a range of communication including;

- Calendar of events
- Venue announcements
- Promotional or social media announcements
- Safety announcement or additional wayfinding inventory
- National movement or celebration
- Naming Rights Partner(s) allocation
- Paid for, non conflicting commercial advertising
- Breaking news or immediate venue instruction
- Sporting scores and fixtures

The ticker tape is integrated into the facade using the same system as the LED screens, also adopting a 62.5mm x 50mm pixel pitch, with colour change ability to suit the desired messaging. Stretching from the very north west corner of the Level 02 box (west side), round to the Ticket Office (south), at a 1m height.









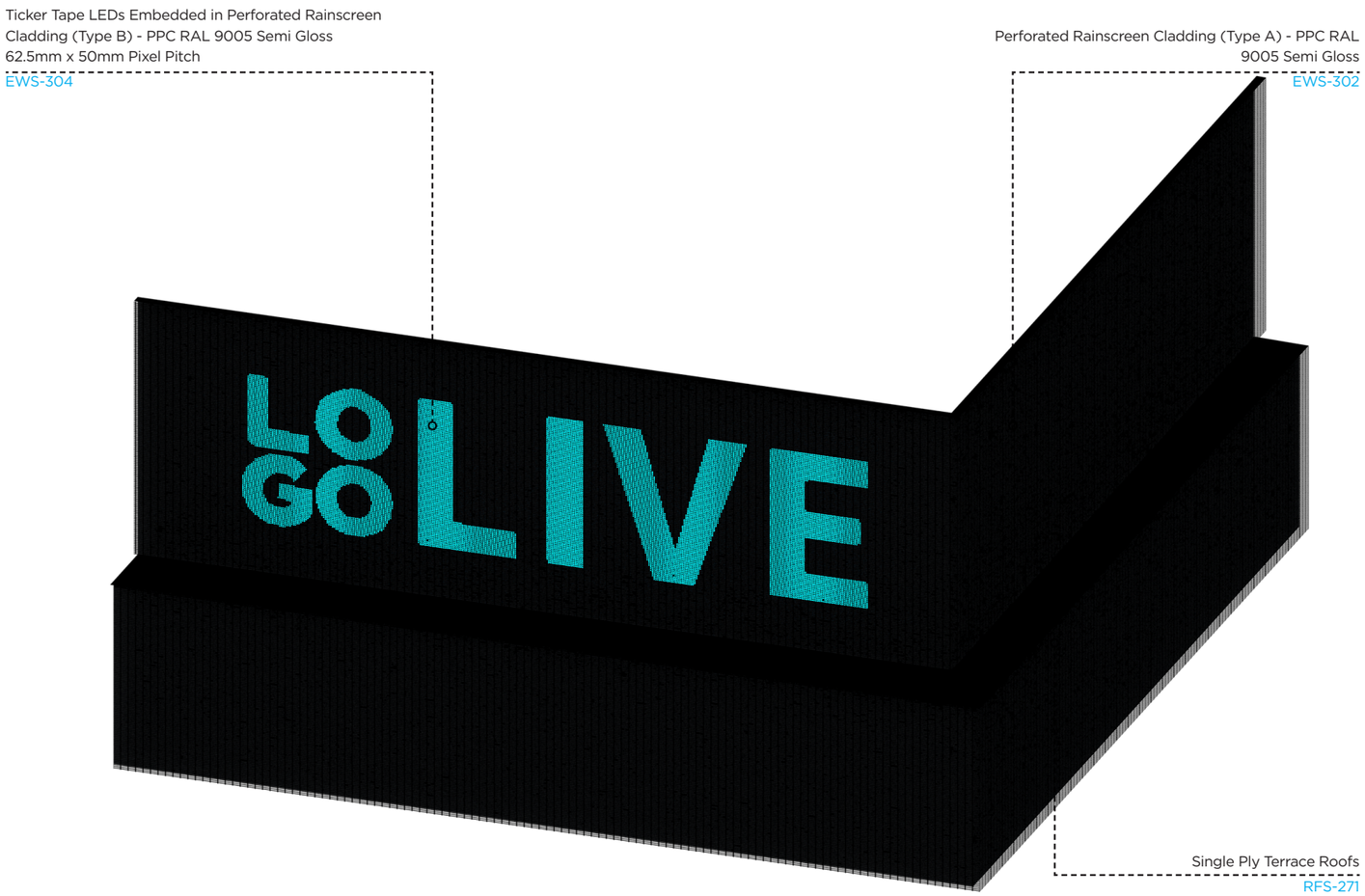


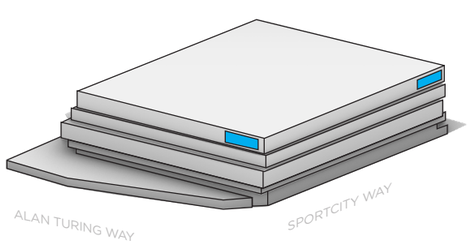
*Indicative Sponsor

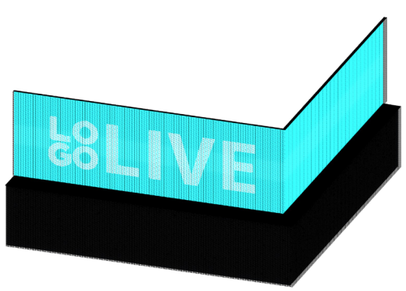
1.6.22 Facade NRP Signage

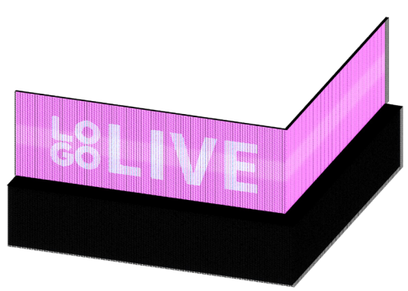
There are naming rights logos situated in two locations on the top box. One on the east side of the north-east corner, and one on the north side of the north-west corner. These are situated as such to ensure all four corners of the building have sponsorship and naming rights capability, meaning that no matter what the visitors approach direction is, there is a high level of visitor engagement.

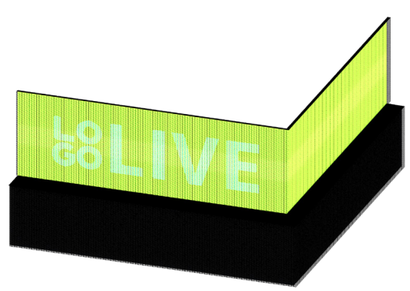
The naming rights logo is integrated into the facade using the same system as the LED screens, also adopting a 62.5mm x 50mm pixel pitch. The LEDs have the ability to change colour to suit the event and NRP preference, working simultaneously alongside the architectural lighting. This could be for a brand change, a sustainability message or a national event like Pride Month.













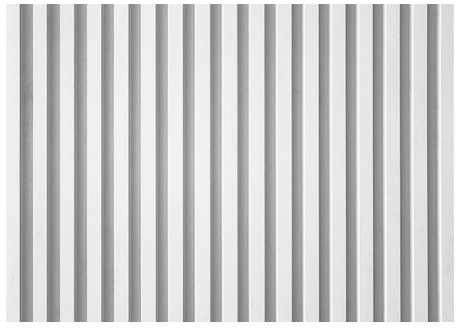
1.6.23 Plinth Materiality

In keeping with the simple massing of the venue into a series of stacked boxes, a controlled palette of materials is proposed to unify the four elevations that the venue presents to the adjacent neighbourhood.

The base of the building is considered in the context of the existing public realm and landscaped approach, with light coloured, ribbed and plain smooth concrete panelling. The entrances and exits are framed with angled architrave returns that match the materiality of the walls and give the impression that the entrances have been carved out of a solid concrete plinth. What is revealed are hot rolled steel door sets which add an element of tactility and modernity to the entrances, but also reflect Manchester's industrial nature.

To create an elevated sense of engagement with visitors, provide an "Instagrammable" moment and increase illumination, the Level 01 soffit is clad with mirror finish stainless steel panels, further animating the guests arrival. This is accompanied by a lighting recess which has colour change ability to pulsate as one with the top box architectural lighting.





Precast and GRC Concrete

All precast and GRC concrete must match to create a consistent aesthetic throughout the lower levels. The desire is to achieve a light, smooth, concrete finish representative of Techrete C195 LAE.

All ribbed panels will use the Reckli Mould 1/47 Rib Type P.

Spec Codes
DRS-281 - Canalside Folding Doors (GRC)
DRS-285 - NW Entrance Swing Gate (GRC)
ESS-460 - NW Entrance Soffit + NE Corner Soffit (GRC)
EWS-451 - Ribbed Panels (Thermal PC)
EWS-452 - Ribbed NW Entrance and Turret (Non-Thermal PC)
EWS-453 - Plain Panels (Thermal PC)
EWS-454 - Plain Panels (Non-Thermal PC)
EWS-455A - Ribbed Corner Panels (Thermal PC)
EWS-455B - Ribbed Corner Panels (Non-Thermal PC)
EWS-455C - Plain Corner (Thermal PC)
EWS-455D - Plain Corner (Non-Thermal PC)
EWS-456 - Architrave Typical L01 (PC)
EWS-457 - Architrave Varying Height L00 (PC)
EWS-458 - Architrave Large Format (PC)
EWS-459 - JMW Parapet Cladding (Non-Thermal PC)
EWS-461 - JMW Parapet Cladding (Non-Thermal GRC)
EWS-465 - NW Entrance Swing Gate (GRC)
EWS-471 - Parapet Coping (PC)

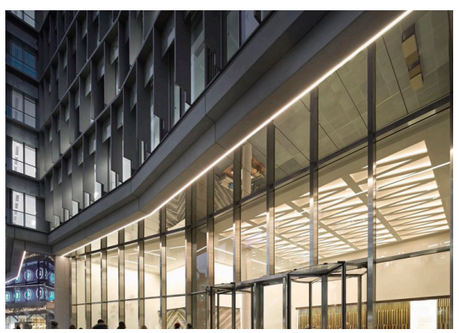


Black Patinated Hot Rolled Steel

The doors and recessed door wall cladding also must match materiality to create a consistent aesthetic. A black patina will be applied to the hot rolled steel to give a clean, modern, industrial look.

Even though the doors are well protected by the building overhangs, the hot rolled steel will need a clear, protective coating to help prevent rusting.

Spec Codes
DRS-253 - Exit/Escape Doors
DRS-255 - L00 Staff Entrance Security Doors
DRS-265 - Entrance Doors
ESS-465 - L01 NW Entrance Soffit
EWS-243 - Canalside Window
EWS-245 - Box Office Window and Transaction Tray
EWS-467 - Recessed Door Wall Cladding



Reflective Soffit

The reflective soffit is supplied by Rimex, specifically their BA Stainless Steel Supermirror product, allowing for appropriate reflectivity and visitor engagement.

Spec Codes
ESS-101 - L01 Reflective Soffit

1.6.24 Concrete Panels

The concrete plinth provides a level of one-on-one interaction with visitors to the venue, therefore a high quality finish must be achieved. The concrete will be of a light colour to allow for the illusion of the darker perforated stacked boxes to be floating above a much lighter element.

To ensure there is a consistent aesthetic across the building, each of the concrete panel types, GRC and precast concrete, will be produced by the same supplier, using a consistent mix to create a unified and indistinguishable design language.

The design team have liaised with leading industry suppliers, and it has been assured that a like for like match can be achieved between GRC and precast. This is important where the GRC panels meet a precast panel, so not to see a deviance in materiality.

A skirting detail treatment is introduced to each of the panels at ground condition to create a suitable detail with the landscape design.

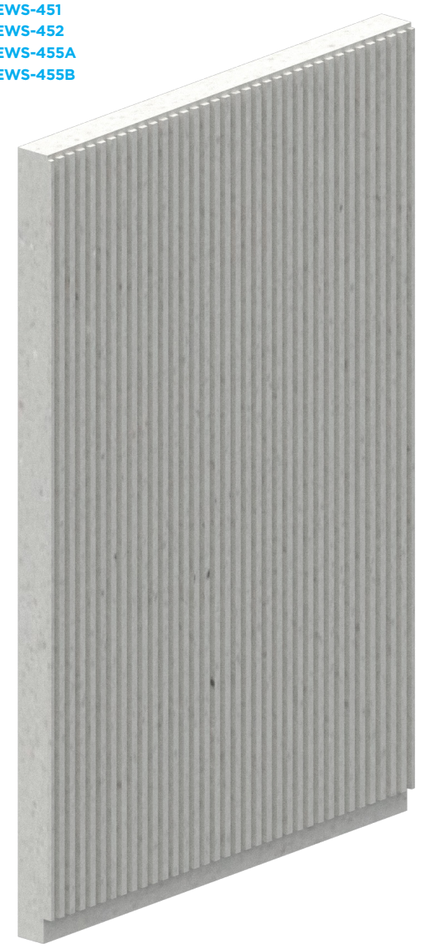
The concrete will either be, or be an appropriate match of the Techrete C195 LAE concrete mix.

The majority of the concrete panels provide a thermal, acoustic and weatherproofing line to the facade, with a 150mm thickness, followed by a 200mm mineral wool composite panel fixed directly to the precast. The build up achieves the U-Value of 0.20W/m2K and acoustic performance of Rw55dB.

Ribbed Canalside GRC Folding Doors
DRS-281



Ribbed Precast Concrete (Thermal and Non-Thermal)
EWS-451
EWS-452
EWS-455A
EWS-455B



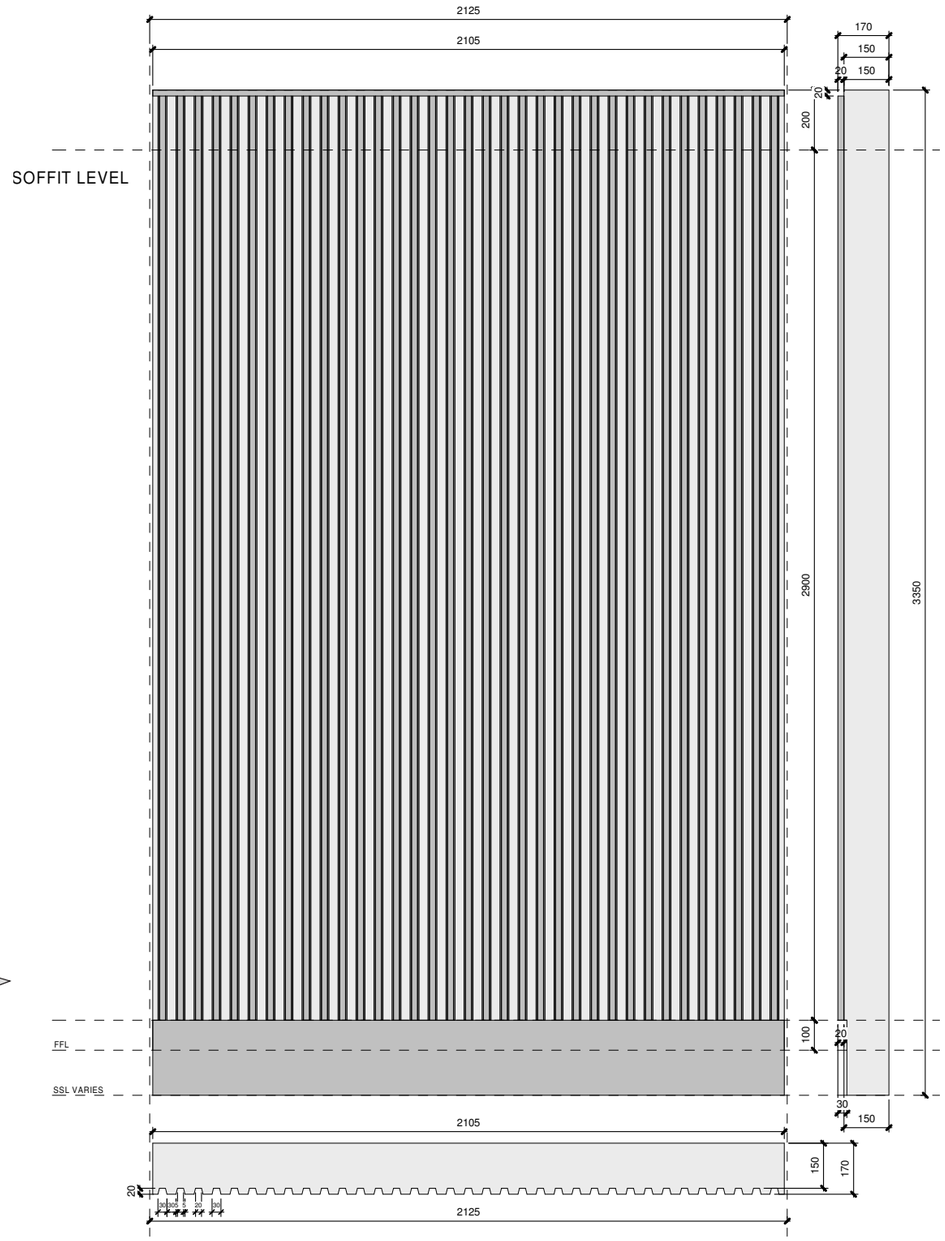
Precast Concrete (Thermal and Non-Thermal)
EWS-453
EWS-454
EWS-455C
EWS-455D
EWS-459

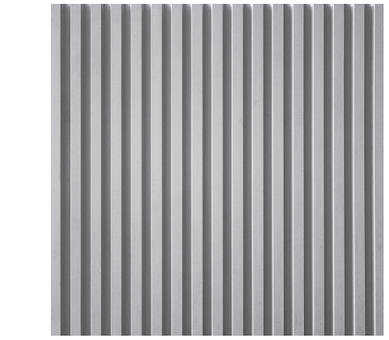


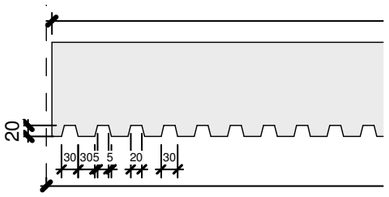
1.6.25 Ribbed Concrete

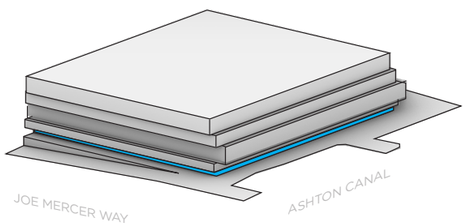
Due to the large scale nature of this building there are often stretches of facade that have no openings and these areas can become quite stark. To avoid this, the L01 band of precast concrete panels are ribbed to increase the tactility of the building and encourage the L01 soffit light to wash down the facade, creating dynamic shadows and lighting effects as the soffit light pulsates with the top box architectural lighting.

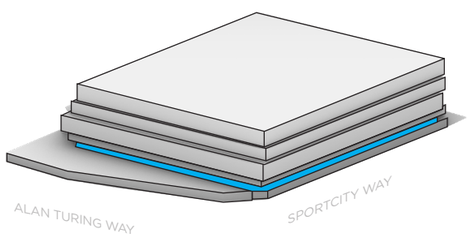
We have specified to use the Reckli Mould 1/47 Rip Type P. The ribs are 30mm thick and taper back to 20mm, at a depth of 20mm.











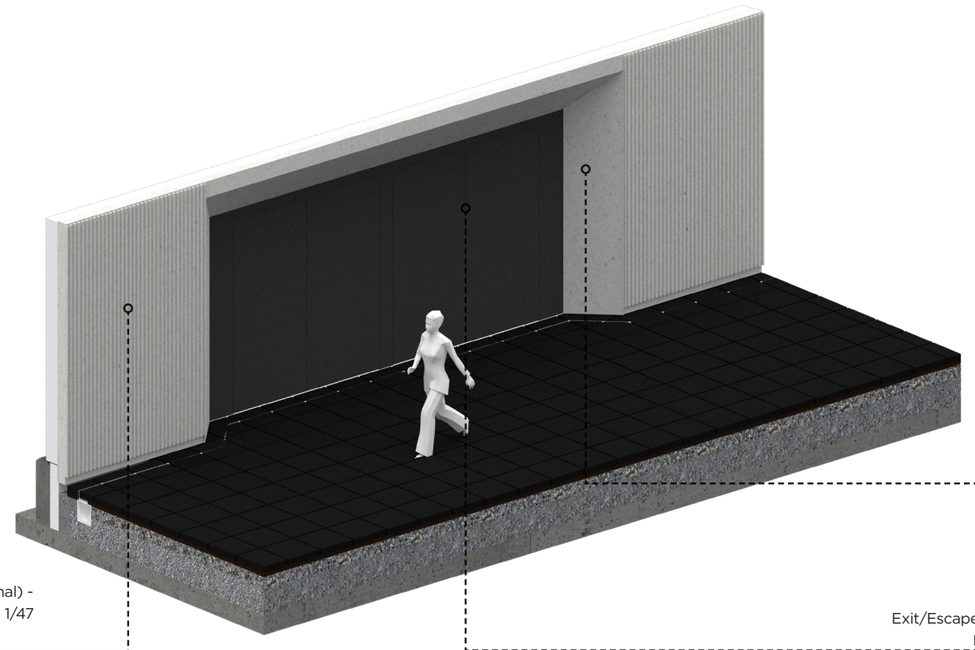
1.6.26 Hot Rolled Steel Door Sets

The nature of a building of this typology requires there to be a large extent of doors for ingress and egress purposes at the lower levels. As a result, the entrance and exit points become a key part of the buildings identity.

The entrances and exits are framed with angled architrave portals that match the materiality of the walls and give the impression the entrances have been carved out of a solid concrete plinth. These are set back to reduce the impact of outward swinging doors on the public realm due to site constraints.

Revealed within are hot rolled steel door sets which add an element of tactility and modernity to the entrances, but also reflect Manchester's industrial nature. A black patina will be applied to the hot rolled steel to give a clean, modern, industrial look. Even though the doors are well protected by the building overhangs, the hot rolled steel will need a clear, protective coating to help prevent rusting.

The sizeable concrete portal of each door set creates a visible opening for visitors and when the doors are open, light will spill out from the interior, welcoming visitors into the venue.







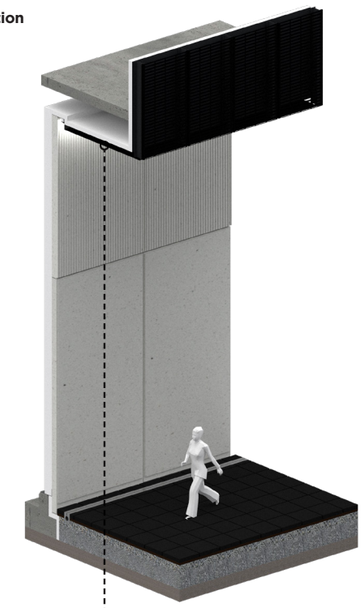


1.6.27 Reflective Soffit

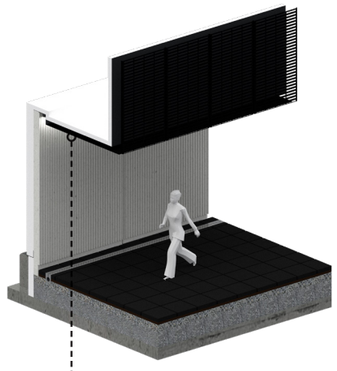
The reflective soffit that runs the entire perimeter of the building is a key feature of the building's identity. Not only does it give an element of weightlessness to the above stacked boxes, but it also gives an increased level of activity for visitors.

The "Instagrammable" nature of the mirror finish soffit will afford visitors the opportunity to take selfies for social media whilst they are queuing pre show as well as on non-event day, providing free exposure and advertisement for the venue.

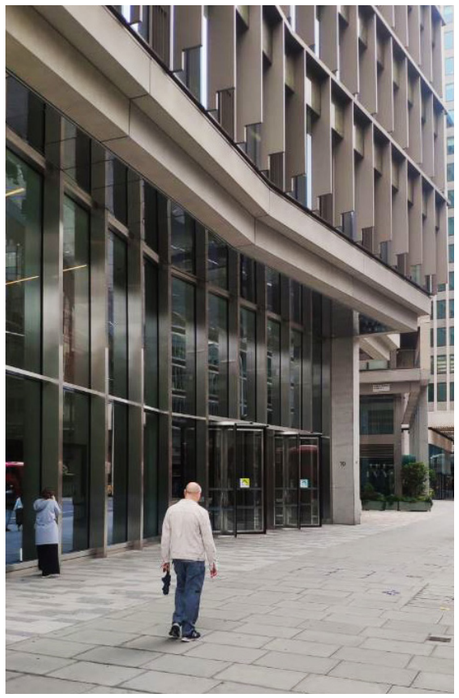
L00 North Facade Condition (Sportcity Way)

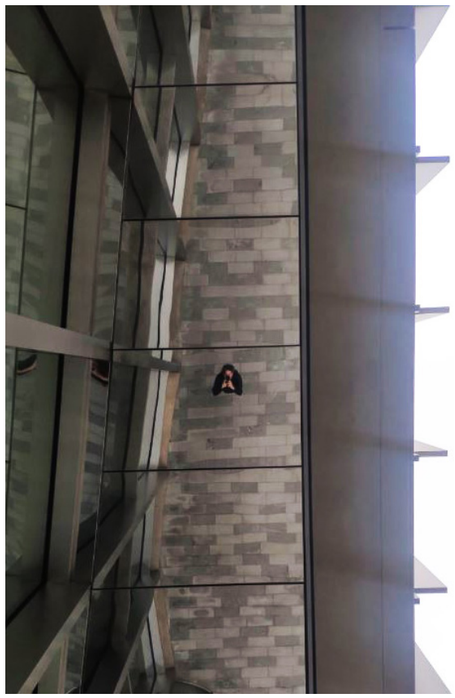


L01 Podium Facade Condition



Reflective Soffit - Rimex BA Stainless Steel Super Mirror Finish
ESS-101



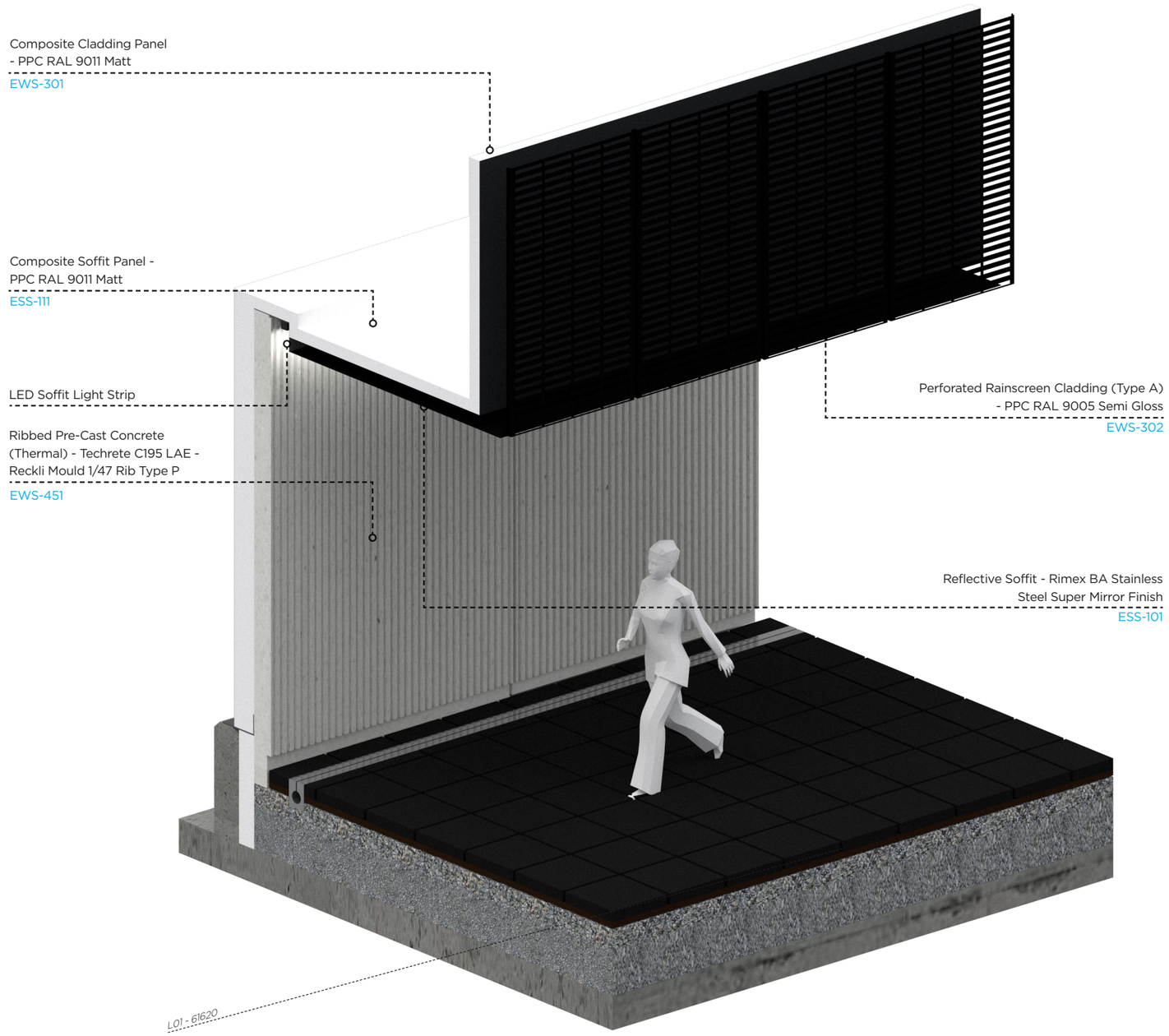


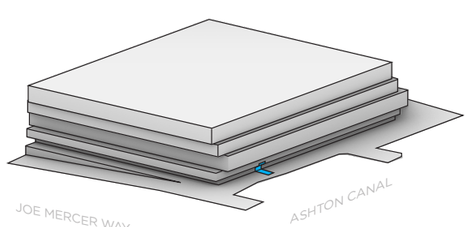


1.6.28 L01 Typical Facade Interface

The visitor approach at Level 01 is proposed to be clad with light coloured, ribbed concrete panelling, framing the main entrances and giving visual contrast against the dark paving to the venue approaches. This concrete panelling is capped by a reflective soffit installed to the base of the building's lowest box, to allow the upper metal-clad boxes to visually float above the base.

In addition to this reflective soffit, a zone of linear lighting is recessed into the soffit at the junction to the concrete facade to create a wash of light and boost illumination as guests approach the entrances.





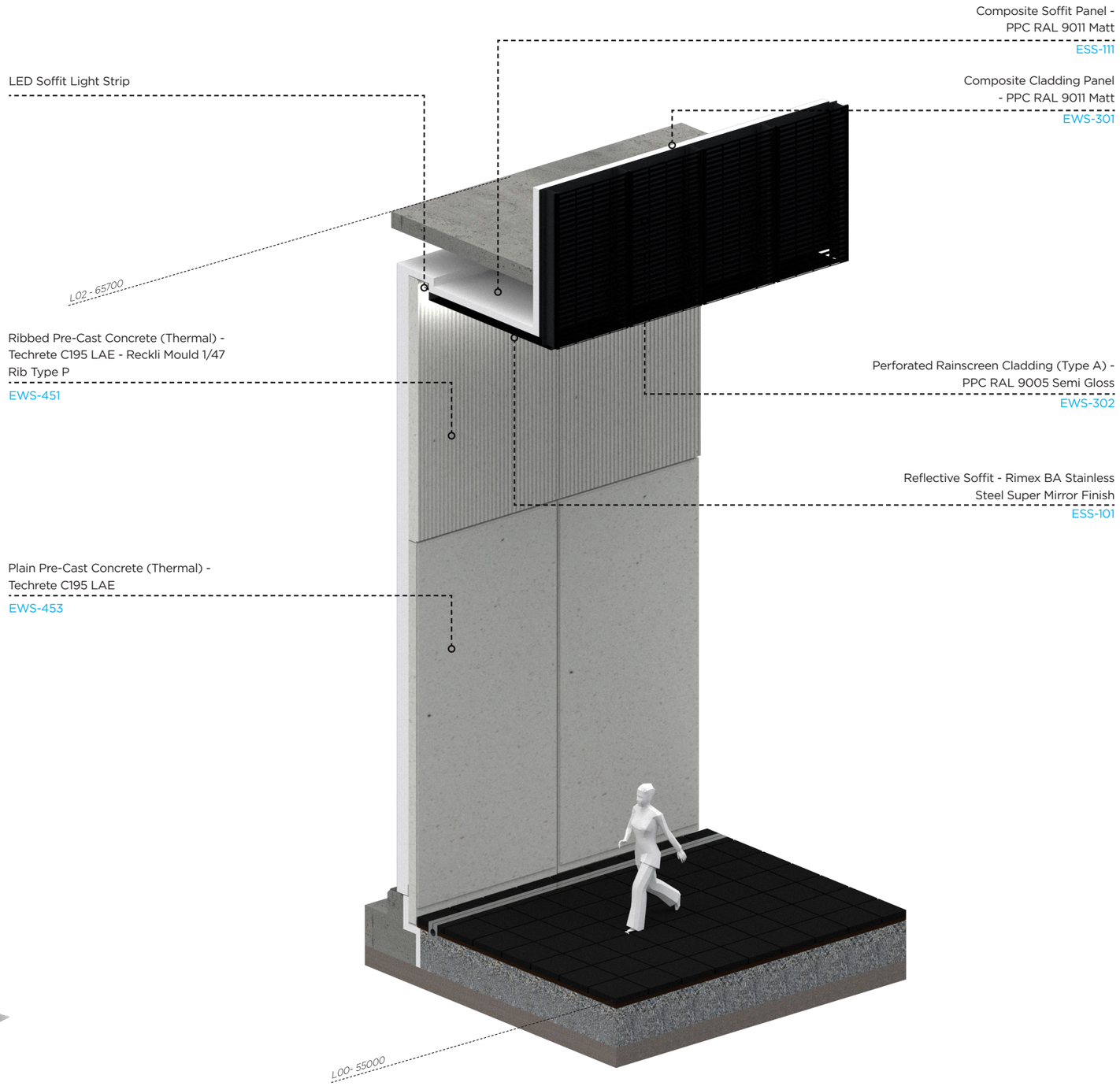
1.6.29 Sportcity Way Facade Treatment

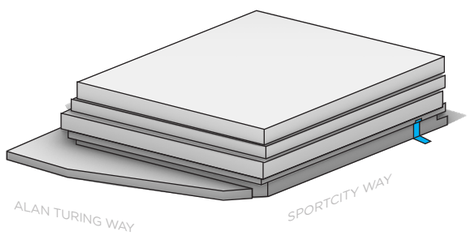
Facing Sportcity Way, the north elevation is the only street facing side to the venue. The upper portion of the facade picks up on the horizontal datum of the L01 ribbed facade panels creating a consistent datum around the extent of the building. Breaking up the otherwise monotonous 6m high, plain smooth converting the plain panels at the bottom into a natural wayfinding indicator as to where you are around the building.

The ribbed and plain concrete panels will use the same concrete mix to achieve visual continuity, with the texture of the ribs being the distinguishing feature between the two.

Logically, this elevation houses the vehicle entrance to the venue located at the north eastern corner, where it provides discrete and level access for all vehicles into the backstage service yard. A metal louvred Hydroswing door will be installed to this entrance, recessed into and polyester powder coated in a colour to match the surrounding concrete panelling.

Above the high concrete base panelling on this side, the reflective Rimex Soffit to the underside of L02 continues the visitor approach lighting and ambiance strategy noted previously.





1.6.30 L01 Doors and Openings

All visitor entry is located at the base of the venue within the solid form of the ribbed concrete panelling that unifies and grounds the building. The grouped entrance and exit doors are recessed into the facade both to assist in simplifying the wayfinding strategy, and to increase podium escape width when opened.

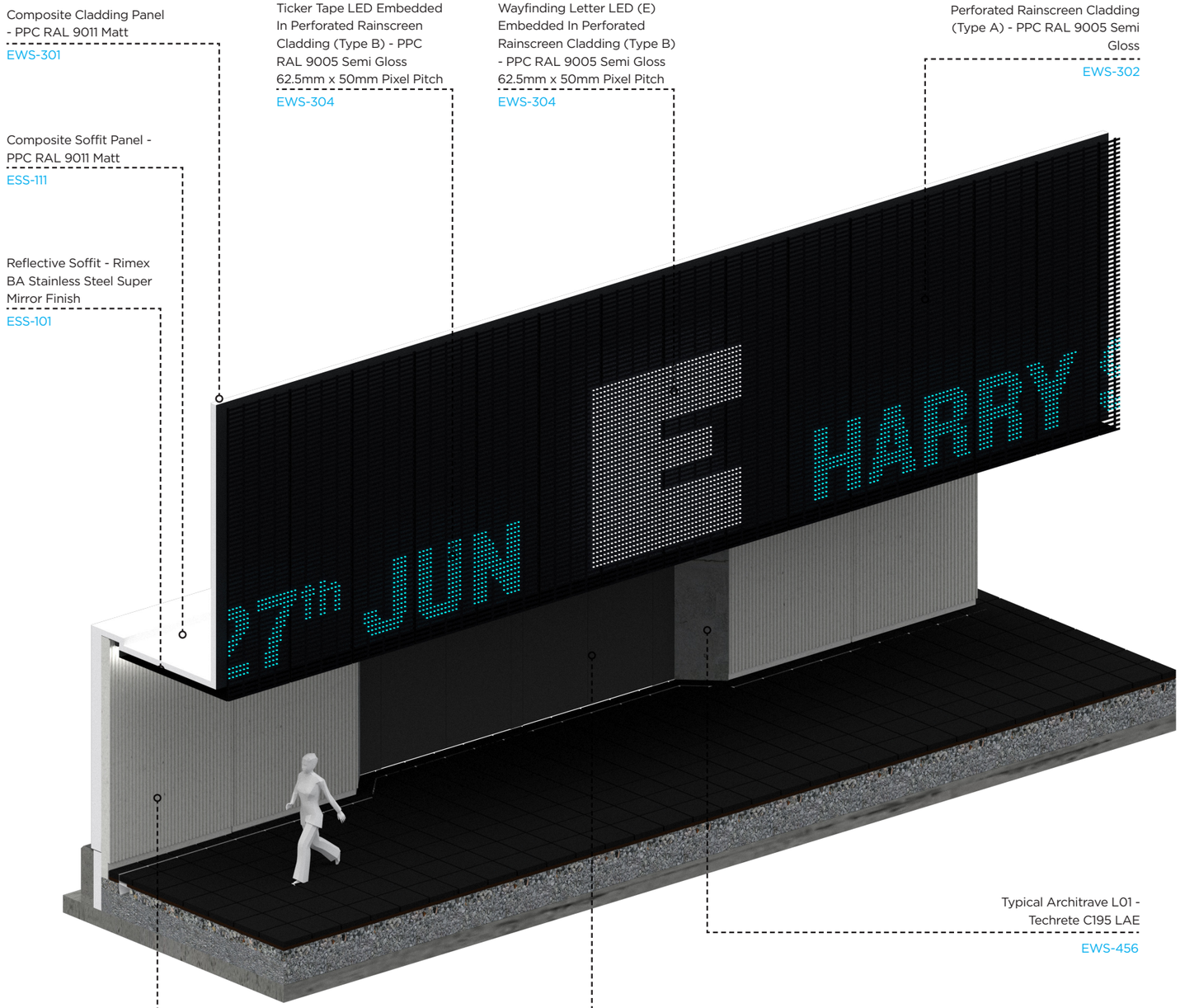
Larger groups of doors for the entrances are clustered together to rationalise entrance points and efficiently manage the security and ticket check processes on arrival.

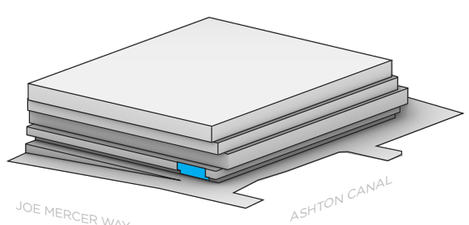
The entrances and exits are framed with angled architrave portals that match the materiality of the walls and give the impression the entrances have been carved out of a solid concrete plinth.

Revealed within are hot rolled steel door sets which add an element of tactility and modernity to the entrances, but also reflect Manchester's industrial nature. A black patina will be applied to the hot rolled steel to give a clean, modern, industrial look.

To demarcate each entrance, a large wayfinding letter is embedded into the facade above each entrance to ensure visitors can find their way. This is accompanied by the light spill from the interior, when the doors are open, welcoming visitors into the venue.

The appropriate doors will be power assisted for ease of ingress and egress.



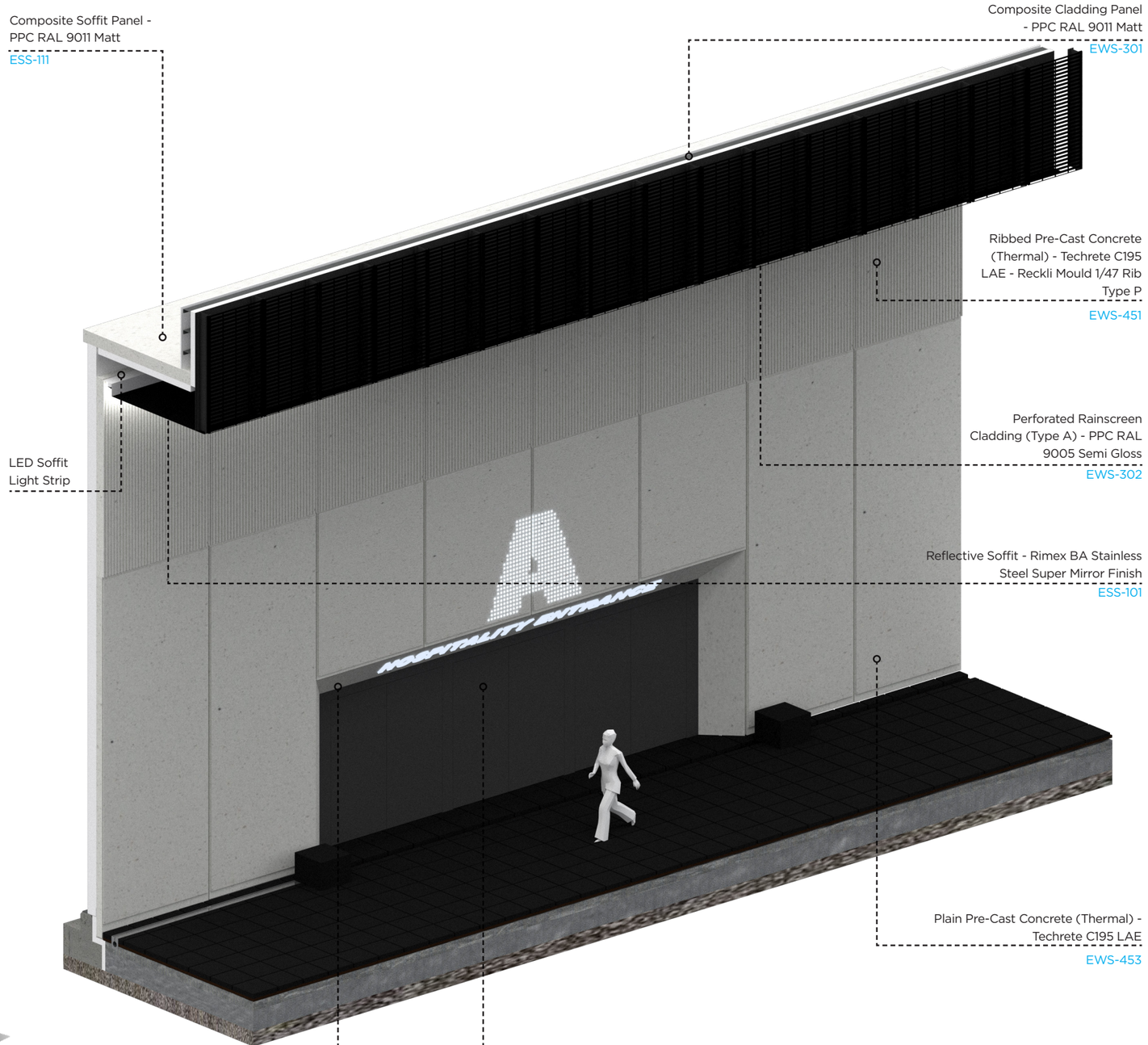


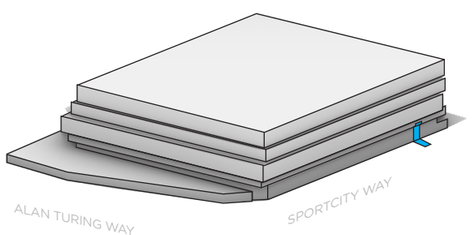
1.6.31 North User Group Two Entrance

In the centre of the north elevation is the User Group Two entrance. This will be treated in the same way as visitor entrances on the other sides of the venue, with large hot rolled steel doors recessed into the surrounding concrete panelling, but will have a larger presence in the 9 metre double height base facade.

To create an elevated level of exclusivity to the entrance, light and sound will spill out from the interior spaces, replicating the feel of an exclusive nightclub, accompanied by hospitality style red rope queue zones.

NRS illuminate signage to be integrated into design





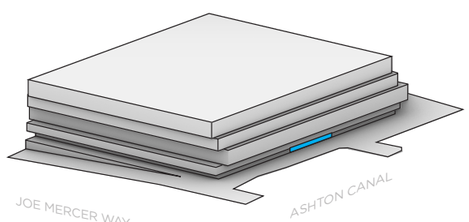
1.6.32 Canalside

The south side of the venue benefits from its proximity to the adjacent and historic Ashton Canal and Forge Lock. The new landscaped area is a primary approach for all visitors to the Level 01 main entrances, with the patterned black pedestrian thoroughfare bordered by canalside seating decks, planters and soft landscaping.

To facilitate the use of the south facing deck, the central portion of the Level 01 facade is proposed to incorporate GRC horizontally folding doors, to reveal a long double-sided bar to allow the venue to open to the landscape in fine weather. This is an alternative and a more cost effective solution in comparison to the Stage 3 design of hydraulic GRC up and over bi-fold shutter doors. On either side of the bar are pairs of doors which could be opened to allow for the concourse to be utilised in non-event hours, allowing passing visitors to use the food and beverage offers within the venue, further activating the public realm. Internal compartment doors at either end of the south concourse on Level 01 will secure the space for event preparation to continue elsewhere in the venue.

To ensure the Canalside bar can be used on every day of the year, not just during warmer days, a vertically sliding Vitrocsa window is incorporated into the bar design. This means that on non-event days, in colder temperatures, the sliding window can remain closed, but the GRC folding doors can be opened highlighting that Canalside is open for business and allowing for a glimpse into the activity within, whilst ensuring thermal integrity.

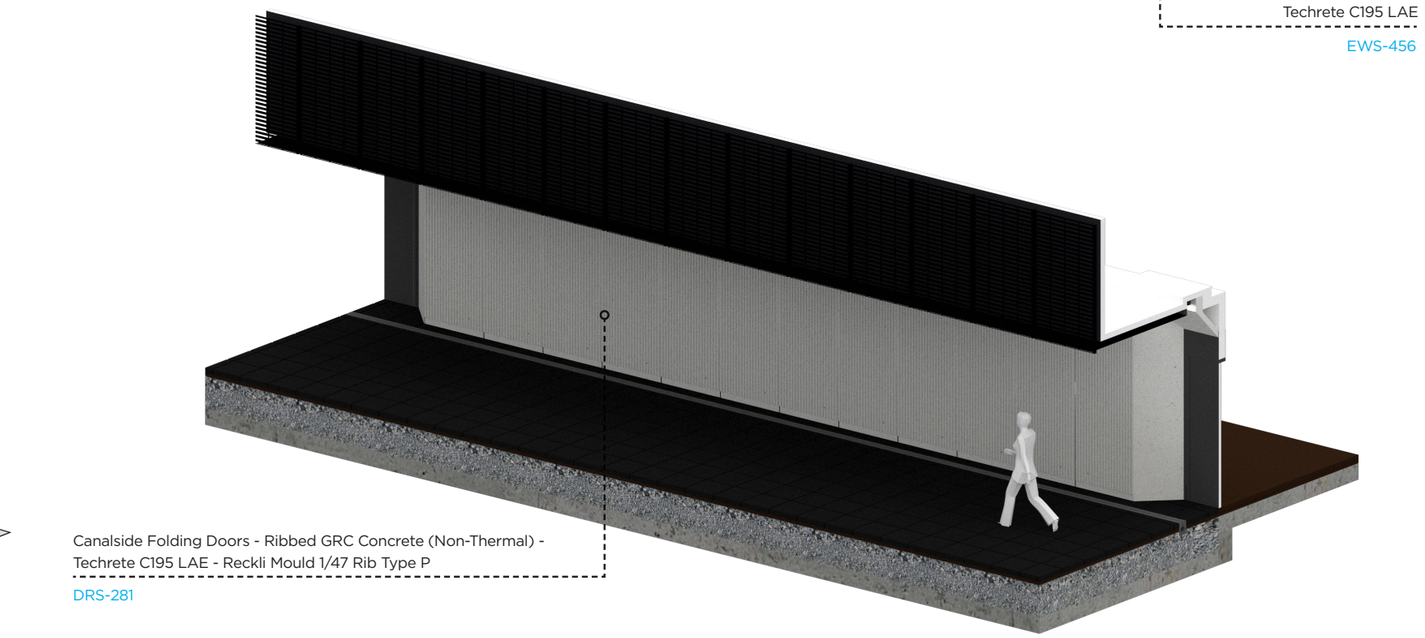
Coloured ceramic tiles line the front of the bar counter in the style of an old victorian pub, providing a bright attractive opening to an otherwise simplistic facade colour palette and simultaneously acting as a wayfinding piece, inviting visitors in.



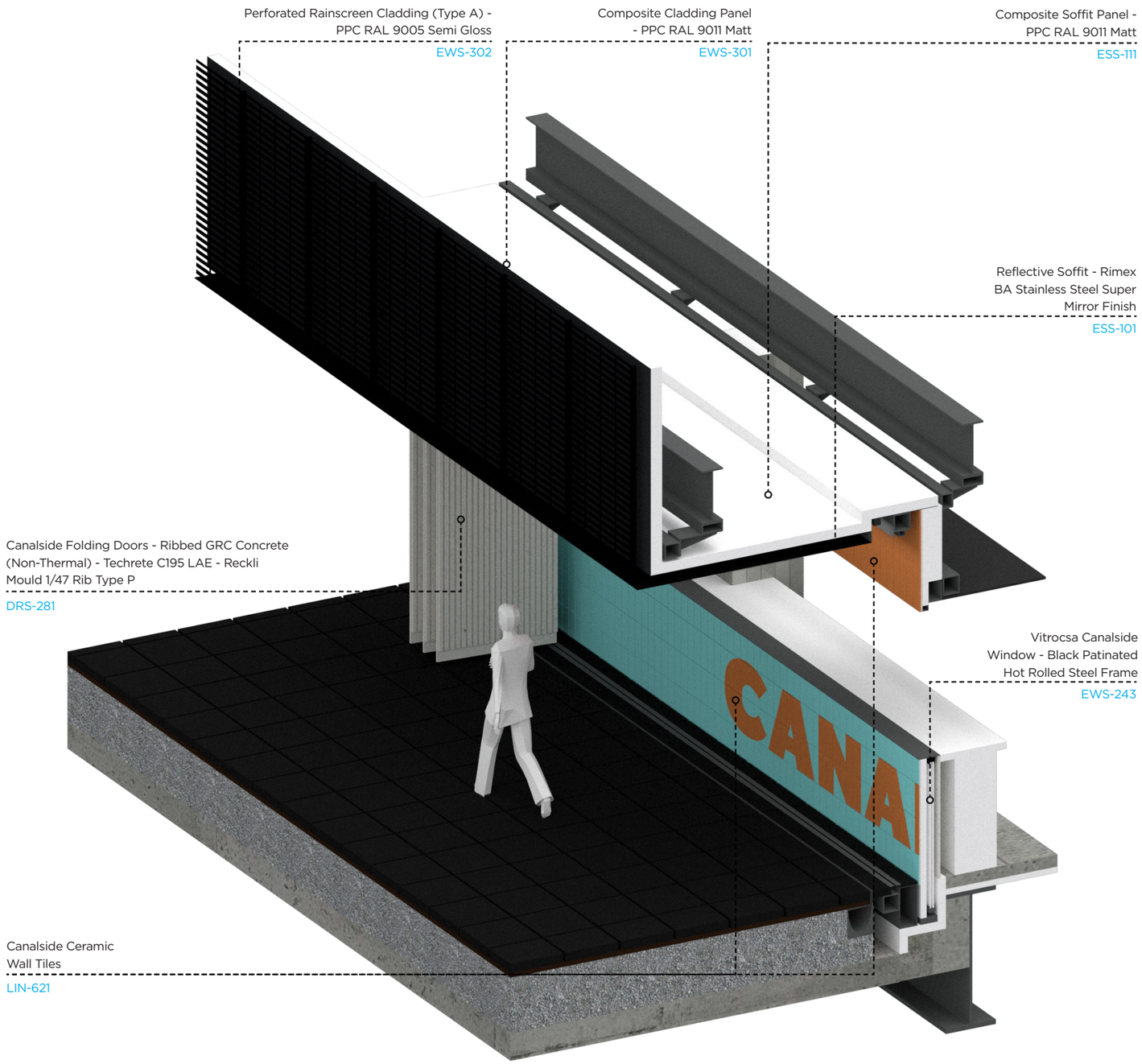
Canalside Open Bar



Canalside Closed



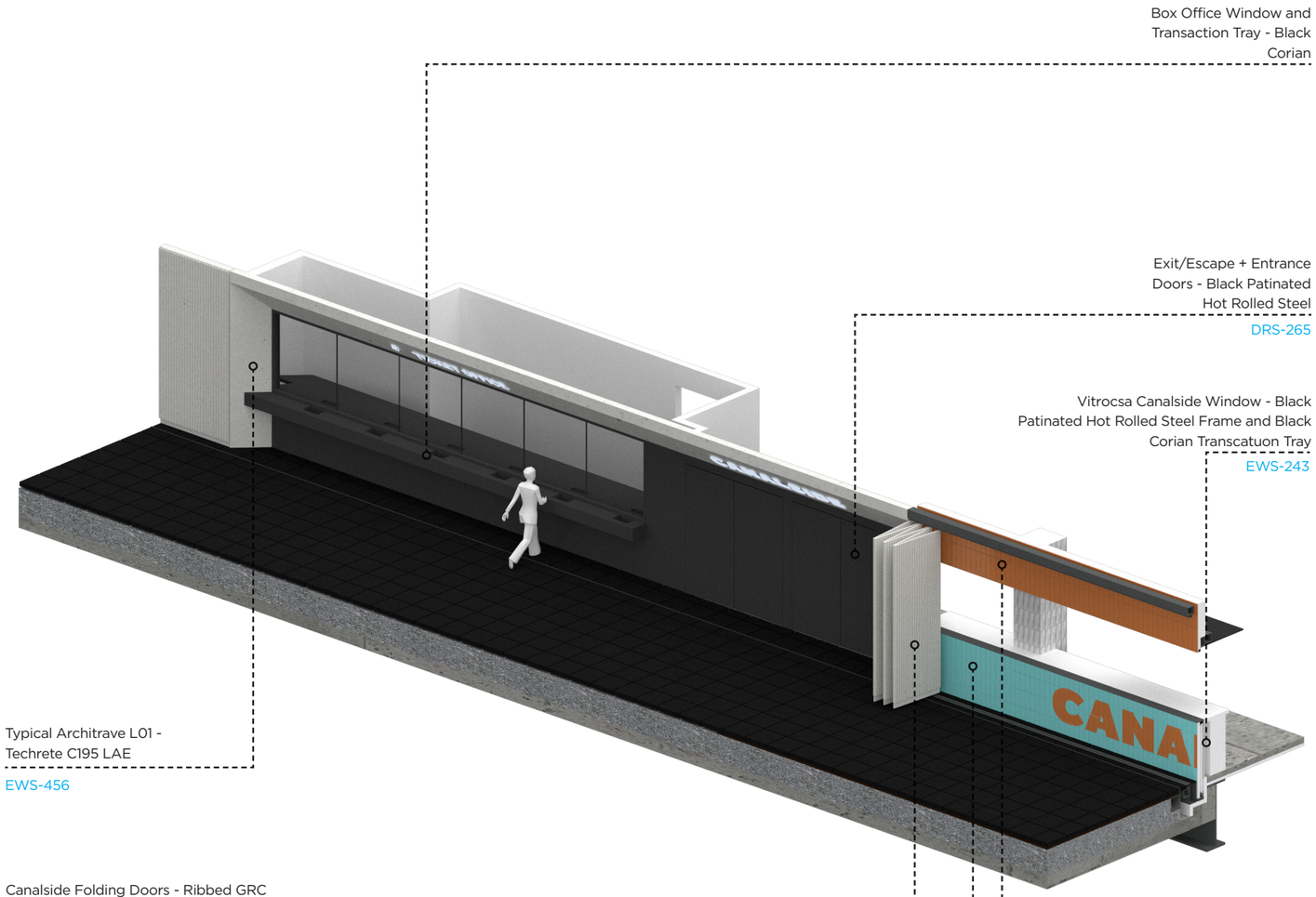
1.6.33 Canalside Opening

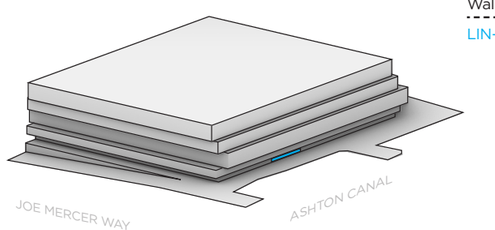


1.6.34 Ticket Office

The ticket office is the only location of the facade which has permanently visible glazing to make it clear for visitors where they can purchase and collect tickets. There are six dedicated points of sale, each designed at an appropriate height for wheelchair users.

The door wall recesses are specified as black patinated hot rolled steel and the ticket office transaction tray is black corian providing a warm surface to touch and an inclusive design approach, sitting within a large precast concrete architrave portal for visual consistency across the entirety of Level 01.





1.6.35 Joe Mercer Way Living Wall

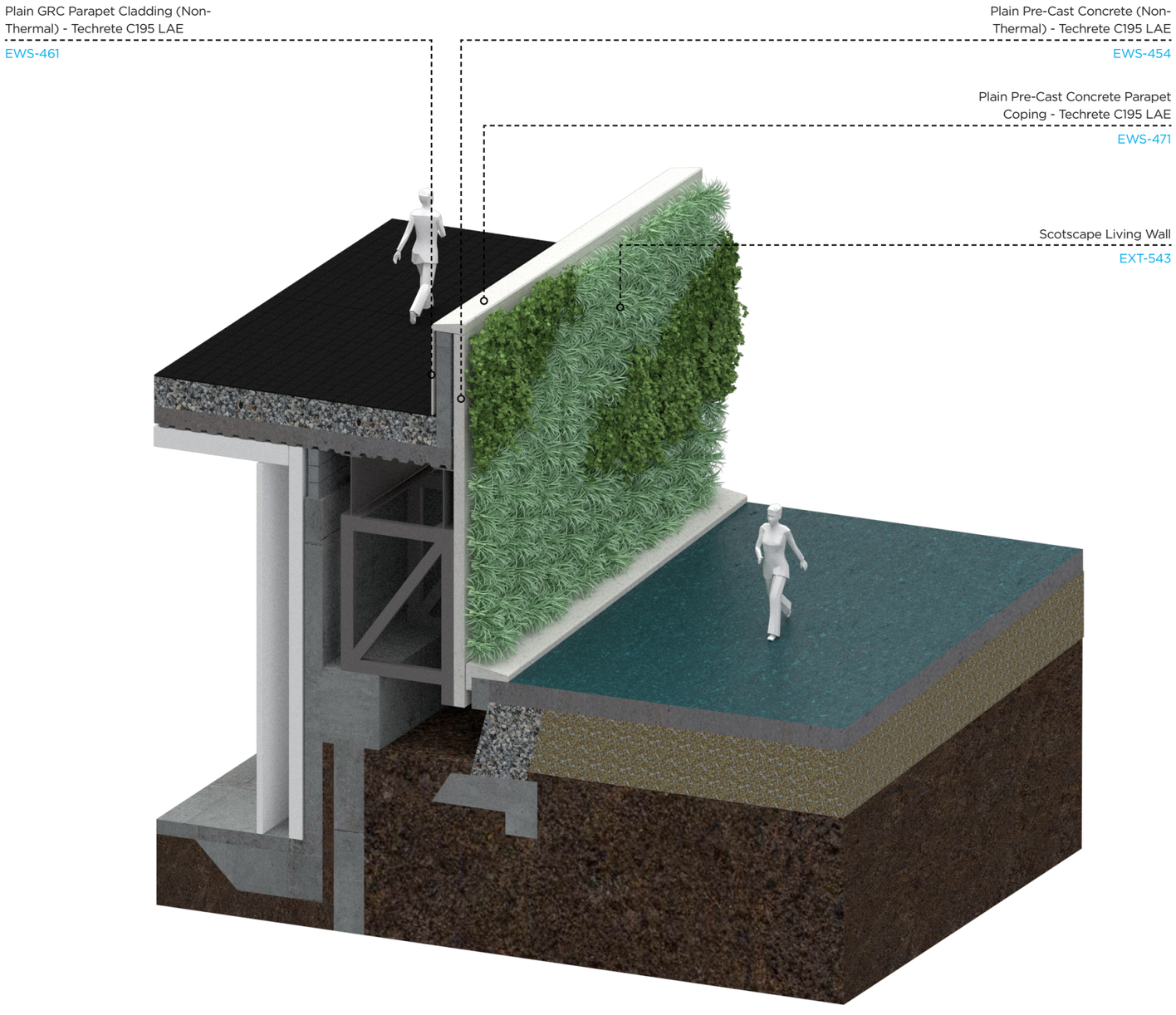
There was an aspiration from the Client and the local council to introduce a series of green corridors throughout the new Etihad Campus.

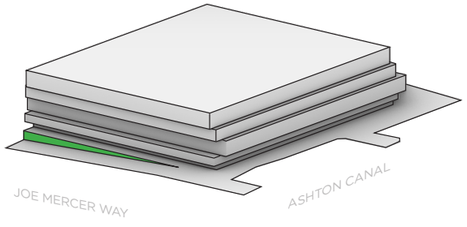
There was the opportunity to maximise the green infrastructure along the canal edge and Philips Park by protecting, extending and enhancing the local wildlife corridors that currently exist.

The landscape proposal aims to extend the green boundary between the canal, Philips Park and the venue to open up the vistas from the site across the canal and down these new green corridors.

As an extension of the green space along the canal and Philips Park, we have designed a series of green screens and living walls around the building that serve to ground the building further within the site context and give direct relevance to the extension of the green infrastructure along the canal and Philips Park.

Due to the highly trafficable nature of Joe Mercer Way, a more sophisticated method of greening has been proposed, utlising cutting edge technology to install a 315m^2 living wall, lining the entire vertical face of the pedestrian boulevard.



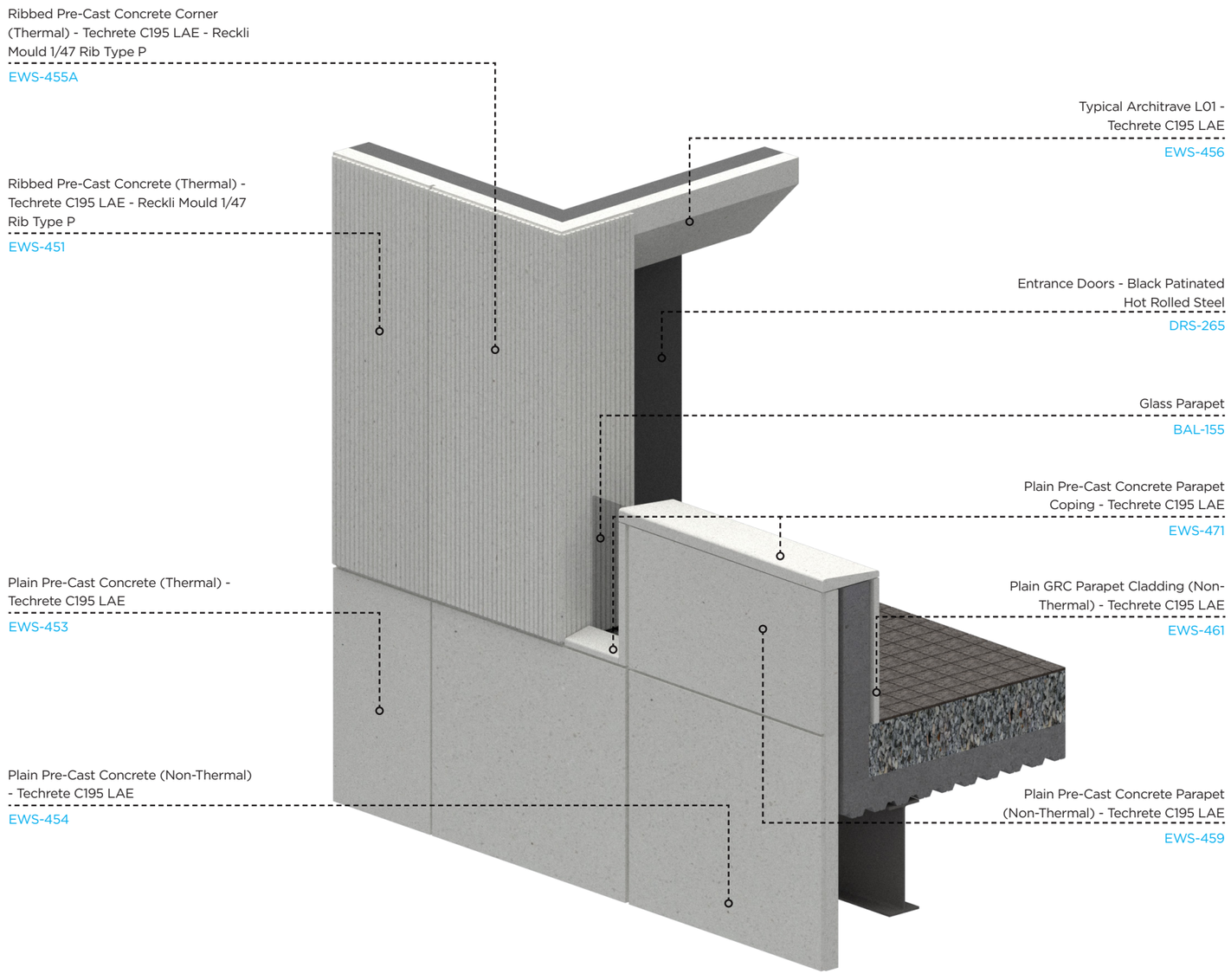


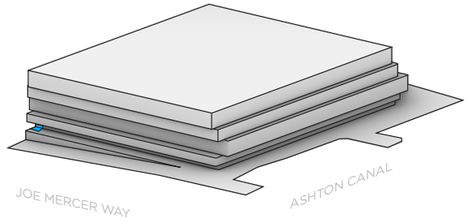
1.6.36 North West Parapet Interface

On the north west of the building we find a unique condition where the L01 Joe Mercer Way parapet meets the corner of the ribbed concrete facade. To ensure the aesthetic of a stand alone concrete element is retained, we have a ribbed corner panel that wraps the facade, and a glazed balustrade that compliments and completes the parapet, making the design intent visible.

The glass balustrade will be heat strengthened and laminated for crowd loading purposes, with a concealed stainless steel U-Capping bracketry.

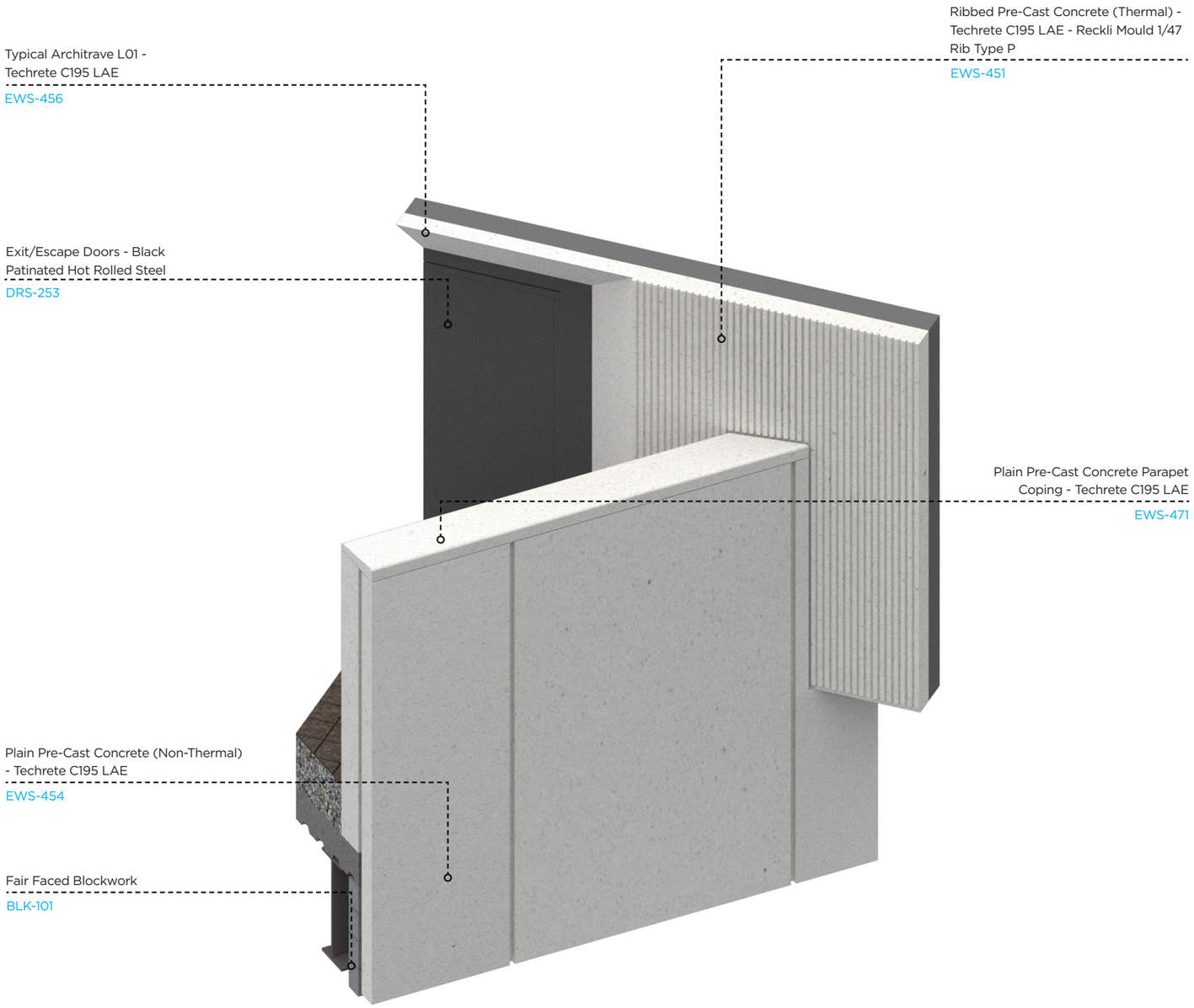
This design also improves buildability and construction sequencing.

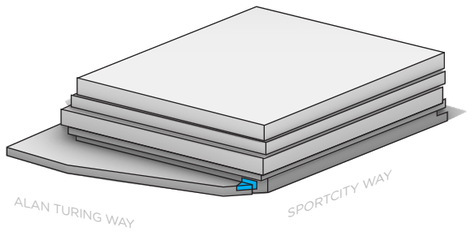




1.6.37 North East Parapet Interface

To the north east, the L01 parapet sits much higher than on the west and as a result, a different design approach has been taken. In the location in which the parapet intersects the ribbed panel, the ribs have been cut back to give the appearance that the parapet wall is protruding out of the solid concrete plinth.



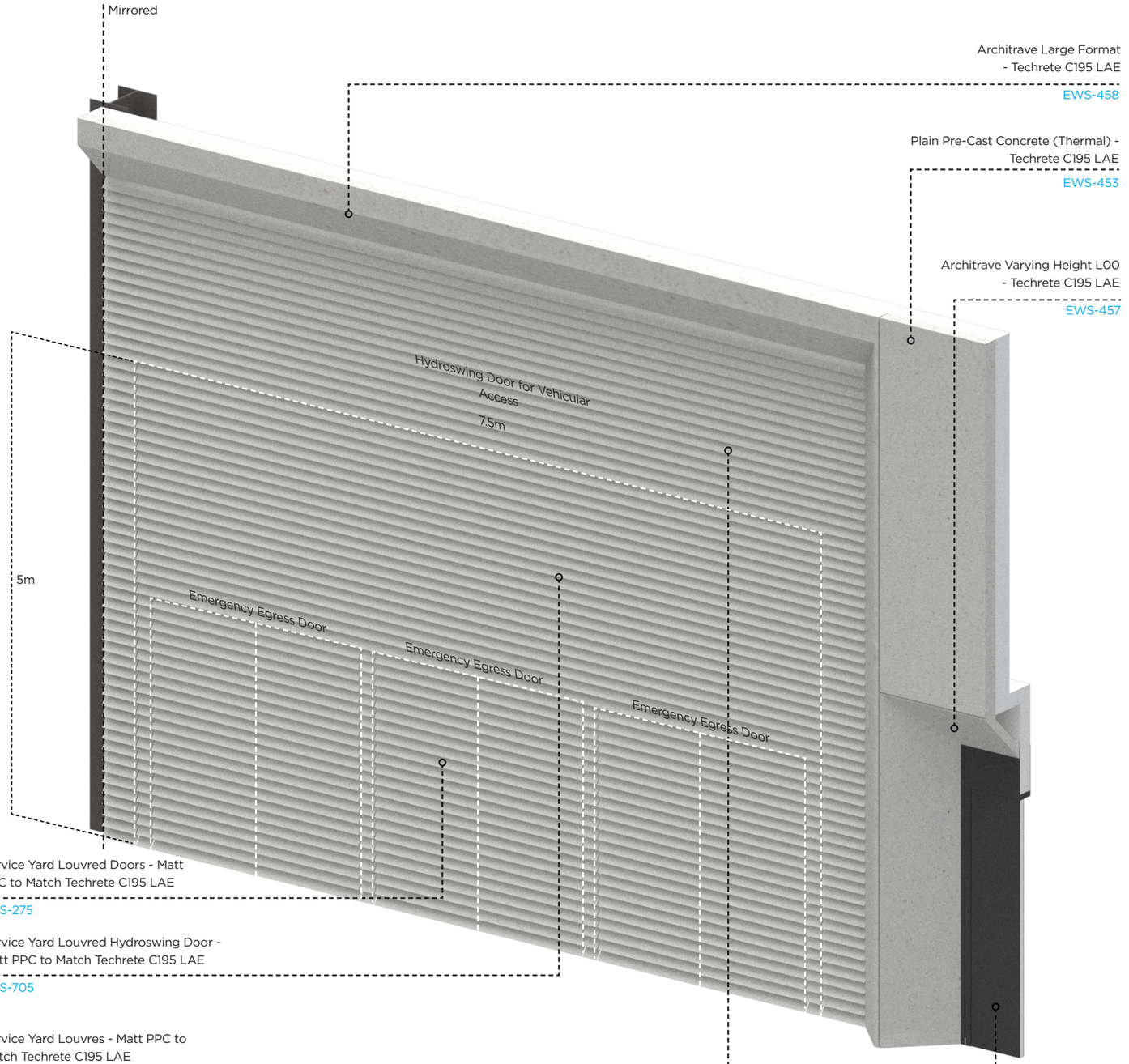


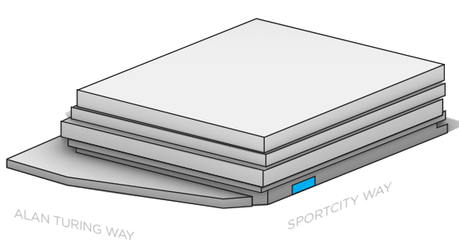
1.6.38 Loading Bay Louvred Doors

The loading bay entrance sits within the northern facade of the building, with access from Sportcity Way at the north eastern corner, where it provides discrete and level access for all vehicles into the backstage service yard.

A metal louvred wall recess sits within a large format of the typical precast concrete entrance portal. The louvres are designed to allow for required upwards of 18m^2 sufficient facade free area to aid the requirement for mechanical ventilation and smoke extract under a fire condition.

The metal louvred wall will be polyester powdercoated to match the aesthetic nature of the concrete subject to testing, and house two large Hydroswing doors for vehicular access which are also clad in the same metal louvres. These two Hydroswing doors have three emergency egress double doors embedded into them which swing outwards, providing plenty of clear width in the unfortunate case of evacuation.





1.6.39 Loading Bay Louvred Doors

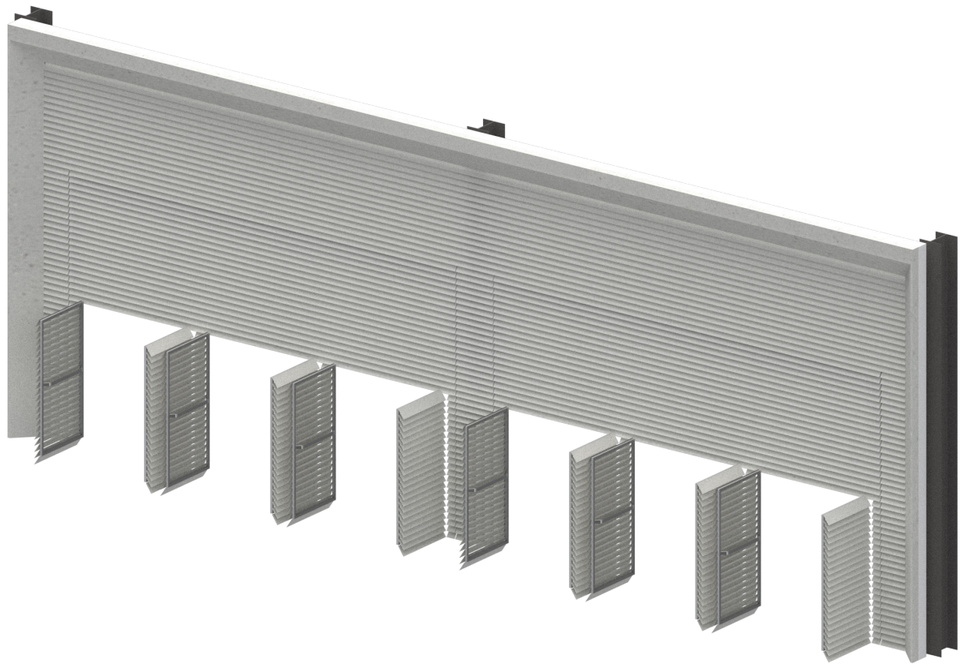
The two large Hydroswing doors are 7.5m wide and 5 metres tall and allow for a clear height of 4.5m for vehicular access, with the left door (east) dealing with ingress and the right door (west) dealing with egress. When open, these doors will have to have members of staff to ensure building security is maintained. It is recommended that these doors are not left open, and are only used when necessary.

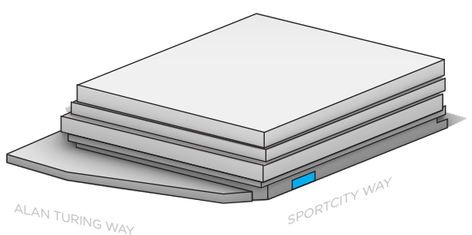
Each Hydroswing door has three emergency egress double doors embedded into them which swing outwards, providing plenty of clear width of 1.97m per door and 11.82m in total, in the unfortunate case of evacuation. These doors will have push bars and will be power assisted for ease of egress.

Loading Bay Doors Open



Loading Bay Emergency Egress Doors Open





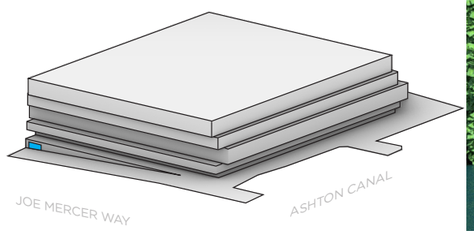
1.6.40 West Entrance Level 00

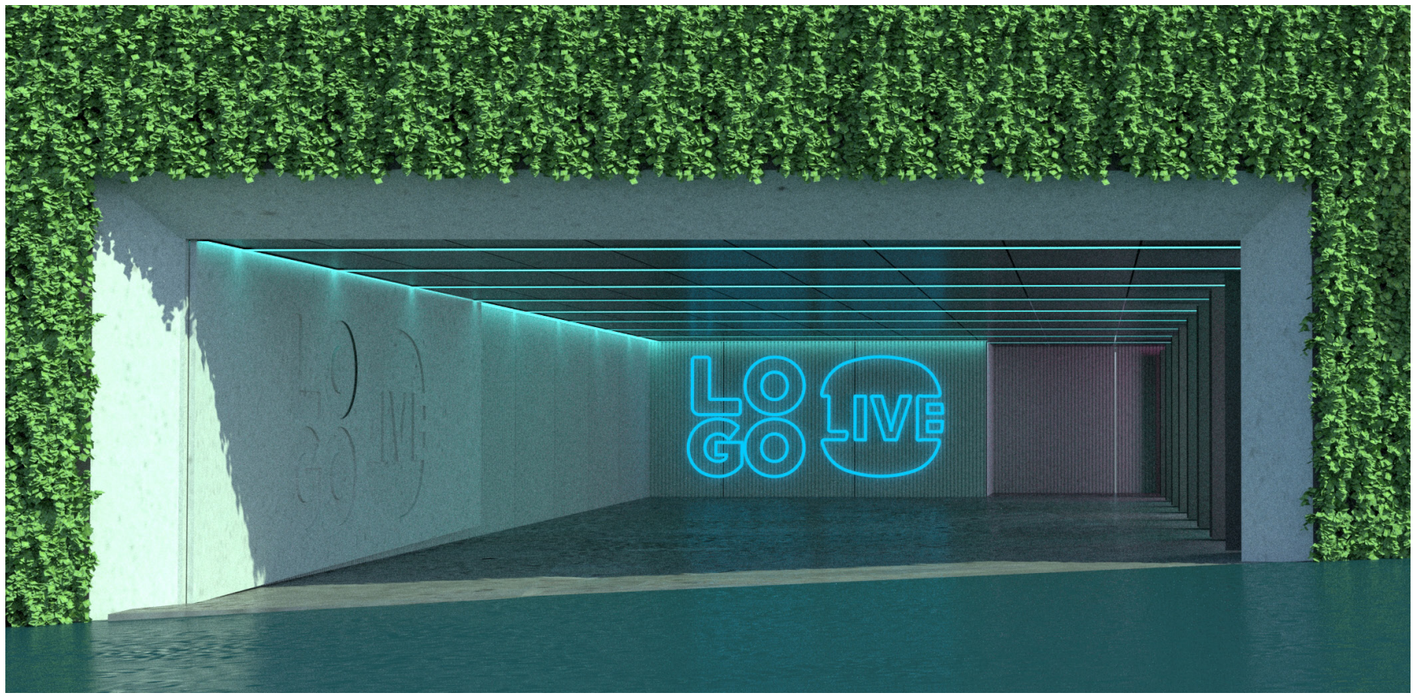
The Level 00 west entrance is a unique entrance to OVG Manchester and turns entering the venue into an experience. As people will predominantly be queueing outside of the entrance on Joe Mercer Way, the covered area becomes solely a transitional space between the outside and in. It's low and oppressive head height intensifies the experience of entering the atrium, drawing your eye up into the cathedral like space.

The nature of the space lends itself to brand activation with the back wall (east) becoming a focal point for all visitors using this entrance. Simple recessed strip lights accentuate the ribbed precast concrete panels which mirror what can be seen on the L01 podium facade, and can change colour depending on the event or branding requirements.

An 8.5m x 3m swing gate closes off the space on non-event day which is overclad in GRC, also affording the possibility for a naming rights partner to be embossed into the panel face.

The surrounding facade is clad with a horticultural designed living wall which frames the entrance adding another layer to the special nature of this entrance.



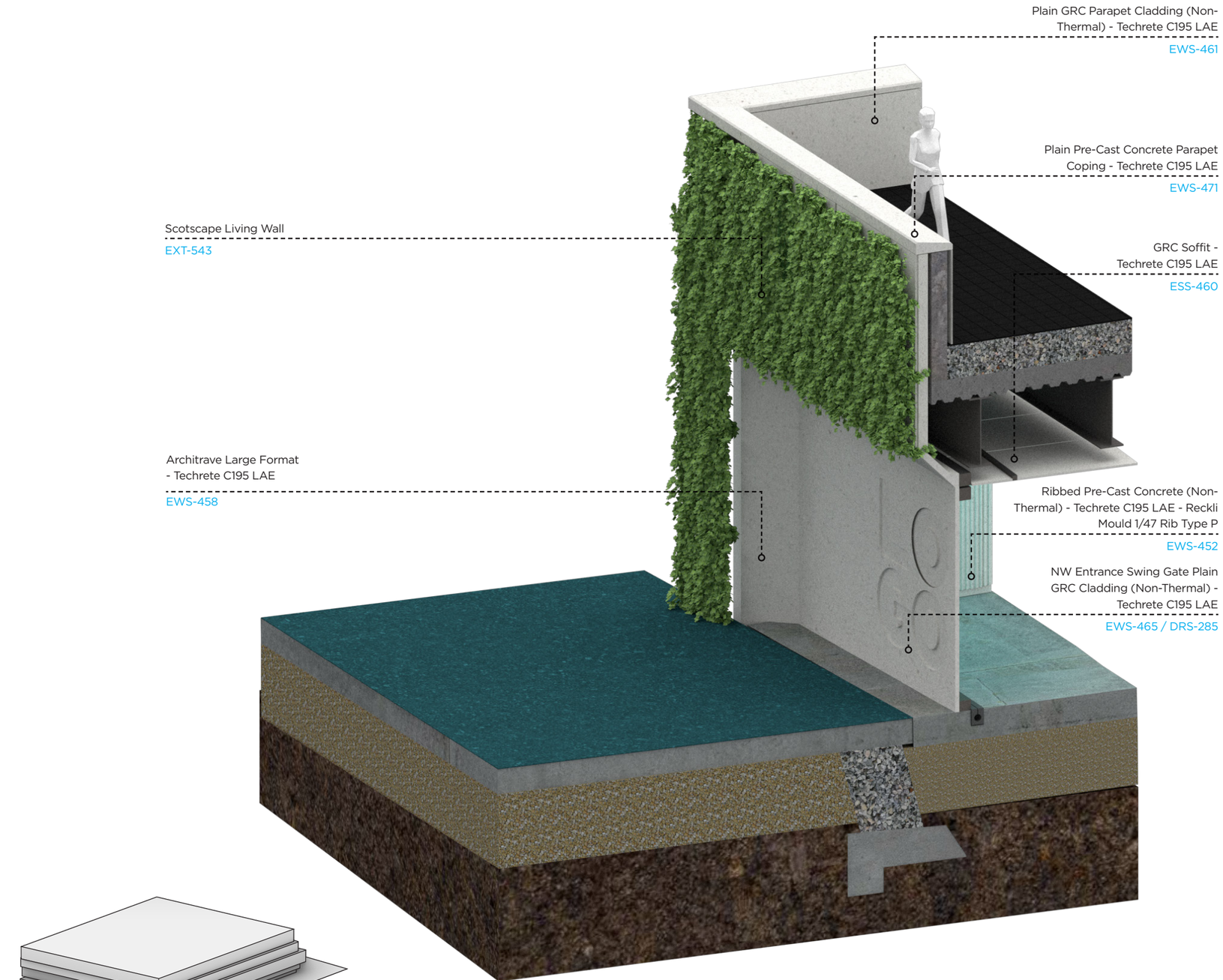


West Entrance L00 Open



West Entrance L00 Closed

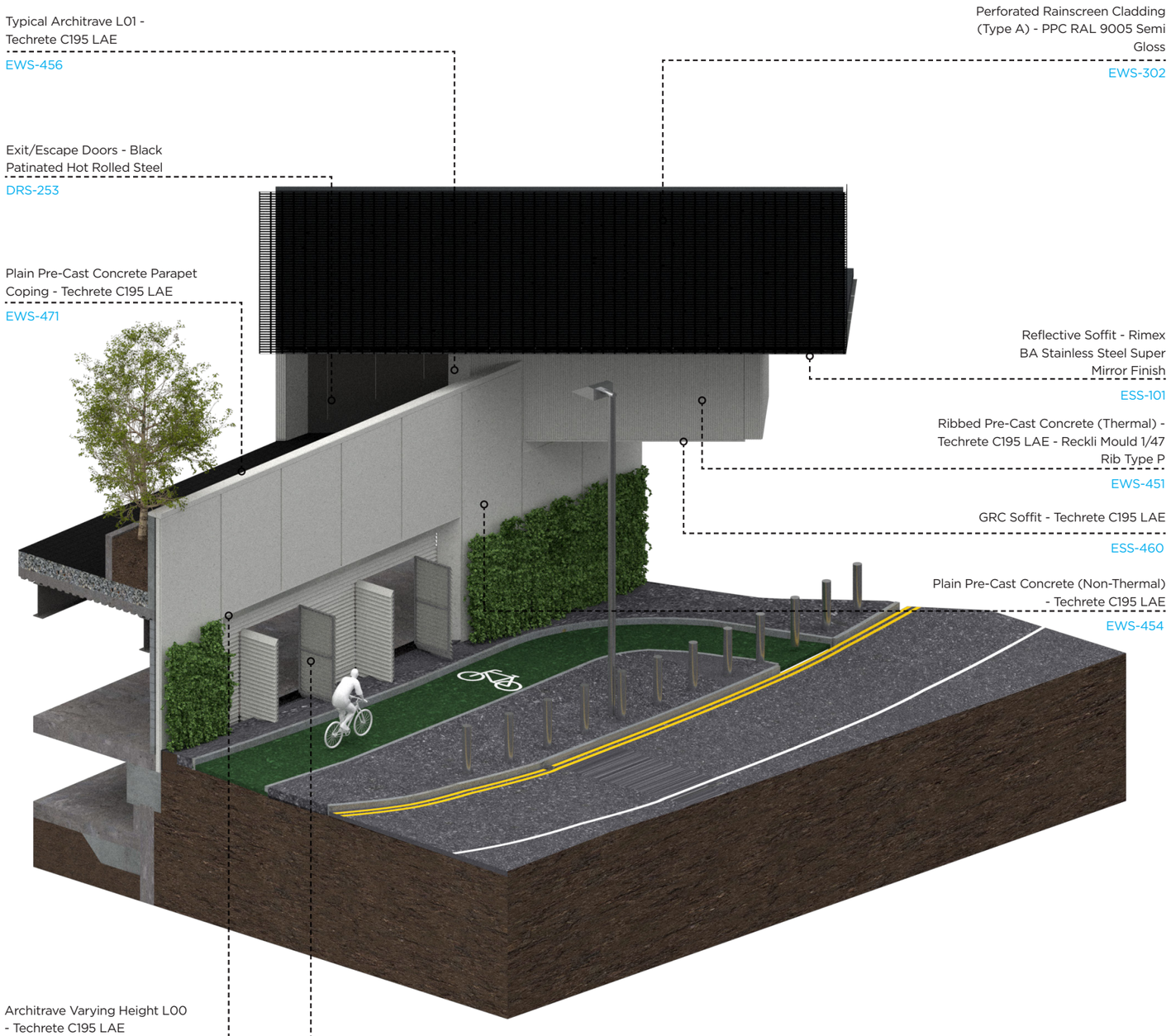
1.6.41 West Entrance Level 00 - Section



1.6.42 North East Louvred Substation

The north east substation follows a similar principal to the loading bay entrance treatment. Given the ventilation requirements, the doors sit within a metal louvred wall recess, where the substation doors are seamlessly embedded, with the same louvred aesthetic. The metal louvres will be polyester powdercoated to match the finish of the concrete subject to testing.

Adjacent to the substation portal opening, green screens will climb the precast concrete facade, softening the Alan Turing Way approach and providing a green corridor between Philips Park and Ashton Canal.

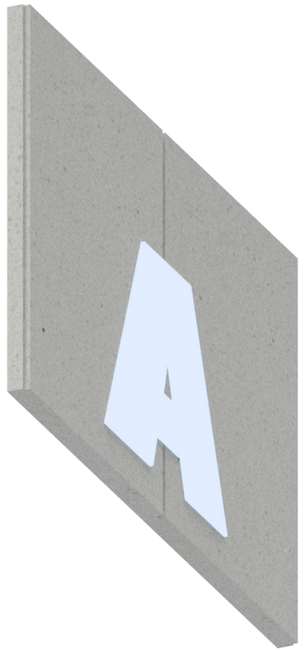


1.6.43 Facade Wayfinding

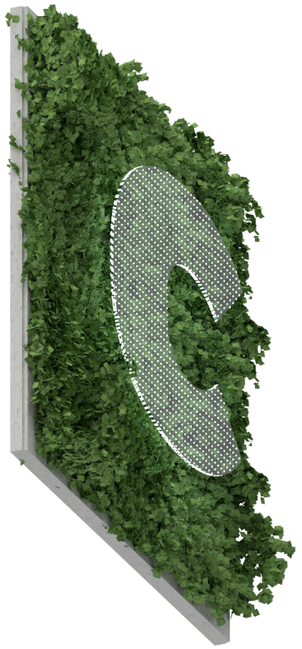
The facade wayfinding solution follows the same principals as the rest of the integrated LED lighting systems. This is to ensure that when turned off, the building stands alone with architectural merit and when switched on, they clearly demarcate entrance points and routes for visitors to the venue.

These designs are anticipated to be refined further following the stage 4 submission.

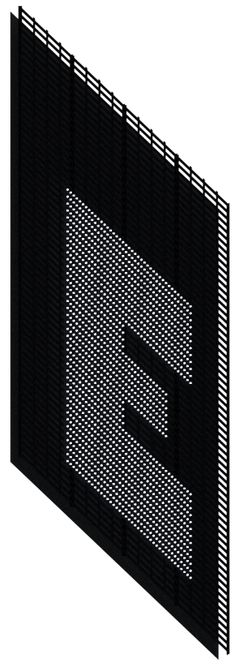
Please refer to section 03: Wayfinding Design for further information.



Illuminated Lightbox (A + B)
2 x Lightbox
(1700w x 1500h x 50d)



LED Embedded Glass (C)
(2670w x 2500h x 10d)
62.5mm x 50mm Pixel Pitch



Embedded LED Stick System (D, E (x2), F + G)
(2750w x 2500h)
62.5mm x 50mm Pixel Pitch

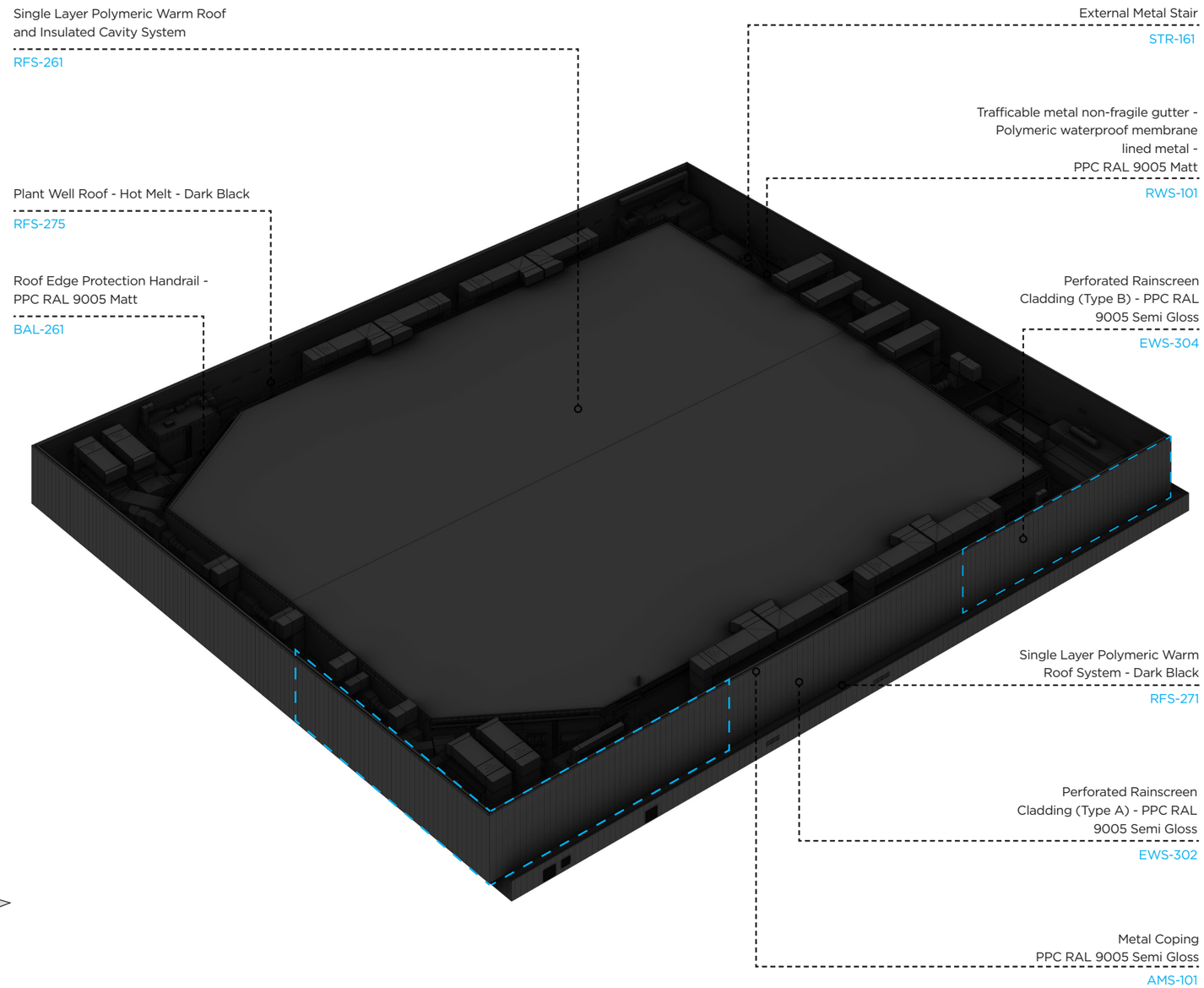
1.6.44 Roof

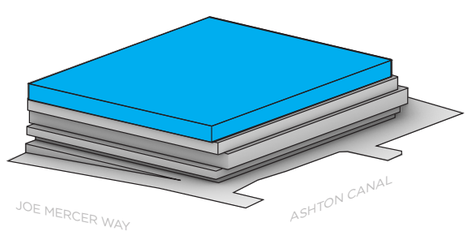
The Arena roof is mainly composed of 2 roof systems, each defined by location and main performance requirements.

A robust, yet relatively simple inverted roofing system with concrete pavers is used for the plant well area. This build-up takes the more industrial nature of an outdoor plant space into account. The dark concrete pavers blend in with the overall colour-scheme of the envelope and at the same time also provide a solid surface for regular maintenance access and plant movement. Large pieces of kit can be set on concrete sleepers, without compromising the waterproofing.

For the roof to The Hall, cost concerns raised during previous stages have been addressed during Stage 4 and the initial standing seam build-up has been replaced by a single layer polymeric warm roof system. The membrane is applied to non-combustible mineral wool roof insulation, supported on a concrete deck, with a highly engineered acoustic built-up suspended internally. The surface is sloped towards 2 insulated gutters running along the North and South of the building, efficiently draining any surface water away without the need of rainwater outlets compromising the high performance build-up both externally as well as internally.

Whilst consideration has been given to both, the application of naming rights as well as photovoltaic cells, both of which are described in more detail within the report, a dark colour for the membrane has been chosen in line with the overall building envelope's colour scheme, making the roof not only a secondary lid part integral part of the overall concept.





1.6.45 Photovoltaic Application

With Manchester aiming to become one of the first carbon neutral cities in the world by 2050, OVG share a common goal in it's prioritisation of sustainability and a greener future.

As a result, alongside other sustainable features, the roof has been designed to house a large amount of photovoltaics.

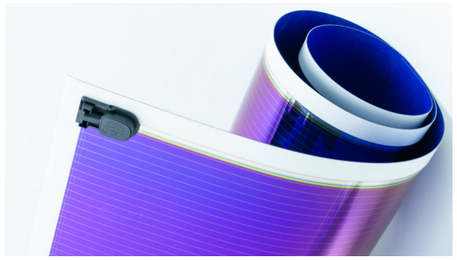
These photovoltaics will utilise the large roof area which provides an ideal platform for generating electric power from solar energy. This transforms the building into a power generator, therefore reducing its CO2 footprint sustainably.

The suggested product is supplied by Heliatek and is light, thin, flexible and efficient. The light nature of the product means it can be directly applied to the roof with minimal fixings and additional roof loading.

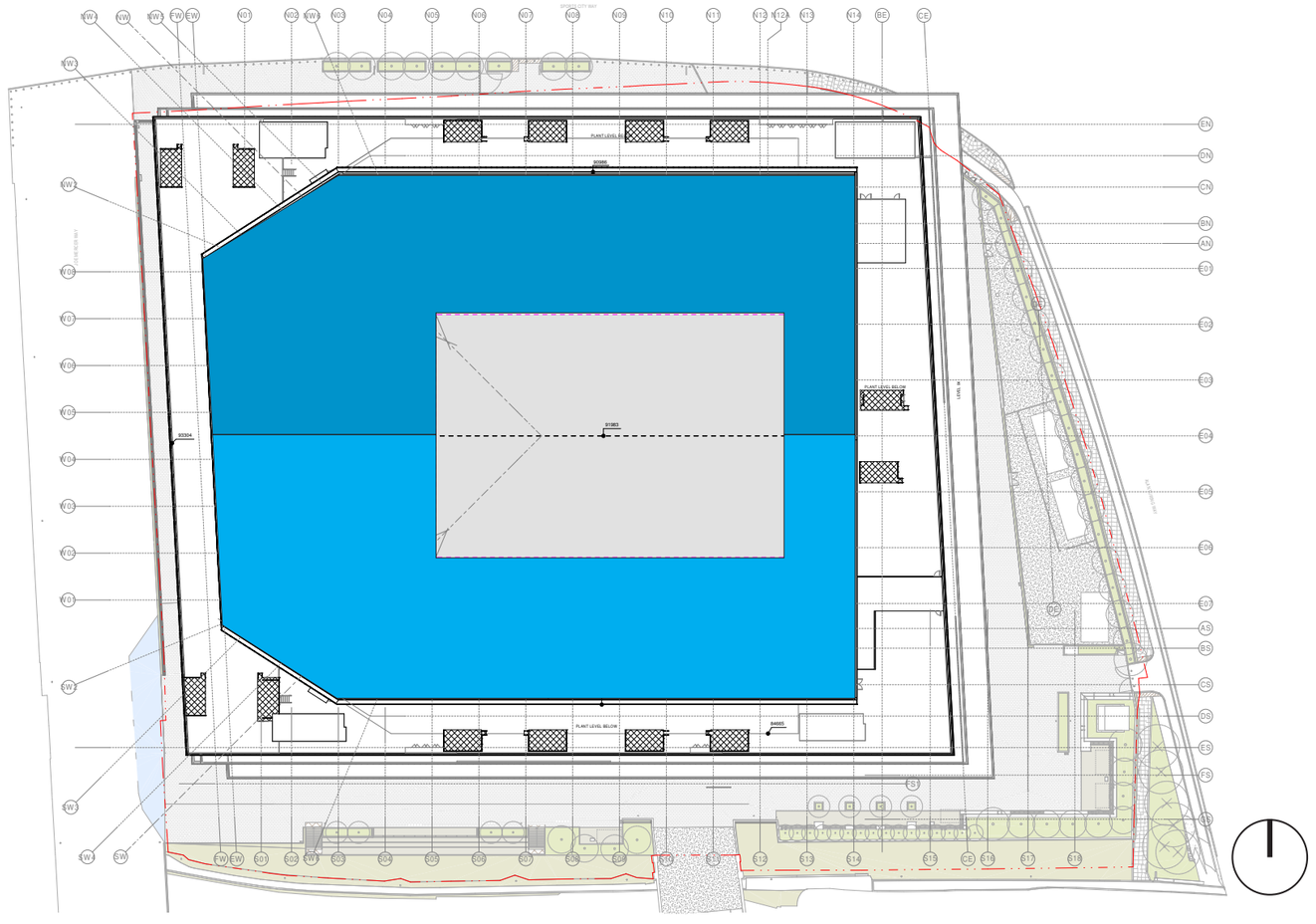
The approach to the photovoltaic application will have to be developed further post Stage 4 with approved client sign off.







Area designated for photovoltaic application


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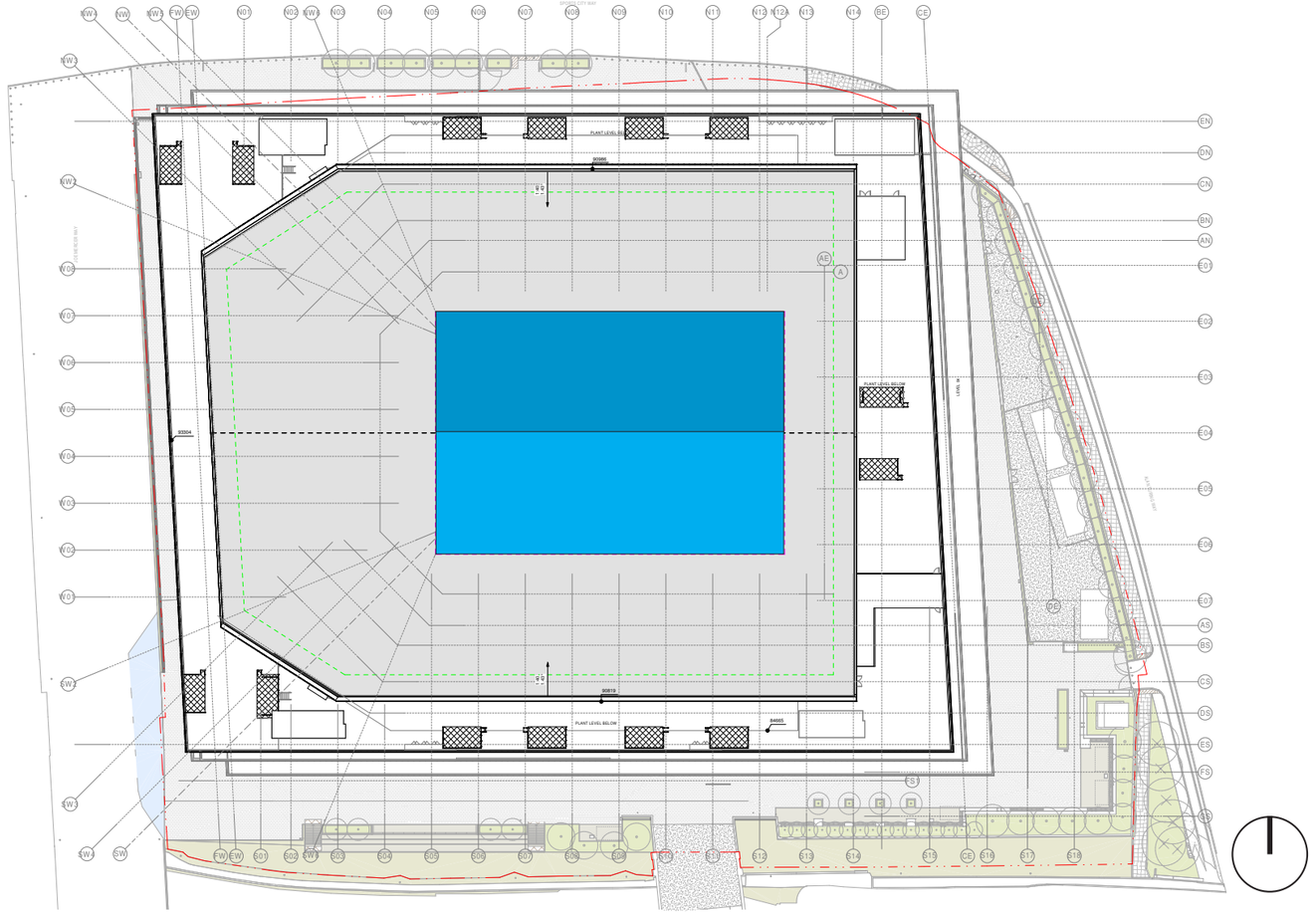
1.6.46 Roof Activation

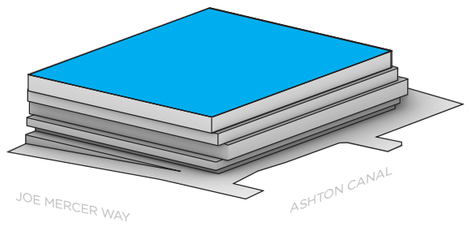
The roof branding fixed activation has a set perimeter allowing a naming rights partner access to feature at the largest scale available, maximising both broadcast and landmark exposure.

The naming rights partner brand mark will align flush on the pitched roof and will not alter the architectural aesthetic or be visible from ground level.

Branded activation will be developed further in conjunction with the client and future naming rights partner once a deal has been secured.

Area designated for possible naming rights





1.6.47 Landmark NRP Sign

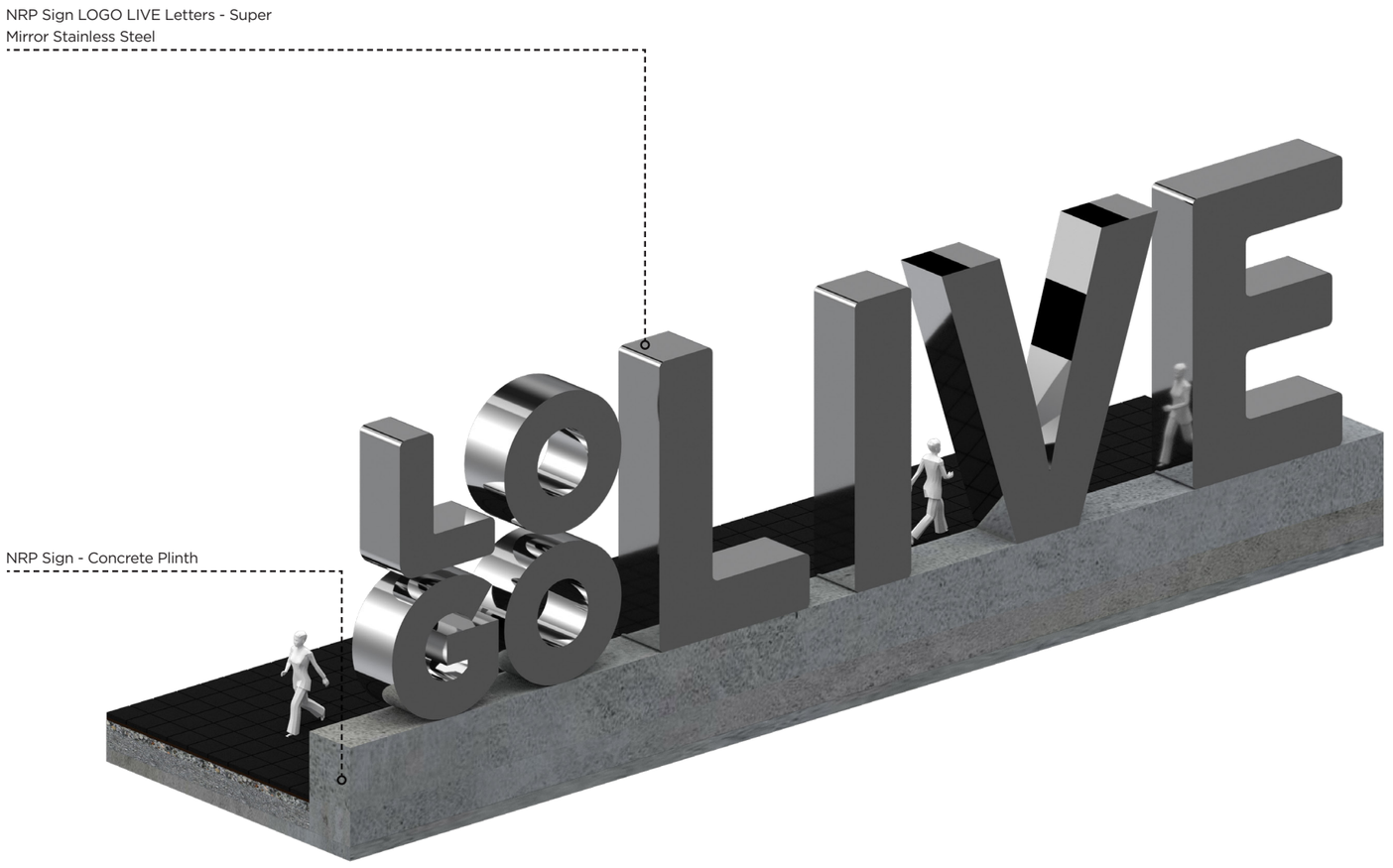
The landmark naming rights partner sign is located perpendicular to the south west end of JMW to maximise footfall exposure for both event and non-event mode.

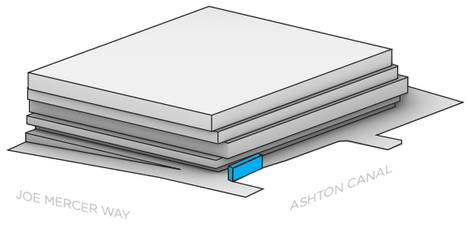
3D forms and lettering form a backdrop to capturing social media images while providing a marquee opportunity.

This sign also contributes to the response of wind mitigation requirements one site and has been developed accordingly with the environmental consultant.

Composed of mirrored glass and polished steel, the letters will appear solid and reflect its surroundings in the daytime, but feature a level of transparency on the front and rear facades. At night and in event mode it will appear to be semi transparent and will emit light from the internal LED fittings which are programmed to elevate the brand positioning alongside the venue lighting system system, so that they work in harmony.

Branded activation will be developed post Stage 4 in conjunction with the client and future naming rights partner.



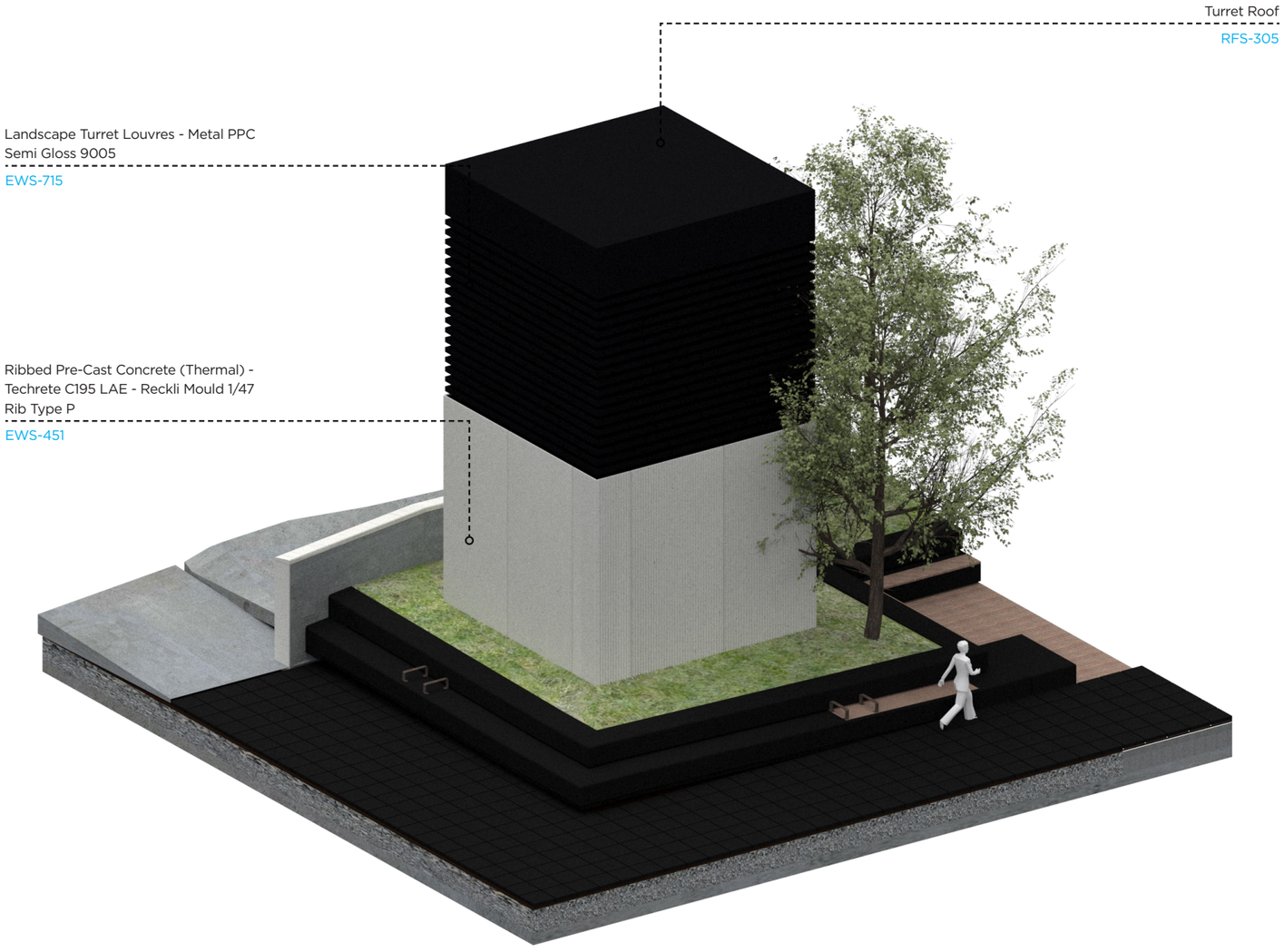


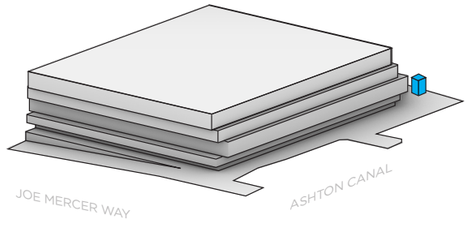
1.6.48 Landscape Turret

The landscape turret has been designed to be a stand alone element with architectural integrity in it's own right given the scale of it. The landscape design using the turret form to arrange seating pockets and a location for pop-up food and beverage stalls to be arranged.

The materiality reflects that of the main venue itself, with non-thermal ribbed concrete panels lining the lower level, and semi gloss RAL 9005 jet back PPC metal louvres to the upper portion.

The louvred part of the turret, acting as smoke extract, is extending from 5.2m AFFL to 10.2m AFFL. Whilst the overall height of the louvred section is driven by the free air requirements, the starting point is based on H&S requirements, preventing hot air impacting passersby.





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FACADE LIGHTING STRATEGY (SATORE)

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1.7

1.7.1 Approach

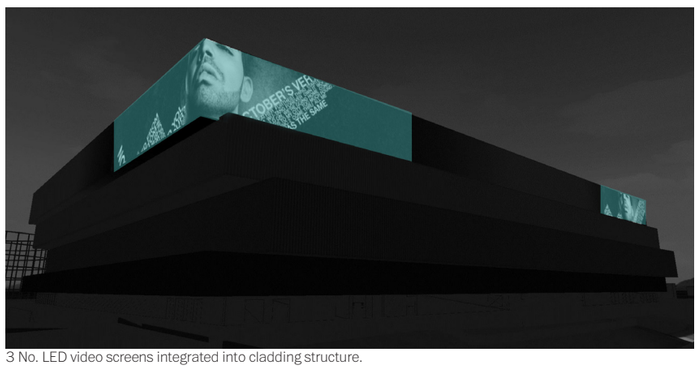
OVG Manchester aims to bring a unique landmark to Manchester both during the day and after dark. The lighting approach has been designed in order to accentuate and complement the architectural features of the building.

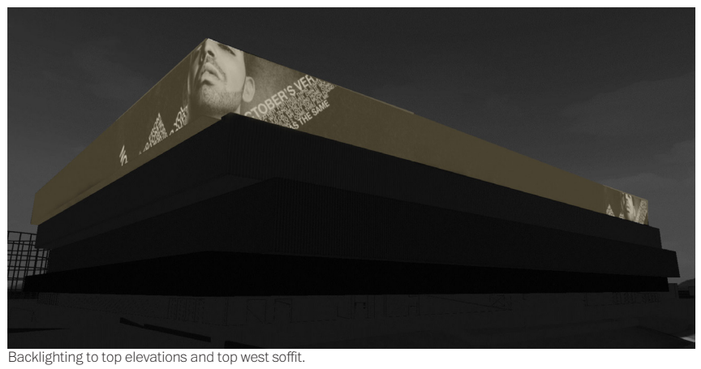
The feature lighting is comprised of two primary elements: 3 No. LED video screens at the prominent corners of the top elevation and LED backlighting to the top elevations and top west soffit. The lighting design was influenced by the following considerations:

- LED video screens have been located to enhance visibility from key vantage points but not disturb neighbouring residential properties
- Primary pedestrian approaches have been considered and lighting will help orient and assist intuitive wayfinding around the site.
- Colour change LED luminaires will allow the venue to react to events within the space but also local, global and national events such as Remembrance Day, Cancer Awareness and Manchester Pride, among others.
- A series of scenes will be programmed to allow varying levels of illumination and ensure the building provides a pleasing backdrop both during events and also on a day to day basis.
- The associated BREEAM credits - Energy 03 and Pollution 04 - were anticipated, however the project brief ultimately allowed viability only for Pollution 04. Energy 03 was not viable given the required (low efficiency) colour changing lighting per the client's brief.



Illustrative visual showing facade feature lighting and video screens.


3 No. LED video screens integrated into cladding structure.

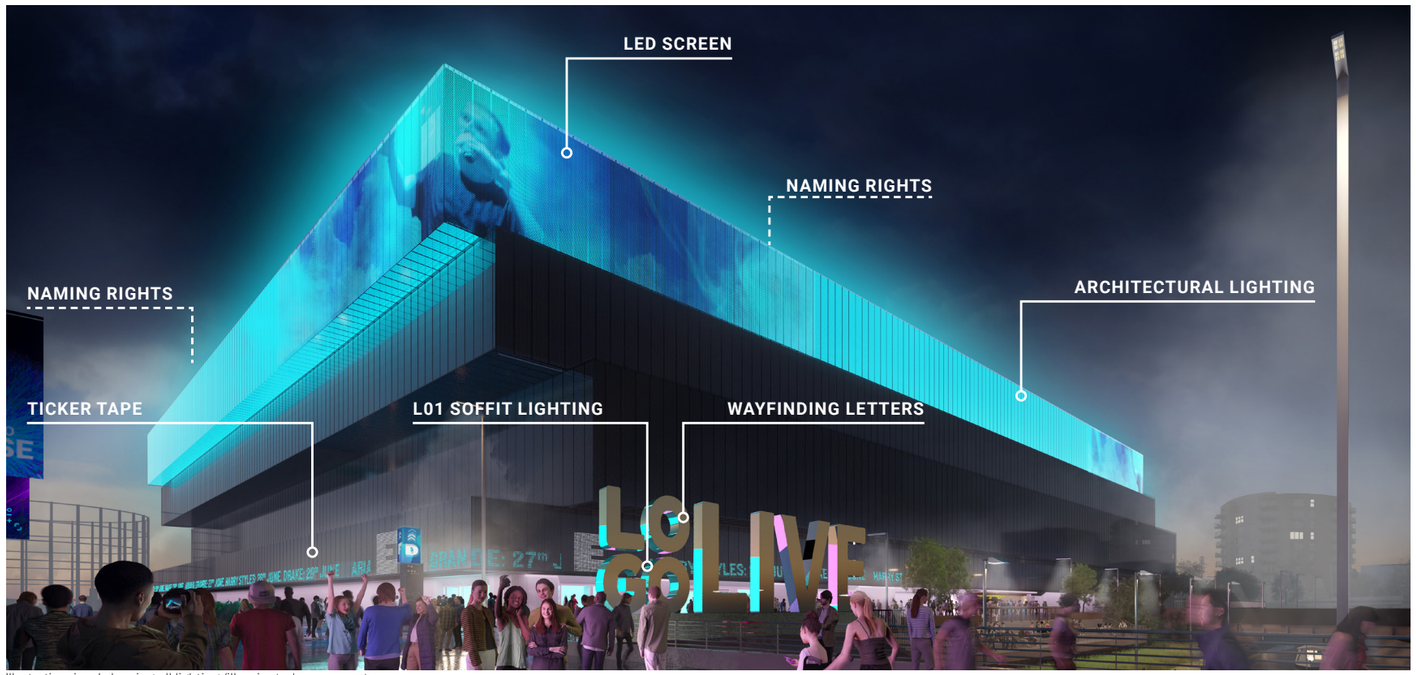

Backlighting to top elevations and top west soffit.

Complementary Elements

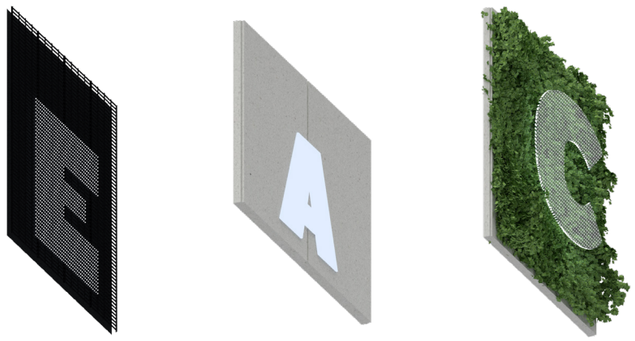
In addition to the feature video and architectural lighting, additional lighting/ illuminated elements were added to further activate the exterior of the building:

- Naming Rights Signage
- Ticker Tape
- Illuminated Wayfinding Letters
- Ground Level Soffit Lighting (activated)
- Architectural Lighting to North West Entrance and to Backstage Club Entrance

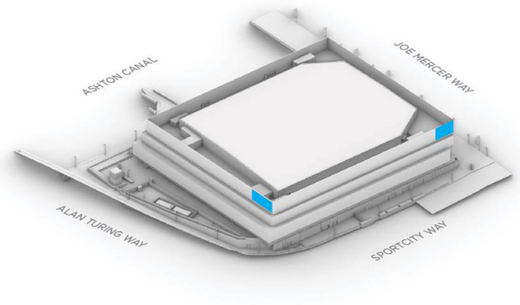
These elements were mostly related to wayfinding and activation and intended to reinforce the identity of the building as an innovative and exciting venue.



Illustrative visual showing all lighting/illuminated components.



Illuminated lettering at perforated panel, concrete wall and green wall.



Naming rights signage locations.

1.7.2 Overview

The video design approach intends to maintain the transparency of the perforated façade to ensure minimum presence when switched off, allowing for consistent architectural backlighting at night and a monolithic façade appearance during the day. The product found to be the best option was Daktronics' PSX-50 stick system.

At Stage 3, the video design parameters and intent were agreed and numerous suppliers - including Daktronics, Street communication, Light Initiative, SACO, PRG Projects, amongst others - were consulted to understand the integration requirements of their product options within the façade and to compare general cost implications. Over the course of Stage 4, a more detailed analysis was developed with shortlisted product options (Daktronics, Philips and Street Communication). In addition, new specific suppliers were included in the analysis following the client's ambitions for a commercial agreement which included the façade lighting (Harman/Martin).

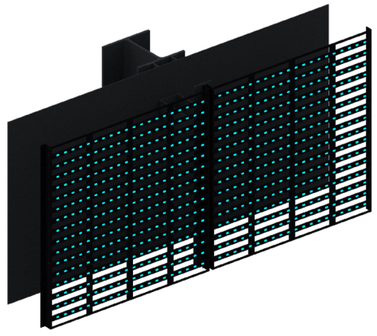
The Stage 4 analysis results demonstrated that the commercial agreement supplier options were not suitable for the project, mainly due to insufficient performance and high costs. It was found that the best option was Daktronics' PSX-50 stick system and this was incorporated into the tender package accordingly. As such, it has been agreed that Daktronics will be approached in the next phase. Then the appointed supplier and contractor will be required to finalise the technical design.

Key requirements set for LED video system:

- Integration into perforated cladding system
- Adequate image resolution from key view points
- Daytime visibility of content
- Limited visibility of LED screen elements when switched off
- Access to all components for maintenance and replacement as required
- Ability to program scenes with varying levels of illumination including luminance adjustability according to daylight levels and timetables
- Control integration with Architectural Lighting to ensure consistent activation of the building
- Value for money



1:1 Prototype of facade cladding panel photos



Top Box facade diagram

1.7.3 Pixel Pitch and General Arrangement

A 50mm horizontal by 62.5mm vertical pixel pitch has been established for the LED video screen mainly based on mechanical, economic and visual criteria.

At Stage 3, it was determined that a 52mm horizontal pixel pitch provided a suitable setting-out for image resolution from key view points, while also allowing for a more cost-effective video system. This was in addition to the 60mm vertical pixel pitch, already determined by free area requirements for mechanical ventilation and based on coordination with ME Engineers. Quotations were obtained from the various manufacturers who could provide the components of the LED screen, which were typically available in a 'stick' or 'string' based arrangement. These consisted of a series of LED diodes mounted in a row (at the required pixel pitch) which combined to form the video screen.

Key assumptions included:

- Sticks or Strings could be mounted directly to the back of the metal cladding panels
- Sticks or Strings could also be attached to an independent framework behind the cladding panel, however this could result in additional costs and integration complexities
- LED domes protruded through a circular opening in the cladding panel, set to 13mm in diameter. However, this diameter directly depended on the particular product dimensions.
- Cabling to be consolidated as much as possible with connections/drivers to sit within the vertical column dividers or behind the metal backing panels
- All elements of the LED screen would be accessible once installation is complete

At commencement of Stage 4, Populous confirmed that the cladding panel sizes had changed which resulted in a new pixel pitch requirement of 62.5mm x 62.5mm.

No supplier was able to achieve the brightness required for appropriate daytime content visibility while addressing all of the other requisites, particularly those related to pixel-pitch and cost.

The final analysis and coordination from Stage 4 proved Daktronics to be the manufacturer that would most likely be able to deliver a successful system to meet the project requirements.
The specific product analysed was the PSX-50 stick system which includes 6 LED diodes per pixel providing enhanced luminance. This system required the horizontal pixel pitch to be changed to 50mm which works with the given architectural panel dimensions.

Once the supplier is appointed it will be important to finalise the technical design and to create a physical mock-up.

Key issues to resolve by the Contractor and appointed Supplier:

- Implication of placement of LED diodes within the metal cladding panel, including image resolution and viewing angle
- Integration with metal cladding panel including fixing details and installation sequence
- Electrical and data distribution including control interface and server/rack room requirements
- Access arrangements for maintenance
- Testing to ensure visibility during daylight hours



Southwest study showing video screens with a 50mm horizontal x 62.5mm vertical pixel pitch, using Daktronics PSX-50 fixture

1.7.4 Product Options Appraisal

Further analysis was performed during Stage 4 for specific product options considering how each of these addresses the key requirements previously outlined, level of customisation when needed and particular trade-offs amongst integration, performance and cost.

Most product options would require modifications in order to meet the project necessities, particularly those related to a seamless integration into the perforated cladding (e.g. bespoke domes). Also, in several cases there would be a trade-off between daytime content visibility and the pixel pitch derived from cladding system design and cost implications.

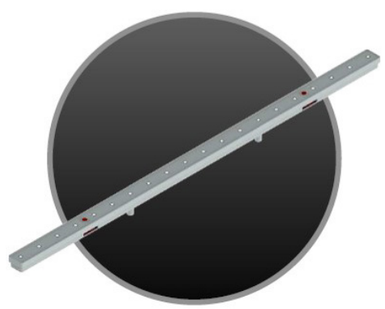
Considering this final appraisal, the recommended option was Daktronics PSX-50 stick due to product quality, suitable integration, daytime content visibility, successful precedent applications, manufacturer's proved capability to handle complex large-scale projects and the reduced trade-offs compared to the other options, such as moderate seams between panels and cost.



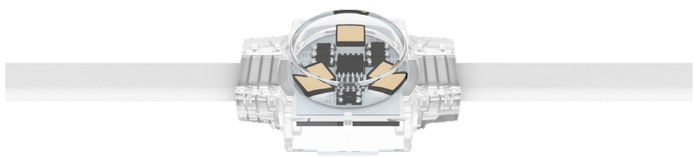
Daktronics PSX-50 stick: This stick product can be mounted directly behind the facade panel, can achieve a suitable pixel pitch and the manufacturer has confirmed daytime visibility will be possible. This is the preferred option.



Martin/Harman VC-Dot 1 with and without dome: This fixture can be easily integrated into the architectural facade but it does not provide enough daytime visibility and control interface is both expensive and complex.

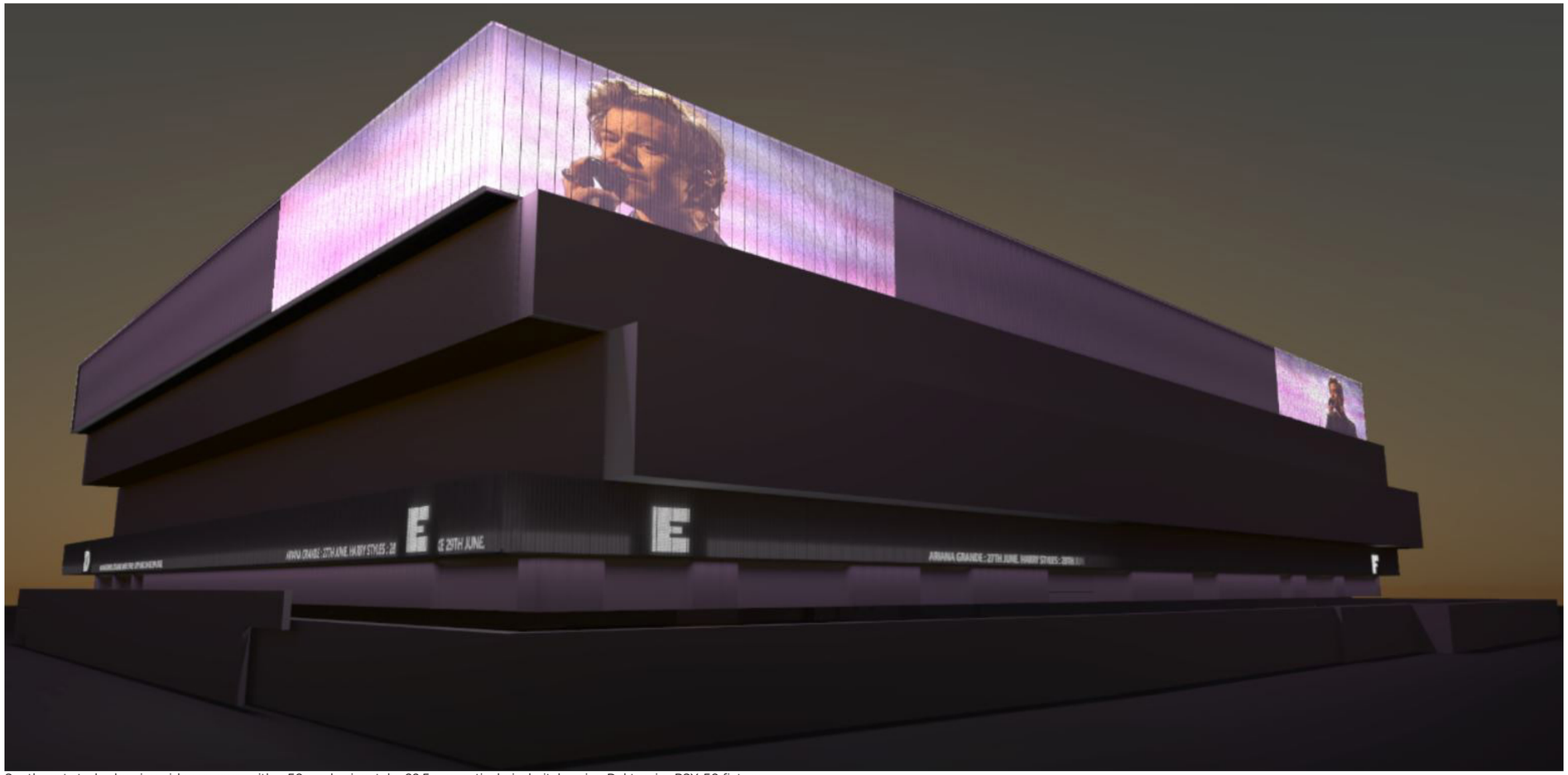


SACO V-Stick S/S2: This fixture can be easily integrated into the architectural facade, it would be easily maintained due to integration method and it can achieve daytime visibility, however its price point is out of budget.



Street Communication S19-3: This dot product can be mounted directly behind the facade panel and it can accomplish a suitable pixel pitch; however the product is of low quality, it provides limited daytime visibility and a larger dot version would mean reconfiguring the facade panels.

1.7.5 Final Result



Southwest study showing video screens with a 50mm horizontal x 62.5mm vertical pixel pitch, using Daktronics PSX-50 fixture

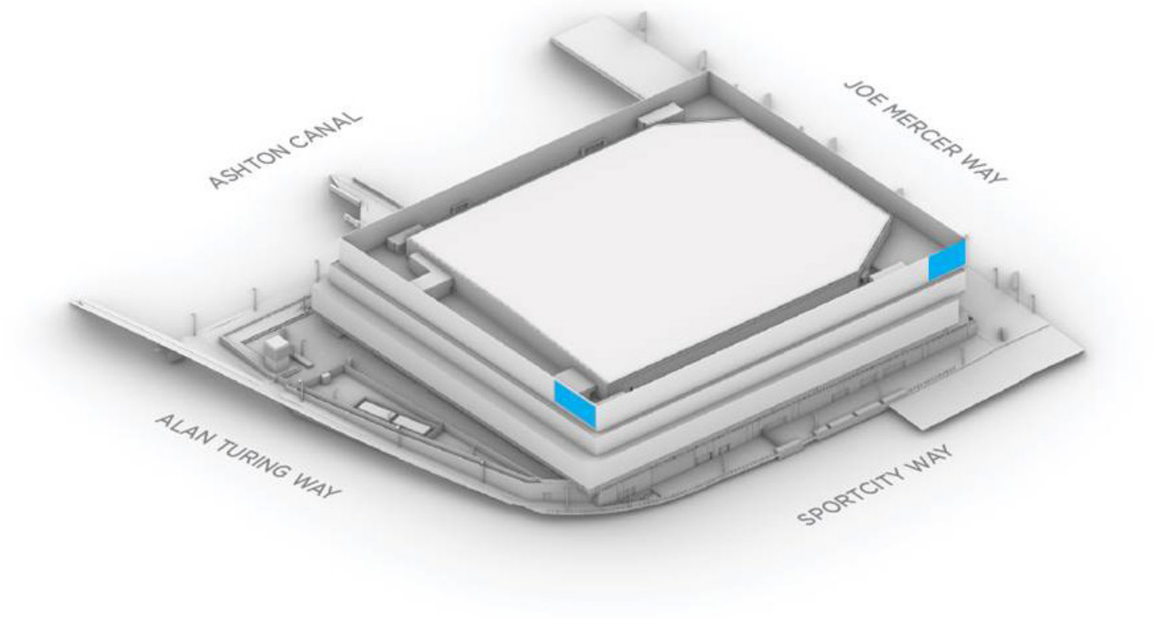
1.7.6 Naming Rights

During Stage 4, Satore explored and confirmed the option of integrating the naming rights signage into the Top Box using the same technique and product as in the video screens: 50mm x 62.5mm pixel pitch with embedded Daktronics PSX-50 LED stick. A major part of this analysis included obtaining quotes from the same suppliers under consideration for the video screens.

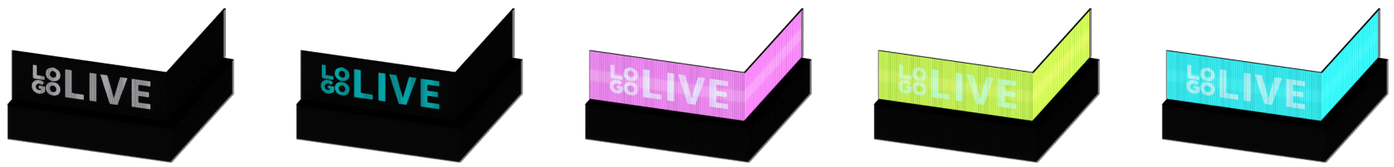
Initial assumptions and considerations:

- 2 No. signage pieces, each with a size of 5.5m height by 11.5m long
- Use of the same LED fitting and same pixel pitch utilised for the Top Box video screens - 50mm x 62.5mm pixel pitch using the Daktronics PSX-50 fitting - and same integration method of fixing the LED stick to the back of the cladding panel.
- Naming rights signage to be controlled separately from video screens.
- Naming rights signage options of single colour and colour change.
- Specific locations at Top Box as shown in top diagram.
- Similar cost to video screens as it represents integration of the same product.

The bottom diagrams represent various programming settings in which the naming rights are in operation while the video screens and architectural lighting are off and also in combination with these using different colours.



Naming rights signage locations.



Naming rights signage design integrates colour changing capability.

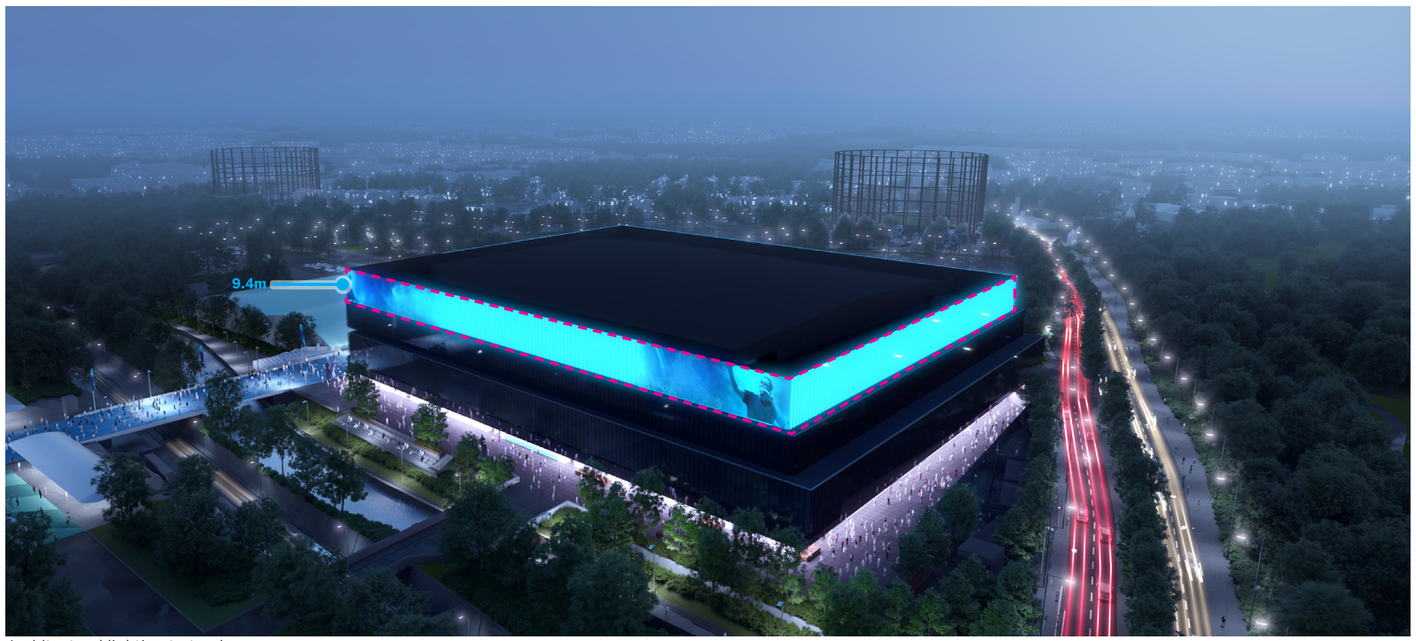
1.7.7 Overview

The Architectural lighting design aims to enhance the perforated façade by creating depth and adding more dynamism both on its own and in combination with the video system. At the end of Stage 4, the product found to be the best option was Chauvet's Ilumiline Series.

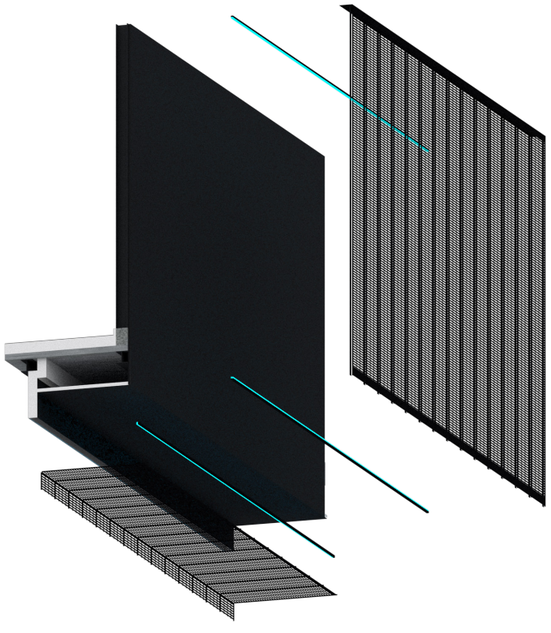
At Stage 3 it was defined that lighting to the façade would be provided to the top elevations by a linear LED luminaire system located behind the perforated metal cladding panels, both those with video content integration and without. Backlighting of the facade ensured luminaires and cabling were not in direct view or exposed to unwanted risk. Due to its significant height (9.4m), the façade was illuminated both from the top and bottom ends to maximise the coverage of light - this is summarised in the bottom left diagram. In addition to lights along the facade of the entire top box we are also providing lights to the soffit beneath the top box on the western facade. All lights have been located within a channel integrated into the facade structure. At this point, the Color Kinetics ColorGraze Powercore MX4 fixture was identified as the best option given its performance (good light output and advanced narrow optics) and competitive cost.

Similar to the video screens, it was requested that alternative manufacturers be considered and assessed during Stage 4. This included Harman/Martin due to the commercial agreement along with SACO and Chauvet. All of these options were examined against the Stage 3 Color Kinetics specification.

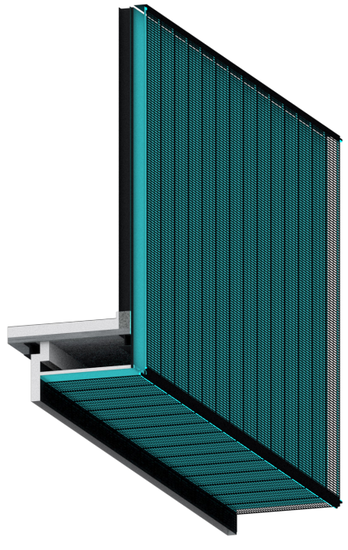
After thorough studies and analysis, it was determined that Chauvet's Ilumiline Series was the best option as it fulfilled the demanding project performance requirements at a very competitive cost. During the next phase, the contractor and the appointed supplier will need to participate in final coordination to ensure proper integration of the light fittings within the facade.



Architectural lighting to top box



Exploded axonometric showing Architectural Lighting components (in blue) on west façade



Axonometric showing final build-up of west façade

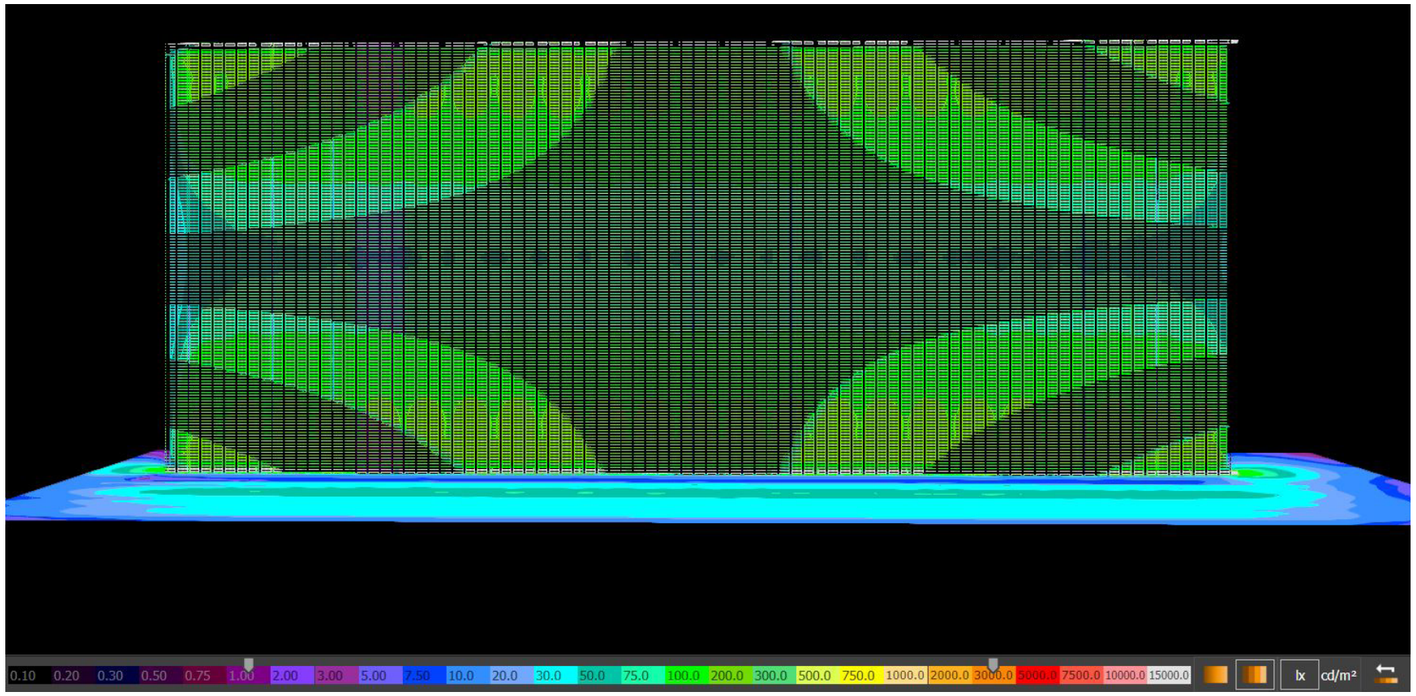
1.7.8 Coverage

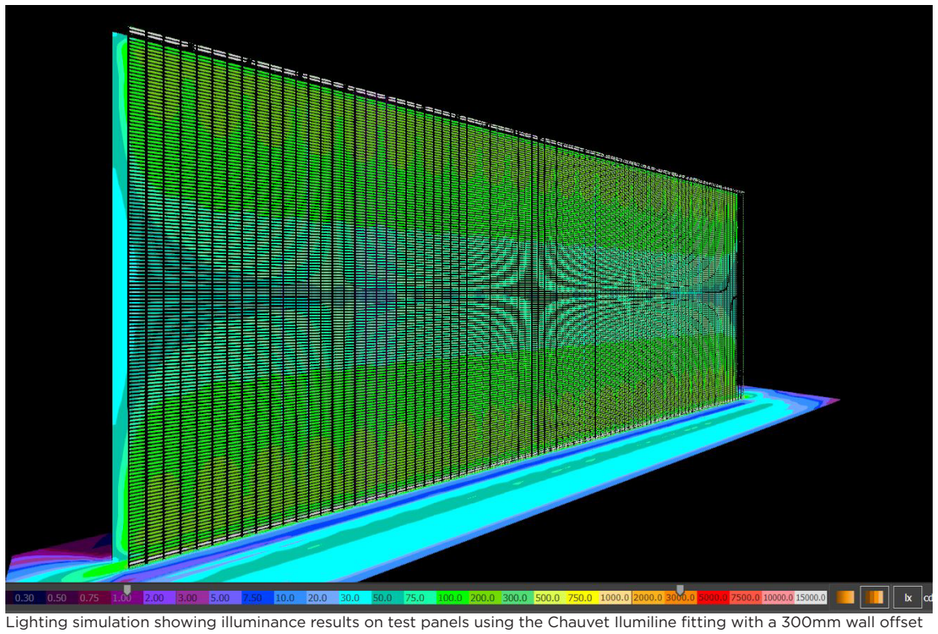
A consistent coverage is key for the design and a set of lighting simulations were performed along all project Stages. This and a physical mock-up allowed Satore to define the performance requirements for the lighting equipment early in the process.

Initially, lighting simulations with different wall offsets and light beam angles were carried out to determine the best solution for the 9.4m high wall. The results showed that a 300mm wall offset (distance between backing panel and centre of light fitting) would allow for the most even coverage. In terms of optics, the narrowest light beams proved to be the most efficient ones for both top and bottom fixtures.

Following the first lighting simulations, physical testing was performed during Stage 3 with 2 No. full sized cladding panels with both light and dark backing panel material for comparison. Although it was confirmed a lighter backing panel would provide better overall coverage and luminance of Architectural lighting to the facade, a darker surface was preferred by Populous as it provides a better visual appearance by day.

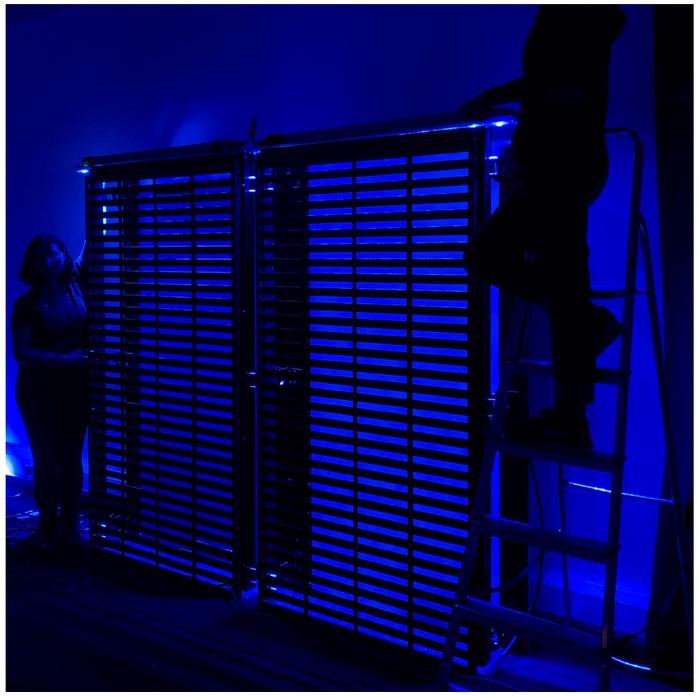
At Stage 4, lighting simulations were performed again this time substituting the preferred fitting from Stage 3 for the selected alternative linear fittings. From these, Chauvet's Ilumiline proved to perform the best by providing a suitable coverage.



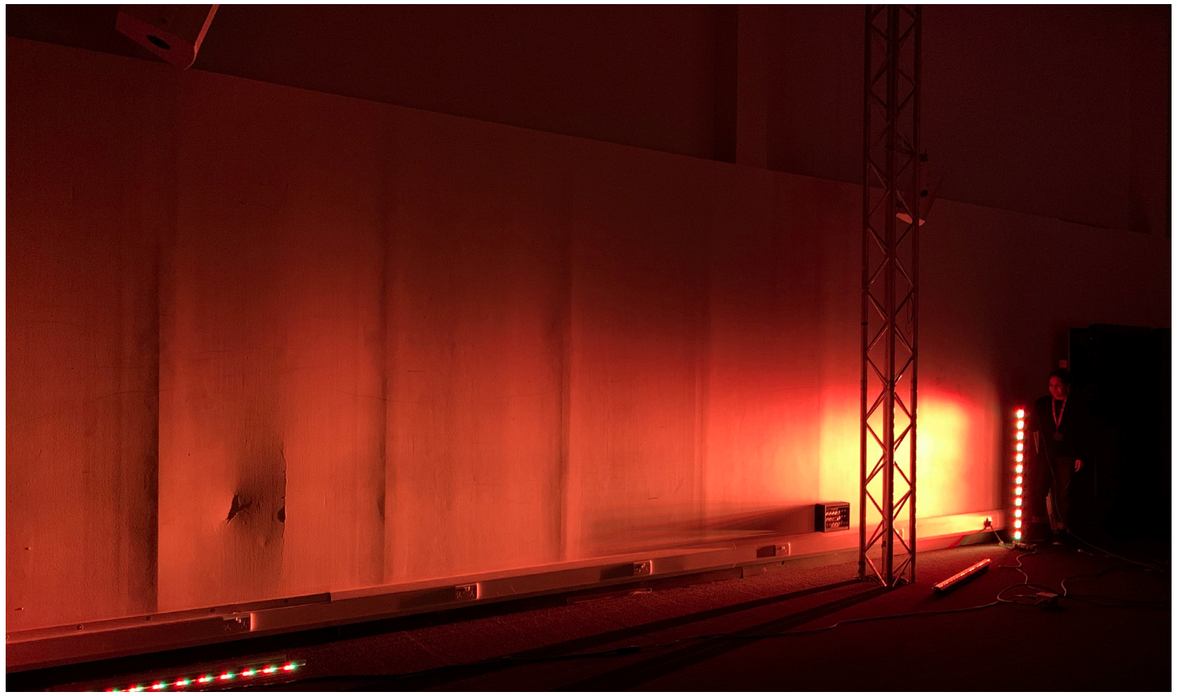


Lighting simulation showing illuminance results on test panels using the Chauvet Ilumiline fitting with a 300mm wall offset (from backing panel to light fixture centre)

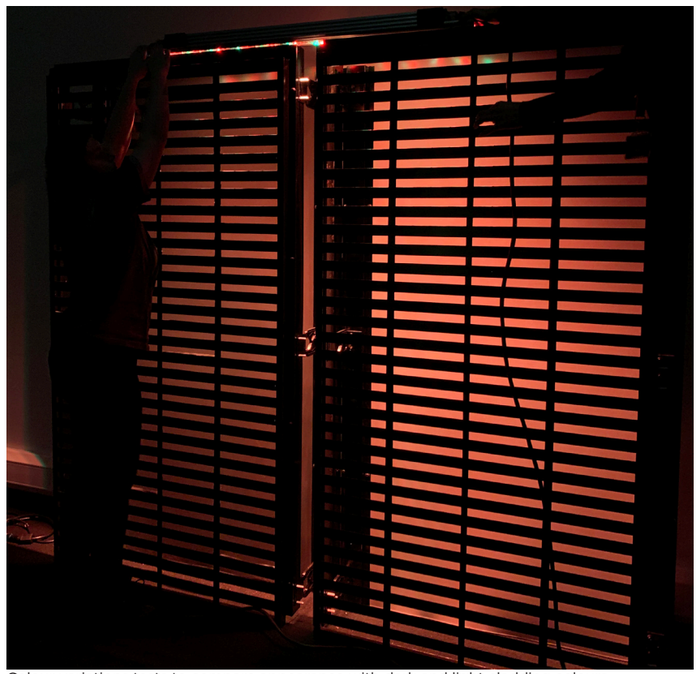
1.7.9 Mock-up



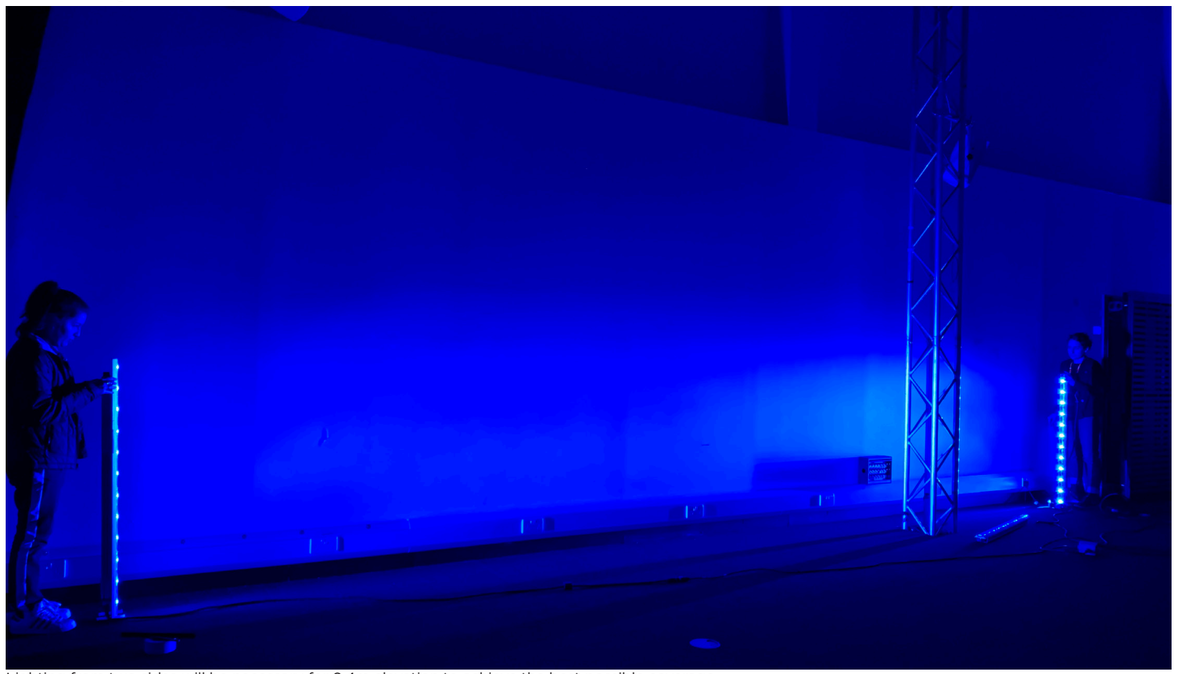
Colour variations tests to compare appearance with dark and light cladding colours



Narrow beam light distribution preferred for 9m elevation



Colour variations tests to compare appearance with dark and light cladding colours



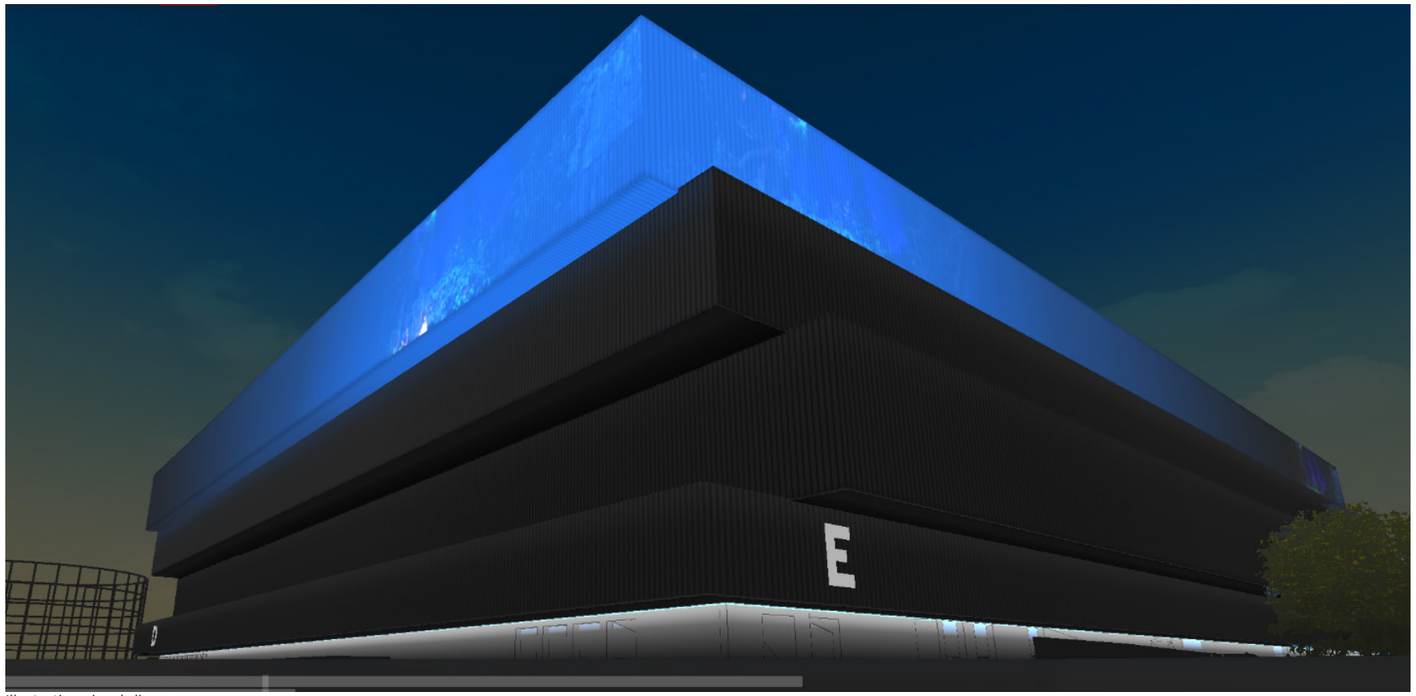
Lighting from two sides will be necessary for 9.4m elevation to achieve the best possible coverage

1.7.10 Lighting Control

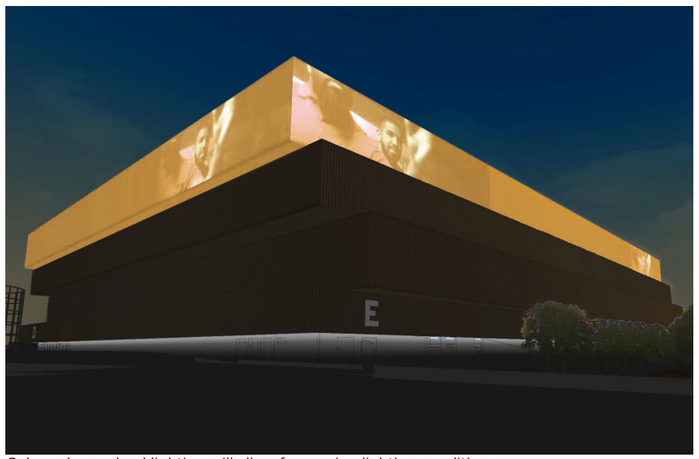
Lighting control will play a critical role in creating a unique landmark for the surrounding area while adding a dynamic sense of change and animation. The contractor and client should develop the design intent for scenes which outlines the visual appearance of the building during various typical events. It will be critical to integrate programming for the LED video, LED backlighting and other building mounted lighting into scenes in order to create a holistic appearance and experience.

Key Architectural Lighting considerations for final contractor-client coordination:

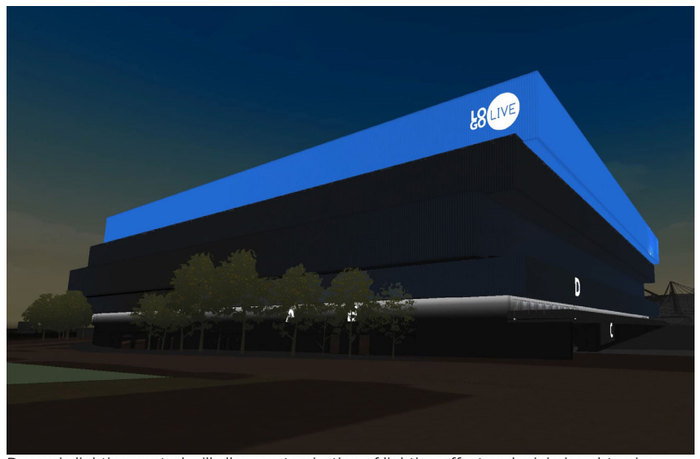
- Video and lighting luminances adjusted in relation to daylight situation and/or time of day.
- Cladding colour of vertical surfaces and soffits will require final study to ensure dark grey finish does not cause unwanted dark areas along facade.
- Lighting detail will require further coordination to ensure continuous light effect is possible across the facade elevations and soffit as they have varying installation conditions.
- Light fittings access and maintenance plan.



Illustrative visual diagram



Colour change backlighting will allow for varying lighting conditions



Dynamic lighting control will allow customisation of lighting effect and minimise obtrusive lighting after hours

1.7.11 Product Options Appraisal

A selection of products were considered for the Architectural Lighting and a thorough comparison was developed during Stage 4. Key criteria included value for money, performance for best facade coverage and integration with the facade panel. As previously outlined, the design team concluded that the best option was Chauvet's Ilumiline Series.

Key comparison criteria consisted of:

- Compact linear fixture profile
- Fixture length(s) compatibility with façade panel lengths minimising equipment/ cabling quantities
- Highly efficient narrow optics
- Dedicated white light chip or alternative advanced colour mix to obtain quality white light
- Competitive cost

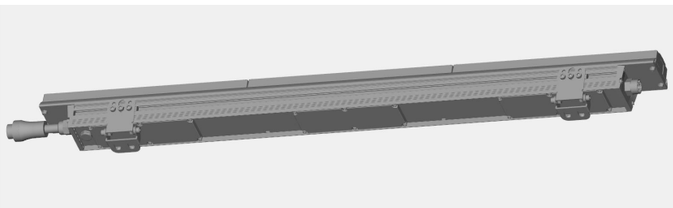
The design team concluded that the preferred product option would be the Chauvet Ilumiline series fixture given that it satisfactorily complies with the technical requirements, also considering cost.



Martin/Harman Exterior Linear Quad Graze: the fixture fits within the facade build up; however its wide optics translates into a less consistent lighting coverage, it would require a continuous run of fittings increasing cabling quantity and labour costs.



SACO Delta Series: the fixture fits within the facade build up; however it has exactly the same distadvantages as the Martin fitting, plus it does not have a dedicated white light chip nor is it capable of producing quality white light.



Chauvet/Iluminarc Ilumiline Series: The fitting provides good overall light coverage (comparable to Color Kinetics), it represents good value for money and there is already a positive relationship with the supplier. This is the preferred option.



Color Kinetics ColorGraze MX4 Powercore: The fixture is easily integrated within the facade, includes advanced optics for best facade coverage, a good colour range and it is available at a reasonable price for quality of product.

1.7.12 Ticker Tape and Lettering

As part of the Stage 4 design development, a Ticker Tape was introduced at the lower part of the building to communicate specific event information to the public at street level. Also, new illuminated lettering was included to indicate primary building entrances.

The design of both illuminated elements followed the same principle as the video screens: a fully integrated LED system within the architecture, with minimum presence when turned off and highly engaging light during operation. As such, the same product - Daktronics PSX-50 - was defined for both Ticker Tape and Lettering.

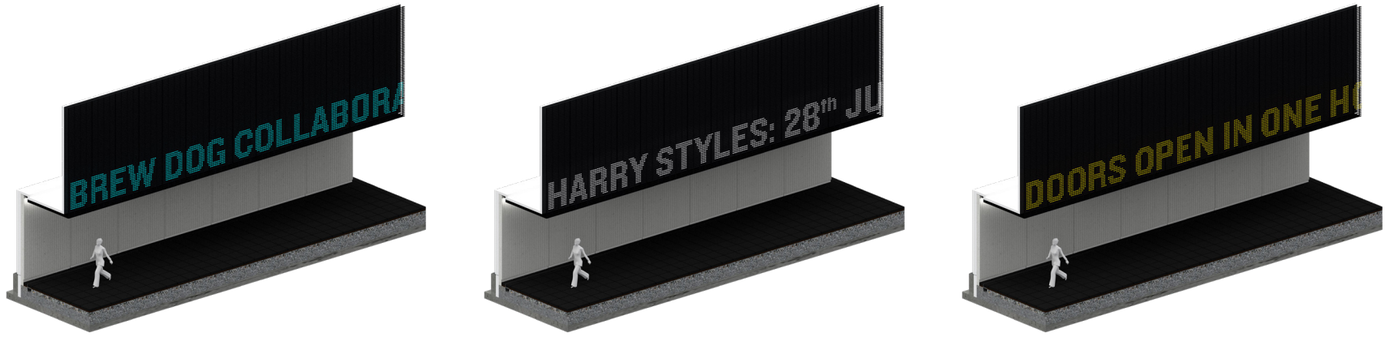
Key Considerations:

- Assumed same product type and pixel pitch of video system used for façade top box.
- Consistency of look in different locations (mesh, concrete and greenery).
- Flexibility for possible future font design changes (lettering).

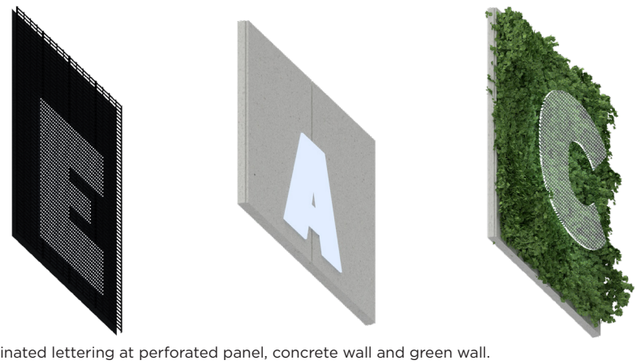
The system proved to work appropriately for the Ticker Tape because it is located within the perforated facade cladding panels which are similar to the Top Box. Further details will need to be developed with the preferred supplier and the contractor considering the reduced facade depth available at the lower level.



South West approach showing ticker tape and some lettering.



Diagrams showing a section of the ticker tape with different content: collaboration, coming event and functional



Illuminated lettering at perforated panel, concrete wall and green wall.

1.7.13 Lettering

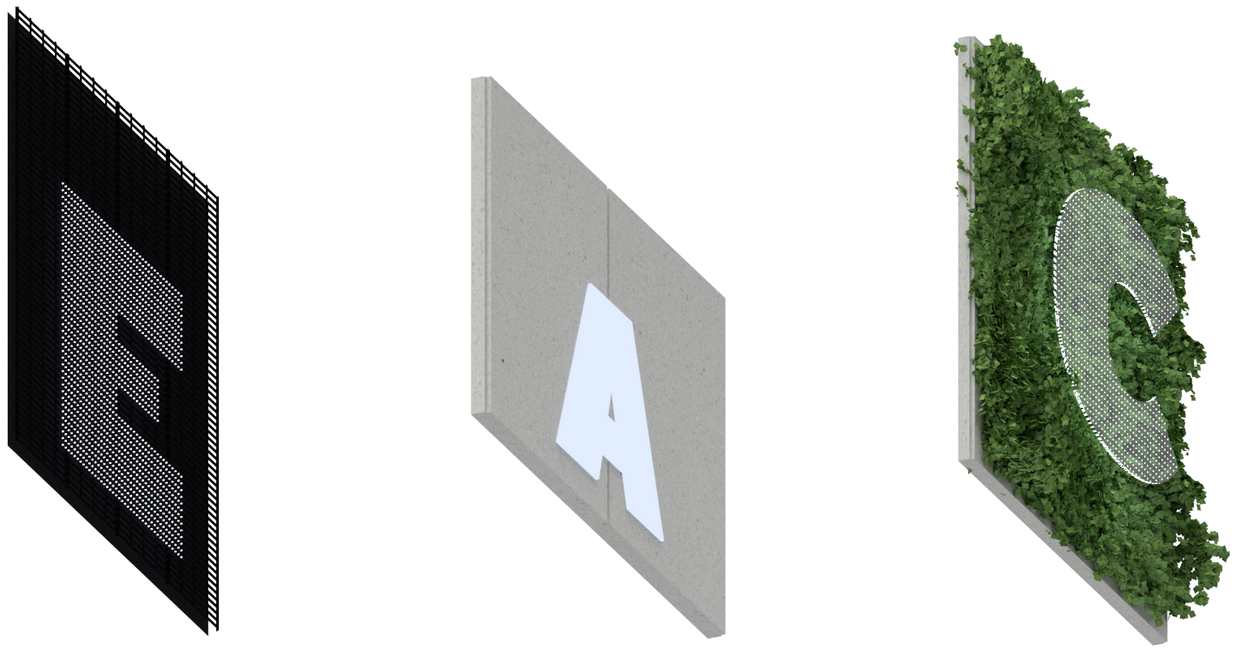
A selection of design options and products were assessed for the Illuminated Lettering considering the different facade materials at the letter locations.

For the Wayfinding Letters the same solution and products used in the Top Box video screens are proposed - embedded Daktronics PSX-50 stick system. The integration of this product varies depending on the facade cladding material.

Summary of options:

- Perforated cladding panel: Daktronics PSX-50 stick system embedded in panel as in Top Box.
- Concrete Panel: LED nodes protrude directly through perforations in pre-cast concrete panel
- Green Wall Option 1: LED modules through perforated panel.
- Green Wall Option 2: LED modules within transparent sheet.

The final design and detailing of these elements will need to be developed by the contractor and preferred supplier in the next design stage.



Illuminated lettering at perforated panel, concrete wall and green wall.

1.7.14 Overview

As part of Stage 4, the Ground Level Soffit linear lighting was turned into a dynamic colour changing lighting source that would also react with the Top Box architectural lighting.

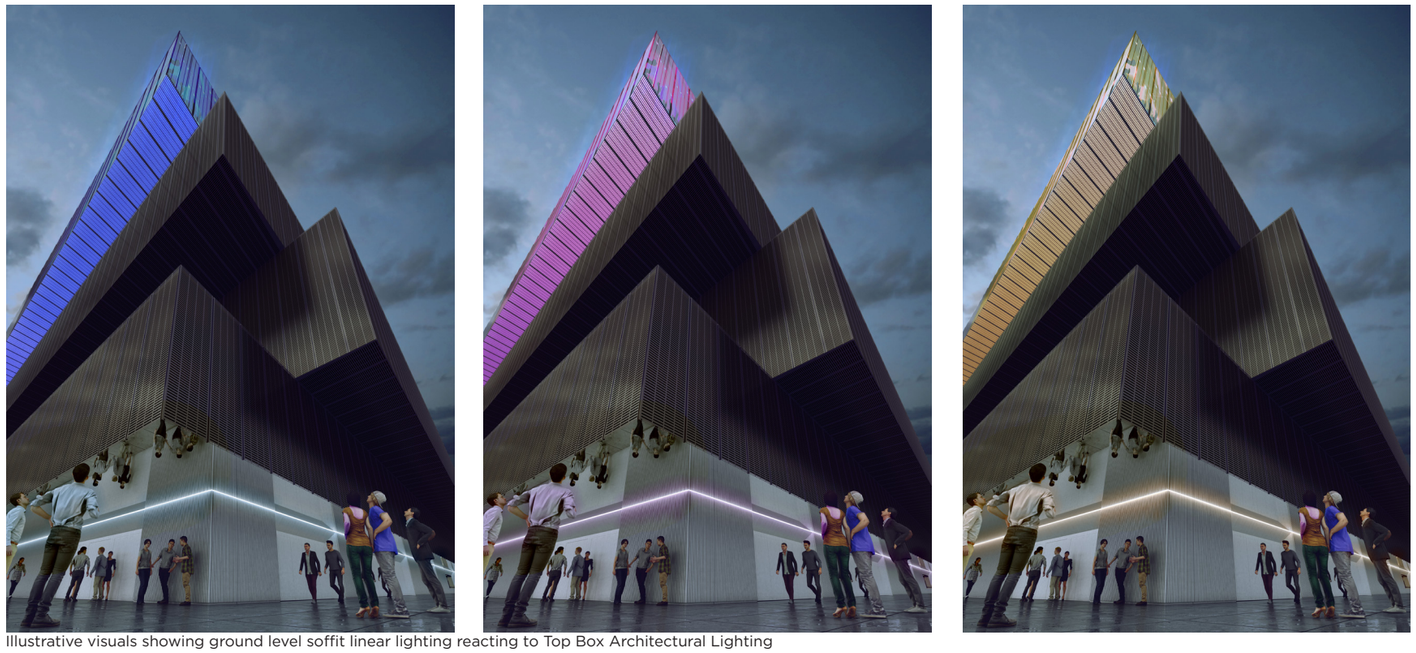
Key Considerations:

- Seamless joints/shadow free soffit, accommodating up to 2.1m wide panels
- Capability to react with Top Box architectural lighting, therefore assumed same product type of architectural lighting as used for façade top box.
- BREEAM Pollution 04 compliance (reduced light spill)
- BREEAM Energy 03 compliance was not viable due to the low efficacy of colour changing LED lighting.
- Adequate circulation lighting levels not to be compromised
- Emergency lighting alternative solution provided by ME Engineers as the previous linear fixture was also serving as an emergency light

The fixture utilised is proposed to be the same as used for the Top Box Soffit Architectural Lighting: Chauvet Ilumiline Series with 10° x 60° optics. This will ensure same lighting quality as in the Top Box, absolute control compatibility and overall adequate performance.



Illustrative visual showing the ground floor soffit linear lighting activated



Illustrative visuals showing ground level soffit linear lighting reacting to Top Box Architectural Lighting

1.7.15 Hospitality Entrances

The North Hospitality Entrance and the Backstage Club Entrance lighting design considered simple integrated solutions that provide comfort, interest and guidance for visitors.

Key Considerations for North Entrance:

- High pedestrian traffic (circulation and queuing)
- Daylight compensation required
- Drawing visitors in and guiding them out

North Entrance lighting:

- Intimate exclusive feel by utilising subtle interior lighting to draw visitors into the building.

The combination of these two layers of lighting will allow for a selection of scenes in which the space can feel bright and large or dim and compressed.

Key Considerations for Backstage Club Entrance:

- Exclusive entrance
- Integral part of the larger facade
- Regular soffit height
- Concrete wall and reflective soffit

Backstage Club Entrance lighting:

- The entry door is framed by pairs of uplights that disappear during the day. The preferred product to accomplish this is Simes 5121.
- Lighting from the interior space spills out creating interest.

*NRS illuminate signage to be integrated into design



North Entrance illustrative visual



Backstage Club Entrance illustrative visual


Precedent uplighting application

FACADE LIGHTING TECHNICAL APPENDIX (SATORE)

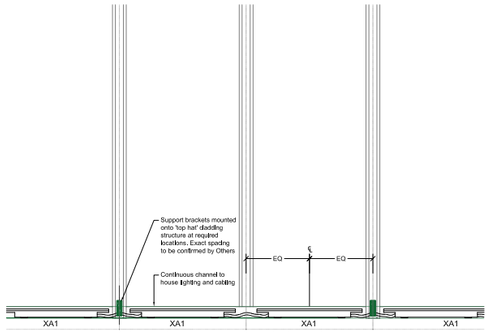
1.8.1 PRELIMINARY ARCHITECTURAL LIGHTING DETAILS 310

1.8.2 PRELIMINARY ARCHITECTURAL LIGHTING SPECIFICATION 311

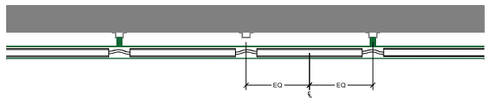
1.8.3 PRELIMINARY VIDEO FIXTURE SPECIFICATION 313

1.8

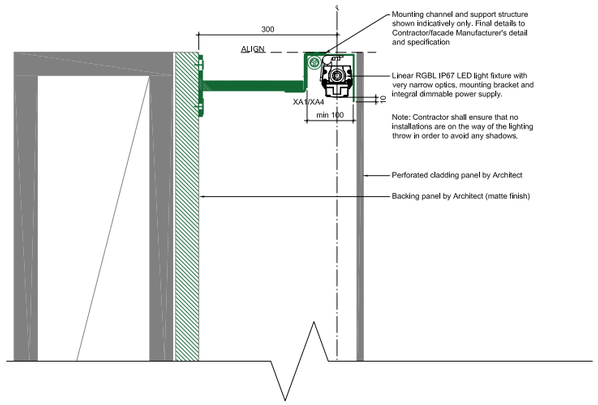
1.8.1 Preliminary Architectural Lighting Details

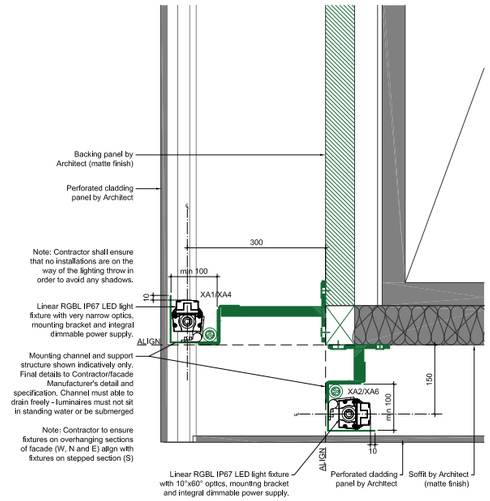


Part Elevation - 1:20 @ A1

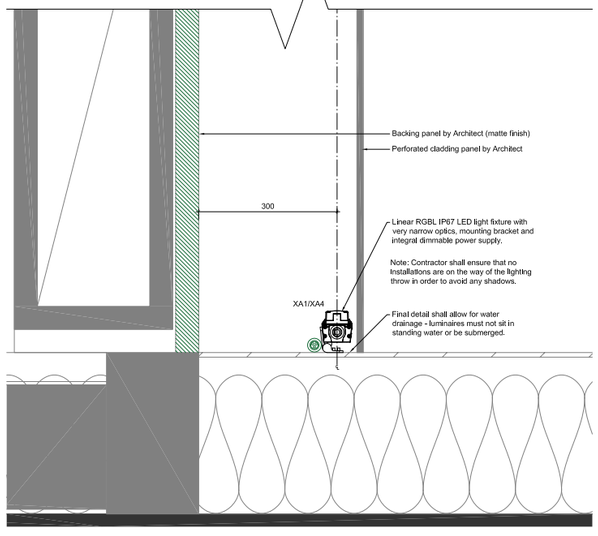


Part Plan - 1:20 @ A1

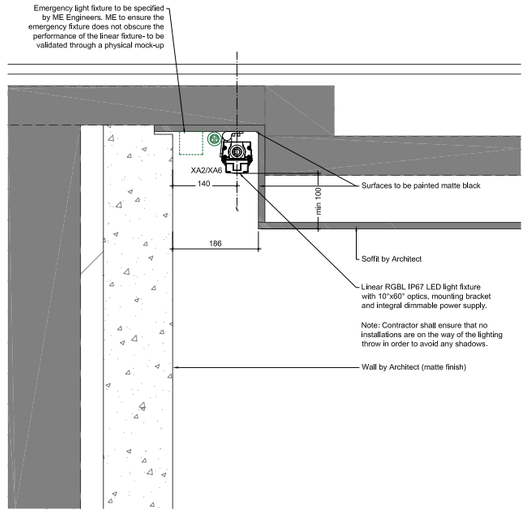




Top Box West Section Detail - 1:5 @ A1



Top Box South Section Detail - 1:5 @ A1



Ground Floor Soffit Section Detail - 1:5 @ A1

NOTES

This drawing represents visual concepts and design intent only. It does not replace the advice of a licensed structural engineer.

The designer is unqualified to determine the structural appropriateness of the design and will not assume responsibility for improper or use.

NOT FOR CONSTRUCTION

REV	DATE	REVISION NOTES	BY
02	07/10/20	Issued for Comment	LA
01	07/11/19	Issued for Comment	LA
00	29/11/19	First Issue of Information	LM

SATORE STUDIO
THE BISCUIT FACTORY
DRUMMOND ROAD, STUDIO A302
LONDON SE16 4DG
UNITED KINGDOM
email-ilee@satorestudio.com

CLIENT
Populous

PROJECT TITLE
OVG Manchester

SAT PROJECT No.
548

Machester,
United Kingdom

DRAWING TITLE
Lighting Details
Façade Architectural Lighting

DRAWING STATUS			RIBA STAGE	BIM STATUS
Issued for Comment			STAGE 4	N/A
DRAWN	CHECKED	DATE	SCALE	
LM	PB	07/10/20	@ A1	

DRAWING No.
Project Originator Zone Level Type Role Number
BRA-SAT-ZZ-ZZ-DR-EL-6900

REVISION
02

1.8.2 Preliminary Architectural Lighting Specification

ILUMINARC®

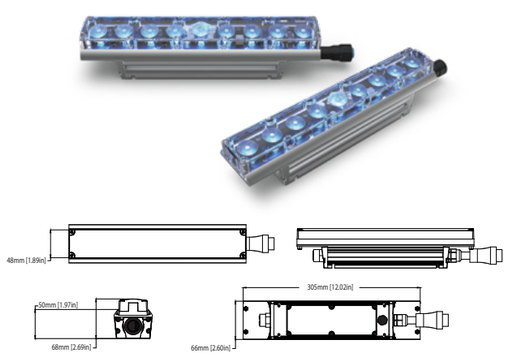
ILUMILINE SL

Client:_____

Project:_____

Date:_____Type:_____

LIGHT SOURCE & OPTICAL SPECIFICATIONS
Light Source: 9 LEDs (quad-color RGBL) 3 W, (200 mA),
50,000 hours life expectancy.
Color Temperature (range): 3200 to 10,000 K
Color Temperature (at full): 20,177 K
Installed Optics: 15°
Optional Beam Spread Filters: 20°, 40°, 55°, 60°x 10°
Beam Angle: 15°
Beam Angle (w/20° filter): 24.5°
Beam Angle (w/40° filter): 36°
Beam Angle (w/55° filter): 38.6°
Beam Angle (w/60°x 10° filter): 38.2°x 19.1°
Field Angle: 32.1°
Field Angle (w/20° filter): 52.5°
Field Angle (w/40° filter): 81.2°
Field Angle (w/55° filter): 122.5°
Field Angle (w/60x10° filter): 75.2°x 42.9°
Lumens: 693
Lumens (w/20° filter): 632
Lumens (w/40° filter): 562
Lumens (w/55° filter): 535
Lumens (w/60x10° filter): 604
Illuminance: 241 lux @ 5 m
Illuminance (w/20° filter) : 80 lux @ 5 m
Illuminance (w/40° filter): 31 lux @ 5 m
Illuminance (w/55° filter): 23 lux @ 5 m
Illuminance (w/60x10° filter): 59 lux @ 5 m



CONSTRUCTION & PHYSICAL SPECIFICATIONS
Dimensions: 12 x 3.03 x 3.43 in (305 x 77 x 87 mm)
Weight: 2.65 lb (1.2 kg)
Exterior Color: Brushed Aliminum
Housing Material: Aluminum, die-cast
Lens Cover: ABS Plastic
Installation Orientation: Any

CONTROL SPECIFICATIONS
Control Protocol: USITT DMX-512a, RDM
DMX Channels: 1, 3, 4, 5, 7, 8
Modes/Personalities: 7 personalities
Remote Addresser: RDM2GO or other RDM Device (Sold Separately)
Data Connection: Hard wired (Req. Ilumiline Power/Data Box)
Data Cable Length: 3.5 in (88.9 mm)

DYNAMIC EFFECTS
Tilt: 0°/180°
Dimmer: Electronic
Shutter/Strobe: Electronic
Strobe Rate: 0 to 20 Hz
Standalone Color Mixing: Yes
Color Temperature Presets: Yes
Dim Modes: 5
Built-in Automated Programs: No

ELECTRICAL SYSTEM SPECIFICATIONS
Input Voltage: 100 to 277 VAC, 50/60 Hz (auto-ranging)
Power Linking: 54 units @ 120 V; 75 units @ 208 V;
82 units @ 230 V; TBD units @ 277 V
Power and Current: 25 W, 0.192 A @ 120 V, 60 Hz
26 W, 0.137 A @ 208 V, 60 Hz
29 W, 0.126 A @ 230 V, 50 Hz
TBD W, TBD A @ 277 V, 50 Hz
Power Supply: Electronic internal
Dimmer: Electronic
Power Connection: Hard Wired (Req. Ilumiline Power/Data Box)
Power Cable Length: 3.5 in (88.9 mm)

THERMAL SPECIFICATIONS
Cooling: Convection
Startup Temperature Range: -4°F to 104°F (-20 to 40)°C
Operating Temperature Range: -20°F to 110°F (-29 to 43)°C

REGULATORY & VOLUNTARY QUALIFICATION
Certification Listings: MET, FCC, CE
Environment: Outdoor/Wet location, IP67 Please refer to the User Manual
and/or the Quick Reference Guide.
Warranty: 24 month manufacturer's limited warranty (for covered regions only)

Complies with:
UL 1573
CSA C22.2 No. 166
MET E113093

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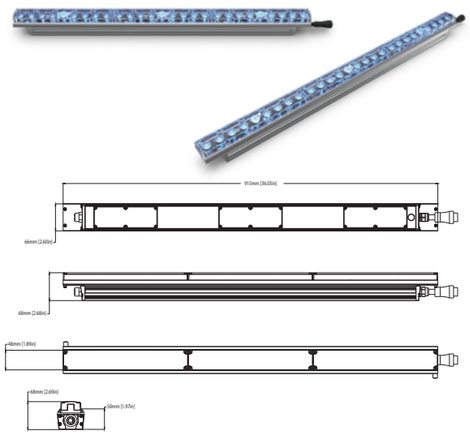
ILUMILINE ML

Client:_____

Project:_____

Date:_____Type:_____

LIGHT SOURCE & OPTICAL SPECIFICATIONS
Light Source: 27 LEDs (quad-color RGBL) 3 W, (200 mA),
50,000 hours life expectancy.
Color Temperature (range): 3200 to 10,000 K
Color Temperature (at full): 24,353 K
Installed Optics: 15°
Optional Beam Spread Filters: 20°, 40°, 55°, 60°x 10°
Beam Angle: 14.8°
Beam Angle (w/20° filter): 24.4°
Beam Angle (w/40° filter): 35.5°
Beam Angle (w/55° filter): 37.8°
Beam Angle (w/60°x 10° filter): 41.4°x 19.9°
Field Angle: 33.1°
Field Angle (w/20° filter): 52.4°
Field Angle (w/40° filter): 109.7°
Field Angle (w/55° filter): 128.9°
Field Angle (w/60x10° filter): 81.7°x 45.9°
Lumens: 2,060
Lumens (w/20° filter): 1,798
Lumens (w/40° filter): 1,604
Lumens (w/55° filter): 1,557
Lumens (w/60x10° filter): 1,722
Illuminance: 497 lux @ 5 m
Illuminance (w/20° filter) : 195 lux @ 5 m
Illuminance (w/40° filter): 79 lux @ 5 m
Illuminance (w/55° filter): 62 lux @ 5 m
Illuminance (w/60x10° filter): 146 lux @ 5 m



CONSTRUCTION & PHYSICAL SPECIFICATIONS
Dimensions: 36 x 3.03 x 3.43 in (915 x 77 x 87 mm)
Weight: 7.05 lb (3.2 kg)
Exterior Color: Brushed Aliminum
Housing Material: Aluminum, die-cast
Lens Cover: ABS Plastic
Installation Orientation: Any

CONTROL SPECIFICATIONS
Control Protocol: USITT DMX-512a, RDM
DMX Channels: 1, 3, 4, 5, 7, 8, 15
Modes/Personalities: 8 personalities
Remote Addresser: RDM2GO or other RDM Device (Sold Separately)
Data Connection: Hard wired (Req. Ilumiline Power/Data Box)
Data Cable Length: 3.5 in (88.9 mm)

DYNAMIC EFFECTS
Tilt: 0°/180°
Dimmer: Electronic
Shutter/Strobe: Electronic
Strobe Rate: 0 to 20 Hz
Standalone Color Mixing: Yes
Color Temperature Presets: Yes
Dim Modes: 5
Built-in Automated Programs: No

ELECTRICAL SYSTEM SPECIFICATIONS
Input Voltage: 100 to 277 VAC, 50/60 Hz (auto-ranging)
Power Linking: 17 units @ 120 V; 27 units @ 208 V;
28 units @ 230 V; TBD units @ 277 V
Power and Current: 74 W, 0.604 A @ 120 V, 60 Hz
80 W, 0.383 A @ 208 V, 60 Hz
85 W, 0.367 A @ 230 V, 50 Hz
TBD W, TBD A @ 277 V, 50 Hz
Power Supply: Electronic internal
Dimmer: Electronic
Power Connection: Hard Wired (Req. Ilumiline Power/Data Box)
Power Cable Length: 3.5 in (88.9 mm)

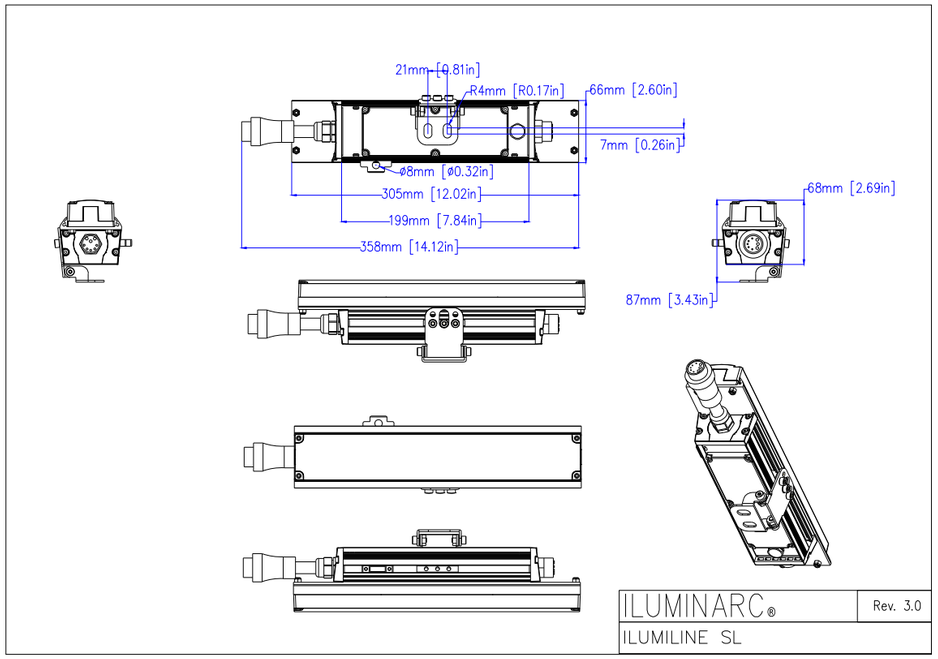
THERMAL SPECIFICATIONS
Cooling: Convection
Startup Temperature Range: -4°F to 104°F (-20 to 40)°C
Operating Temperature Range: -20°F to 110°F (-29 to 43)°C

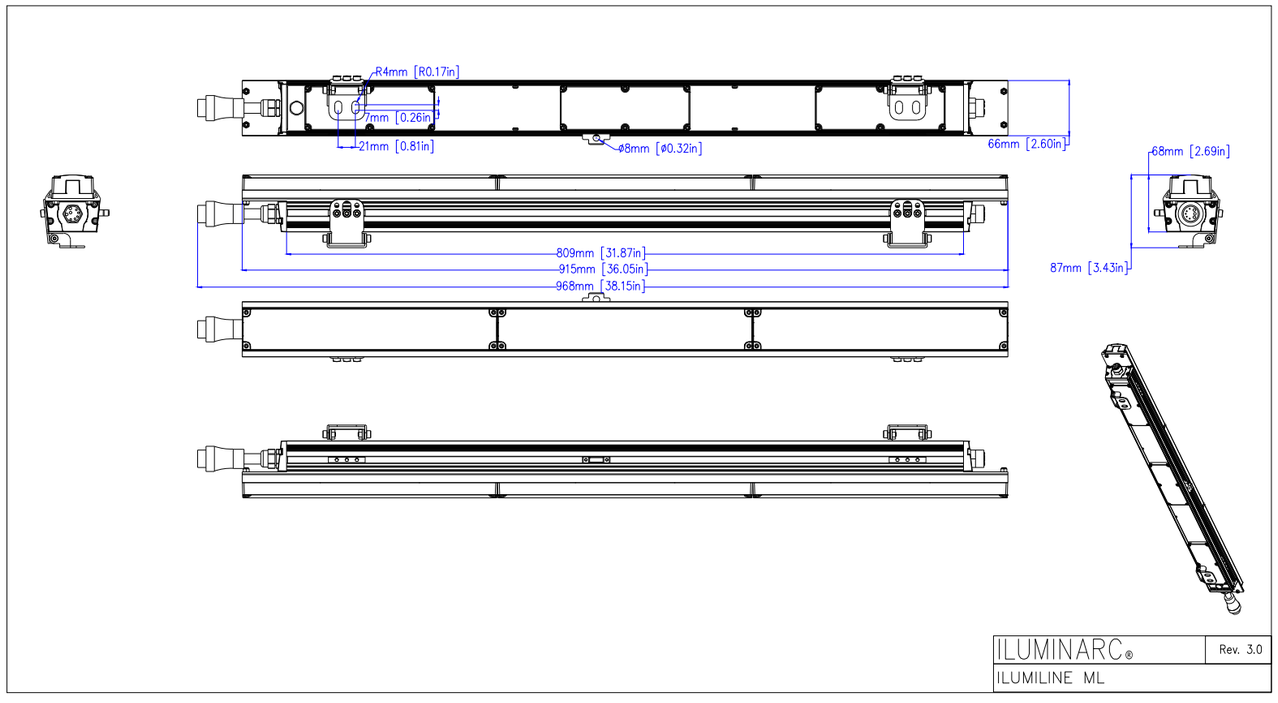
REGULATORY & VOLUNTARY QUALIFICATION
Certification Listings: MET, FCC, CE
Environment: Outdoor/Wet location, IP67 Please refer to the User Manual
and/or the Quick Reference Guide.
Warranty: 24 month manufacturer's limited warranty (for covered regions only)

Complies with:
UL 1573
CSA C22.2 No. 166
MET E113093

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1.0 ARCHITECTURE

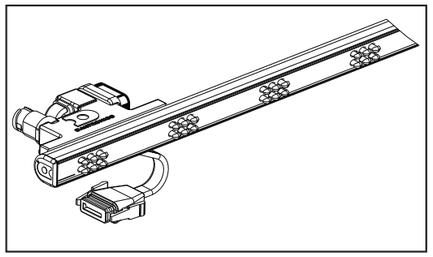




1.8.3 Preliminary Video Fixture Specification

ProPixel® PSX-5706-50 Quick Guide 1 of 4







SPECIFICATIONS

Model number	PSX-5706-50	**LED lifetime**	75,000 hours (half brightness)
LED technology	Through-hole LEDs	**Intensity/pixel**	17.5 candelas
Pixel configuration	2 red, 2 green, 2 blue LED	**Intensity/element**	700 to 1400 candelas
Pixels/element	Variable 40 to 80 pixels	**Power/element average**	7.6 watts - 15.2 watts
Native element pixel pitch	50 mm (1.969")	**Power/element maximum**	29.6 watts - 59.2 watts
Element Length	2000-4000 mm (78.74-157.48")	**Power/pixel**	0.925 watts maximum
Element width	12 mm (0.472")	**Color processing**	16-bit (281 trillion colors)
Element depth	14 mm (0.551")	**Dimming control**	64 levels
Element weight	0.64 - 1.23 kg (1.14 - 2.71 lbs)	**Operating temperature**	-40° to 49° C (-40° to 120° F)
Horizontal viewing angle	110° (55° off center)	**Service access**	Front or Rear
Vertical viewing angle	50° (25° off center)	**Environmental rating**	IP 67

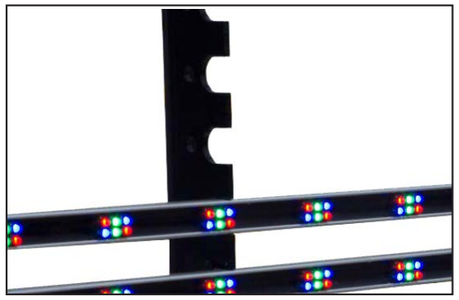
DD2766835 Rev 0
2 April 2014

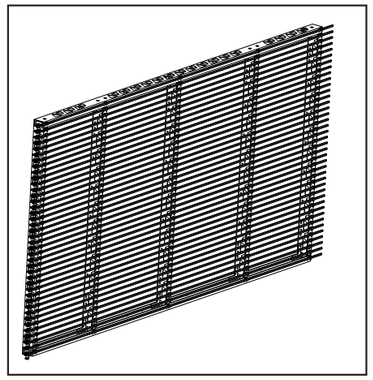
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tel 605-697-4036 or 800-325-8766 Fax 605-697-4700
www.Daktronics.com

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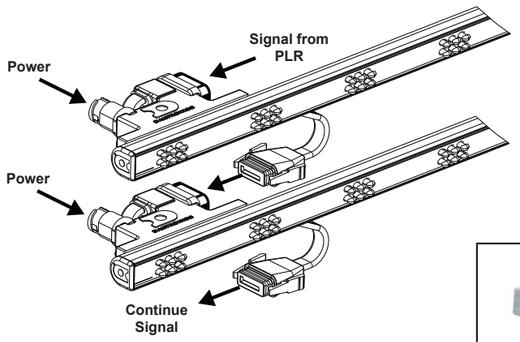
ProPixel® PSX-5706-50 Quick Guide 2 of 4

Frame Options





Connecting Power and Signal





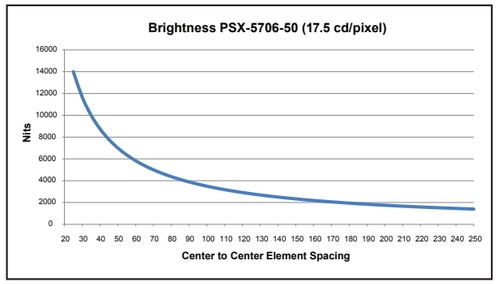
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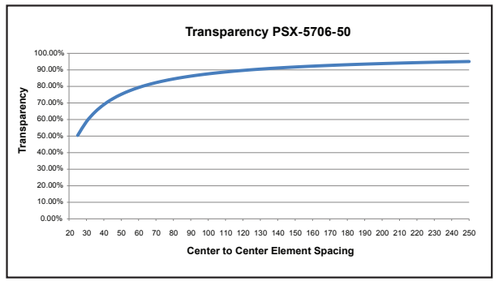
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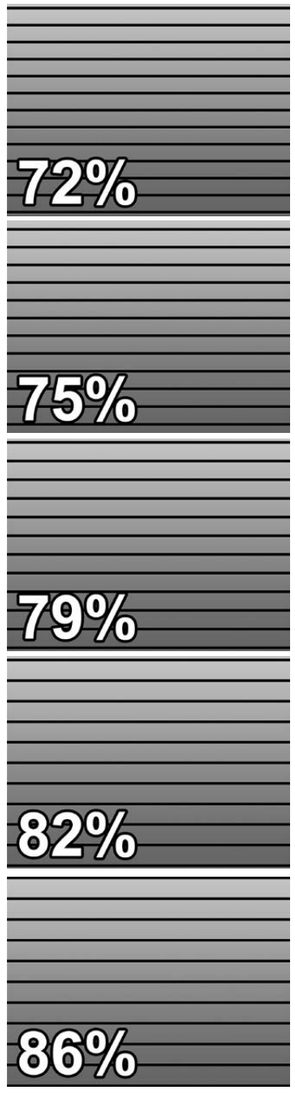
Brightness and Transparency





Brightness (Nits)	Transparency Percentage	Element to Element Spacing
8000	71.66%	43.75 mm (1.72 in)
7000	75.20%	50.00 mm (1.97 in)
6000	78.74%	58.33 mm (2.30 in)
5000	82.29%	70.00 mm (2.76 in)
4000	85.83%	87.50 mm (3.44 in)

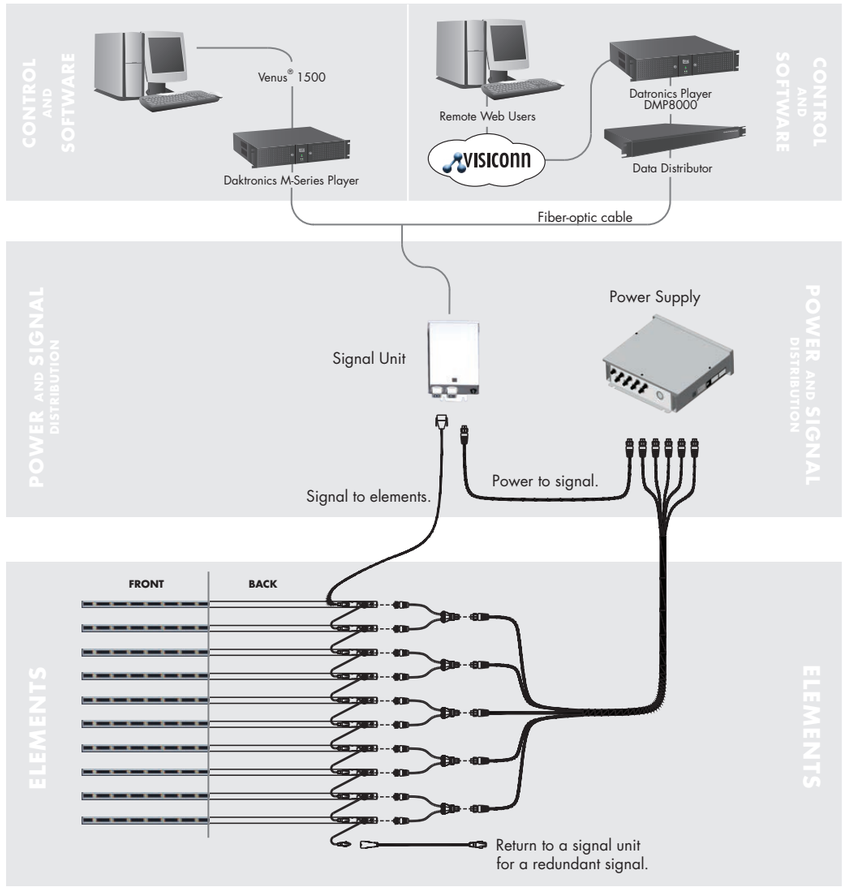
See-Through Displays



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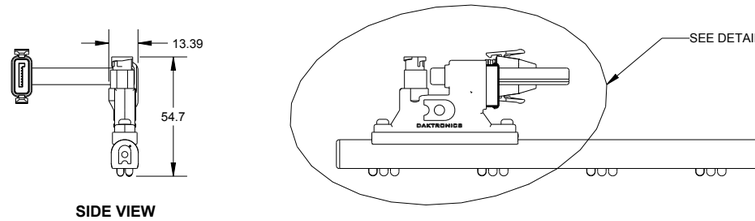
ProPixel® PSX-5706-50 Quick Guide 4 of 4



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2 April 2014

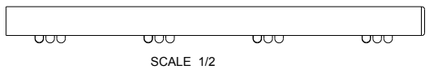
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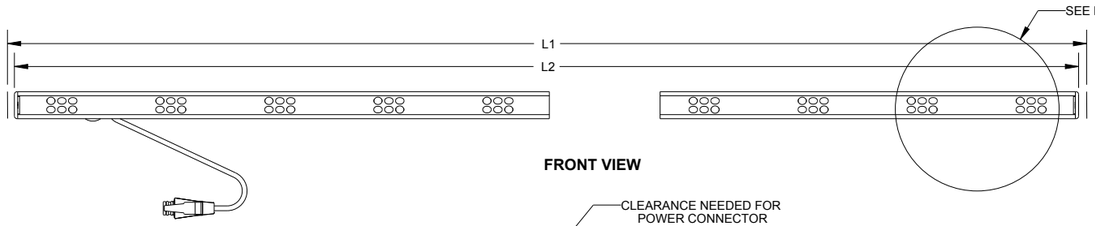


SIDE VIEW

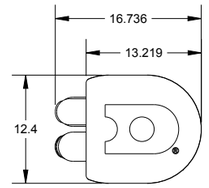
TOP VIEW



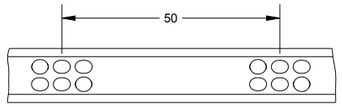
SCALE 1/2



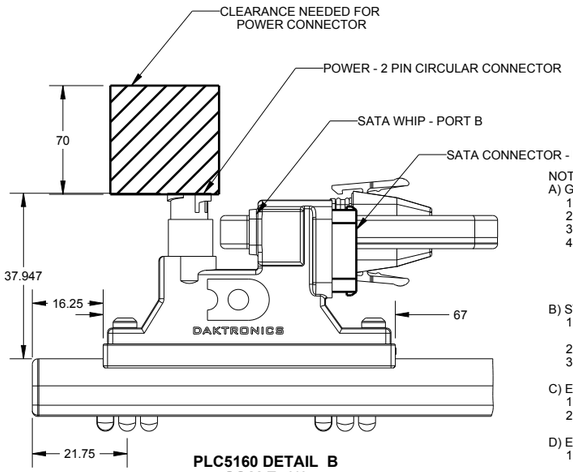
FRONT VIEW



SIDEVIEW DETAIL
SCALE 2/1



PIXEL ARRANGEMENT DETAIL A
SCALE 1/1



PLC5160 DETAIL B
SCALE 1/1

NOTES:
A) GENERAL
1) DIMENSIONS ARE IN MILLIMETERS
2) PIXEL ARRANGEMENT: 2R 2G 2B
3) PIXEL TECHNOLOGY: THROUGH HOLE
4) MATERIAL:
A) HOUSING: ALUMINUM EXTRUSION, ANODIZED
B) END CAPS: POLYCARBONATE
C) ENVIRONMENTAL PROTECTANT: SILICONE BASED POTTING

B) STRUCTURAL
1) UNSUPPORTED SPANS MUST NOT EXCEED 1M
A) REFERENCE DD FOR DETAILED STRUCTURAL REQUIREMENTS
2) SEE DWG-1160328 FOR STANDARD MOUNTING
3) SEE DWG- FOR SPECIAL GKD MESH MOUNTING

C) ENVIRONMENTAL
1) AMBIENT OPERATING TEMPERATURE: -40C - 50C
2) ENVIRONMENTAL PROTECTION: IP67

D) ELECTRICAL
1) STANDARD INTENSITY - 17.5CD/PIXEL
A) PRODUCT CODE: 1718
B) MAX WATTS PER PIXEL: 0.74W @ 24 VDC
2) HIGH INTENSITY - 20CD/PIXEL
A) PRODUCT CODE: 1803
B) MAX WATTS PER PIXEL: 0.88W @ 24 VDC
3) LOW INTENSITY - 7.25CD/PIXEL
A) PRODUCT CODE: 1804
B) MAX WATTS PER PIXEL: 0.348W @24VDC

* SEE NOTE D FOR APPROPIATE PRODUCT CODE WXYZ

ASSEMBLY*	DESCRIPTION	DESIGN LENGTH L1	ACTUAL LENGTH L2	WEIGHT KG	ANODIZE COLOR
0A-WXYZ-6520	PSX-50 ELEMENT, PL5, 50mm, 2.0M	2000	1993.5	0.64	CLEAR
0A-WXYZ-6522	PSX-50 ELEMENT, PL5, 50mm, 2.2M	2200	2193.5	0.69	CLEAR
0A-WXYZ-6524	PSX-50 ELEMENT, PL5, 50mm, 2.4M	2400	2393.5	0.75	CLEAR
0A-WXYZ-6526	PSX-50 ELEMENT, PL5, 50mm, 2.6M	2600	2593.5	0.81	CLEAR
0A-WXYZ-6528	PSX-50 ELEMENT, PL5, 50mm, 2.8M	2800	2793.5	0.87	CLEAR
0A-WXYZ-6530	PSX-50 ELEMENT, PL5, 50mm, 3.0M	3000	2993.5	0.94	CLEAR
0A-WXYZ-6532	PSX-50 ELEMENT, PL5, 50mm, 3.2M	3200	3193.5	0.99	CLEAR
0A-WXYZ-6534	PSX-50 ELEMENT, PL5, 50mm, 3.4M	3400	3393.5	1.05	CLEAR
0A-WXYZ-6536	PSX-50 ELEMENT, PL5, 50mm, 3.6M	3600	3593.5	1.11	CLEAR
0A-WXYZ-6538	PSX-50 ELEMENT, PL5, 50mm, 3.8M	3800	3793.5	1.17	CLEAR
0A-WXYZ-6540	PSX-50 ELEMENT, PL5, 50mm, 4.0M	4000	3993.5	1.23	CLEAR
0A-WXYZ-7520	PSX-50 ELEMENT, PL5, 50mm, 2.0M	2000	1993.5	0.64	BLACK
0A-WXYZ-7522	PSX-50 ELEMENT, PL5, 50mm, 2.2M	2200	2193.5	0.69	BLACK
0A-WXYZ-7524	PSX-50 ELEMENT, PL5, 50mm, 2.4M	2400	2393.5	0.75	BLACK
0A-WXYZ-7526	PSX-50 ELEMENT, PL5, 50mm, 2.6M	2600	2593.5	0.81	BLACK
0A-WXYZ-7528	PSX-50 ELEMENT, PL5, 50mm, 2.8M	2800	2793.5	0.87	BLACK
0A-WXYZ-7530	PSX-50 ELEMENT, PL5, 50mm, 3.0M	3000	2993.5	0.94	BLACK
0A-WXYZ-7532	PSX-50 ELEMENT, PL5, 50mm, 3.2M	3200	3193.5	0.99	BLACK
0A-WXYZ-7534	PSX-50 ELEMENT, PL5, 50mm, 3.4M	3400	3393.5	1.05	BLACK
0A-WXYZ-7536	PSX-50 ELEMENT, PL5, 50mm, 3.6M	3600	3593.5	1.11	BLACK
0A-WXYZ-7538	PSX-50 ELEMENT, PL5, 50mm, 3.8M	3800	3793.5	1.17	BLACK
0A-WXYZ-7540	PSX-50 ELEMENT, PL5, 50mm, 4.0M	4000	3993.5	1.23	BLACK

REV	DATE:		BY:
01	12JAN2015	ADDED 3.5 MM OVERALL EXTRUSION LENGTH AND SHIFTED PLC 1.75 MM INWARD.	CPL 17754

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SCALE: ENTER SCALE
SHEET: 1 OF 1 | REV: 01 | JOB NO: P 1718 | FUNC-TYPE-SIZE: E _ 07 _ B

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ACCESSIBILITY (BUROHAPPOLD)

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1.9.3 ACCESSING THE SITE 323

1.9.4 EXISTING ROAD AND PAVEMENT MODIFICATIONS 324

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1.9.7 SANITARY ACCOMMODATION 327

1.9.8 WHEELCHAIR USER ACCESS TO AUDITORIUM 328

1.9

1.9.1 Accessibility

The applicants and their project team are committed to creating a new venue that will achieve world-class standards. We have adopted a people-centred approach that will manifest itself in the creation of a venue that is inclusive and accessible from the outset. Ease and surety of movement throughout and the ability to access all that the venue has to offer means that access in both a physical and experiential sense will help to create the 'next generation venue'.

Creating inclusive and accessible facilities starts with the simple premise that inclusion is embedded in the design process to remove barriers, promote equity of experience and continuously challenge and interrogate the design. Our strategic approach to access, inclusion and delivering a venue that exceeds minimum requirements will be to provide a venue that allows people to use the scheme safely, with dignity, comfort, convenience and confidence. The design of the scheme incorporates good practice guidance such as BS 8300:2018 Design of an accessible and inclusive built environment - Code of practice.

People should be able to make effective, independent choices about how they use the venue without experiencing undue effort or separation, and will be able to participate with equality in the activities that the scheme offers. The proposals not only consider those barriers that form physical constraints but also barriers experienced by people who are neurodivergent, have mental ill health issues, who are deaf, deafened and hard-of-hearing and people or who are blind or partially sighted.

As part of Manchester's Core Strategy, there is an aspiration that by 2027 'Manchester will be a successful and accessible City in the front rank of cities in Europe and the world'. This scheme is an opportunity to meet and exceed that aspiration through the adoption of the following four principles, which incorporate CABE's 'Principles of Inclusive Design'. These principles are embedded as part of design deliberations and output to ensure that all parts of the built environment:

- Can be used safely, easily and with dignity by all regardless of disability, age, gender, ethnicity or economic circumstances.
- Are convenient and welcoming with no disabling barriers, so everyone can use them independently without undue effort, separation or special treatment.
- Are flexible and responsive, taking account of what different people say they need and want, so people can use them in different ways.
- Are realistic, offering more than one solution to help balance everyone's needs, recognising that one solution may not work for all.

No matter how physically accessible a venue is, without clear operational policy mechanisms, the accessibility of the venue will be compromised and over time, diminish. Therefore, sufficiently robust provision, criterion and practices must be established by the building management and operators including the development of active management plans. For this reason, the applicants are seeking to obtain Attitude is Everything's (AiE) Charter status. AiE's Charter is a combination of physical provision, service offering and operational practice designed to guide venue and event organisers through a wide range of topics. The Charter sets out 21 criteria such as the provision of information, booking disability equality training to provision within the physical site looking at viewing platforms, toilets (including Changing Places facilities) and emergency evacuation plans. There are also requirements for staff training, consultation and engagement.

There is also an aspiration that the venue becomes the touring communities' favourite venue. As the design develops, the development of back of house and performers' facilities will address disabled and non-disabled users, in order to ensure that every effort is made to allow the programming of deaf and disabled artists to operate freely and to make as many performance areas as possible accessible. As part of our drive to achieve AiE Charter Status we will look at removing obstacles in all areas from rehearsing, recording and performing, to attending industry events. The design team and OVG have been consulting and engaging directly with Attitude is Everything to deliver a venue that should obtain Charter Status.

As the design develops we will continue to look at how operational and management policies, procedures and practices might create unintended barriers and work to remove them.

Planning Policy and Legislation

The following sets out the planning context and statutory provisions of the Equality Act that have been considered in regards to delivering an accessible and inclusive environment.

Equality Act 2010

The Equality Act 2010 provides the legal framework that protects people from discrimination. The Act is anti-discrimination legislation across nine 'protected characteristics'. These are:

- Age
- Disability
- Gender reassignment
- Marriage and civil partnership
- Pregnancy and maternity
- Race
- Religion or belief
- Sex
- Sexual orientation

The Act applies to all providers of services, public authorities carrying out their functions, associations and employers. It applies to all services, whether or not a charge is made for them. The reasonable adjustments duty within the Act imposes a duty on employers, service providers and public functions to make reasonable adjustments to any physical feature which may put a disabled person at a substantial disadvantage compared to non-disabled people. The is not a minimalist policy of simply ensuring that some access is available to disabled people; it is, so far as is reasonably practicable, to approximate the access enjoyed by disabled people to that enjoyed by the rest of the public. The Act does not place a duty to make reasonable adjustments for other protected characteristics but reasonable adjustments will be required to any relevant provisions, criteria or practices.

The National Planning Policy Framework (2019)

The NPPF highlights that planning policies and decisions should ensure that developments create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.

Manchester Planning Policy

The Local Plan is the spatial strategy for the local authority and comprises development plan documents with policies on the development, use of land, allocations of sites for particular types of development and development management policies, of which the Core Strategy, adopted in July 2012 forms one part.

The revised Local Plan will replace the Core Strategy and the Unitary Development Plan policies and will be set in the context of the emerging Greater Manchester Spatial Framework (GMSF) which will provide a vision and strategic policies for development across Greater Manchester.

Manchester City Council Planning Policy: Core Strategy 2012

The scheme addresses Policy SP1: 'Spatial Principles: core development principles in that the needs of all members of the community have been considered regardless of age, gender, disability, sexuality, religion, culture, ethnicity or income. The proposals also responds to Policy DM 1: 'Development Management' that the built environment is accessible to disabled people.

Draft Greater Manchester Spatial Framework (2019)

The Greater Manchester Spatial Framework is an ambitious vision for the future of Greater Manchester. The 2019 consultation draft sets out an aspiration for a 'Greater Manchester for Everyone' which promotes greater inclusion in a variety of ways: such measures including:

Achieving the high quality, inclusive design of places and developments

Supporting greater inclusion through the design and implementation of individual development proposals

Inclusion is also a component of sustainability. Policy GM-E-1: Sustainable Places indicates the following key attributes for all development, wherever appropriate, should be consistent with being socially inclusive; and respond to the needs of all parts of society; enabling everyone to participate equally and independently; providing opportunities for social contact and support; and promoting a sense of community.

Inclusive design guidance and standards

Inclusive design issues are to be reviewed in accordance with the objectives of the following:

- Building Regulations 2010 and associated Approved Documents
- Equality Act 2010
- Greater Manchester Planning Policy
- Manchester City Council Planning Policy
- National Planning and Policy Framework, 2012
- Planning and Compulsory Purchase Act, 2004

Reference is to be made to the following documents during design development for this project:

- Access for All, UEFA and CAFÉ Good Practice Guidance to Creating an Accessible Stadium and Matchday Experience for All, 2011
- Accessible Stadia, FAIF and FLA, 2003
- Accessible Stadia, Supplementary Guidance, Sports Ground Safety Authority, 2015
- Accessible Sports Facilities, Sport England, 2010
- Attitude is Everything, Venues: Charter of Best Practice
- BS 6465-1:2006, Code of practice for the design of sanitary facilities and scales of provision of sanitary appliances
- BS 6465-2:2017, Sanitary installation
- BS 8300-1:2018, Design of an accessible and inclusive built environment; Part 1 External environment – Code of practice
- BS 8300-2:2018, Design of an accessible and inclusive built environment; Part 2 Buildings – Code of practice
- BS EN 81-70:2018. Safety rules for the construction and installation of lifts: Part 70: Accessibility to lifts for persons including persons with disability
- Building Regulation Approved Document K – Protection from falling, collision and impact 2013
- Building Regulation Approved Document M – Access to and use of Buildings Vol 2: Buildings other than dwellings, 2015
- Design for Access 2, 2003
- Guidance on the provision of spending facilities for guide dogs and other assistance dogs, The Guide Dogs for the Blind Association, 2015
- Guide to Safety at Sports Grounds (the Green Guide), Sixth Edition, Sports Ground Safety Authority, 2018
- Technical Standards for Places of Entertainment 2015 (Revised 2019).

Inclusive Design Provision

The following commentary describes the inclusive and accessible features incorporated into the scheme. In addition, there are high-level parameters which follow in each section, outlining a recommended approach to delivering an inclusive environment and establish a working framework to inform further design development.

Parking

Accessible parking will be located in the Etihad Campus Car Park H which will have with designated accessible parking bays set out as per BS 8300-1:2018 figure 4 with a standard bay of 2400mm x 4800mm with 1200mm access zones to either side of the space and a marked 1200mm rear safety zone.

On non-match days, the full complement of spaces would be available to serve OVG Manchester: on match days, a parking management strategy between OVG and Manchester City FC is to be devised to allocate designated accessible parking bays between the two venues.

To encourage inclusive cycling, as the design is developed, cycle parking for non-standard cycles such as tricycles or tandem bikes will be included.

Approach/ Public realm

The wider transport and connectivity strategy is set out in the Traffic and Transport Assessments.

OVG Manchester will primarily be approached on foot from the north via Joe Mercer Way to the west which will connect the Ground Floor level with Level 01. Limited VIP drop off will be permitted at the north along Sportcity Way.

The design of the public realm (see section 02 of this report) demonstrates in detail that the design of the public realm has adopted inclusive design principles set out above and sought to minimise physical barriers and visual clutter, seeking to contribute to the delivery of a high-quality public realm.

In developing the public realm, we have adopted the following principles:

- Circulation routes are to be step-free routes
- All footways, footpaths and floor surfaces are to:
- Be installed with any necessary joints closed and flush to prevent small wheels, walking sticks and canes becoming trapped
- Have consistent use of tone and surface when paths are used as a wayfinding tool
- Use visually contrasting surfaces to indicate level differences.
- Not have highly patterned surfaces including stripes
- Not incorporate highly reflective materials.
- All principal routes to approach, enter and use of the building and their facilities are to be accessible. The shallowest possible gradients are to be used on all routes. Gradients on primary circulation routes are preferably to be less steep than 1:21 (eg slopes)
- Materials used within the external environment should be installed to provide a level and even surface: access routes are to have a firm, slip-resistant and reasonably smooth surfaces
- Resting places with suitable seating will be incorporated to limit travel distances to less than 50m
- Where seating is provided within the external landscape, there will be a mixture of accessible seating and based on guidance set out in BS 8300-1. Seating will feature some backrests and armrests and developed to areas to include space for wheelchair and scooter users
- The design of external stairs, indicative nosings and associated handrails must be designed to meet the objectives of AD M
- External stairs are to have a ‘corduroy’ hazard warning surface at the top and bottom landings of a series of flights to give advance warning of a change in level in accordance with AD M Diagram 4.

Entrances

Members of the public will enter the venue at Ground Floor level or from Level 01 south podium. The hospitality entrance is on the northern face of the venue. To facilitate access for disabled patrons and patrons that require step-free access there will be two accessible entrances, one located at GF Level adjacent to the hospitality entrance and one at the southwest corner on the Level 01 podium. Accessible entrances will be clearly signed.

All external doors used by member of the public will be power assisted; within banks of doors at principal entrances at least one door will be automated. Entrance doors to the should to conform to AD M and BS 8300-2 and provide 1000mm effective clear widths as per AD M Diagram 9.

All doors are to be clearly identifiable within the facade of the development through the use of signage and lighting.

Circulation (horizontal)

All circulation routes (both front and back of house) are to be accessible; plant areas are excluded. Where routes are not step-free, adjacent means of making level changes will be provided, such as with slopes, ramps or lifts. Horizontal circulation throughout the venue are wide and unimpeded.

Where corridors are formed that will meet the provisions of AD M and provide at least 1800mm in width; where this cannot be provided corridors will not be narrower that 1200mm and require suitably placed turning spaces of 1800mm by 1800mm

As the design develops the following considerations will be made:

- All doors are to be made clearly identifiable within their immediate environment, with their architraves contrasting visually with the walls in which they are mounted
- The opening force of manual doors, when measured at the leading edge of the door, should be not more than 30 N from 0° (the door in the closed position) to 30° open, and not more than 22.5 N from 30° to 60° of the opening cycle
- Ironmongery is to meet the provisions of AD M and BS 8300-2
- Where glazed doors are provided, they will feature manifestation to meet the provisions of AD K or guidance of BS 8300-2.

Circulation (vertical)

Stairs

Internal stairs will be designed to accord with AD M and BS 8300; these also generally accord with Green Guide sixth edition whereby a going at least 300mm deep is adopted with a riser height of between 150-170mm (although with the deeper going a riser height of up to 180mm is allowed). Utility stairs, for example for egress in stair cores, will accord with AD K. Gangway steps (as defined by AD K) will be designed to accord with AD K, and Green Guide.

In the detailed designing of stairs the following parameters will be adopted:

- All stair risers are to be closed
- Stepped routes and associated handrails shall be designed to meet the provisions of AD K and AD M; on wide stairs (greater than 1.8m width) channelled routes will provided on sections of the stair
- Visually contrasting nosings must be included on all stepped routes, to meet the recommendations of BS 8300-2.

The main feature stairs om the east and west atriums are comprised of four flights of 12 risers each and incorporate 3 intermediate landings. This exceeds the maximum number of 36 risers set out in AD K which requires that the stair is then ‘cranked’. However, the stairs have been designed to conform to BS 5395-1:2010 which allows for series of continuous straight flights and the following conditions are met: goings to be a minimum of 300mm deep; there are to be no more than 20 risers in a flight; intermediate landings are approximate 2.2m deep; the 3.7m stair is divided into 3 channels. The handrail and nosing detailing will meet AD M and AD K requirements to further enhance safety.

Lifts and escalators

All passenger lifts will be specified to meet BS 8300 and BS EN 81:70. Escalators are to be specified to meet the criteria of EN 115-1:2017 and BS 5656-2:2004.

Escalators are usually sited in an obvious circulation path making it easy for people to board them. Alternative circulation using adjacent lifts, stairs or ramps for journeys between adjacent floors will be clearly visible and/or signed as this provides choice for those people who cannot or choose not to use escalators.

Passenger lifts serving GA and hospitality areas will exceed the minimum dimensions for lifts set out in AD M and BS 8300.

A minimum space of 1500mm by 1500mm will be provided at the opening of the lift.

Facilities

The design of front of house facilities, such as the box office or concessionary spaces are to be developed. Back of house provision are to be provided on the same basis as front of house provision ensuring that there are accessible facilities including sanitary accommodation.

- Facilities for cyclists are to also have inclusive provision including areas large enough to accommodate tricycles and recumbent bicycles, sanitary accommodation, changing and drying areas.
- Box office facilities are to be designed to accommodate as wide a range of users as possible. A single height counter at 850mm will allow choice for all users and accommodate seated and standing users alike.
- Facilities such as reception desks or concession counters shall be designed to meet the needs of people standing, wheelchair users and people of short stature, including the needs of disabled staff
- Sound enhancement systems are to be included in reception desks/counters with appropriate signage to identify it to visitors
- A quiet room/sensory room with a view of the venue bowl, is proposed at Level 01 which will be developed in conjunction with the operator

Additional facilities include a multi-faith room located back-of-house at Level 02, the design of which is to be developed allowing for two separated areas if required to accommodate separate-sex prayer facilities.

Seating

The OVG Manchester hall has been designed for maximum flexibility to allow for all popular configurations to suit the needs of artists' creative shows and the touring event community. The auditorium capacities are detailed in section 1.1 of this report.

As part of the design development process, investigation have been made into providing more flexible seating arrangements for wheelchair users allowing for seating with a companion, a group of wheelchair users or with a group of seated users. Development of a ticketing strategy to accompany the flexible nature of the seating will require development by the operators.

With the introduction of demountable wheelchair viewing platforms to the rear of the lower tier, the option of increasing venue capacity is possible. If tickets are not sold for these viewing positions, they can be the platforms can be removed and standard seats fitted in these locations.

As recommended by AD M and BS 8300, for larger capacities for spectator events the application of Accessible Stadia Table 4 is appropriate. Conformance to this means that for capacities of 18,000-20,000 would be based on 100 plus 5 per 1000 above 10,000 (eg 140-150 wheelchair viewing positions plus companion seats); for 20,000 plus the calculation would be based on 150 plus 3 per 1000. Based on capacities between 20-24,000 spectators, the range of wheelchair viewing positions might be 150-165 plus companions.

In section 1.1 the maximum number of wheelchair users as set out above are referred to as 100%; all the demountable wheelchair viewing positions removed and the maximum number seats substituted in their place is referred to as 0%. The 0% capacity calculations which create the highest capacities have been used to ensure that safe egress and evacuation can be achieved in this seating format.

Additionally, each of the 24 suites will be able to accommodate at least one wheelchair user; each of the Loge Clubs should be able to accommodate at least two wheelchair users in each of the four clubs.

Wheelchair user viewing spaces and amenity seating is dispersed throughout the venue. These positions will be generally within 40m of unisex wheelchair accessible WCs; in some instances distances may be nominally more than 40m; the routes to those WCs will be unimpeded by obstructions such as doors.

Wheelchair user viewing positions will be 900mm wide by 1400mm deep plus space for a companion seat (overall dimension will

therefore be 1400mm x 1400mm) with a clear circulation space of 1200mm minimum behind these positions.

Generally, wheelchair viewing positions will have a C90 standing (minimum) viewing value with the exception of ice hockey, where the C values for all spectators are diminished (see commentary section 1.1. of this report)

As set out in Accessible Stadia Supplementary Guidance, the provision of amenity and easy access seating will be calculated on the same basis as wheelchair viewing positions. As the design progresses, the design team will identify easy access seats to accommodate ambulant disabled people or those with an assistance dog. Seats will be located in easily accessible areas, such as at the end of rows, or where steps are minimised to accommodate spectators with limited mobility.

Amenity and easy access seating will generally be located within 40m of accessible WC facilities such as a cubicle or enlarged cubicle within separate sex facilities or a wheelchair accessible WC.

Sanitary Accommodation

Unisex wheelchair accessible toilets will generally be provided in the same locations as male/female toilets. As per BS 8300-2:2018 the minimum internal finished dimension will be no less than 1700mm wide by 2200mm deep. If doors open inwards then the room size will be increased to include a space of 800mm by 1400mm clear of all fixtures (including drop down rail when in the down position) and the arc of the door swing.

Accessible WCs will provide a choice of left and right hand transfer and have been provided on the basis of 1:15 for wheelchair accessible seating generally within 40m travel distance. They will also be located in areas where there are no wheelchair viewing positions, recognising that not everyone who uses an accessible WC is a wheelchair user.

Every series of separate-sex will incorporate at least one cubicle for ambulant disabled people, 800mm to 1000mmwide, with 750mm clear space forward of the pan and an outward swinging door as per BS 8300-2 Figure 46. Where there are four or more cubicles there will be an enlarged cubicle.

Two ‘Changing Places’ (CP) facility to accord with the recommendations of BS 8300 will be provided. There will be one at Ground Floor Level and one at Level 01 at the southwest.

Back of house accommodation will include changing and WC facilities suitable for ambulant disabled and wheelchair users who are staff, performers, team or crew members; in all cases the level of accommodation will equivalent facilities, and where possible, integrated facilities. Accessible facilities will also be provided for members of the event and production control areas at Level 04.

There are two wheelchair accessible ‘parenting’ rooms; one located at Level 00; the other at Level 01.

Assistance Dog Spending Area

While people with sensory impairments primarily require an assistance dog, people with mobility impairments and wheelchair users may also have an assistance dog with them. It is essential to provide suitable areas for assistance dogs to be watered and relieve themselves. A dog spending area will be located in Ground Floor North Foyer to provide relieving stations for assistance dogs. This will be designed in accordance with the RNIB’s ‘Guidance on the provision of spending facilities for guide dogs and other assistance dogs’.

Communication Aids and Information Systems

- Communication aids such as sound reinforcement systems to assist hearing aid users, as well as the hard-of-hearing and deafened staff and visitors are to be provided as appropriate

- Counter loops must be incorporated into the design of ticket offices/reception areas/bar service counters and similar locations to be determined.

Signage and Wayfinding Strategies

An inclusive signage strategy is to be developed reflecting the applicant’s brand principles while ensuring that signage is legible for all. The key considerations will be:

- The strategy is to be taken into account at all design stages to ensure sight lines, lighting, visual contrast and legibility are appropriate

- The wayfinding and signage strategy must ensure that information is not only text based, to ensure it is accessible to people with cognitive impairments and for people whose first language may not be English.

A detailed commentary on the approach to external signage and wayfinding can be found in section 03 Wayfinding.

Lighting

Good lighting is crucial in ensuring that partially sighted people and people with sensory/neurological processing difficulties are able to use external environments and buildings conveniently and safely. Lighting design will accord with BS 8300, as these recommendations now generally align with the recommendations of the SLL Code for Lighting.

Internal finishes, fixtures and fittings

Visual contrast is defined in the Approved Document M as 30 points difference (minimum) between light reflectance values. BS 8300-1 and Part Annex B indicates that if lighting levels are greater than 200 lux, then 20 points difference (minimum) in light reflectance values establishes contrast.

- Particular attention should be paid to visual contrast, lighting and materials for features such as walls, ceilings and floors

- In areas where clear communication is required particular attention must be paid to the reverberant nature of materials

- Fixtures and fittings, including ironmongery and controls are to visually contrast with their surrounds, be usable by people with limited dexterity and reachable by those who are seated or standing

Emergency Egress

The responsibility to provide access means that suitable egress strategies must be developed for disabled people. Safe evacuation of people with physical disabilities or impairments relies on a combination of physical features and management procedures plus the development of a robust evacuation strategy developed by building management. A more detailed discussion in regard to our proposed approach to evacuation is covered in section 1.11 Ingress and Emergency Evacuation.

The majority of wheelchair users and companions are expected to be located at Level 01 and will have step-free access to external, limiting vertical movements. Similarly, wheelchair users and companions will be located on the venue floor at Level 00 will have step-free egress.

Wheelchair users and companions located at height in the venue will be located on in the hospitality areas at Level 02 and on Level 03. The evacuation strategy will incorporate the use of evacuation lifts throughout with designated refuge areas provided to accommodate the number of users on each level.

However, subject to layouts, a progressive horizontal evacuation might be feasible in order to reduce the number of refuge spaces required. Additionally, there will be a number of ambulant disabled people that may need assistance and will need to be considered as part of the evacuation strategy.

The number of disabled people who could be present within the hospitality areas, not just the bowl, will also be considered in the requirement for provision of refuge spaces.

1.9.2 General Access and Approach Outside the Site Boundary

Introduction and Scope of Study

This document summaries the crowd flow study inputs and assumptions considered for the proposed venue in Etihad Campus, during the following critical scenarios:

- Pre-event arrivals
- Intervals
- Post-event departures
- Multi-event scenario when Venue and stadium would egress at the same time.

The key objective of the crowd flow study is to ensure the Venue can be efficiently operated during major events and is fully integrated into the wider environment. The Venue has been designed with the view to delivering a safe, efficient and comfortable environment for all users. The scope of our study covers the following elements of the Venue and the site to ensure an efficient and comfortable experience for all spectators for normal operating conditions:

- Width and capacity of site connectivity (North walkway, South Podium and Joe Mercer Way)
- Width and capacity of entrances and exits.
- Width and capacity of stairs and escalators.
- Area and capacity of concourse.

Site Movements

Arena Only Egress Scenario

Based on discussions with OVG and review of transport mode splits at the existing Etihad campus, we assume spectators leave the proposed venue and use various transport modes in the following proportion:

- 40% of spectators move to the North to use the existing car park or walk further North away from the campus,
- 20% of the spectators use the Metro,
- 5% of spectators leave via the canal walk

And the remaining 35% of spectators go South via the Etihad Stadium Plaza to city, bus stops etc

Multi-Event Scenario

To test a worst-case multi-event scenario a peak egress is modelled (i.e. spectators leaving the site after an event at proposed venue and a match at Etihad Stadium). The key inputs considered, as agreed with OVG, are;

A stadium event with 61,000 spectators (allowing for an expanded north Stand) and ~25,000 spectator event at the proposed venue.

The proposed venue would discharge 20 minutes after the final match whistle at the Etihad Stadium.

It is assumed that simultaneously egress from both the stadium and the proposed venue would be a rare occurrence, the operational management plan developed by the client should consider this rare scenario and have a strategy to manage flows

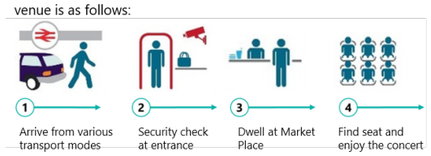
Spectators clear the bowl of the proposed venue in 8 minutes.

Images on the right represent the egress flow of spectators to the different transport modes in the following proportion after a multi-event scenario. This is based on discussion with BuroHappold transport team and OVG as well as review of CCTV footages of Etihad Stadium match days.

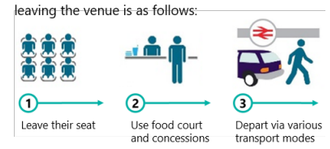
From the proposed venue: 20% of spectators go north to use the existing car park or walk further north away from the campus, 20% of spectators use Metro, 5% of spectators leave via canal walk, and the remaining 55% of spectators go South via Etihad Stadium plaza to the city, bus stop etc.

From the stadium: 25% of spectators go north to use the existing car park or walk further north away from the campus, 10% of spectators use Metro, 1% of spectators leave via canal walk, and remaining 64% of spectators go South to city, coach park, bus stop etc. via Etihad stadium plaza

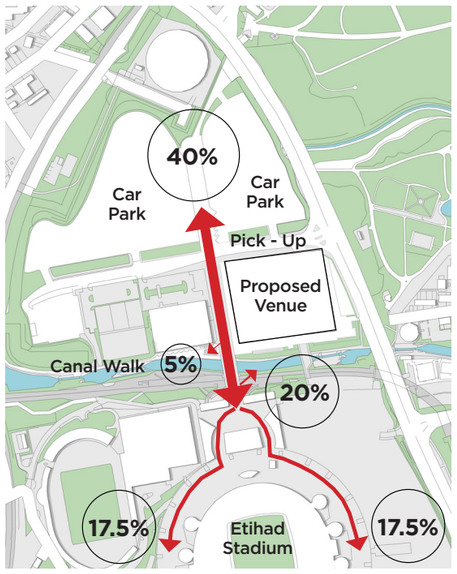
The **arrival process** considered for spectators arriving into the venue is as follows:



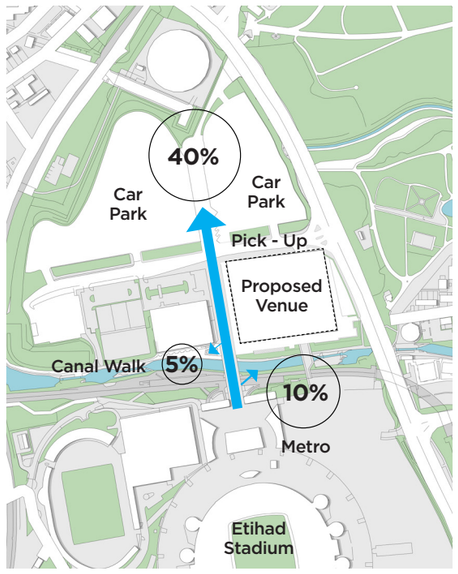
The **departure process** considered for spectators leaving the venue is as follows:



Venue - General Spectators



Stadium - General Spectators



1.9.3 Accessing the Site

Existing vehicle access to the site, adjacent car parks and tennis centre is from Sportcity Way via Alan Turing Way. A second junction is present at the northern end of the car park, providing an exit route onto Alan Turing Way. This junction is not in routine use and is closed off with removable bollards.

Sportcity Way currently becomes very congested after a football match. All vehicles exit the site via the Sportcity Way/Alan Turing Way junction whilst large crowds of visitors cross Sport City Way to access the car parks or exit the campus on foot to the north. Currently, a manual traffic and crowd management operation is employed on match days, using a large group to marshal, to alternate vehicle and pedestrian flow through Sportcity Way to keep the two groups separate.

The arena proposals include measures to improve this situation and lessen the need for manual intervention. These are described in more detail in the Transport Assessment, but summarised below. (Access to the site via public transport is described in section 2.5 of this document):

- Re-opening the northern junction onto Alan Turing Way.

The existing junction is altered to provide a left-in-left-out access, which will be opened on event days only. This will provide an access route into and out of the site for cars, to allow parking in the northern car parks without conflicting with crowd flows on Joe Mercer Way. Providing this second point of access allows continued access for vehicles during the temporary partial closures of Sportcity Way before and after events. It is anticipated that this junction will require a degree of manual traffic management on event days to balance the large but short term flows of traffic departing the site with the other traffic flow on Alan Turing Way. This may involve the temporary closure of the inside lane of Alan Turing Way on approach from the south, to provide a dedicated lane for traffic turning out of the site from the campus.

1. New left turn access to be designated for use of service vehicles only.

2. Existing route used to provide vehicle access to and from the Western car park.

3. Realigned cycle path to suit new junction arrangement.

4. 8m wide pedestrian route separated from vehicle traffic by kerbs.

5. Venue service vehicles stacked within carpark as needed.

6. Car park arrangements remain unchanged.

7. Existing access used for car park egress. Widened to provide two lanes directly to ATW junction.

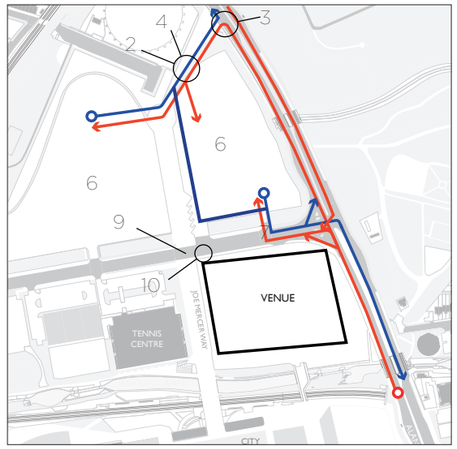
8. Venue Security screening area.

9. Route closed to vehicular traffic after game or event.

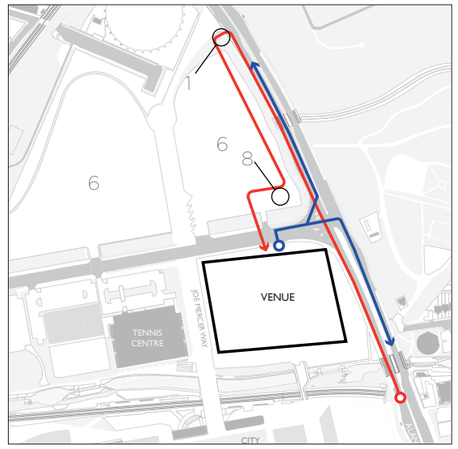
10. Footway widened for Venue visitors.

Entry

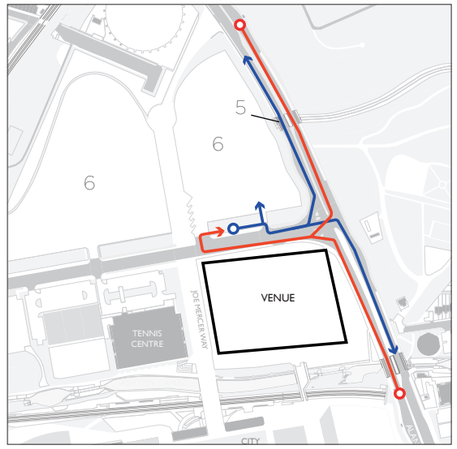
Depart



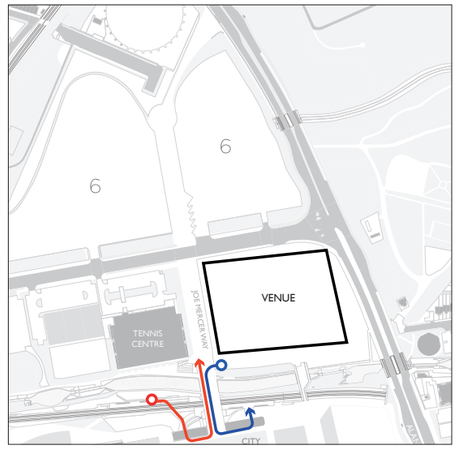
Car Access



Service Vehicles



VIP



Tram Station Access

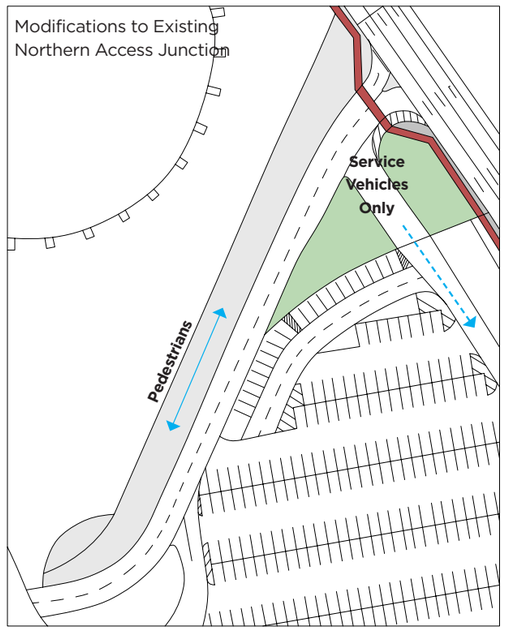
1.9.4 Existing Road and Pavement Modifications

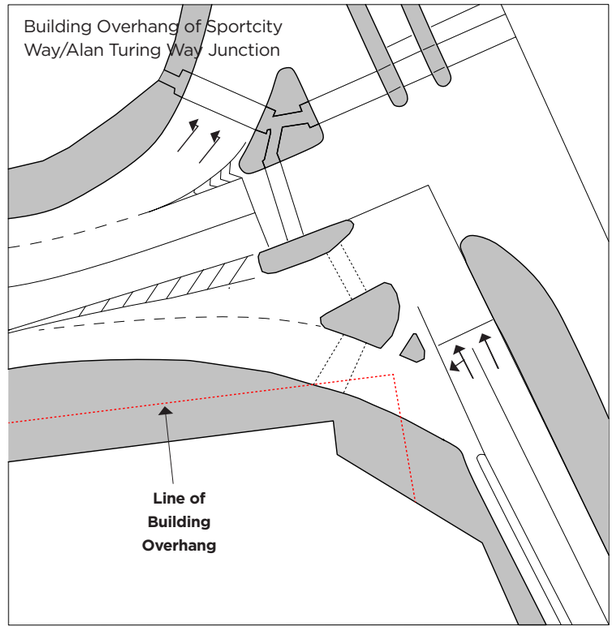
This access point also allows a separate, dedicated event vehicle access route to be provided. Large events at the arena will attract a significant number of trucks delivering equipment for the set-up of the show, including stage equipment lighting rigs etc.. It is proposed for these vehicles to be temporally marshaled in the car parks prior to entry to the arena service yard. This also provides an opportunity for security checks to be undertaken before vehicles are allowed to enter the building. The area will be provided by temporarily setting aside an area of car parking, delineated by barriers and cones. This replicates the arrangement currently in use on match days to park home team coaches in the same car park.

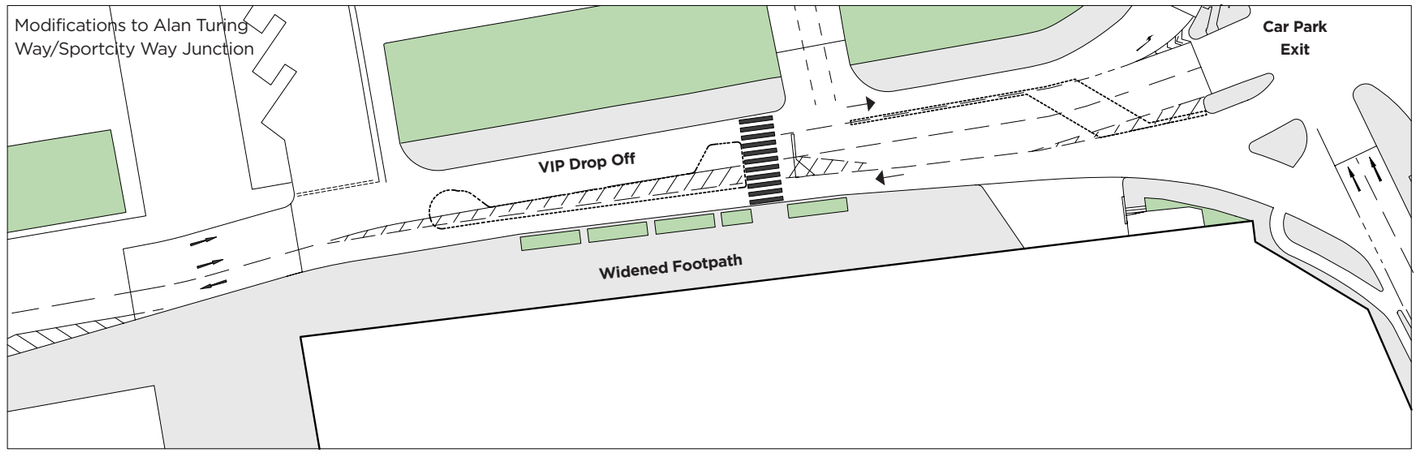
- Alterations to Sportcity Way

Sportcity Way currently provides five lanes of traffic and a narrow footway to the north of the arena site. It is proposed to widen the footway to provide sufficient safe width for crowds to congregate and enter the building before an event and depart afterwards. To the east, this achieved by widening the footway into the site, allowing the existing Sportcity Way/Alan Turing Way junction to remain unchanged. To the west this is achieved by narrowing the overall carriageway width and loss of a traffic lane.

The taxi and car pick-up/drop off facility will be done from Rowsley Street – which is where the existing taxi rank is for the stadium.







1.9.5 Parking

The OVG Manchester Venue will become a key visitor attraction within a wider campus of world-class sport and entertainment facilities.

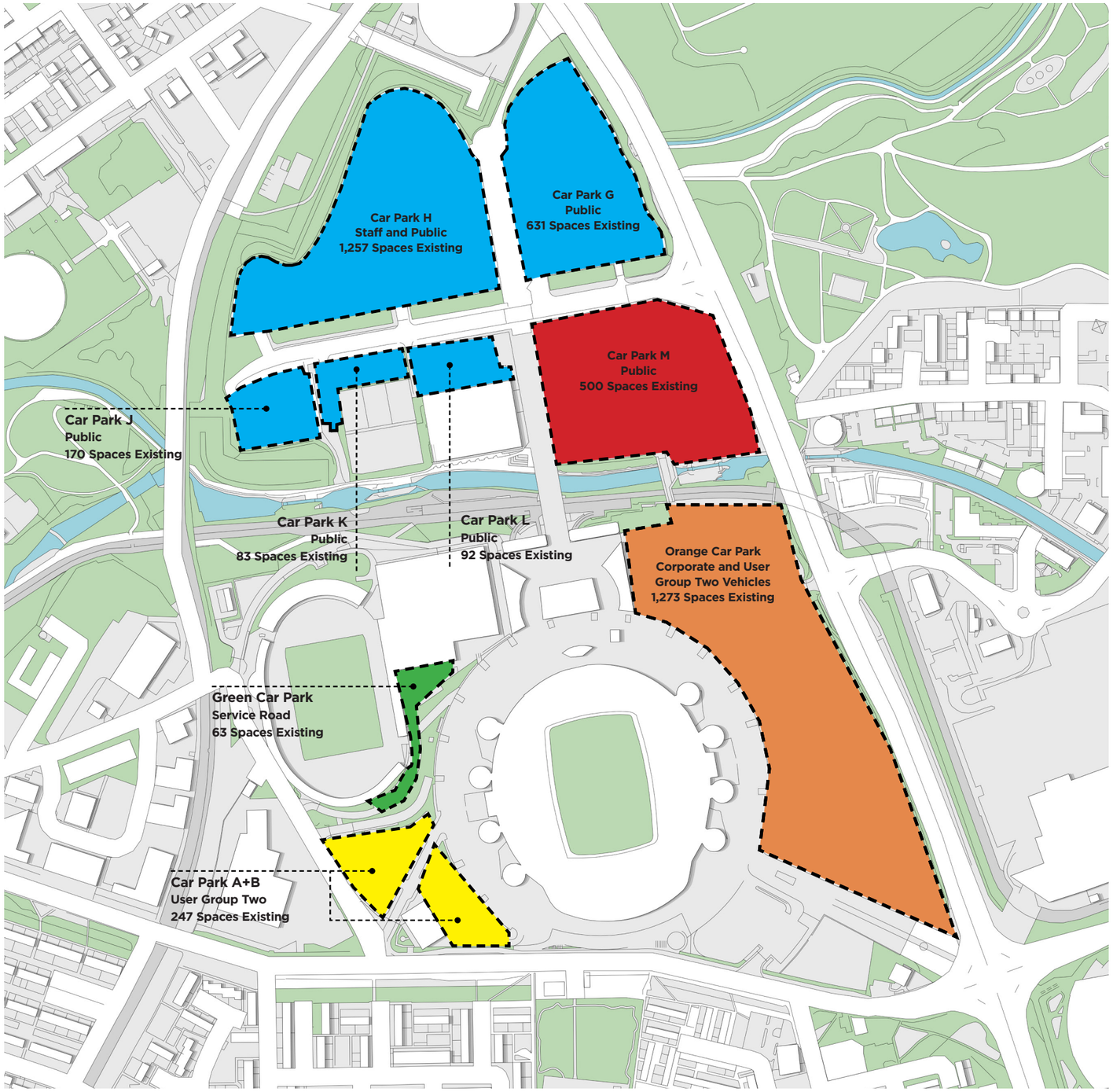
With Manchester's vision for a more sustainable city there will be a high encouragement to use a more sustainable mode of transport rather than by car. However, the parking provision and strategy has been considered to ensure the campus can operate as a collective destination rather than a number of individual components, ensuring efficiency during various campus events and usage combinations.

Existing parking is provided across the campus in a number of surface level car parks. The Venue site is currently an informal parking area. Approximately 3,800 spaces will remain available within the campus once the spaces provided on the Venue site are deducted. The majority of spaces are provided to the north of the Venue site, in car parks G and H, which provide just over 2,000 car parking bays. These car parks are accessed from Alan Turing Way. Designated accessible parking bays will be located in Etihad car park H/Blue car park which is adjacent to Joe Mercer Way. A further 1,800 spaces are provided in car parks surrounding the Etihad Stadium to the south of the Venue.

Parking provision for the Venue will be made within these two car parks. The number of parking spaces available to Venue visitors will vary depending on the pattern of events taking place across the campus at the time. The two scenarios that result in the maximum and minimum allocation of parking spaces for the Venue are:

- When a Venue event is the only event taking place on the campus: All campus parking spaces will be made available to the Venue.
- When a Venue event runs in parallel with a football match in the Etihad Stadium: 500 spaces will be made available to the Venue.

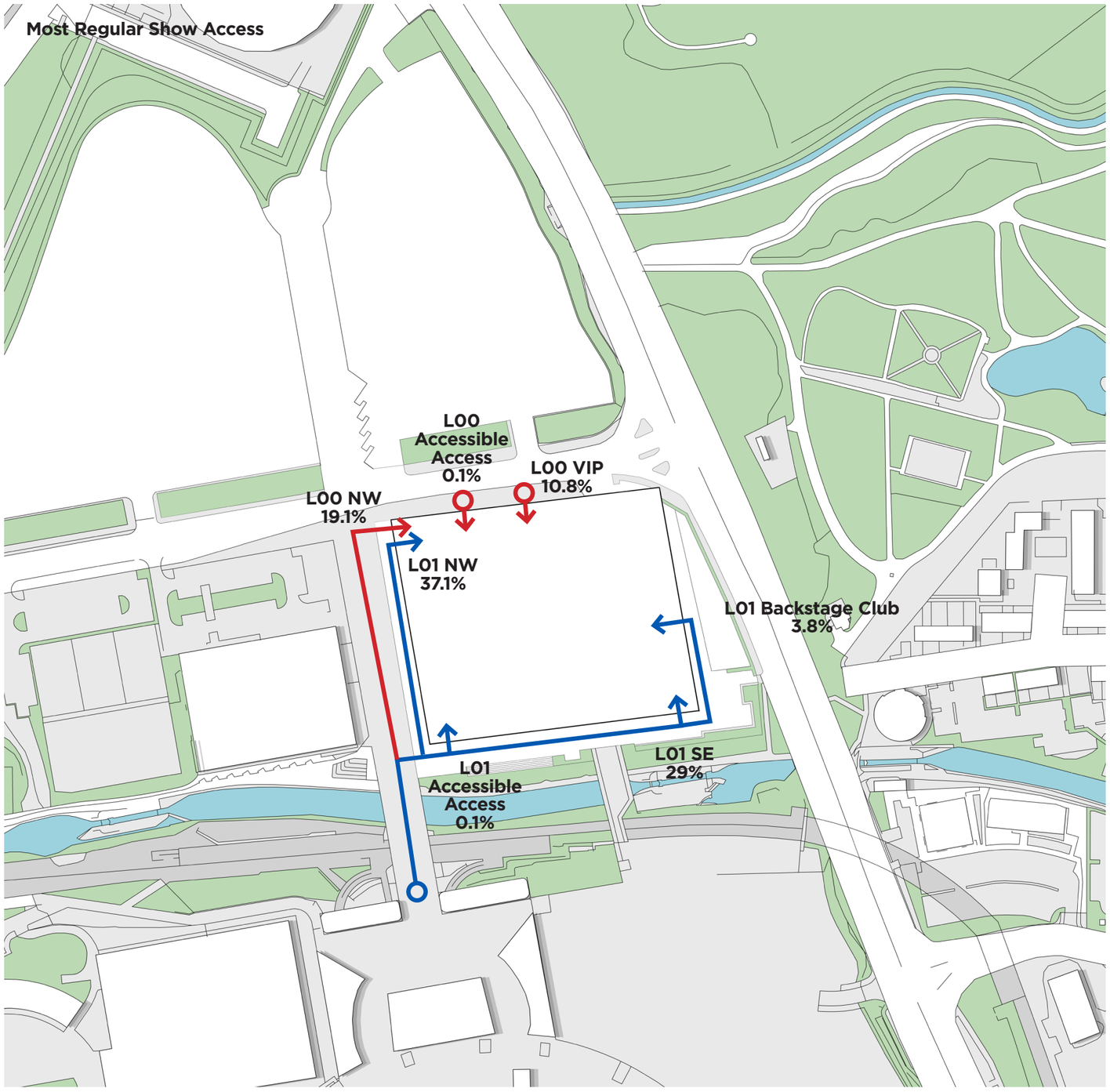
Car parking will be made available on a pre-booked basis only. This is to manage demand in advance and ensure the allocated parking numbers are achieved for each campus event combination. The details and provider of the booking system are to be agreed with the football club.



1.9.6 Existing Road and Pavement Modifications

Accessing the Venue

The design of the building exploits the existing site levels to give level access to the main entrances at levels 00 and 01. The site has a considerable change in level from north to south (4m) which is reflected in the pedestrian boulevard which connects the north car park and the stadium (Joe Mercer Way). The current proposal is to maintain Joe Mercer Way as the main access route to the stadium and to tie in the lower concourse level (Level 01 +61.620) with the high point of Joe Mercer Way and the event floor level and loading bay entrance with the low point of Sportscity Way (+55.00).



1.9.7 Sanitary Accommodation

All front of house sanitary fixtures have been caclulated to meet the requirements of BS 6465 Part 1 Table 8 - 'Assembly Buildings where WC use is not concentrated at intervals,' as the most approriate guidance. In order to meet the needs of different audience profiles, the scheme has been developed with fixture provision on the basis of 70% male : 70% female, to give an overprovison of 140% against the guidance for minimum fixtures.

Sanitary blocks have been located to suit the capacity of seating bowl on each level to minimise travel distances to facilities, and blocks are sized to be as efficient of space and fixture layouts as possible.

At all levels, fixture numbers are 'rounded up' to ensure that fixtures are correctly balanced in each block, and in particular, that no male block has less than 2 WC pans.

Hand dryers are proposed to be provided at 1 dryer per 2 hand basins units.

Unisex wheelchair accessible toilets will generally be provided in the same locations as male/female toilets. As per BS 8300-2:2018 the minimum internal finished dimension will be no less than 1700mm wide by 2200mm deep. If doors open inwards then the room size will be increased to include a space of 800mm by 1400mm clear of all fixtures (including drop down rail when in the down position) and the arc of the door swing.

Accessible WCs will provide a choice of left and right hand transfer and have been provided on the basis of 1:15 for wheelchair accessible seating generally within 40m travel distance. They will also be located in areas where there are no wheelchair viewing positions, recognising that not everyone who uses an accessible WC is a wheelchair user.

Every series of separate-sex WCs will incorporate at least one cubicle for ambulant disabled people, 800mm to 1000mmwide, with 750mm clear space forward of the pan and an outward swinging door as per BS 8300-2 Figure 46. Where there are four or more cubicles there will be a cubicle for ambulant disabled people plus an enlarged cubicle 1200mm wide with an outward swinging door, based on the provisions of AD M section 5.

Changing Places facilities provide sufficient space and equipment for people who are not able to use the toilet independently, and will accord with the recommendations of BS 8300-1, with location to be determined as the design progresses. There are three ‘parent’ rooms at Level 03, the details of which are also to be developed as the design progresses.

Back of house accommodation will include changing and WC facilities suitable for ambulant disabled and wheelchair users who are staff, performers, team or crew members; in all cases the level of accommodation will equivalent facilities, and where possible, integrated facilities. Accessible facilities will also be provided for members of the event and production control areas at Level 04.

There are three ‘parent’ rooms at Level 03, the details of which are to be developed as the design progresses.

As part of on-going design development the following considerations will be made:

- As part of the future design development, if self-contained cubicles are used to provide gender neutral facilities, those toilet compartments should accord with the spatial requirements of BS 6465-2. In addition, at least one self-contained unisex toilet for ambulant disabled people should be co-located per group of gender neutral toilets as per BS 8300-2 Figure 39 illustrate; it is 1200mm wide, with 750mm forward of the pan and includes a basin. These can be handed with an open side to the left or right

- Baby changing facilities will not be provided in wheelchair accessible toilets. If baby changing facilities are provided, there will be wheelchair accessible baby changing facilities.

- Fixtures and fittings are to contrast visually from their backgrounds.

While people with sensory impairments primarily require an assistance dog, people with mobility impairments and wheelchair users may also have an assistance dog with them. It is essential to provide suitable areas for assistance dogs to be watered and relieve themselves. A dog spending area will be located in the North East of L01 to provide relieving stations for assistance dogs. This will be designed in accordance with the RNIB’s ‘Guidance on the provision of spending facilities for guide dogs and other assistance dogs’.

- Communication aids such as sound reinforcement systems to assist hearing aid users, as well as the hard-of-hearing and deafened staff and visitors are to be provided as appropriate

- Counter loops must be incorporated into the design of ticket offices/reception areas/bar service counters and similar locations to be determined.

1.9.8 Wheelchair User Access to Auditorium

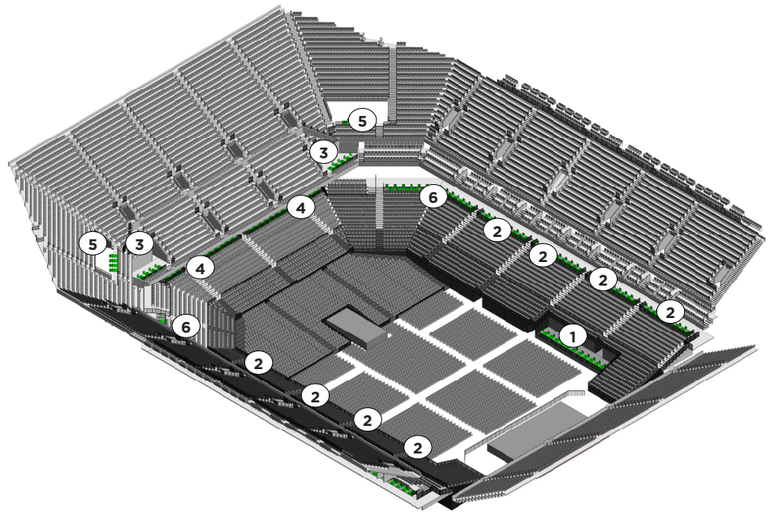
The approach to calculating the appropriate number of wheelchair viewing positions for the extensive variety of configurations set out in section 3.8 of this submission is based on two of those configurations – all seated with a capacity of 20,500 and all standing with a capacity of 23,500. As recommended by AD M and BS 8300, for larger capacities for spectator events the application of accessible stadia is appropriate.

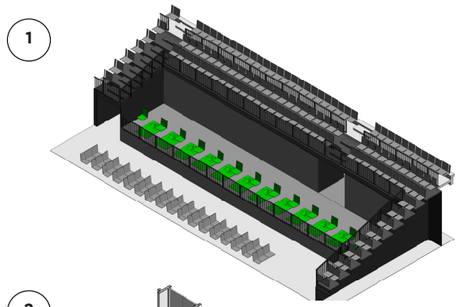
For a capacity of 20,500 the recommended number of wheelchair viewing spaces (plus companion seats) would be 151 positions: for 23,500 the number would be 154 positions. The 'permanent' complement of wheelchair viewing positions will be 118 positions at Level 01 and 8 at level 03. These would be proportionate for a capacity up to approximately 15,000. Higher capacities in the venue use the event floor: the balance will be on a mode-by-mode basis to make up or exceed the minimum recommended allocation of wheelchair viewing positions.

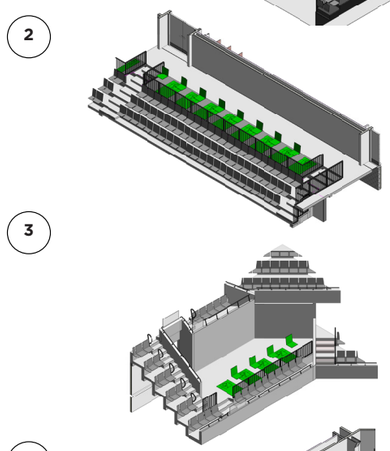
Additionally, each of the 26 suites will be able to accommodate at least one wheelchair user; each of the Loge Clubs should be able to accommodate at least two wheelchair users in each of the four clubs.

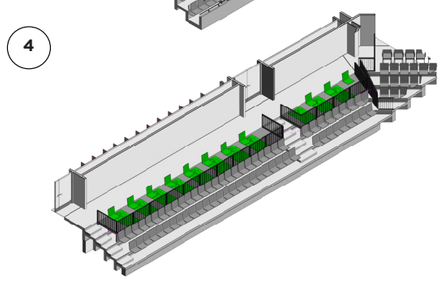
Wheelchair user viewing spaces and amenity seating is dispersed throughout the stadium. Permanent wheelchair viewing positions will provide a C60 (minimum) viewing. These positions will be generally within 40m of unisex wheelchair accessible WCs; in some instances distances may be nominally more than 40m; the routes to those WCs will be unimpeded by obstructions such as doors.

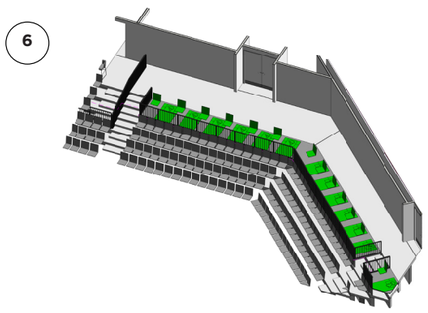
Wheelchair user viewing positions will be 900mm wide by 1400mm deep plus space for a companion seat (overall dimension will therefore be 1400mm x 1400mm) with a clear circulation space of 1200mm minimum behind these positions.

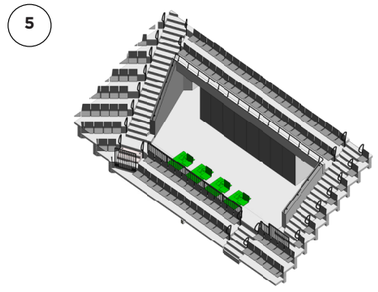




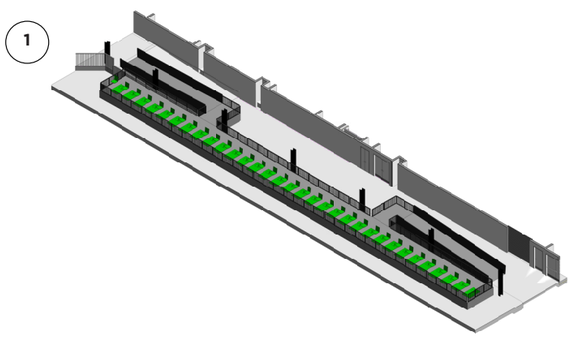








Level 00 Demountable Wheelchair platform in Concert Standing Mode



Accessible Seating

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BOH AND SERVICING

1.10.1 EVENT SERVICING 333
1.10.2 CATERING AND SECURITY CONTROL 334
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1.10.9 ARTIST AREAS - PLAN 342

1.10

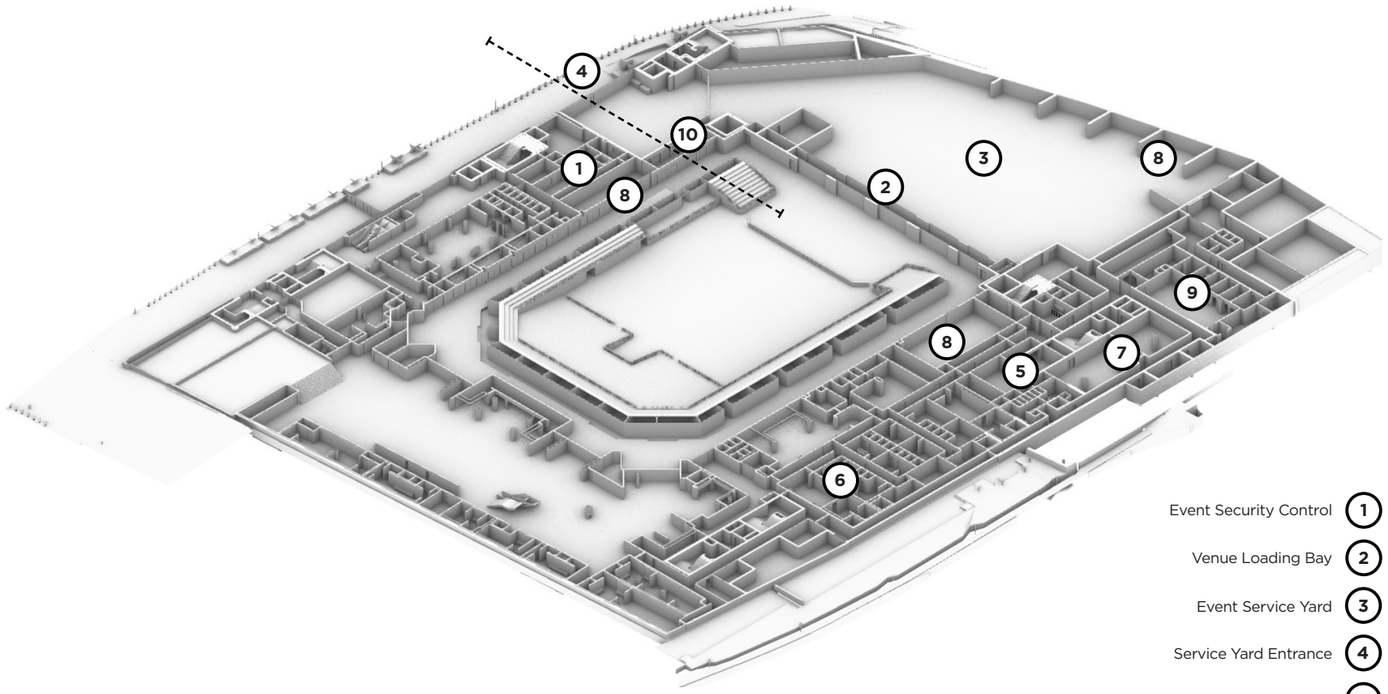

LO
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HARRY ST

1.10.1 Event Servicing

Key to venue operations is the back of house service yard. Accessed from Sports City Way on the north side of the venue, tour support vehicles enter the building at grade through the large entrance and can reverse straight up to the back stage area roller shutter enclosures for efficient event set up.

A clear height of 4.5m is maintained throughout the vehicle service yard.

Open bulk storage areas for demountable tier sections and equipment are located to the east and south sides of the service yard, furthest from the entrance.



Event Security Control 1

Venue Loading Bay 2

Event Service Yard 3

Service Yard Entrance 4

Production Office 5

Artist's Facilities 6

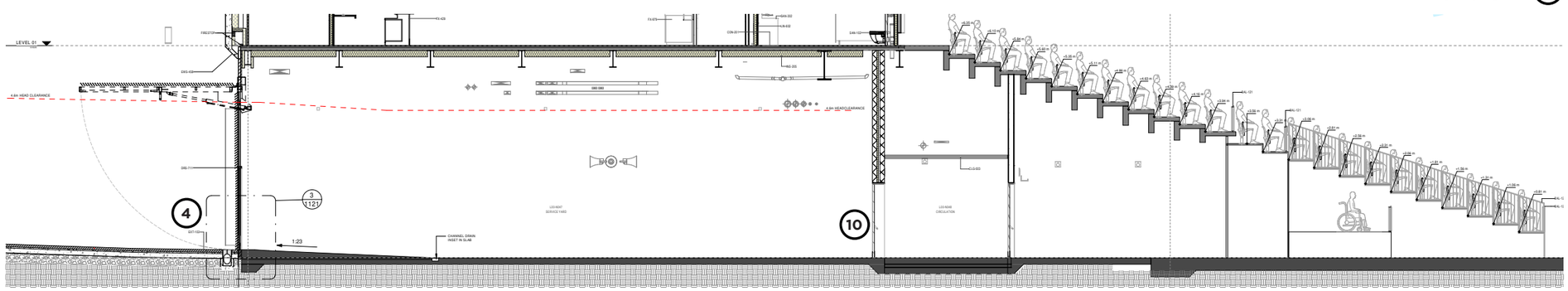
Crew Facilities 7

Venue Storage 8

Main Kitchen 9

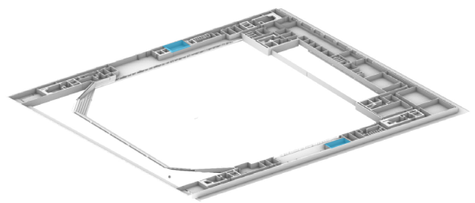
Bowl Emergency Egress 10

Section Through Service Yard and Bowl Emergency Egress

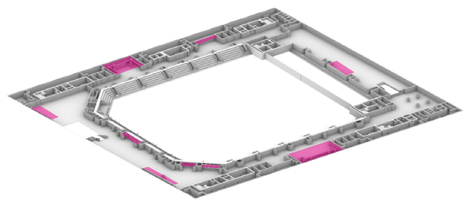


1.10.2 Catering and Security Control

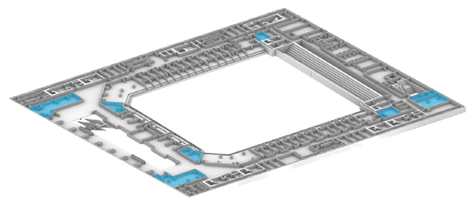
Level 04



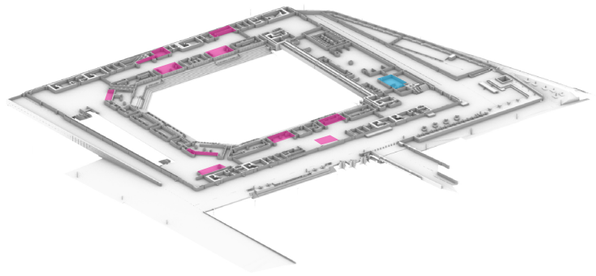
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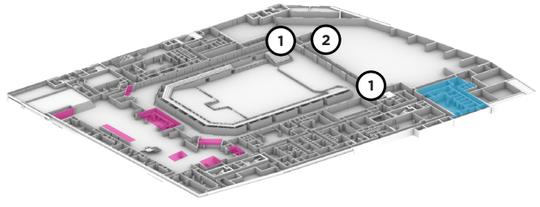
Level 02



Level 01



Level 00



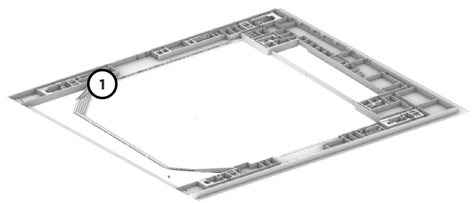
1 Service Lift

2 Waste Management

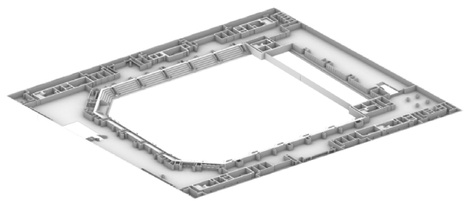
Kitchens

Concessions

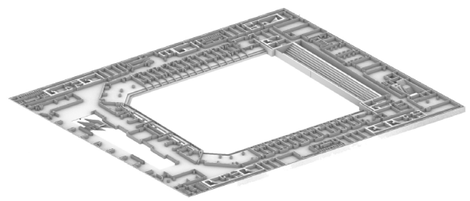
Level 04



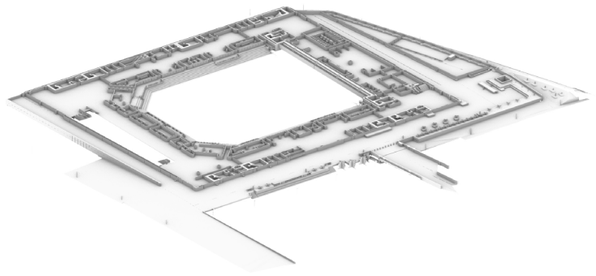
Level 03



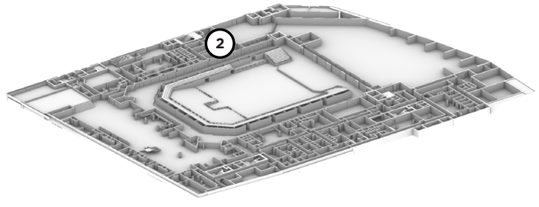
Level 02



Level 01



Level 00

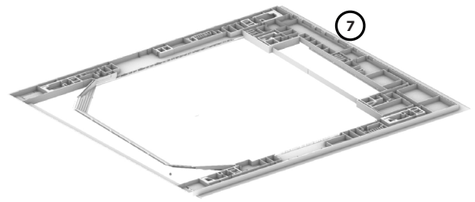


1 Event Control Room

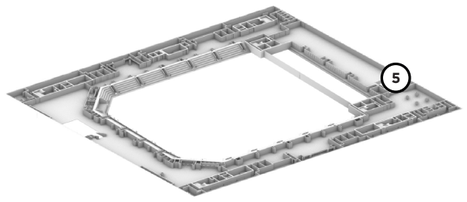
2 Security Office

1.10.3 Event Staff Facilities

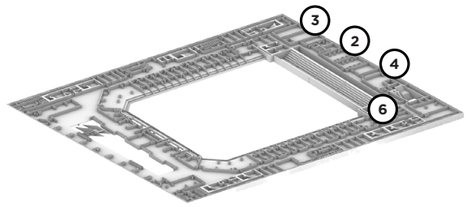
Level 04



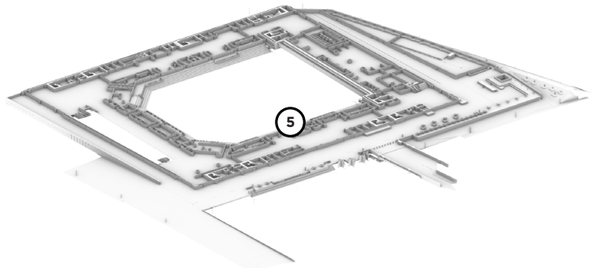
Level 03



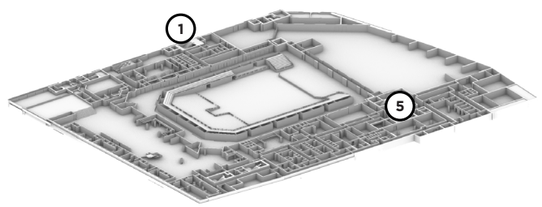
Level 02



Level 01

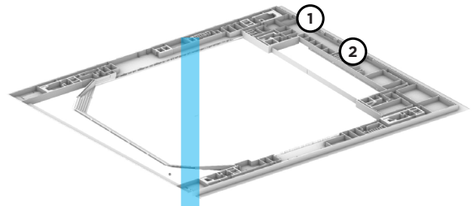


Level 00

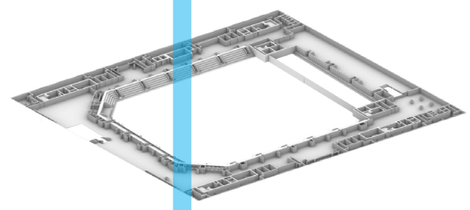


1. Staff Entrance
2. Uniform Distribution / Changing Facilities
3. Briefing Room
4. Staff Canteen / Training Room
5. Medical Room
6. Prayer Room
7. Management Office

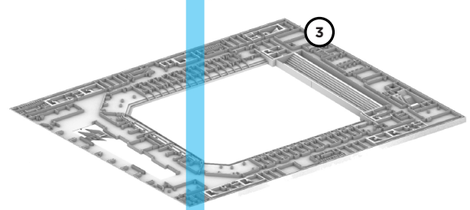
Level 04



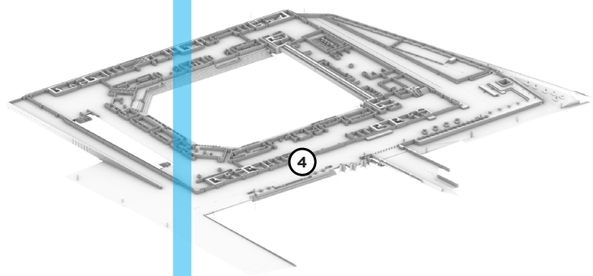
Level 03



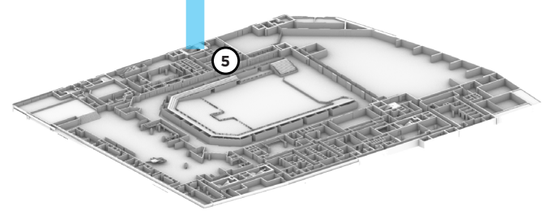
Level 02



Level 01



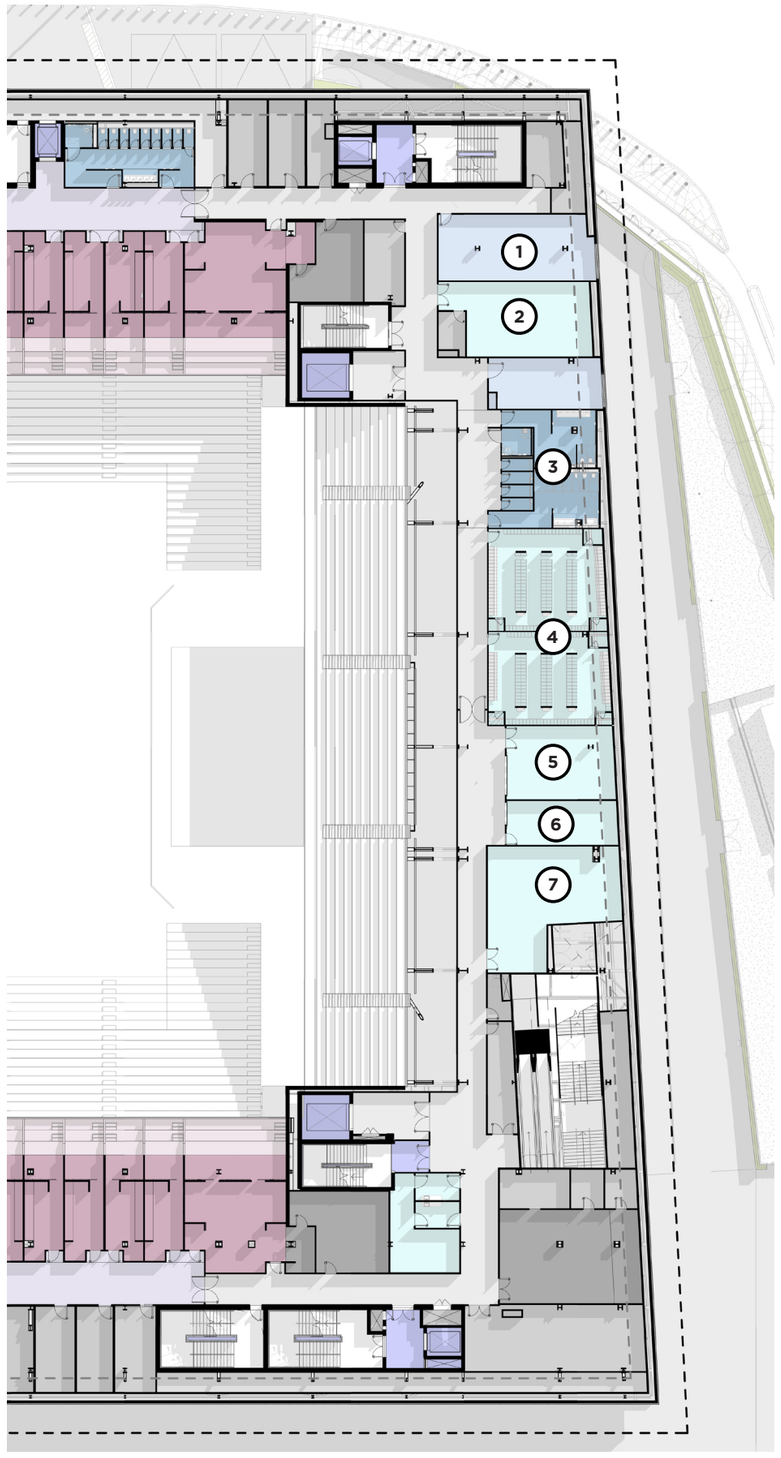
Level 00



1. Venue Management Offices
2. Operating Caterers Office
3. Hot Desk Event Office
4. Box Office
5. Reception

A full suite of event staff support facilities are provided at Level 02 on the east side of the venue. Event staff enter the building on the north side through the dedicated staff entrance which is managed by the adjacent Security Suite, and travel up to Level 02 via the staff stair and lift.

Arrayed along the main corridor are a series of spaces including dedicated locker rooms, showers and toilet facilities, the briefing room for approximately 50 people; uniform and equipment distribution storage spaces, and a staff canteen with beverage making facilities for approximately 80 people. Additional hot-desk office space and a dedicated sponsor's office are also provided



1. Hot Desk Office
2. Briefing Room
3. Staff WC's / Showers
4. Staff Locker Rooms
5. Uniform Store
6. Equipment Store
7. Staff Canteen

1.10.4 Venue Management Office

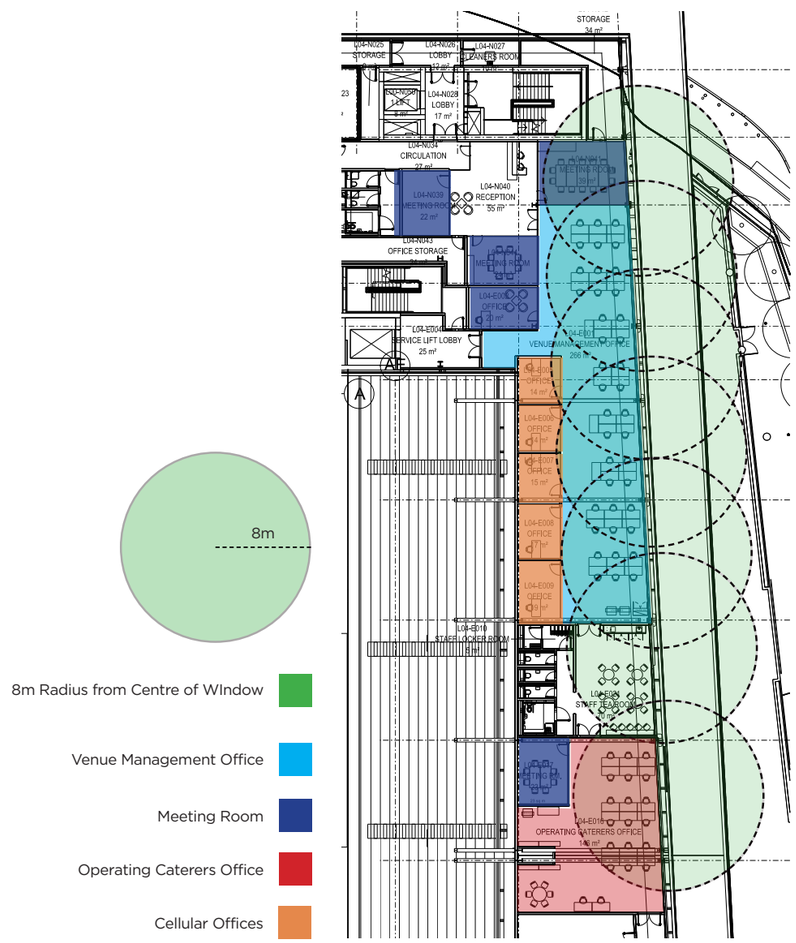
The Venue Management offices within OVG Manchester have been designed to ensure that all desks benefit from natural light from windows in the East facade. A combination of open plan office space and cellular offices re provided in line with the projected management requirements, along with a main reception area and an array of meeting rooms . Meeting rooms and cellular offices are glass fronted to allow for transfer of natural light between spaces . The venue management office suite is divided into two sections : the main management area to the North East, and the operating caterer's management offices in the centre East. These two spaces are linked by a central and shared bay of staff break room with adjacent sanitary and shower facilities.

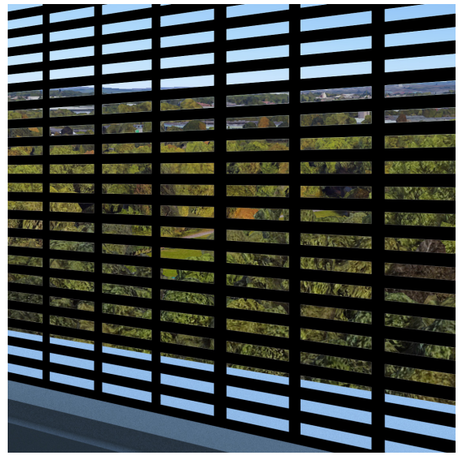
There are seven strategically placed windows along the facade, which ensure that all desks are within 8 metres distance of windows. The outer facade design Includes a contemporary use of black perforated metal panels which overlay the windows, maintaining a uniformity of the facade appearance from outside. The sizing and spacing of the perforations has multiple functions, however for the office areas the 41.7% open area performs the following functions :

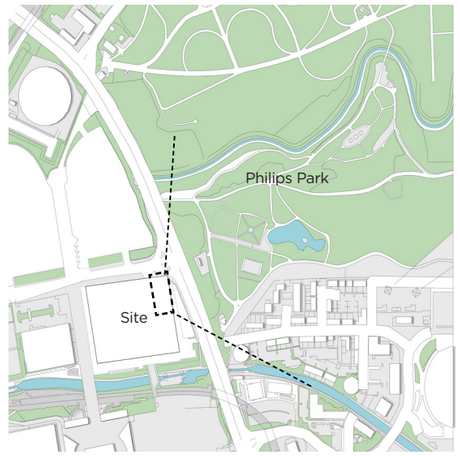
Allows adequate light into the interior spaces where needed

Allows for views out from the office areas towards Phillips Park

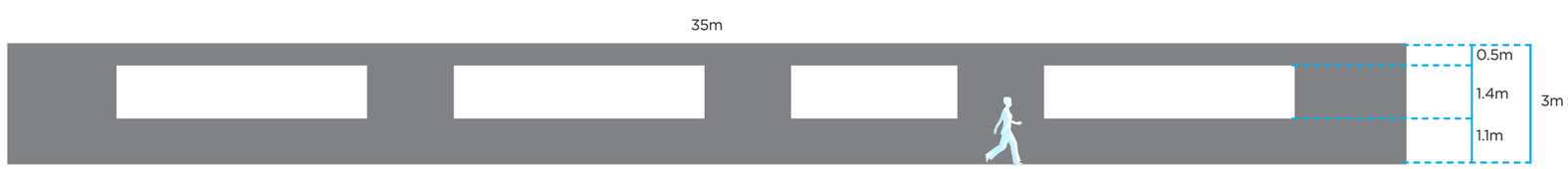
Dim out blinds are provided to the external windows to manage morning glare from direct sunlight and mitigate light spill from the office areas at night.







View to Philips Park



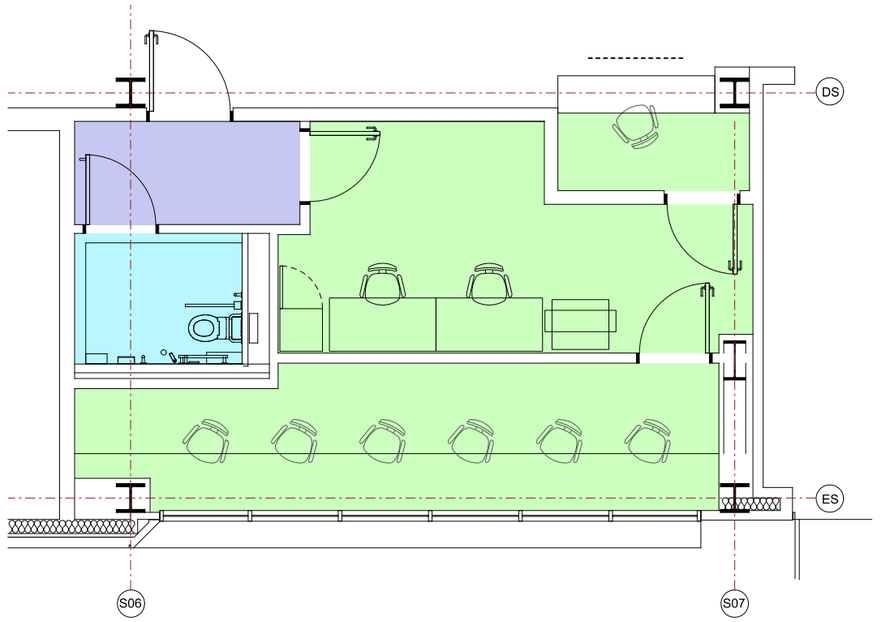
Event Management Office External Wall Elevation

1.10.5 Box Office

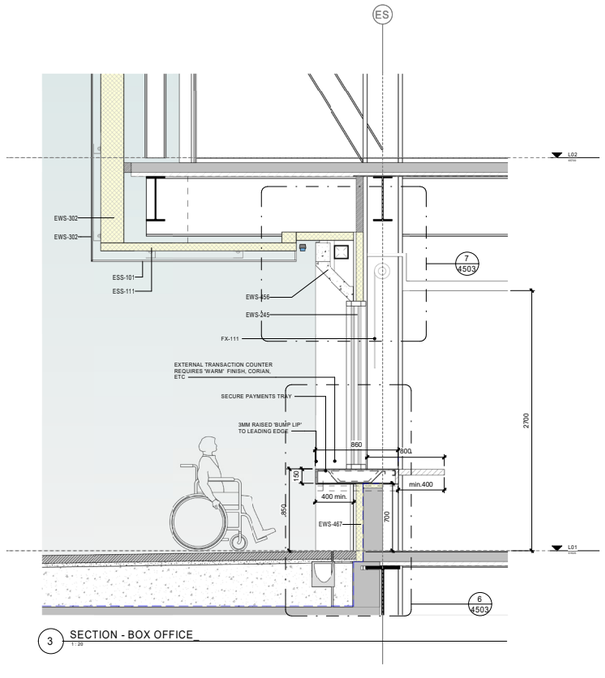
The Box Office is situated on the south side of the Venue, accessed directly from the external Canalside podium approaches. It is designed to be fully accessible to visitors, with a consistent counter height.

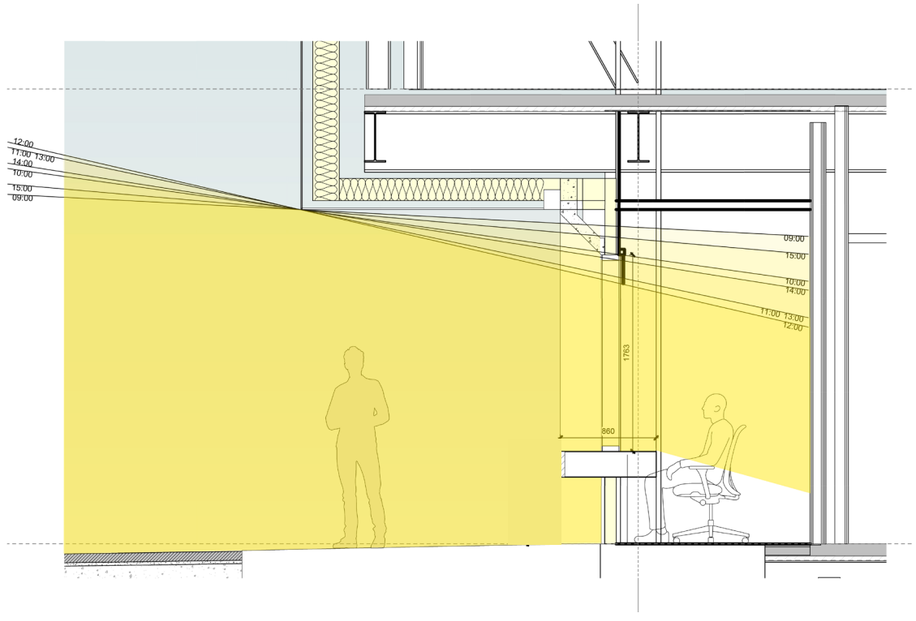
The ticket office is located on the south facade and the building design utilises both the form and internal design to aid in glare control. Within the stepped, stacked box form, the lowest box acts as a canopy which partially shades the Box Office occupants from solar glare throughout the summer months, ensuring a more comfortable working environment.

Internally, dlm out blinds are provided to each exterior ticket window, both to prevent view into the facility when the Box Office is closed, and to mitigate low afternoon sunlight glare for the staff working within.

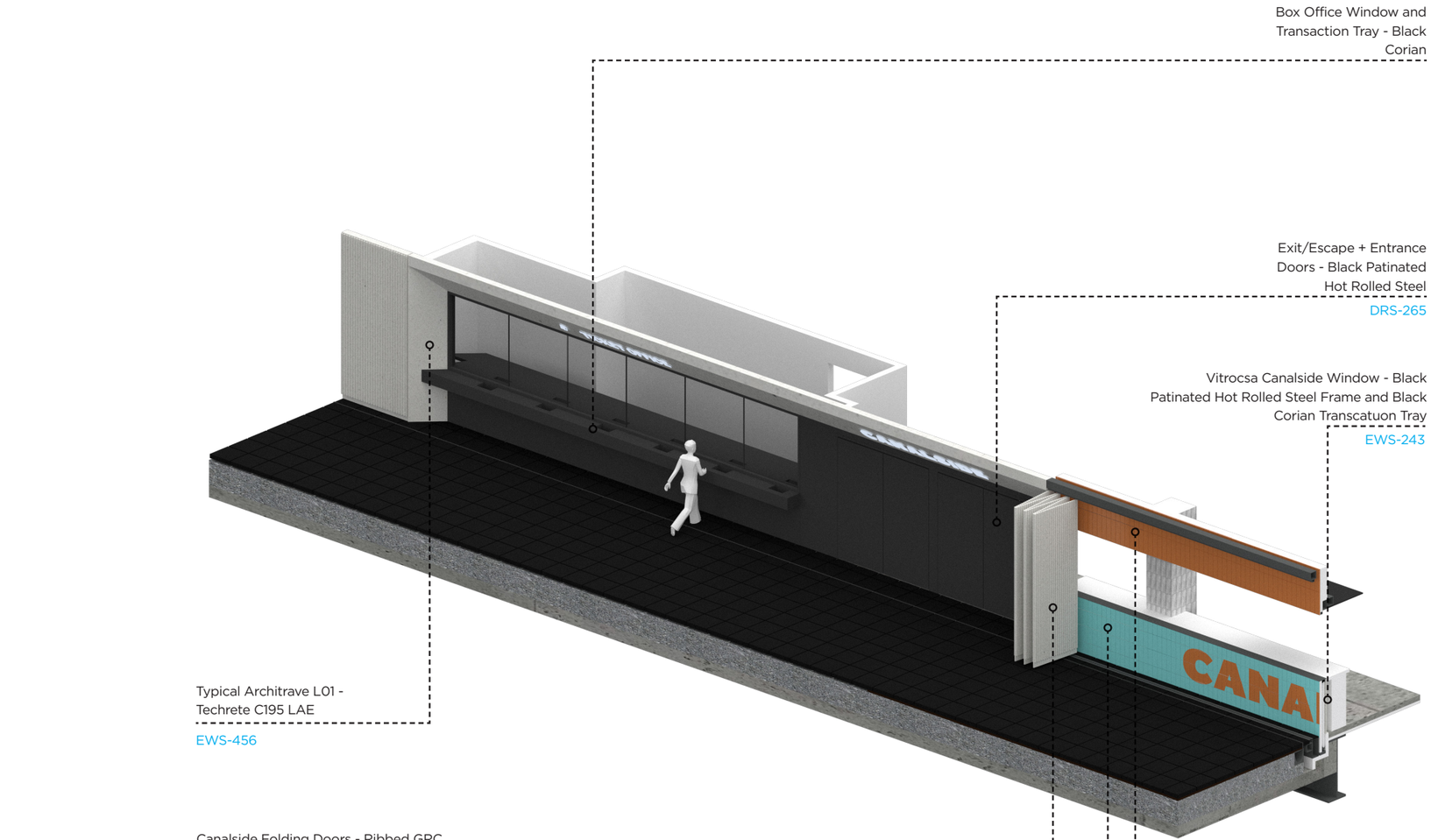


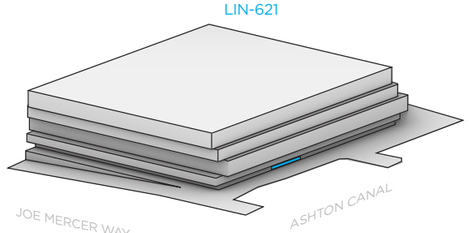
Box Office Plan





1.10.6 Artists' Areas





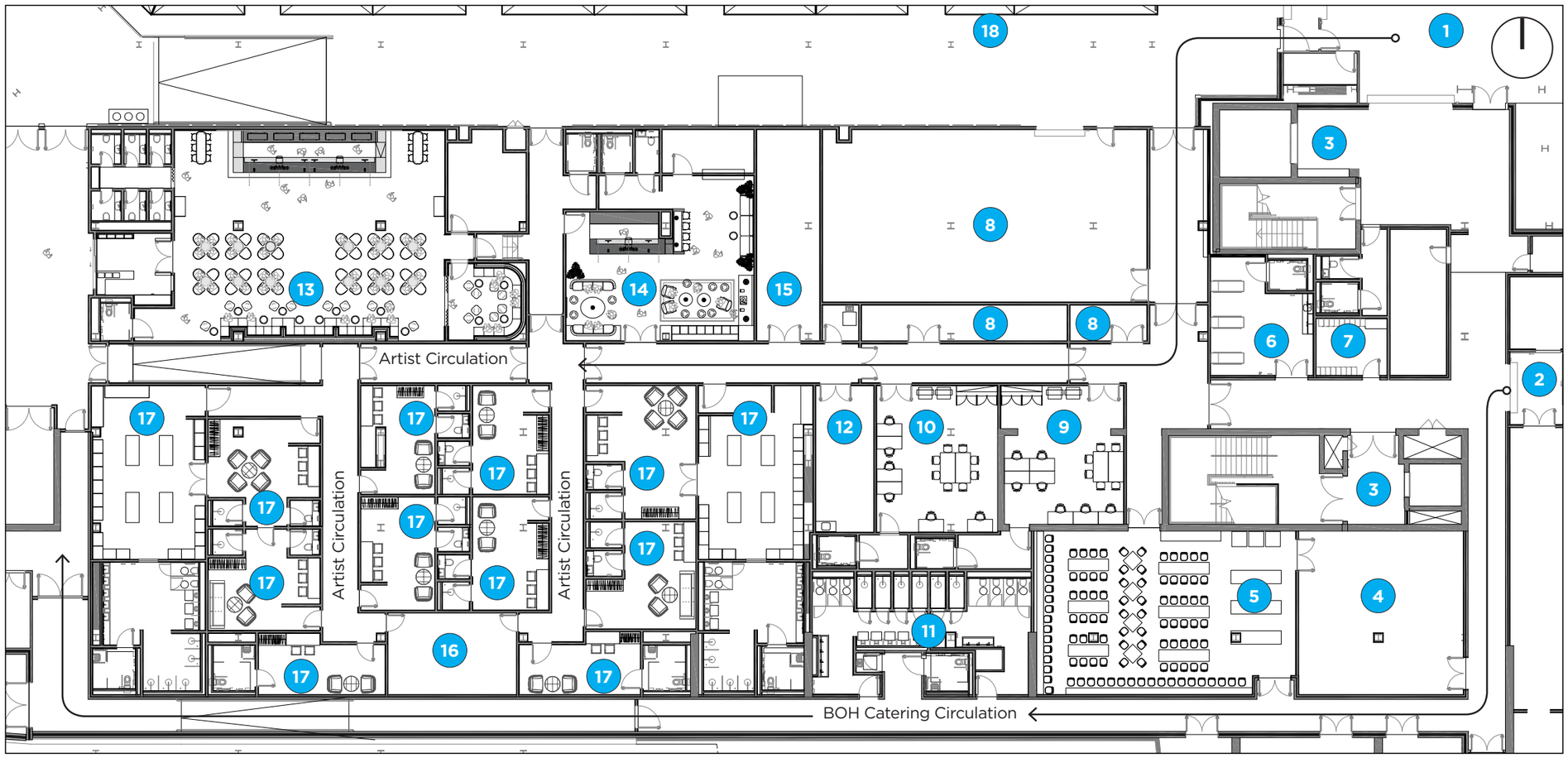
1.10.7 Artist Areas ££££

THE ARTIST'S SANCTUARY

The artists areas form part of the ground floor south event production area. The artists will arrive into the yard from Sports City Way and will be escorted through into the south. We have a total of 12 dressing rooms which include two team dressing rooms. Each dressing room will contain a television, WC and shower facilities as well as a vanity table with an illuminated mirror. There is space for furniture and clothes racks. Artist's will have access to a games room and the Green Room, all situated within close proximity.

Conceptually we wanted to create a safe and welcoming sanctuary for the artists. We have a simple material palette which includes a plasterboard soffit, painted walls and carpet tiles. The walls are two toned and finished in relaxing grey tones. The washrooms are clean with white vertical stack bond tiles and black accents for a contemporary finish. The vanity unit and illuminated mirror is the feature within the space, which we have lined with rounded timber battens behind to create some warmth within the space.

1.10.8 Artist Areas - Overview



Plan

KEY:

1. Artist VIP Drop-Off
2. Main Comms. Kitchen
3. Circulation (all levels)
4. Crew Kitchen
5. Crew Catering
6. First Aid Room
7. Crew Lockers
8. Storage
9. Production office
10. Promoter Office
11. Crew Facilities
12. Laundry
13. The Record Room
14. The Green Room
15. Wardrobe
16. The Games Room
17. Dressing Rooms
18. The Hall

1.10.9 Artist Areas - Plan



Plan

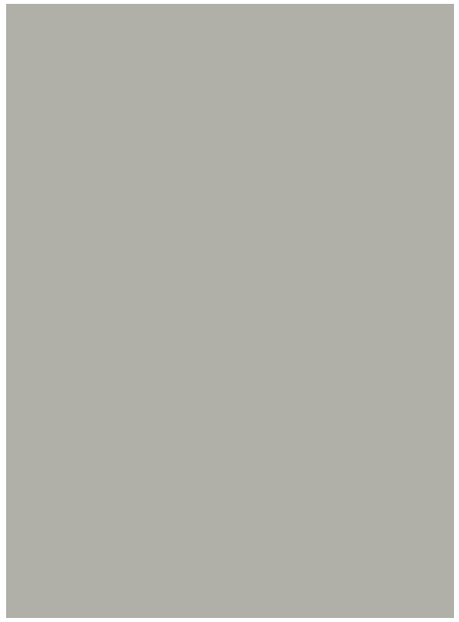
Red dashed line indicates the security line at each door within the artist area

KEY:

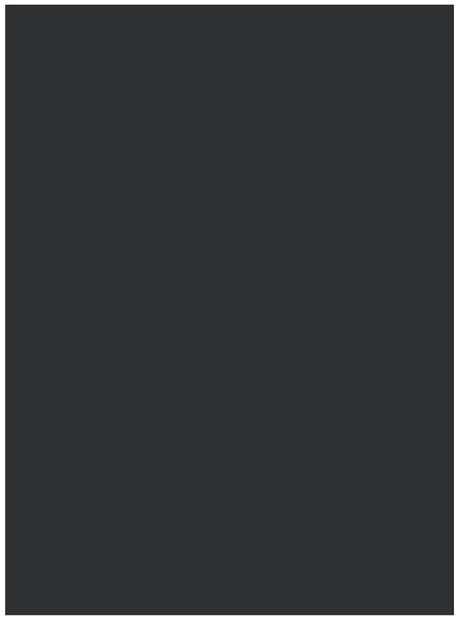
1. Dressing Room 01 (team)
2. Dressing Room 02
3. Dressing Room 03
4. Dressing Room 04
5. Dressing Room 05
6. Dressing Room 06
7. Dressing Room 07
8. Dressing Room 08
9. Dressing Room 09
10. Dressing Room 10
11. Dressing Room 11
12. Dressing Room 12 (team)
13. The Record Room
14. The Green Room
15. Wardrobe
16. Laundry
17. Production Office
18. Games Room

1.10.10 Artist Areas - Material Palette

PLASTERBOARD SOFFIT - CLG-101



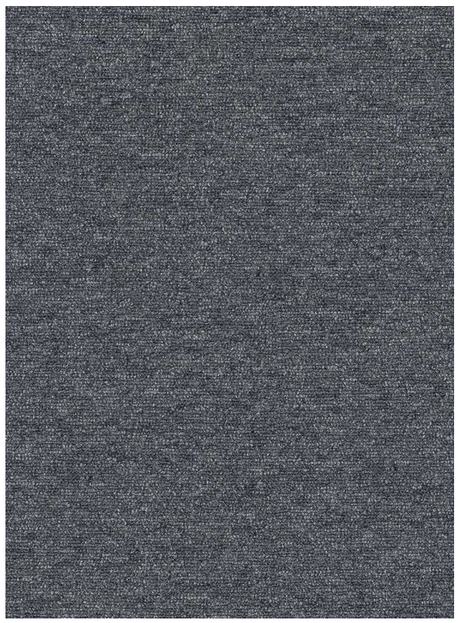
PAINT FINISH - PT-103



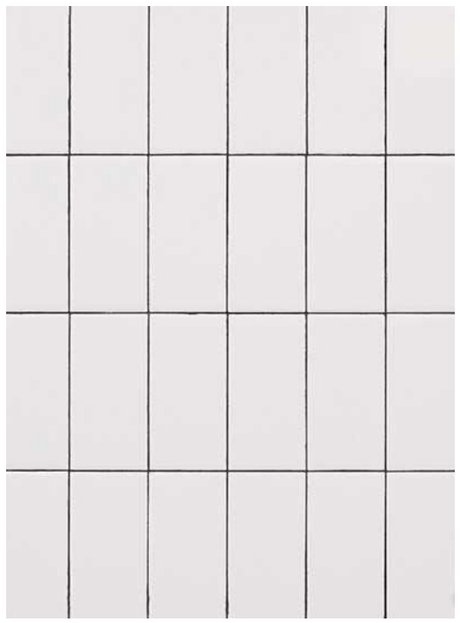
PAINT FINISH - PT-103



ROUNDED TIMBER - LIN-125



CARPET TILE - FL-611



WALL TILE - LIN-601



FLOOR TILE - FL-705



SATIN BRASS ACCENTS - VARIOUS CODES

1.10.11 Artist Areas - Star Dressing Room



1.10.12 Artist Areas - Star Dressing Room



INGRESS AND EMERGENCY EVACUATION

1.11.1 INGRESS 348

1.11.2 EGRESS 350

1.11.3 EVACUATION 352

1.11

1.11.1 Ingress

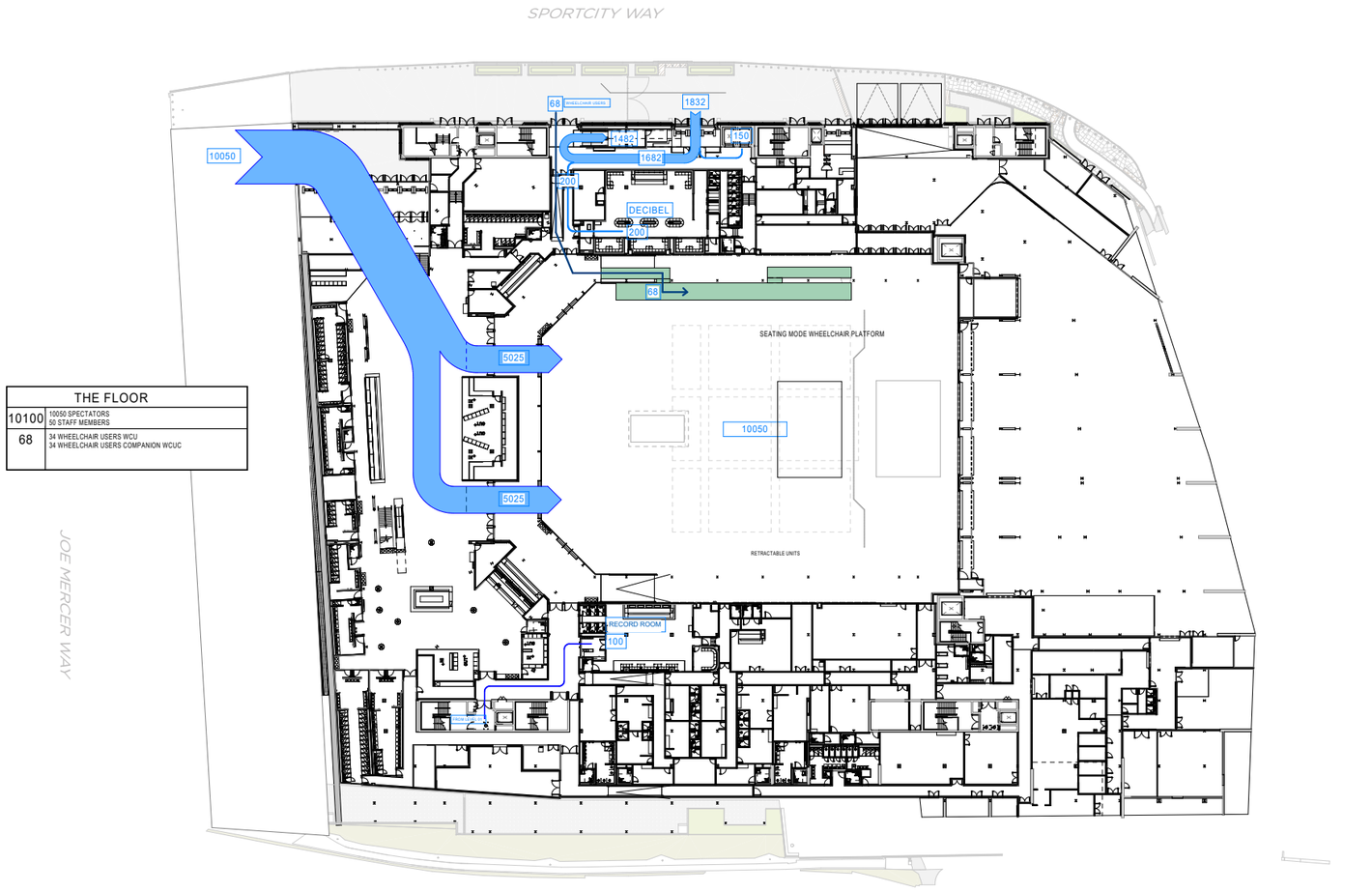
General Ingress

All circulation routes (both front and back of house) are designed to be accessible, with the exception of plant areas. Where routes are not step-free, alternative means of making level changes are provided, such as slopes, ramps or lifts. Where corridors are formed, they meet the provisions of AD M and provide at least 1800mm of width. Where this cannot be achieved corridors will be no narrower than 1200mm and appropriate space of 1800mm by 1800mm is provided for turning spaces.

The stage 4A design has been developed to incorporate the following considerations:
• All doors are clearly identifiable within their immediate environment.
•Powered doors are located at entrances to the venue and the event floor for accessible spectators.
•The opening force of manual doors, when measured at the leading edge of the door, should be not more than 30 N from 0° (the door in the closed position) to 30° open, and not more than 22.5 N from 30° to 60° of the opening cycle.
• Ironmongery provided is to meet the provisions of AD M and BS 8300-2
• Glazed doors will meet the provisions of AD K or guidance of BS 8300-2

Stairs

Internal stairs are designed to accord with the provisions of AD M and BS 8300. These also generally accord with the Green Guide Sixth Edition whereby a going at least 300mm deep is adopted with a riser height of between 150-170mm (although with the deeper going a riser height of up to 180mm is allowed). Utility stairs, for example for egress in stair cores, are designed to accord with AD K. Gangway steps (as defined by AD K) are designed in line with AD K, and Green Guide.
In the detailed designing of stairs, the following parameters will be adopted:
• All stair risers are to be closed
• Stepped routes and associated handrails will be designed to meet the provisions of AD K and AD M; on wide stairs (greater than 1.8m width) channelled routes are provided on sections of the stair.
• Visually contrasting nosing's must be included on all stepped routes, to meet the recommendations of BS 8300-2.



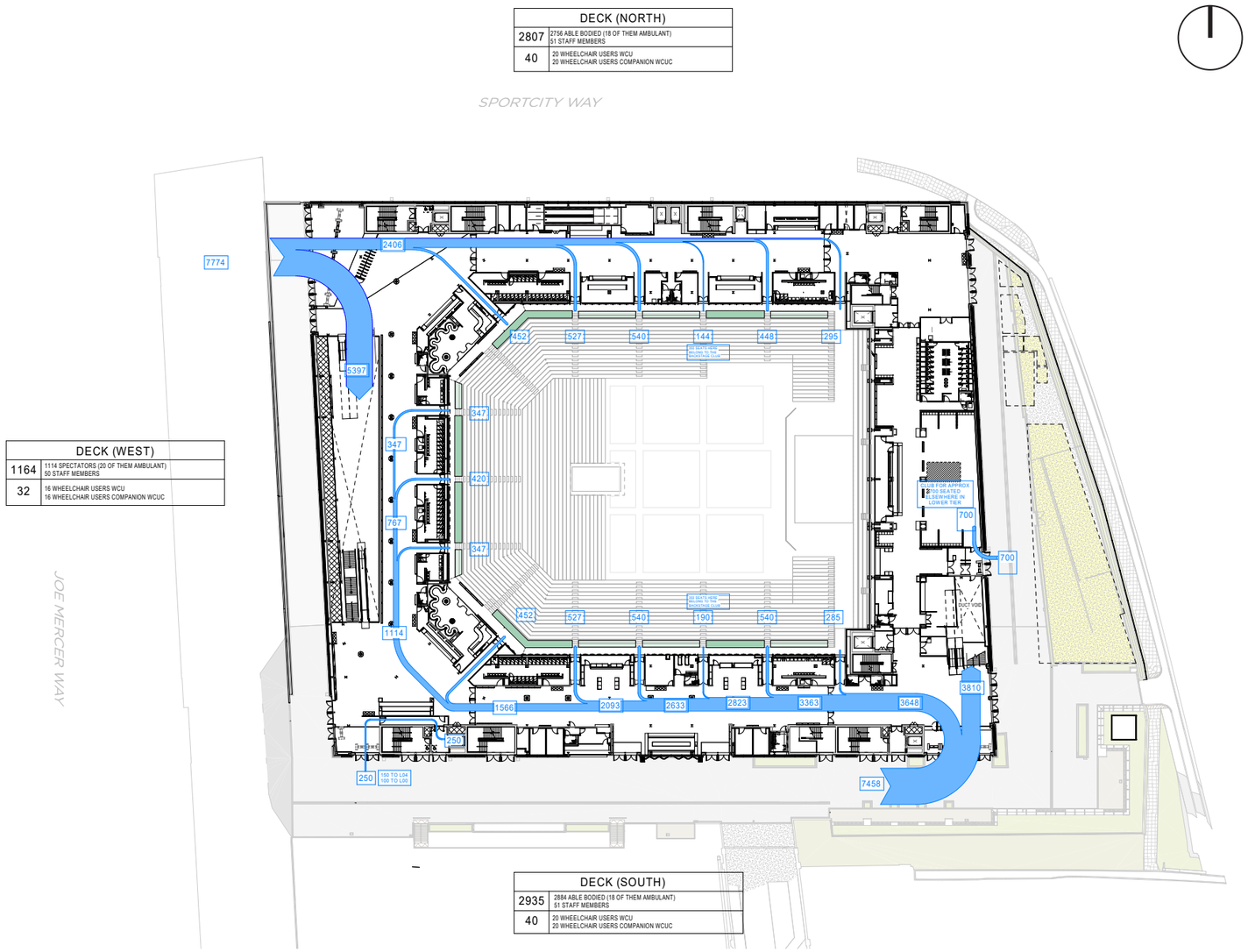
Ground Floor Plan - Ingress

Lifts and Escalators

All passenger lifts will be specified to meet BS 8300 and BS EN 81:70. Escalators are to be specified to meet the criteria of EN 115-1:2017 and BS 5656-2:2004.

Escalators are generally sited in obvious circulation routes making it easy for people to board them. Alternative circulation, using adjacent lifts, stairs or ramps for journeys between adjacent floors, is clearly visible and/or signed; as this provides choice for those people who cannot or choose not to use the escalators.

Passenger lifts serving User Group One and User Group Two areas are sized to exceed the minimum dimensions for lifts set out in AD M and BS 8300. A minimum space of 1500mm by 1500mm will be provided at the opening of the lift.



Level 01 Plan - Ingress

1.11.2 Egress

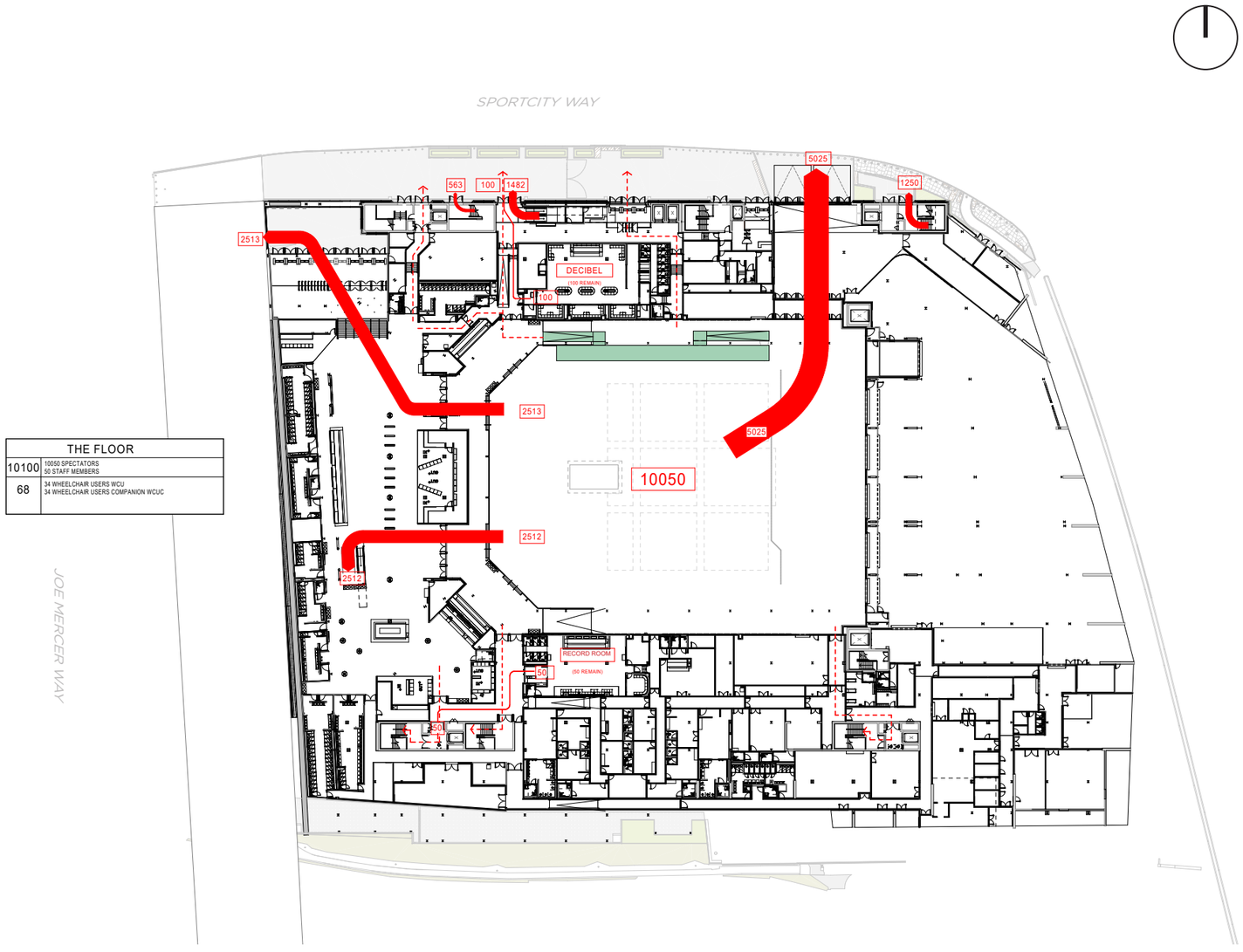
General Egress

Further work has been undertaken during Stage 4A to maximise the capacity of the venue whilst still providing safe egress and emergency egress from the arena. This capacity is based on meeting the 8 minutes period to evacuate the arena and is driven by the fire strategy and the crowd flow analysis from the external areas.

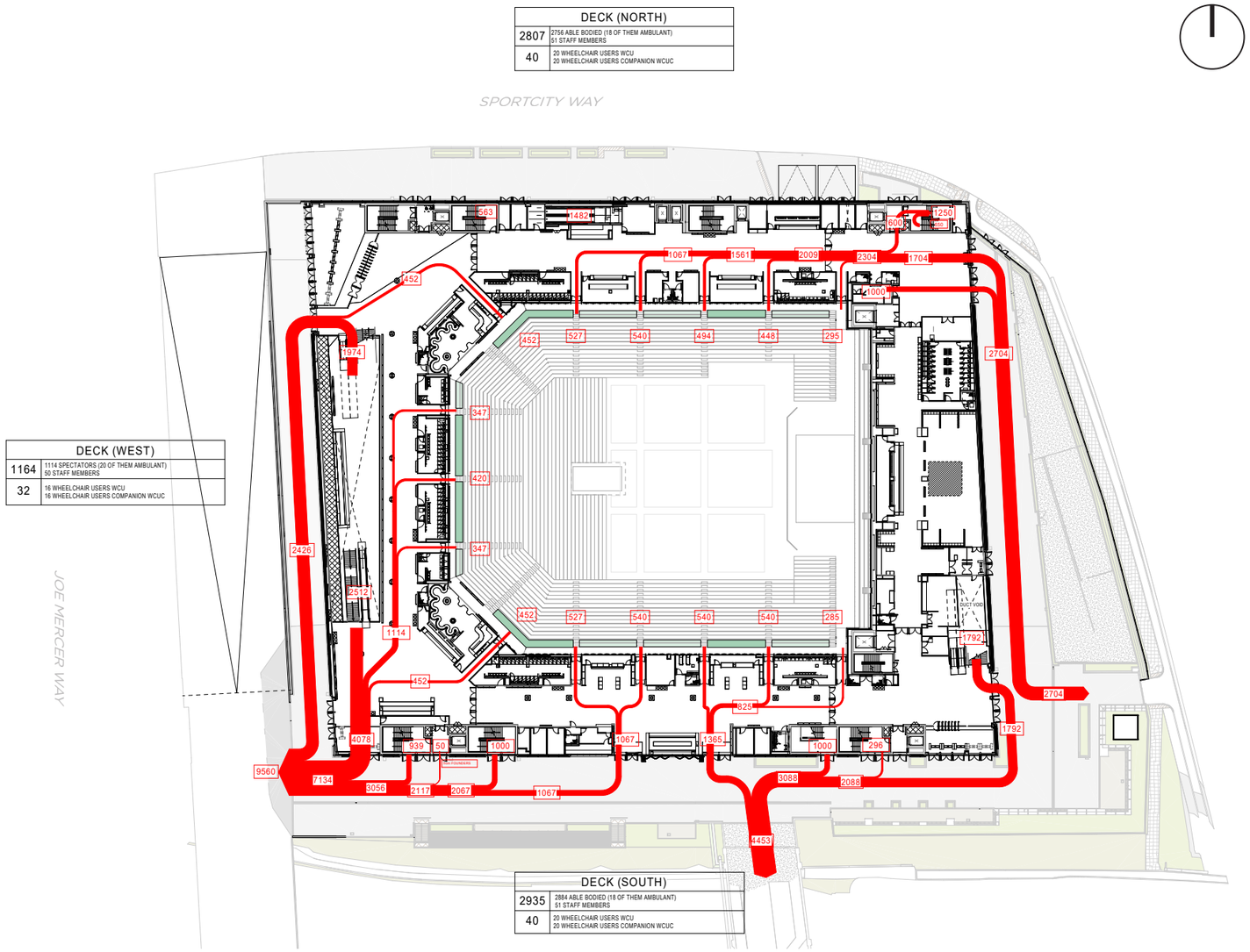
Final confirmation of the capacity numbers with be shown from further crowd flow analysis that has been produced for Stage 4A and will be documented in the Buro Happold Crowd Movement and Fire Engineers section of the Stage 4 Report.

All key external areas will need to have appropriate management procedures put in place to ensure the crowd flows are monitored and managed. An adequate number of stewards should be provided to manage locations where there are cross-flows to keep the crowd moving.

For normal egress only 50% of the hospitality spectators are assumed to leave the venue at the end of an event. It is intended that the hospitality spaces remain open post event as this will reduce the overall spectator numbers moving to the external areas post event.



Ground Floor Plan - Egress



Level 01 Plan - Egress

1.11.3 Evacuation

The responsibility to provide access means that suitable egress strategies must be developed for disabled people. Safe evacuation of people with physical disabilities or impairments relies on a combination of physical features and management procedures plus the development of a robust evacuation strategy to be developed by building management.

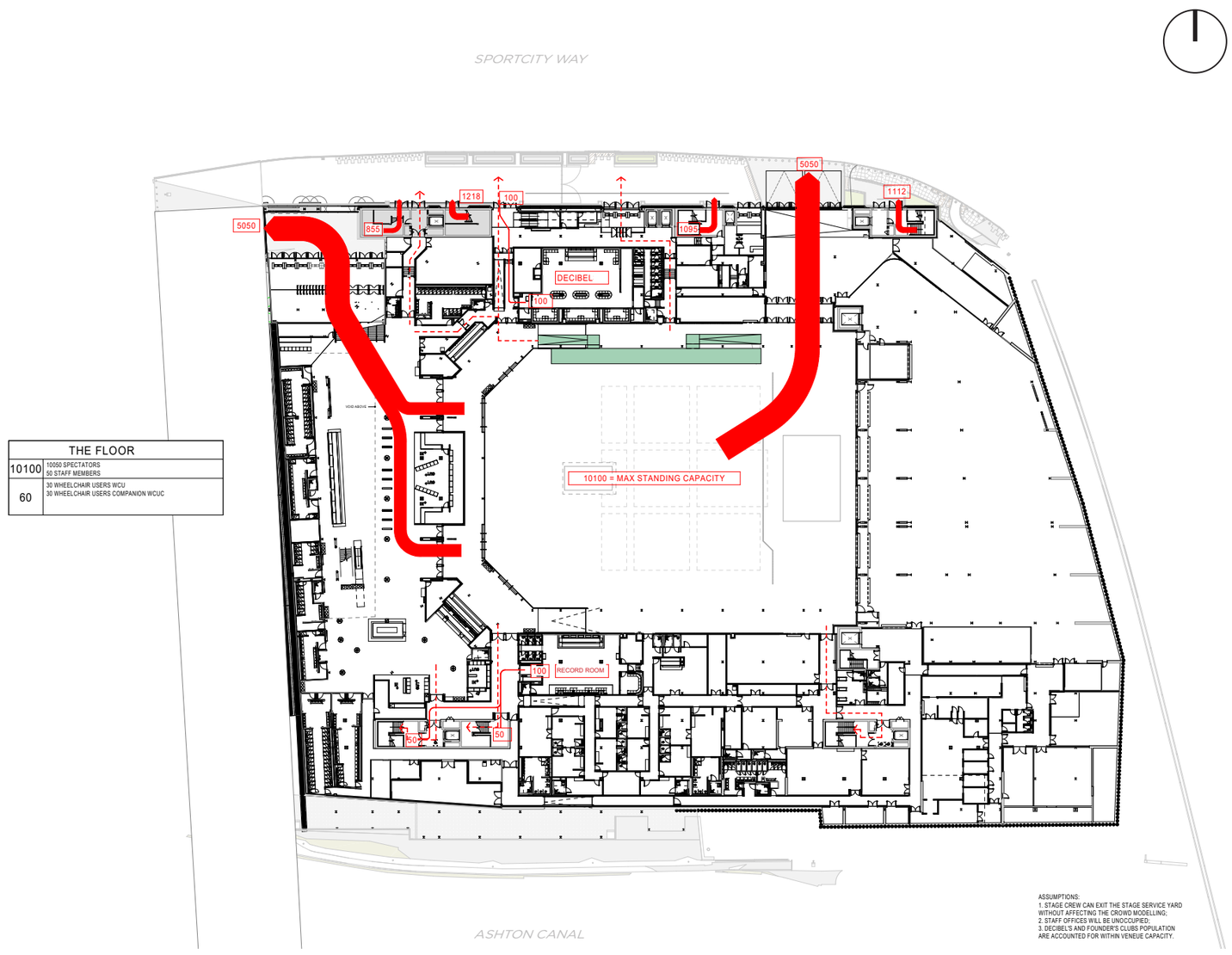
The 110 wheelchair users and companions are now located at Level 01 and will have step-free access to the external podium, limiting vertical movements. Similarly, wheelchair users and companions located on the Event Floor will have step-free access and egress. Wheelchair users and companions located at height in the venue will be located in the User Group Two areas at Level 02 and on Level 03. There are a total of 8 wheelchair users and companions at level 02 and 8 wheelchair users and companions at level 03.

The evacuation strategy incorporates the use of firefighting lifts for evacuation which are located at the four corners of the building. Designated refuge areas are provided with emergency voice communication for the use of any users on each level.

A progressive horizontal evacuation approach is proposed to allow occupants to move horizontally to an alternative fire compartment, acting as a place of relative safety, before continuing their evacuation using any firefighting lifts that are not required by the fire service.

Horizontal evacuation is also provided within the seating bowl at level 1 with a clear route of 1.3 meters to the rear of the tier to allow able spectators to evacuate into the adjacent fire compartment. Adjustments have been made to the compartment lines in the north and south concourses at level 01 to allow for this horizontal evacuation.

The number of disabled people who could be present within the User Group Two areas, not just the bowl, is also to be considered in the requirement for provision of refuge spaces.



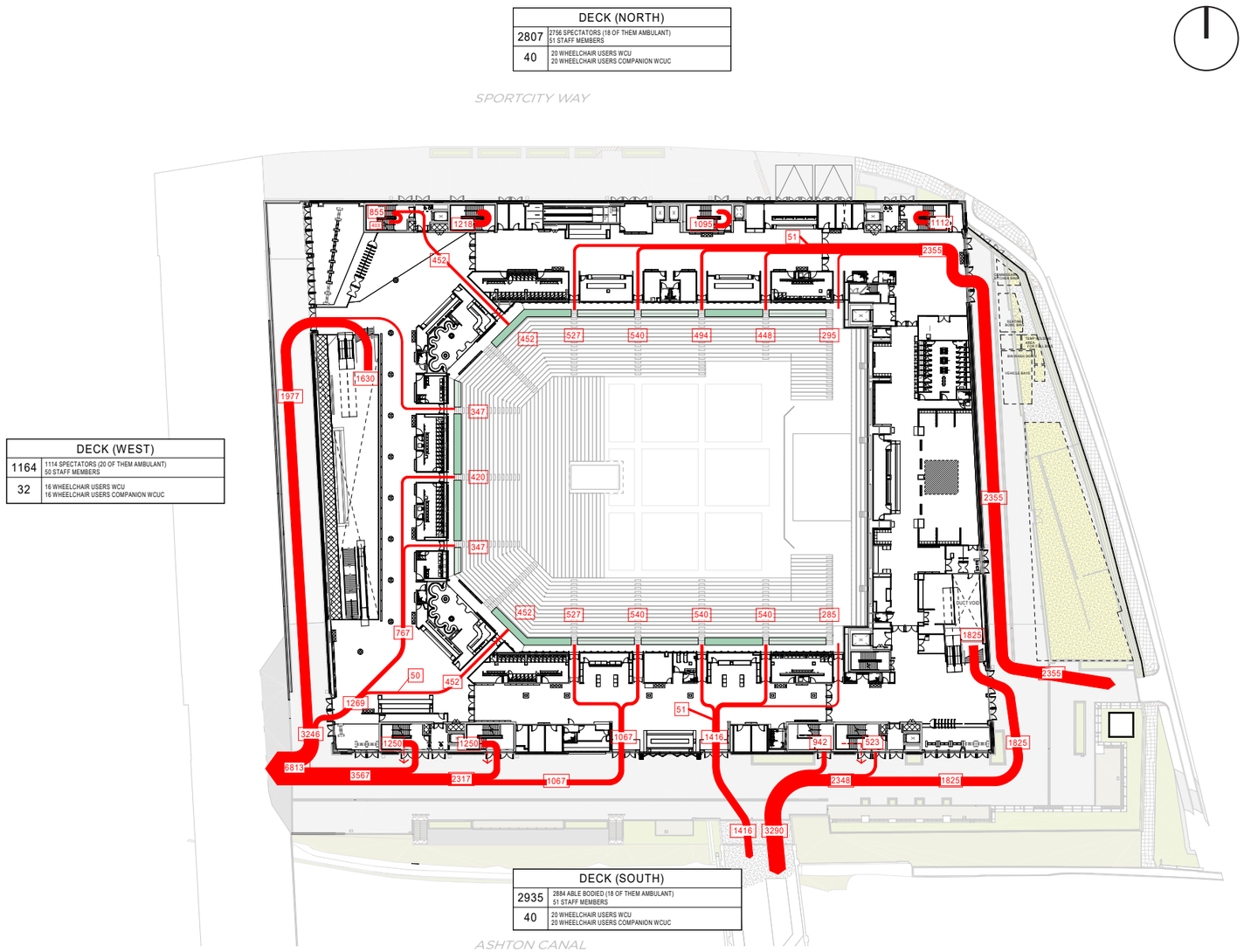
Ground Floor Plan - Evacuation

Fire Strategy

The fire strategy for OVG Manchester has been developed to enable safe evacuation of all occupants. The venue will be designed to meet the functional requirements of the Building Regulations 2010. BS 9999, 2017 will be used as the overall guidance for most areas of the building with the means of escape assessment conducted in accordance with BS7974:2019 and its associated Published Documents.

A fire engineered assessment has been performed to demonstrate safe escape within the building. This considers the amount of time required for occupants to escape and assesses the time available for escape based on maintaining tenable conditions with smoke control systems and other active and passive fire safety systems. The required safe egress time has been designed to aim to meet 8 minutes from the point when occupants first hear the fire alarm and start moving to when they leave the building or enter a free-flowing protected stair. The aim of this figure is to minimise the risk of any panic and ensure occupants are able to leave within a reasonable time frame upon becoming aware of a fire. 10 protected stairs and 2 open accommodation stairs (supported by a smoke control system) have been used for the escape assessment. Exits direct to external areas are available at Level 0 and at Level 1.

Evacuation of disabled people requires no manhandling management procedures plus a liaison between building managers and occupants. Evacuation is proposed to be provided via evacuation lifts in the building. Occupants can move to adjacent building zones to wait in a place of relative safety before continuing evacuation using the evacuation lifts. A means of two-way communication between the waiting area adjacent to each lift and a central monitored location from where evacuation assistance will be coordinated will be provided.



Level 01 Plan - Evacuation

1.11.4 Fire Strategy Overview

The structure for OVG Manchester is designed to 90 minutes fire resistance. 90 minute compartmentation is provided between the bowl and surrounding compartments. Areas of higher fire risk- such as storage and kitchens will be separated by fire resisting construction (30 minutes). This high level of compartmentation assists in maintaining a high level of safety for both ambulant and disabled occupants during the evacuation period.

Sprinklers are provided throughout OVG Manchester with the exception of the main Hall area, where sprinklers are not provided due to the height of the space. These assist in managing potential fire sizes and increase safety for escaping occupants and fire service intervention. Smoke control is provided in the bowl, atrium and in concourses where people are required to escape back through from the bowl.

An external fire spread assessment has been conducted to ensure fire spread does not occur outside the building. Fire resistance will be provided to the façade where any occupants need to escape within 1.8m.

Vehicular firefighting access is provided around the site to within 18m of firefighting cores as well as to access points on the north and south elevations. Four firefighting cores are provided with dry risers in each to enable firefighting internally. Smoke clearance is provided in the basement areas and loading bay at Level 0 to assist in firefighting operations.



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GA PLANS

1.12.1 LEVEL 00 BASE 358

1.12.2 LEVEL 01 DECK 359

1.12.3 LEVEL 02 CLUB 360

1.12.4 LEVEL 03 LOFT 361

1.12.5 LEVEL 04 HANGOUT 362

1.12.6 LEVEL 05 PLANT 363

1.12

1.12.1 Level 00 Base

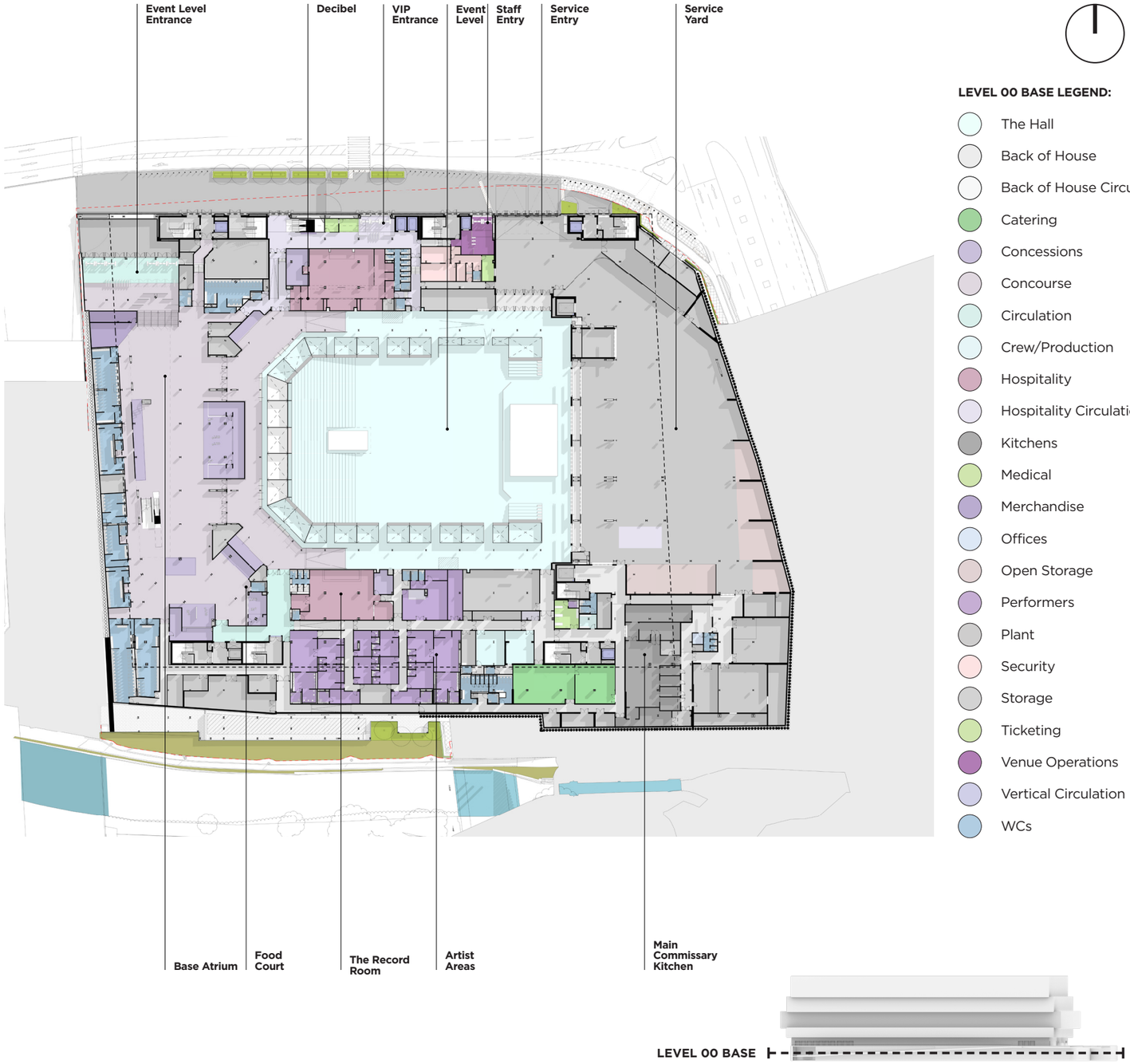
The Level 00 Base of the building is accessed from two sides, the north and the east.

The north east corner houses the main vehicle entrance to the venue service yard from Sportcity Way, and the premium hospitality entrance is centred to the north side, closest to the main car parks. An accessible entrance also forms part of this north spectator entrance area, with internal ramped access to the auditorium floor and lift access to the upper levels. The northwest corner houses the main entrance for the auditorium floor guests from Joe Mercer Way, leading to the atrium hall concourse and food court.

The atrium floor is connected to the upper levels by open stairs and escalators, and by lifts in the main cores. The atrium is a triple height space from Ground Floor through to Level 02, with feature bars and food service, this atrium space is the vibrant heart of the building pre-event. Access to the auditorium is through large banks of doors on the east side of the atrium floor, furthest from the stage end. To the north and south sides of the auditorium are two premium hospitality spaces - Decibel and The Record Room, with access to the atrium, the main floor, and to the lower tier, as required.

To the east side, behind the stage end is the large service yard that is key to the efficient operation of the event set-up. Supported by an array of storage spaces, this area is also the main delivery point for the commissary kitchen in the south east corner. Adjacent to the north service yard entrance is a dedicated staff entrance and suite of security management offices. Two large capacity service lifts are located to each side of the backstage area for transport of goods and equipment up through the building. A waste compactor room is located close to the north service vehicle entrance, for ease of access.

On the south side of the Ground Floor is the suite of artists' dressing rooms, green room and other event support spaces for performers and competitors. Event crew facilities are located alongside but separated from the artists' facilities in the south east corner, with excellent connectivity both to the auditorium and the back of house staging areas and facilities in the service yard.



1.12.2 Level 01 Deck

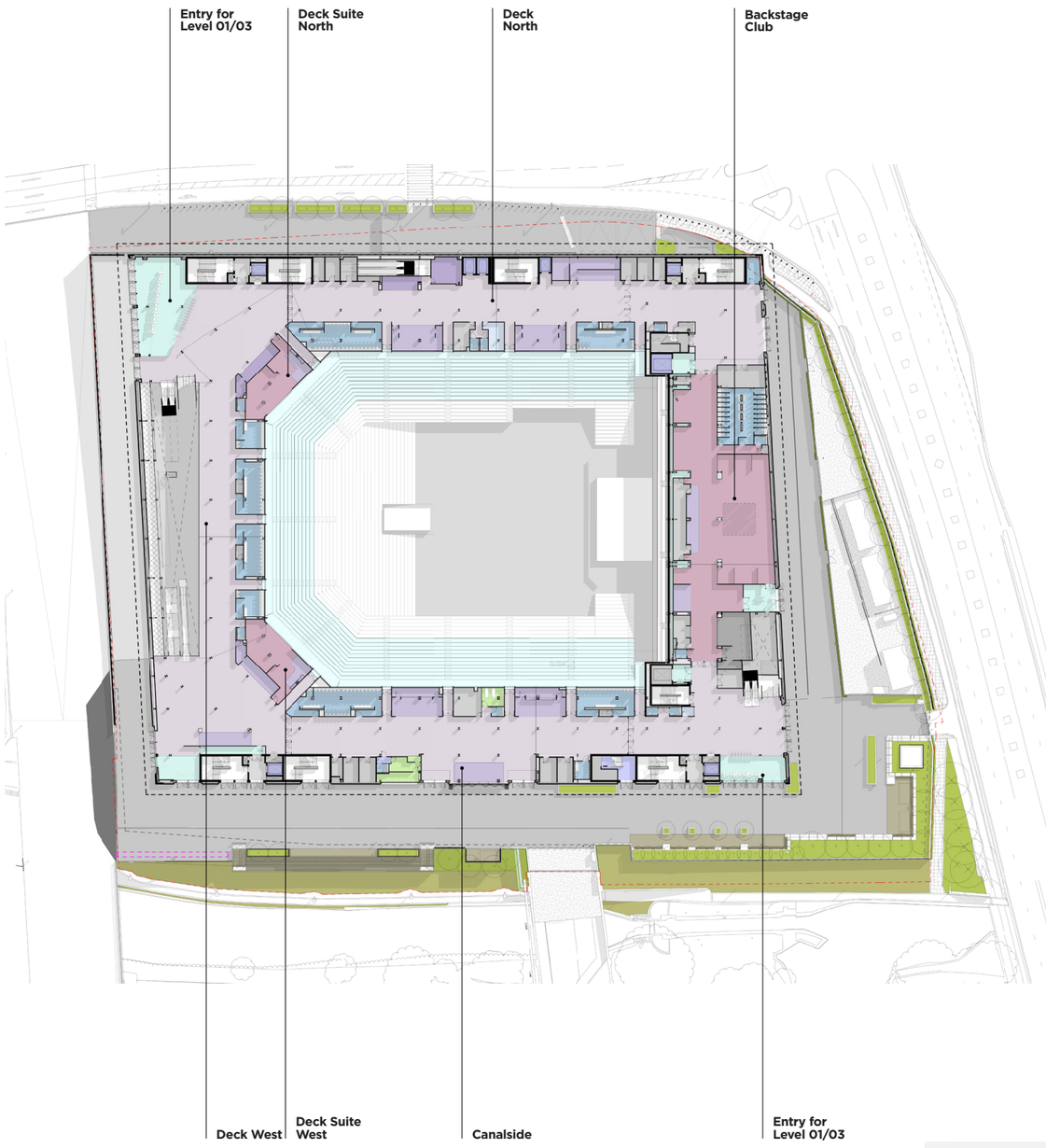
This level of the building is accessed from three sides, optimising access from the existing site levels to bring spectators into the building. Primary entrances are on the north west and south east corners, taking spectators into the building to access the concourse at Level 01, and with lift, escalator and stair access up to Level 03. The northwest entrance is via a level platform across the front of the building accessed at the south west corner junction with Joe Mercer Way. This connects to the landscaped external space on the south side of the building that provides a level access route to the south east entrance.

The L01 concourse extends through three sides of the venue, from north through to west and south, and is lined with a range of spectator amenities for food and beverage service and merchandise, as well as distributed sanitary and other fan support facilities. The west concourse overlooks the atrium floor and feature bar on the level below. Also on the south side is the venue box office, with a series of outward facing ticket windows to the canal-side approach, as well as internal ticketing information desk. The landscaping on the south side includes small seating areas facing the venue and overlooking the canal towpath, and potential spaces for pop-up food and retail units, as well as a bar in the centre of the building façade which can open to the exterior area. A series of compartment doors in each concourse allows each zone to be opened as required either pre-event or on non-auditorium event days, offering additional use, activation and amenity.

At the back of the building, parallel with Alan Turning Way is the primary entrance for the Backstage Club. This lounge has dedicated sanitary and catering support spaces.

The concourses have level access to the back of the lower tier of the auditorium. Backstage Club guests will access their seats through the Level 01 concourse.

Separating the building from Alan Turning Way is the east external compound space – a series of enclosures for operational support, including water tanks, occasional support vehicle parking and waste management.



LEVEL 01 DECK LEGEND:

- The Hall
- Back of House
- Back of House Circulation
- Catering
- Concessions
- Concourse
- Circulation
- Crew/Production
- Hospitality
- Hospitality Circulation
- Kitchens
- Medical
- Merchandise
- Offices
- Open Storage
- Performers
- Plant
- Security
- Storage
- Ticketing
- Venue Operations
- Vertical Circulation
- WCs



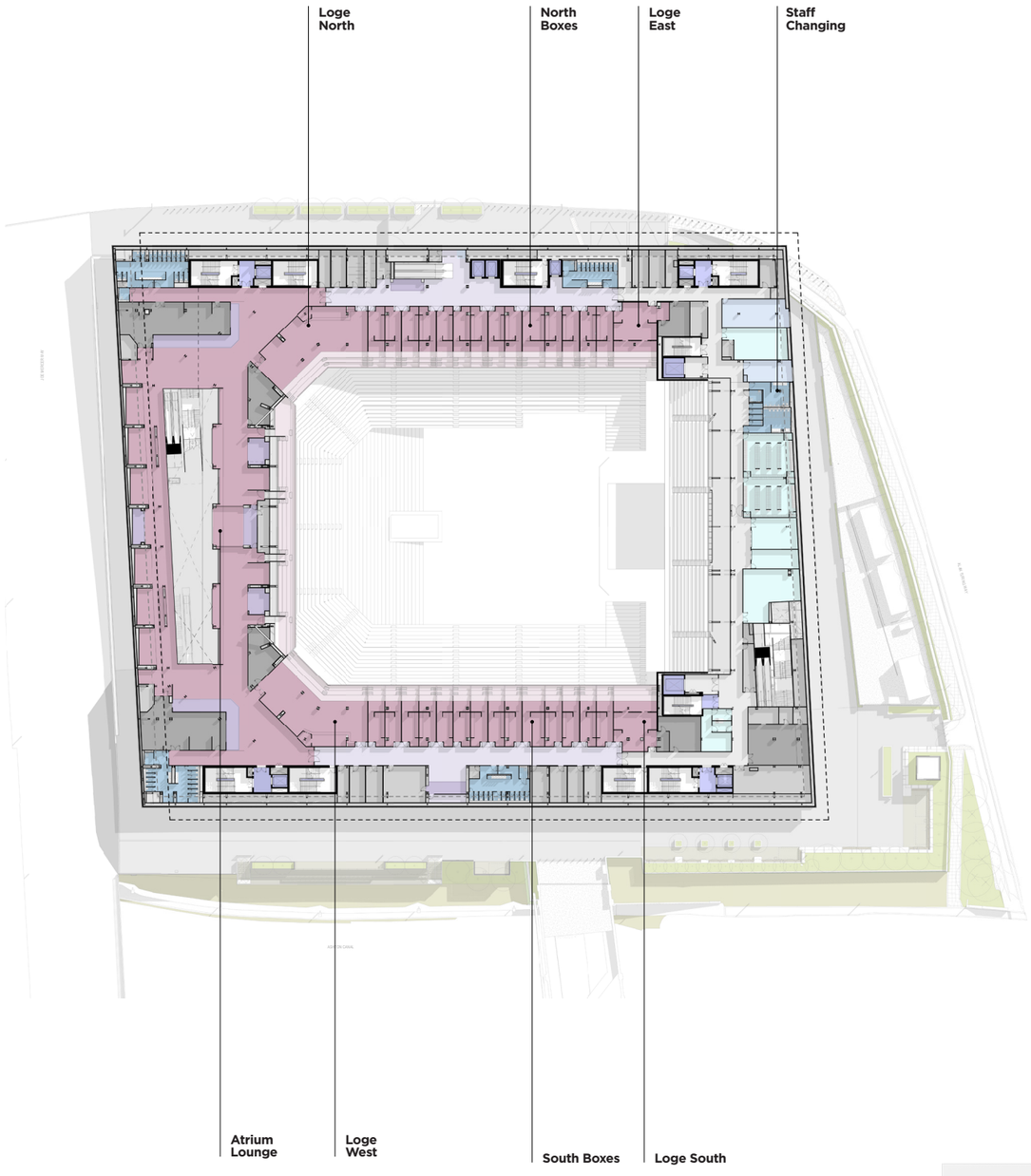
1.12.3 Level 02 Club

Premium guests arrive at the VIP entrance on the north side of the venue at Ground Floor, and access Level 02 via dedicated escalators and lifts.

The majority of the premium seats in the Hall are located at this Level 02 Club Level, with guests seated on the north, west and south sides. The supporting accommodation is sub-divided into a series of spaces – individual Boxes and slightly larger 'Loge' lounges that are open to the Hall on the north and south sides, with dedicated seats on the tier in front. The west Atrium Lounge is separated from the Hall by the rise of the south upper tier. However, the generous lounge area surrounds the top level of the west atrium space, with views down to the concourse spaces and activity below on Level 01 and Ground Floor. This west Atrium Lounge is provided with a range of seating areas and dedicated kitchens, food counters and bars.

A corridor circulation route is provided with bars, small seating lounge areas and spectator support facilities to connect all three sides of the Club Level.

To the east side of the auditorium are the venue back of house event staff support facilities – including locker rooms, sanitary and shower facilities, a multi-faith room, and event office spaces, all accessed via the north side staff entrance lift and stair.



LEVEL 02 CLUB LEGEND:

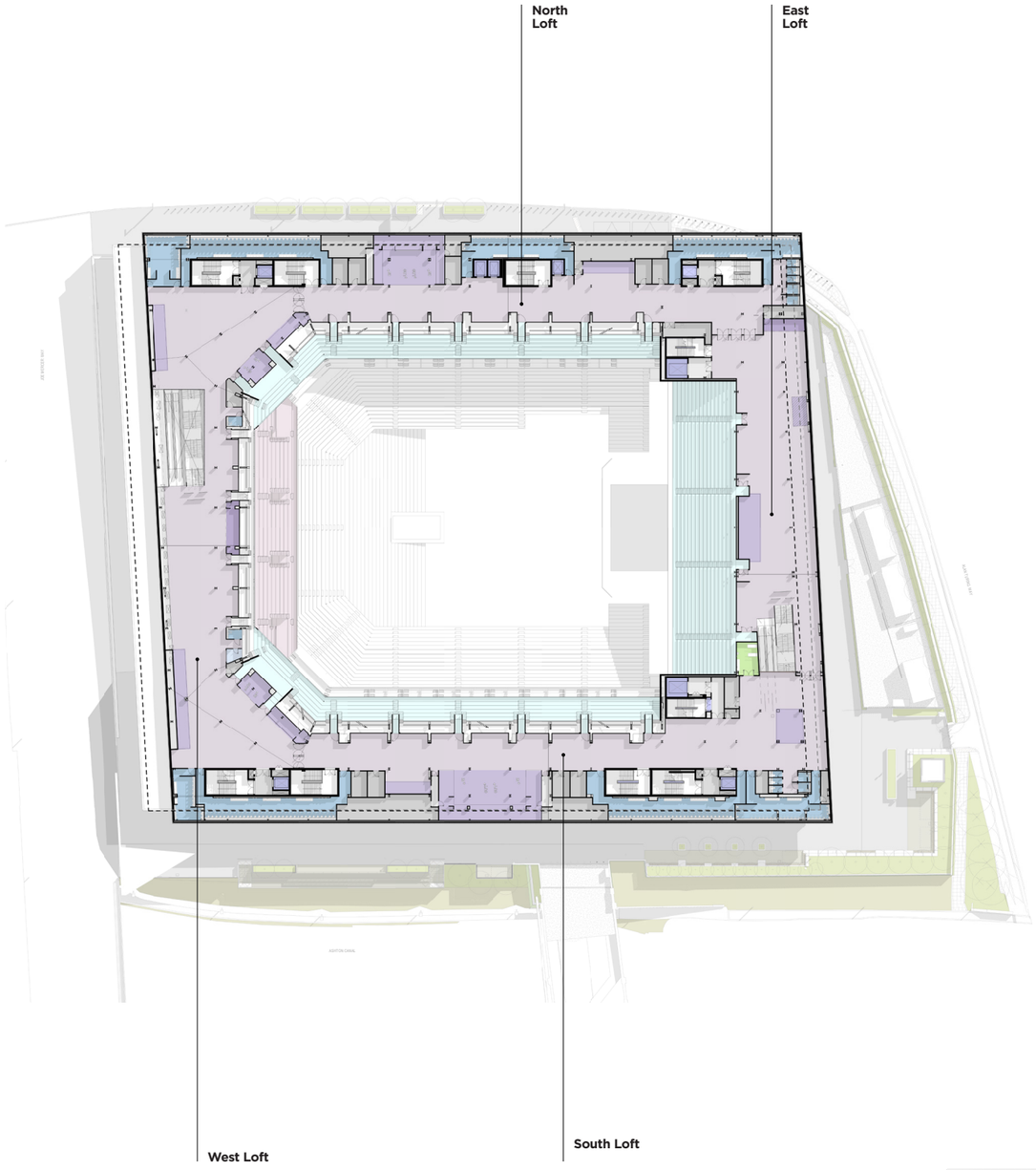
- The Hall
- Back of House
- Back of House Circulation
- Catering
- Concessions
- Concourse
- Circulation
- Crew/Production
- Hospitality
- Hospitality Circulation
- Kitchens
- Medical
- Merchandise
- Offices
- Open Storage
- Performers
- Plant
- Security
- Storage
- Ticketing
- Venue Operations
- Vertical Circulation
- WCs



1.12.4 Level 03 Loft

Level 03 serves the majority of Fans seated on the upper tier. From entrances on Level 01, people will travel by escalator and lift to this level, arriving in the centre of the west and east stands. Once at this level, a full circuit of concourse provides access to the main horseshoe upper tier on the north, west and south sides, and also to the east tier behind the stage. The concourse spaces are double height, providing a different atmosphoere and sense of space to the upper tier fans.

Sanitary facilities, food and beverage and other spectator support facilities are distributed to all sides of the concourse, but predominantly to the north, south and west sides, to serve the majority of spectators for most event modes.



LEVEL 03 LOFT LEGEND:

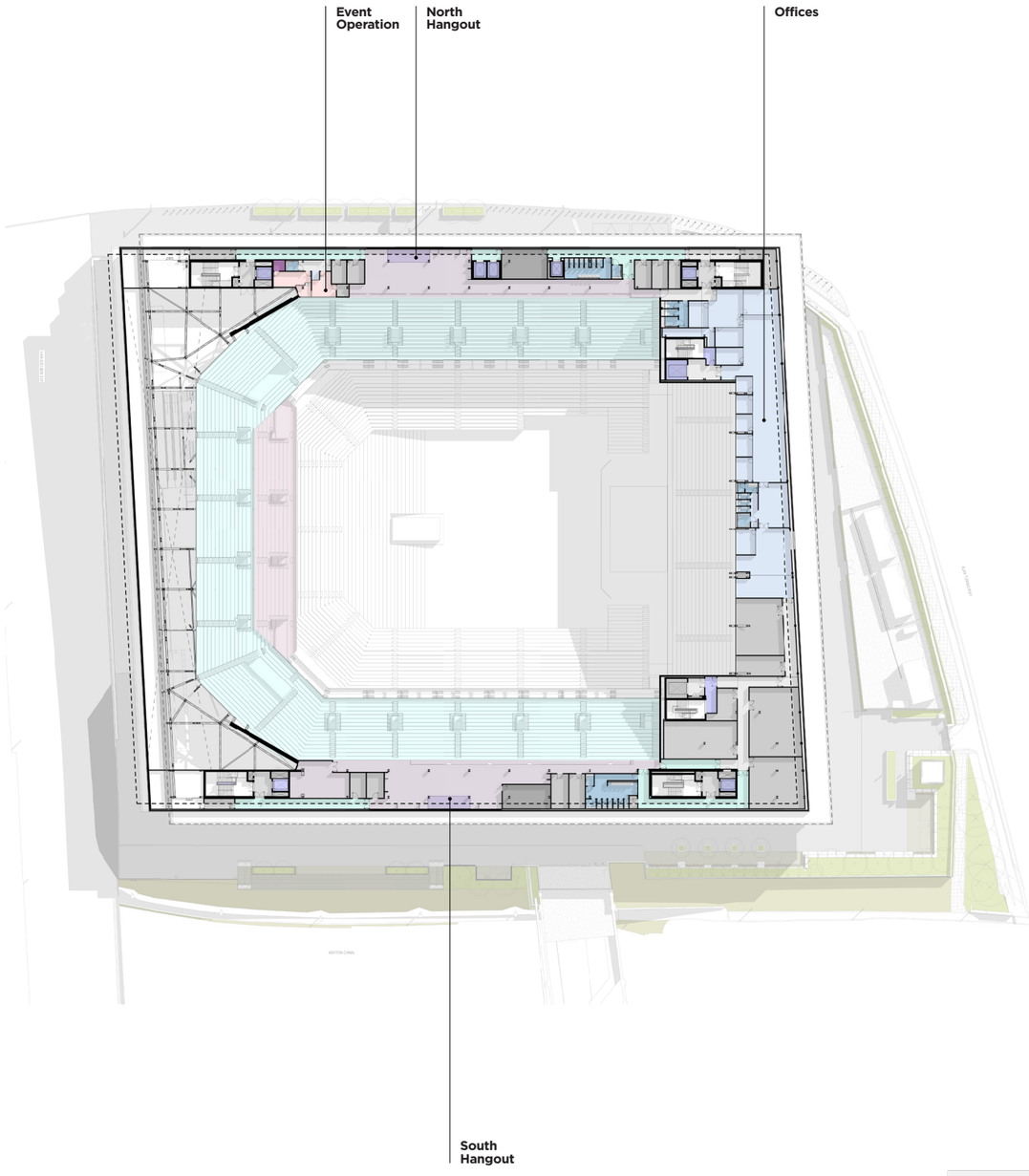
- The Hall
- Back of House
- Back of House Circulation
- Catering
- Concessions
- Concourse
- Circulation
- Crew/Production
- Hospitality
- Hospitality Circulation
- Kitchens
- Medical
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- Offices
- Open Storage
- Performers
- Plant
- Security
- Storage
- Ticketing
- Venue Operations
- Vertical Circulation
- WCs



1.12.5 Level 04 Hangout

Spectator accommodation at Level 04 comprises two slim Hangout lounge spaces on the north and south sides that are open to the main auditorium with views down to the stage and event floor. Guests in these lounges do not have access to the back of the tier, and are accommodated at two levels of stepped platform with sofa seating and standard seating at the front of the lounge to watch performances. The lounges have dedicated sanitary, catering and bar support spaces.

The main venue management offices are located to the east side of the building on Level 04, along with sundry plant and storage spaces.



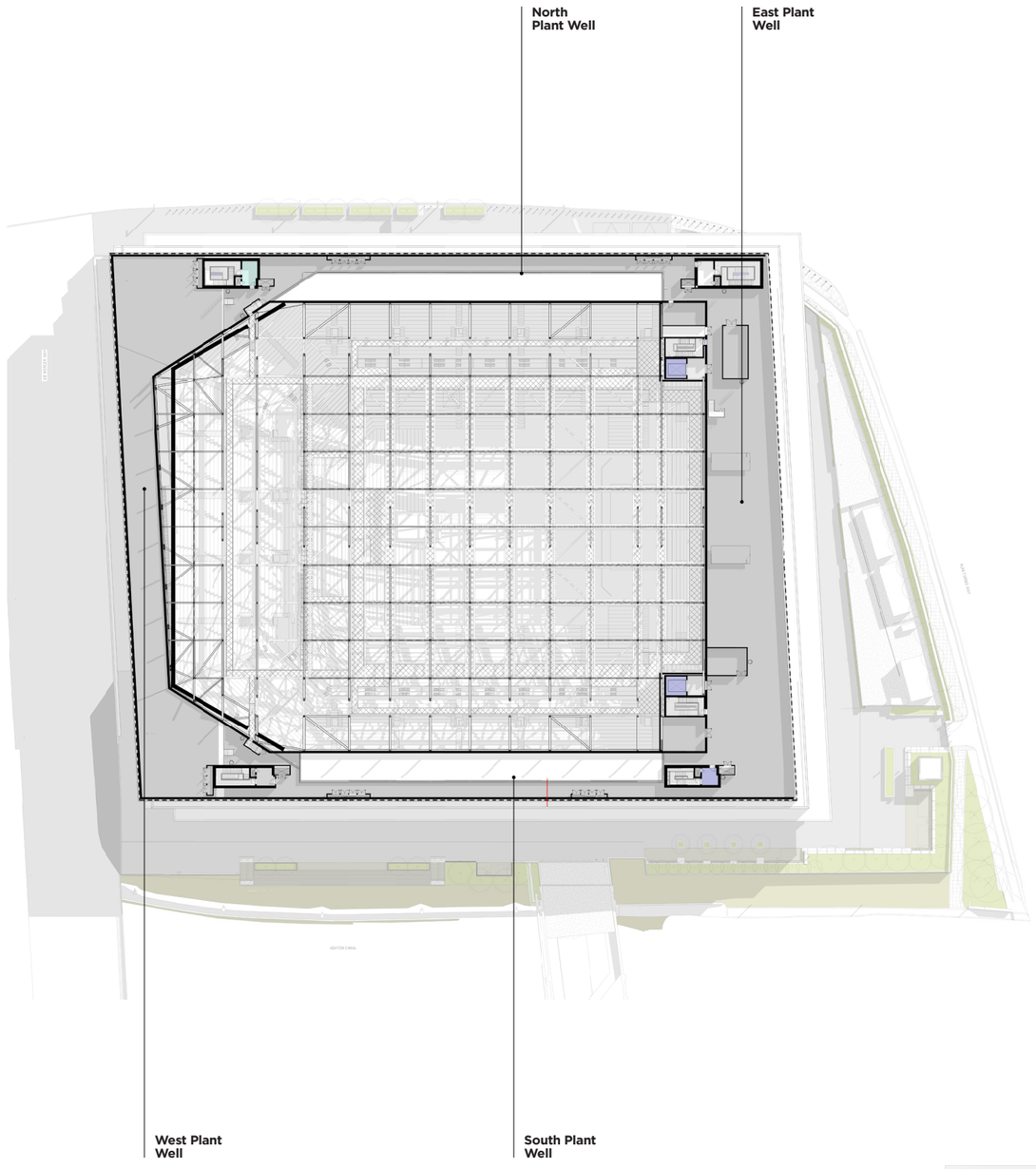
LEVEL 04 HANGOUT LEGEND:

- The Hall
- Back of House
- Back of House Circulation
- Catering
- Concessions
- Concourse
- Circulation
- Crew/Production
- Hospitality
- Hospitality Circulation
- Kitchens
- Medical
- Merchandise
- Offices
- Open Storage
- Performers
- Plant
- Security
- Storage
- Ticketing
- Venue Operations
- Vertical Circulation
- WCs



1.12.6 Level 05 Plant

There is no spectator accommodation at Level 05. This level is primarily comprised of back of house plant spaces and external plant wells on the perimeter of the building. Vertical circulation is linked to access points for the ceiling rigging platforms at high level over the auditorium floor.



LEVEL 05 PLANT LEGEND:

- The Hall
- Back of House
- Back of House Circulation
- Catering
- Concessions
- Concourse
- Circulation
- Crew/Production
- Hospitality
- Hospitality Circulation
- Kitchens
- Medical
- Merchandise
- Offices
- Open Storage
- Performers
- Plant
- Security
- Storage
- Ticketing
- Venue Operations
- Vertical Circulation
- WCs

LEVEL 05 PLANT




EXPERIENCE
CANAL SIDE
CANALSIDE
113

LANDSCAPE DESIGN

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2

LANDSCAPE DESIGN STRATEGY

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2.1

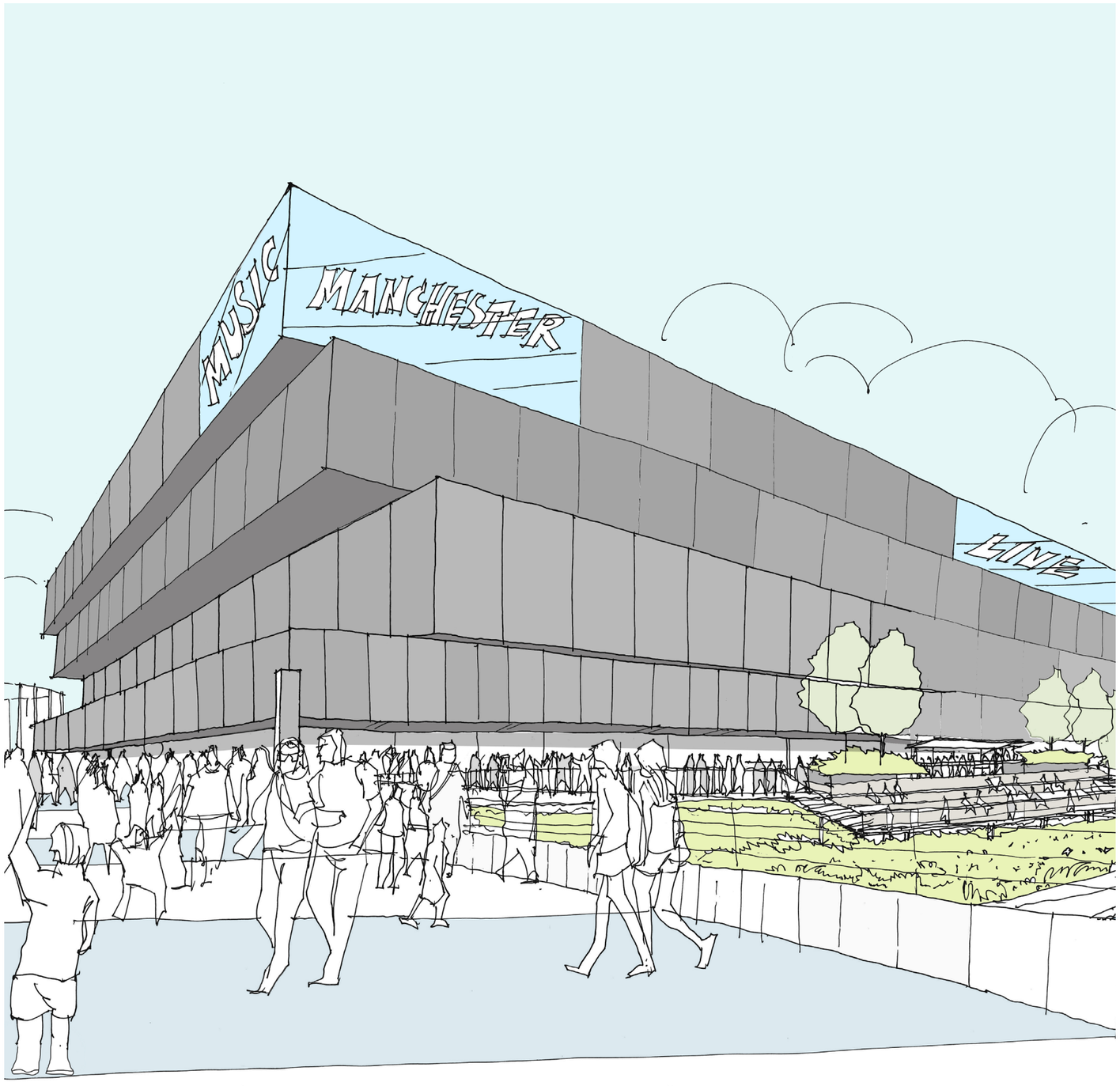
2.1.1 Concept

The public realm of the proposed development focuses on creating a landmark design which will provide a unique sense of place for users to explore and enjoy. The landscape strategy integrates with the surrounding community while drawing locals, visitors and tourists together.

The development introduces a well-designed place that enhances the local character and makes a positive contribution to the health, safety and wellbeing of the community by connecting with its history. The created space brings opportunities for a wide range of activities to generate a comfortable and lively microclimate that interlinks users.

Moreover, one of the most important principles of the public realm is to connect to its surroundings, opening views towards Ashton Canal and providing a safe relationship with the Etihad Campus scheme and Philips Park. The podium level links with the canal and bridges to make the development part of a cohesive wider scheme. The connection between the site and Philips Park is enhanced by greenery facing the area, thus creating a subtle transition for visitors between the city's blue and green infrastructure. In this manner, the proposed public realm acts as a junction between Ashton Canal and Philips Park.

The link to the existing surroundings is also improved by the enhancement of its biodiversity. The introduction of native vegetation which upgrades the quality of nearby green infrastructure, improving the performance of its functions and creating connections with them. The Public Realm surrounding the Venue serves a number of different functions and varies in character to reflect these.



2.1.2 Design Principles

The proposed development has addressed six key considerations: site access, crowd flow, place making factors, biodiversity, wind mitigation and vertical screen. These considerations create a safe, attractive, high quality, inclusive and legible public realm; it will contribute positively to local character and identity and encourage the appropriate level of activity and social interaction.

Site access is important as pedestrian and vehicular routes have been identified around the site. Based on that, the public realm creates clear connections to appropriately direct crowd flows and provides an active frontage on Ashton Canal to generate new opportunities.

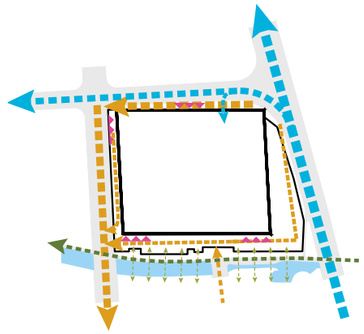
Crowd flow requirements have been integrated in the design to ensure a balanced relationship between spaces and path widths on event days. Therefore, ingress and egress hierarchies have been considered to ensure an efficient evacuation of the site, and a sequence of spaces have been created to serve the different needs of the users in this scenario.

Strategic place making brings value by providing attractions for users and ensuring that the scheme's numerous character areas suit both event and non-event day. The public realm presents various materials and formal/ informal seating to give an extra layer of complexity. Historical references are present in the design through the paving materiality; dark paving represents the local coal mining history while complementing the geometry of the building.

A green ring is provided to link with existing green infrastructure, complementing its biodiversity value by adding native species to the scheme. This additional vegetation improves visual performance, supports local wildlife, and creates a welcoming atmosphere for users of the external areas.

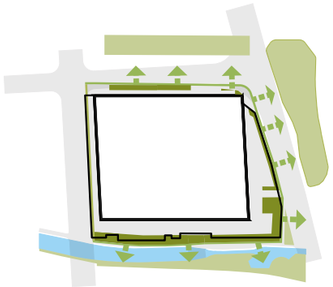
Strong winds coming mostly from the south need to be screened. Vegetation is placed in strategic areas to create sheltered zones and places to gather. These natural shelters at place making corners will state a strong relationship between

Green screens utilize vertical surfaces to incorporate more green into the scheme and reinforce the green component of the site.



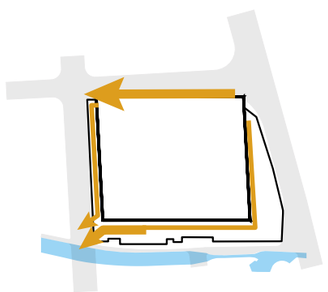
Site Access

Pedestrian movement and vehicular circulation around the site have been studied to provide an active frontage towards Ashton Canal.



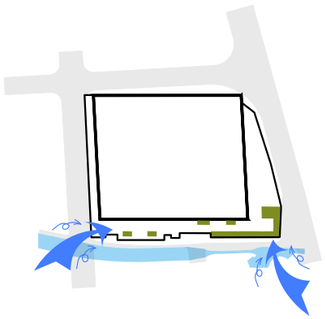
Biodiversity Green Ring

The proposal incorporates a green outdoor area that links with existing surroundings to enhance the green asset and biodiversity.



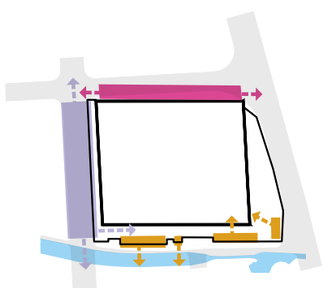
Crowd Flow

Egress flow hierarchy considered for relationship between outdoor spaces and surrounding opportunities.



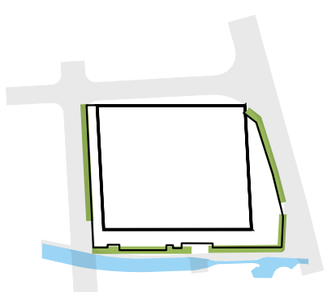
Wind Mitigation

Vegetation is placed in strategic areas to create comfortable zones and protect users from the wind.



Place Making

Public realm character areas suit both event and non-event day as part of visitor experience strategy.



Vertical Green

Green screens are used to complement user experience and reinforce the green component of the site.

2.1.3 Boundary Treatment

The site is bound by Sportcity Way to the north, Alan Turing Way to the east, Ashton Canal to the south and Joe Mercer Way to the west.

Our strategy for the boundaries of the scheme reflects their varied characteristics. As a general aim, all boundaries have been softened as much as possible by the introduction of native planting, barrier free access and buffer zones while keeping a visual connection with the existing surroundings.

The Joe Mercer Way boundary is treated with a full planted living wall to provide soft landscape materiality and a welcoming link to the surroundings. The vertical element also uses the difference in levels as an opportunity to improve the user experience.

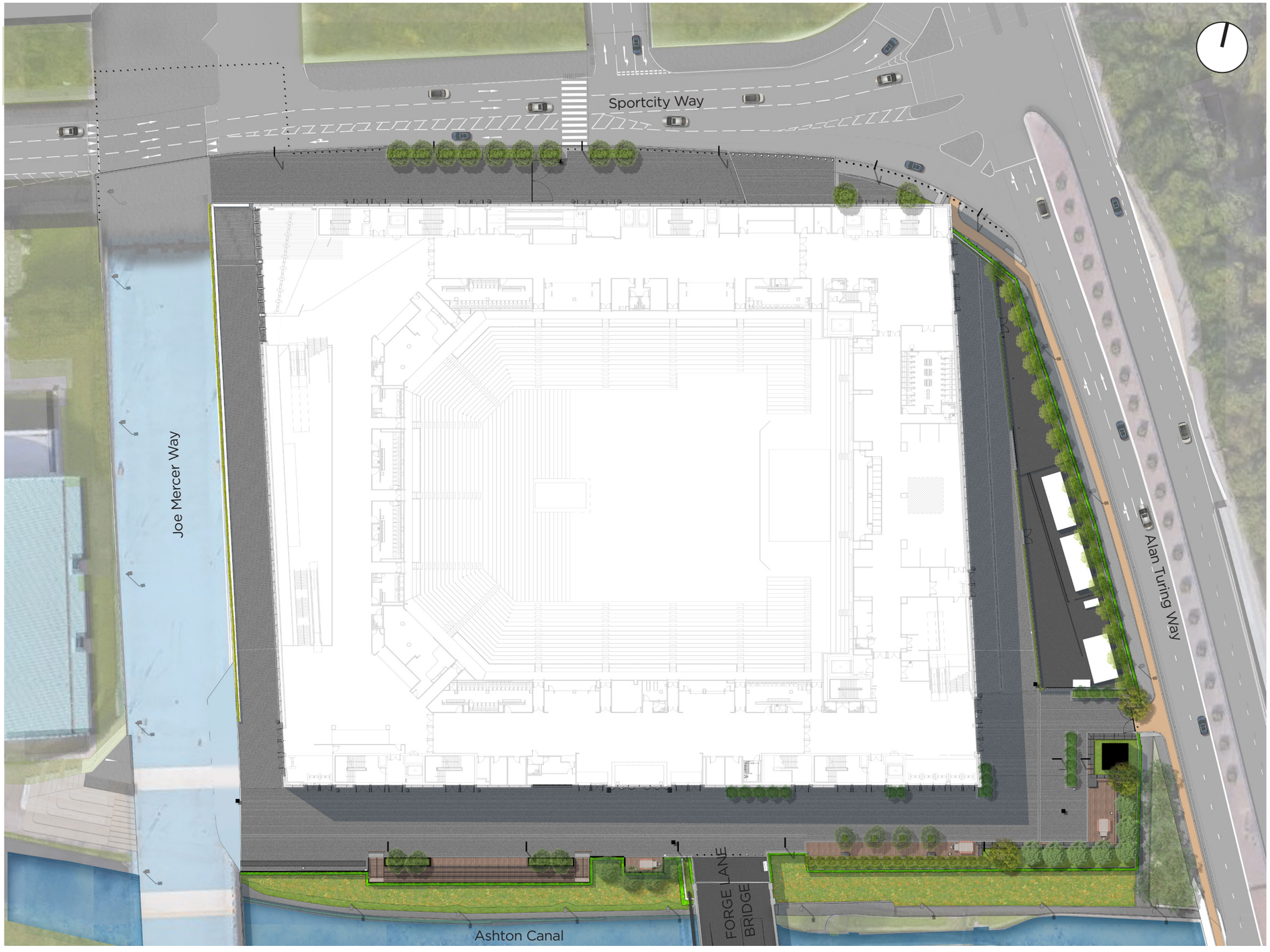
The interface between the podium and Ashton Canal is enhanced by the introduction of native wildflower planting and timber tiered seating facing the canal. Trees are also introduced to visually connect both areas as part of the same scheme and a pre-cultivated modular green screen in the southwest bridges the green spaces on both levels while introducing the wind mitigation screen.

Alan Turing Way is treated with a green buffer to separate the podium from heavy traffic. This also helps to keep a communal green space between both by linking with the green screen next to the existing footpath. An integrated gate allows fire access and an integrated green screen covers the compound fence, introducing comfortable spaces and easy access for technical support.

Sportcity Way incorporates a temporary VIP drop-off and raised planters with understory planting and trees. The step and shared surface ramp access to the north-eastern corner also links to the Alan Turing Way side and complements the proposed planters, as both elements relate to the existing green areas around the site.



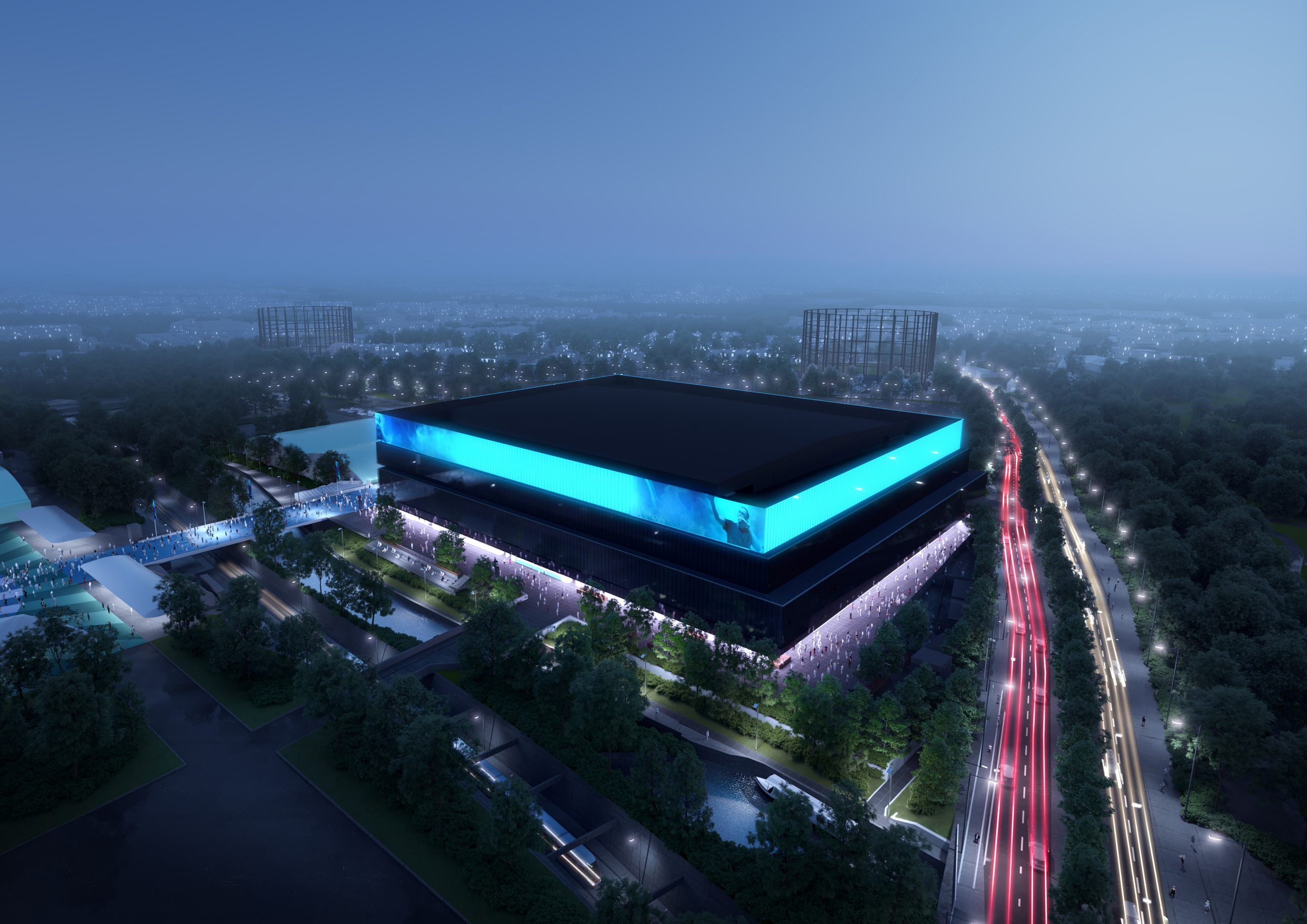
2.1.4 Site Plan



GENERAL ARRANGEMENT

2.2.1 LANDSCAPE GA 375
2.2.2 ASHTON CANAL AND JOE MERCER WAY JUNCTION 376
2.2.3 SOUTH PODIUM TIERED DECKING 377
2.2.4 ASHTON CANAL AND ALAN TURING WAY JUNCTION 378
2.2.5 FORGE LANE BRIDGE 379
2.2.6 ALAN TURING WAY (LEVEL 01) 380
2.2.7 COMPOUND AREA 381
2.2.8 SPORTCITY WAY AND ALAN TURING WAY JUNCTION 382
2.2.9 NORTH-EAST JUNCTION 383
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2.2.11 SPORTCITY WAY AND JOE MERCER WAY JUNCTION AXO 385
2.2.12 DECKING AND SEATING AREA 386
2.2.13 TIERED GRANITE SEATING AREA 387

2.2



2.2.1 Landscape GA

Landscape Strategy

The overall landscape design has been developed from Stage 3 and refined in each of the following areas: external paving, street furniture, planters, metal work, security external lighting, and drainage strategy. The design has been coordinated closely across all disciplines such as crowd movement, civils, lighting and security to ensure all necessary criterias are met.

The granite stone paving is selected from a range of products and the detail of paving design is developed with the civil engineer and the leading mortar bedding specialist to ensure the loading requirement, long term performance, maintenance and aesthetic are all satisfied. The paving design at Stage 4 illustrates the method and rule to build a very contemporary and minimal look of paving for the public realm that neat paving interface can be achieved with all external elements. One of the key changes from the previous stage is material at the compound area where concrete block paving has been replaced by tarmac.

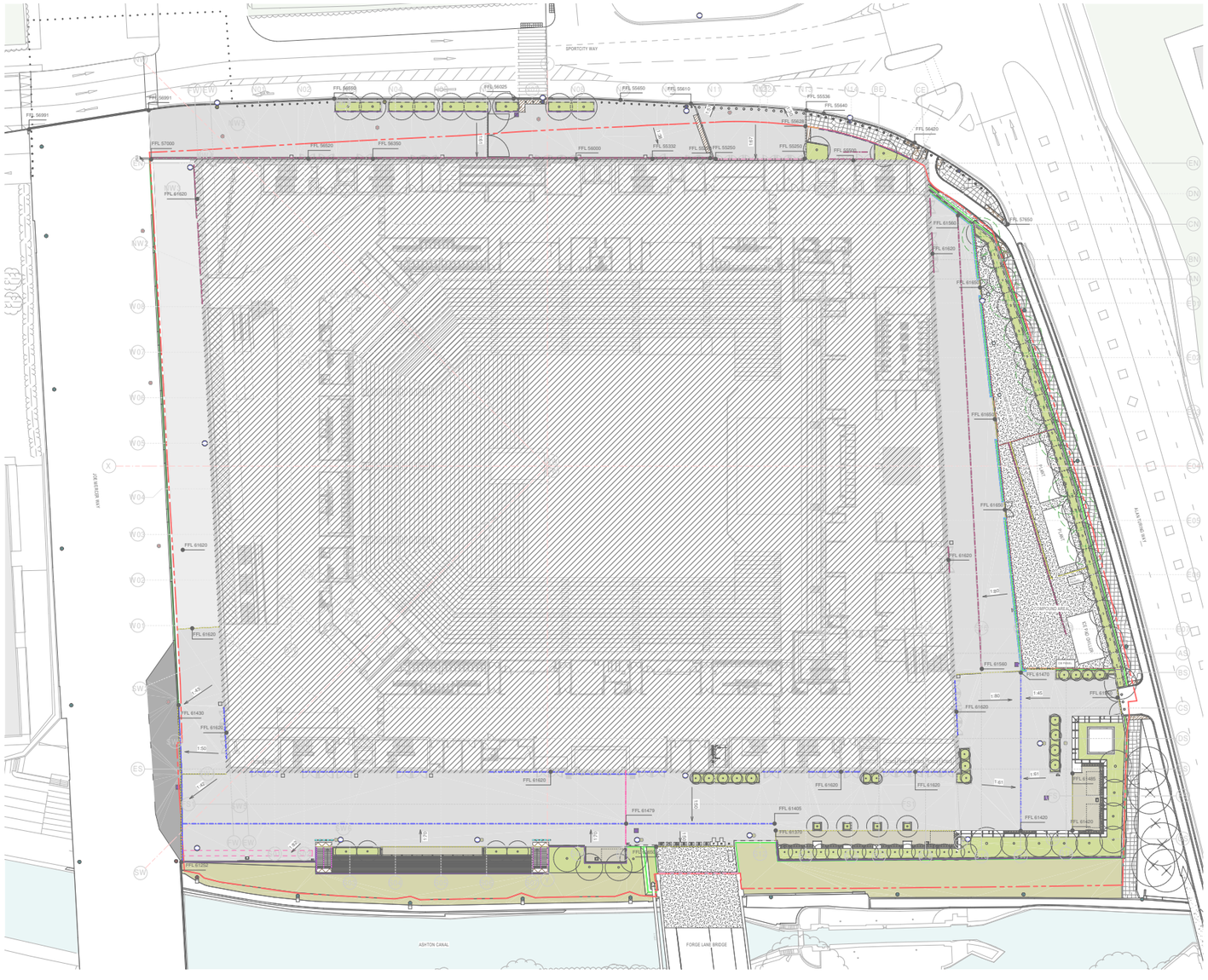
Some of the key features within the public realm are timber tiered decking, planters and seating wall. Head of stair barriers have been incorporated at the step access of the timber seating area, adjacent to an integrated timber drink shelf. The concrete planters are specified to match the materiality of the facade precast concrete panels. Additional planters are added into the design at the south east corner for wind mitigation. The granite seating wall has been rationalized by minimizing the module and introducing enlarged stone elements to provide resting points for wheelchair users.

Gates and fences are the same black colour as the other external metalwork such as balustrades, head of stair barriers etc., thus blending in with the overall venue colour scheme. The gate at Alan Turing Way entry, is one of the security features in the project.

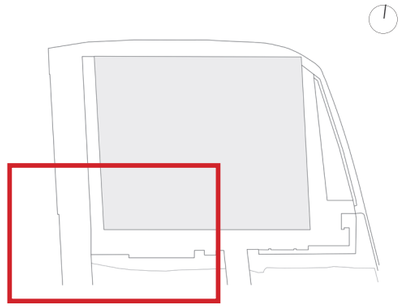
In order to meet crowd movement requirements, the number of planters at the north west corner has been reduced and replaced by HVM bollards. Forge Lane Bridge HVM bollards line has moved onto the podium sitting within the redline boundary.

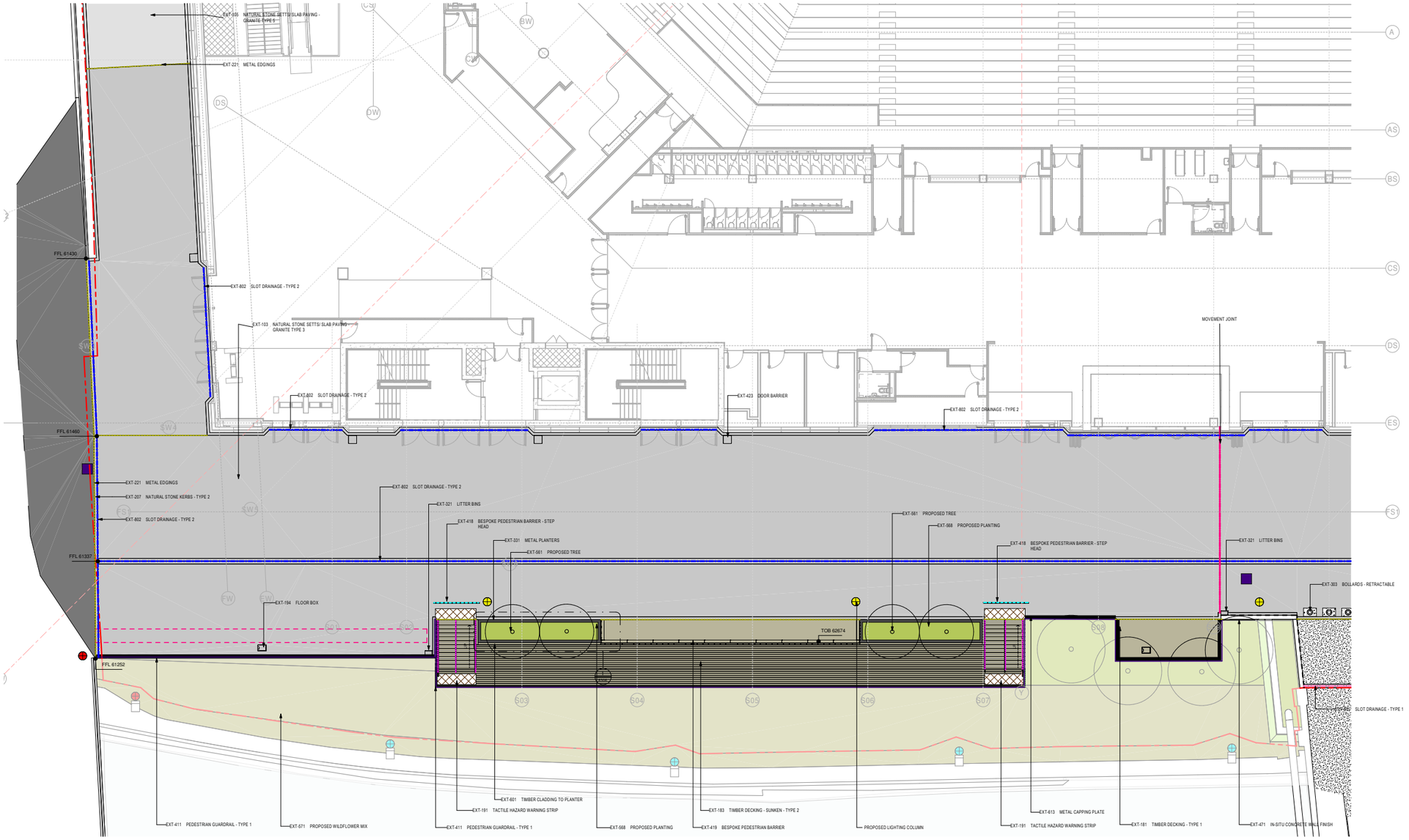
The external lighting specification is one of the key elements that has been refined during Stage 4. The design is to have CCTV integrated on the landscape lighting columns to maintain a clean building facade and soffit. In order to reduce street clutter, the proposed lighting columns are also integrated with HVM bollards on Sportcity Way. Along the eastern side of Joe Mercer Way, existing lighting columns are removed and replaced with an alternative lighting solution to maintain the best view of the building and the associated naming rights partners display.

The drainage strategy has been rationalised with slot drainage along the north façade changing to a concrete channel drain matching the colour of the adjacent paving, reducing the visual impact whilst improving performance and maintenance.

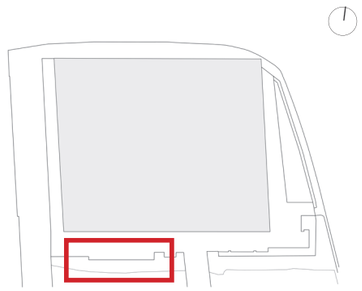


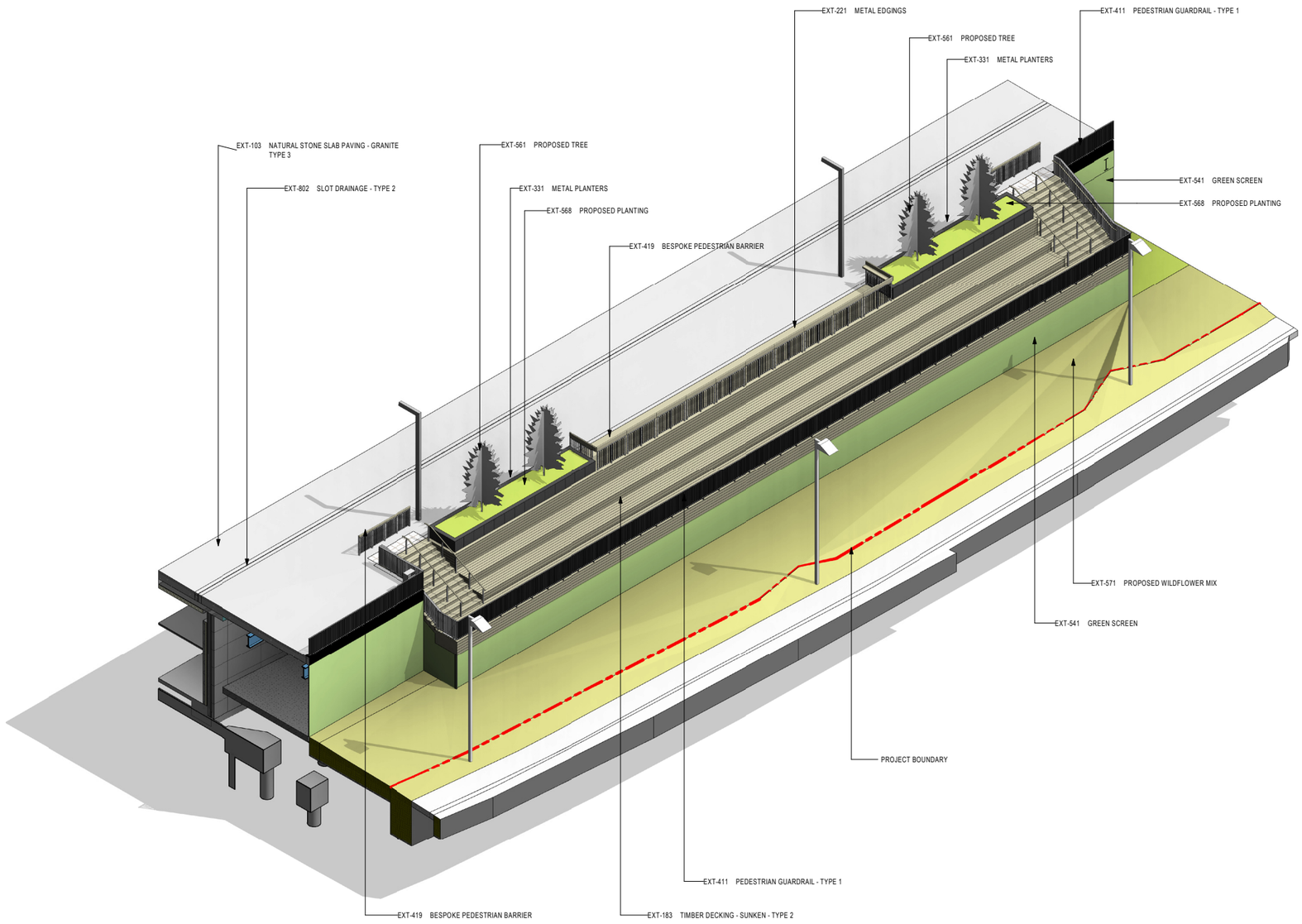
2.2.2 Ashton Canal and Joe Mercer Way Junction



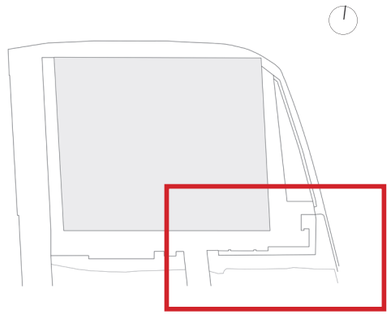


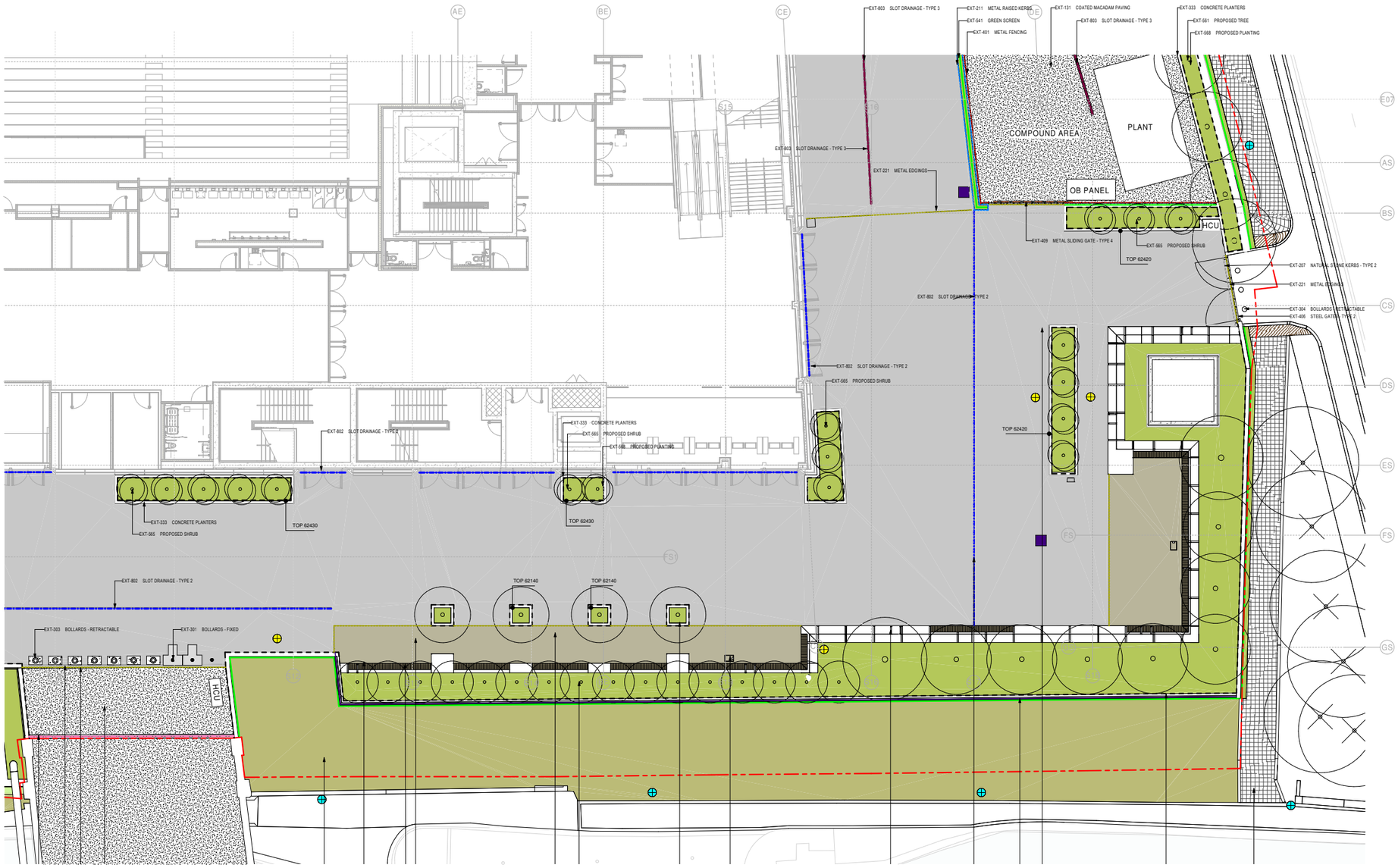
2.2.3 South Podium Tiered Decking



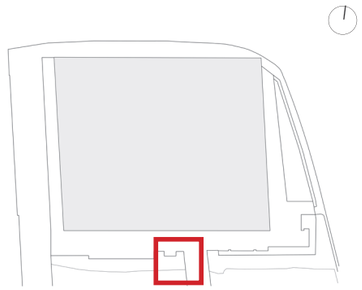


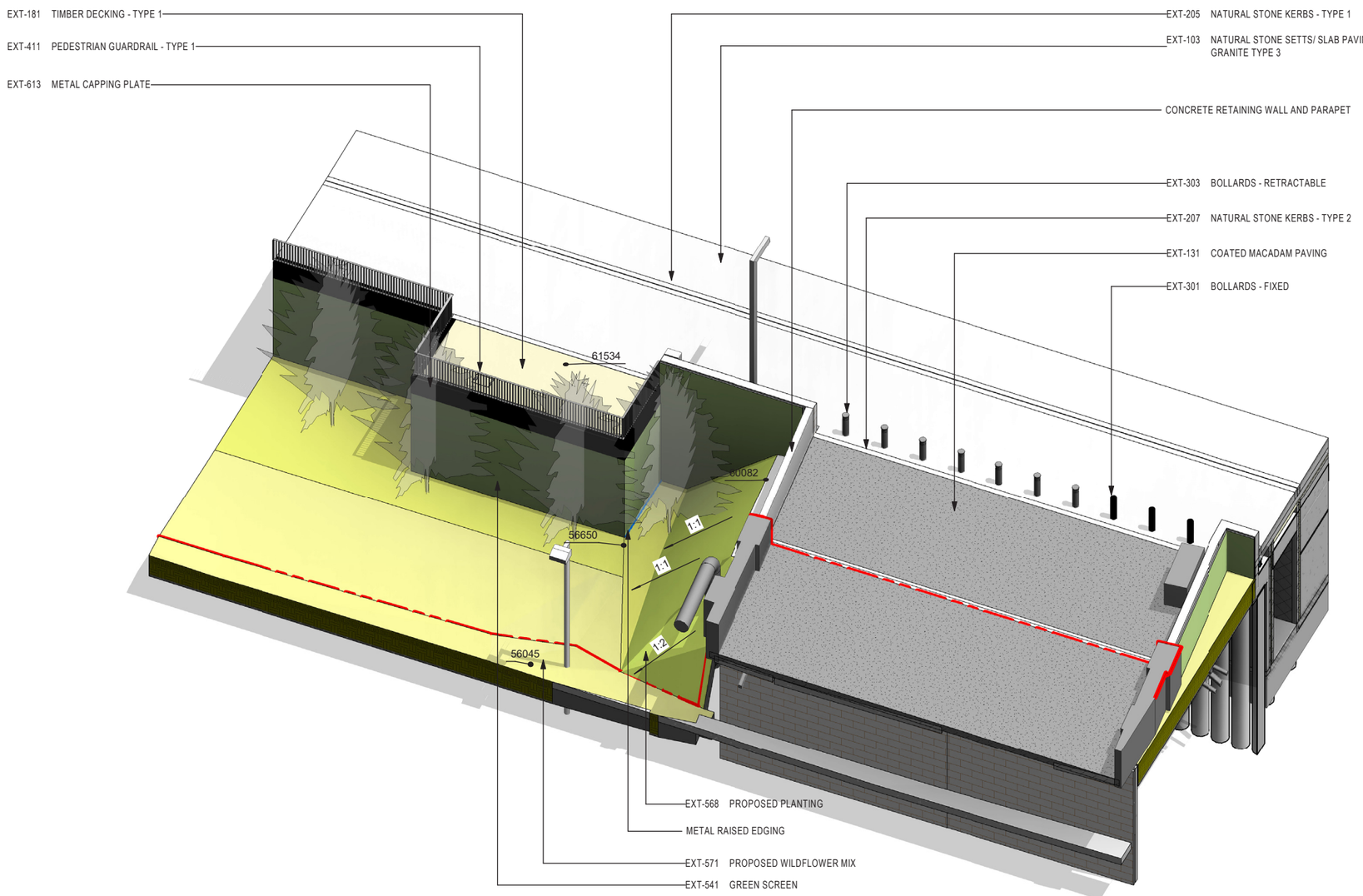
2.2.4 Ashton Canal and Alan Turing Way Junction



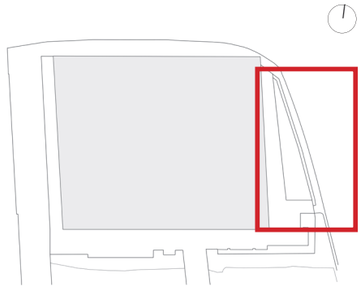


2.2.5 Forge Lane Bridge



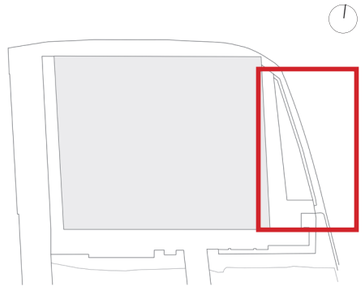


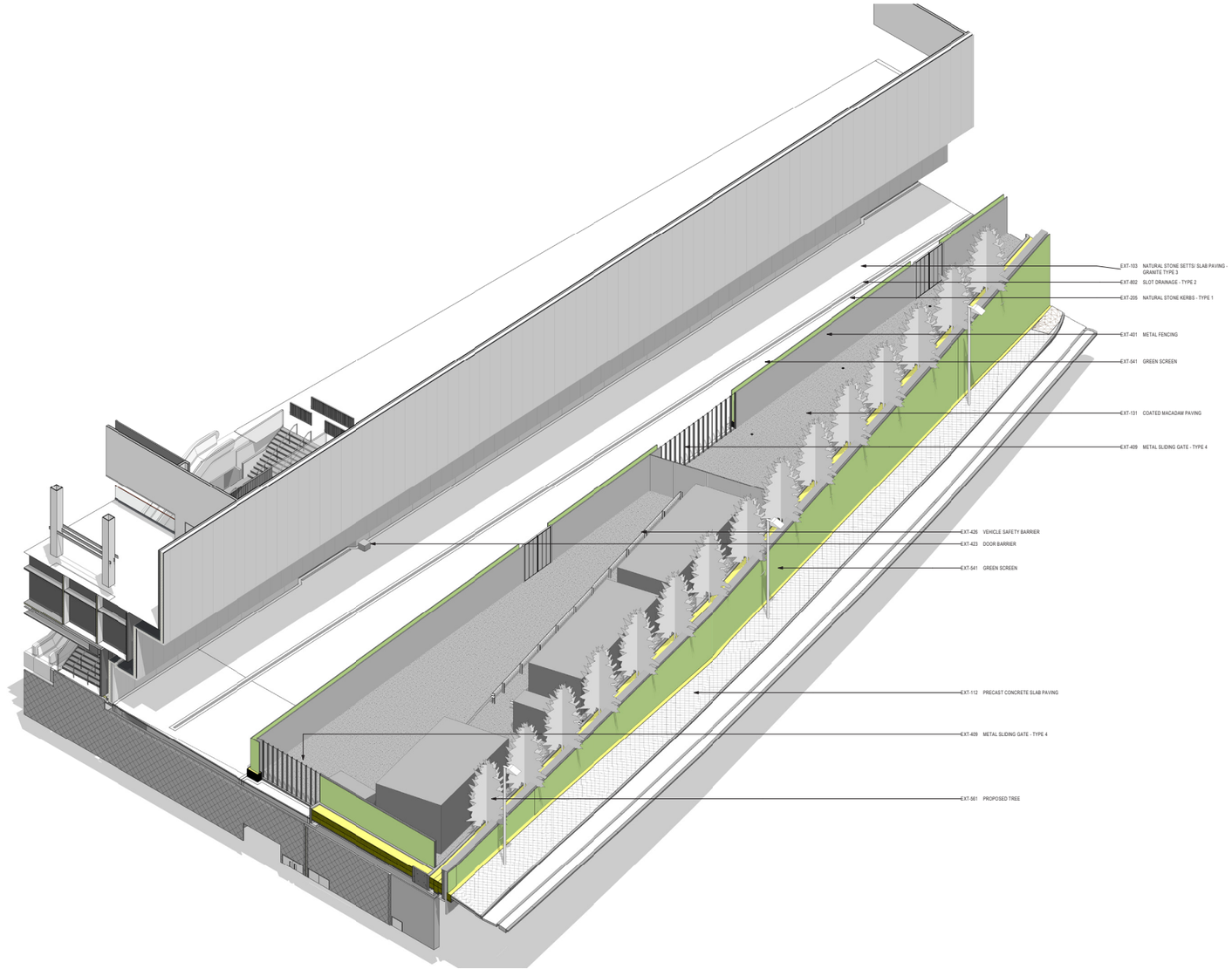
2.2.6 Alan Turing Way (Level 01)



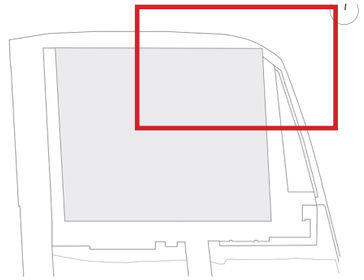


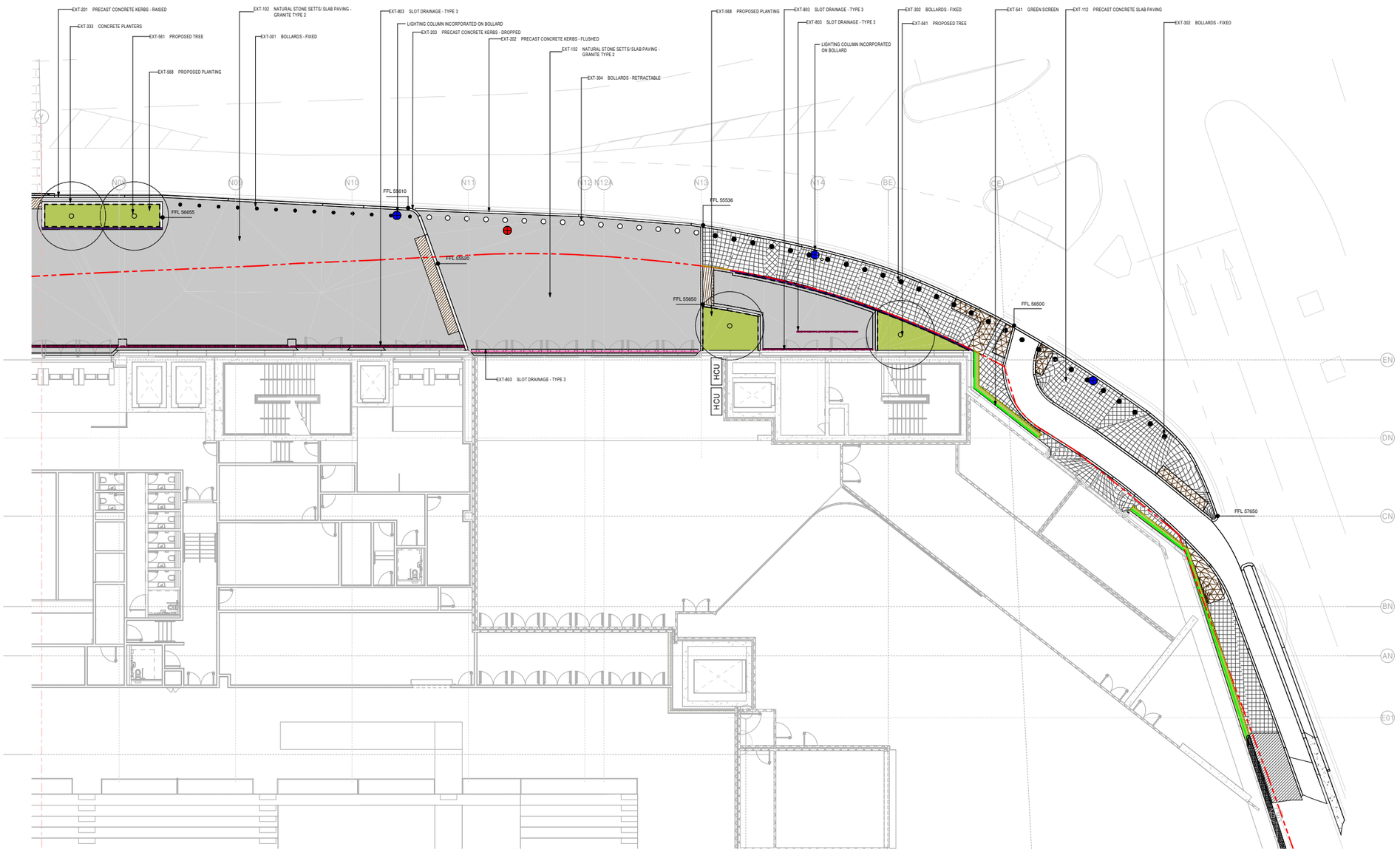
2.2.7 Compound Area



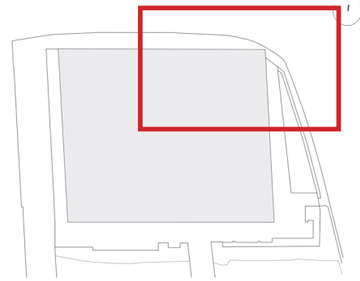


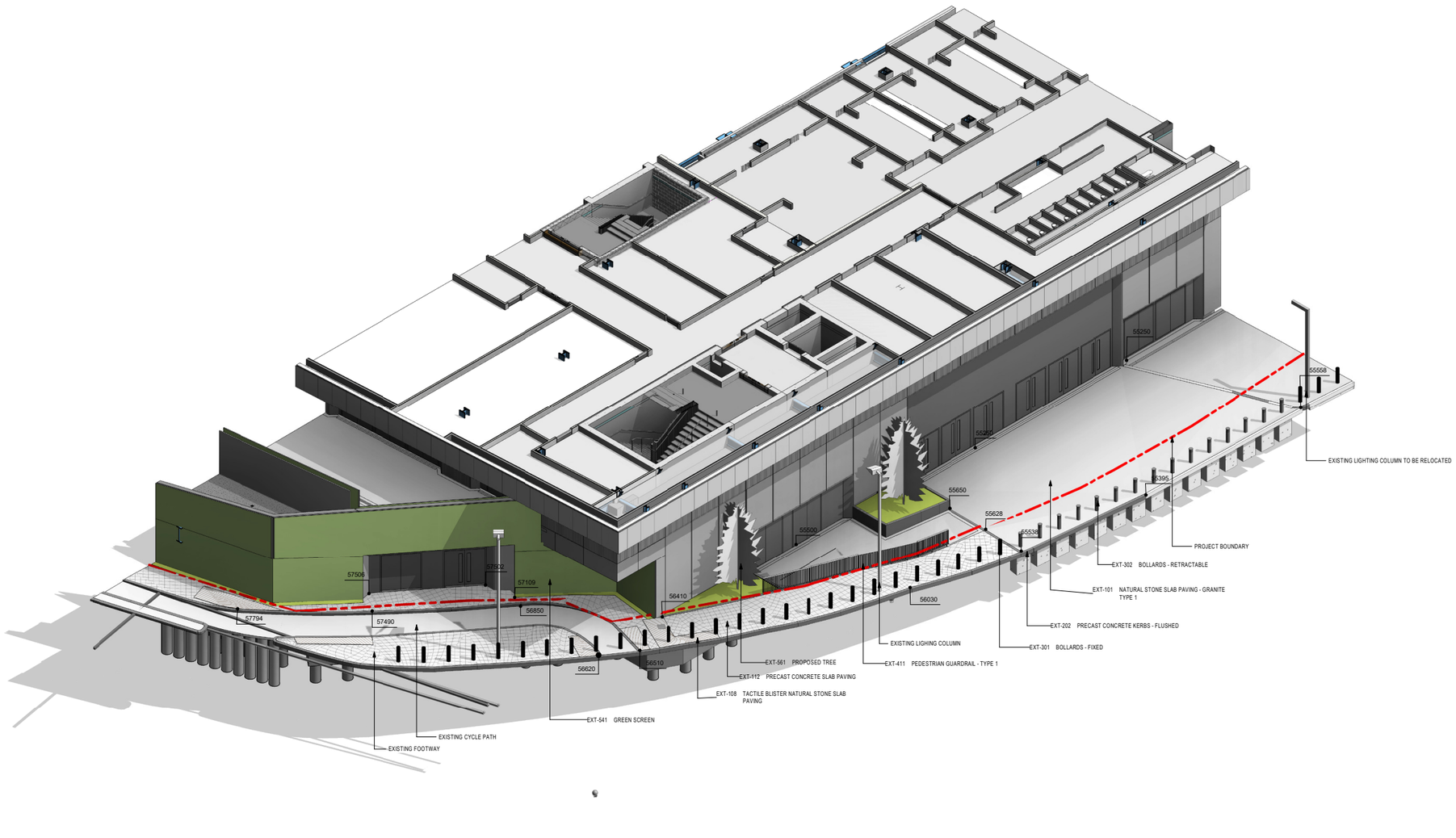
2.2.8 Sportcity Way and Alan Turing Way Junction



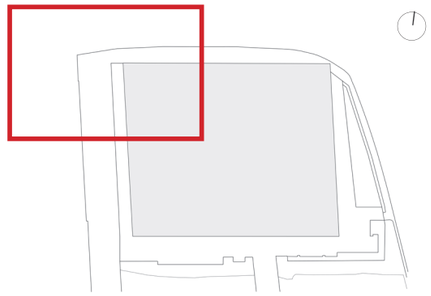


2.2.9 North-East Junction



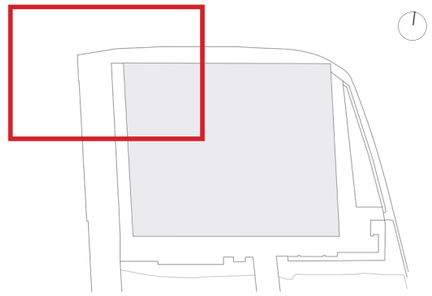


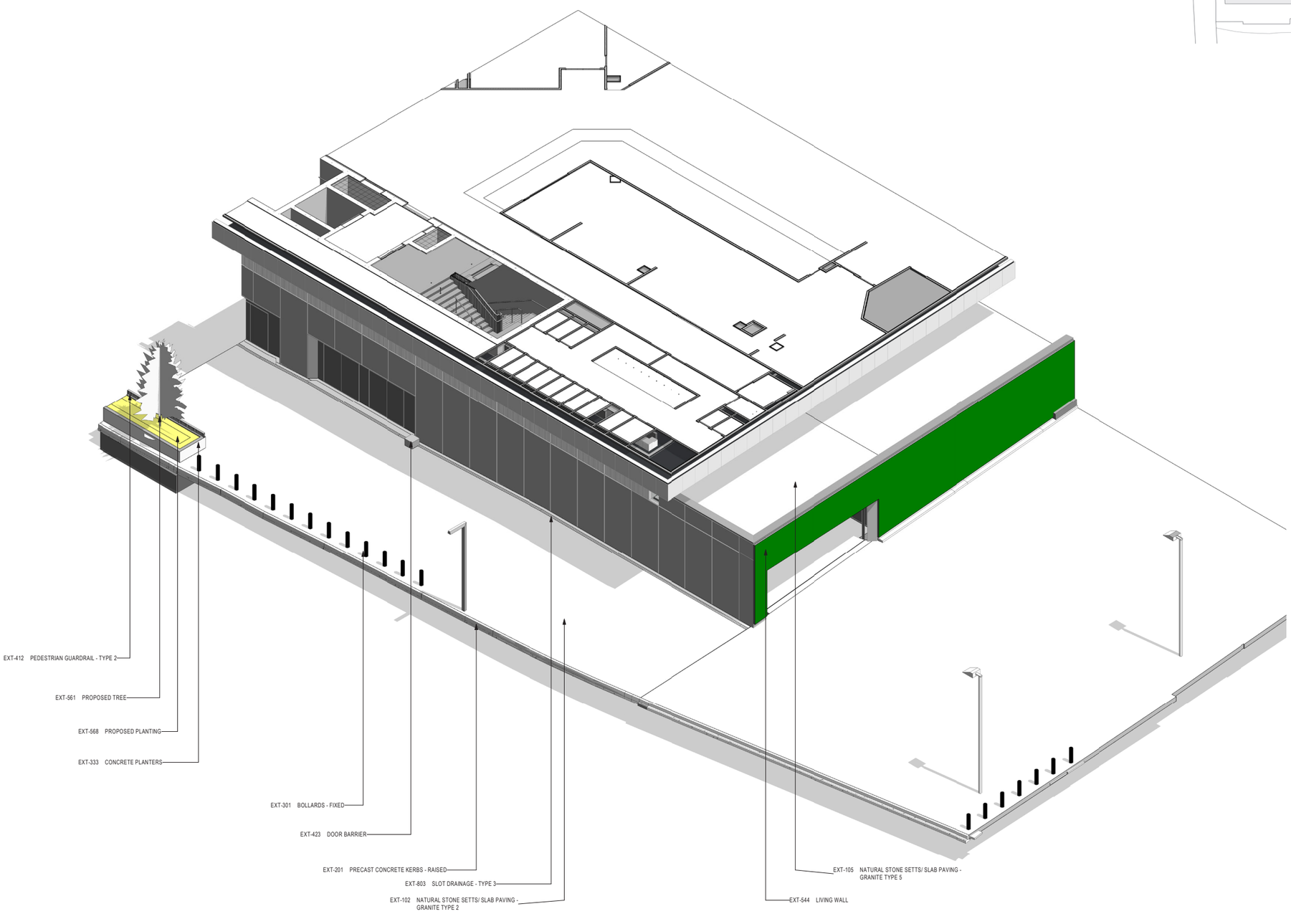
2.2.10 Sportcity Way and Joe Mercer Way Junction



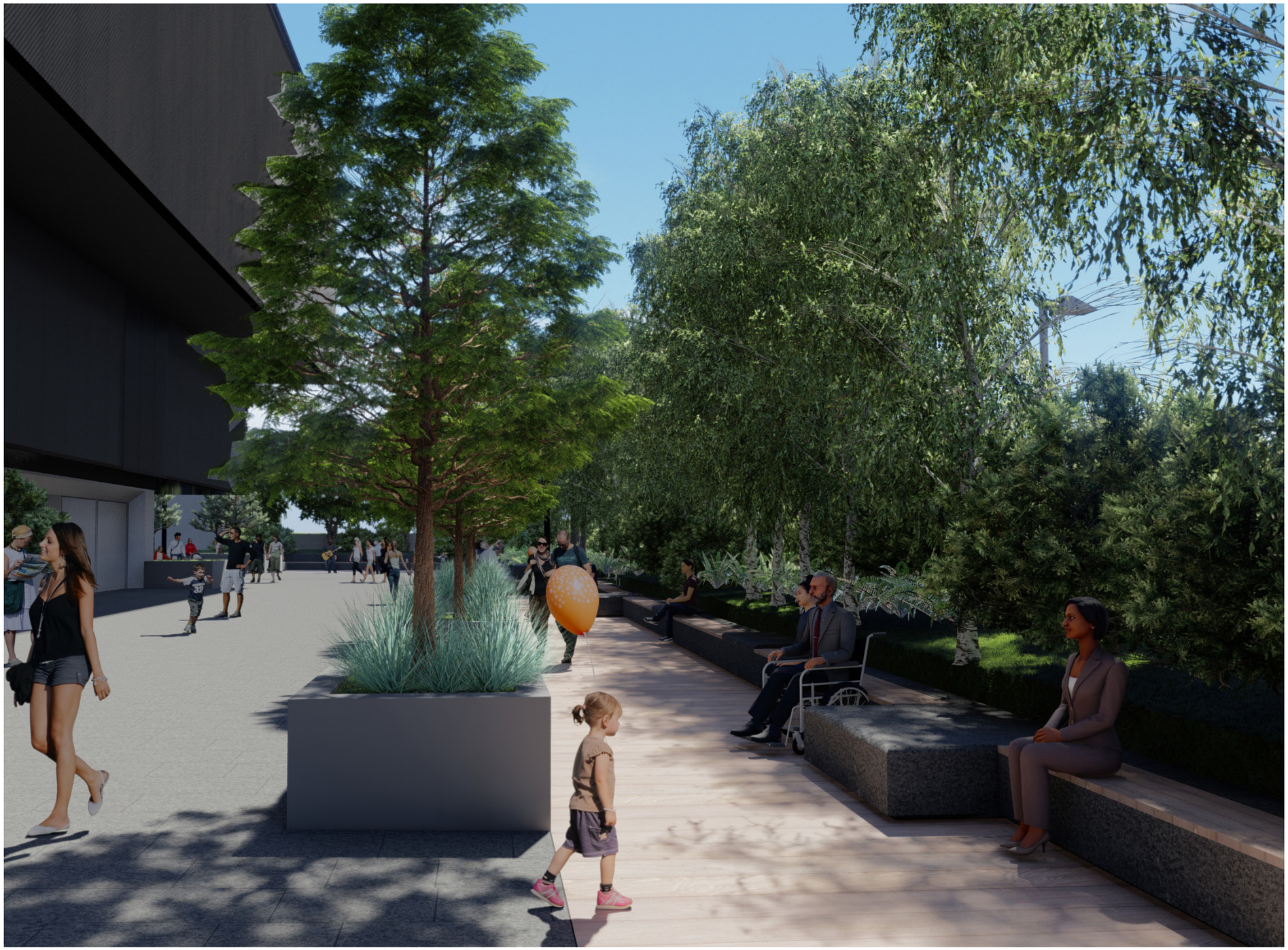


2.2.11 Sportcity Way and Joe Mercer Way Junction Axo





2.2.12 Decking and Seating Area



2.2.13 Tiered Granite Seating Area



HARD LANDSCAPE

2.3.1 HARD LANDSCAPE PLAN & PALETTE 390

2.3.2 PAVING TYPE & GRANITE PAVING PATTERN 392

2.3

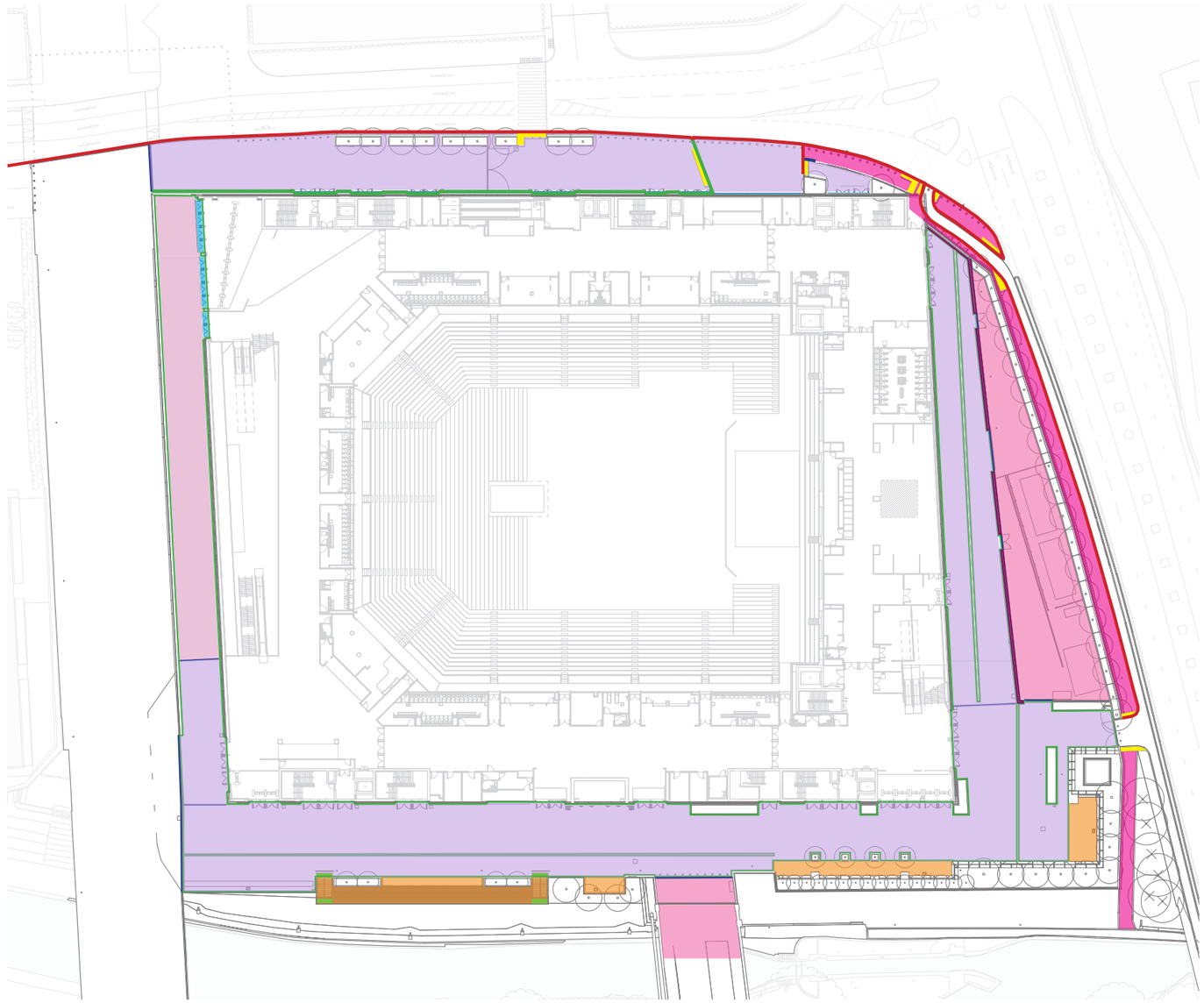
2.3.1 Hard Landscape Plan & Palette

Hard Landscape Strategy

The hard landscape proposal is to create a cohesive picture across the two levels of public realm by using the same paving materials. The considered material palette has been chosen to holistically compliment the overall building design strategy.

Natural stone paving is proposed as the main paving material, acting as a dark canvas hosting general pedestrian movements. Flamed and bush hammered textures are designed with a unique linear pattern, introducting an additional layer of information, guiding users through the landscape.

Timber decking highlights the resting/activation areas inviting users to sit and relax as the material change partially disconnects the user from the crowd flow in darker areas. Anti-slip aggregate insert is integrated in each timber panel to ensure the safety of users when the surface is wet.



KEY:

- EXT-101, EXT-102, EXT-103, EXT-104 Natural Stone Paving (Non-permeable)
- EXT-105, EXT-106 Natural Stone paving (Permeable Bound)
- EXT-131-Tarmac
- EXT-112 Concrete Paving Slabs
- EXT-181, EXT-183 Timber Decking
- EXT-108 Tactile Hazard Warning Studs
- EXT-191 Tactile Hazard Warning Strip Paving
- EXT-205, EXT-207 Stone Kerb
- EXT-211 Metal Raised Kerb
- EXT-221 Metal Edging



EXT-101, EXT-102, EXT-103, EXT-104
Natural Stone Paving (non-permeable)
200x200x80mm,
300x200x80mm,400x200x80mm
6mm joint. Black Granite - Flamed, Bush Hammered



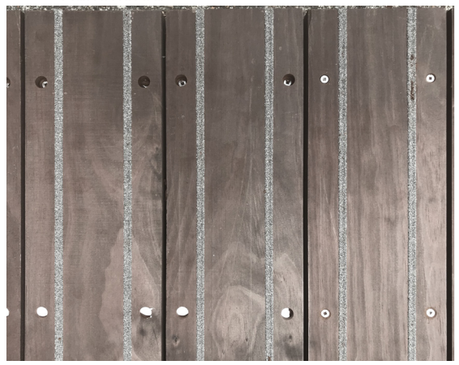
EXT-105, EXT-106 Natural Stone Paving (permeable bound)
200x200x80mm, 300x200x80mm, 400x200x80mm 10mm joint. Black Granite - Flamed, Bush Hammered



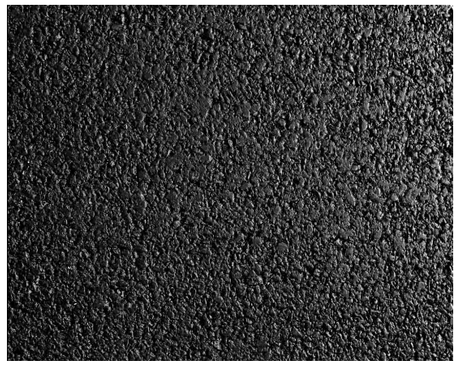
EXT-112 Concrete Paving Slabs
400x4v00x80mm, 5mm joint
Grey Textured Concrete



EXT-191 Tactile Hazard Warning Strips
400x25x5mm
Stainless Steel



EXT-181, EXT-183 Timber Decking
140x40mm, 140x20mm, 5mm joint
with 2 slip resistant aggregate inserts



EXT-131 Tarmac
To match existing



EXT-108 Tactile Warning Studs
25mm diameter
316 Stainless Steel

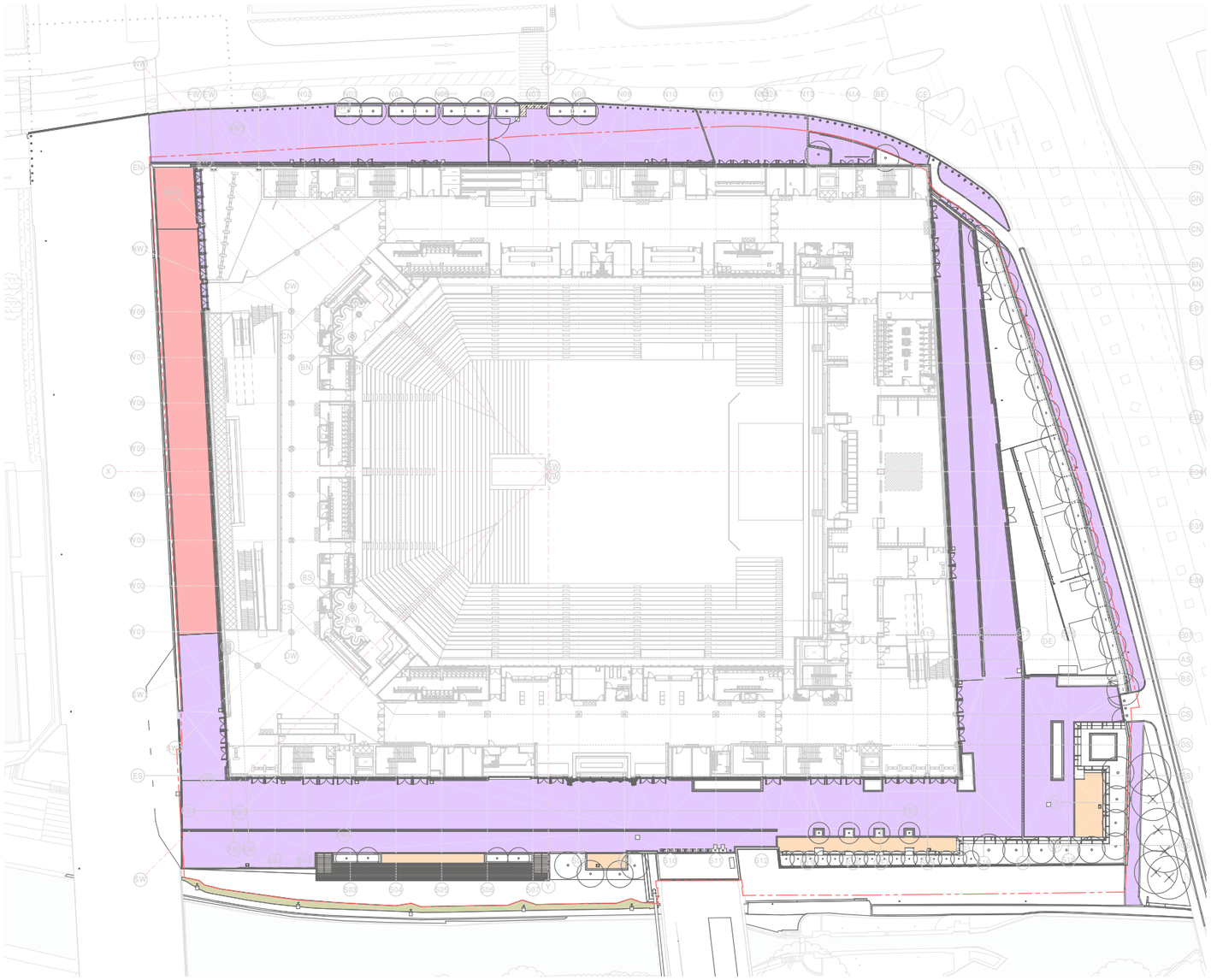


EXT-221 Metal Edging
150mm height. Aluminium

2.3.2 Paving Type & Granite Paving Pattern

The grey coloured aggregate will naturally blend in with the timber, which during the weathering process will naturally fade and slowly turn grey.

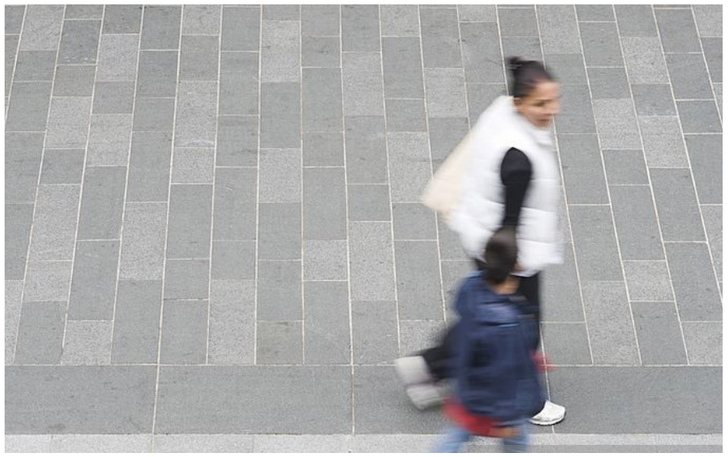
Addressing the need for vermin mitigation, a steel mesh has been introduced under the timber decking.



KEY:

- Impermeable Paving
- Permeable Paving
- Permeable decking

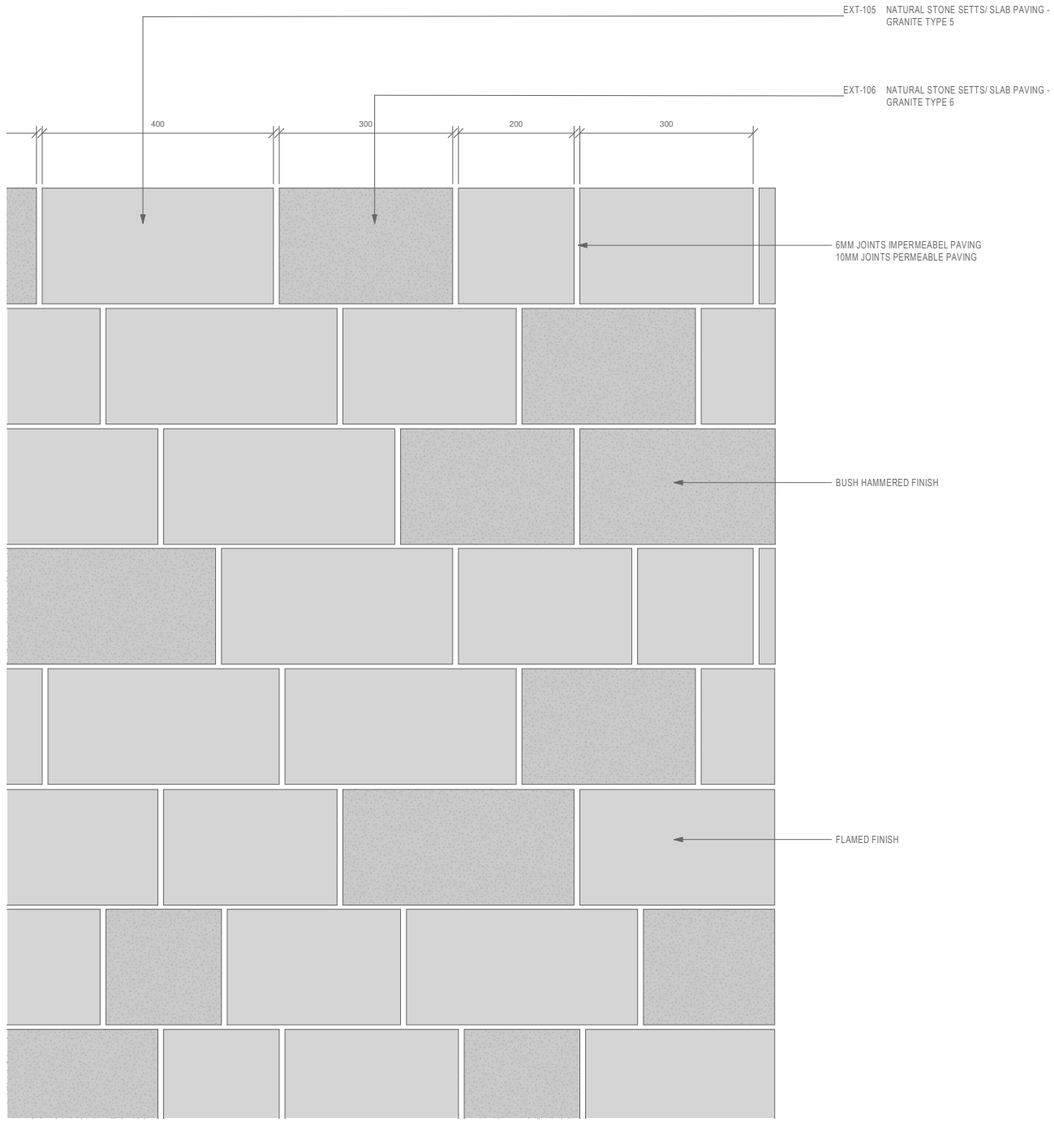
Typical Granite Paving Plan (Ground Floor & Level 01)



Black granite stone paving (dry condition)



Black granite stone paving (wet condition)



SOFT LANDSCAPE

2.4.1 GROUND FLOOR SOFT LANDSCAPE PLAN & PALETTE 396

2.4.2 GROUND FLOOR GREEN SCREEN PLAN & PALETTE 398

2.4.3 LIVING WALL 402

2.4.4 LEVEL 01 SOFT LANDSCAPE PLAN & PALETTE 404

2.4.5 LEVEL 01 GREEN SCREEN PLAN & PALETTE 406

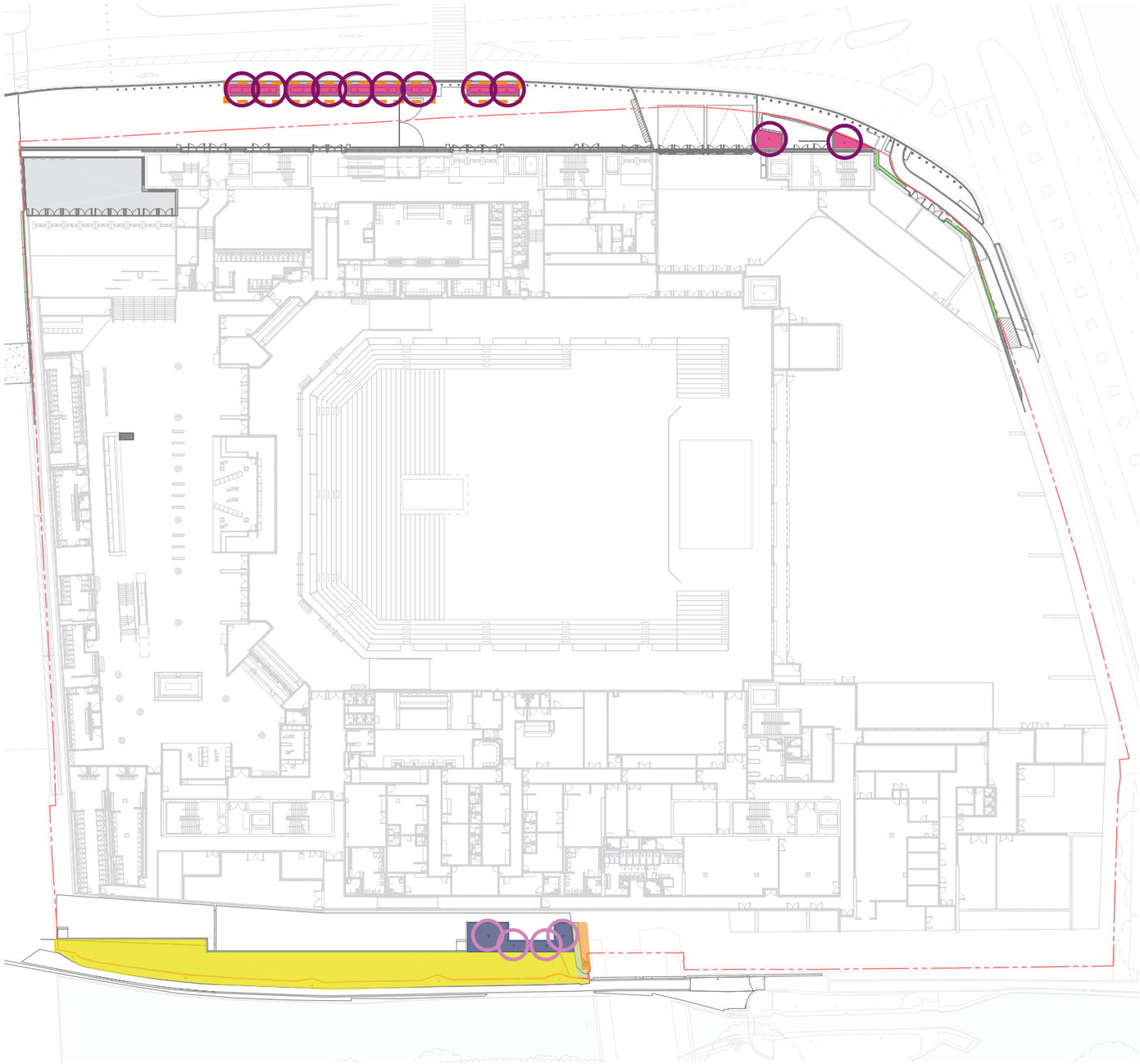
2.4

2.4.1 Ground Floor Soft Landscape Plan & Palette

Soft Landscape Strategy

The soft landscape strategy aims to provide a range of planting with different purposes such as providing shelter, seasonal interest, dense screening, wildlife attraction and wind mitigation. The robust nature of the proposed species reflects the demands of large crowds moving across space.

The biologically diverse meadow and wildflower species connect with existing surroundings by introducing native species, attracting wildlife and reflecting seasonal change while providing a lush look to the visitors walking along Ashton Canal. The southern podium will present understory planting mixes to match the wildflower colours, while the northern side of the site, next to Sportcity Way, will introduce shade tolerant vegetation due to the shadow that the architecture casts on the public realm.



KEY:

- Project Boundary
- EXT-561 *Acer campestre*
- EXT-561 *Pinus sylvestris*
- EXT-568 Planting Mix A
- EXT-568 Planting Mix B
- EXT-568 Planting Mix C
- EXT-571 Wildflower Mix
- EXT-525 Root Space Structure



EXT-561 Proposed Tree
Acer campestre



EXT-561 Proposed Tree
Pinus sylvestris



EXT-525 Root Space Structure



EXT-568 Planting Mix A
Achillea 'Terracotta'



EXT-568 Planting Mix A
Linaria vulgaris



EXT-568 Planting Mix A
Liriope muscari 'Monroe White'



EXT-568 Planting Mix C
Dryopteris erythrosora



EXT-568 Planting Mix C
Polystichum munitum



EXT-568 Planting Mix C
Skimmia japonica 'Nymans'



EXT-571 Wildflower Mix
Knautia arvensis



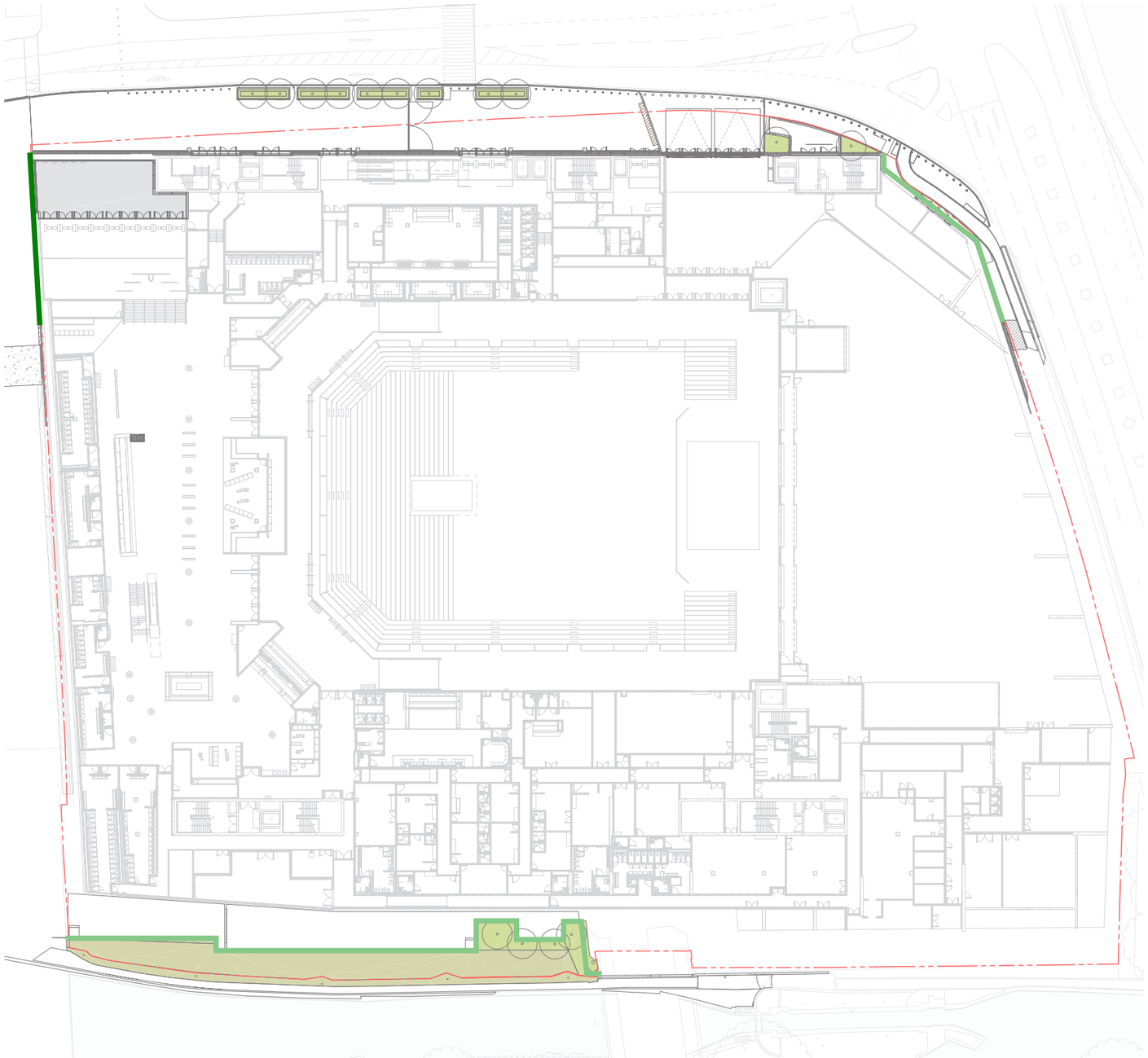
EXT-571 Wildflower Mix
Lotus corniculatus



EXT-571 Wildflower Mix
Veronica spicata subsp. Hybrida

2.4.2 Ground Floor Green Screen Plan & Palette

Green screen is introduced and provides an enhanced green approach along the entire southern interface, working as the backdrop of wild flowering. It also provides a softer edge on the compound fence and along Alan Turing Way making the building stand out from the greenery. The green screens are supplied as a pre-grown panel at 3m height with 80% green coverage. Evergreen Ivy is selected to ensure the year-round visual interest. Green screen is also one of the main features that contribute to Biodiversity Net Gain across the site.



KEY:

- Project Boundary
- EXT-541 Green Screen
- EXT-544 Living Wall

Green Screen Modules



Pre-cultivated screen panels: 1200x3000mm



Full coverage after one year

Green Screen Palette



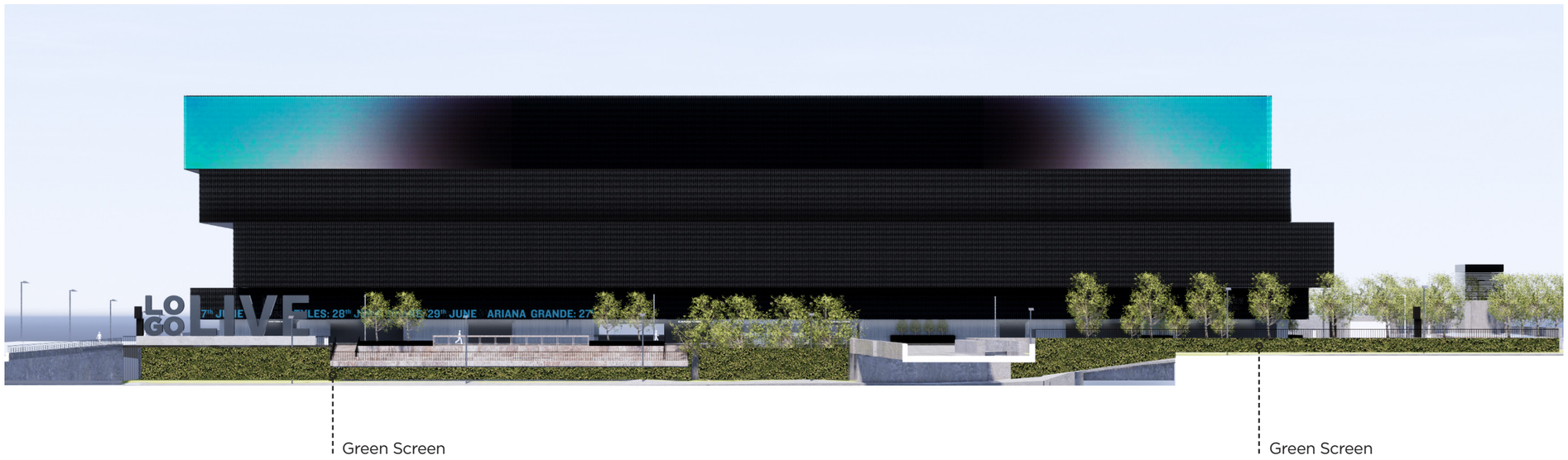
Hedera helix ‘Woerner’

Living Wall

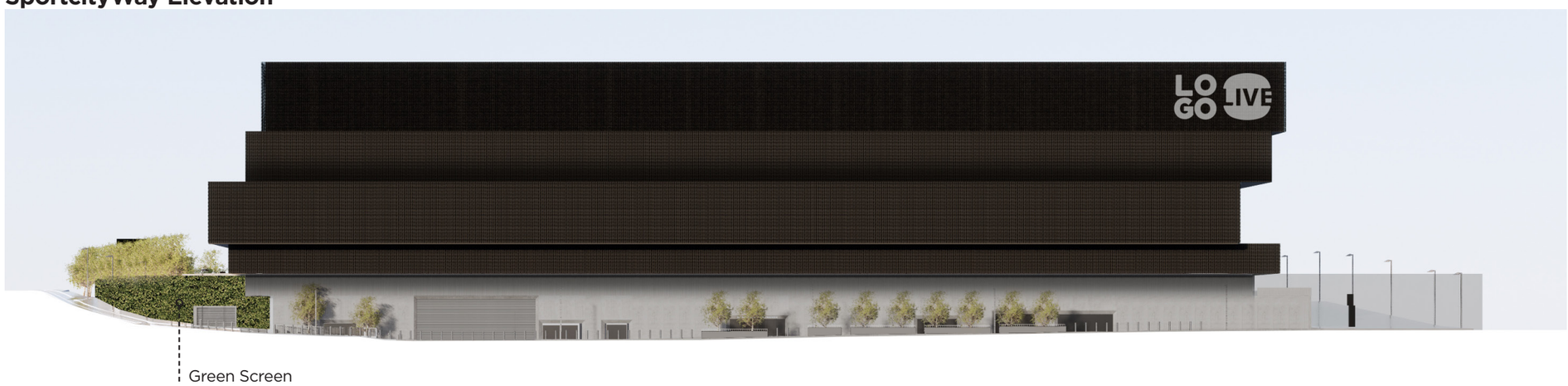


Living wall

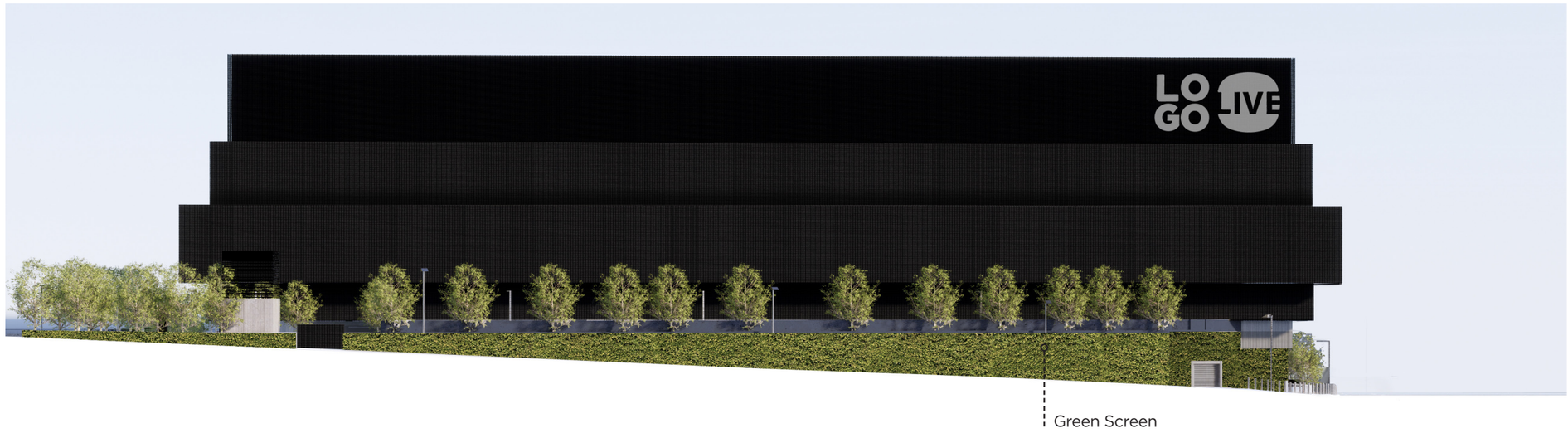
Ashton Canal Elevation



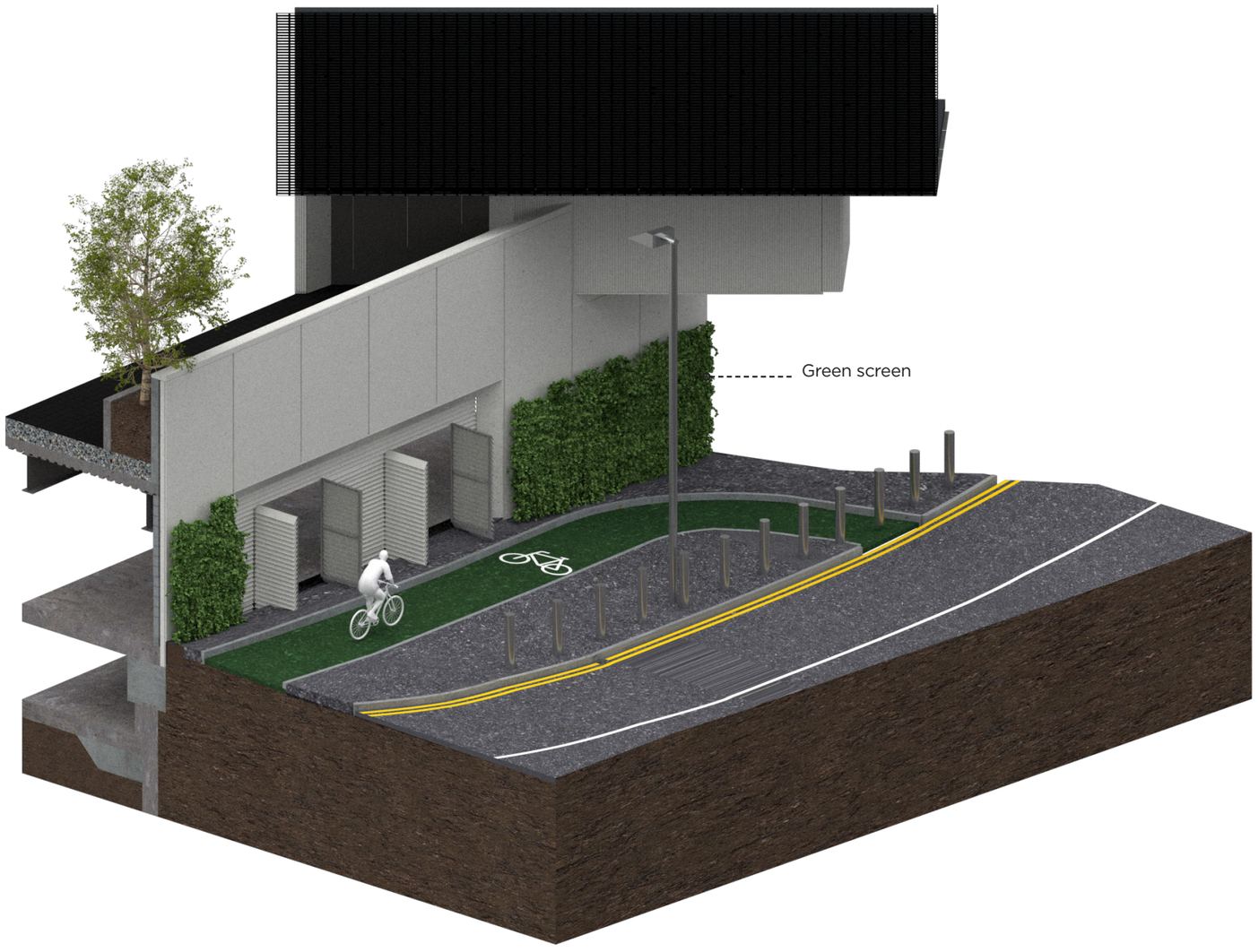
SportcityWay Elevation



Alan Turing Way Elevation

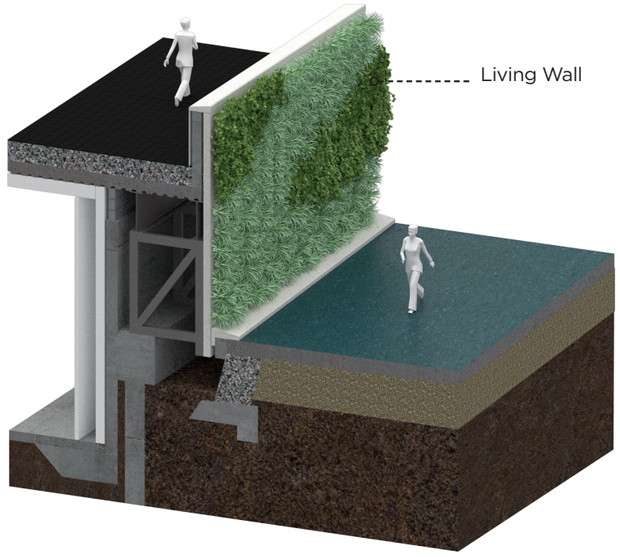


Alan Turing Way Junction AXO (Louvred Substation)



2.4.3 Living wall

The living wall, acts a ‘green corridor’ for Joe Mercer Way, creating a powerful visual statement on arrival. It covers the entire length of the facade which encapsulates the north-west Joe Mercer Way entrance. Compared with green screens, the look and feel of the living wall is much more sophisticated, with a dynamic and visually appealing quality. The living wall forms a ‘vertical garden’ which comes with strong seasonal colour changes due to it's modular construction, allowing for a range of different plants to be imbedded into the facade. The planting design can be changed at any time to replace dead plants or suit various needs such as an event or a naming rights partner. Lastly, the living wall demonstrates an important sustainability message and social responsibility.

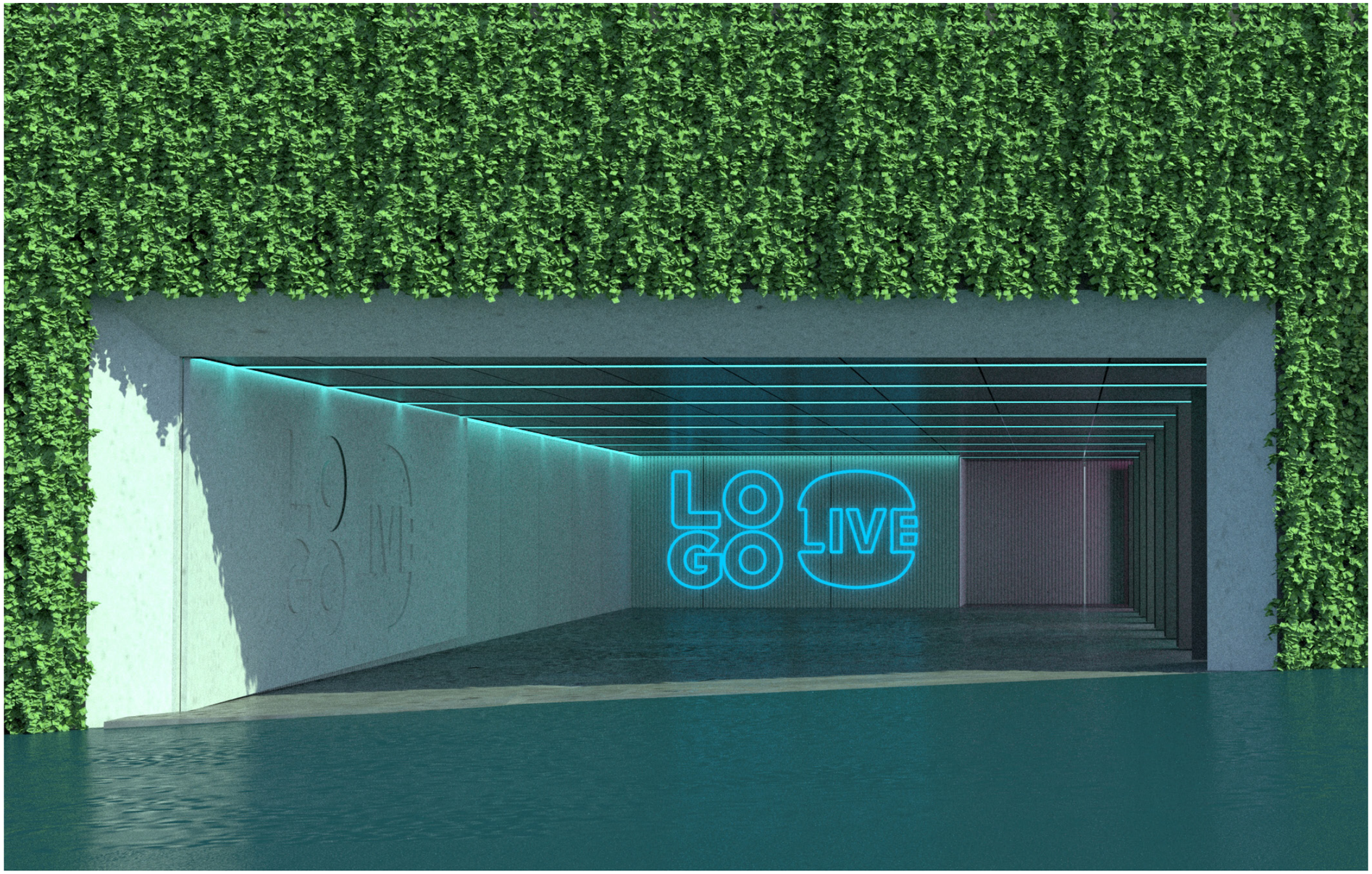




Joe Mercer Way Elevation



Joe Mercer Way Entrance

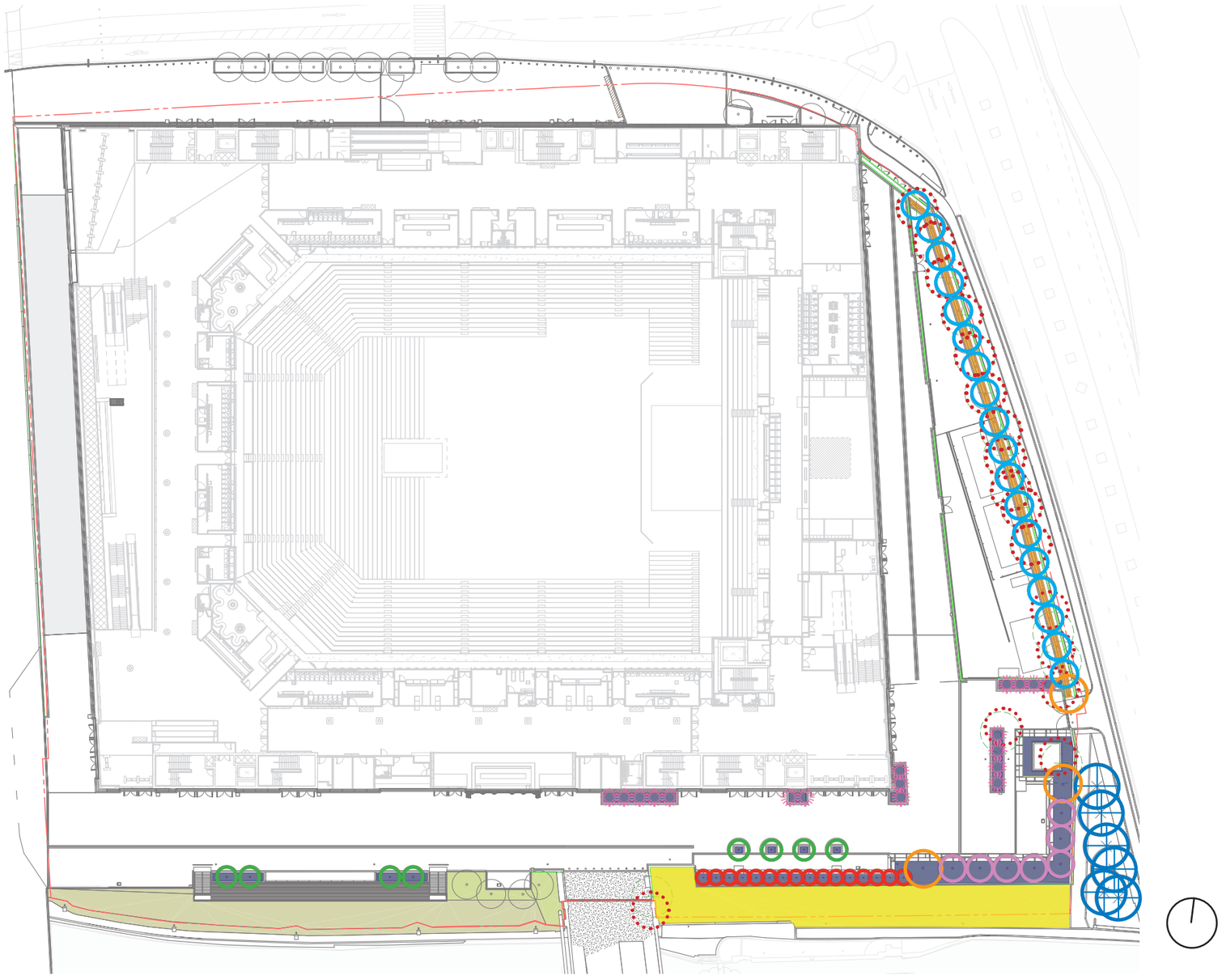


2.4.4 Level 01 Soft Landscape Plan & Palette

The chosen vegetation for wind mitigation features mature, robust and wind tolerant trees and shrubs. Evergreen trees are selected to provide shelter and create comfortable human experiences suitable for the proposed uses of space. Shrubs and short trees will play an important role in creating pockets of character and shelter from wind on site as well.

KEY:

- Project Boundary
- EXT-561 *Betula pendula*
- EXT-561 *Magnolia grandiflora*
- EXT-561 *Pinus sylvestris*
- EXT-561 *Sorbus aria*
- EXT-561 *Tilia cordata*
- EXT-565 *Prunus lusitanica*
- EXT-568 Planting Mix A
- EXT-568 Planting Mix B
- EXT-571 Wildflower Mix
- Existing Tree To Be Retained
- Existing Tree To Be Removed





EXT-561 Proposed Tree
Magnolia grandiflora



EXT-561 Proposed Tree
Pinus sylvestris



EXT-561 Proposed Tree
Sorbus aria



EXT-561 Proposed Tree
Tilia cordata



EXT-565 Proposed Shrubs
Prunus lusitanica



EXT-568 Planting Mix A
Achillea 'Terracotta'



EXT-568 Planting Mix A
Liriope muscari 'Monroe White'



EXT-568 Planting Mix B
Pachysandra terminalis 'Green Carpet'



EXT-568 Planting Mix B
Philadelphus 'Belle Etoile'



EXT-568 Planting Mix B
Viburnum tinus

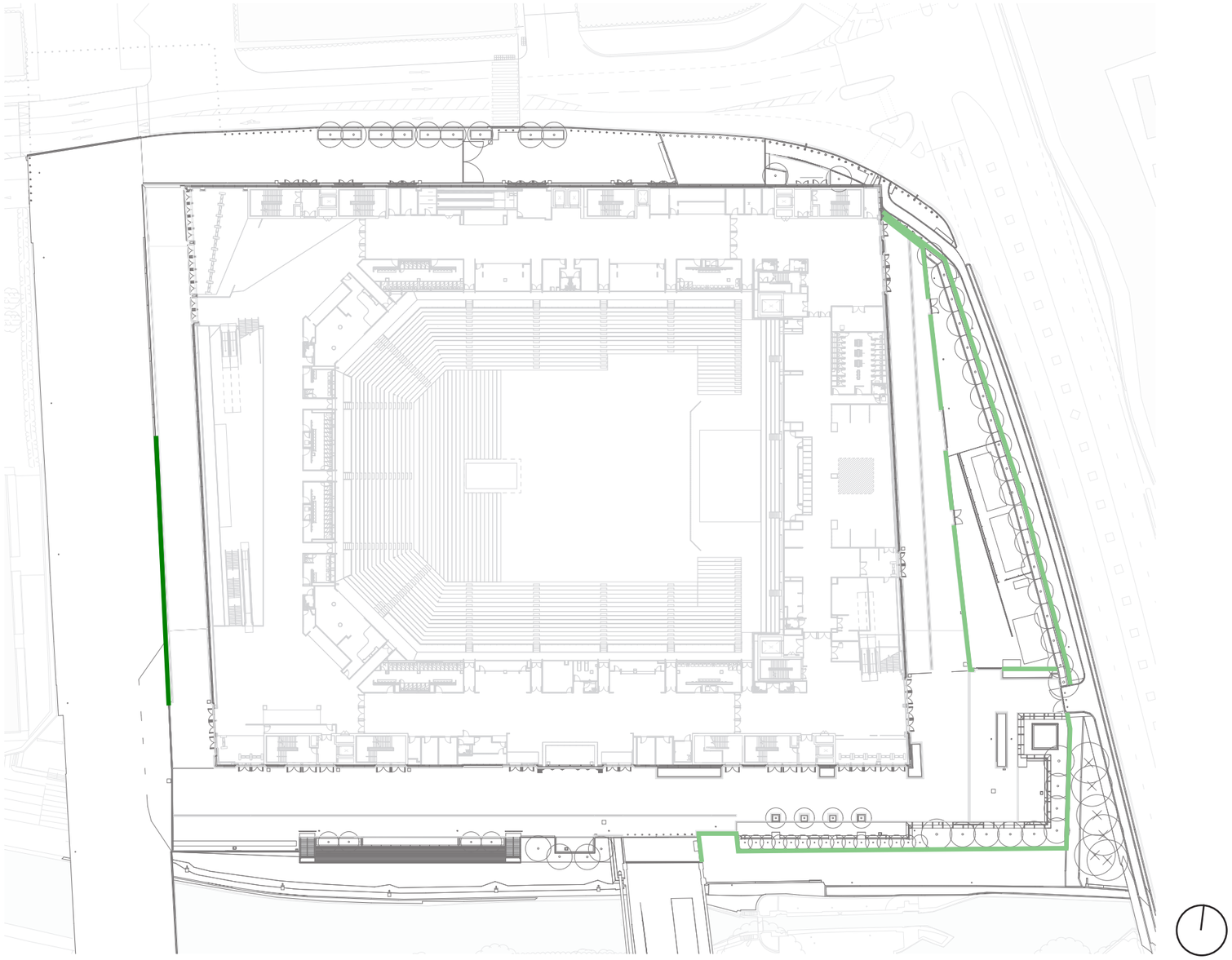


EXT-571 Wildflower Mix
Lotus corniculatus



EXT-571 Wildflower Mix
Veronica spicata subsp. Hybrida

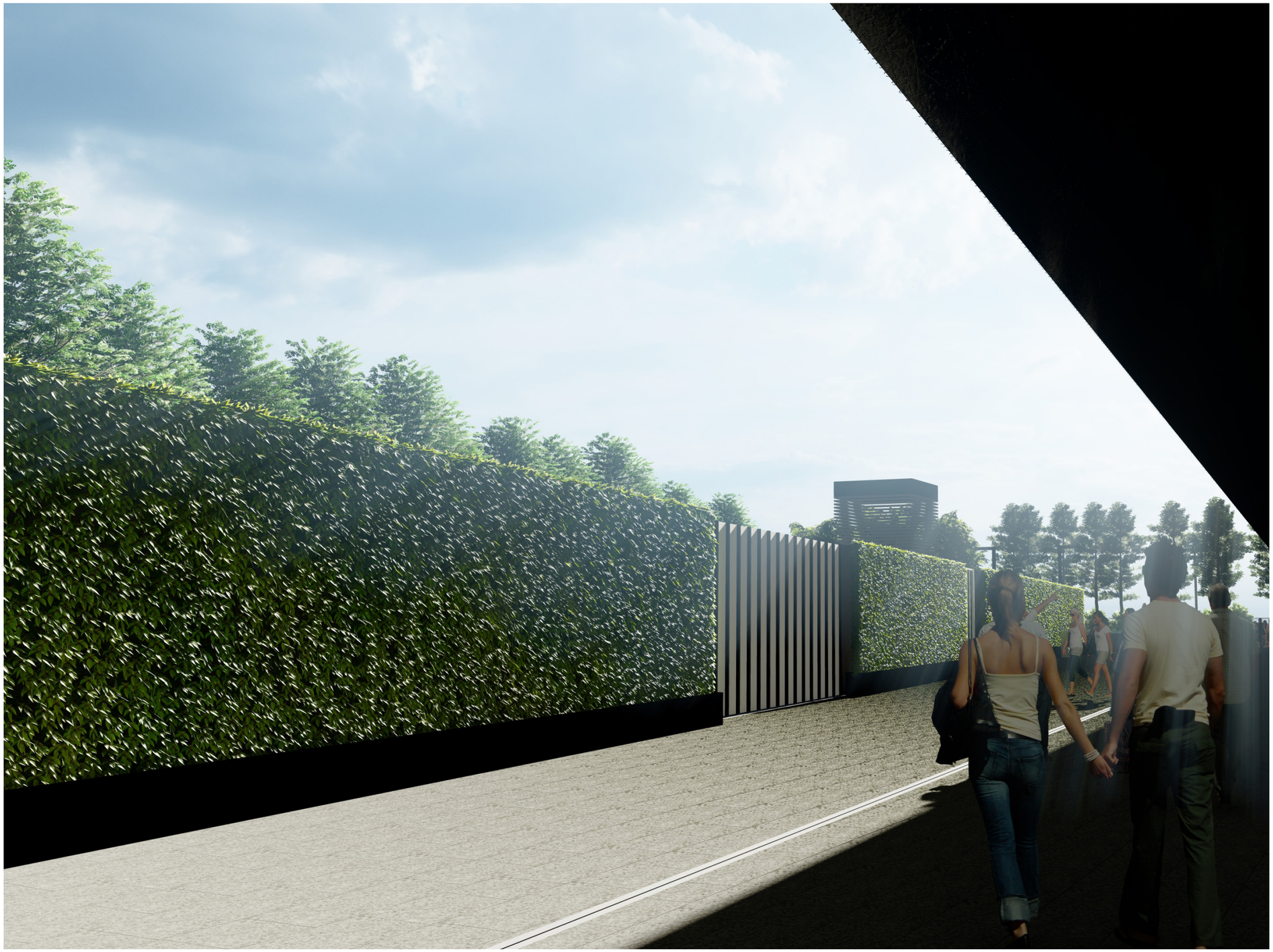
2.4.5 Level 01 Green Screen Plan & Palette



KEY:

EXT-541 Green Screen

EXT-544 Living Wall



STREET FURNITURE

2.5.1 STREET FURNITURE PLAN & PALETTE 410

2.5.2 TIMBER TIERED DECKING DETAILS 412

2.5

2.5.1 Street Furniture Plan & Palette

Street Furniture Strategy

The street furniture strategy focuses on simplifying colours and tones to connect with the building.

Black natural stone is used for the seating wall to bring a natural touch and interact with the rest of the scheme by linking to its dark tones.

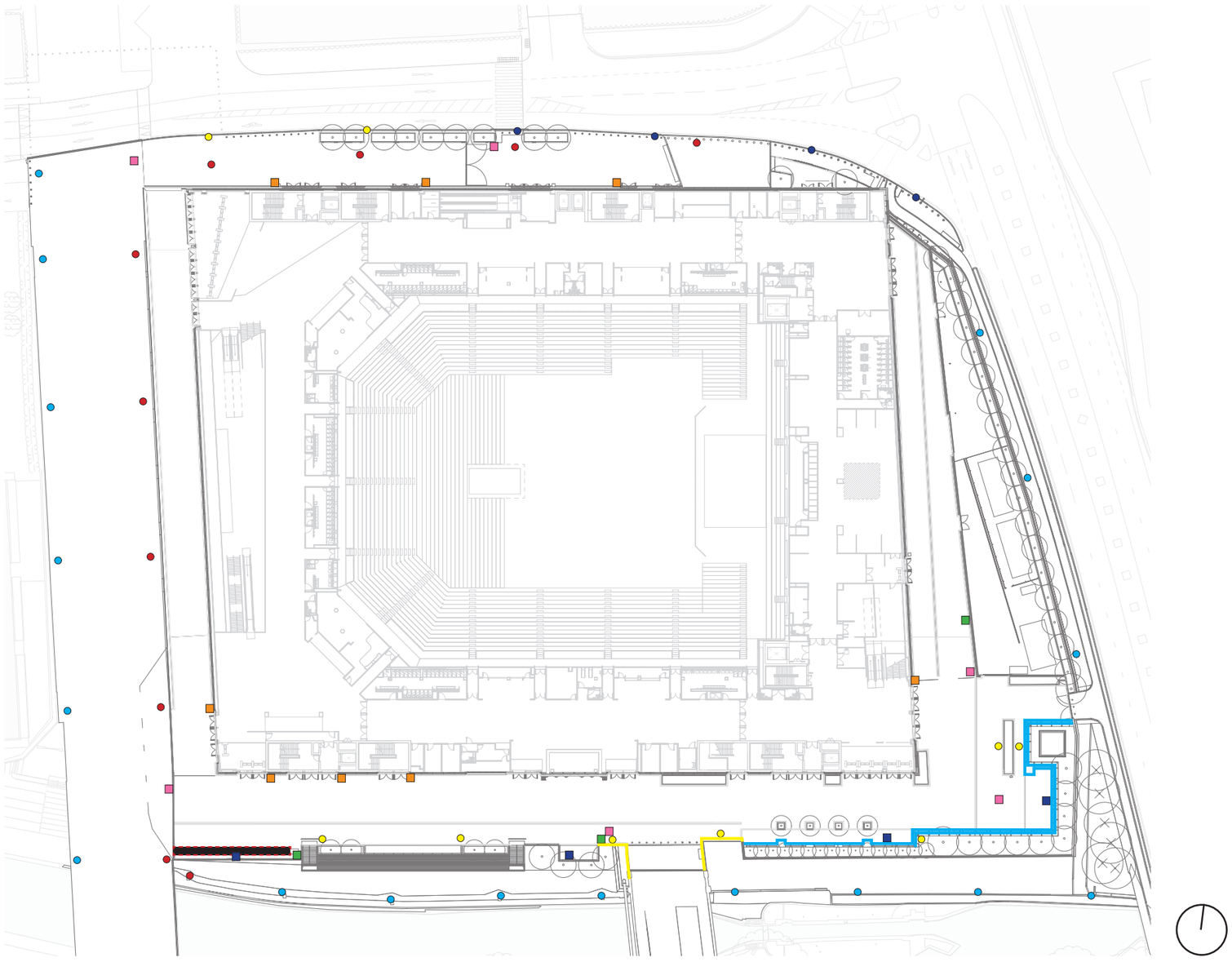
Bins and wayfinding totems are also coloured in black to match the rest of the materiality and bring a cohesive language.

Moreover, floorboxes are integrated with paving and finished with the same material to provide a seamless design and integrate all the elements with a clean look.

Timber tiered seating is introduced as cantilevered steps with a supporting structure towards Ashton Canal. An inviting viewing point is presented to provide opportunities for formal/informal seating, being able to be used in many ways. The tiered element will play a major role in the scheme as a result of its location, orientation, materiality and use opportunities. In order to achieve the minimal look of this space, the handrail is featured with railing that is made of the same timber and with LED integration.

KEY:

- EXT-311 Natural Stone Seating Wall
- EXT-321 Litter Bin
- EXT-471 In Situ Concrete Wall
- EXT-194 Floor Box
- Wayfinding Totem
- EXT-423 Door Barrier
- Location for Naming Rights Signage





EXT-311 Natural Stone Seating Wall
Black Granite, Flamed.
Integrated LED, recessed anti skate slot.



EXT-321 Litter Bin
850x745x485mm
Black Powder Coated Steel



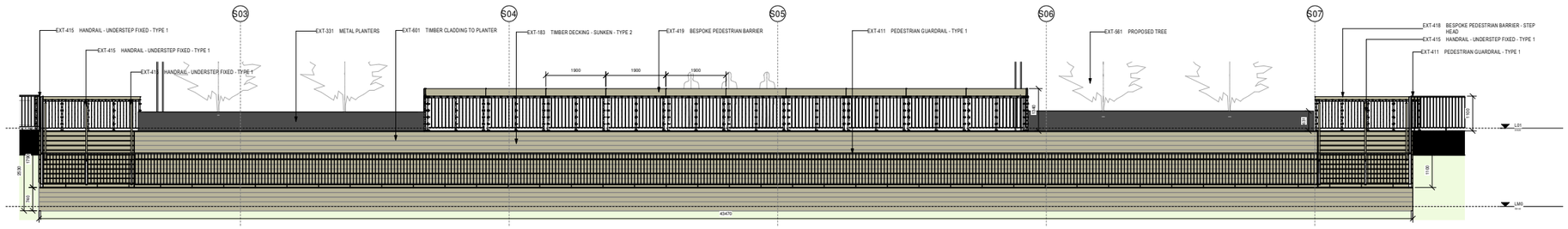
EXT-194 Floor Box



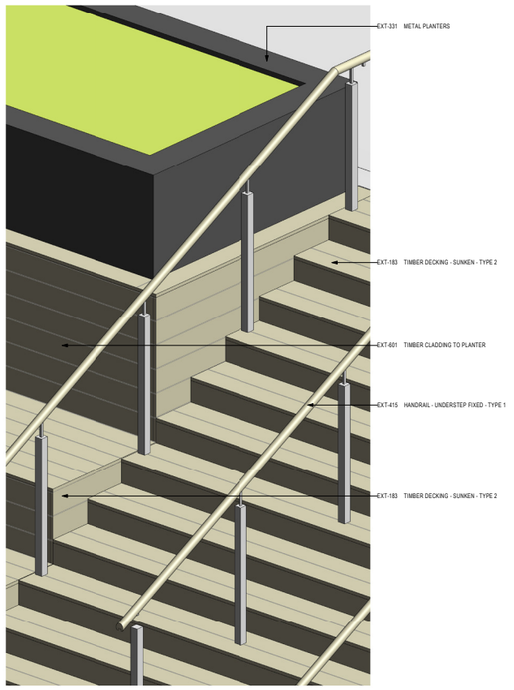
Wayfinding Totem

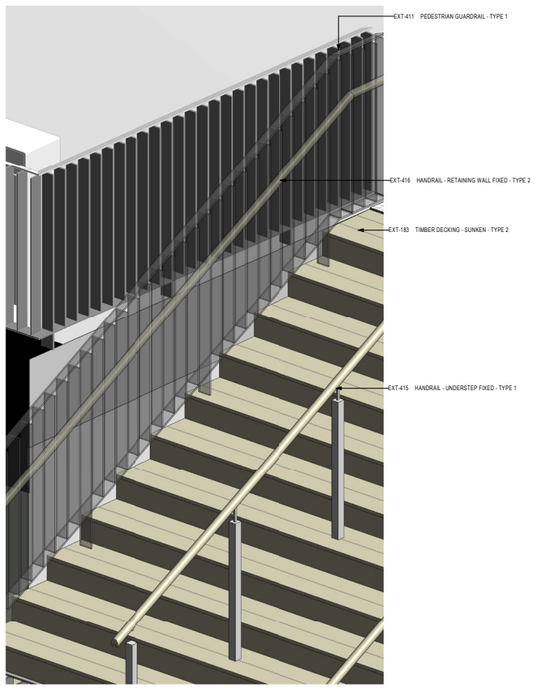
2.5.2 Timber Tiered Decking Details

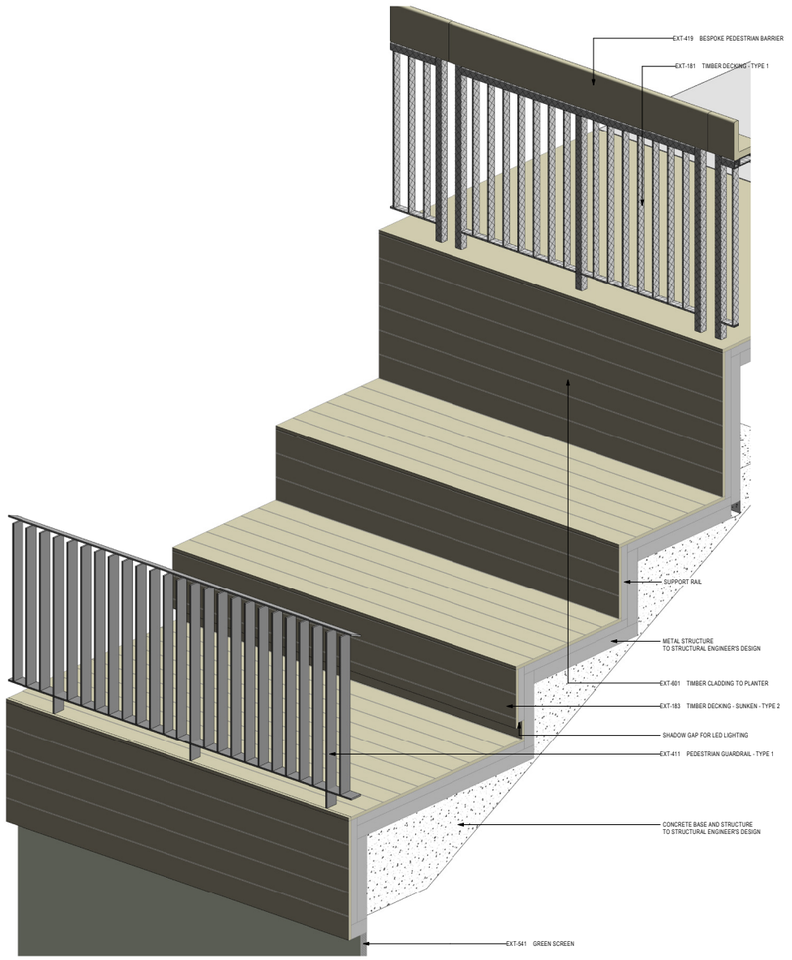
Timber Tiered Decking Elevation (Level 01)



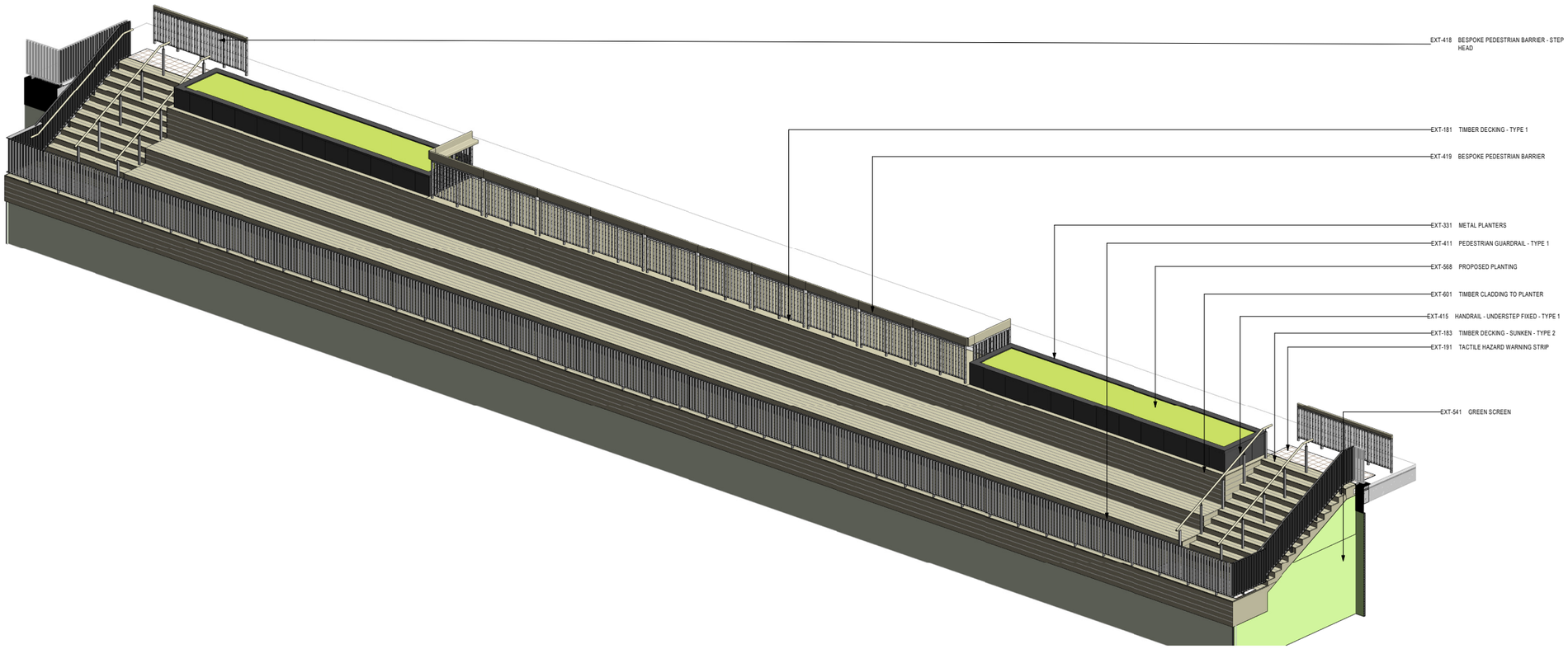
Timber Tiered Decking Step/Handrail/Balustrade







Timber Tiered Decking AXO (Level 01)



PLANTERS

2.6.1 PLANTERS PLAN & PALETTE 410

2.6

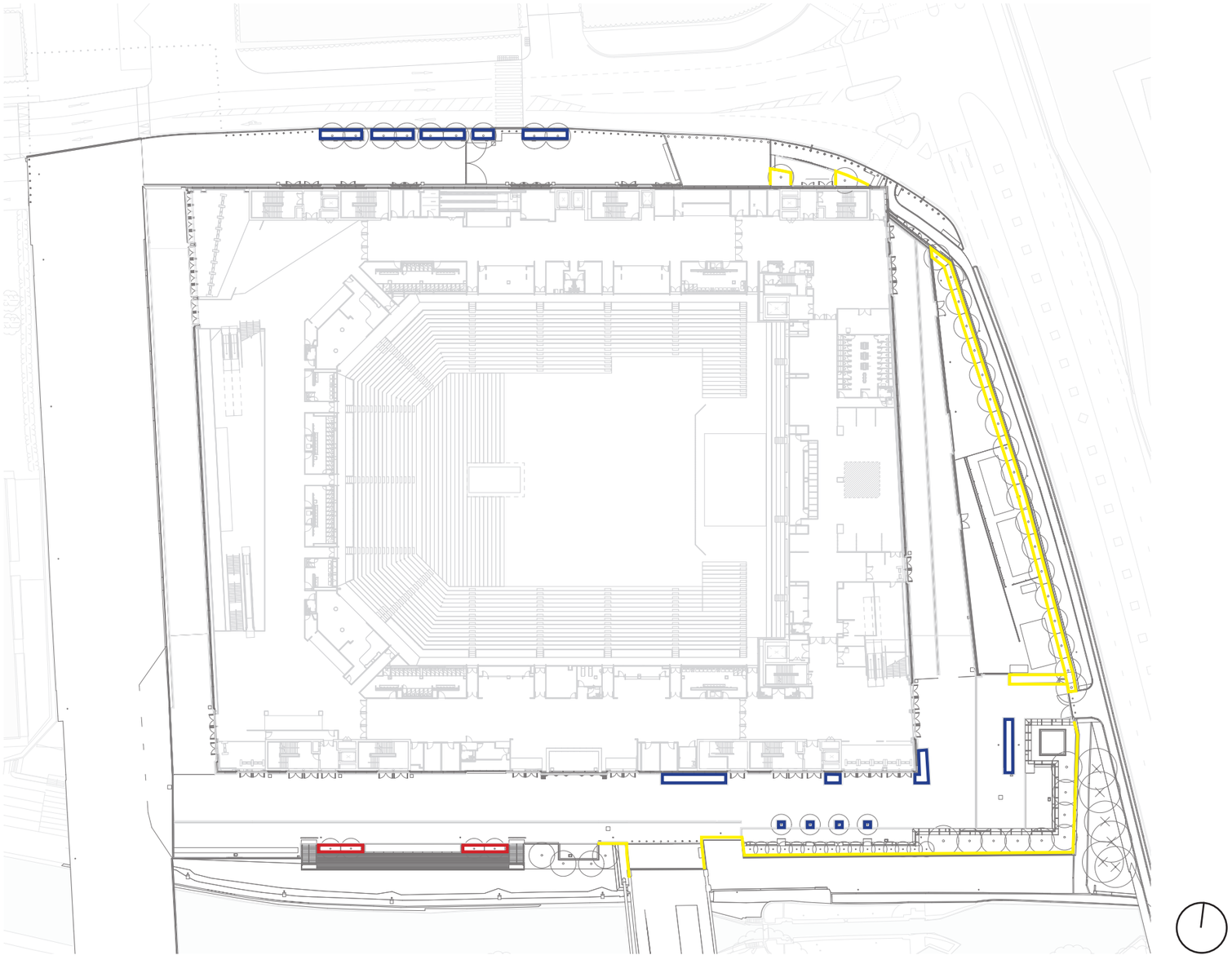
2.6.1 Planters Plan & Palette

Planters Strategy

Planters are designed with three different finishes in order to work cohesively with the other elements.

Metal planters are powder coated in black to connect with the dark materiality of the landscape strategy. They will provide a smooth edge above the timber decking that links with the facade.

Concrete planters are divided into two groups according to their visibility. The visible planters that interact directly with visitors have a finish that matches the facade in colours and texture to ensure they are perceived as a part of it.



KEY:

- EXT-331 Metal Planters
- EXT-333 Pre-cast Concrete Planters
- EXT-471 In Situ Concrete Planters



EXT-331 Metal planters
Black Powder Coated Steel



EXT-471 In Situ Concrete Wall
Natural colour, Plain finish



EXT-333 Concrete Planters
To match facade concrete finish

EXTERNAL METAL WORKS

2.7.1 METAL WORKS PLAN & PALETTE 420

2.7.2 TYPICAL PEDESTRIAN BARRIER DETAILS 422

2.7

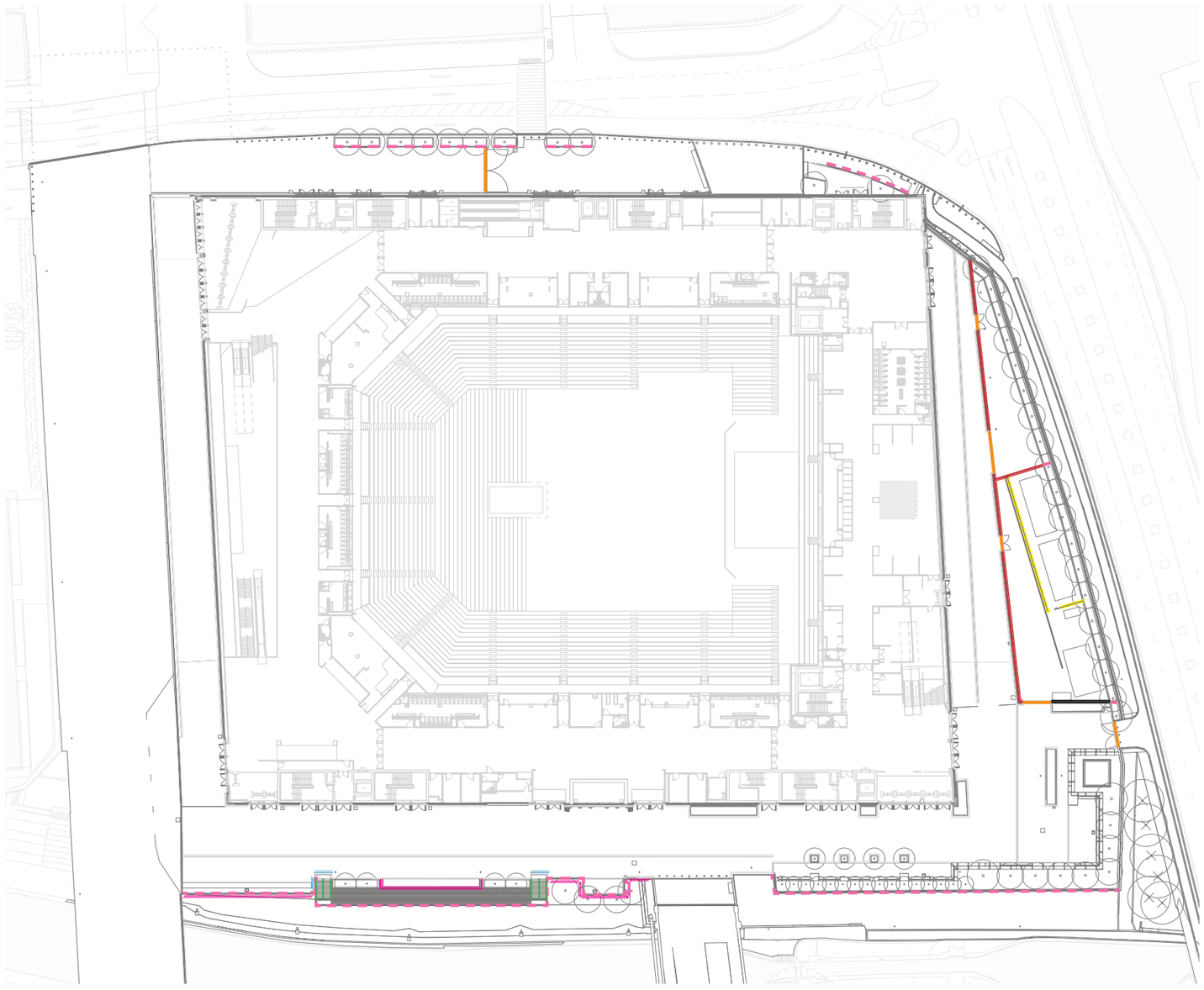
2.7.1 Metal Works Plan & Palette

Metal Works Strategy

All metalwork elements share the same language and design to create an integrated scheme that links with the building's dark material palette and colours.

Balustrades follow the same design guidelines used in the interiors but are adapted to have an external look and function.

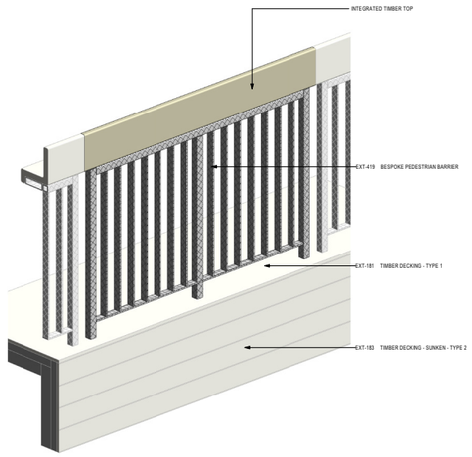
Handrails integrate a timber top to ensure comfort for the users and connect with Tiered Decking and timber areas. LED lighting is integrated below the timber tops and provides visibility at any time of the day.

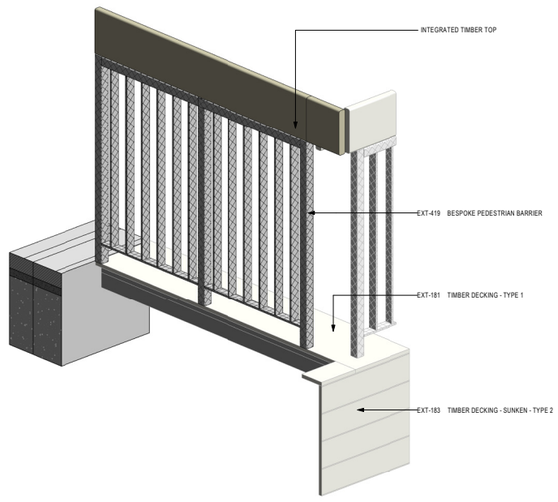


KEY:

- EXT-415, EXT-416 Handrail
- EXT-411, EXT-412 Balustrade
- EXT-419 Barrier With Integrated Shelf
- EXT-418 Head of Step Barrier
- EXT-401 Security Fence
- EXT-426 Armco Barrier
- EXT-611 Metal Cladding
- EXT-613 Metal Capping Plate
- EXT-405, EXT-406, EXT-407, EXT-409 Gates

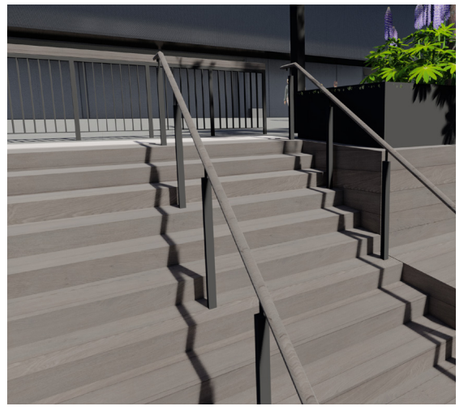
2.7.2 Typical Pedestrian Barrier Details







EXT-411, EXT-412 Balustrade
Black Powder Coated Steel



EXT-415, EXT-416 Handrail
Black Powder Coated Steel



EXT-419 Bespoke Barrier With Integrated Shelf

SECURITY

2.8.1 SECURITY PLAN & PALETTE 424

2.8

2.8.1 Security Plan & Palette

Security Strategy

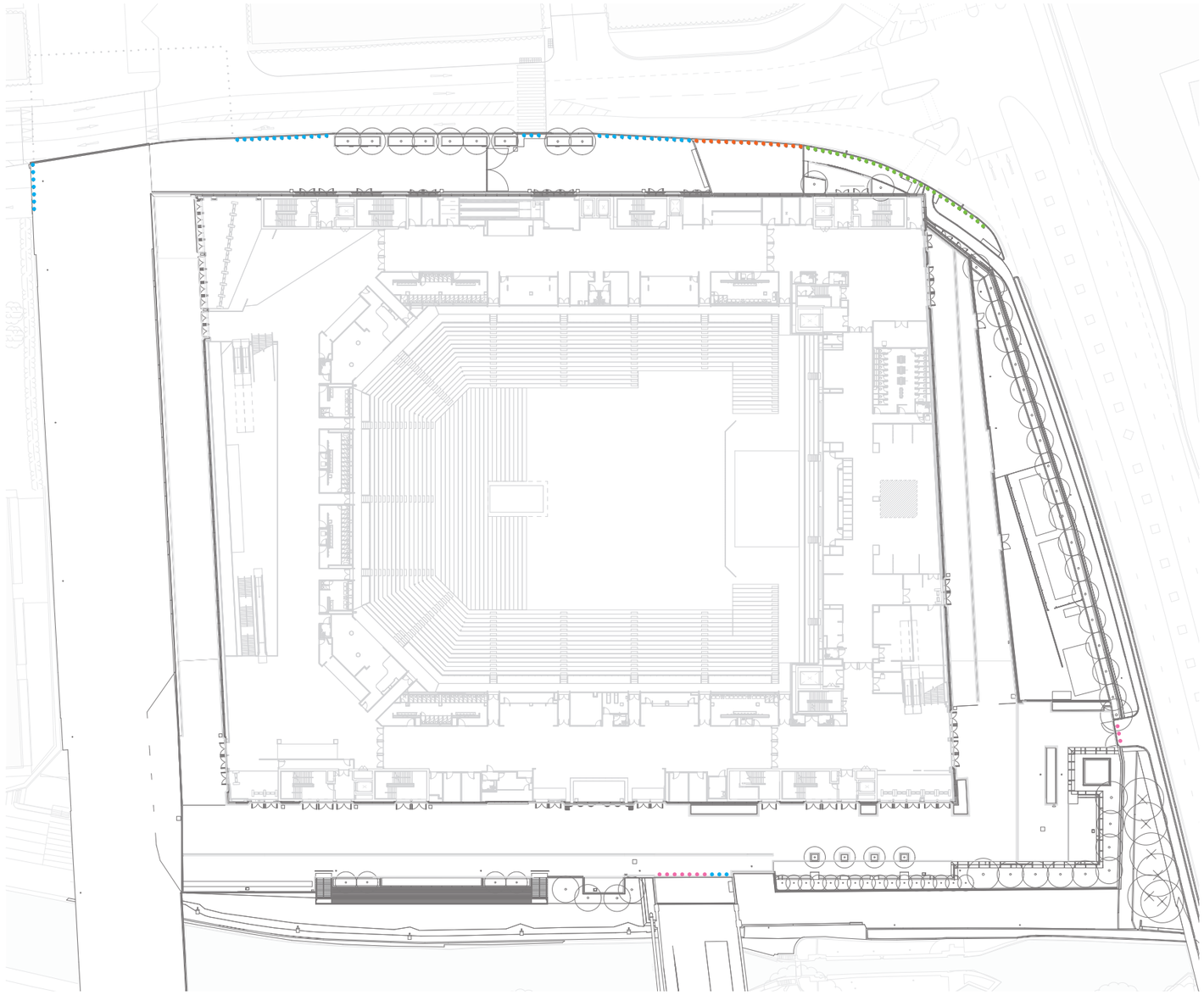
Our security strategy has been designed in accordance with advice from security consultants.

Bollards are black PPC with their finish to match the existing bollards on Joe Mercer Way and Etihad Campus.

Certain bollards on Sportcity Way are integrated with lighting columns to ensure a simplified design and a cohesive language, reducing the number of elements in the public realm.

Sportcity Way also includes concrete planters which represent an integrated HVM measure as they are designed to withstand the impact of hostile vehicles.

Fences and gates are designed following security requirements and also follow the same materiality and colours of the rest of the scheme providing an integrated public realm.



KEY:

- EXT-301 PAS Rated SP400 Static Bollards
- EXT-302 PAS Rated SP1000 Static Bollards
- EXT-303 PAS Rated SP400 Retractable Bollards
- EXT-304 PAS Rated SP1000 Retractable Bollards



EXT-301, EXT-302 Static Bollards
Stainless Steel PAS68 rated, shallow mounted foundation, Black PPC finish with white reflective band



EXT-303, EXT-304 Retractable Bollards
Stainless Steel PAS68 rated Black PPC finish with white reflective band



EXT-405, EXT406 Steel Gates
Black Powder Coated Steel



EXT-401 Fence
Steel Fence, 3000mm height

EXTERNAL LIGHTING & CCTV

2.9.1 EXTERNAL LIGHTING & CCTV PLAN & PALETTE 428

2.9

2.9.1 External Lighting & CCTV Plan & Palette

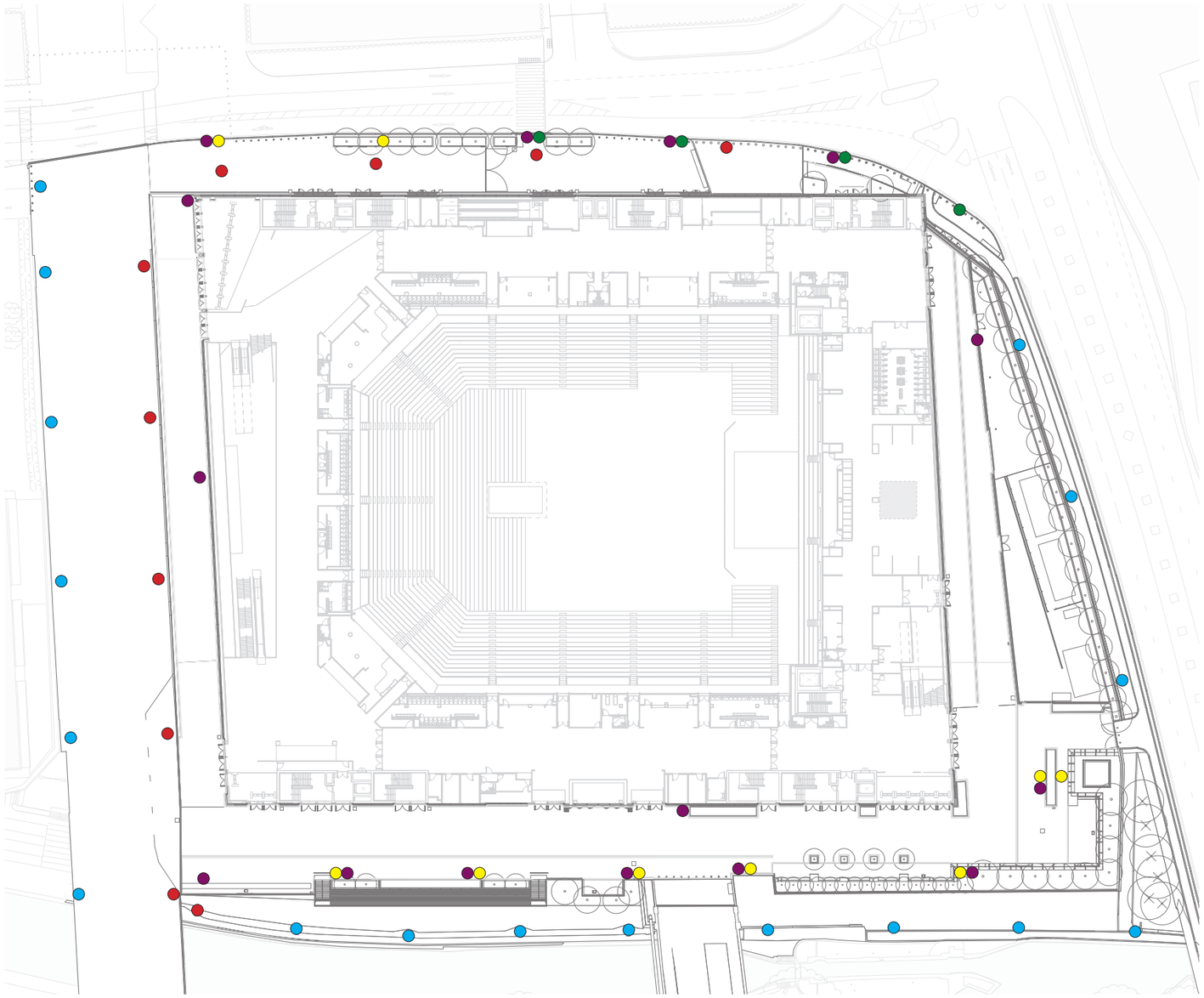
External Lighting & CCTV Strategy

External lighting elements follow the main geometry of the building and maintain the tones and materiality presented in the rest of the landscape scheme.

Proposed lighting columns have been considered throughout the landscape scheme and in specific areas integrated with bollards to ensure a simple design that reduces the number of elements and represents a clean look.

At the south-western side, existing lighting columns are currently blocking the landmark naming rights partner sign. As a result, it is proposed to remove these, as well as the others on the eastern side of Joe Mercer Way to maintain a minimal look and maximize the visual impact of the naming rights partner landmark sign, living wall and facade. Alternative lighting solutions are in discussion.

Lighting column design has been considered to ensure they follow deflection requirements for CCTV, which is integrated, and wifi.

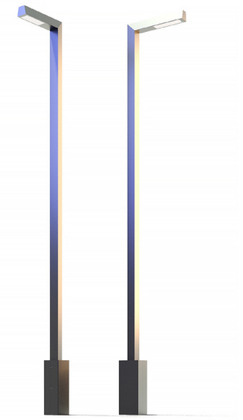


KEY:

- Proposed Lighting Column
- Existing Lighting Column To Be Retained
- Existing Lighting Column To Be Removed
- Lighting Column Integrated with Bollard
- CCTV Camera



Proposed Lighting Columns



Lighting Column Integrated with Bollard



Existing Lighting Columns to be retained,
Joe Mercer Way



Existing Lighting Columns to be retained,
Alan Turing Way and Ashton Canal

DRAINAGE

2.10.1 GRADING & DRAINAGE PLAN 432

2.10.2 DRAINAGE PALETTE 433

2.10

2.10.1 Grading & Drainage Plan

Drainage Strategy

The paving on Level 01 is divided into two types, non-permeable and permeable bound.

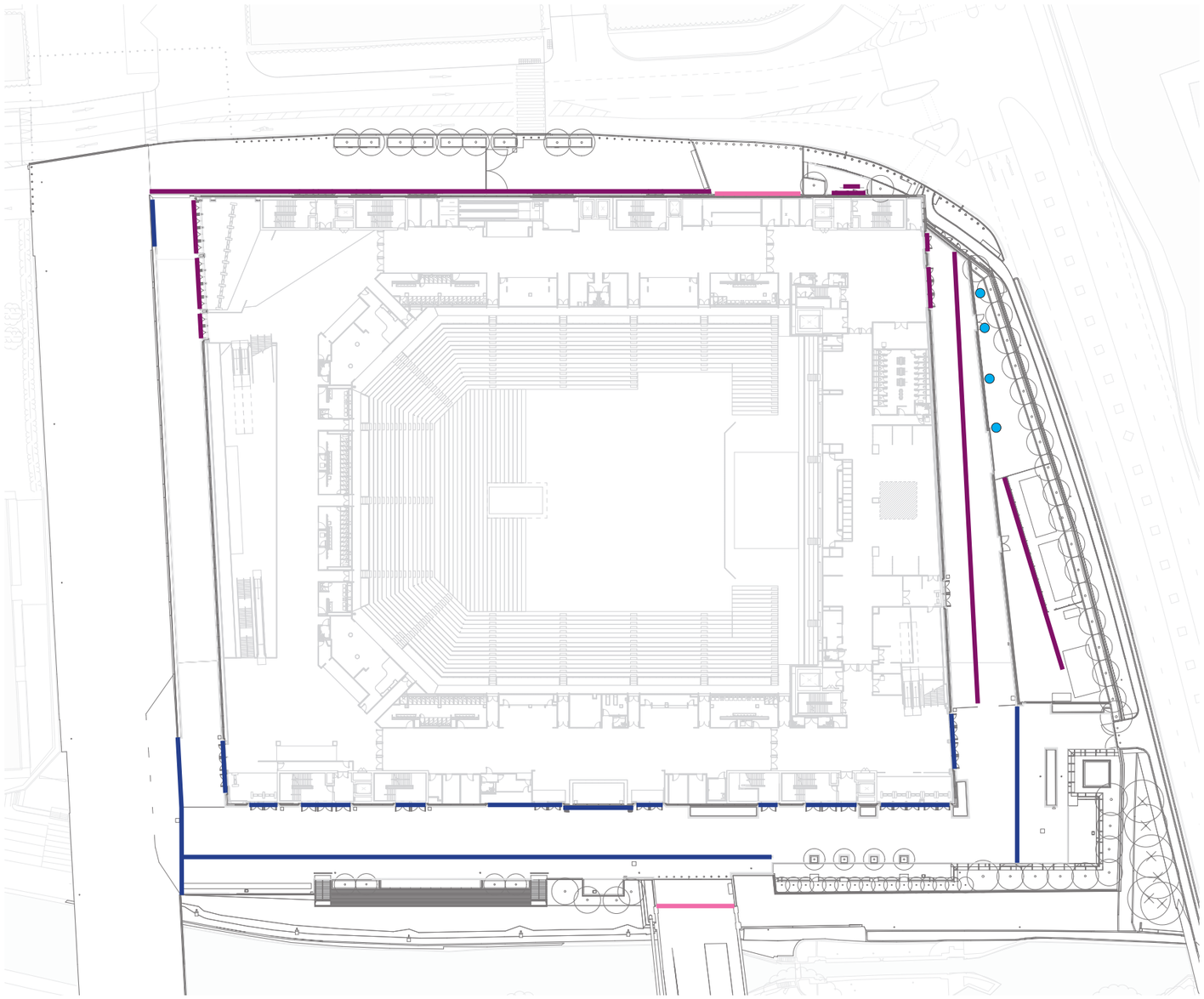
Slot drainage is provided around non-permeable areas as water is directed by slopes to the channels where it is collected and distributed.

Drainage channels are provided to all doors thresholds to ensure water is kept out of the building including doors that are located next to permeable areas.

Areas with permeable bound paving will allow water to run through their build-up and be collected beneath.

Floor gullies are proposed in the Compound area together with cross-falls for an efficient drainage system.

Therefore, build-ups and thicknesses have been studied to allocate specific volumes of water or required falls.



KEY:

- Project Boundary
- EXT-811 Floor Gully
- EXT-801 Slot Drain Type 1
- EXT-802 Slot Drain Type 2
- EXT-803 Slot Drain Type 3

2.10.2 Drainage Palette



EXT-801 Slot Drainage - Type 1
ACO RoadDrain 200



EXT-802 Slot Drainage - Type 2
Brickslot single slot offset



EXT-803 Slot Drainage - Type 3
ACO MonoDrain PD100D



EXT-811 Floor Gully
L2106 Vari-Level Grating

IRRIGATION

2.11.1 GROUND FLOOR IRRIGATION PLAN 436

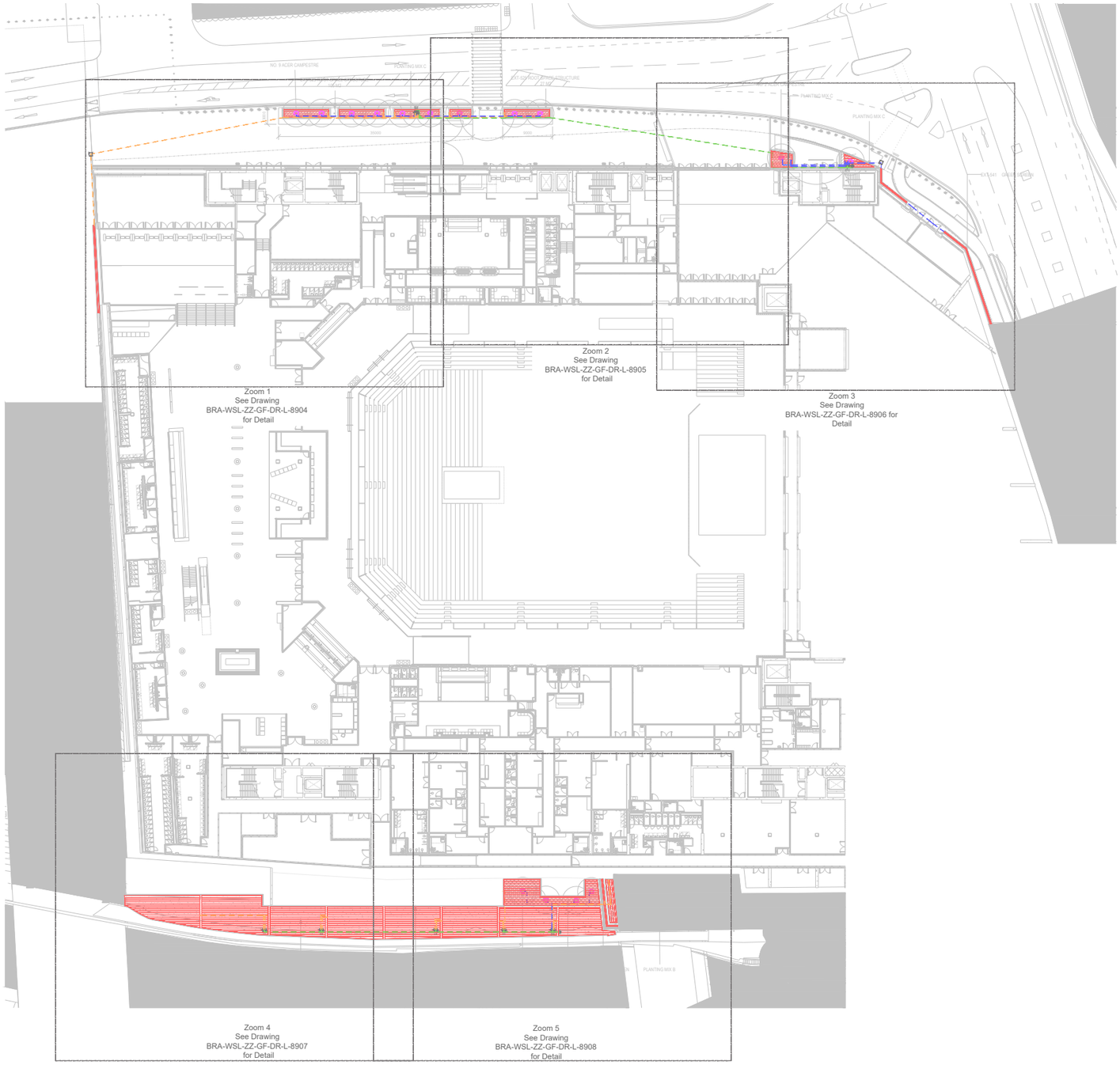
2.11.2 LEVEL 01 IRRIGATION PLAN 437

2.11

2.11.1 Ground Floor Irrigation Plan

Irrigation Strategy

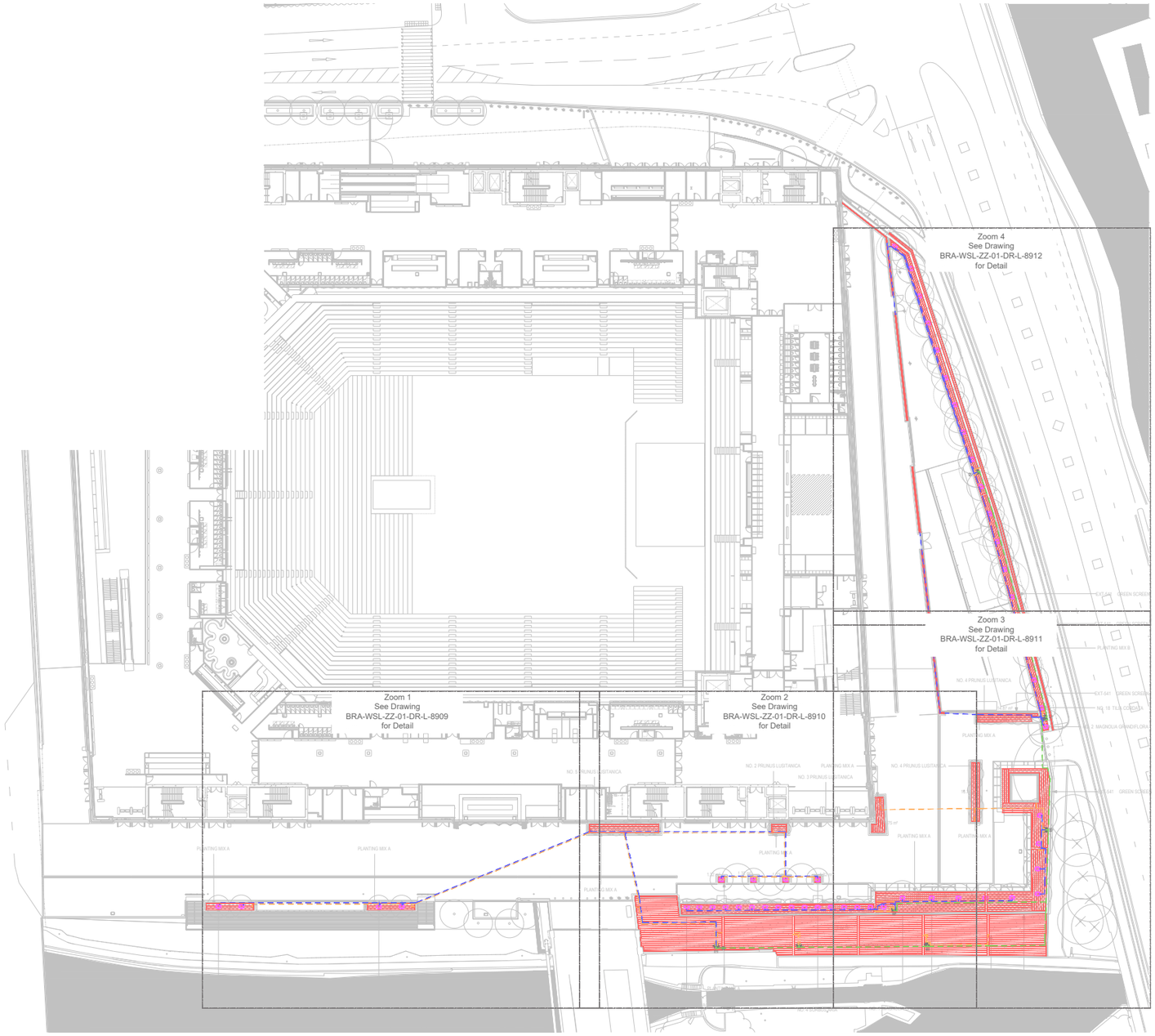
The design team have been working with Irrigation consultant (Waterscape Ltd) which has produced comprehensive irrigation design for the project. Irrigation plantroom is integrated with PH plantroom at Level00 with build-in fertilizer system. Dripping network is laid out across the all shrub, wild flower and green screen area with separate control to ensure the irrigation requirement for various type of planting can be met. Tree rings are included for all tree irrigation and both dripping network and Tree ring will be sitting under the mulch layer that has been specified as a part of soft landscape design.



KEY:

- 50mm PE Mainline Pipework
- 32mm PE Lateral Pipework
- 25mm PE Lateral Pipework
- Rain Bird 2.3 l/h, 33cm Spaced Pressure Compensating Dripline
- Tree Ring c/w 8 x 7.6 l/h Pressure Compensating Emitters
- Connection Point From Irrigation Plantroom (Irrigation System Pipe and Signal Cable), Exact Location TBC
- Solenoid Valve
- Suitable Chamber for Irrigation Pipework directional Change within the hard landscape (by others)

2.11.2 Level 01 Irrigation Plan



KEY:

- 50mm PE Mainline Pipework
- 32mm PE Lateral Pipework
- 25mm PE Lateral Pipework
- Rain Bird 2.3 l/h, 33cm Spaced Pressure Compensating Dripline
- Tree Ring c/w 8 x 7.6 l/h Pressure Compensating Emitters
- Connection Point From Irrigation Plantroom (Irrigation System Pipe and Signal Cable), Exact Location TBC
- Solenoid Valve
- Suitable Chamber for Irrigation Pipework directional Change within the hard landscape (by others)


BLOCKS
301-306
BLOCKS
321-324
TO DECK

WAYFINDING DESIGN

3.1 WAYFINDING PRINCIPLES 441

3.2 NAMING CONVENTIONS 445

3.3 VENUE FUNCTIONALITY 467

3.4 EGRESS STRATEGY 489

3.5 WAYFINDING VISUAL IDENTITY 497

3.6 PRODUCT 511

3.7 SMART VENUES 529

3.8 BACK OF HOUSE STRATEGY 543

3.9 STATUTORY SIGNAGE 549

3

LEVEL 0
BASE

109

THIS IS MANCHESTE
THIS IS MANCHESTE
THIS IS MANCHESTE
THIS IS MANCHESTE

108

LEVEL 1
DECK

GIVE YOURSELF A TRY
GIVE YOURSELF A TRY
GIVE YOURSELF A TRY

WAYFINDING PRINCIPLES

3.1.1 WAYFINDING PRINCIPLES 442

3.1

3.1.1 Wayfinding Principles

Wayfinding can impact experiences either positively through communication or negatively with a lack thereof. Encompassing the end-to-end journey of an experience, wayfinding employs a variety of communication mediums which can cover various locations and distances.

Individuals focus on different types of information at different points in the journey. So, no single medium should be implemented through the entire wayfinding journey.

The wayfinding system should make it efficient to recognise relationships across different platforms to indicate what is relevant to the individual (IAI, 2013). In situations where various mediums of communication occur across a significant amount of time, cohesive information and design cues across solutions are vital.

Pictograms should be introduced from the beginning with a firm assurance that, once at the Venue, the user will find the same pictograms in use, this creates a sense of familiarity.

Developing a broader understanding of the spatial environment, we can implement "Place Making", providing a strong sense of understanding that ties branding and identity into the environment to create a solid sense of orientation (SEGD, 2015).

Identity at each location

By interweaving the Venue brand into the graphic expression of the wayfinding system and adhering to wayfinding principles, we allow the Venue branding to come to life, through a choice of colours, typefaces and pictograms.

These graphic devices enable the implementation of brand alignment throughout the physical environment.

Regions of visual character

Regions assist wayfinding by providing a set of cues for recovering location. They associate a set of defining features with an area in space, and give a way of identifying a place as being in a certain region.

Moving from one room or space to another through a threshold makes explicit the motion from one region of the Venue to another.

Interpretation

Using figurative numbers and directional symbols allows people to glance quickly while moving to the end destination and creates a universal messaging system, regardless of dialect or language.

Signs that are frustrating to interpret and confusing diminish the customer's experience.

Memorable landmark cues

Landmarks can be distinguished spaces as well as memorable objects. It could stand as an exemplar or representative.

Landmarks are the anchors along which paths are defined and our mental maps are built.

Too many choices

Sign content should be minimal and only direct to the most relevant destinations in the Venue (which need to be agreed and signed of by the client in the list of terminology).

Layout should be designed to ensure that people encounter the main points no matter what route they take; within the shortest number of steps.

Decision points

Decision points are where individuals must make a wayfinding decision. Information should be relevant to both the choices offered to the navigator at that point, and the larger goal of the navigational task.

A navigator begins with a goal (destination), and acquires information from their environment to make their first move towards this goal.

Sight lines

Sight lines are a valuable means of giving information about what's ahead to encourage the visitor to navigate. To make a sight line interesting, the designer can provide a "wienie" (Walt Disney) - a goal to navigate toward. It might be some feature or object that is striking or unusual (landmarks), by creating visual magnets.

Well-structured paths

Well-structured paths are continuous and have a clear beginning, middle, and end when viewed in each direction. They should confirm progress and distance to their destination along their length.

NOTE:

All materials, sizes and construction details are pending further development & consultation with sign manufacturer.

All content in the Wayfinding chapter is indicative.


112
113
113

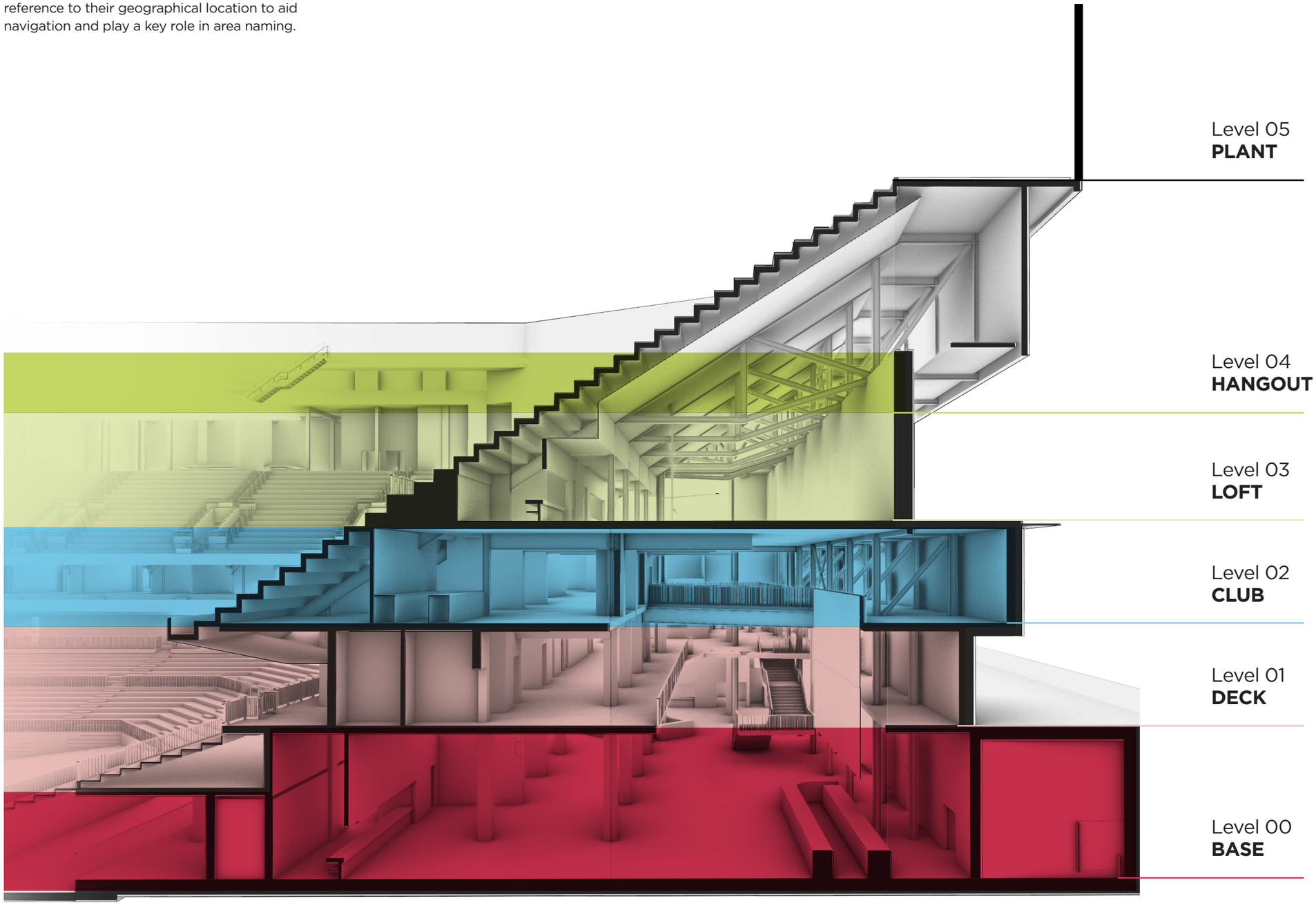
NAMING CONVENTIONS

3.2.1 LEVEL NAMING 446
3.2.2 AREA NAMING 447
3.2.3 AREA SPONSORSHIP 448
3.2.4 ENTRANCE NAMING 449
3.2.5 BLOCK NUMBERING 450
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3.2.7 ROW NUMBERING - OVERVIEW 452
3.2.8 ROW NUMBERING - MODES 453
3.2.9 SEAT NUMBERING - OVERVIEW 455
3.2.10 SEAT NUMBERING - LEVEL 03 456
3.2.11 SEAT NUMBERING - LEVEL 02 457
3.2.12 SEAT NUMBERING - LEVEL 01 458
3.2.13 SEAT NUMBERING - LEVEL 00 459
3.2.14 NAMING CONVENTIONS - OVERVIEW 461
3.2.15 VERTICAL CIRCULATION - NUMBERING 462
3.2.16 ARTIST AREA ROOM NUMBERING 464

3.2

3.2.1 Level Naming

Each level has been given a unique name to define it as a destination. The names make reference to their geographical location to aid navigation and play a key role in area naming.



3.2.2 Area Naming

The venue is provided with a series of spaces, which span across different floors. Each area has been given a unique name to define it as a destination. The naming is expressive, yet not too descriptive as to define its purpose.

Where necessary, the areas make direct reference to the level name. This is to aid and support navigation within the Venue.

The spectators have been divided into two designations - User Group One are Fans who have access to the concourse spaces. User Group Two are the Guests who have designated access to the array of premium lounges and suites

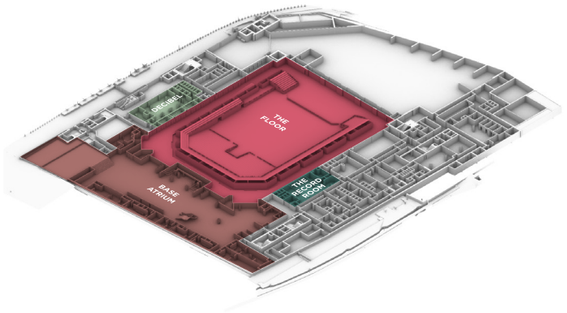
User Group One

LEVEL	AREAS
Level 00 **BASE**	The Floor
	Base Atrium
Level 01 **DECK**	Canalside
Level 02 **CLUB**	
Level 03 **LOFT**	
Level 04 **HANGOUT**	

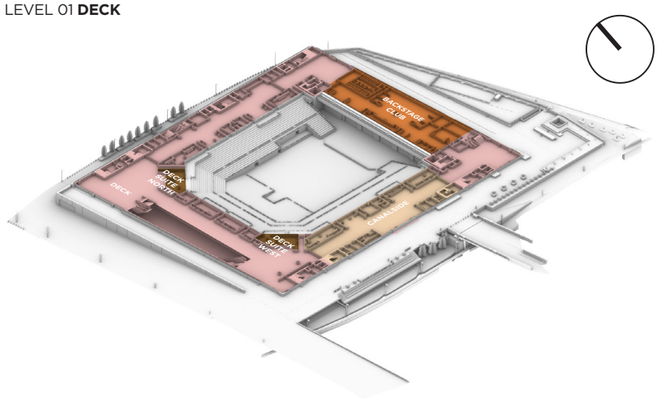
User Group Two

LEVEL	AREAS
Level 00 **BASE**	Decibel
	The Record Room
Level 01 **DECK**	Deck Suite North
	Deck Suite West
	Backstage Club
Level 02 **CLUB**	201 Loge East
	216 Loge North
	221 Loge West
	236 Loge South
	Atrium Lounge (217-220)
	Boxes (202-215, 222-235)
Level 03 **LOFT**	
Level 04 **HANGOUT**	North Hangout
	South Hangout

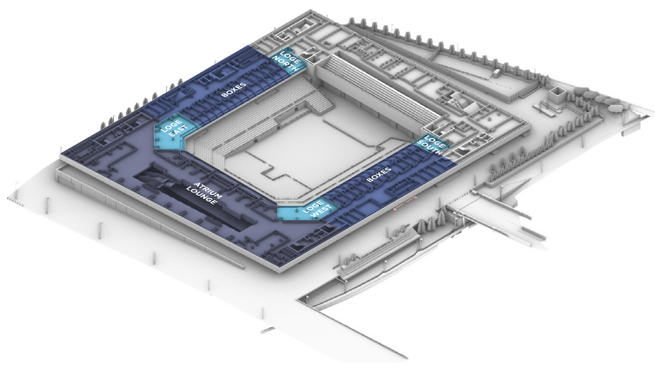
LEVEL 00 **BASE**



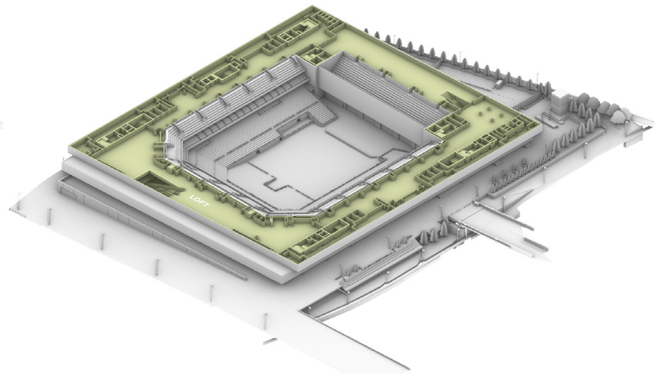
LEVEL 01 **DECK**



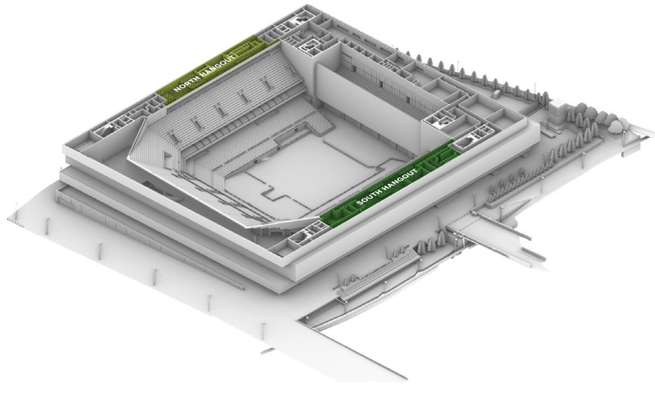
LEVEL 02 **CLUB**



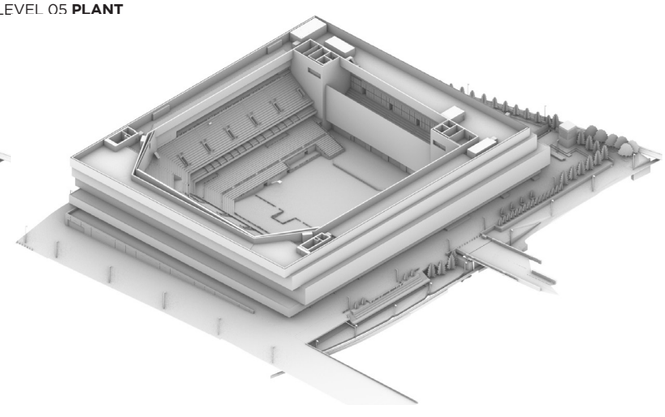
LEVEL 03 **LOFT**



LEVEL 04 **HANGOUT**



LEVEL 05 **PLANT**



3.2.3 Area Sponsorship

It is an aspiration of the Venue to create sponsored areas. The naming conventions need to support this aspiration, whilst maintaining clear wayfinding principles.

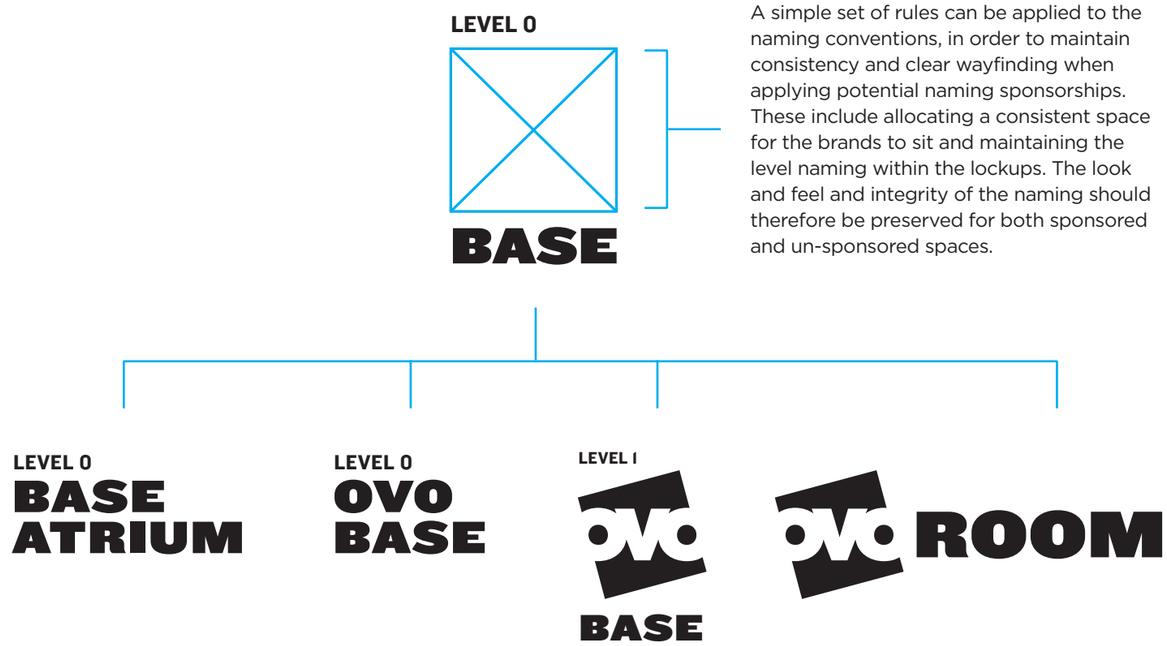
All concourses will need the level name as a supporting title. This is to maintain key stages of the user journey, and allow users to easily navigate to their block.

In more isolated instances, complete sponsor take-overs could be achieved as reiteration of level is not essential.

The table below offers an example of the level of sponsorship achievable for each area and will require further development and direction with input from the client:

LEVELS & AREAS	UN SPONSORED	SUPPORTED SPONSOR	TAKEOVER SPONSOR
The Floor	•		
Base Atrium		•	
Decibel			•
The Record Room			•
Level 01 Deck		•	
Deck Suite North			•
Deck Suite West			•
Canalside		•	
Backstage Club			•
Level 02 Club		•	
Loge North			•
Loge East			•
Loge South			•
Loge West			•
Atrium Lounge			•
Boxes			•
Level 03 Loft		•	
North Hangout			•
South Hangout			•

Guidelines for sponsorship



A simple set of rules can be applied to the naming conventions, in order to maintain consistency and clear wayfinding when applying potential naming sponsorships. These include allocating a consistent space for the brands to sit and maintaining the level naming within the lockups. The look and feel and integrity of the naming should therefore be preserved for both sponsored and un-sponsored spaces.

Un-sponsored example
Original naming is maintained

Supported Sponsor example
Sponsor is supported by the level name and the Venue look and feel is maintained

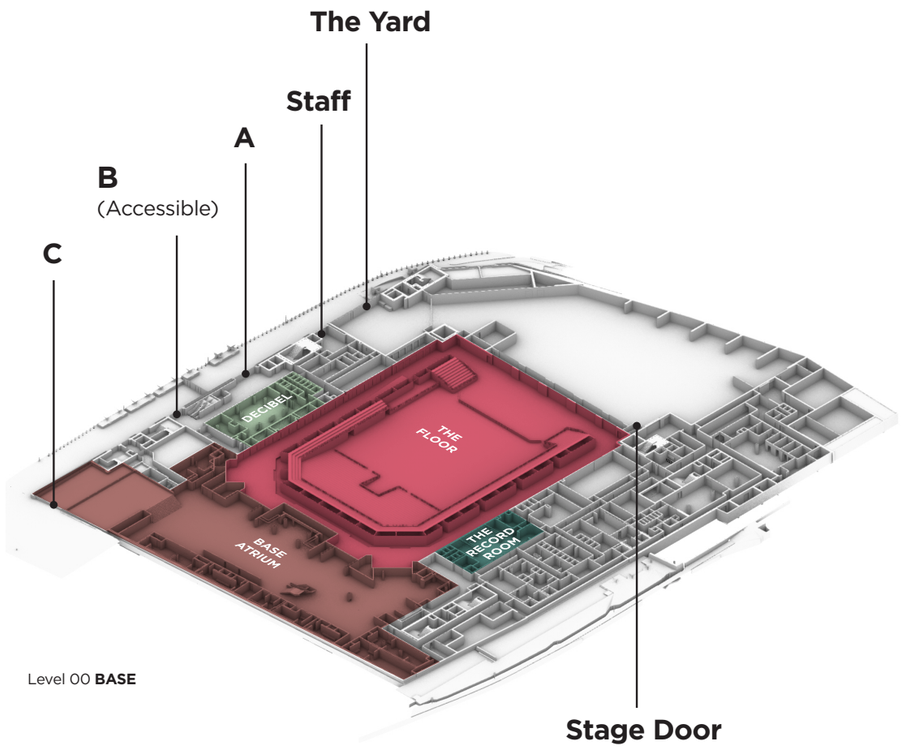
Supported Sponsor example
Sponsor logo is supported by the level name

Takeover Sponsor example
Complete sponsor takeover of space

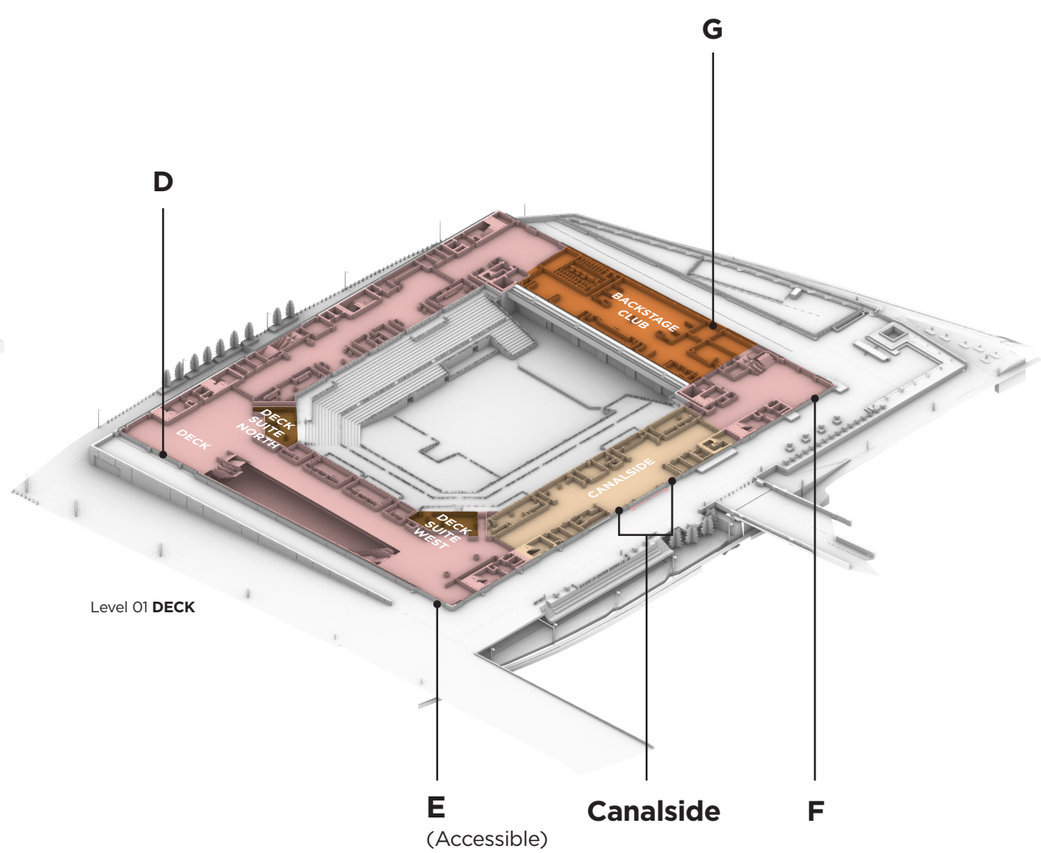
3.2.4 Entrance Naming

In order to manage crowds and simplify journeys, the public entrances have been named alphabetically as A - G. From these entrances the users will circulate internally to their respective vomitories. The Canalside entrance has been given a name as this is a destination rather than concourse access.

By labeling entrances in this way we are able to simplify the journey and use progressive disclosure to supply onward journey information in manageable parts, rather than overloading users with unnecessary, complex information. Using non-specific naming for the entrances also allows for flexibility in multiple modes.



Level 00 **BASE**

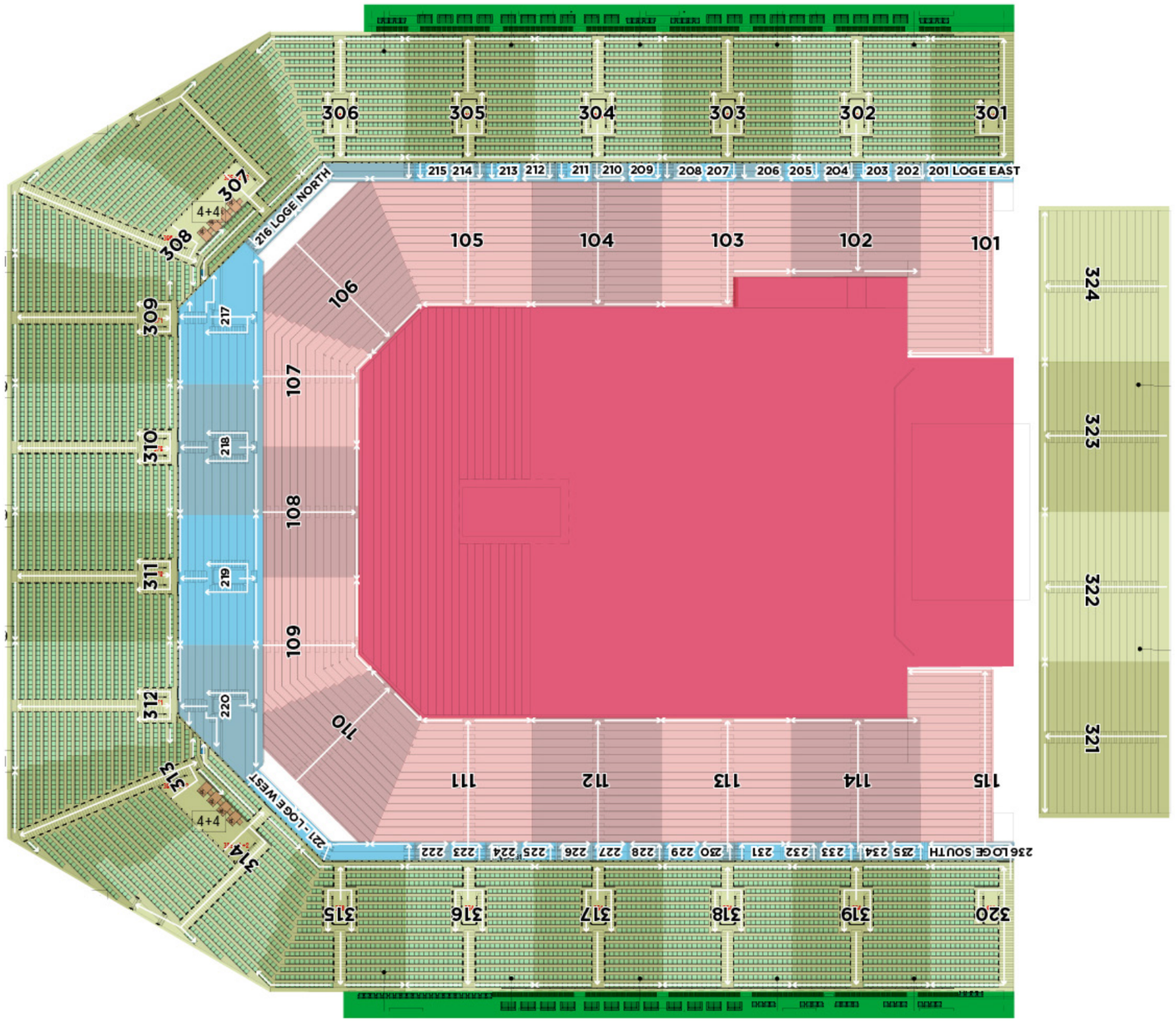


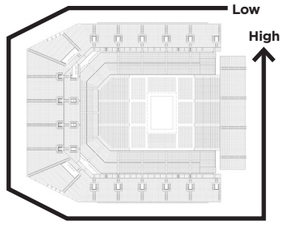
Level 01 **DECK**

3.2.5 Block Numbering

This diagram details block numbering.

For Level 01 - Level 03, the block numbers correspond to the level that they are located on and increase consecutively starting from the north east and moving around anti-clockwise.





3.2.6 Floor Seating Block Numbering

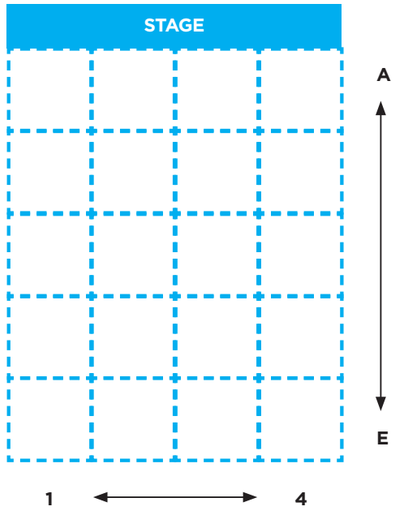
On The Floor, the block numbers are flexible to allow for the different modes. The strategy involves using alpha/numeric naming so blocks can be dropped or added depending on different seating compositions.

When the seating tiers are extended onto the floor it creates a hard barrier. Users enter from the West and have to make a decision to go left or right. Once on the correct side of the hall they then have a choice of three doors.

By splitting the floor horizontally into 1-4, users are able to navigate to the correct side of the hall. The floor is then divided into a 4x5 grid, which determines the block numbers. The blocks nearest the stage are lettered 'A', and run consecutively through the alphabet towards the back of the floor. In this way front row seats are always lettered 'A' to give a sense of prestige.

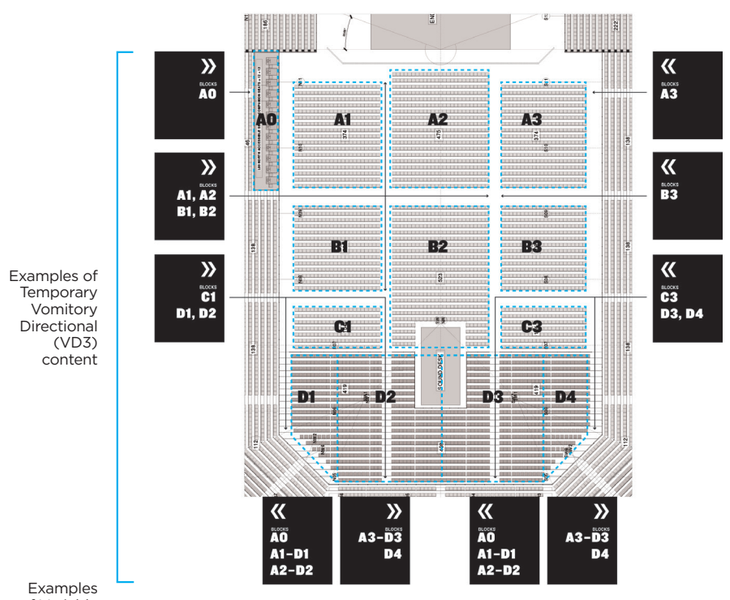
Below is a diagram of the flexible grid system.

Right, are diagrams of how the grid system is able to flex across different seating modes.



Floor Seating Grid System

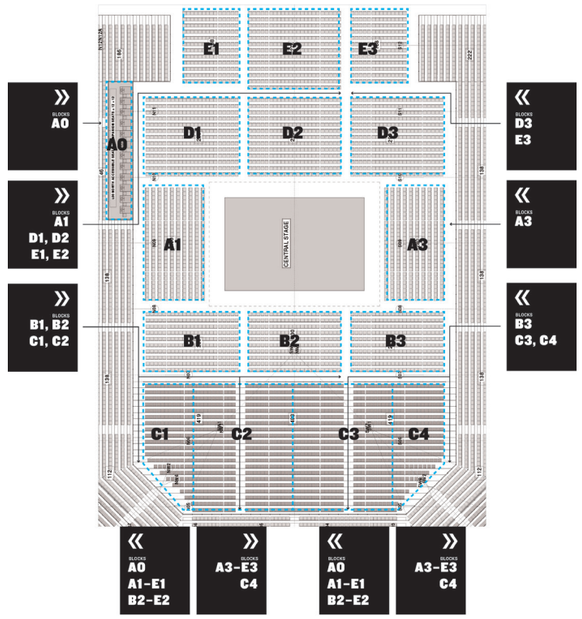
Seating



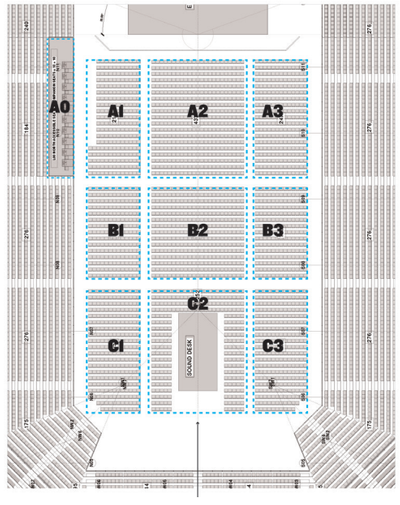
Examples of Temporary Vomitory Directional (VD3) content

Examples of Variable Vomitory Directional (VD1) content

Centre Stage



Ice Terrace Seating

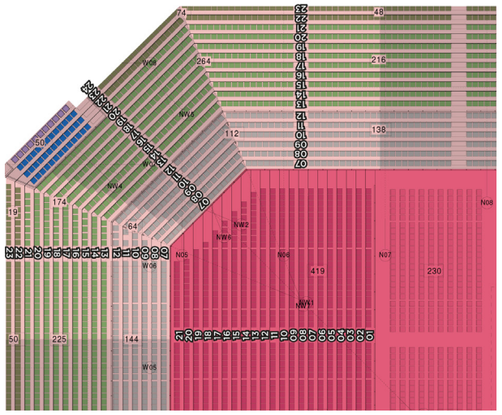


Examples of Variable Vomitory Directional (VD1) content

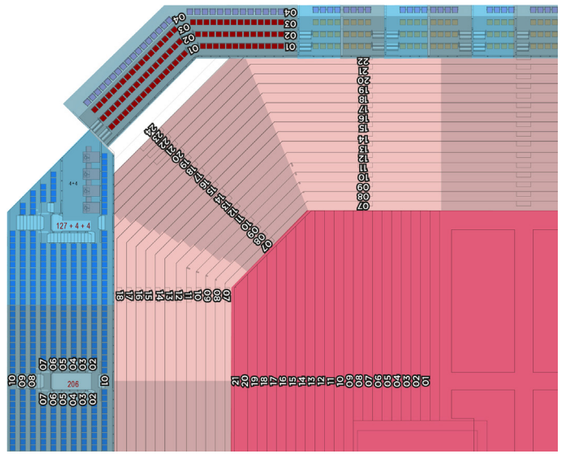
3.2.7 Row Numbering - Overview

Principles

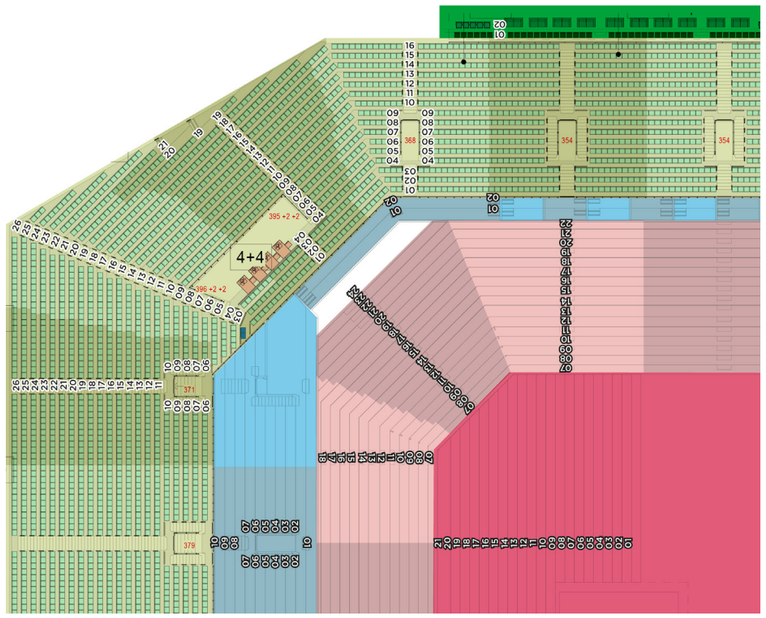
- As there are more than 25 rows, a numeric system is used for the tiers.
- To account for the different seating modes, the row numbers begin counting up from the scenario with the most seats. Once this has been established, row numbers will work for all modes without alteration.
- Row numbers begin with 01, starting with the lowest row (closest to stage), and count up until the last row.
- The system restarts with row 01 at each tier.
- For floor seating rows, an alphabetic system is used. This is to avoid confusion when both row and seat naming appear on seats.



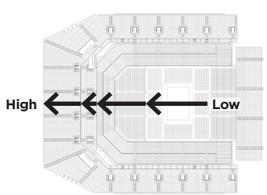
Level 00 **BASE** - Level 01 **DECK**



Level 00 **BASE** - Level 02 **CLUB**



Level 00 **BASE** - Level 03 **LOFT**



3.2.8 Row Numbering - Modes

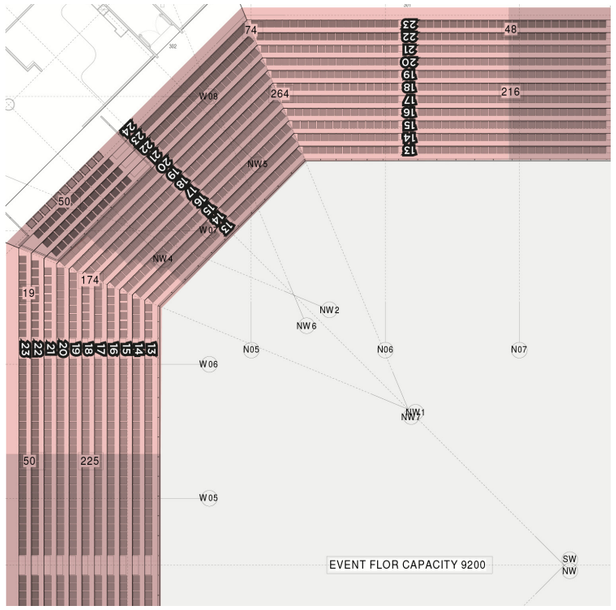
Principles

- To account for the different seating modes, the row numbers begin counting up from the scenario with the most seats. Once this has been established, row numbers will work for all modes without alteration.

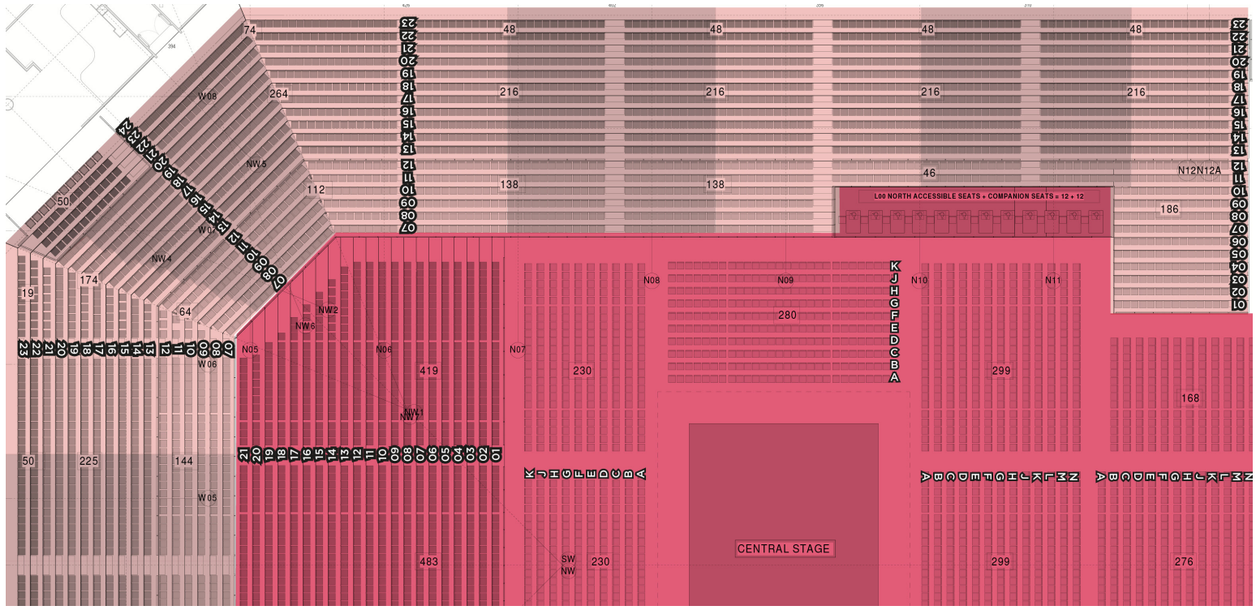
- For floor seating rows, an alphabetic system is used. This is to avoid confusion when both row and seat naming appear on seats.

- For floor seating rows, the system restarts with row A at each block. This is to allow for flexibility on the floor.

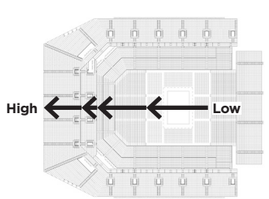
These principles are demonstrated in the diagrams below and on the next page:



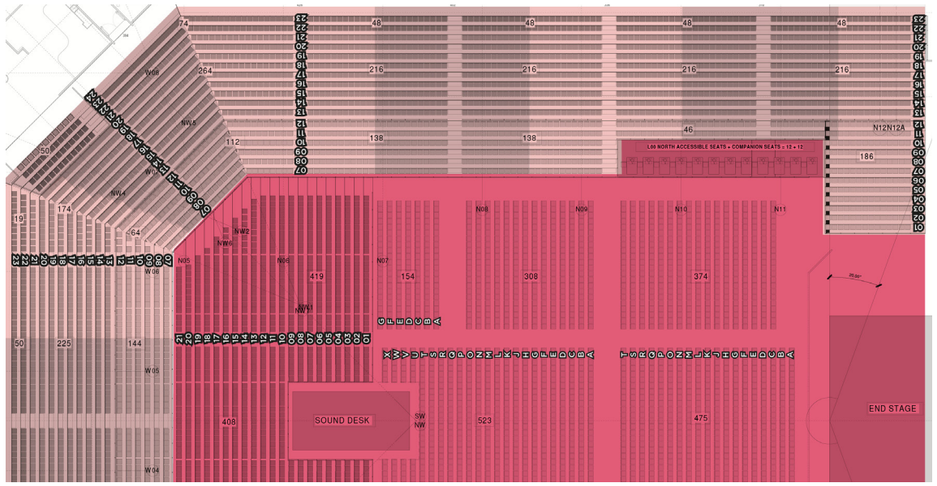
Part Standing



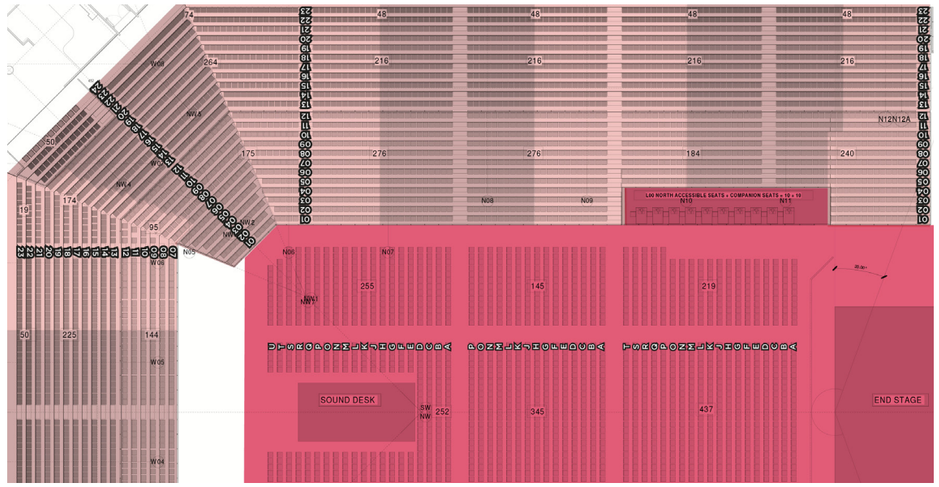
Centre Stage



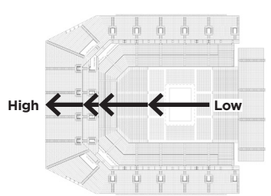
Row Numbering - Modes



End Stage



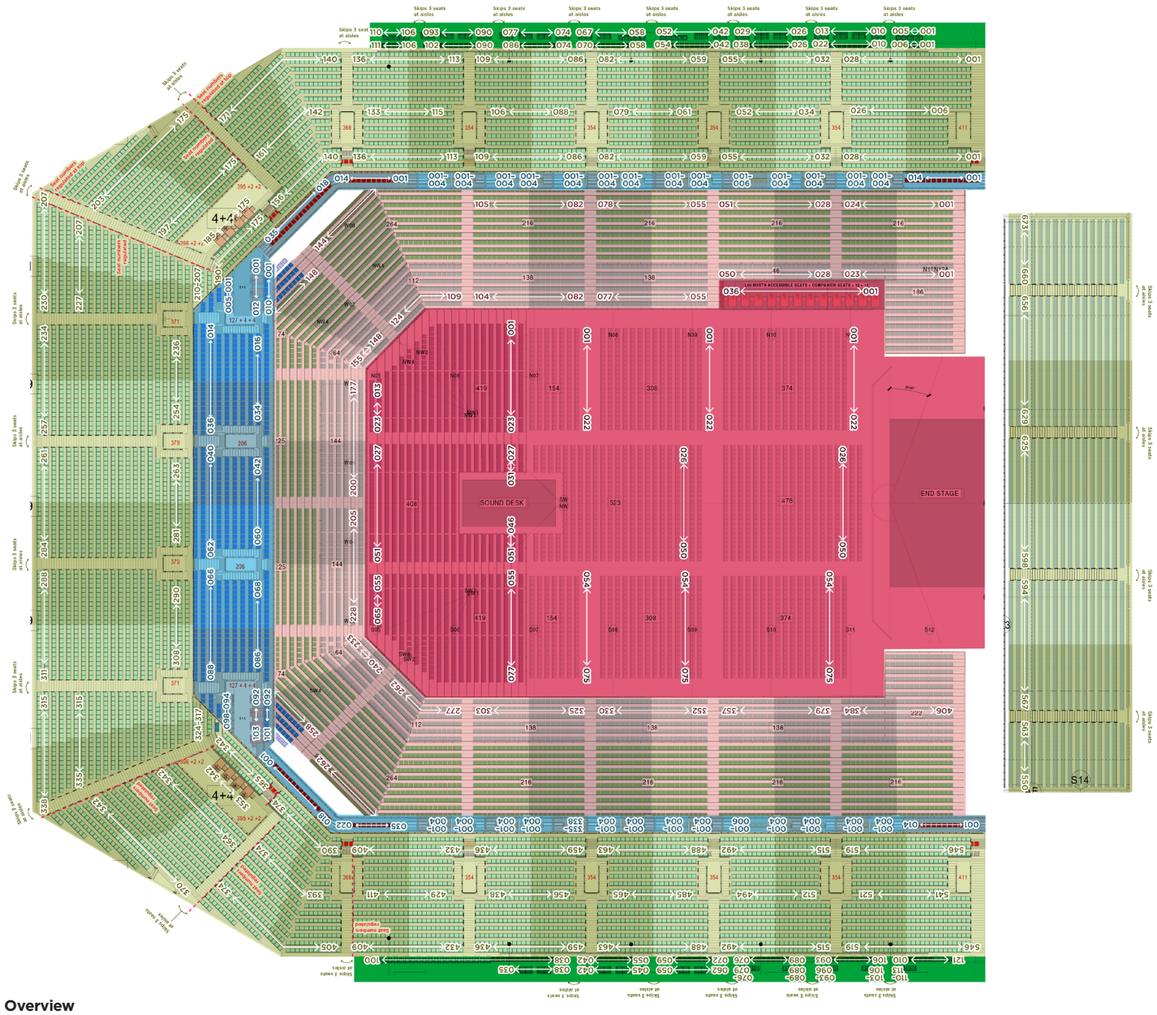
Ice Terrace Seating



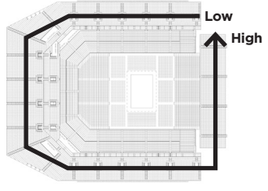
3.2.9 Seat Numbering - Overview

Principles

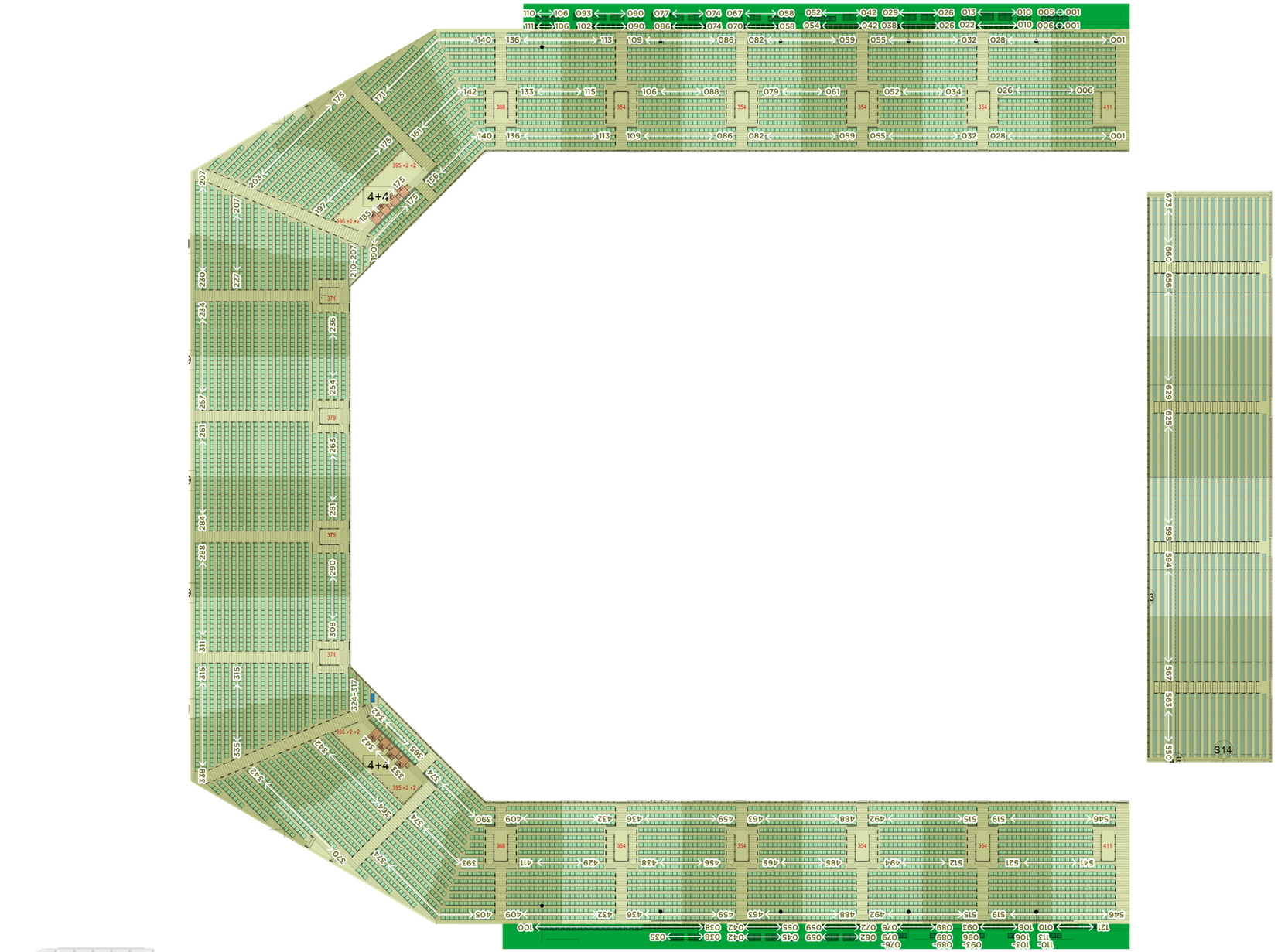
- Seats are numbered beginning with 001 and count up from the north east, moving around anti-clockwise.
- At each aisle the numbers regulate to avoid long ranges in end seats.
- After this point the highest seat number from the previous block (the end number from the longest row) is taken as the starting point for the starting seats in next row after the aisle.
- Three extra seats are added to ensure flexibility if seats are added. This way the first seats after each aisle all start with the same number.
- In hospitality, seat numbers restart with each box.
- To account for the different seating modes, the seat numbers need to run across the scenario with the most seats. Once this has been established, seat numbers will work for all modes without alteration.

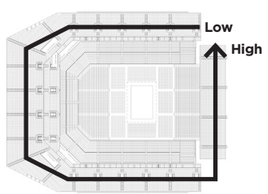


Overview

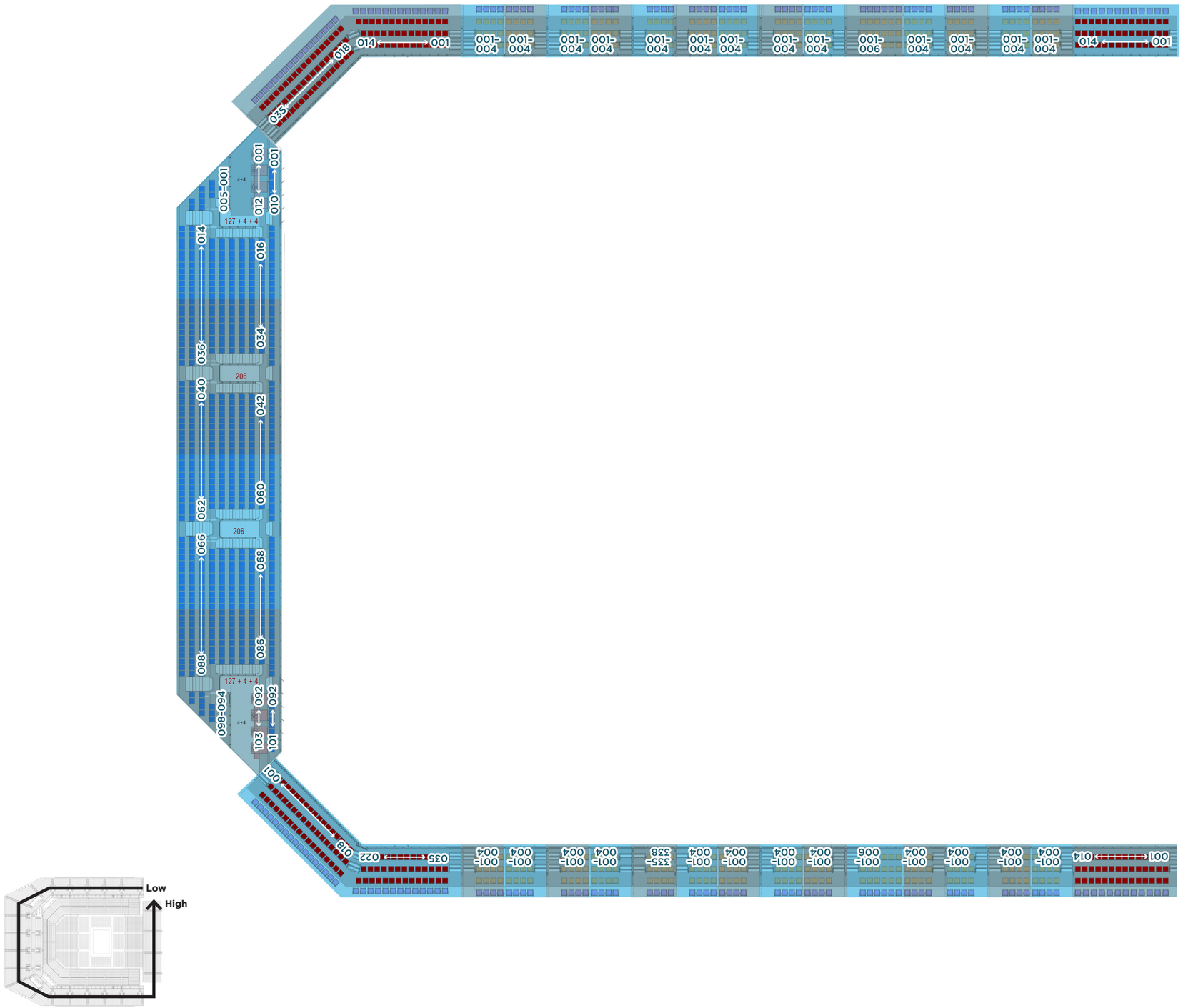


3.2.10 Seat Numbering - Level 03

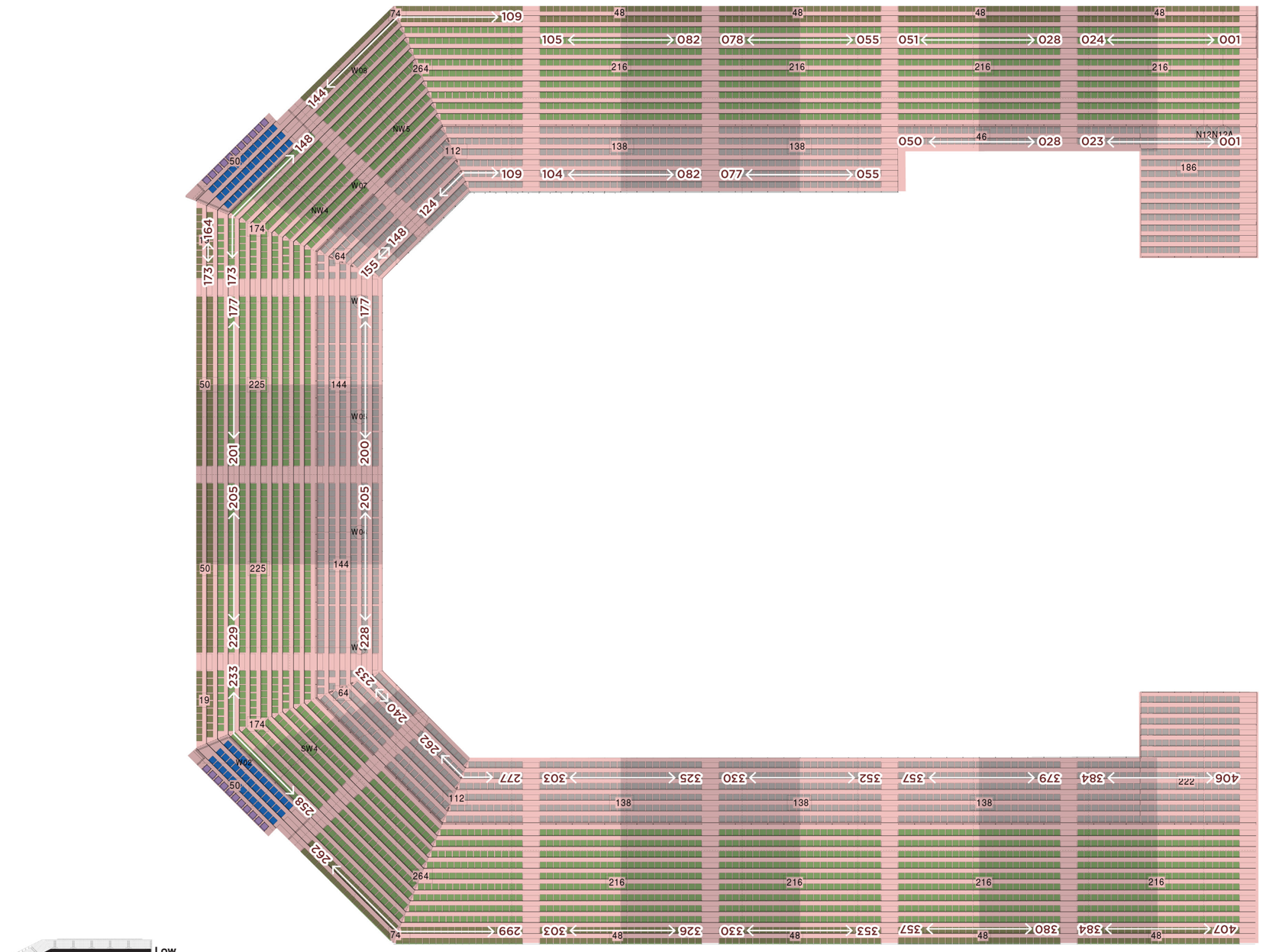




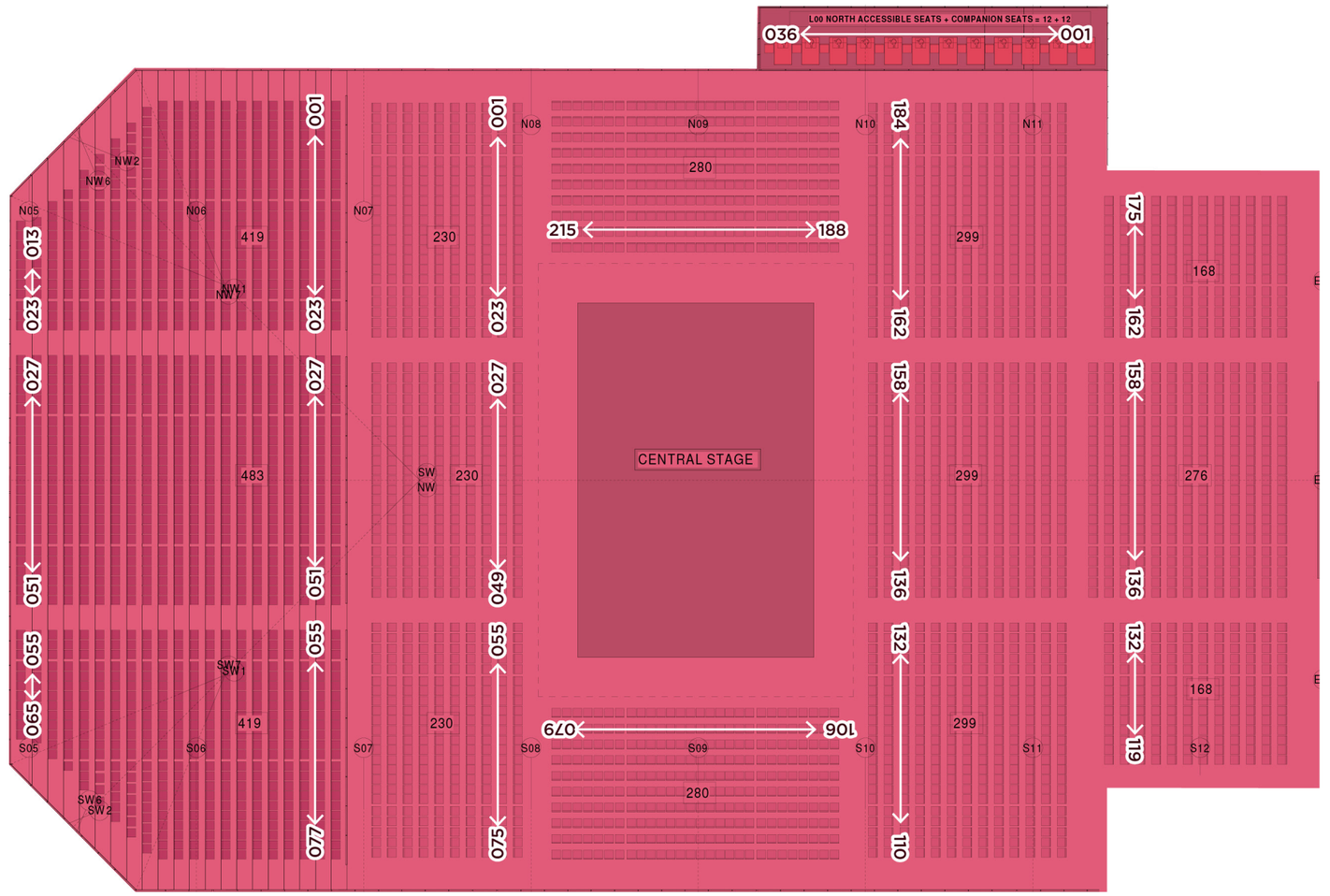
3.2.11 Seat Numbering - Level 02



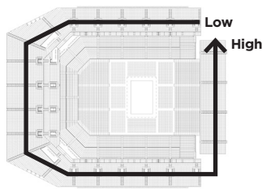
3.2.12 Seat Numbering - Level 01



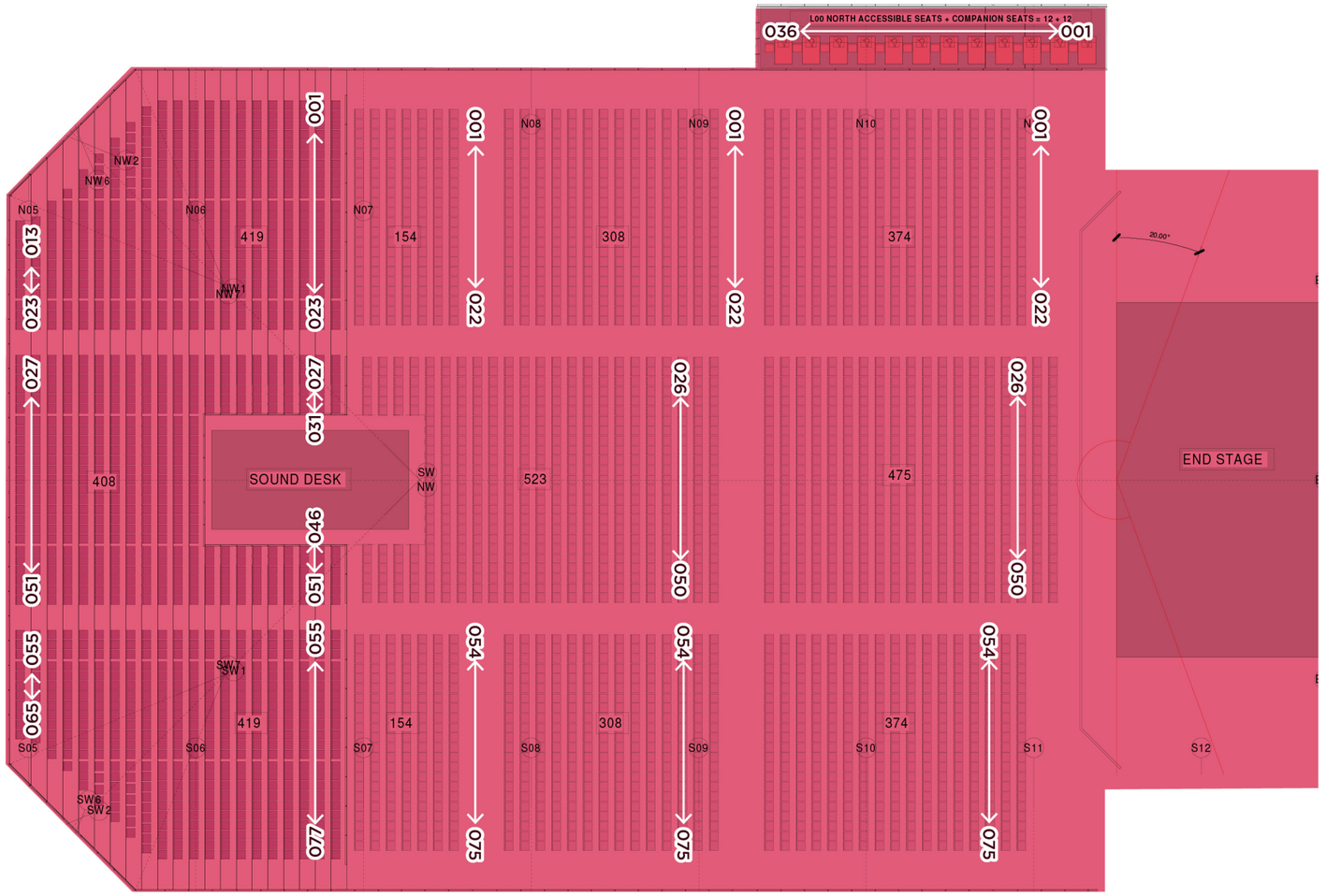
3.2.13 Seat Numbering - Level 00



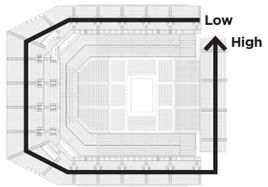
Centre Stage



Seat Numbering - Level 00



End Stage



3.2.14 Naming Conventions - Overview

The table to the right shows an overview of all the areas within the Venue.

This communicates the naming strategy as a whole, which creates a logical and unified experience.

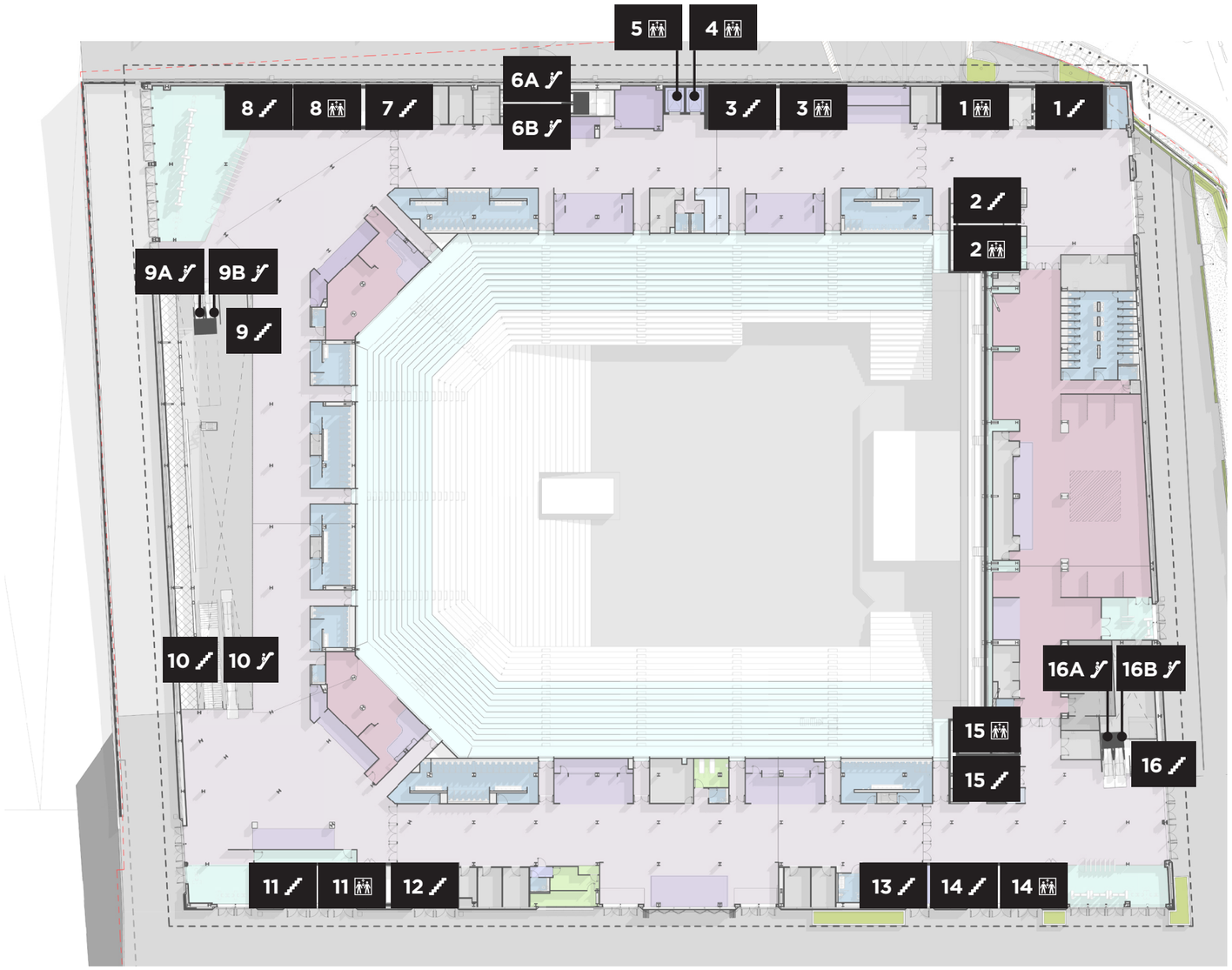
This table also starts to highlight the key stages of the user journey. These stages will be used to create progressive disclosure and in turn greatly influence the wayfinding strategy.

1 ENTRANCE	LEVEL ACCESS
Stage Door	*Talent*
Staff	*BoH*
The Yard	*BoH*
A	Level 00 **BASE** Level 01 **DECK** Level 02 **CLUB** Level 04 **HANGOUT**
B Accessible	Level 00 **BASE** Level 01 **DECK** Level 02 **CLUB** Level 04 **HANGOUT**
C	Level 00 **BASE**
D	Level 01 **DECK** Level 03 **LOFT**
E Accessible	Level 00 **BASE** Level 01 **DECK** Level 03 **LOFT** Level 04 **HANGOUT**
F	Level 01 **DECK** Level 03 **LOFT**
G	Level 01 **DECK**
CANALSIDE	Level 01 **DECK**

2 LEVELS	USERS	2A AREAS	3 BLOCKS	4 ROWS	5 SEATS
Level 00 **BASE**	User Group One / Two	**The Floor**	**Flexible**	**Flexible**	**Flexible**
		Base Atrium	**-**	**-**	**-**
	User Group Two	**Record Room**	**-**	**-**	**-**
		Decibel	**-**	**-**	**-**
Level 01 **DECK**	User Group One	**-**	**101 – 115**	**01 – 24**	**001 – 406**
		Canalside	**-**	**-**	**-**
	User Group Two	**Backstage Club**	**-**	**-**	**-**
		Deck Suites	**-**	**21 – 24**	**152 – 164** **242 - 254**
Level 02 **CLUB**	User Group Two	**Boxes**	**202 – 215,** **222 – 235**	**01 – 10**	**001 – 006**
		Loges	**201, 216, 221,** **236**		**001 - 035**
		Atrium Lounge	**217 – 220**		**001 - 103**
Level 03 **LOFT**	User Group One	**-**	**301 – 324**	**01 – 26**	**001 – 673**
Level 04 **HANGOUT**	User Group Two	**North & South Hangout**	**-**	**01 – 02**	**-**

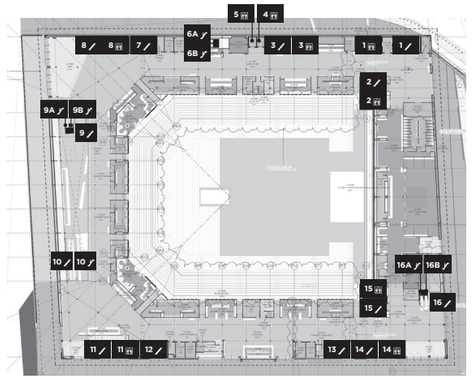
3.2.15 Vertical Circulation - Numbering

The vertical circulation within the Venue has been numbered consecutively anti-clockwise, to match the direction of the block numbering.



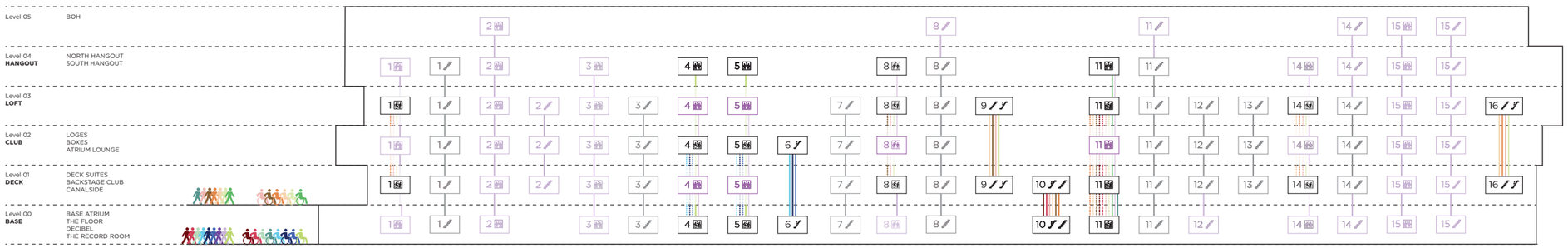
Vertical Circulation - Overview

The diagram below is an overview of all the vertical circulation within the Venue, as well as the proposed uses for each core.



Users

- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS



3.2.16 Artist Area Room Numbering



Plan

Red dashed line indicates the security line at each door within the artist area

KEY:

1 Dressing Room 01 (team)	4 Dressing Room 04	7 Dressing Room 07	10 Dressing Room 10	13 The Record Room	16 Laundry
2 Dressing Room 02	5 Dressing Room 05	8 Dressing Room 08	11 Dressing Room 11	14 The Green Room	17 Production Office
3 Dressing Room 03	6 Dressing Room 06	9 Dressing Room 09	12 Dressing Room 12 (team)	15 Wardrobe	18 Games Room

3.0 WAYFINDING DESIGN

VENUE FUNCTIONALITY

3.3.1 VENUE MODES 468
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3.3.3 LINEAR JOURNEY - STEPS 470
3.3.4 LINEAR JOURNEY - TICKET STRATEGY 471
3.3.5 LINEAR JOURNEY - VERTICAL CIRCULATION 472
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3.3.16 EXPLORATION JOURNEY - HALF CAPACITY EVENT 486

3.3

3.3.1 Venue Modes

The Venue is a flexible space that can adapt to different capacity events and modes. Areas and sections of levels can be isolated, to manage crowd flow and handle different needs.

The Venue functions in three main modes. Full Capacity Event, Half Capacity Event and Non Event / Private Event.

The movement of people between each of these modes can be catagorised as either traditional Linear Journeys, or more flexible Exploration Journeys between the levels.

The following pages analyse these two journey types in more detail.

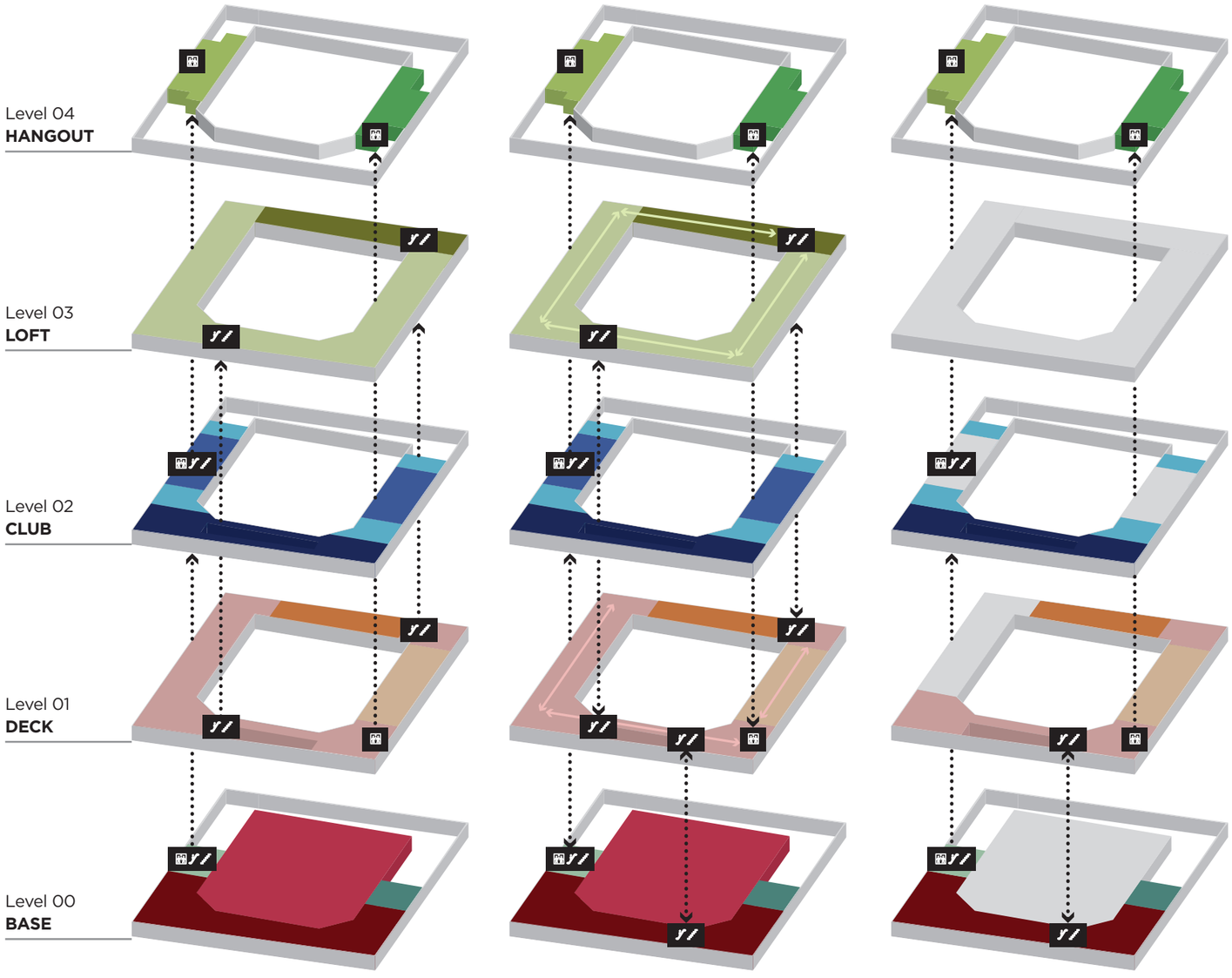
Areas

- BASE ATRIUM
- THE FLOOR
- DECK
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES

Linear Journey
Full Capacity Event Mode

Exploration Journey
Half Capacity Event Mode

Exploration Journey
Non Event / Private Event Mode



3.3.2 Progressive Disclosure

There is a need to establish a set of principles for the sequence of what information is displayed at each stage of the journey.

Providing information in manageable chunks avoids overloading of information, therefore aiding decision making.

Many factors compete for user attention, particularly when the environment is very busy and the users are easily distracted.

Sight lines are a valuable means of giving information about what's ahead to encourage users to navigate. The scale and position of information and products should be positioned according to relative importance.

Hierarchy of information

1 External

Primary;
Entrance Letters
Secondary;
Ticket Office
Canalside

2 Entrances

Primary;
Entrance Letters

3 Circulation

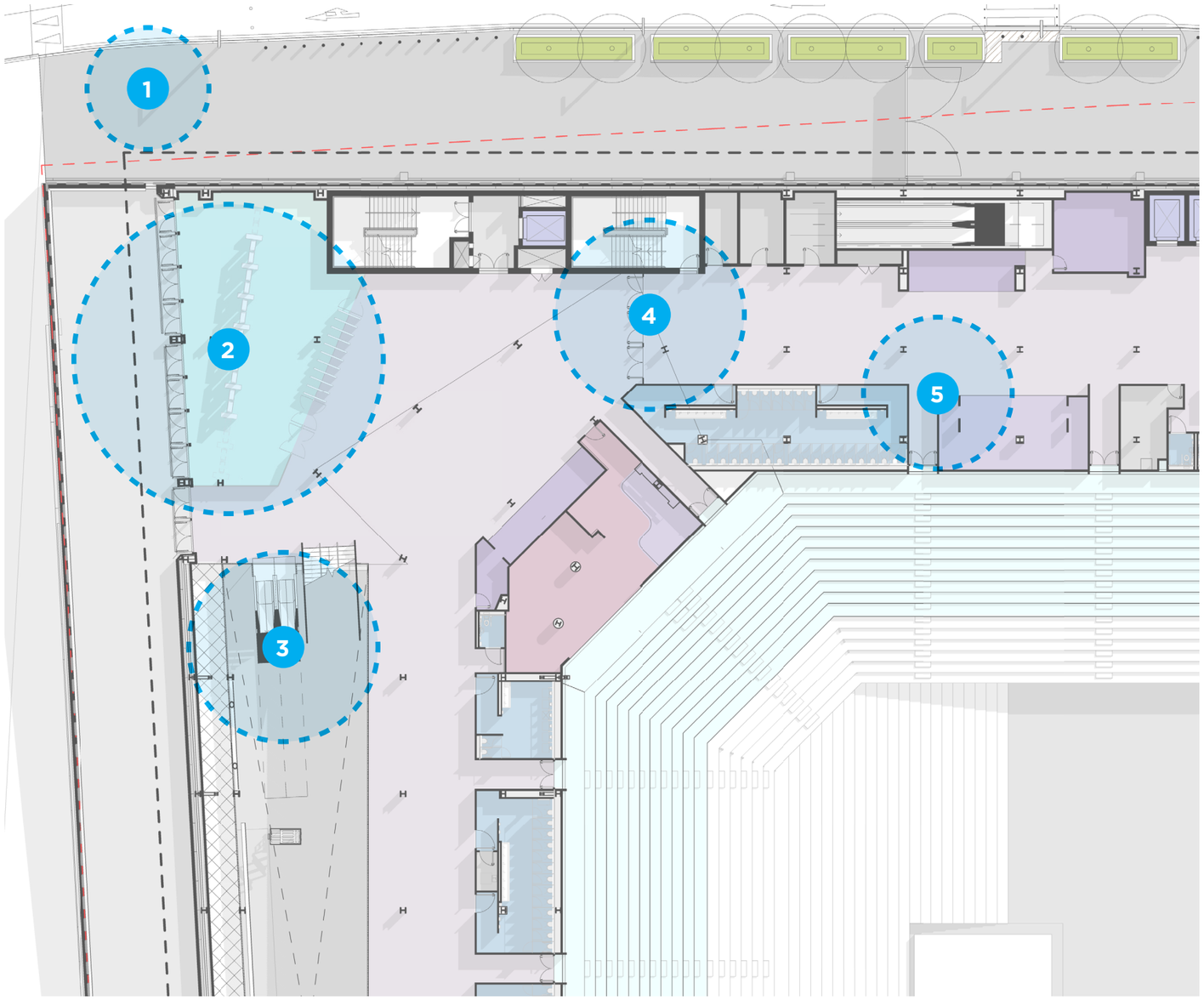
Primary;
Level
Blocks
Secondary;
Areas
Facilities

4 Thresholds

Primary;
Blocks
Secondary;
Vertical Circulation
Additional Facilities

5 Blocks

Primary;
Block Numbers



3.3.3 Linear Journey - Steps

A traditional user journey follows a linear system of progressive disclosure. This is to get users to their seat with minimal deviation. This user journey applies to the Full Capacity Event Mode and ticketed Private Event Mode.

Full Capacity Event Mode



User Group Two

ENTRANCE	LEVEL	AREAS	BLOCK / SUITES	ROW	SEAT
A - G	Level 00 **BASE** Level 01 **DECK** Level 02 **CLUB** Level 03 **LOFT** Level 04 **HANGOUT**	Deck Suites Backstage Club Hangout Bars The Record Room Decibel Atrium Lounge Loges North - West	101 - 324	01 - 26	001 - 673
alpha	name	name	numerical	numerical	numerical

Private Ticketed Event Mode



ENTRANCE	LEVEL	AREAS
A - G	Level 00 **BASE** Level 01 **DECK** Level 02 **CLUB** Level 03 **LOFT** Level 04 **HANGOUT**	Base Atrium Deck Suites Backstage Club Hangout Bars The Record Room Decibel Loges North - West Atrium Lounge
alpha	name	name

3.3.4 Linear Journey - Ticket Strategy

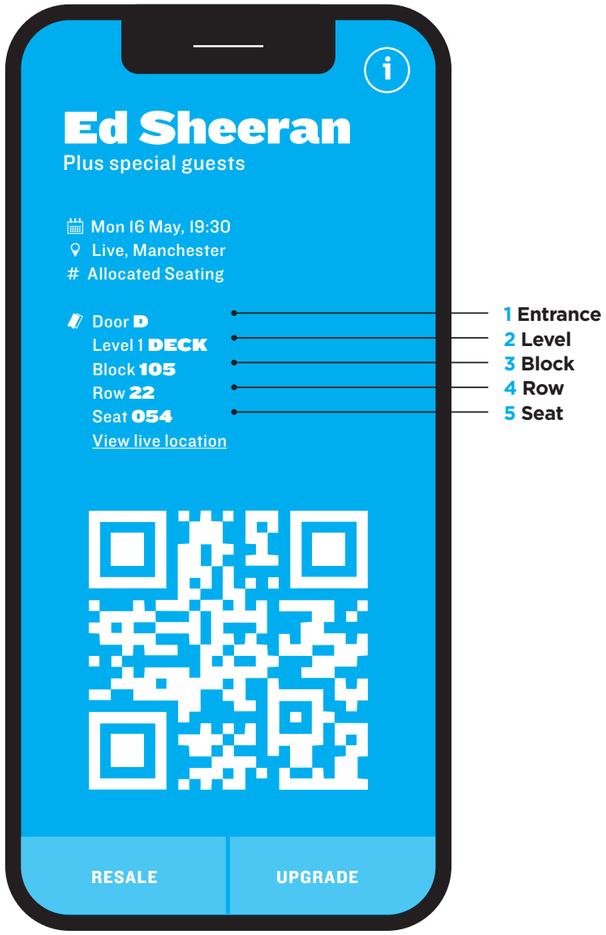
The ticketing strategy hugely influences the wayfinding strategy of the entrances, circulations and ingress routes. The information of the ticket design will inform the user of their route to their seat.

The user journey as a whole, from outside the Venue to the seat, is made of a series of specific targets or sub-journeys. The architectural features of the Venue that form these targets, such as entrances, seating blocks, seating rows and so on, will be named using a mix of numbers, letters and names.

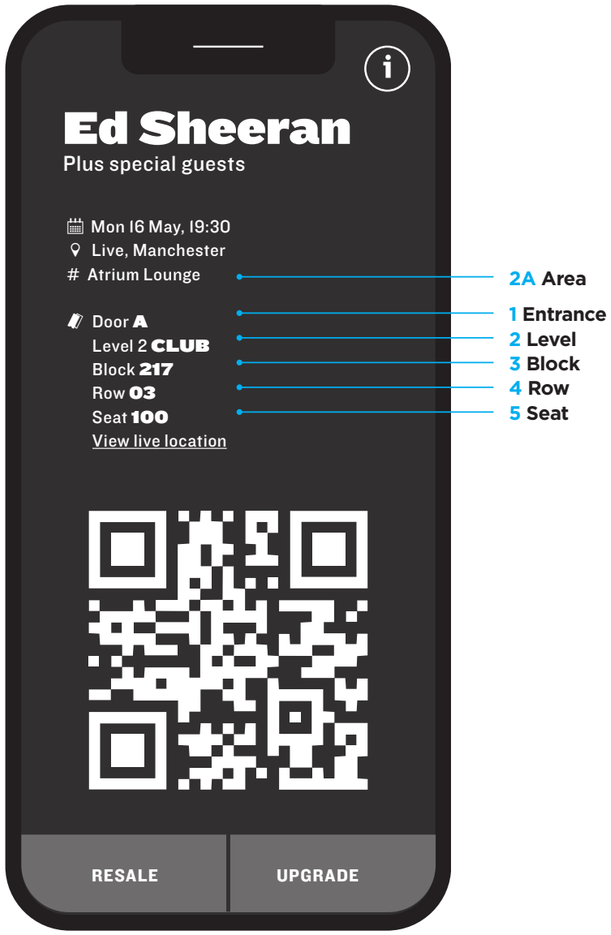
The wayfinding strategy will need to clearly sign each stage of this user journey, so that users will know what to do and how to do it with minimum effort and without error.

The ticket strategy needs to allow for efficient information delivery in different venue modes and functions. The strategy for Full Capacity Event and Private Ticketed Event are illustrated below. They show how information can be grouped to provide logical progressive disclosure when different areas of the Venue are isolated.

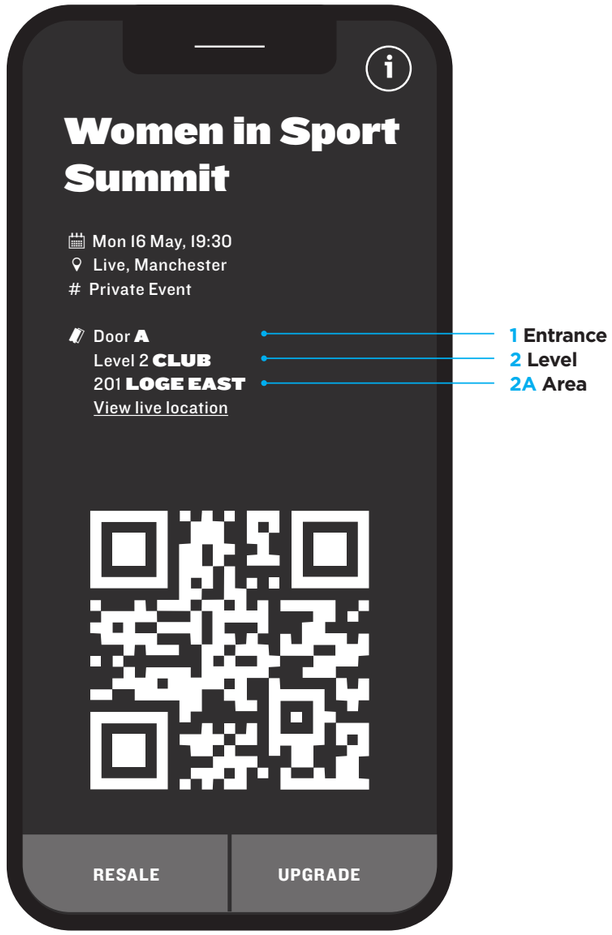
Full Capacity Event Mode
User Group One - Ticket Example



Full Capacity Event Mode
User Group Two - Ticket Example



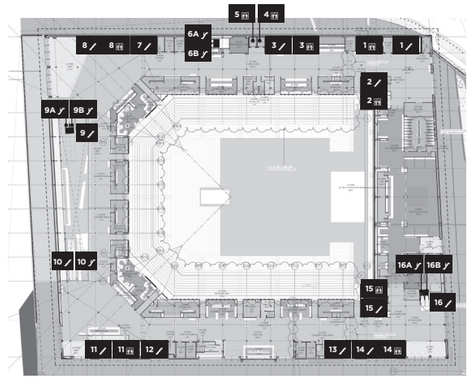
Private Ticketed Event Mode
User Group Two - Ticket Example



3.3.5 Linear Journey - Vertical Circulation

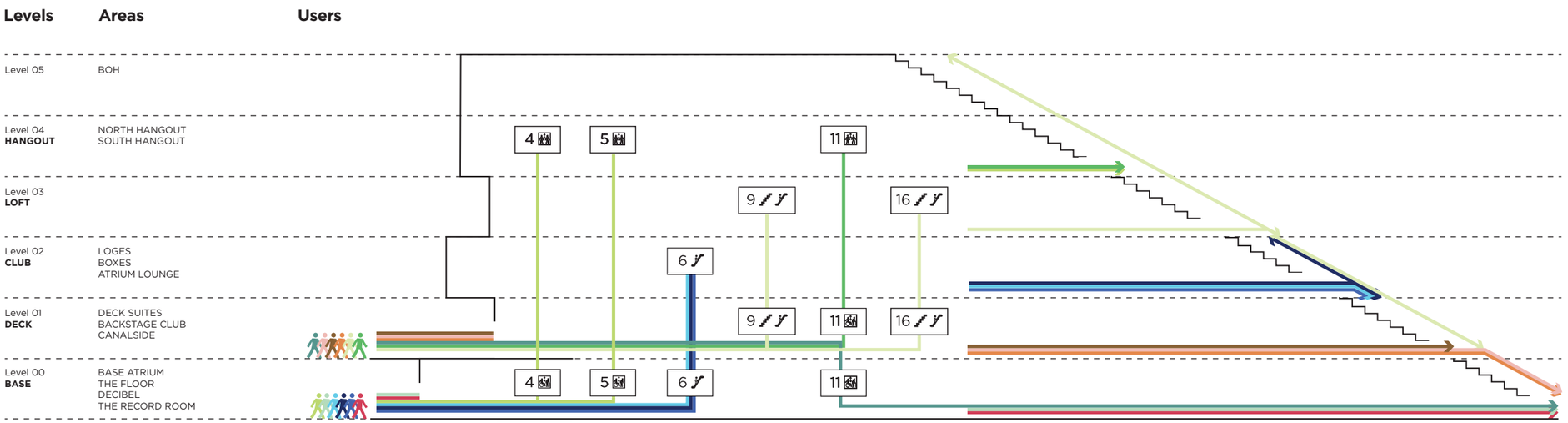
The diagram on this page illustrates the linear ingress journey in Full Capacity Event mode.

Users follow their linear journey steps from the street to their seat.



Users

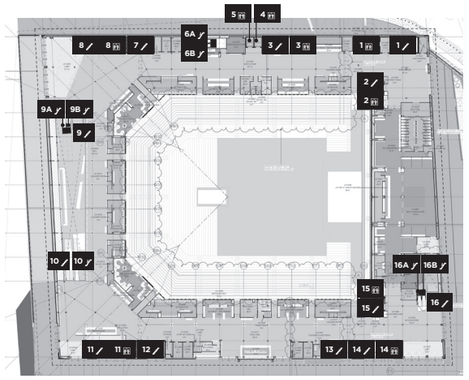
- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS



3.3.6 Linear Journey - Accessible Vertical Circulation

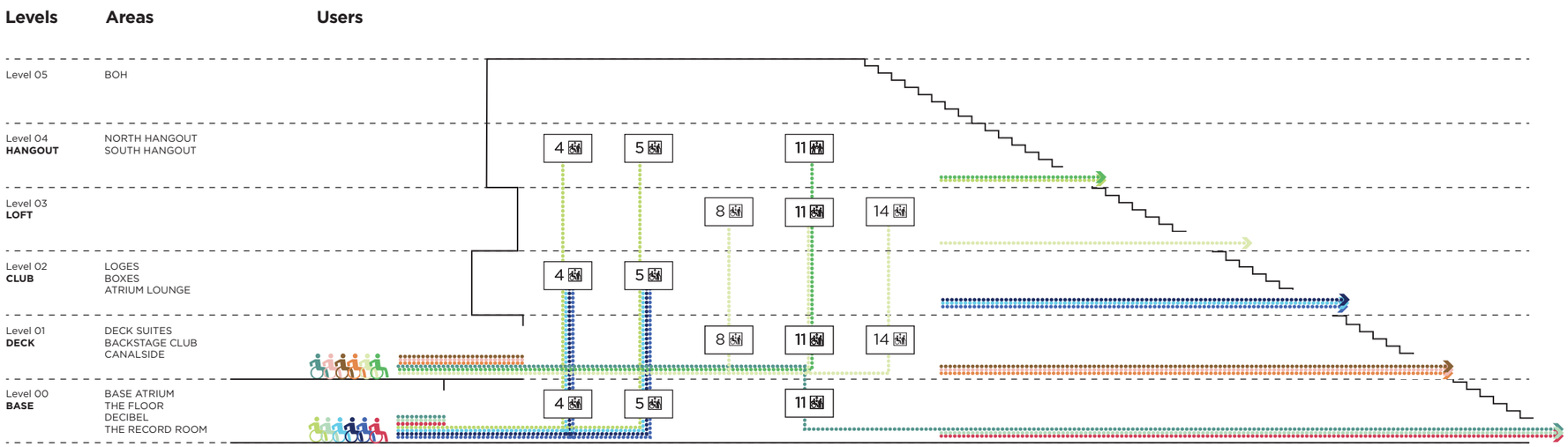
The diagram on this page illustrates the linear accessible ingress journey in Full Capacity Event mode.

Users follow their linear journey steps from the street to their seat.



Users

- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS

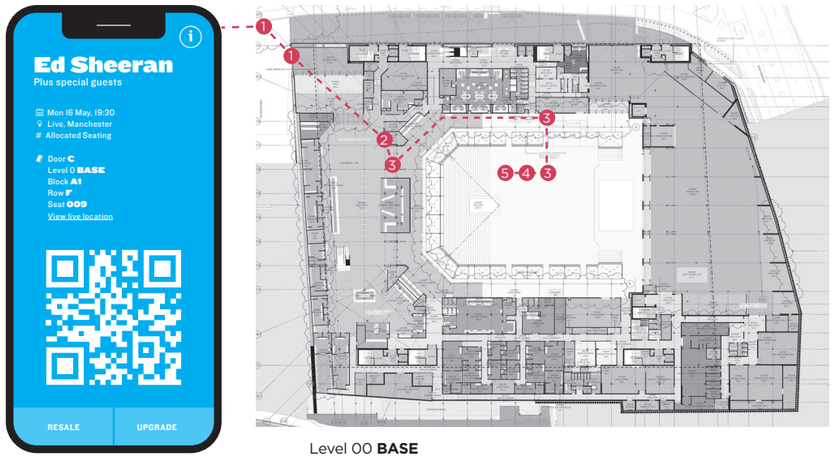


3.3.7 Linear Journey - Level 00 BASE

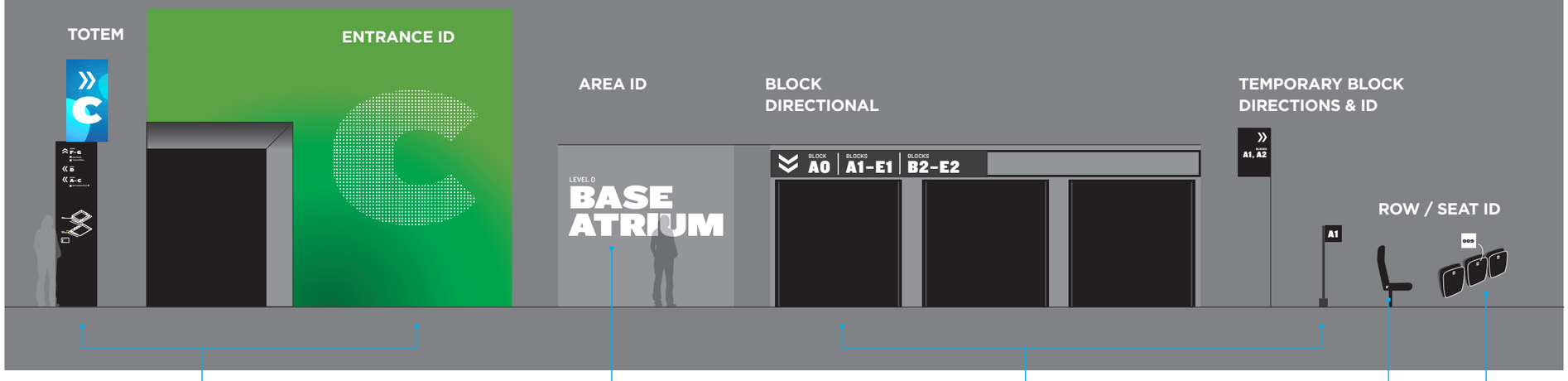
User Group One
Base Ingress Journey Example

The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.



Level 00 **BASE**



1
ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2
LEVELS & AREAS

High impact level signage announces where users are in the Venue.

3
BLOCK

High level block directionals give onward information through the thresholds. Once on the floor, temporary signage directs users to the correct side of the hall and through the correct door. A similar product is then used to distinguish the different blocks. These products have maximum flexibility to accommodate all Venue modes.

4
ROW

Visible sequential numbering allows for quick orientation and efficient flow. An alphabetic system is used to avoid confusion when both row and seat naming appear on seats.

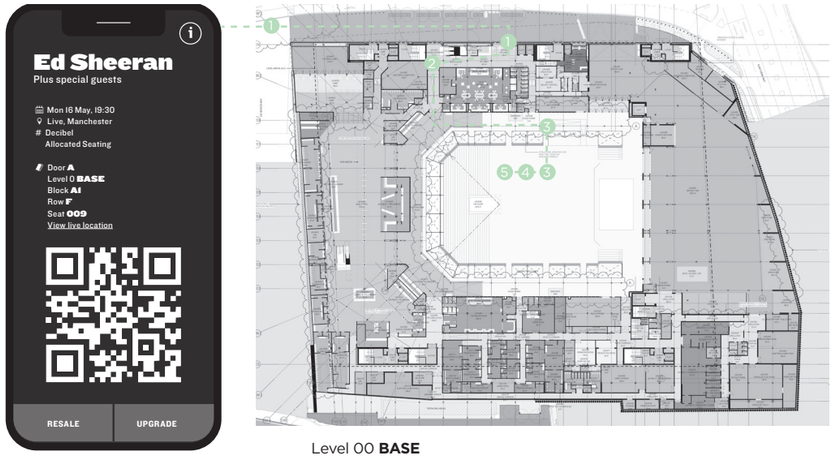
5
SEAT

Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

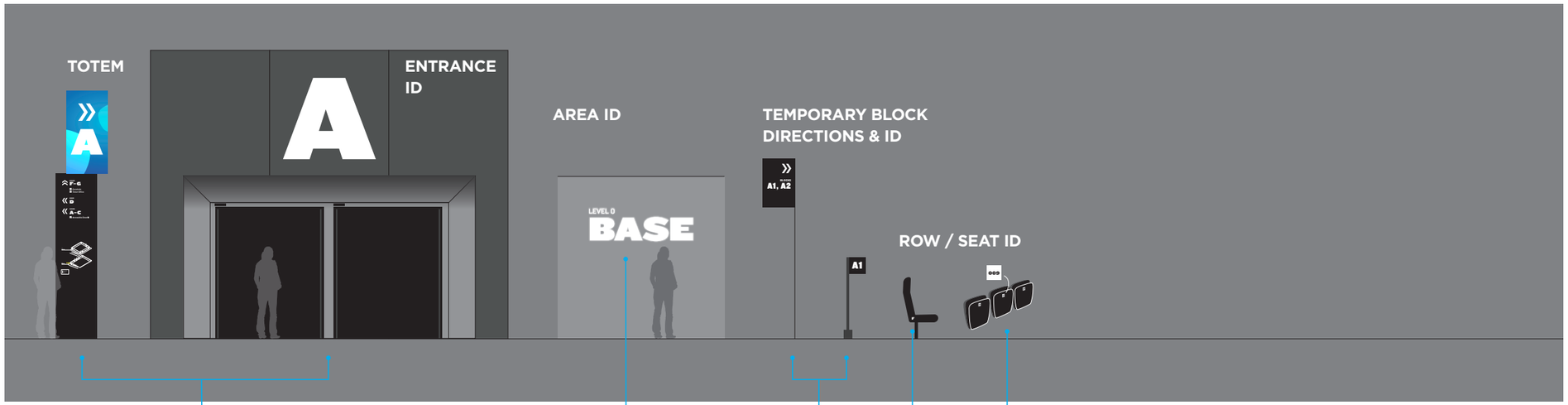
User Group Two
Decibel Ingress Journey Example

The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.



Level 00 **BASE**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

High impact level signage announces where users are in the Venue. From here, directionals provide onward information to different areas.

3

BLOCK

Temporary signage directs users to the correct side of the hall and through the correct door. A similar product is then used to distinguish the different blocks. These products have maximum flexibility to accommodate all Venue modes.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow. An alphabetic system is used to avoid confusion when both row and seat naming appear on seats.

5

SEAT

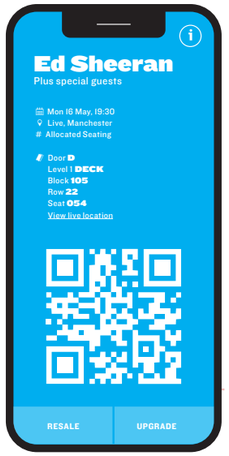
Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

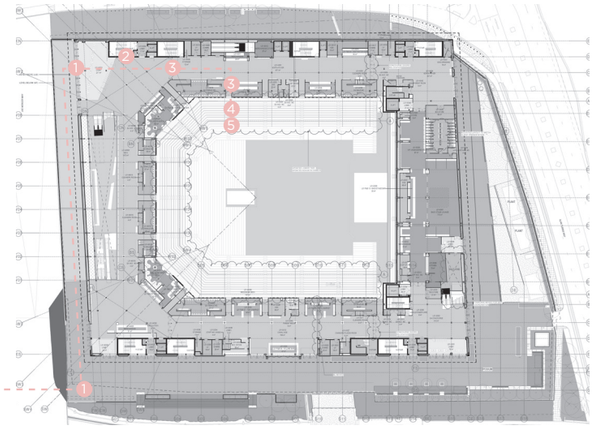
3.3.8 Linear Journey - Level 01 DECK

User Group One
Deck Ingress Journey Example

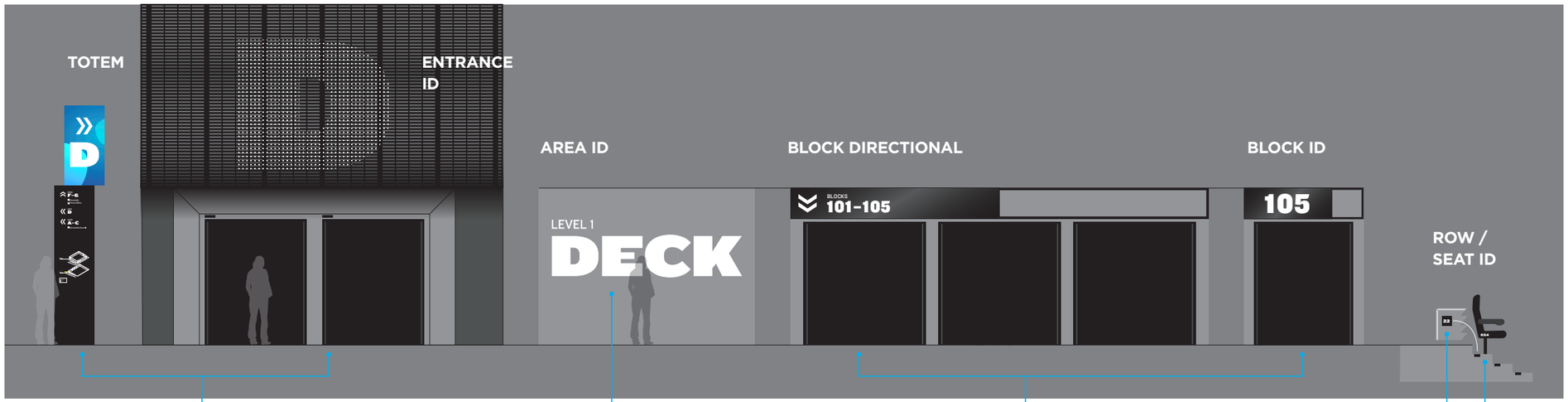
The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.





Level 01 **DECK**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

High impact level signage announces where users are in the Venue.

3

BLOCK

High level block directionals give onward information through the thresholds. Visible sequential numbering of the blocks then allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

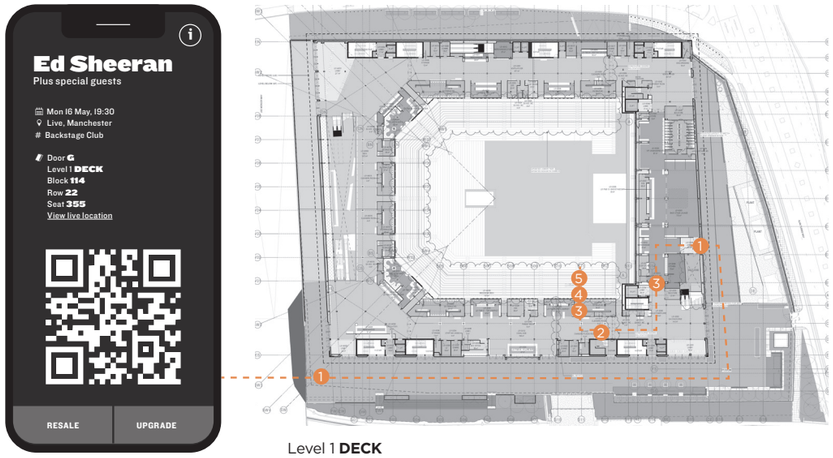
SEAT

Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

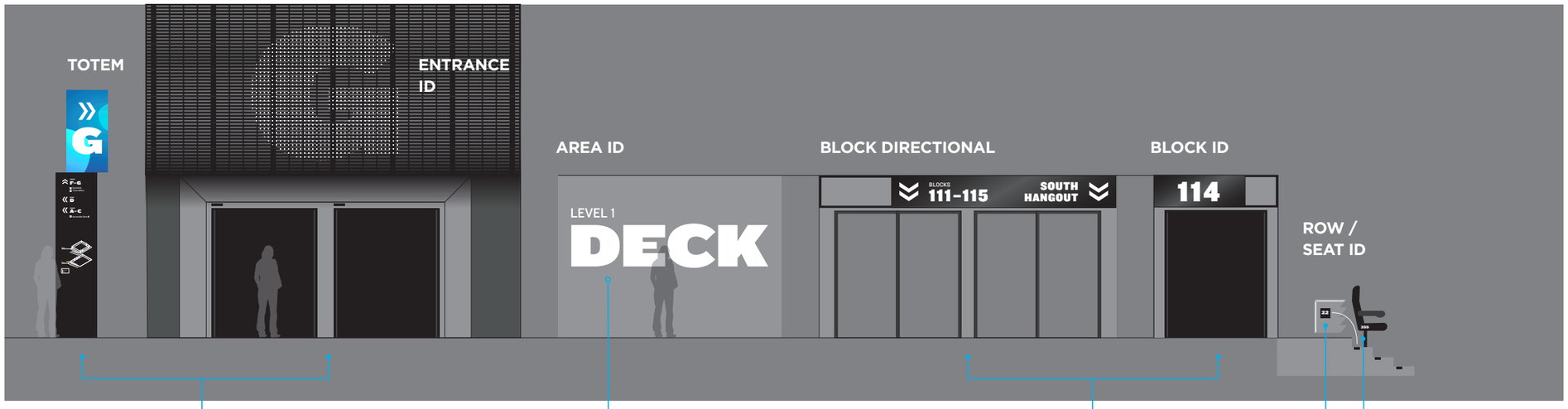
User Group Two
Backstage Club Ingress Journey Example

The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.



Level 1 **DECK**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

High impact level signage announces where users are in the Venue.

3

BLOCK

High level block directionals give onward information through the thresholds. Visible sequential numbering of the blocks then allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

SEAT

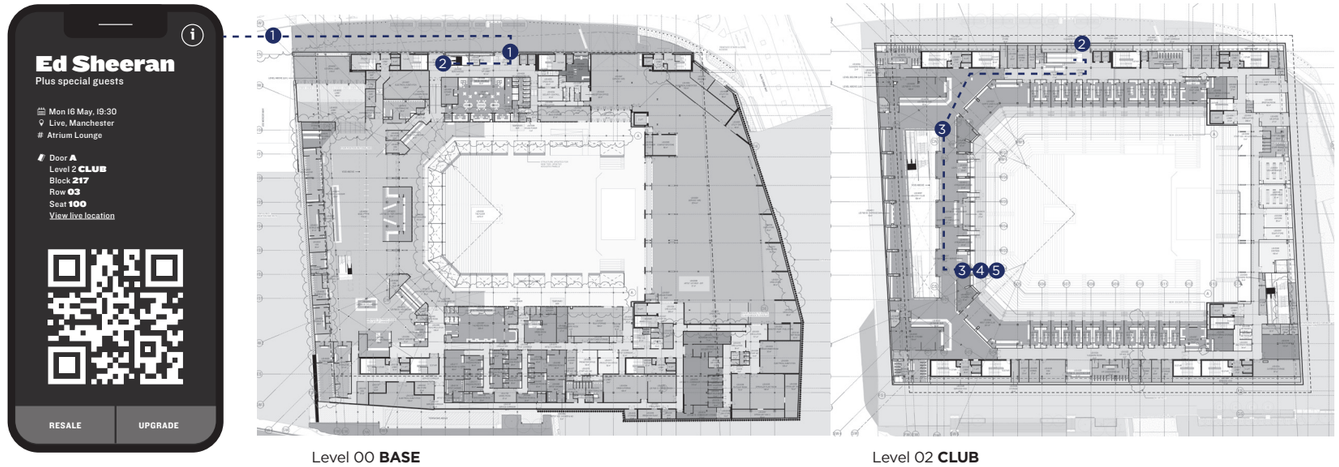
Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

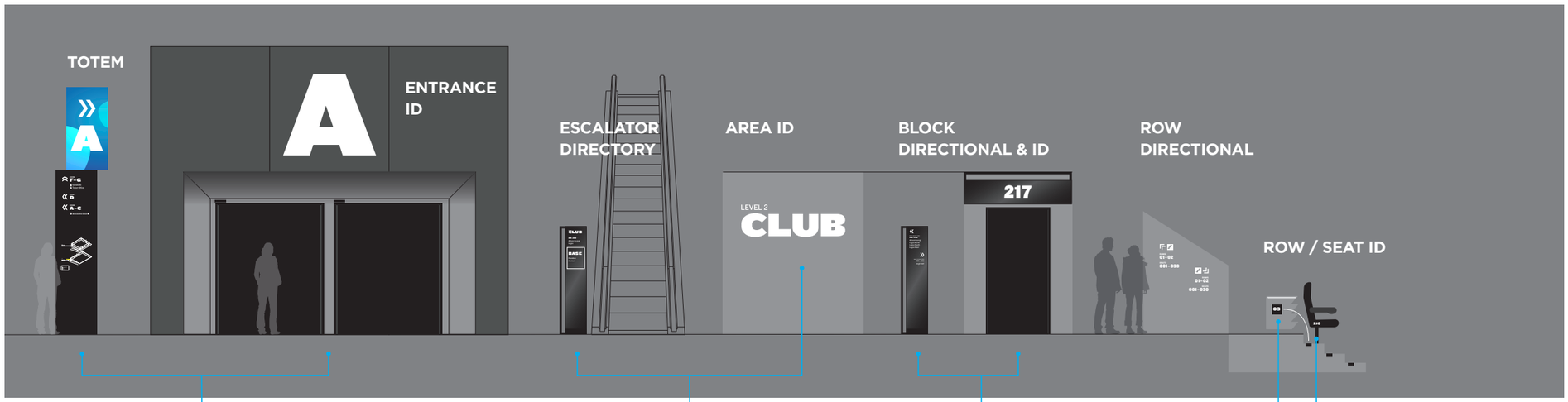
3.3.9 Linear Journey - Level 02 CLUB

User Group Two
Atrium Lounge Ingress Journey Example

The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.





1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

Escalator directories provide onward vertical information. High impact level signage announces where users are in the Venue.

3

BLOCK

Freestanding directionals give onward information through the thresholds. Visible sequential numbering of the blocks then allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

SEAT

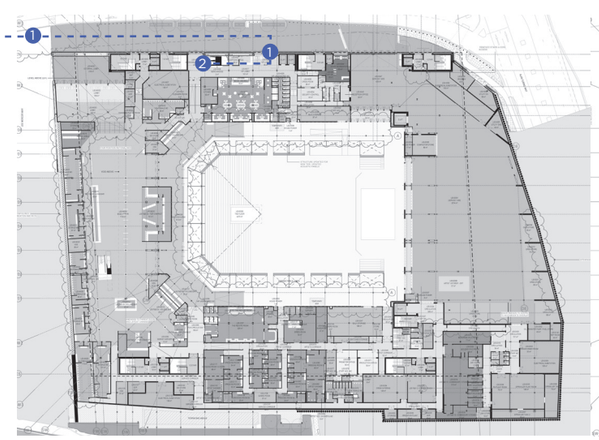
Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

User Group Two
Club Ingress Journey Example

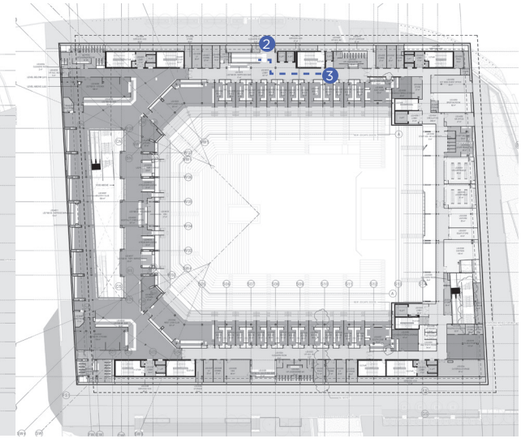
The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

Principles of progressive disclosure of information avoids overload of information.

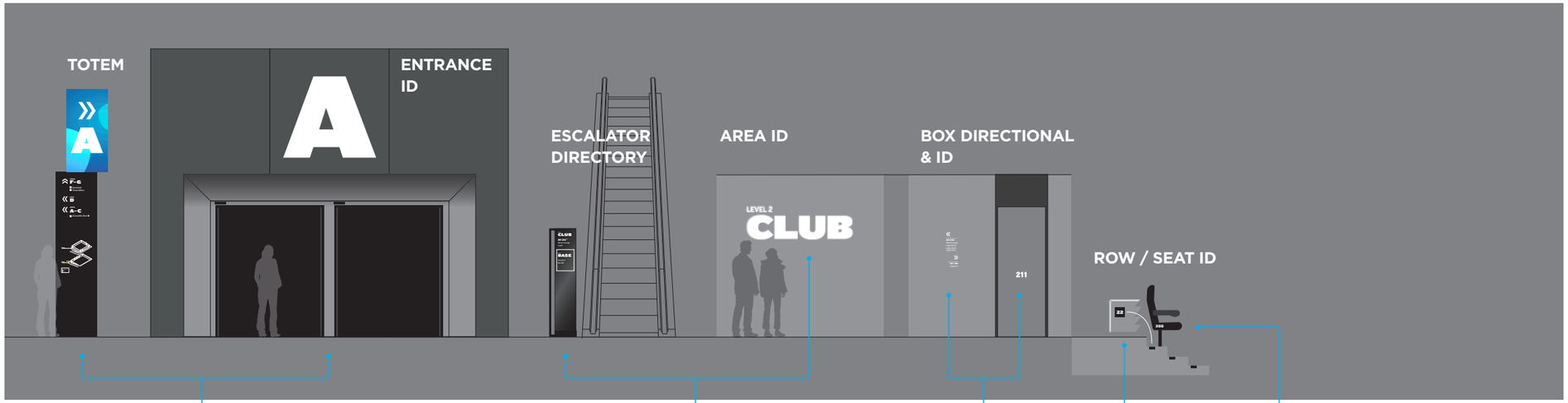




Level 00 **BASE**



Level 02 **CLUB**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

Escalator directories provide onward vertical information. High impact level signage announces where users are in the Venue.

3

BLOCK

Illuminated directionals give onward information at decision points and through the thresholds. Visible sequential numbering of the boxes then allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

SEAT

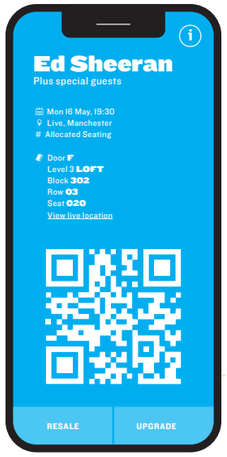
Visible sequential numbering allows for quick orientation and efficient flow.

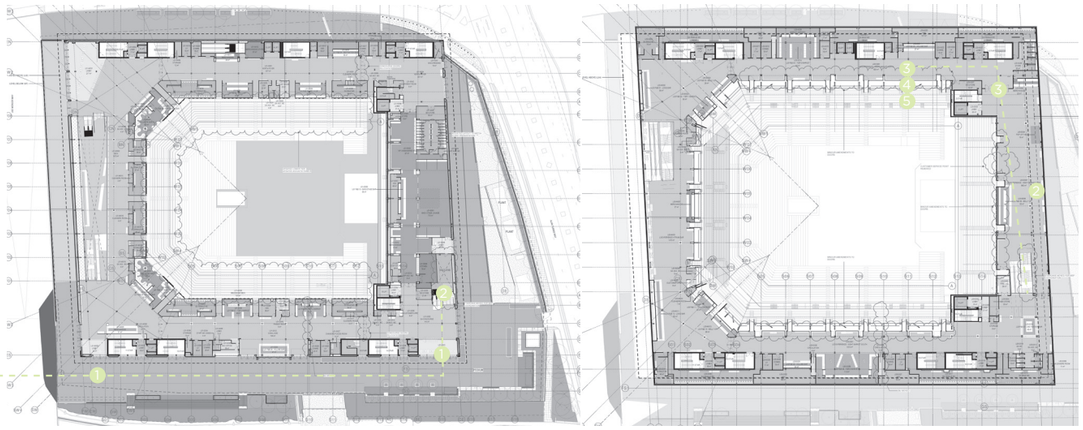
3.3.10 Linear Journey - Level 03 LOFT

User Group One
Loft Ingress Journey Example

The diagram on this page illustrates a linear users ingress journey through the architectural targets. Users follow their ticket from point of entry to seat.

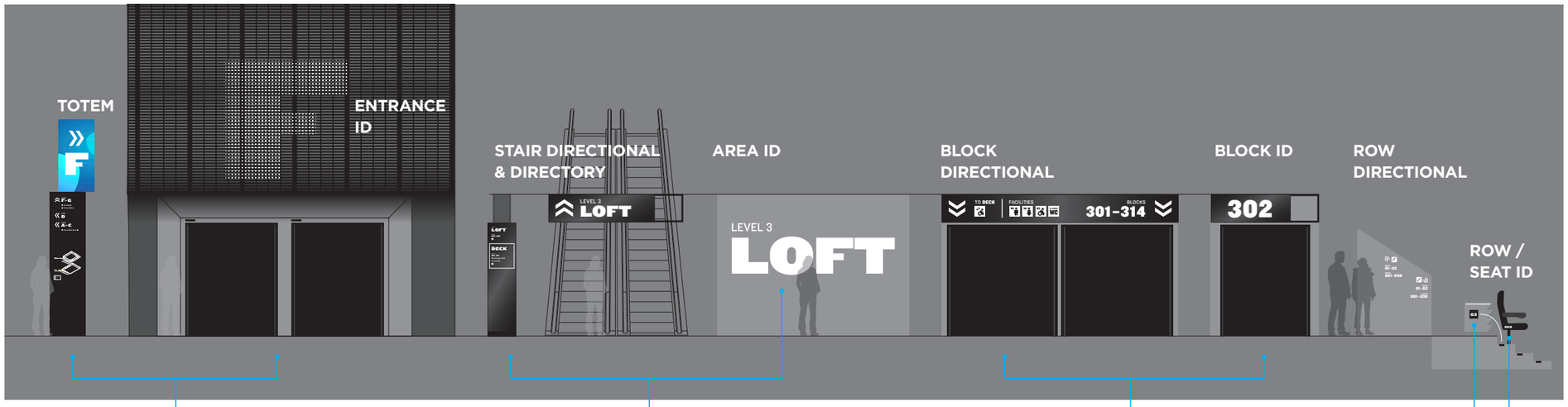
Principles of progressive disclosure of information avoids overload of information.





Level 1 **DECK**

Level 3 **LOFT**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

High impact stair directionals and directories provide onward vertical information. High impact level signage announces where users are in the Venue.

3

BLOCK

High level block directionals give onward information through the thresholds. Visible sequential numbering of the blocks then allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

SEAT

Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

3.3.11 Exploration Journey - Steps

Half Capacity Event Mode and Non Event Modes allow and encourage deviation. Rather than pushing users to their seat, they are encouraged to explore the multiple offers.

In order to accommodate this exploration journey, the wayfinding strategy needs to supply a supportive system, that gives users the confidence to deviate away from the traditional linear journey.

Half Capacity Event Mode



Level 00 **BASE**
Level 01 **DECK**
Level 02 **CLUB**
Level 03 **LOFT**
Level 04 **HANGOUT**

The Floor
Base Atrium
Deck Suites
Backstage Club
Decibel
The Record Room
Atrium Lounge

Non Event Mode



Level 00 **BASE**
Level 01 **DECK**

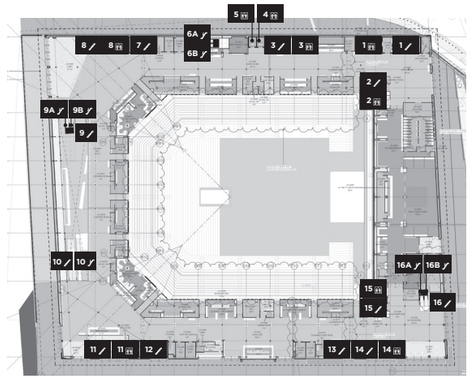
Base Atrium
Canalside

3.3.12 Exploration Journey - Vertical Circulation

Half Capacity Event Mode

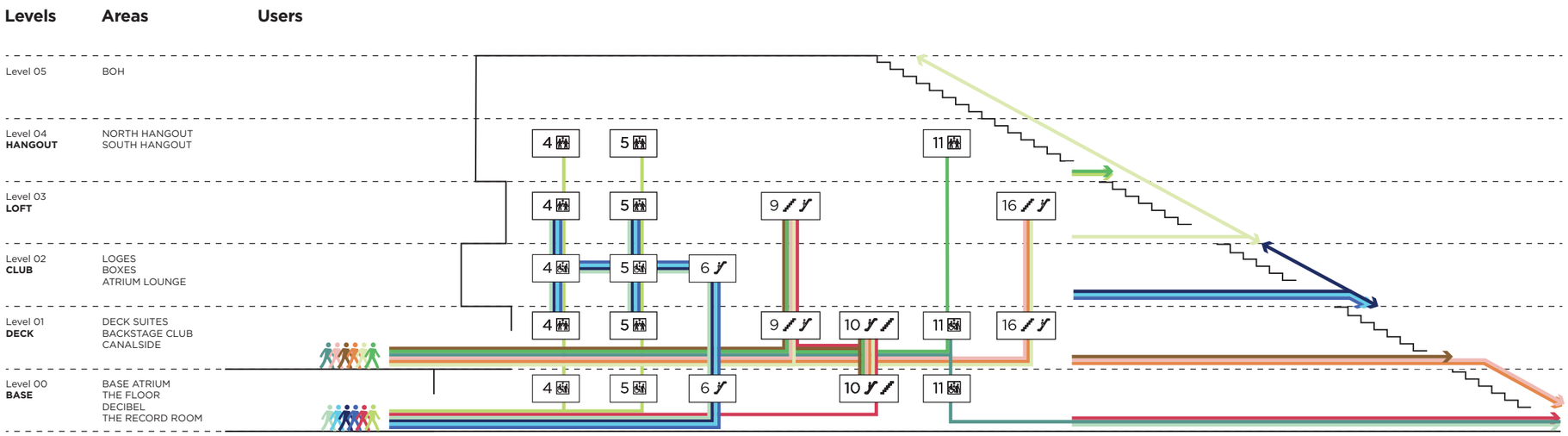
The diagram on this page illustrates the exploration journey in Half Capacity Event Mode.

Users are able to follow explorative journey steps to deviate from their linear path.



Users

- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS

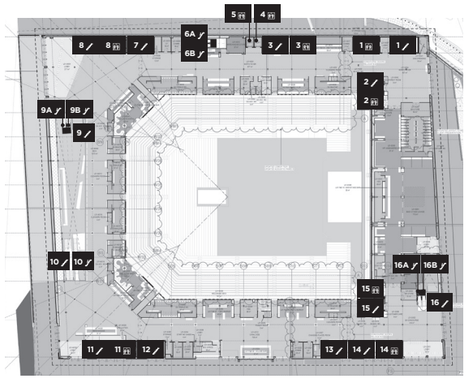


3.3.13 Exploration Journey - Accessible Vertical Circulation

Half Capacity Event Mode

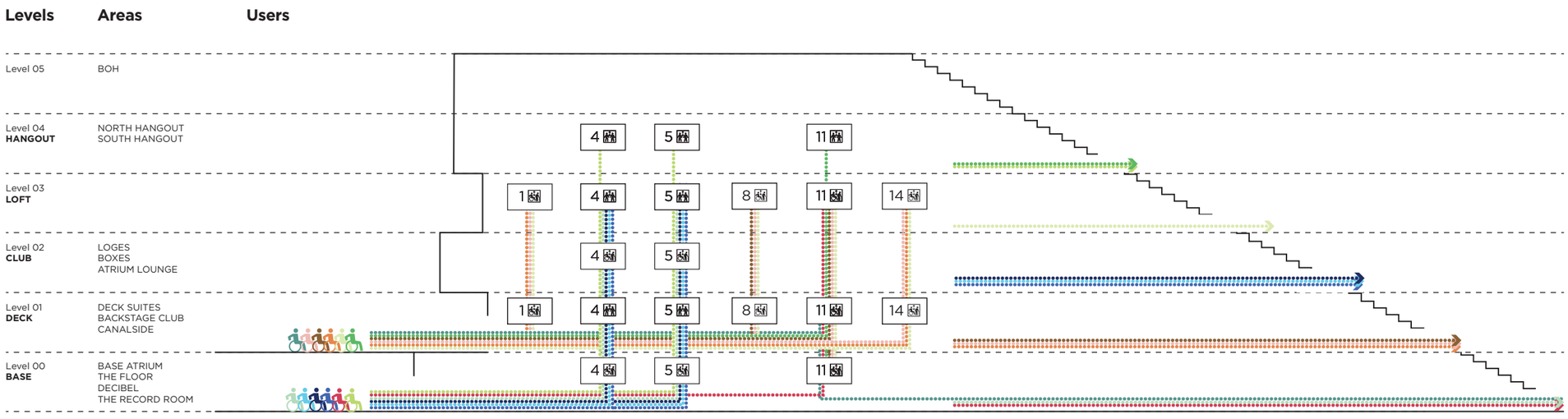
The diagram on this page illustrates the accessible exploration journey in Half Capacity Event Mode.

Users are able to follow explorative journey steps to deviate from their linear path.



Users

- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS

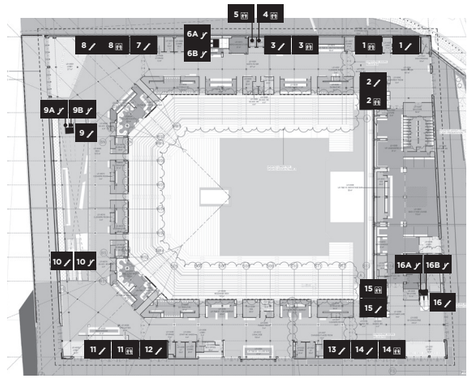


3.3.14 Exploration Journey - Vertical Circulation

Non Event / Private Event Mode

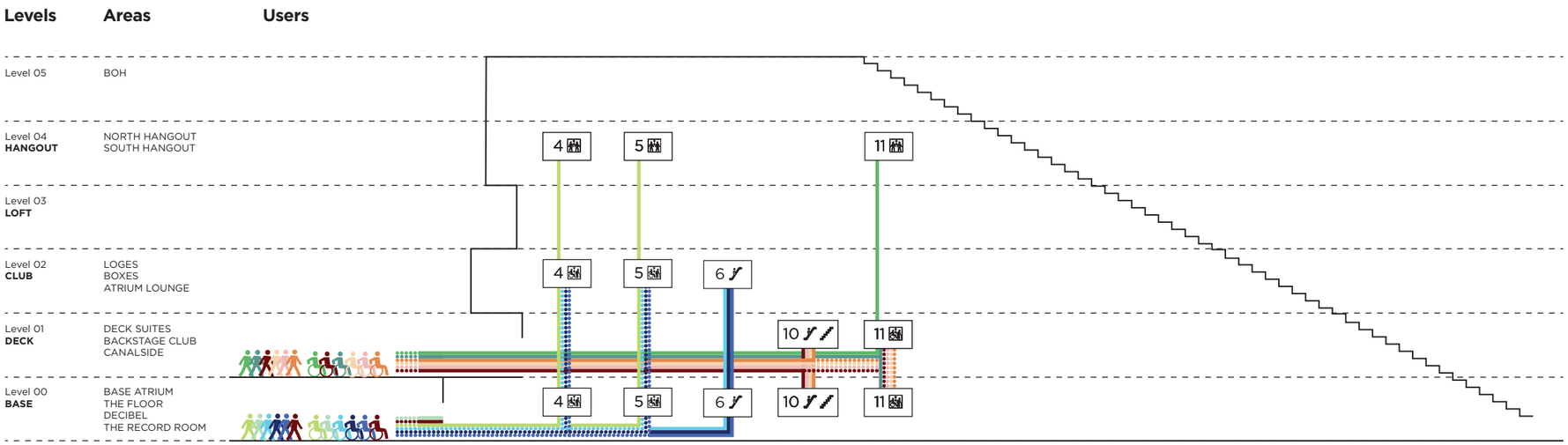
The diagram on this page illustrates the exploration journey in Non Event / Private Event Mode.

Users are able to follow explorative journey steps to deviate from their linear path.



Users

- BASE ATRIUM
- THE FLOOR
- DECK
- DECK SUITES
- BACKSTAGE CLUB
- CANALSIDE
- LOFT
- NORTH HANGOUT
- SOUTH HANGOUT
- DECIBEL
- THE RECORD ROOM
- LOGES
- ATRIUM LOUNGE
- BOXES
- CLUB
- TALENT
- BOH
- EGRESS

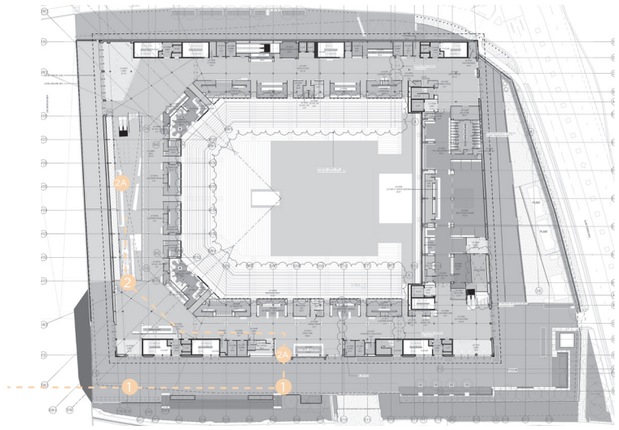


3.3.15 Exploration Journey - Canalside

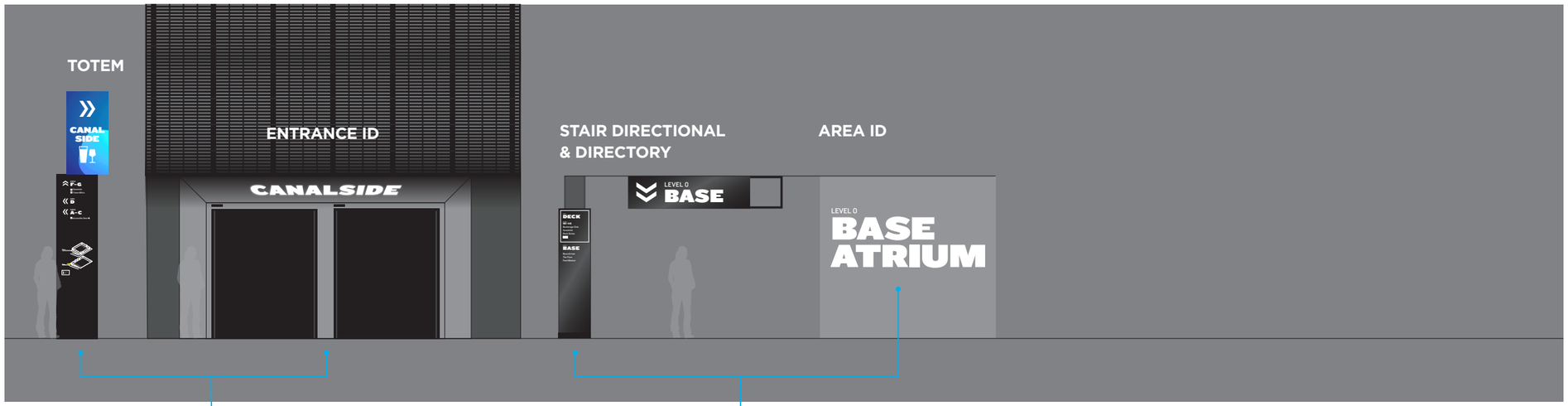
Canalside Ingress Journey Example

In this mode users are free to move around the Canalside, West Deck and Base Atrium. By providing clear level IDs and onward circulation information, users are able to explore and self navigate within the Venue.

Principles of progressive disclosure of information avoids overload of information.



Level 1 **DECK**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys.

2

LEVELS & AREAS

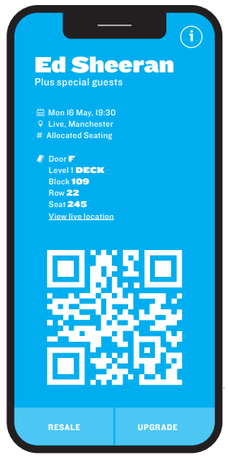
High impact level signage announces where users are in the Venue. From here, directional signage and circulation directories provide onward information.

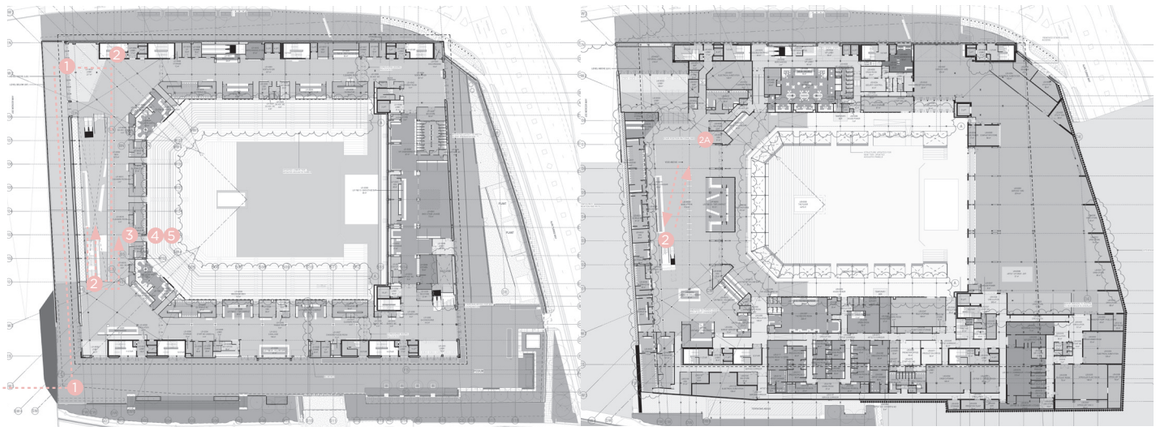
3.3.16 Exploration Journey - Half Capacity Event

Half Capacity Ingress Journey Example

In Half Capacity Event Mode, users are able to deviate from their linear journey. By providing clear level IDs and onward circulation information, users can explore the multiple offers by self navigating within the Venue. This supportive system therefore gives users the confidence to explore, knowing they can find their way back again.

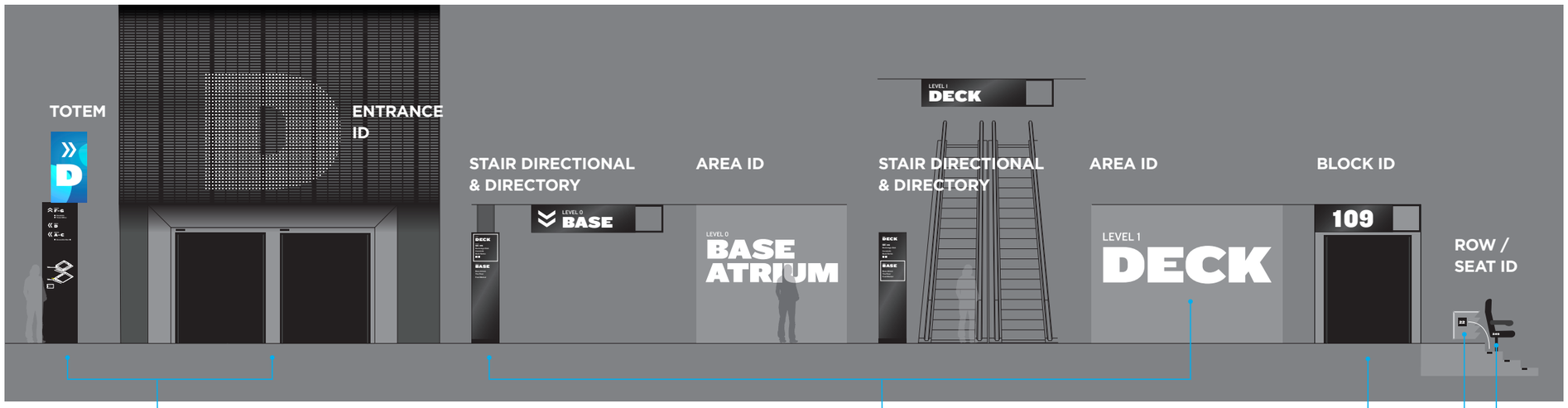
Principles of progressive disclosure of information avoids overload of information.





Level 1 **DECK**

Level 0 **BASE**



1

ENTRANCES

High level identity signage pushes users towards relevant entry points to avoid cross flows and simplify journeys. The letters run consecutively to allow for self navigation.

2

LEVELS & AREAS

The combination of high impact level signage and circulation information creates opportunities to explore the Venue, whilst clearly communicating a users location simultaneously. This will give users the confidence to journey away from their block, knowing they can find their way back again.

3

BLOCK

When users return to their level, visible sequential numbering of the blocks allows for quick orientation and efficient flow with reduced directional signage.

4

ROW

Visible sequential numbering allows for quick orientation and efficient flow.

5

SEAT

Visible sequential numbering allows for quick orientation and efficient flow. At each aisle the numbers regulate to avoid long ranges in end seats.

3.0 WAYFINDING DESIGN

EGRESS STRATEGY

3.4.1 EGRESS STRATEGY 490

3.4.2 EGRESS STRATEGY - OVERVIEW 491

3.4.3 EGRESS STRATEGY - LEVEL 03 LOFT 492

3.4.4 EGRESS STRATEGY - LEVEL 01 DECK 493

3.4.5 EGRESS STRATEGY - LEVEL 00 BASE 494

3.4.6 VERTICAL CIRCULATION EGRESS 495

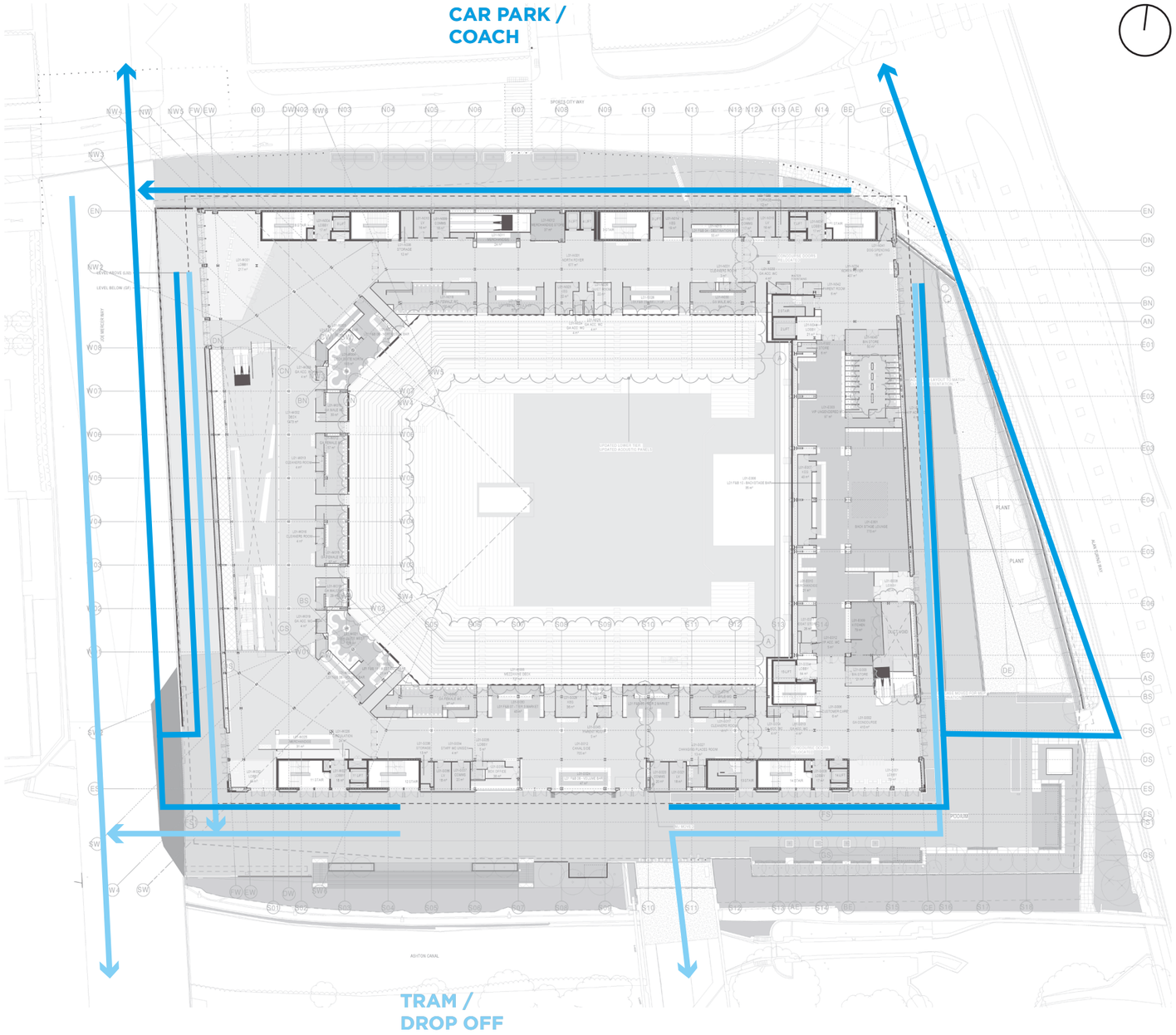
3.4

3.4.1 Egress Strategy

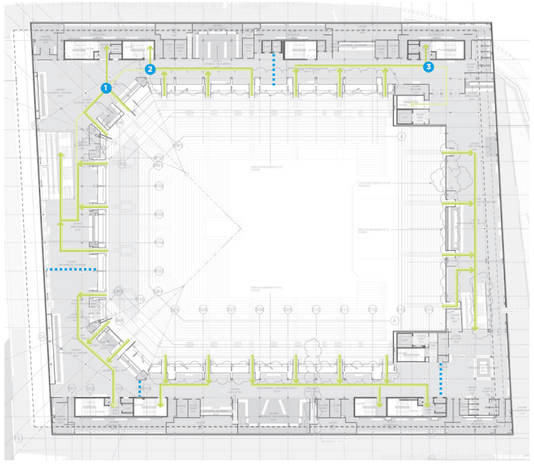
To try and minimise pinch points on egress, a wayfinding strategy has been developed to sort visitors into north and south users.

There are opportunities both internally and externally to achieve this split.

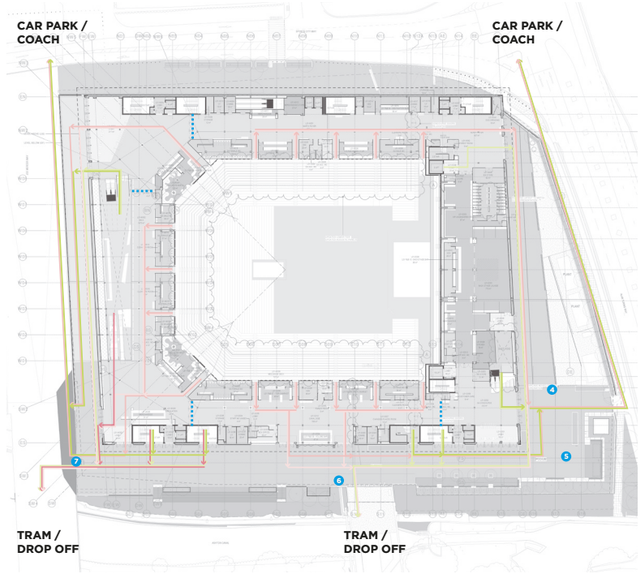
Where possible, we will direct car park and coach users to north exits and tram and drop-off users to south exits.



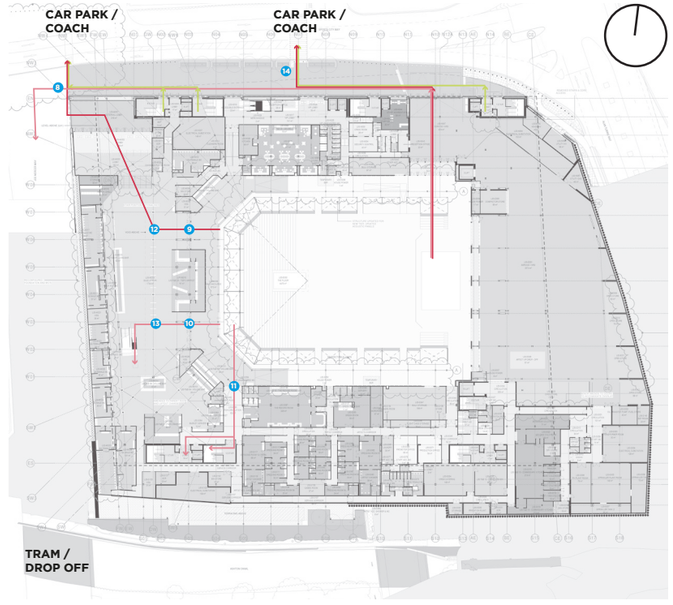
3.4.2 Egress Strategy - Overview



Level 03 **LOFT**



Level 01 **DECK**

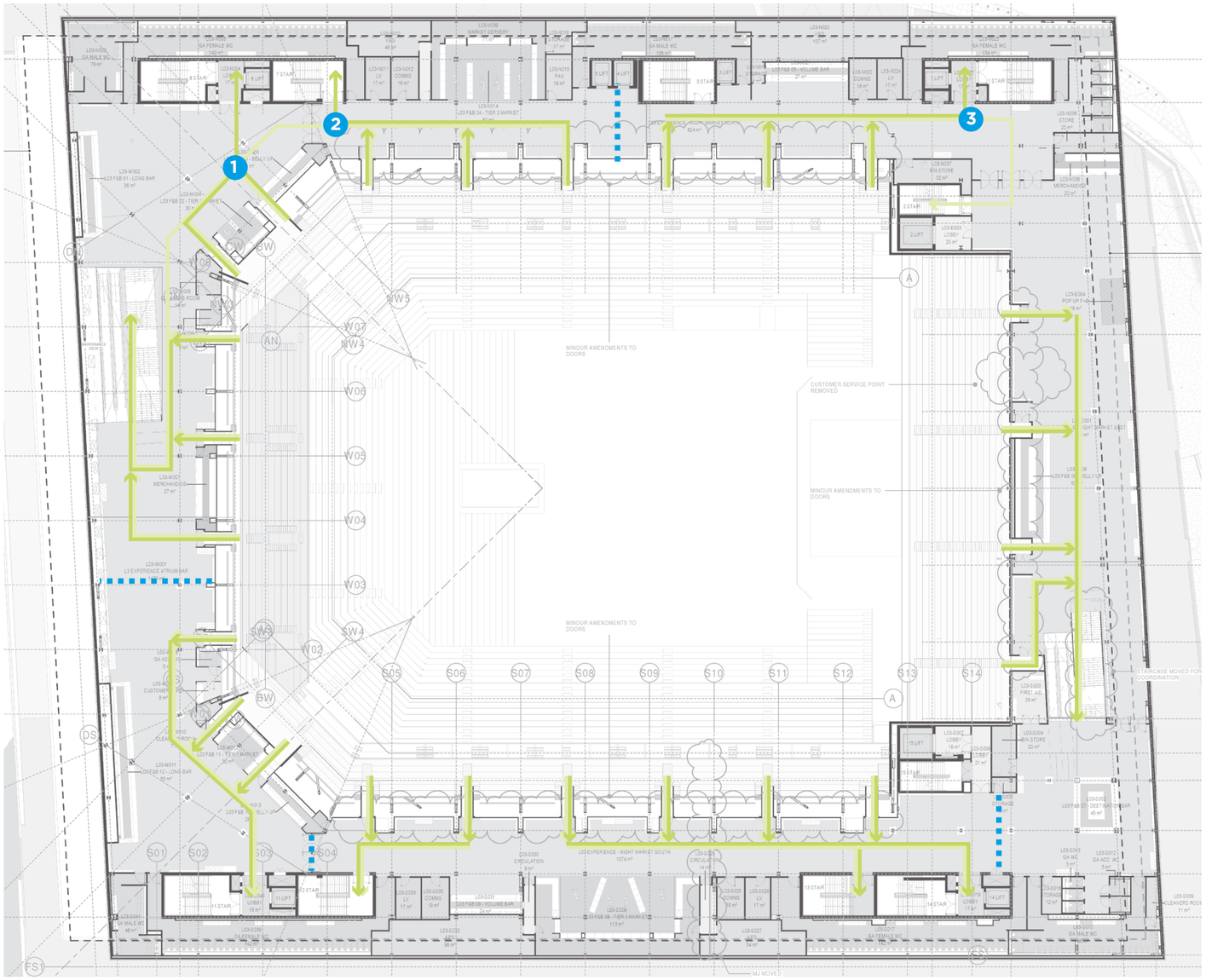


Level 00 **BASE**

Users

- L3 North
- L3 South
- L1 North
- L1 South
- L0 North
- L0 South

3.4.3 Egress Strategy - Level 03 LOFT



1 Stewards to direct:
Right for car park & coach
Left for tram & drop-off

Additional support from digital screen take over

2 Stewards to direct:
Right for car park & coach
Onwards for tram & drop-off

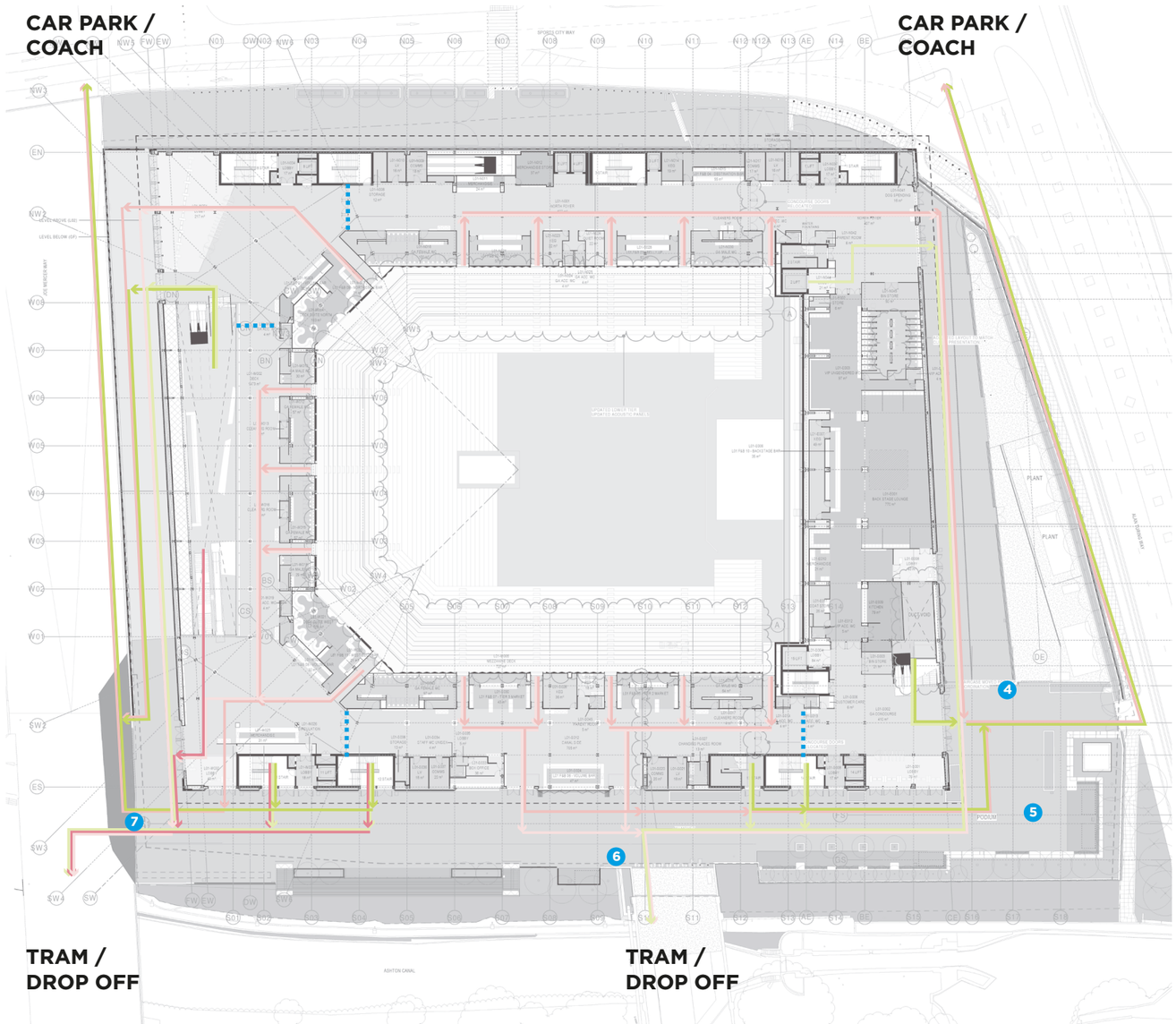
Signage over stair door:

3 Stewards to direct:
Left for car park & coach
Right for tram & drop-off

Users

- L3 North
- L3 South
- L1 North
- L1 South
- L0 North
- L0 South

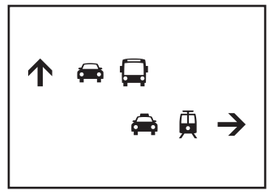
3.4.4 Egress Strategy - Level 01 DECK



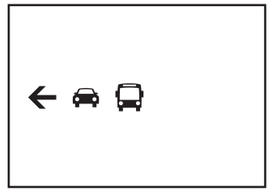
Users

- L3 North
- L3 South
- L1 North
- L1 South
- L0 North
- L0 South

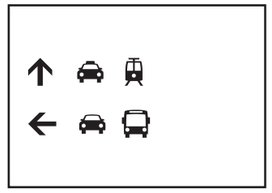
4 Totem to direct:



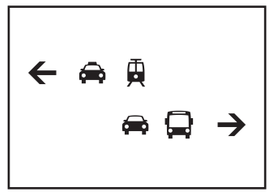
5 Totem to direct:



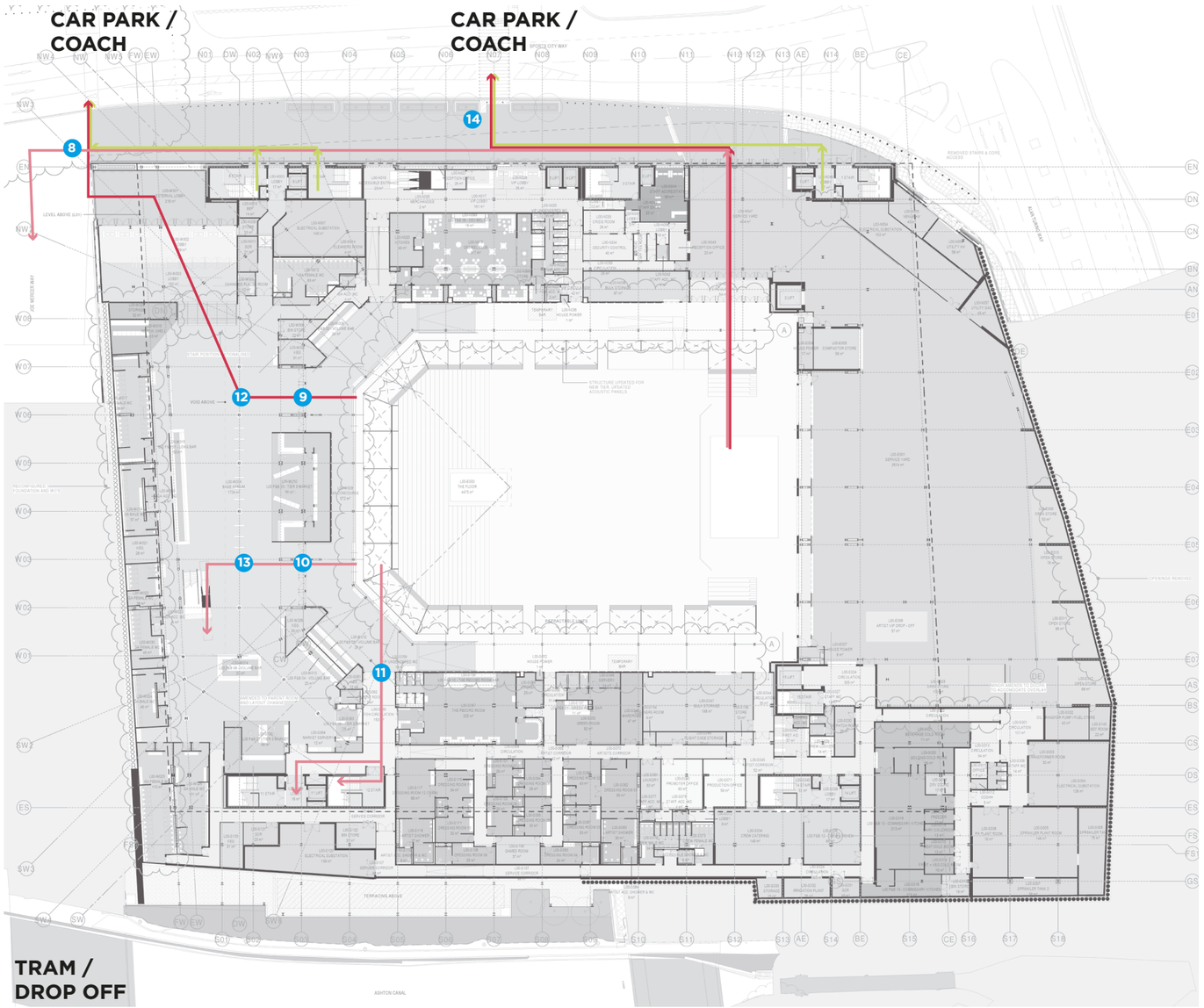
6 Totem to direct:



7 Totem to direct:



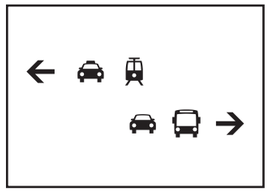
3.4.5 Egress Strategy - Level 00 BASE



Users

- L3 North
- L3 South
- L1 North
- L1 South
- L0 North
- L0 South

8 Totem to direct:



9 Signage to direct:



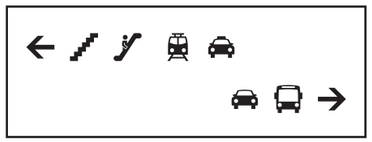
10 Signage to direct:



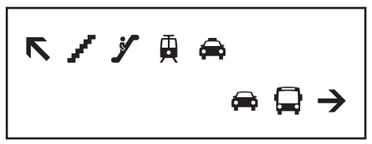
11 Signage to direct:



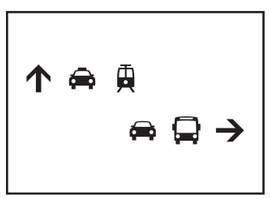
12 Column to direct:



13 Column to direct:

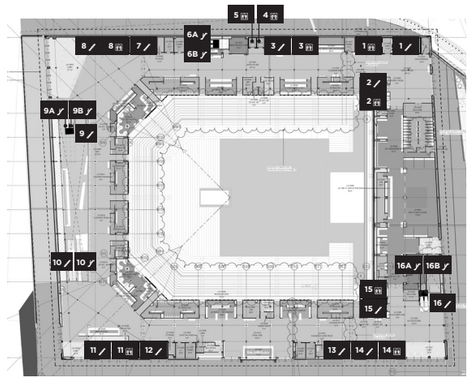


14 Totem to direct:



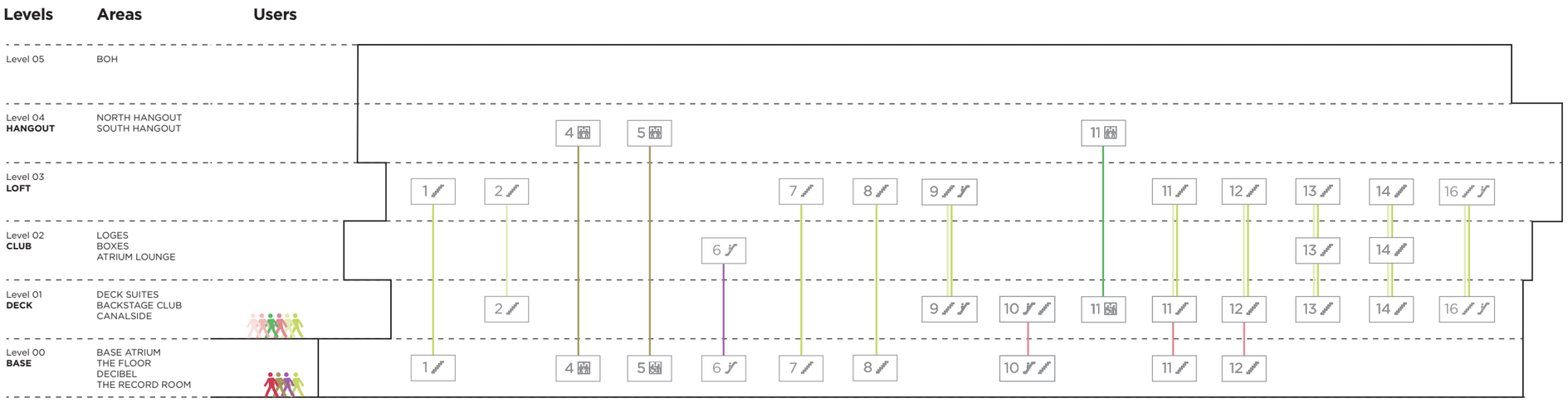
3.4.6 Vertical Circulation Egress

The diagram below shows egress vertical circulation.



Users

- L3 North
- L3 South
- L1 North
- L1 South
- L0 North
- L0 South
- User Group Two
- North Hangout
- South Hangout



WAYFINDING VISUAL IDENTITY

3.5.1 CONCEPTUAL APPROACH 498

3.5.2 TYPOGRAPHY 500

3.5.3 COLOURS 502

3.5.4 VISIBILITY AND TYPE SIZES 503

3.5.5 PICTOGRAMS 504

3.5.6 CONTENT LAYOUT & HIERARCHY 506

3.5.7 ARROW 507

3.5.8 MAP 508

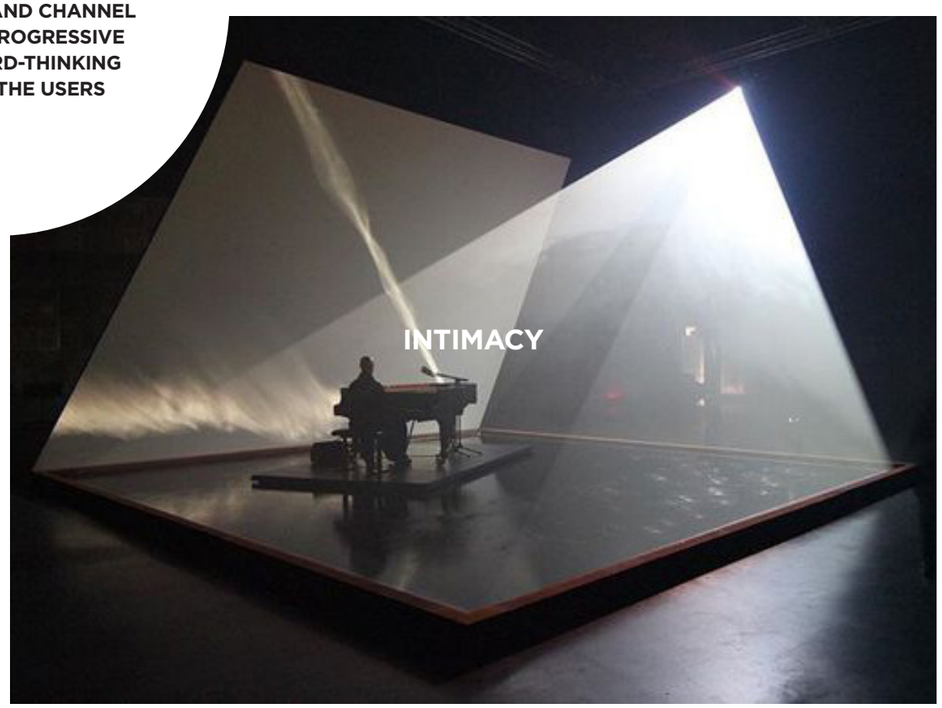
3.5

3.5.1 Conceptual Approach



TAKE THE SPIRIT OF THE CITY, ACKNOWLEDGE THE RICH CULTURAL LEGACY OF THE MUSIC SCENE AND CHANNEL THIS INTO A PROGRESSIVE AND FORWARD-THINKING SPACE FOR THE USERS





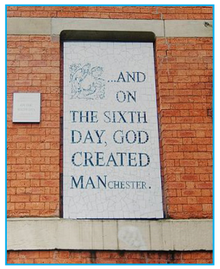
Authenticity, Intimacy and Atmosphere are the cornerstones of the Venue's positioning concept.

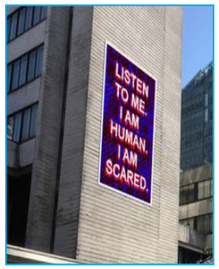
These aspirations and what they represent, combine to create a unique and personal user experience with Manchester at its core.

We will take everyday utilitarian materials, re-work and re-think how designers use them, and how users will view them to convey an authentic nod to Manchester.

MANCHESTER AUTHENTICITY













DIY SPIRIT **INDUSTRY** **PRIDE** **UNITY** **HONEST** **COMMUNITY** **OWNERSHIP**







WAREHOUSE AESTHETIC

- Hero architecture materiality by working with surfaces
- Make a statement
- Honest materiality
- Large interventions
- Confident
- Bold

SEAMLESS

- Hero architecture materiality by reflecting it back
- Integrate seamlessly into a busy and changeable environment

ADAPTABLE

- Signage needs to be flexible and adaptable to manage various modes and uses
- Dynamic
- Integrated technology
- Changeable content

3.5.2 Typography

Importantly, the typeface is the only component of a wayfinding system that will be used across all wayfinding elements.

A wayfinding typeface family should not only be legible, but also distinct and recognisable as part of the overall brand of the Venue.

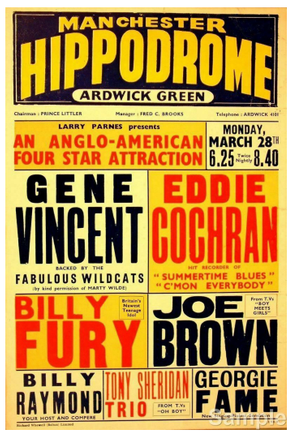
'Knockout' is the proposed wayfinding typeface for the Venue.

Knockout's nine-width, four-weight family offers a range of typographic voices, originally inspired by traditional American wooden type. This gives great flexibility and choice as well as the visual appeal of styles that are individually designed.

Knockout is bold, confident and expressive with nods to industry. It is therefore harmonious to the authenticity of Manchester.

KNOCKOUT

ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz
abcdefghijklmnopqrstuvwxyz
0123456789
0123456789
0123456789
0123456789









Knockout inspiration
Gig Posters

Typography

Three weights of knockout are predominantly used.

93 ULTIMATE HEAVYWEIGHT
This weight is used to announce areas within the Venue. It is used large to grab attention and give the Venue it's distinct character.

91 ULTIMATE MIDDLEWEIGHT
This weight is used for numbers. It has lots of character whilst also being functional for legibility.

31 Junior Middleweight
This weight is light for improved legibility, whilst still retaining the look and feel of the typography family.

Knockout is an off-the-shelf typeface that is commercially available. Therefore the typeface family could be utilised for concessions and other uses beyond wayfinding.

DESCRIPTORS
Knockout
31 Junior Middleweight
Uppercase
Tracking +25

LEVEL 0

AREAS
Knockout
93 Ultimate Heavyweight
Uppercase
Tracking +50

BASE

DESCRIPTORS
Knockout
31 Junior Middleweight
Uppercase
Tracking +25

BLOCKS

NUMBERS
Knockout
91 Ultimate Middleweight
Tracking +50

301–306

BODY COPY
Knockout
31 Junior Middleweight
Title Case

Backstage Club

3.5.3 Colours

Use and choice of colour

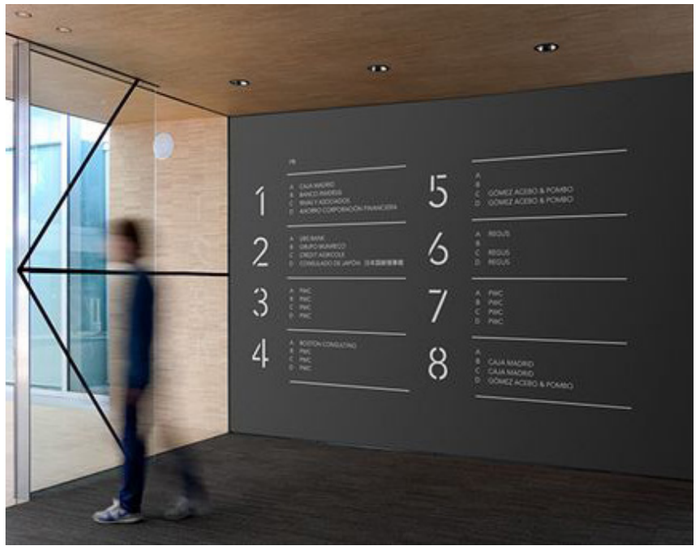
The wayfinding colour palette can form part of the overall brand palette and must be consistent to allow the signange to standout and be recognized within a noisy environment.

It is proposed the Venue's wayfinding system uses a monochromatic colour palette throughout.

This will form a neutral non-distracting backdrop against the variable and vibrant interiors.

White on a dark background will generally be used to provide a strong tonal contrast. This will improve legibility, particularly with screen application or within a darkened interior environment where ambient light sources are used.

Additionally, using a wayfinding palette that is not reliant on colour is advantageous to those with colour vision deficiency, which affects approximately 1 in 12 men (8%).











Benchmarking monochrome wayfinding systems

3.5.4 Visibility and Type Sizes

The opposite chart shows the distance at which specific lettering sizes can be read by someone with average eyesight. It is important to consider those with who may required glasses just for long distance or close focal purposes.

This data was used to dictate the minimum size for any sign for any given distance. Often sizes are used larger for greater awareness and visual impact.

The tables to the right are produced for general guidance only. Factors such as mounting height, architectural features, lighting, material etc. all effect legibility and should be taken into account.

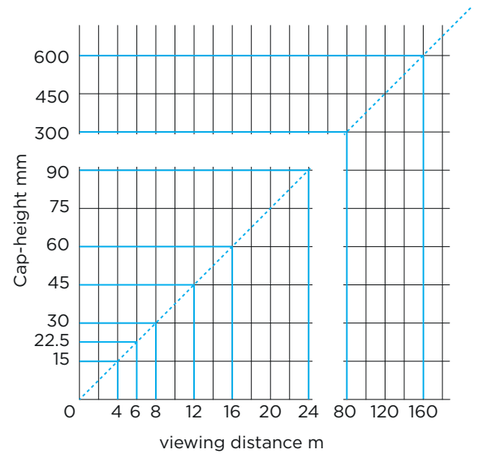
Pedestrian sizes will be based on ADA standards, benefiting all through universal design principles.

Tactile or Braille will not be supported within the Venue. However it is recommended that other technologies, such as NaviLens, for the visually impaired is implemented.

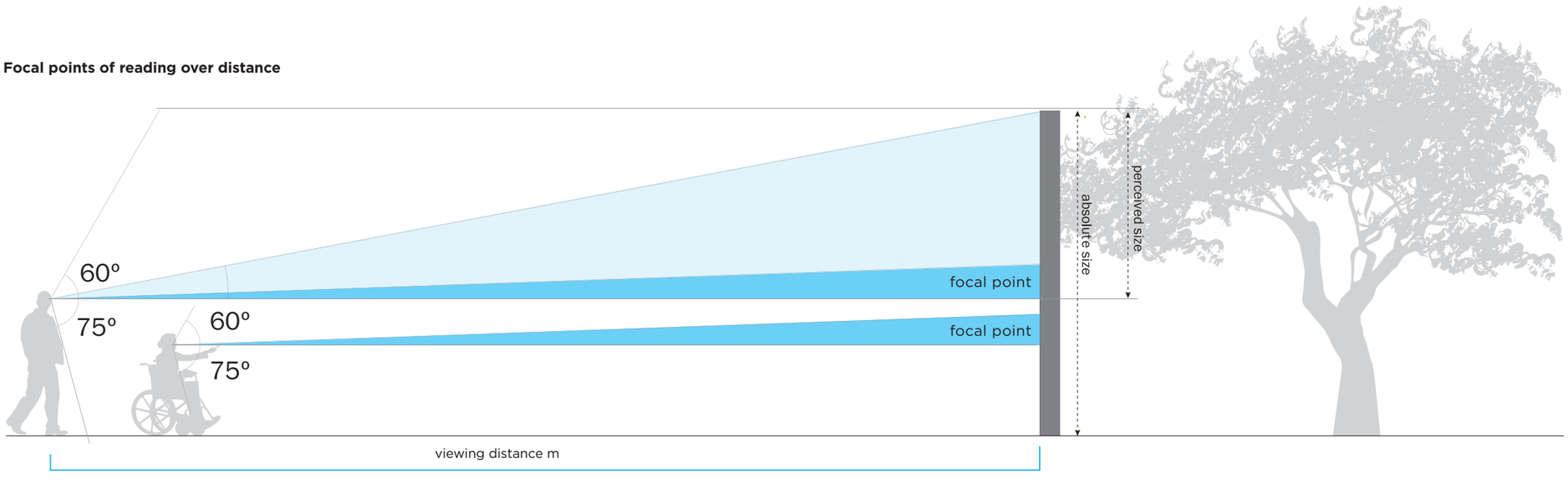


Cap-height	x-height	Type Size	Distance
300mm	234mm	1277pt	80m
90mm	70mm	384pt	24m
60mm	47mm	256pt	16m
45mm	35mm	192pt	12m
30mm	24mm	128pt	8m
22.5mm	18mm	96pt	6m

Minimum type sizes against viewing distances



Focal points of reading over distance



3.5.5 Pictograms

Pictograms were originally designed as universal communicators across languages and cultures. Pictograms are useful when users scan signage from a distance or at speed and are more accessible to those with cognitive impairments or those who do not understand English. They are also very space efficient and work particularly well when used as super-graphics large scale.

For years relevant international standards organisations, such as ISO, BS and AIGA, have refined the general direction of pictorial graphic details. However, these pictograms can appear dated with content no longer current.

Ever since the 1972 Munich Olympics custom pictograms have been used to create a unique character of the event environment.

It is important to design pictograms that are timely accurate and universally understandable, but also recognisable. The pictograms should capture the uniqueness of the environment and create a sense of place.

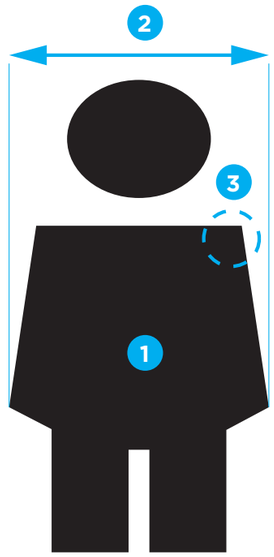
The design of the pictograms correspond and compliment the typography to assure visually unity.

Characteristics applied to all pictograms

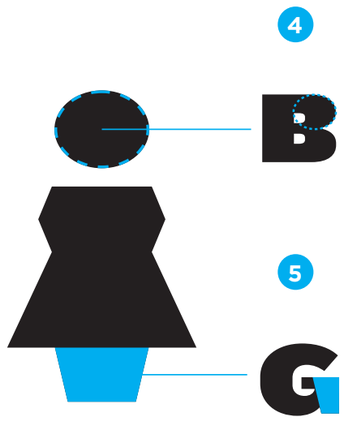
1. Thick, solid forms match the heavy weight of the typeface.
2. Expanded width of the typeface is mirrored in the width of the pictograms.
3. Sharp points and angular forms from the typeface are used in the pictograms.

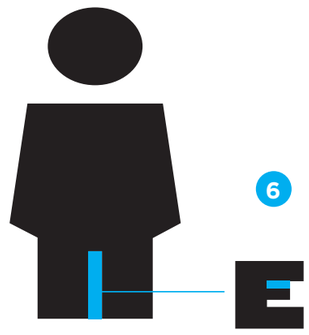
Characteristics applied when appropriate

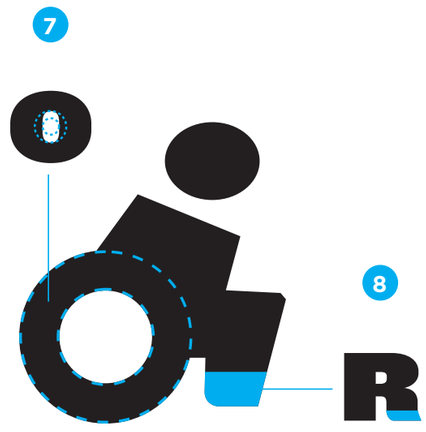
4. Wide ellipsis.
5. Shapes that narrow at one end.
6. Thin gaps.
7. Stroke weight derived from the difference between the height and width of counters.
8. Curved details in angular forms.











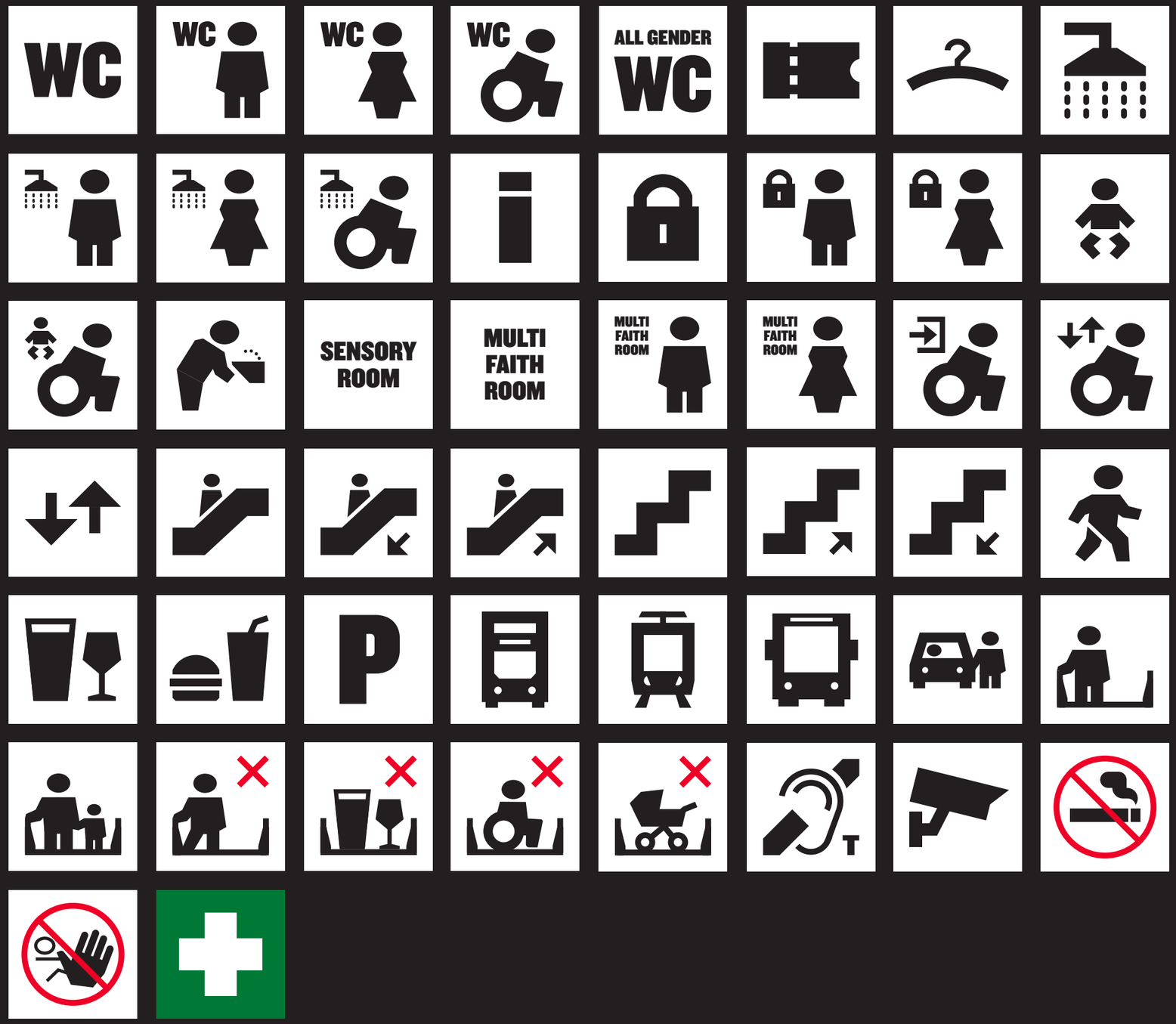
Pictograms

The current work in progress pictogram family is shown to the right. These are based on the principles of design.

Additional pictograms include:

Prohibited

- No alcohol
- No bikes/cycling
- No glass/bottles
- No electronic cigarettes
- No sharp items
- No dogs
- No food/drink



NOTE:

All materials, sizes and construction details are TBC pending further development, consultation with sign manufacturer and sign off by client.

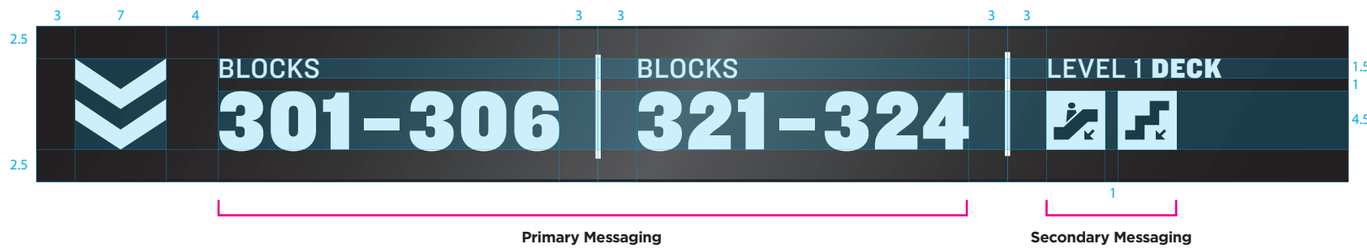
All content is indicative.

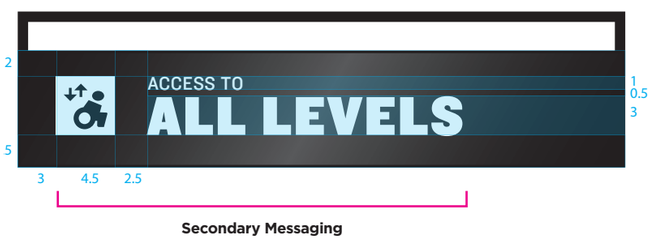
3.5.6 Content Layout & Hierarchy

All signs are set out on an underlying grid derived from the visible measurements of the typeface. The smallest measure is then used as a unit to create a grid in which to layout product information.

The grid is scalable depending on how large the type appears, ensuring a common relationship between the design elements.

In this way the lockups are maintained as well as the size relationship between primary and secondary information messaging.

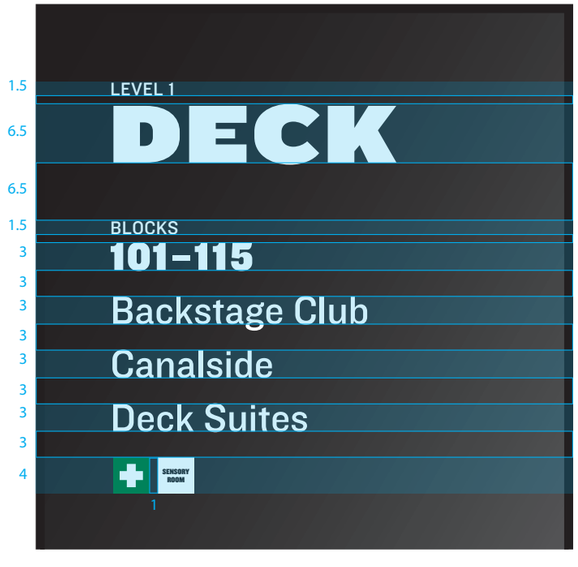












3.5.7 Arrow

The chevron arrow compliments the bold, warehouse aesthetic of the Venue.

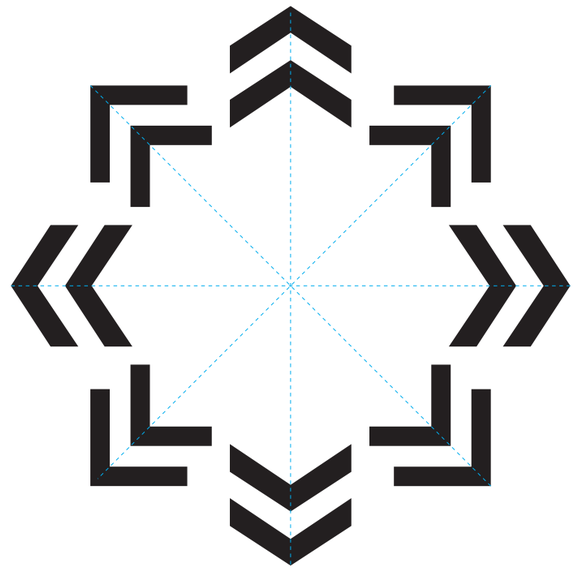
To ensure unambiguous directions, the arrow should be positioned to coincide with the direction in which it points – arrows that point left are on the left side of the sign; arrows that point right are to the right. Always direct ahead and to the left first, followed by to the right.

Where possible, arrows shall not be set inside any other shapes for maximum legibility.

There are different configurations of the arrow in increments of 45-degrees. Arrows have a fixed position in relation to text legends.



Custom Arrow



Rotations, alignment and order

Align left

Align right



Alignment with text legend

3.5.8 Map

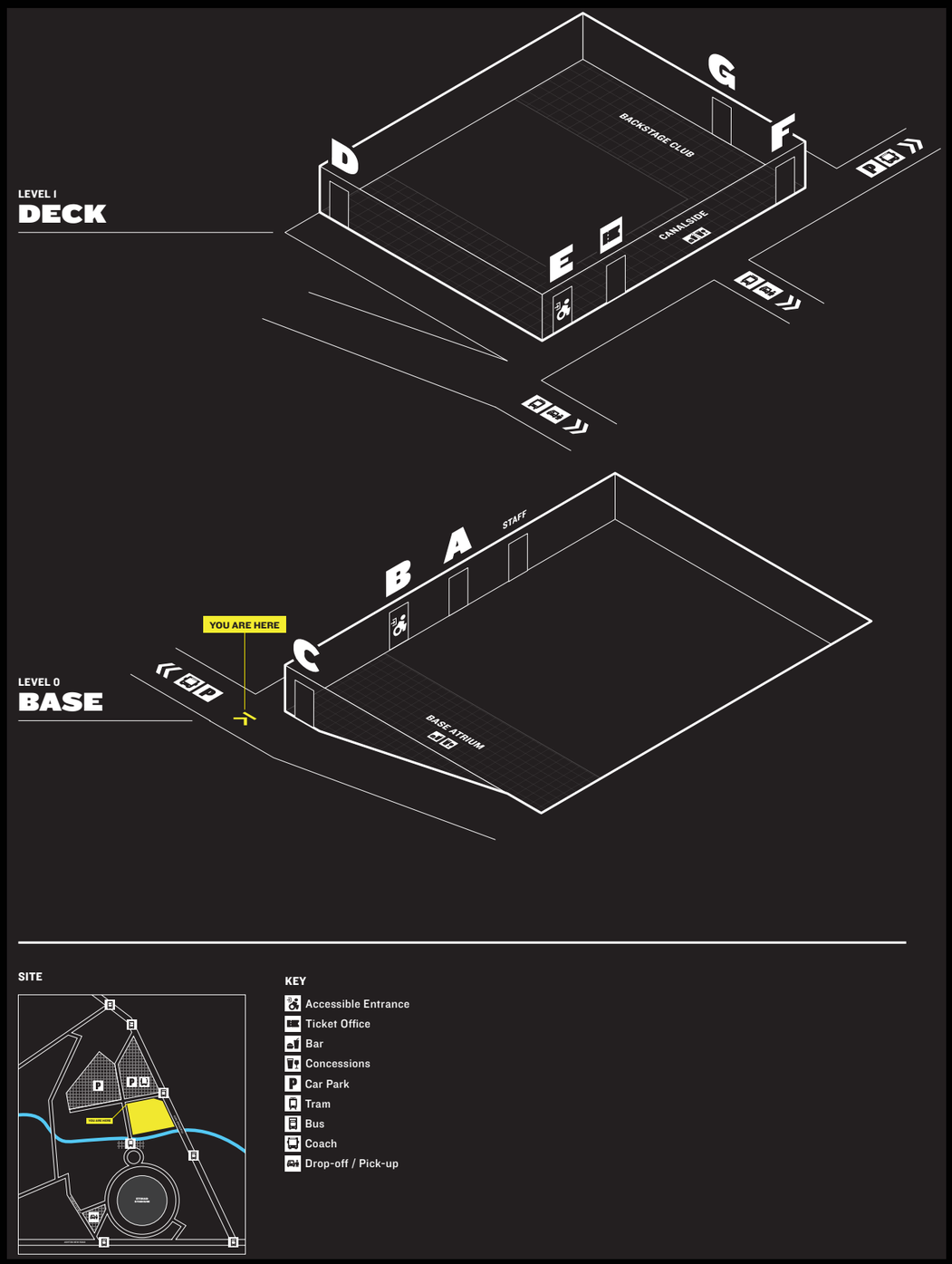
The current work in progress exterior map design is shown to the right. This has been developed to help aid ingress, egress and give supportive information on the totems.

This will allow visitors to orientate themselves, helping them to understand the Venue as a whole and journey plan accordingly.

Mapping offers a degree of self-help not reliant on staff personnel, and is particularly helpful during non-event times.

Entry points and key destinations are identified, as are landmarks for ease of verbal direction giving.

The map is designed to reflect the graphic style of the wayfinding elements and is complimentary to the wayfinding concept and conceptual approach.



3.0 WAYFINDING DESIGN

PRODUCT

3.6.1 DESIGN ROUTE 512

3.6.2 VARIABLE SIGNAGE 514

3.6.3 STATIC SIGNAGE 515

3.6.4 EXTERNAL SIGN FAMILY 516

3.6.5 INTERNAL SIGN FAMILY 517

3.6.6 PRODUCT FAMILY 519

3.6.7 CANALSIDE 522

3.6.8 LEVEL 01 - DECK 523

3.6.9 BACKSTAGE CLUB 524

3.6.10 LEVEL 02 - CLUB 525

3.6.11 LEVEL 03 LOFT 526

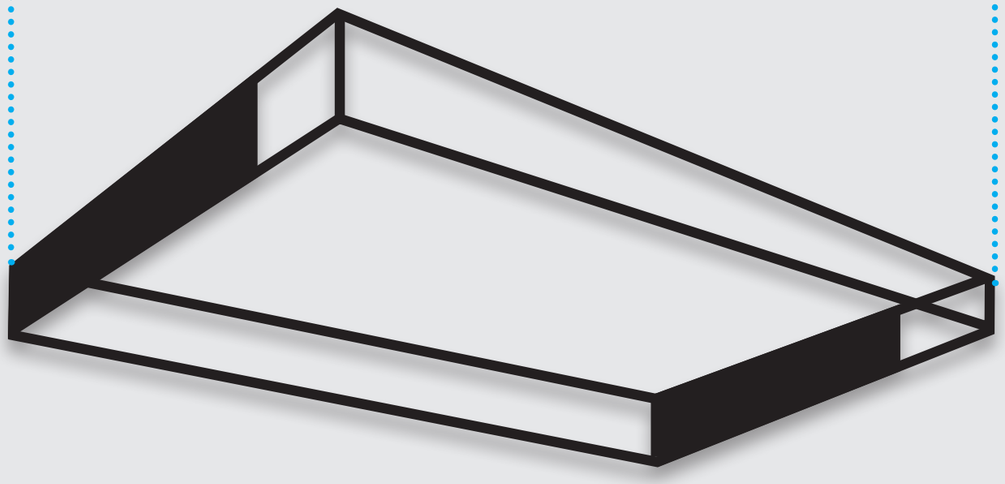
3.6.12 LEVEL 03 LOFT 527

3.6

3.6.1 Design Route

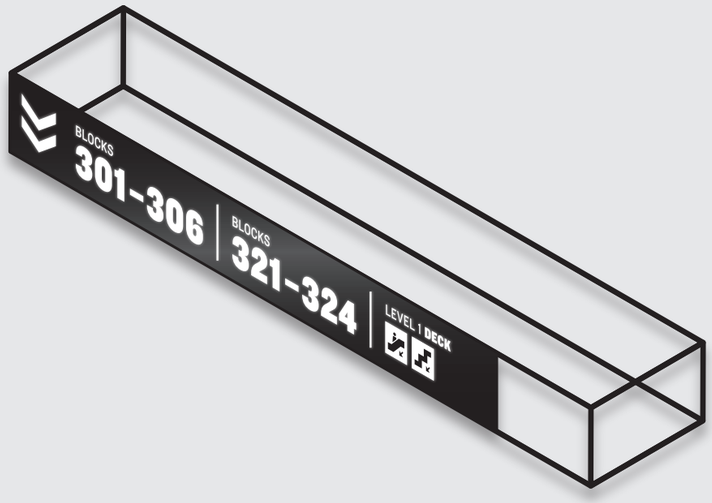
The Venue's unique and distinctive architecture directly influences the wayfinding product form.



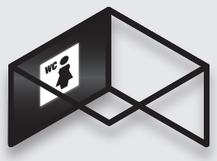


A series of blocks, overhangs and offsets are used to create an adaptable and scalable product form. The form is able to stack and vary in length and width to adapt to all environments.















3.6.2 Variable Signage

Signage needs to be flexible and adaptable to manage the various modes and uses of the Venue.

The content of the variable sign product is changeable, dynamic and can be tailored for different functions. This is achieved using a digital display, which allows for maximum flexibility.

When used internally, these screens are integrated within the sign, so as to create a seamless product.

The flexibility of this product can be demonstrated by the external totem. The lower half of the totem is for static, consistent content and the top half is a digital display for event specific information.

The digital display is able to give onward ingress information, essential egress information to manage crowds or provide commercial messaging.



Reference - Technology



Reference - Metallic Black



Variable Modes



Ingress



Egress



Commercial

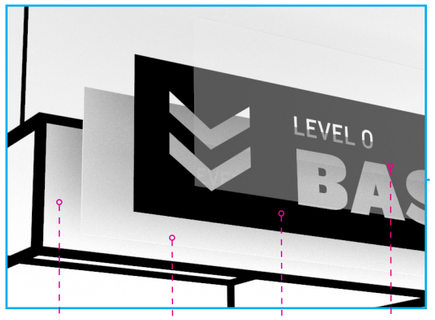
3.6.3 Static Signage

The signage needs to integrate seamlessly into a busy and changeable environment whilst also appearing bold and confident.

This is achieved by creating large-scale, illuminated products that compliment the open spaces of the Venue.

The scale of the products are maintained by introducing a metal 'wire-frame'. This allows the signs to be large without feeling overbearing.

Faces of the wire-frame are then filled with black gloss panels. These panels hero the materiality of the architecture by reflecting it back.

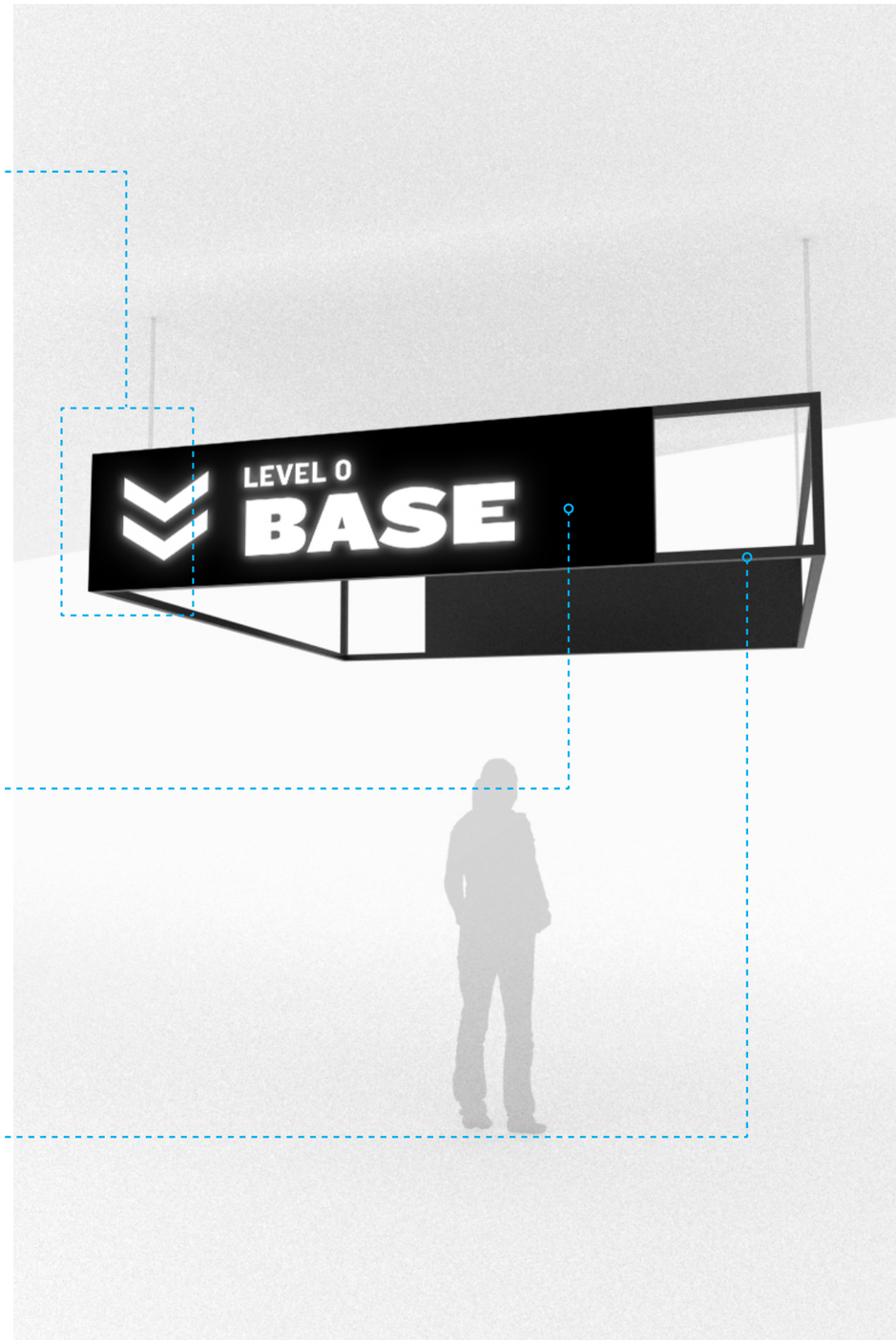


Lightbox with sidemounted LEDs

5mm acrylic panel

Profile cut black metallic vinyl wrap

3mm clear acrylic panel



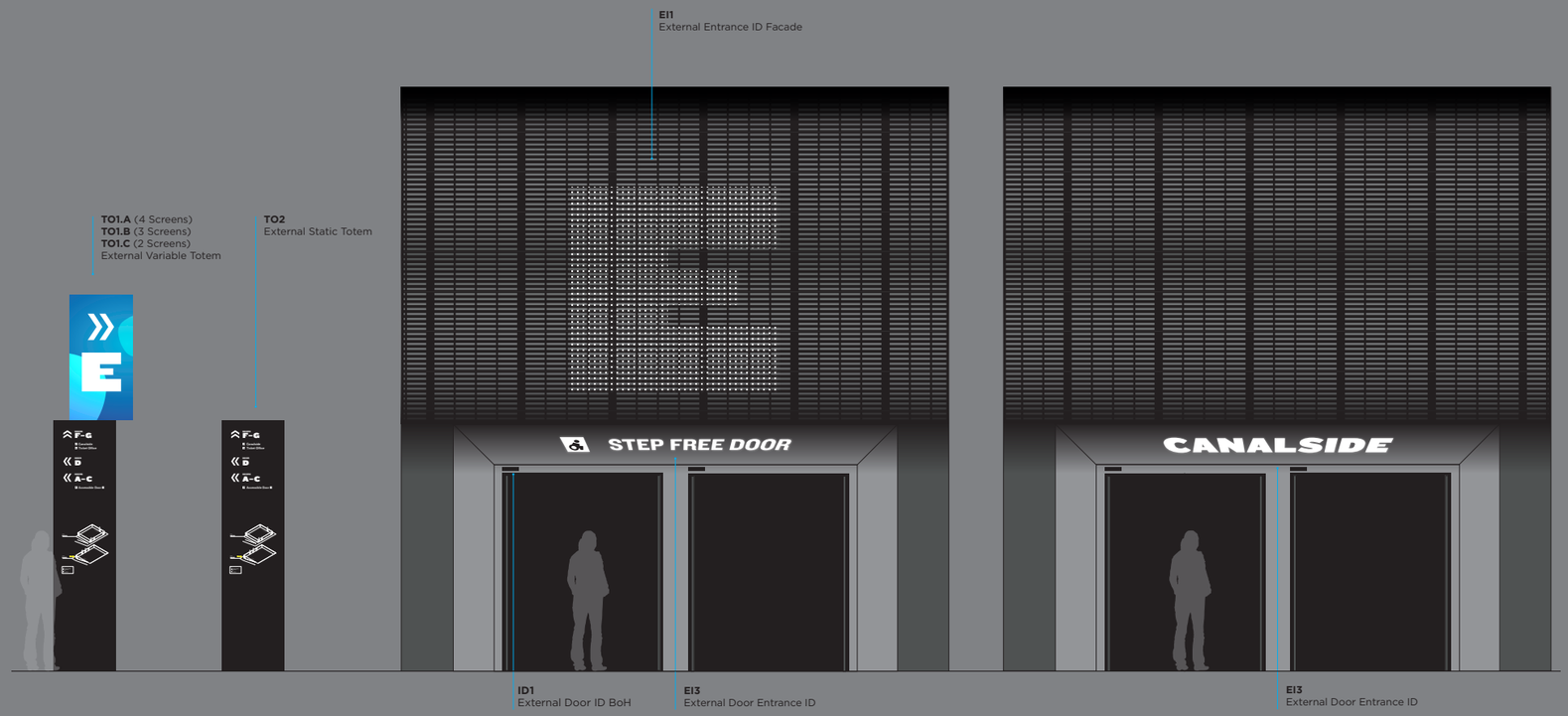


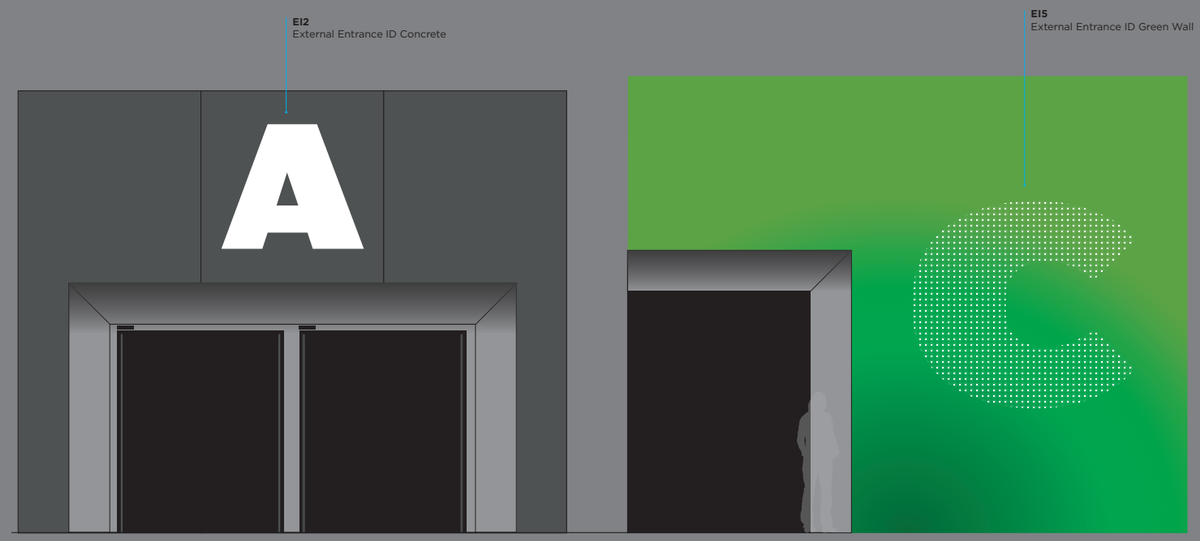
Reference - Metallic Black



Reference - Industrial wire-frame

3.6.4 External Sign Family





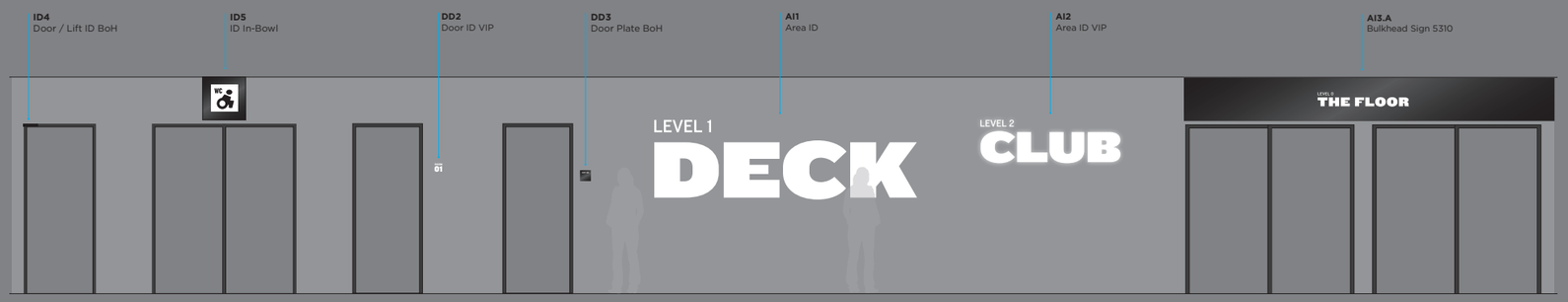
3.6.5 Internal Sign Family

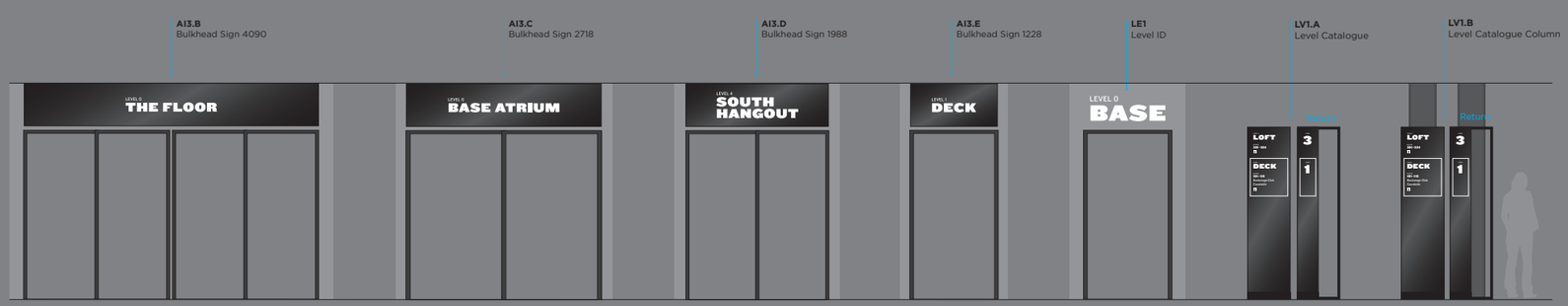


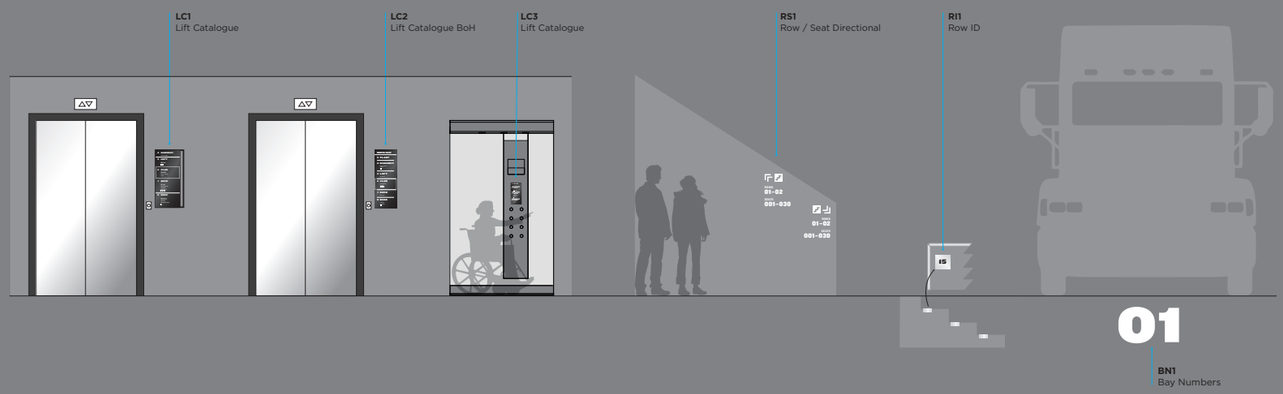




Internal Sign Family





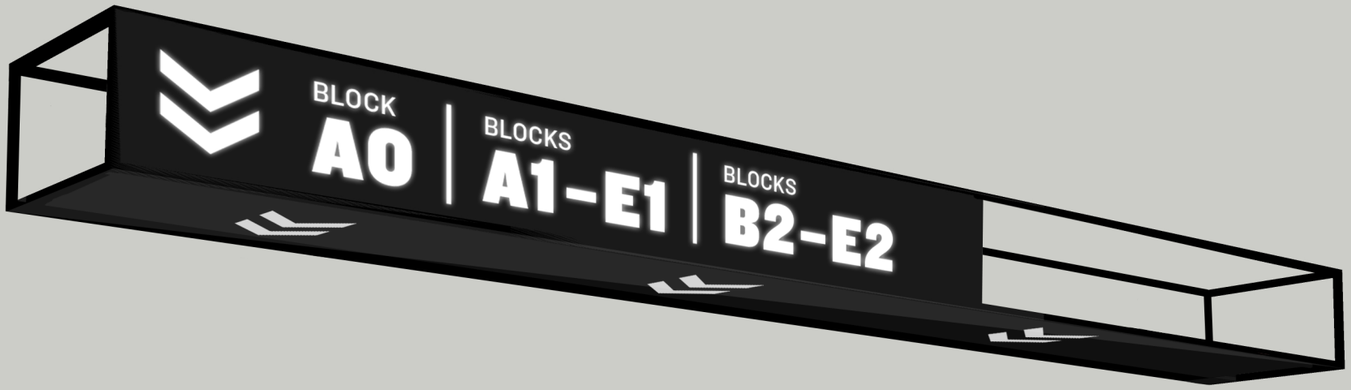


3.6.6 Product Family

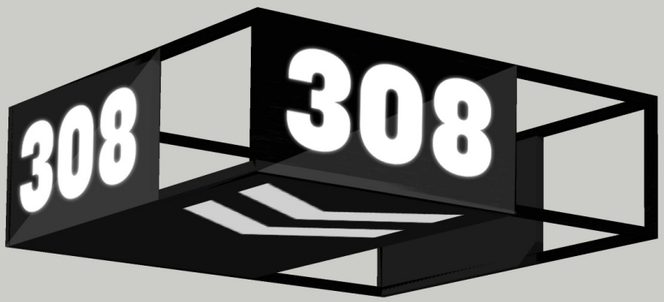
DR1 - Directional Bulkhead



VD1 - Variable Vomitory Directional



VI1 - Vomitory ID

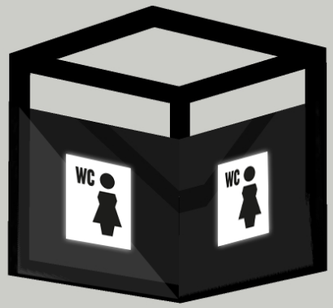


Product Family

ID2 - ID Large



ID3 - ID Small



DR5 - Directional VIP

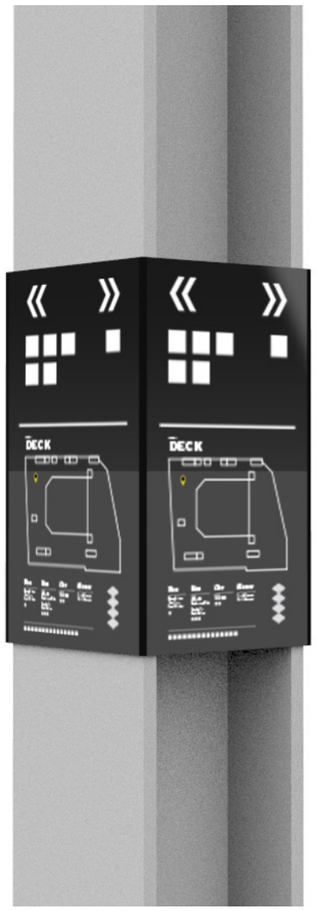


LC1 - Lift Catalogue



Product Family

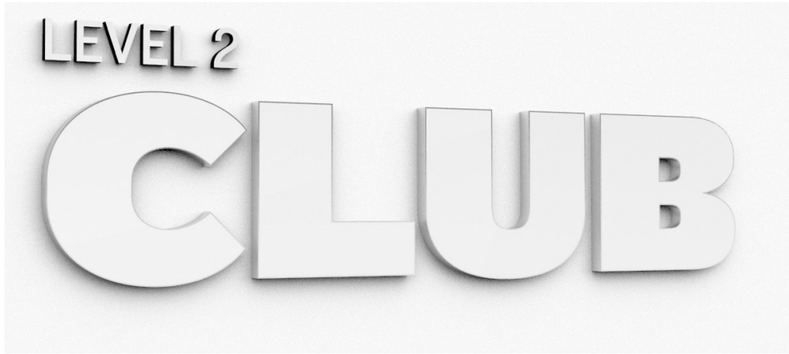
DR2 - Directional Column



LV1 - Level Catalogue



AI2 - Area ID VIP



3.6.7 Canalside



3.6.8 Level 01 - DECK



3.6.9 Backstage Club



3.6.10 Level 02 - CLUB



3.6.11 Level 03 LOFT



3.6.12 Level 03 LOFT



SMART VENUES

3.7.1 SMART WAYFINDING 530

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3.7

3.7.1 Smart Wayfinding

Data is the new force behind business, operations and venue design.

It is a design driver that not only forms our digital world but seeps into and changes our physical experience.

It starts from the beginning of the user journey, how the shows are sold, how spectators move around the venue, the choices they are offered and the interactions they make. Data delivers a connected and personal experience across every touch point.

It splits into three key sections:

1. Optimisation of the Venue's operations
2. Delivering the Venue's user experience
3. Data driven revenue

These can be delivered by working with and integrating a venue identity with a 'tech delivery partner' to deliver opportunities for:

- Accessible wayfinding support
- Live locations
- Live queue information
- Live egress and transport information
- Location sensitive push notifications
- Up sale on venue ticketing
- Lounge and hospitality access
- Drinks and food promotions
- Loyalty schemes
- A contactless cash alternative
- Syncing with other platform to scan for recommended events
- Pre and post event content
- Unique offers and merchandising



3.7.2 Understanding The Audience

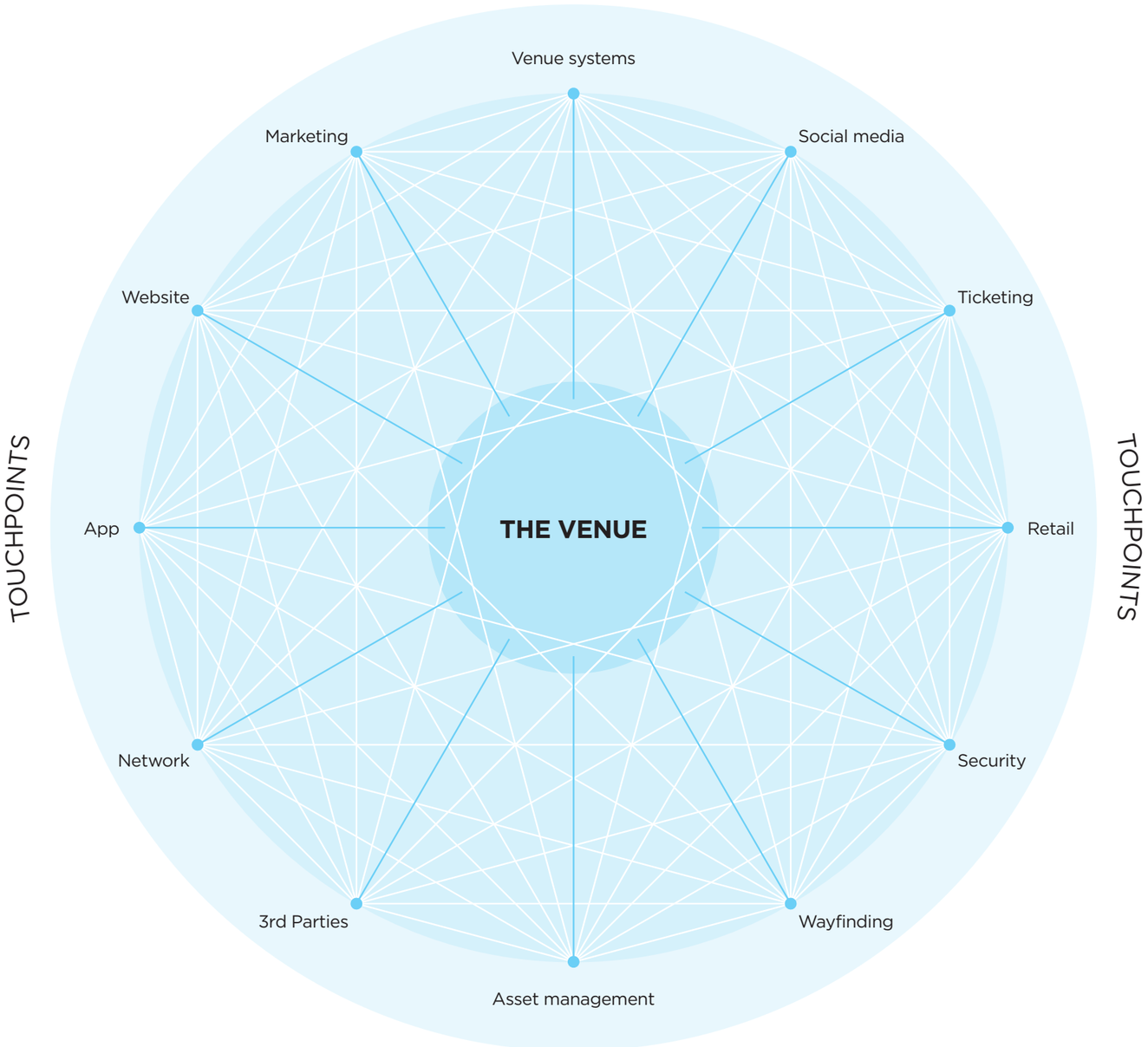
By connecting the day to day behavior of users outside the venue and their interactions within the venue we are able to build user profiles. Profiles can be built using information such as ticket purchases, e-commerce and marketing platforms.

By understanding how and what users interact with, we can adapt marketing and service offerings to create a unique experience.

As we continue to collect data it inherently gets more useful, with more data not only to analyse but to also action upon.

By collecting large quantities of data from a variety of sources we are able to learn about less obvious correlations and to recognise behavioral patterns that could improve venue operations or the fan experience.

Smart venues have the ability to never stop learning or evolving. Customer habits can change rapidly, driven by a constantly changing consumer technology market. With this, the Venue needs to evolve to changing user needs through an iterative cycle of measuring, analysing, changing and testing.



3.7.3 Connecting Venue Operations

A large part of improving the venue experience is about reducing the traditional pain points that can ruin it. A smart venue could help to alleviate some of these issues by monitoring and helping to adapt to the conditions.



Quick and efficient queuing

By monitoring crowding levels externally and internally, it is possible to adjust digital wayfinding products to direct people in different ways, allowing for smoother flows and less queueing.



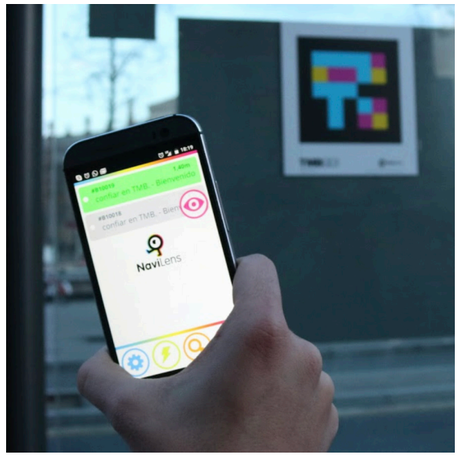
Finding your friends

Meeting or losing your friends can always be a frustrating experience The Venue could help to facilitate finding them again through a venue app or wearable tech.



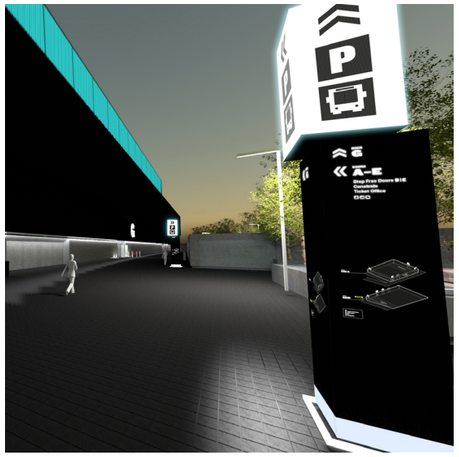
Ordering to your seat

Getting food and drink at a venue can involve a lot of queuing. A smarter approach could be to separate payment and collection to reduce waiting times using the app and offering to-seat services.



Accessible technology

Inefficient cellular or WiFi connectivity can have an impact on people making purchases, sharing or communicating. It is important to consider other technology solutions that can fill this gap in order to create a truly connected service.

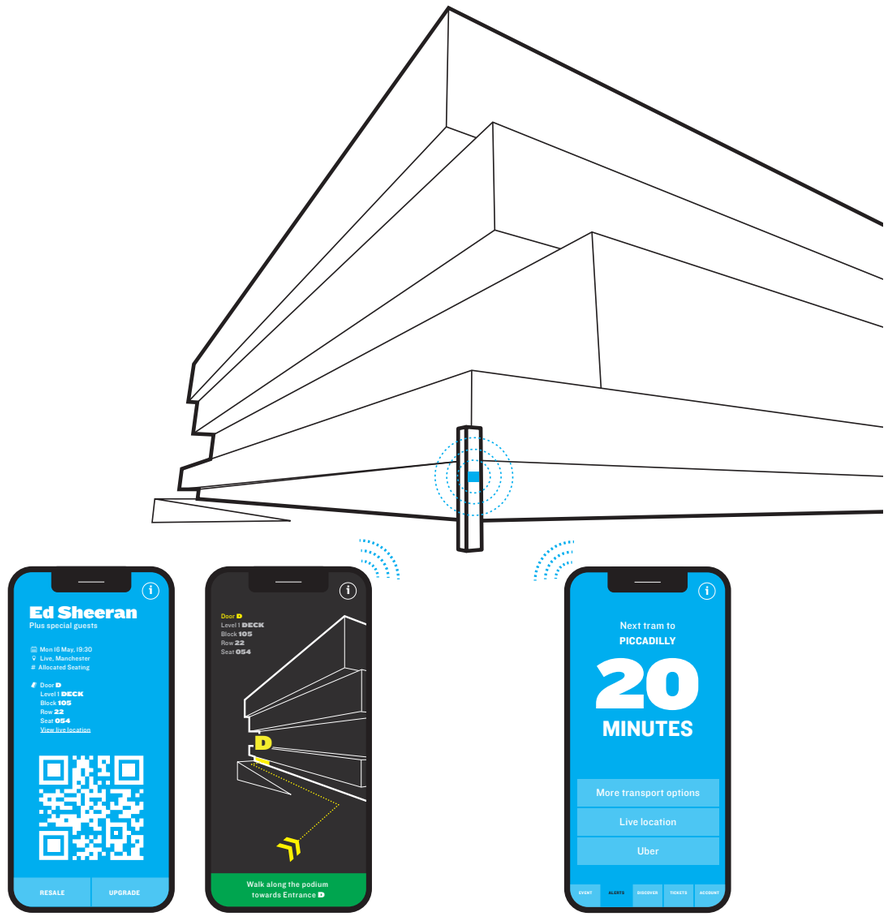


Live egress information

The last part of your experience is leaving and this can have a negative impact on the memories you had in the venue. Live egress information could help people navigate to the least busy route away from the Venue and to explore different transport options.

3.7.4 Smart Wayfinding Examples

External



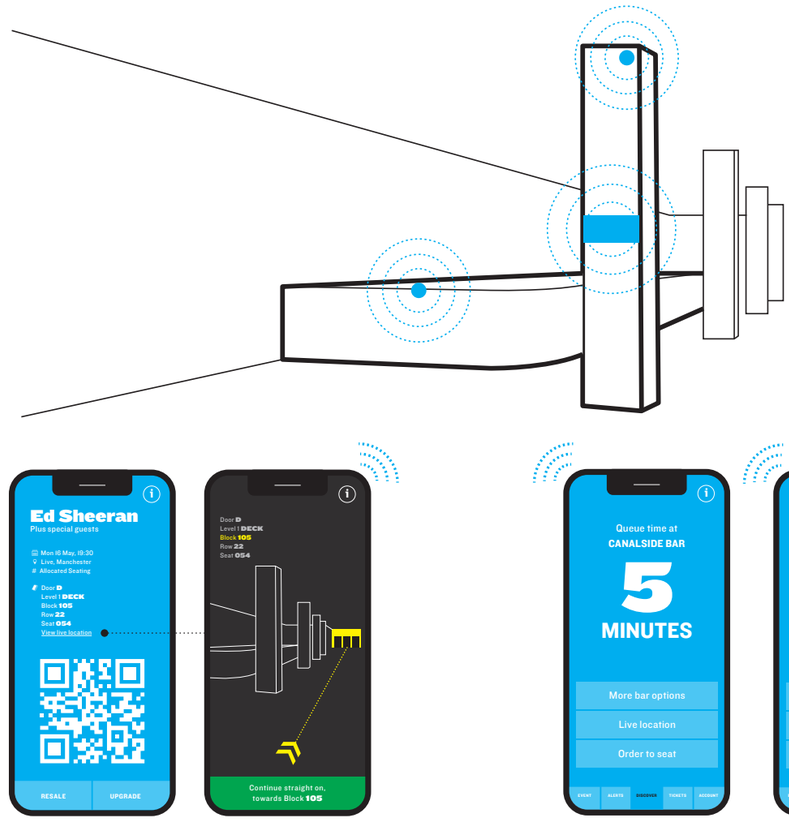
Personalised Wayfinding

Markers located around the site supply live location data. This could then be translated into a personal wayfinding solution.

Live Egress And Transport Information

By partnering with third-party transport apps, live transport information can be sent via push notifications.

Internal



Personalised Wayfinding in Venue

Markers located around the site supply live location data. This could then be translated into a personal wayfinding solution.

Live Queue Information

Technology can be used to generate live data about queues and wait times. This can then be combined with other technologies to provide live directions to other facilities.

Location Sensitive Push Notifications

Push notifications relevant to your location can be used to provided offers, deals and generate more spend.

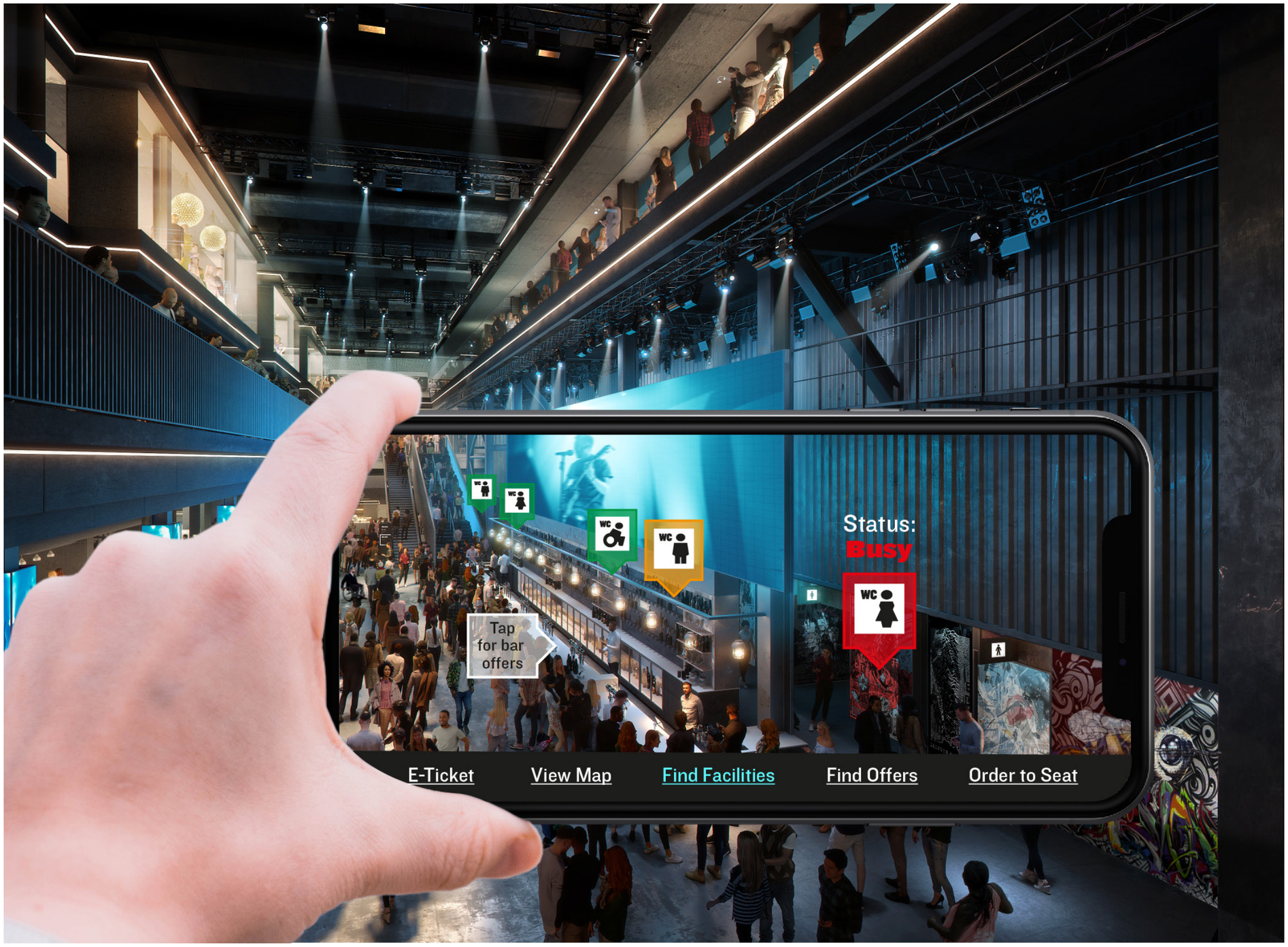
3.7.5 Personalised Wayfinding Example



Personalised Wayfinding Example



3.7.6 Live Queue and Push Notifications Example



3.7.7 Live Egress Example



Live Egress Example



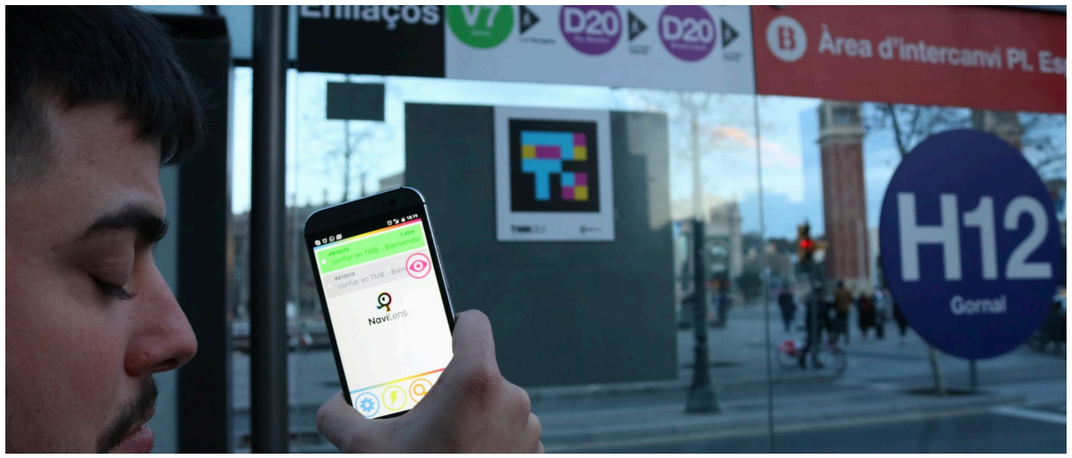
3.7.8 Benchmark Technologies

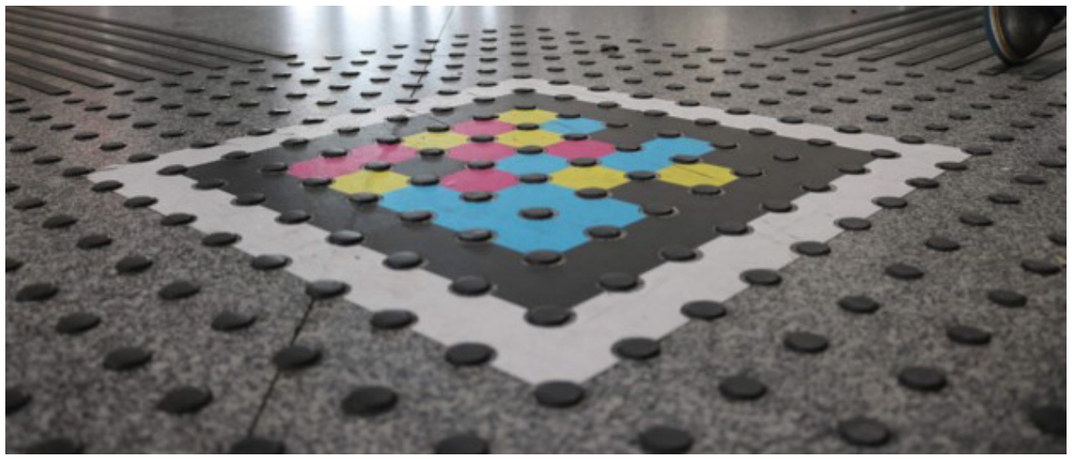
NaviLens

Smart wayfinding could be provided using technology such as NaviLens, which would enhance the user experience by providing a personal, connected and holistic offer throughout the Venue.

NaviLens Features

- Reading markers with NaviLens is almost instantaneous.
- Capable of reading the labels from long distances, depending on the size of the marker.
- No need for focusing, which is essential for people with visual impairments.
- Navilens algorithm detects the tags when the user is walking or in motion while the cell phone is pointed up.
- Navilens accurately detects the distance between the user and the tags. In addition, NaviLens provides the relative angle of the user with respect to the tag.
- It detects multiple tags simultaneously, efficiently communicating them to the user.







Benchmark Technologies

CrowdVision

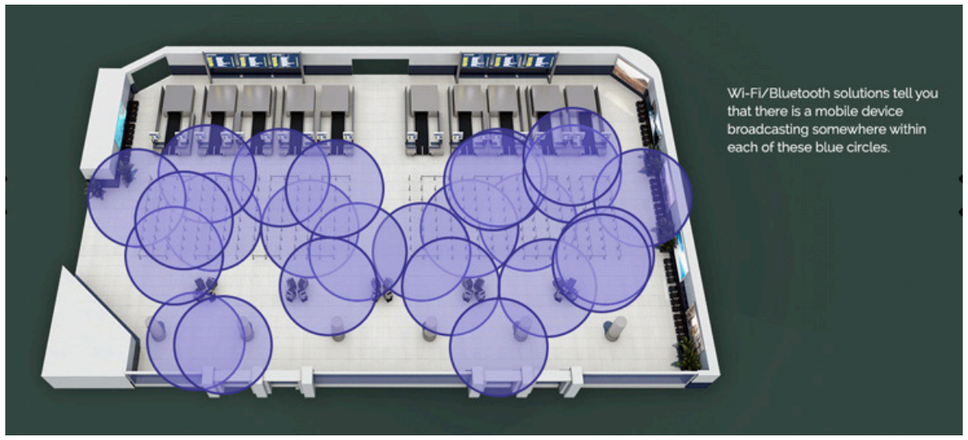
The user experience could be further enhanced using a technology such as Crowdvision. CrowdVision's pedestrian analytics solution processes live video input from commercial off the shelf cameras. The system detects pedestrian movements automatically and outputs live data about everything from flows, queues and wait times to processing times, occupancies, and asset utilisation. As it is video based it captures every user, not relying on just people using or having a phone.

CrowdVision Features

- Creates a dashboard of information and insights for operations staff to help them make informed decisions that can improve the movement of people through spaces.
- Works reactively (real time conditions) and pro-actively (predicting future conditions based off past experience).
- Data generated can be used to automatically control other systems.
- Can also be used to monitor the effectiveness of retail outlets and how people interact with the environment, useful for activated spaces and selling spaces to brands/concessions.



What Crowdvision sees



What wifi/bluetooth sees



Benchmark Technologies

Wayfindr

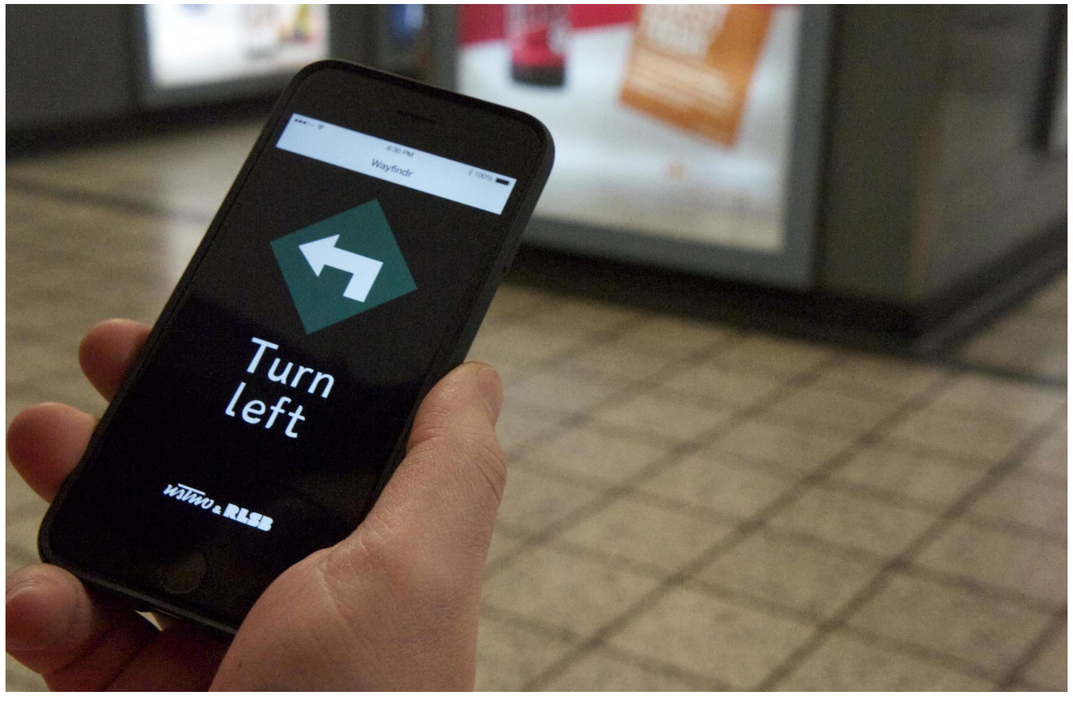
Wayfindr are an award-winning social tech non-profit, with ambitions to help the world's 285 million blind people navigate indoor environments independently.

Their mission is to empower vision impaired people to travel independently, through inclusive and accessible audio navigation. They have developed the world's first internationally-approved standard for accessible audio navigation.

"Emerging indoor navigation technologies hold the key to a revolution in independent navigation for blind and partially sighted people. In order to achieve the greatest impact globally, we need to implement a consistent standard across wayfinding systems. This will truly open up a world where vision impaired people are no longer held back by their sight loss, removing barriers to employment, to meeting friends and family and engaging in their community. The internationally-recognised Wayfindr Open Standard does just that."

The Wayfindr Open Standard, in conjunction with on-site trials and consultancy, can be used by the Venue to create inclusive and consistent experiences for vision impaired customers.





BACK OF HOUSE STRATEGY

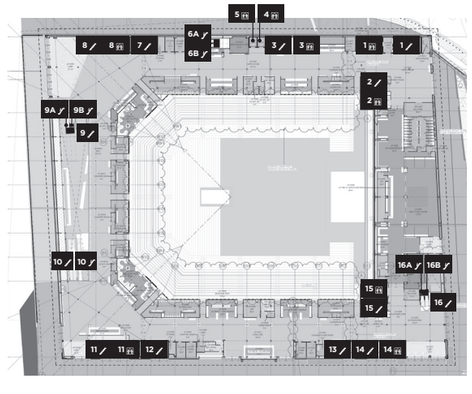
3.8.1 BOH VERTICAL CIRCULATION 544

3.8.2 BOH STRATEGY 545

3.8

3.8.1 BoH Vertical Circulation

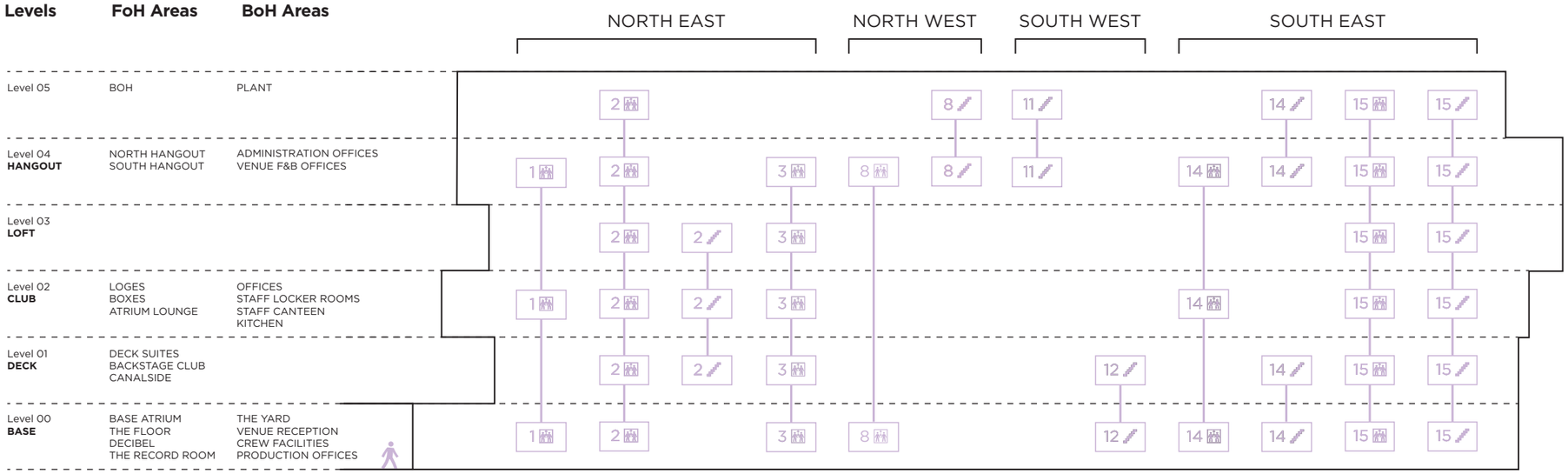
The diagram below is an overview of the back of house (BoH) vertical circulation and the key BoH areas within the Venue.



Users

BOH

Levels	FoH Areas	BoH Areas
Level 05	BOH	PLANT
Level 04 **HANGOUT**	NORTH HANGOUT SOUTH HANGOUT	ADMINISTRATION OFFICES VENUE F&B OFFICES
Level 03 **LOFT**		
Level 02 **CLUB**	LOGES BOXES ATRIUM LOUNGE	OFFICES STAFF LOCKER ROOMS STAFF CANTEEN KITCHEN
Level 01 **DECK**	DECK SUITES BACKSTAGE CLUB CANALSIDE	
Level 00 **BASE**	BASE ATRIUM THE FLOOR DECIBEL THE RECORD ROOM	THE YARD VENUE RECEPTION CREW FACILITIES PRODUCTION OFFICES



3.8.2 BoH Strategy

The site has been split into four zones based on the key lift cores to simplify information and group key locations. The zoning will be applied across the BoH signage to aid navigation.

Core numbering follows a consecutive, anti-clockwise strategy, to match the direction of the block numbering.

BoH signage will direct users to key destinations within the zones including vertical circulation, facilities, services, and office spaces. In the respective zones, door signs will aid the identification of individual locations and rooms.

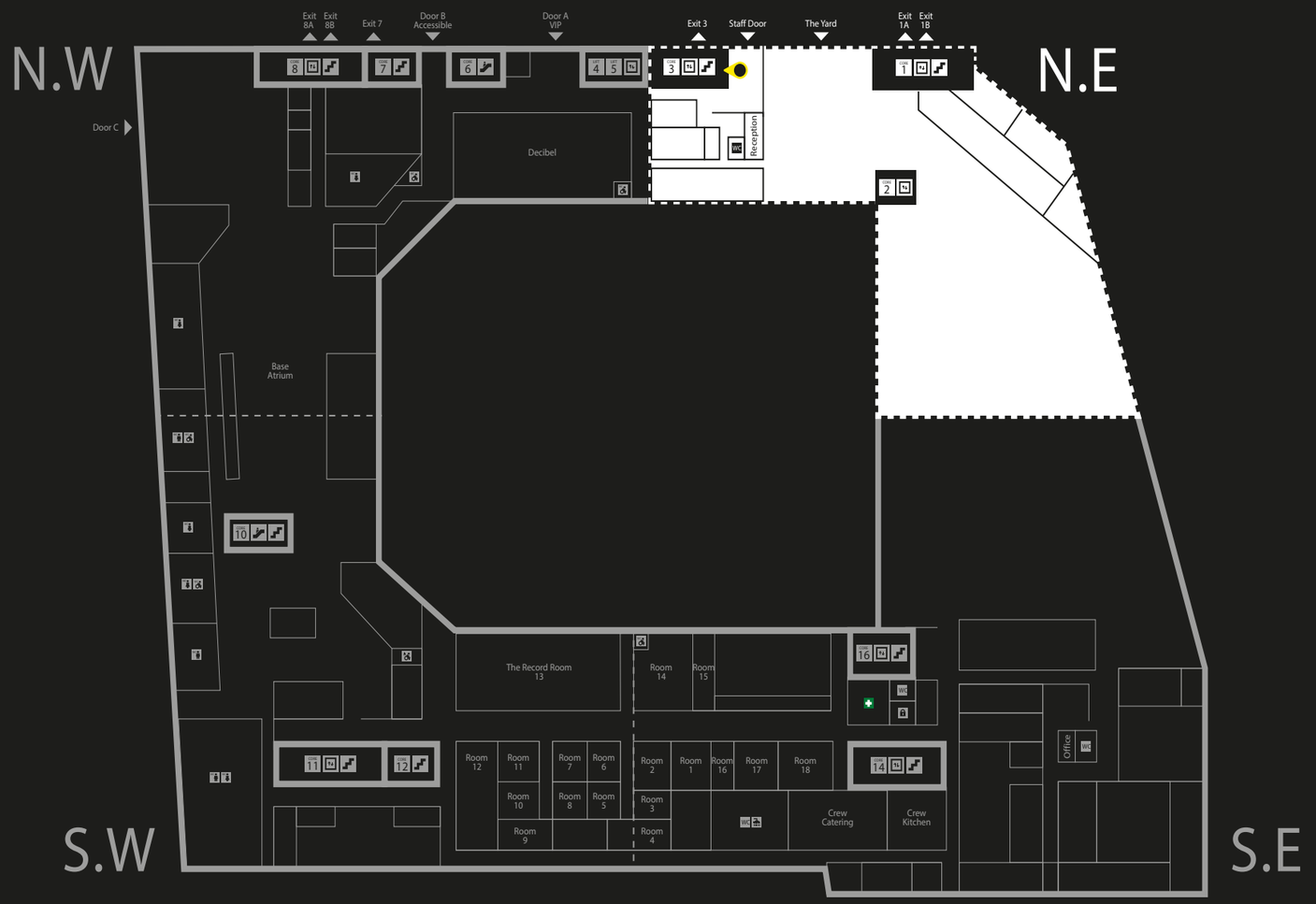
Key BoH Areas

	NORTH EAST	NORTH WEST	SOUTH WEST	SOUTH EAST
Level 00 **BASE**	• The Yard • Staff Entrance • Venue Reception • Core 1 • Goods Lift 2 • Core 3 • Exit 1A, 1B • Exit 3	• Decibel • Entrance A (VIP) • Entrance B (Accessible) • Entrance C • Lifts 4 & 5 • Escalator 6 • Core 7 • Core 8 • Exit 7 • Exit 8A, 8B	• The Record Room • Base Atrium • Core 11 • Core 12	• Production Offices • Artist Rooms • Crew Catering • Crew Lockers • First Aid • Toilets • Showers • Core 13 • Core 14 • Goods Lift 15
Level 01 **DECK**	• Backstage Club • Core 1 • Goods Lift 2 • Core 3	• Entrance D • Deck Suite North • Lifts 4 & 5 • Core 7 • Core 8 • Stairs 9	• Entrance E • Deck Suite West • Canalside • Stairs 10 • Core 11 • Core 12 • Exit 11A, 11B, 11C • Exit 12A, 12B	• Entrance F • Entrance G • Backstage Club • Core 13 • Core 14 • Goods Lift 15 • Stairs 16 • Exit 13 • Exit 14A, 14B, 14C
Level 02 **CLUB**	• Event Briefing Room • Service Partner Offices • Sponsor's Office • Staff Locker Rooms • Staff Toilets • Staff Showers • Core 1 • Goods Lift 2 • Core 3	• Lifts 4 & 5 • Escalator 6 • Core 7 • Core 8	• Core 11 • Core 12	• Staff Canteen • Level 2 Kitchen • Multifaith Room • Core 13 • Core 14 • Goods Lift 15
Level 04 **HANGOUT**	• Administration Offices and Meeting Rooms • Offices • Toilets • North Hangout • Core 1 • Goods Lift 2 • Core 3	• North Hangout • Lifts 4 & 5 • Core 7 • Core 8	• South Hangout • Core 11 • Core 12	• Venue F&B Offices • South Hangout • Core 13 • Core 14 • Goods Lift 15
Level 05	• Plant	• Plant		• Plant

BoH Strategy

The site has been split into four compass zones to simplify information and group key locations. The zoning will be applied across the BoH signage to aid navigation.

The current work in progress BoH map is shown to the right.



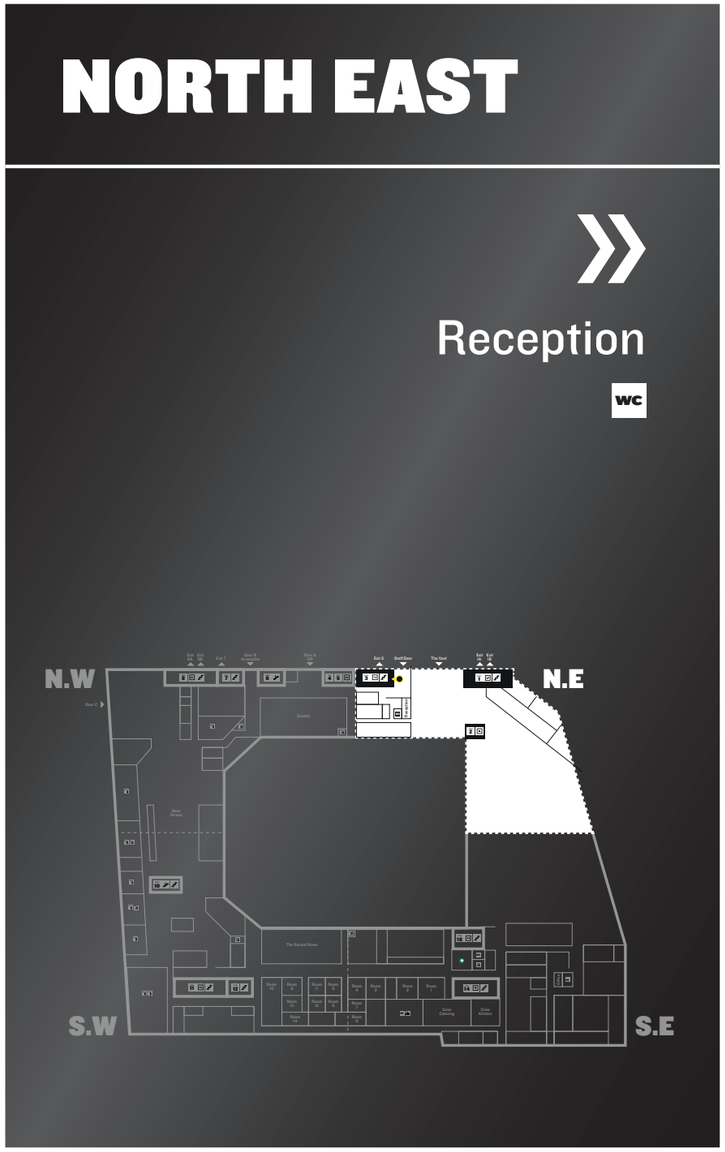
NOTE:

All materials, sizes and construction details are pending further development & consultation with sign manufacturer.

All content is indicative.

BoH Strategy

Directional signage supports BoH users from their arrival points and directs them to key destinations within the boundaries of each zone. Similarly, lift directories list all key destinations within the respective zone the lift is located in.



Directional Signage



Lift Directory

STATUTORY SIGNAGE

3.9.1 STATUTORY SIGNAGE OVERVIEW 550

3.9.2 PLACEMENT 551

3.9.3 STATUTORY SIGN FAMILY 552

3.9

3.9.1 Statutory Signage Overview

The statutory signage is developed in parallel with the wayfinding signage and should be considered part of the overall communication hierarchy.

Statutory signage is defined as all front of house and back of house operational signage typologies listed below:

- Prohibitory signage
- Regulatory signage
- Health & Safety signage

Statutory signage strategy, design and coordination scope of works to include:

- Development of core statutory signage strategy based on the BS EN ISO 7010:12+A5:2015 (BS EN ISO 7010) standards.
- Design of statutory signage system detailing, graphic style, typography, scale and materiality The graphic symbols used are based on the standard BS EN ISO 7010:12+A5:2015 (BS EN ISO 7010), and cover a variety of methods of communicating health and safety information.
- Coordination with project wayfinding signage system to ensure the are no location or communication clashes.
- Coordination with ME engineers to ensure that the appropriate containment (power & data) has been provided for sign locations.
- Location and installation detail drawings issued for each sign typology.
- For 100% submission all floor plans within the building will be provided with separate fire and life safety as well as health and safety signage location plans.

Sign type	Colour	Meaning	Instruction and information
	Red	Prohibition sign Danger alarm	Dangerous behavior; stop; shutdown; emergency cut-out Devices; evacuate
	Yellow Amber	Warning sign	Be careful; take precautions; examine
	Blue	Mandatory sign	Specific behavior or action, eg. wear protective equipment
	Green	Emergency escape First-aid sign No danger	Doors; exits; escape routes; equipment and facilities Return to normal

Prohibitory signs



Warning signs



First-aid signs



Firefighting signs



Mandatory signs



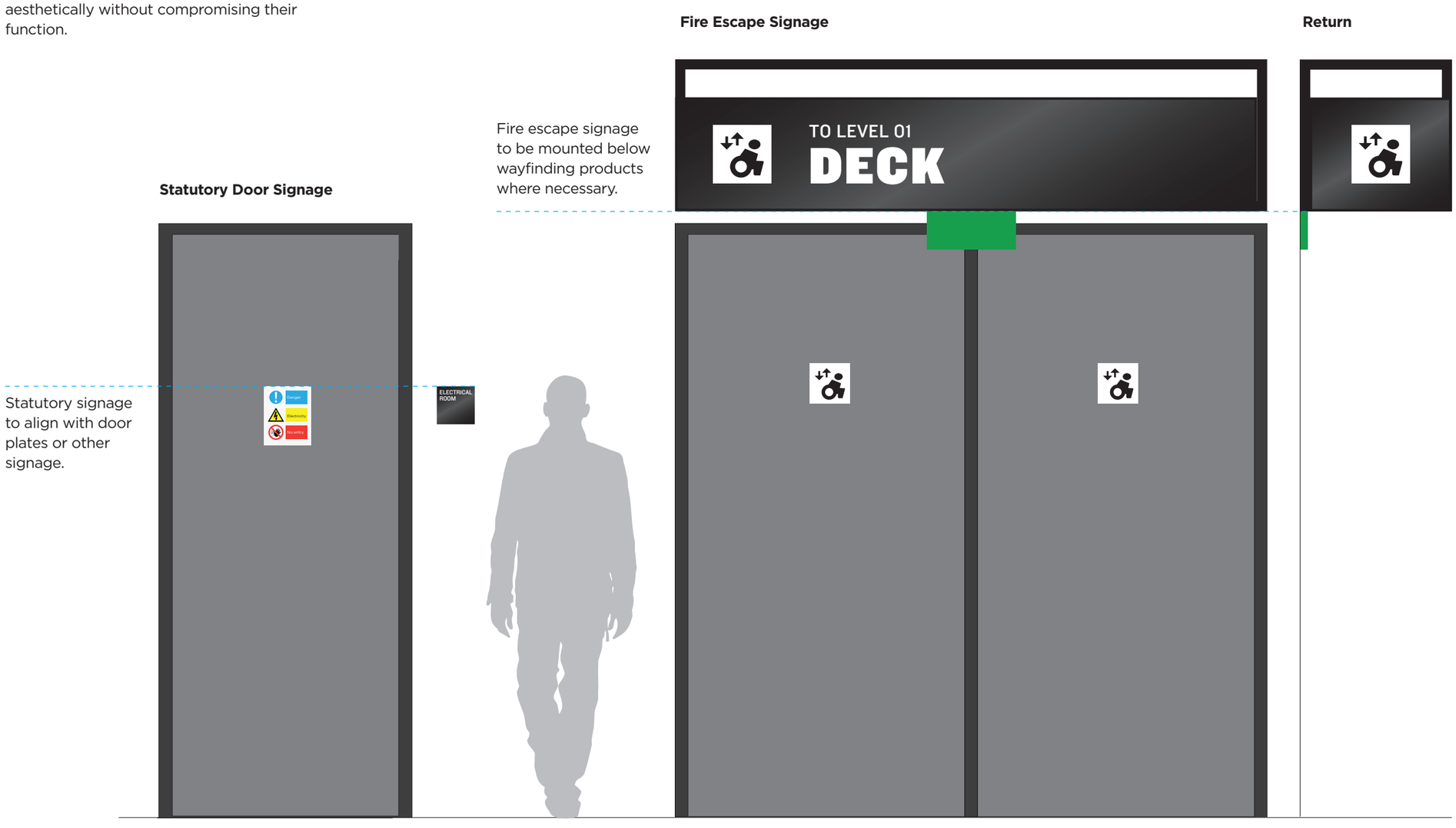
3.9.2 Placement

Typical statutory signage and placement

The placement of statutory door signage must always be considered relative to other signage, particularly door plates.

Where both wayfinding and fire escape signage is needed, the fire escape sign is to sit below the wayfinding product. This is within the recommended mounting heights of 2-2.5m.

Every effort must be made to position signs aesthetically without compromising their function.

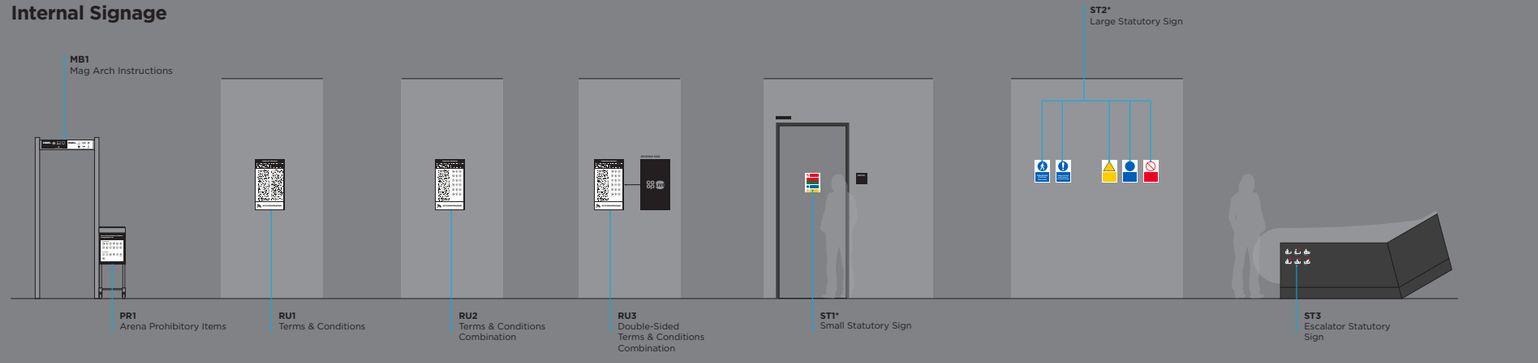


3.9.3 Statutory Sign Family

External Signage



Internal Signage



Internal Signage



3.0 WAYFINDING DESIGN

COMMERCIAL ACTIVATION

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4.3 DIGITAL EXPERIENCE 569

4.4 EXTERNAL 577

4

INTRODUCTION

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4.1.2 ACTIVATION CHANNELS 559

4.1.3 COMMERCIAL OPPORTUNITY 560

4.1.4 BRAND HIERARCHY 561

4.1

4.1.1 Activate Design Report

The purpose of this study is to determine the activation opportunities for the venue, both internal and externally.

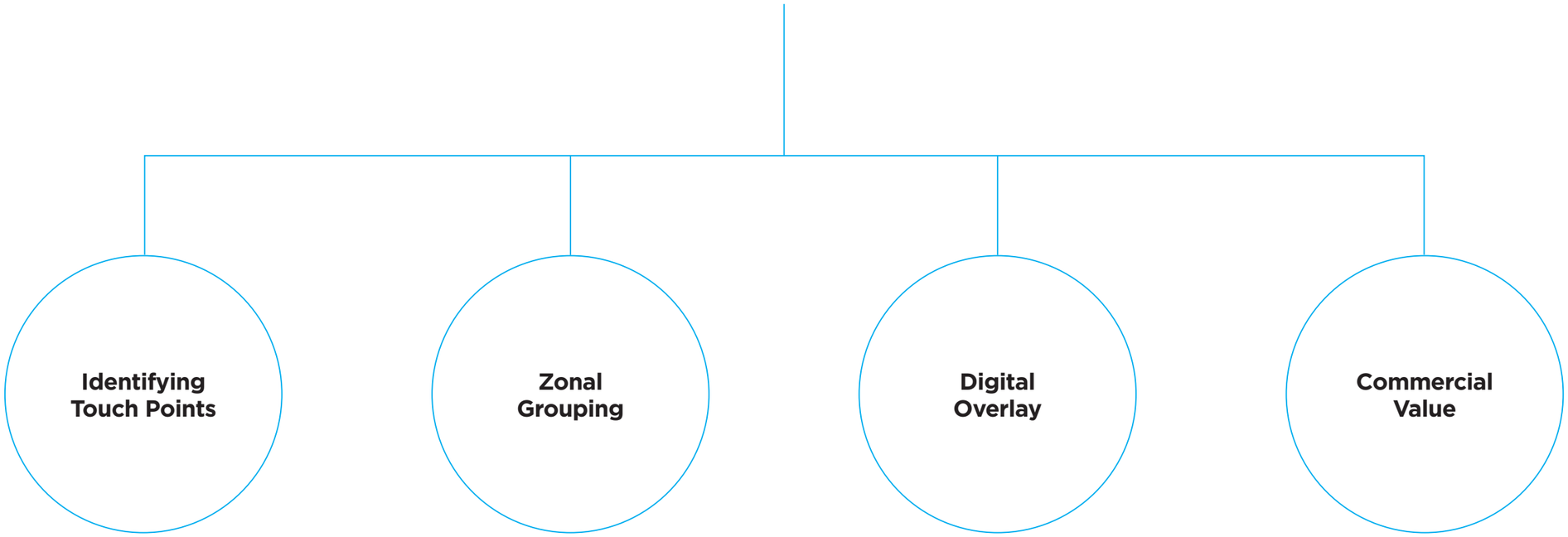
By identifying areas with the highest visibility and footfall, opportunities can be measured through zonal groupings, key touchpoints and commercial assessment.

This helps to determine the value of these surfaces for naming rights, brand partners, paid commercial and experiential interventions.

** Progress has been ongoing with a specific Naming Rights Partner, however this information remains confidential and is not enclosed in this section.*

4.1.2 Activation Channels

Developing activations through the following channels



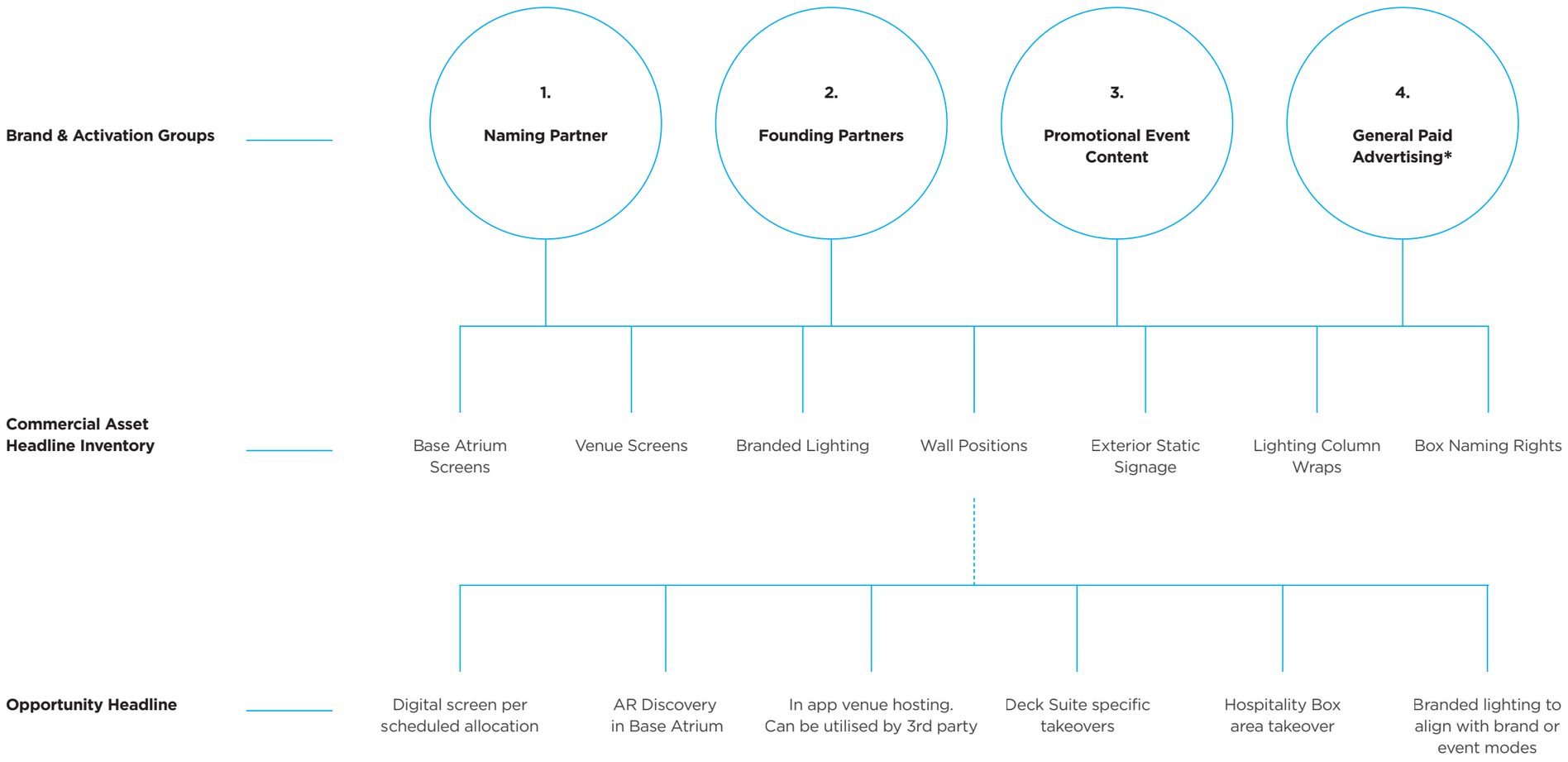
- User journeys
- Ingress & Egress
- Distance & viewing angles

- Level & floor grouping
- Creation of cornerstone activation
- Area specific activation to explore disruptive area spacing
- Entrances

- AR engagement
- Social media hot spots
- Social media based reward scheme
- Bespoke payment services
- Service & venue app
- Third party apps

- Commercial revenue per location or zone grouping
- Measure crowd & traffic flow
- Venue specific context &commercially driven paid content

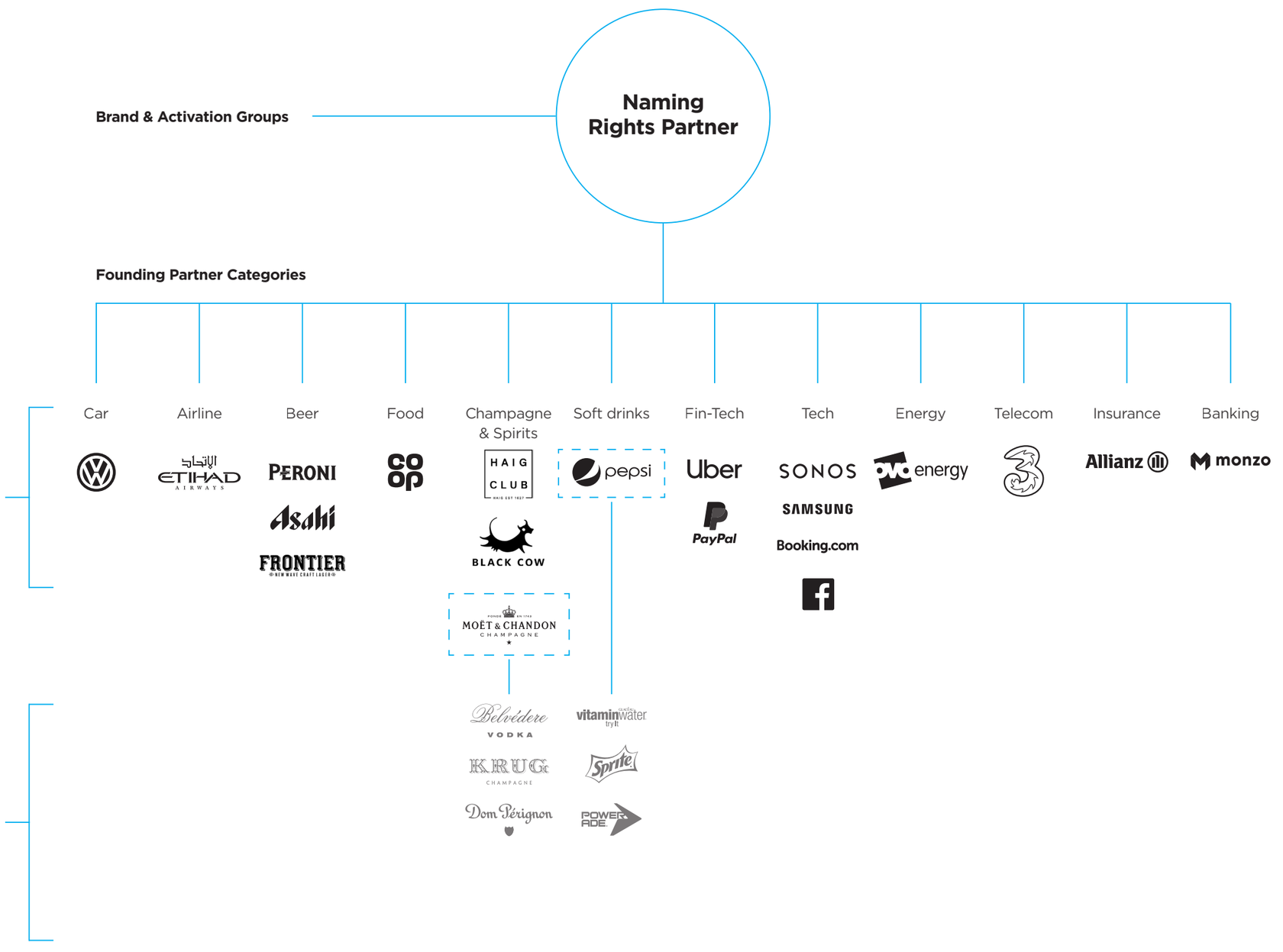
4.1.3 Commercial Opportunity



*General Paid Advertising (not to competitors of Naming or Founding Partners, increasing the value to them by giving them exclusivity)

The above is setout only as a strategy and any potential applied branding will be developed to be integrated carefully throughout the interior and exterior spaces while retaining the integrity of the building. The design and future development of activation and commercial integration is to avoid a 'badging' of logos and graphics on walls or columns that distract from the interior finish.

4.1.4 Brand Hierarchy



CONCEPTUAL APPROACH

4.2.1 CONCEPTUAL APPROACH 564

4.2.2 VENUE POSITIONING 565

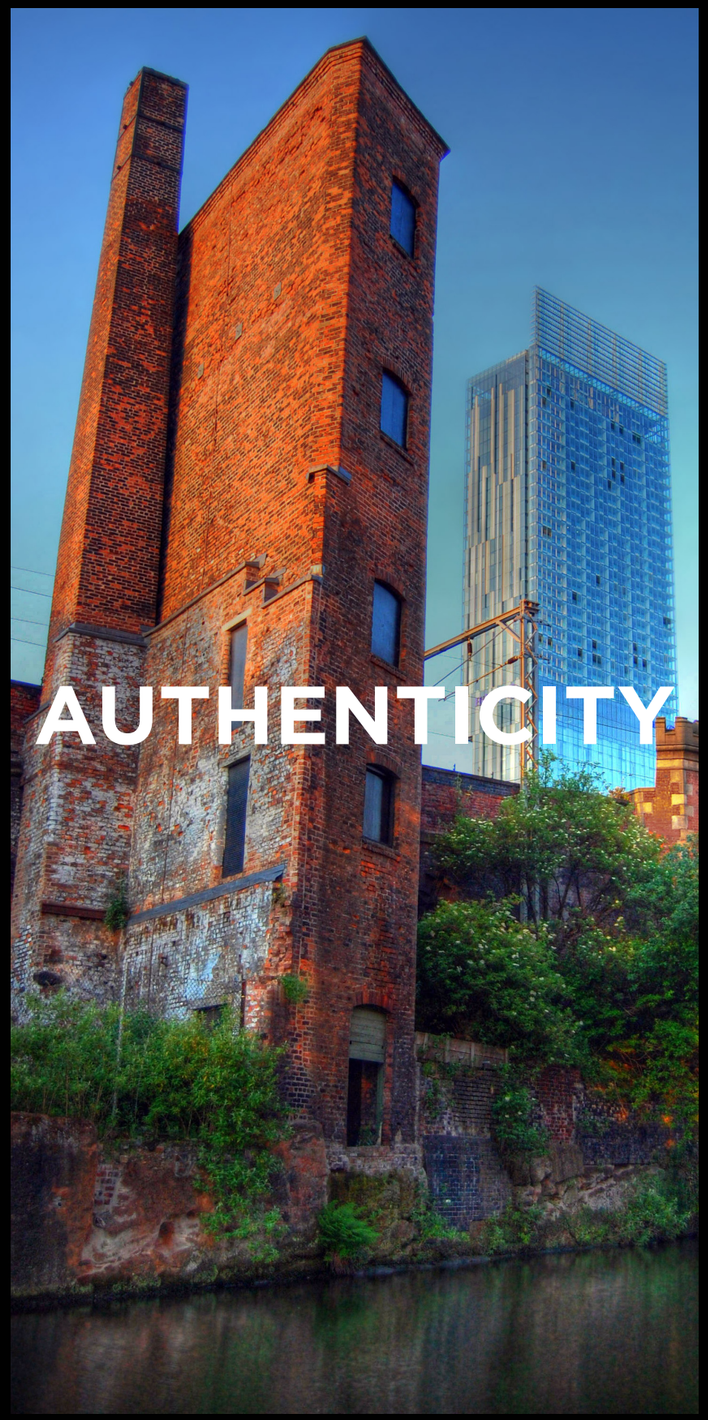
4.2.3 VENUE APPLICATION 566

4.2

4.2.1 Conceptual Approach

Take the spirit of the city, acknowledge the rich cultural legacy of the music scene and channel this into a progressive and forward thinking venue for the users.

4.2.2 Venue Positioning







4.2.3 Venue Application

Applying the Manchester authenticity drivers to create the next generation music venue, defined by what makes the venue unique through internal & external activations and digital immersive experiences.

Unique to Manchester

A user experience that is authentic to the cultural musical and club history of Manchester, whilst acknowledging the legacy of the city and atmosphere whilst using innovative approaches.

Digital Approach

It starts from the beginning of the user journey, how the shows are sold, how spectators move around the venue, the choices they are offered and the interactions they make. Delivering a connected and personal experience across every touch point.

Commercial Opportunity

The commercial intent is to use the authenticity drivers when aligning with future partners throughout the venue, adopting local philosophies and ideas whilst in keeping with the tradition of the area and it's materiality.

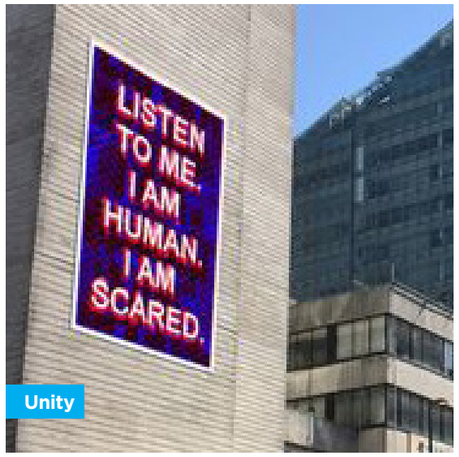
Venue Application



Ownership

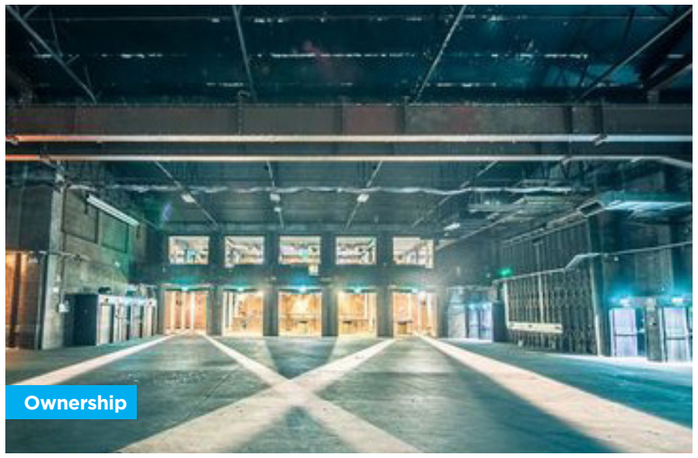


Honest



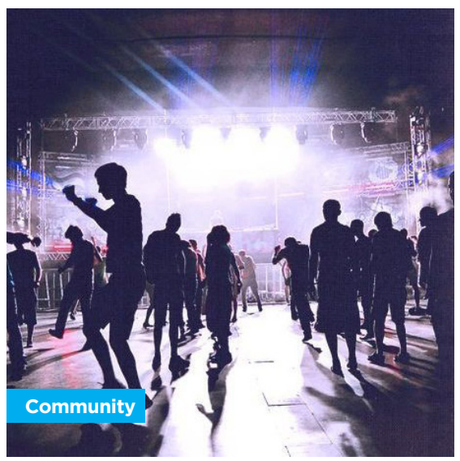
Unity

Manchester: Authenticity


Ownership



Industry


Community



Pride

DIGITAL EXPERIENCE

4.3.1 CONCEPTUAL APPROACH 570

4.3.2 VENUE POSITIONING 571

4.3.3 VENUE APPLICATION 572

4.3.4 CONCEPTUAL APPROACH 573

4.3.5 AUGMENTED REALITY IN THE BOWL 574

4.3.6 VENUE APPLICATION 575

4.3

4.3.1 Conceptual Approach

We have identified future digital technologies which can be applied and combined holistically with the venue creating a greater connection with users. These additions are not in the base scheme and would need to be implemented as an addtional cost.

Not all moments are the same and should respond to the experience in keeping it fresh and relevant.

To do this we are learning from the past, adapting to the present and preparing for the future using technology as a tool for delivery, not dictate.

4.3.2 Venue Positioning

Artificial intelligence, facial recognition, personalisation and an ever increasing array of technologies begin to make an impact on events from music and theatre through to sporting venues.

It is the ability of integrated AR and VR that will stay with the hearts and minds of audiences and users.

This creates multifaceted experiences for fans and audiences that can extend beyond the venue into the home by leverage technology to enhance the physical experience.
From unique artist and performance content to blending the physical and digital worlds together through augmented backdrops and 3D content that blend together in one experience.

Augmented reality is proving to be a potent marketing tool for a number of brands, drink brands are some of the strongest uses yet of this technology.

Smartphone or tablet cameras can be used to recognise the shape of anything, turning products into experiences that educate consumers about the company and brand, generating unique moments based around bowl content.



4.3.3 Venue Application

The future of 5G-enabled Augmented Reality will transform the way we approach and experience the world around us by bridging the digital and physical world. This will enable new interactions to play a key part in connecting this technology to the venue's users.

Companies like 'Scape' use unique approaches such as their own 'visual positioning API' that is able to perform reliably and accurately, regardless of time of day producing dynamic scenes or changing environmental conditions.

LOGOLIVE

Using the free standing brand mark as an activation trigger, various options and approaches can be programmed to be triggered in the environment.

Other landmarks across the podium and the venue its self can be used as triggers to augmented reality.



Floating messages appear in the camera view



Dallas Cowboys volumetric video activation



Augmented animation overlay



Dallas Cowboys volumetric video activation



Ken Kelleher AR sculpture external

4.3.4 Conceptual Approach

Concept:

Re-imagining the venue's three-storey Base Atrium with brand activated artwork that exists as a hidden layer to the audience experience, activated through phones and tablet devices.

By making use of the three-storey Base Atrium the engaging work can connect the different levels without effecting through views or content displayed on the Base Atrium screens set above the bar.

Each level can provide different perspectives of the brand activation creating a one-on-one experience with the work.

The work should emphasise the volume of the Base Atrium that is designed to augment.



Ken Kelleher AR sculpture Internal

4.3.5 Augmented Reality in the Bowl

Embracing the connected world through the mobile devices that for some time has been looked upon as diluting the live experience.

Venues can own the moment by providing a platform for performances and teams to change the way they perceive the show, enhancing the way modern fans engage with live events.

Events can geotag and time stamp the experience providing unique content to each show, venue and demographic location. Keeping content within the geo fencing of the venue ensuring only fans receive the content.

Live and Legible

Augmented reality technology can improve accessibility in live performances and sporting events.

With technology such as the Epson's 'Moverio BT-350 Smart Glasses' and systems developed by Accenture called 'Open Access Smart Capture' audiences can view real-time information and subtitles during live performances. This allows overlaying the real world without blocking out the stage.

This technology makes it possible for the hearing-impaired to attend any show they like, sit in any seat they please and to keep focus on the performance.

Software has the ability to watch and listen to the performance in real time and adapt with human monitoring and change things during the show. The viewer has the ability to adapt the system to suit their needs.



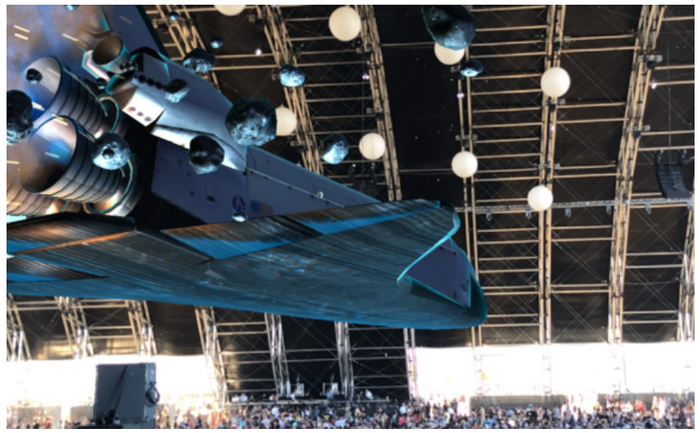
Bono appears from screen through AR



Madonna appears with a visual retrospective of herself



National Theatre content overlay



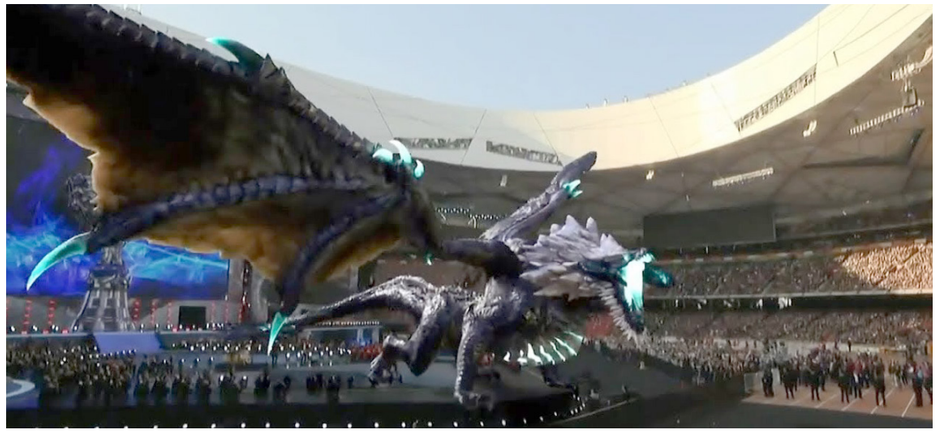
Augmented content at Coachella



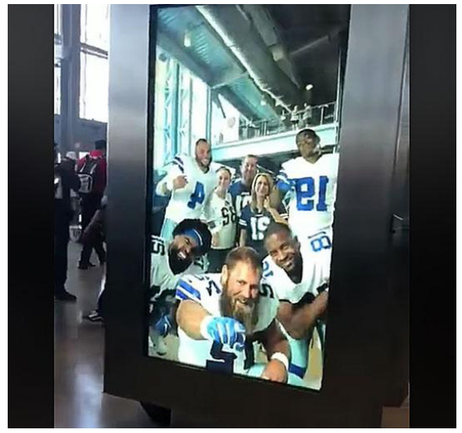
4.3.6 Venue Application

Throughout the different spaces and levels in a venue there are points where audiences naturally gather and dwell, from a bar to a implied space on a concourse where there is room to stand in groups.

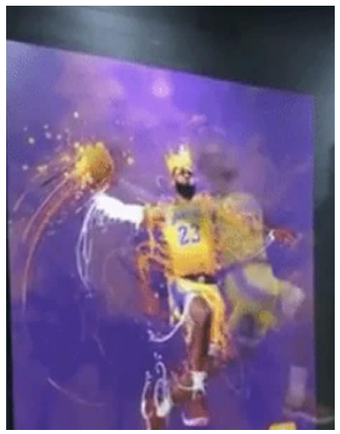
In these moments it is where brand positioning can be brought to life with augmented overlays that tap into the fanzone mentality, providing 3D content that allow fans to capture selfies with team or band members.



Riot Games opening with AR Dragon in venue



Dallas Cowboy team selfie

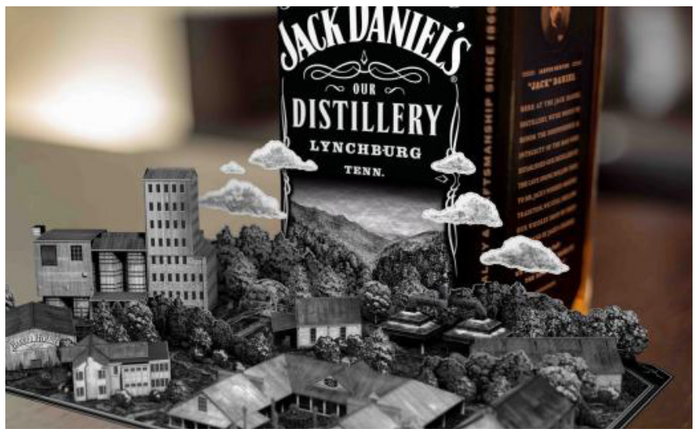




Lebron James in store 'Slam-Dunk' for snapchat



Star wars 'Find the Force' AR



Jack Daniels AR animated book campaign

EXTERNAL

4.4.1 CONCEPTUAL APPROACH 578

4.4.2 FACADE STUDY - DIGITAL & FIXED ACTIVATIONS 579

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4.4.9 FACADE - FIXED NAMING RIGHTS PARTNER BRANDING 586

4.4.10 FACADE - LED SCREENS 587

4.4.11 FACADE - TICKERTAPE 588

4.4.12 LEVEL 01 LANDSCAPE - FIXED ACTIVATION 590

4.4.13 ROOF - FIXED ACTIVATION 592

4.4.14 LEVEL 00-01 LANDSCAPE - DIGITAL ACTIVATION 593

4.4

4.4.1 Conceptual Approach

The external study determines the opportunities for the venue exterior, locating areas with the highest visibility and over all uninterrupted sight lines from optimum vantage points.

Studies have been undertaken to emphasise field of vision, fixed & variable signage and application for a naming rights brand partner or experiential intervention.

** Progress has been ongoing with a specific Naming Rights Partner, however this information remains confidential and is not enclosed in this section.*

NOTE:

Branded activation will be developed post planning in conjunction with the client and future naming partner.

4.4.2 Facade Study - Digital & Fixed Activations

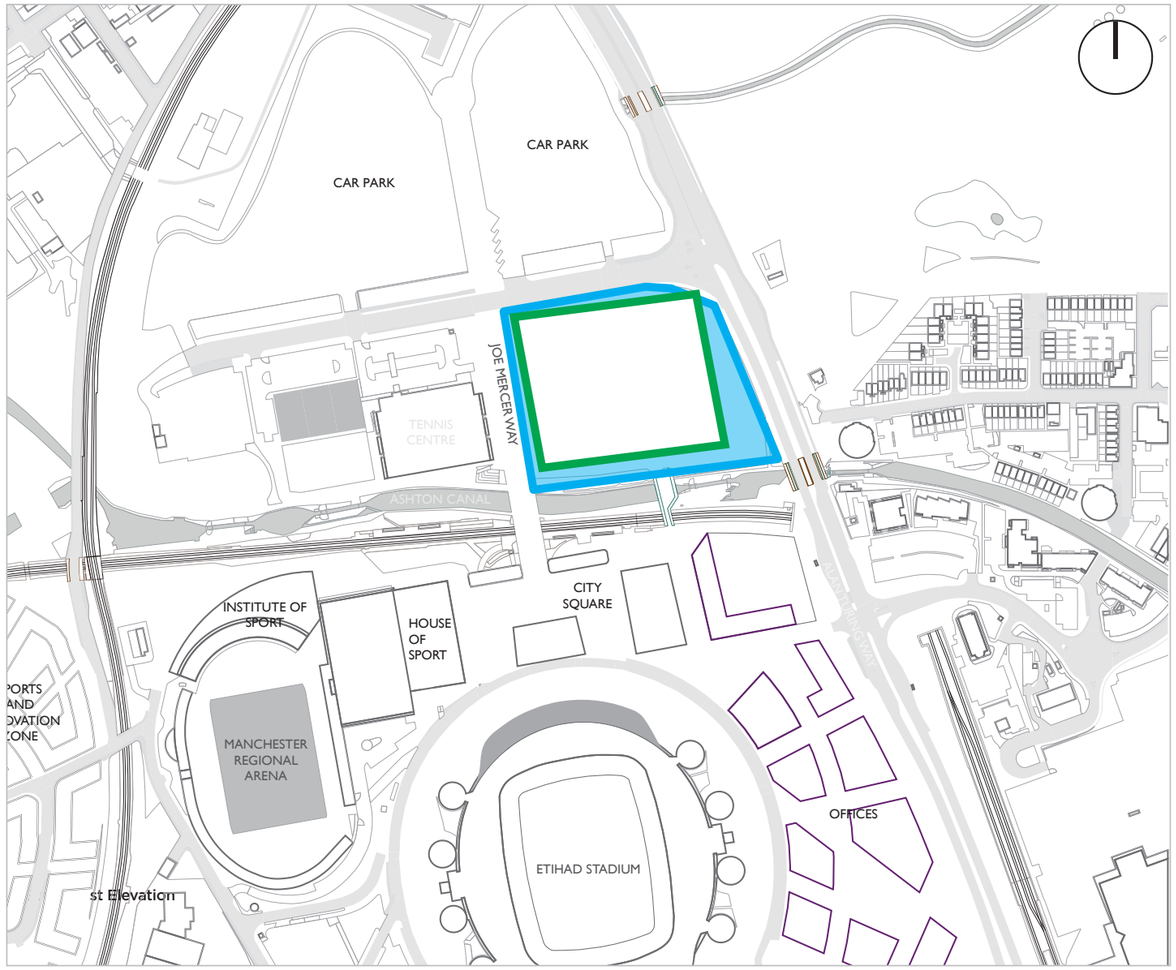
Base activation opportunities as either zonally grouped or stand alone areas.

1. Facade

- Fixed signage
- Digital
- Lighting
- Projection mapping

1. Podium

- Fixed signage
- Digital
- Lighting
- Pop ups
- Festival framework



L04
L03
L02
L01
L00
ALL EXT

4.4.3 Venue Application

The vertical field of vision is measured from the average eye height using an equal part 30° vertical viewing angle either side of the centre point.

The eye has a natural tendency to focus on the upper half of the visual cone. Ultimately there is rapid eye movement followed by additional head movement to fully absorb content. Both dorsal (Backward movement) and ventral (forward movement) are limited to a 60° angle.

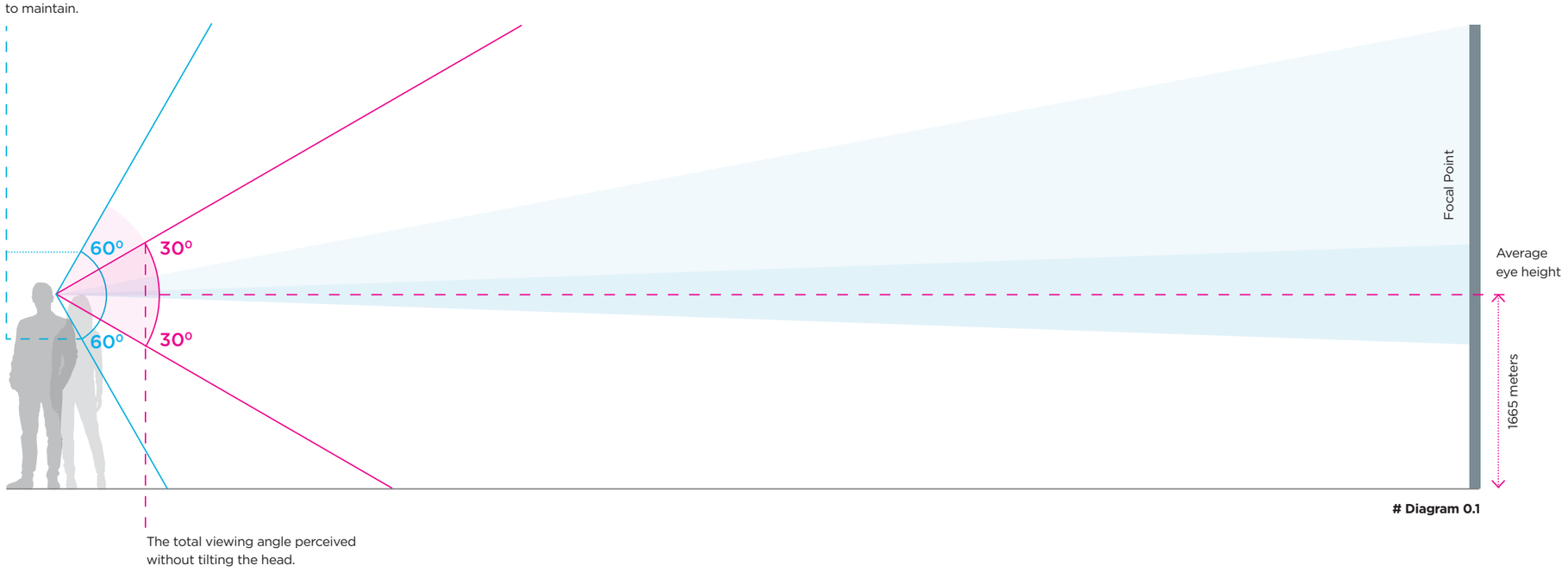
The design principle of information sizing and visibility is to evaluate the environment and how many factors compete for the user group's attention.

If the environment is very busy and the visitor is easily distracted, for example by talking to others, it will be important to provide ample large information display.

Sizing should be large and provide clear focal points with considerable white space (non-information space) around the core message.

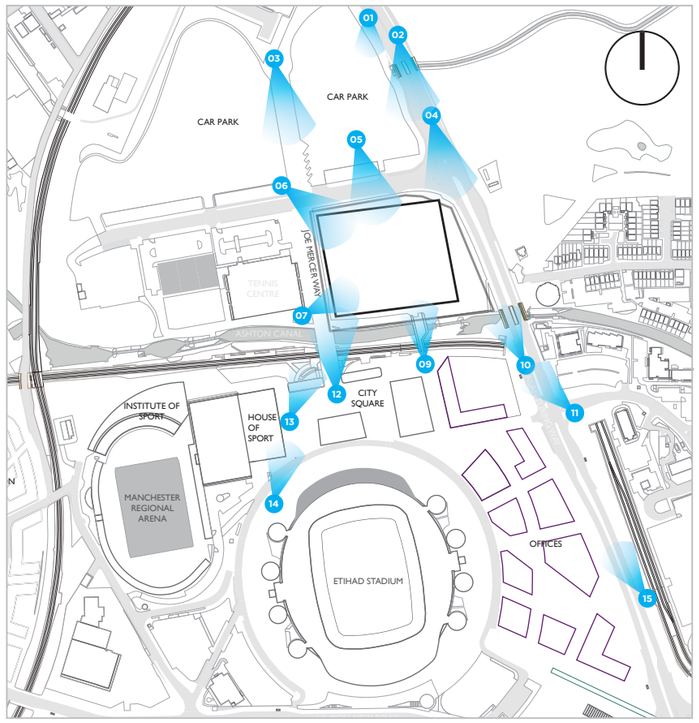
In order to provide coherent content the reading distances and text heights are considered within the confines of the environment's scale and context.

 # Diagram 0.1
To enable content to be viewed it should sit with in the visible cone. The 60° cone follows the rotation of the head.



 # Diagram 0.1

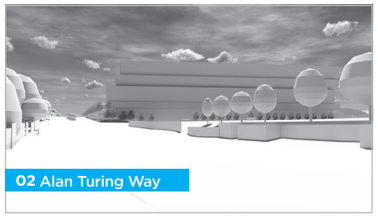
4.4.4 AR Discovery Application



Viewing locations

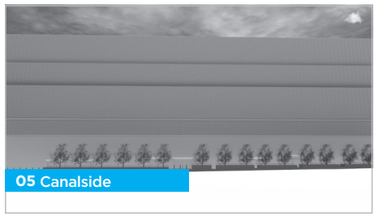
By looking at the venue from a range of angles on approach and around the various arrival points we can determine the best positions for activation on the facade and on podium, with consideration given for the optimal viewing angles based on the field of vision diagram on previous page.

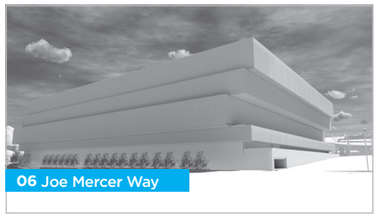




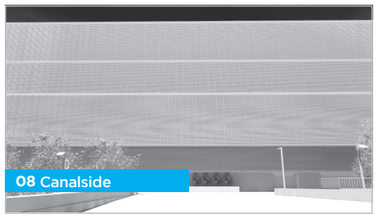


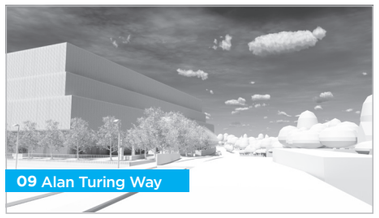






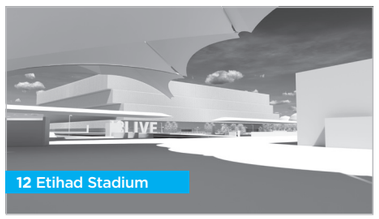


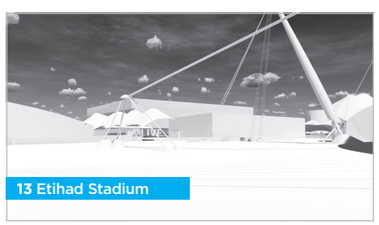








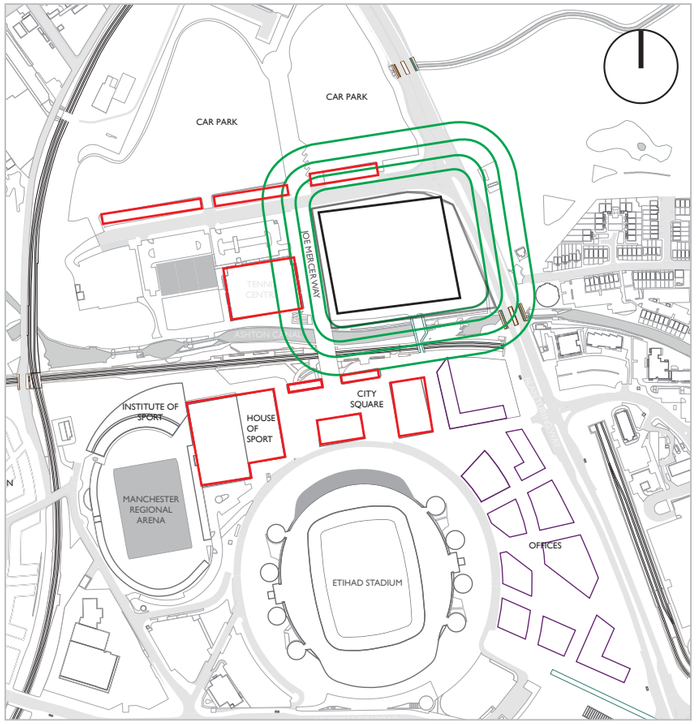








4.4.5 Facade Study - Viewing Distances & Angles

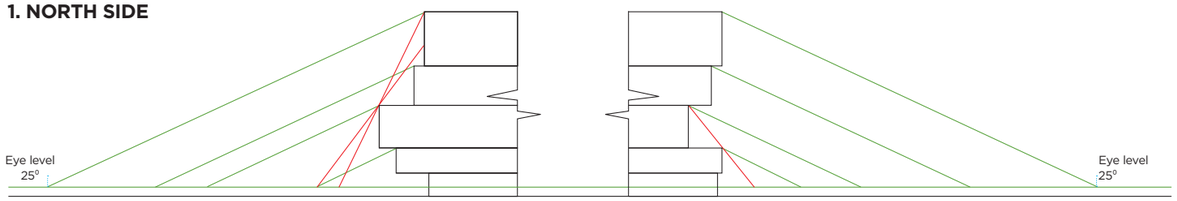


Viewing Distances by Level

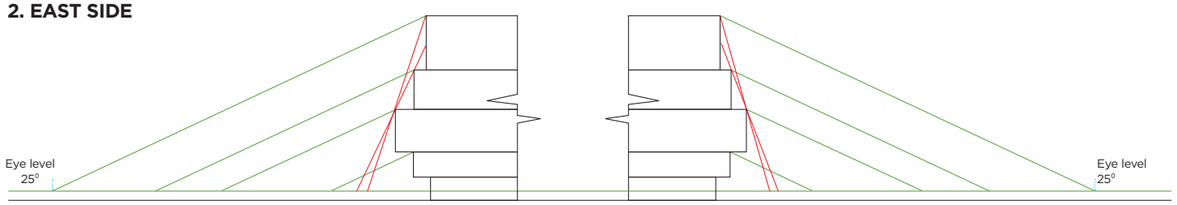
Based on the field of vision diagram on page number 446, this study and accompanying diagrams show legibility and optimum exposure for the commercial activation items.

The final locations for each of the activations will be determined by the optimum exposure to audiences arriving and passing users. Consideration of future developments on campus will also be taken into account on the final locations. These are shown in the site plan above.

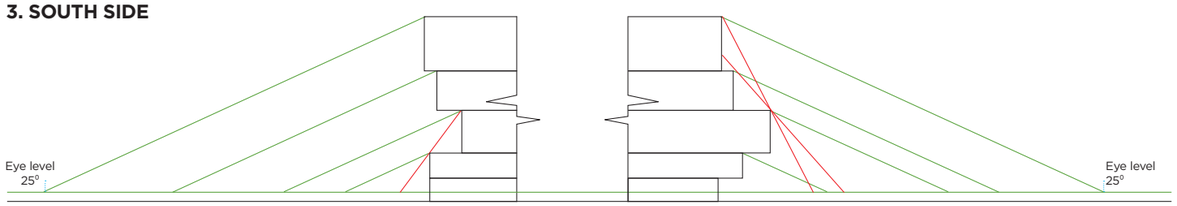
1. NORTH SIDE



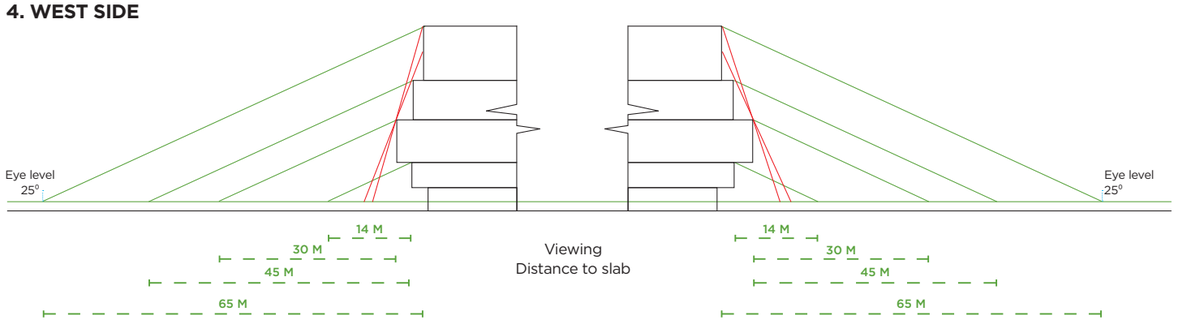
2. EAST SIDE

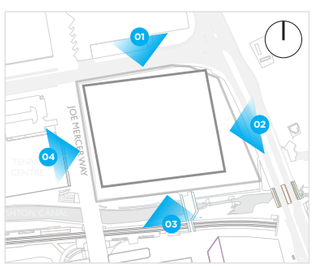


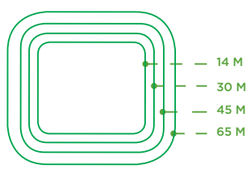
3. SOUTH SIDE



4. WEST SIDE





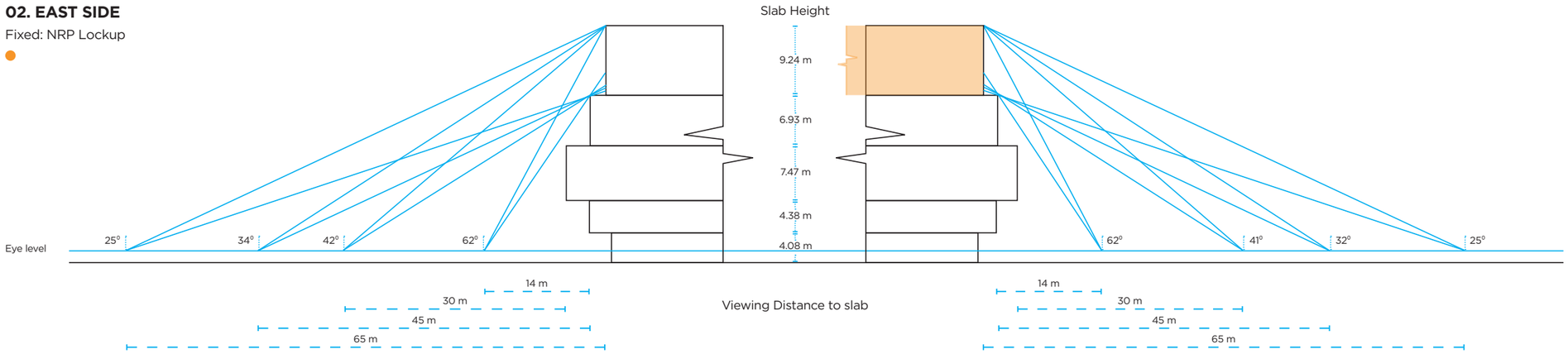


Each distance is determined by the optimum angle of viewing on approach for each of the tiers.

4.4.6 Facade Study - Fixed Activation

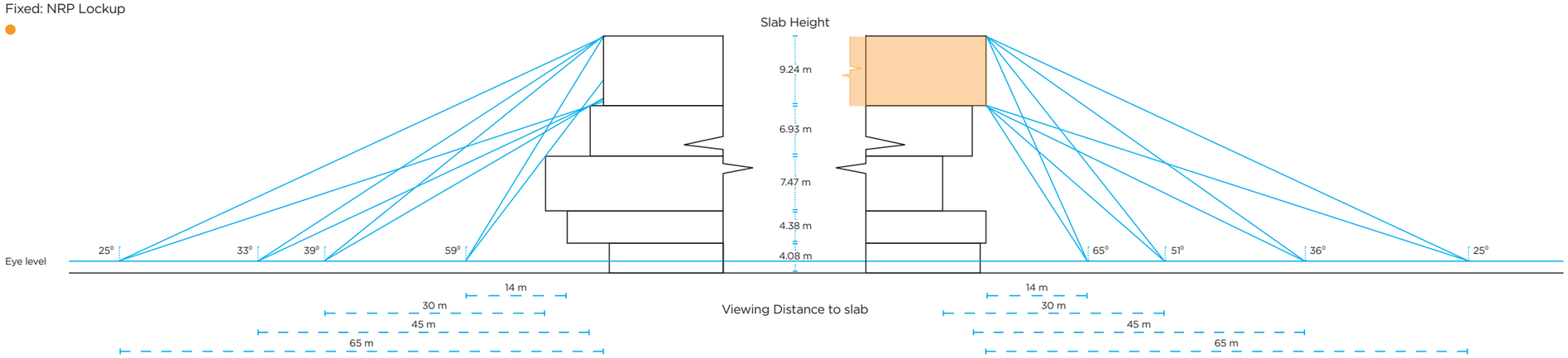
02. EAST SIDE

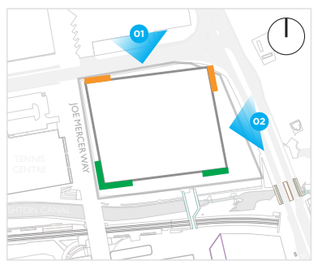
Fixed: NRP Lockup



01. NORTH SIDE

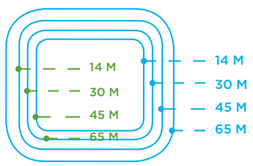
Fixed: NRP Lockup





Viewing distances fixed activation

The final locations for each of the fixed signage provides the optimum exposure to audiences approach to the venue and general passing users. It also creates a visual mark for audiences to follow while avoiding the future developments on campus.



Key

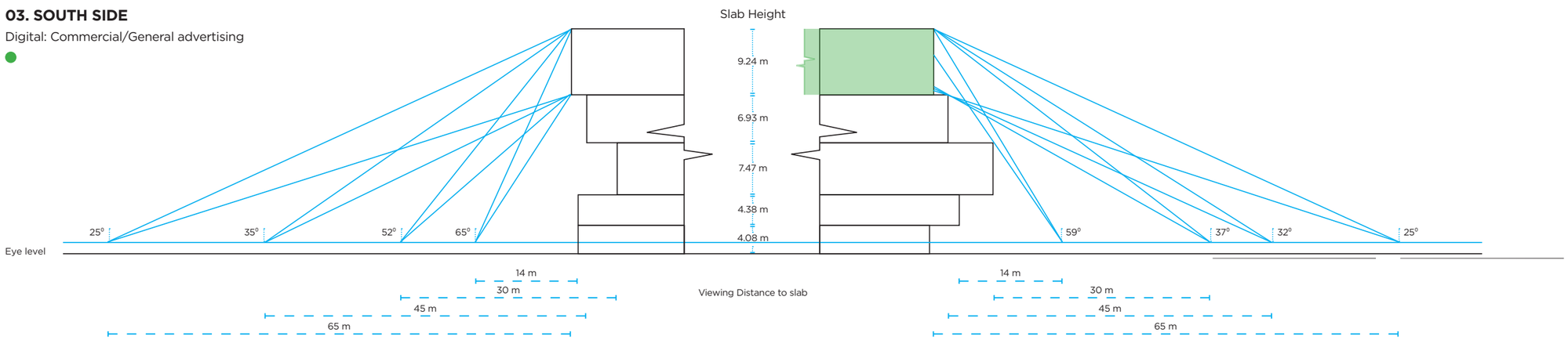
Viewing Distance

NRP Fixed logo

4.4.7 Facade Study - Viewing Distances & Angles

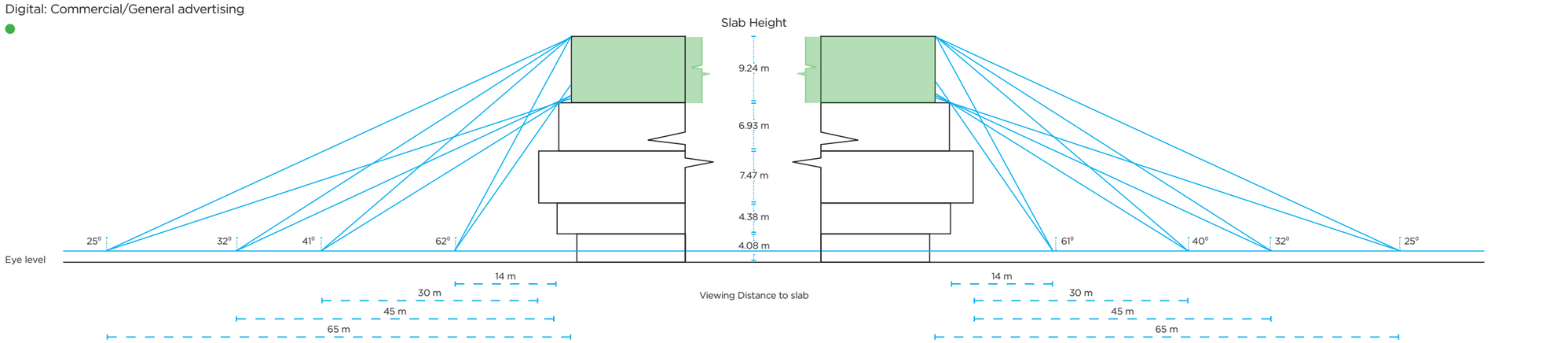
03. SOUTH SIDE

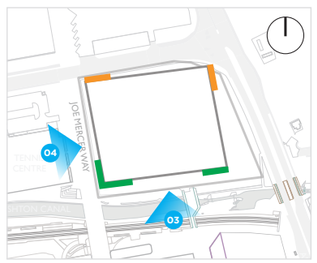
Digital: Commercial/General advertising



04. WEST SIDE

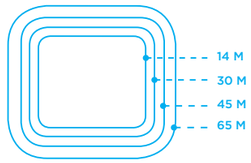
Digital: Commercial/General advertising





Viewing distances fixed activation

The final locations for each of the fixed Naming Right Partner and LED screens provides the optimum exposure to audiences approach to the venue and general passing users.



Key

Viewing Distance

Screens

4.4.8 Venue Commercial Items

Activation Items



1. Fixed Naming Rights

Fixed signage
Digital
Lighting



2. LED Screens

Digital
Lighting



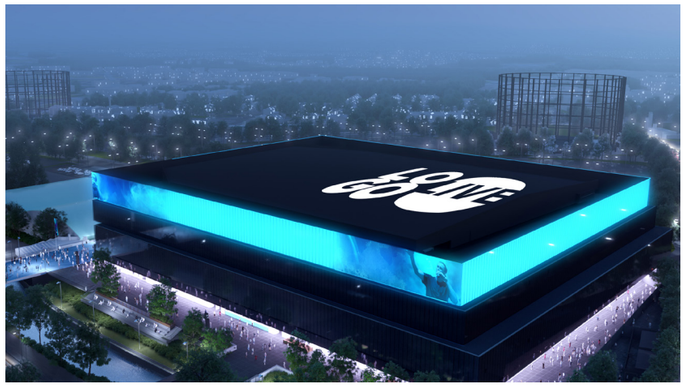
3. Tickertape

Digital
Lighting



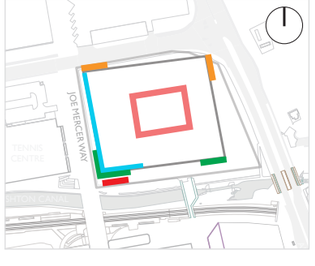
4. Landmark Fixed Activation

Fixed signage
Lighting



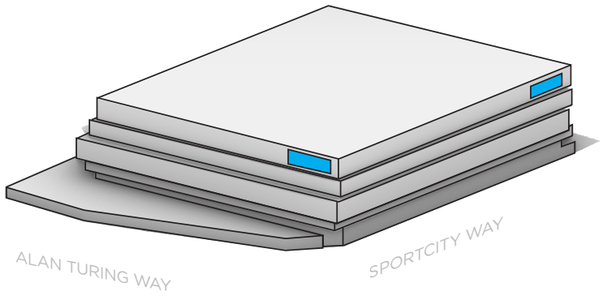
5. Roof Branding

Fixed signage
Lighting



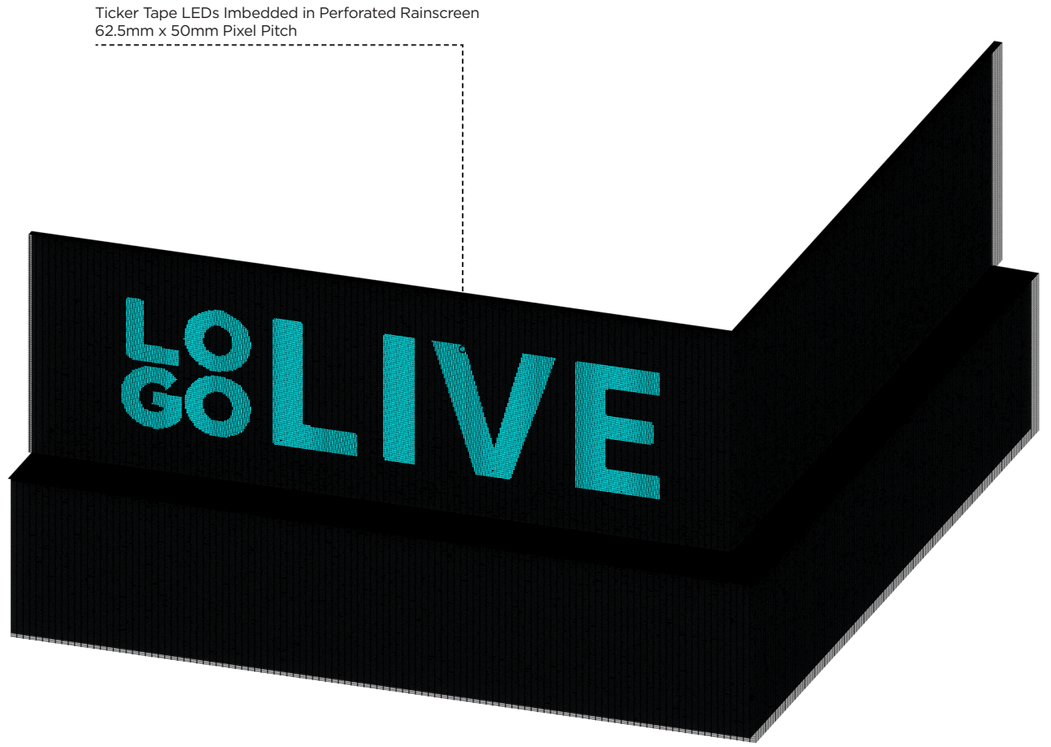
- Fixed Naming Rights
- LED screens
- Tickertape
- Landmark Fixed Activation
- Roof Branding

4.4.9 Facade - Fixed Naming Rights Partner Branding

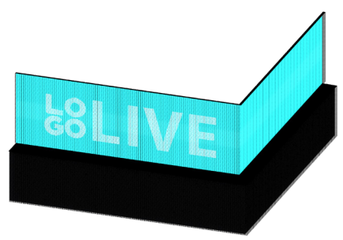




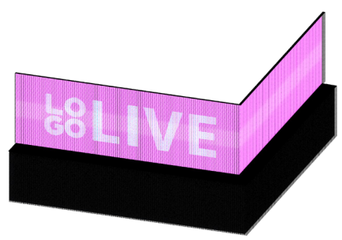
The scale shown for the 'Naming Rights Partner' is not fixed and will ultimately change based on the final naming strategy and agreement with a 'NRP'.



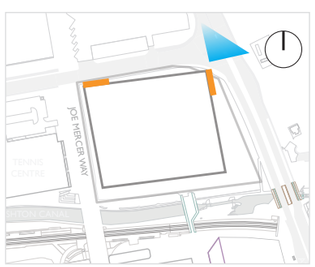
Non Event



Event



Versatile



Fixed Naming Rights Partner branding

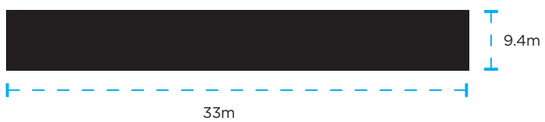
4.4.10 Facade - LED Screens

The LED Screens act as a variable activation opportunity first, and as an additional information platform to the venue.

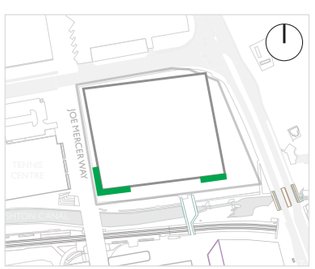
The screens allow the venue to present a range of communications including;

- Naming Rights Partner(s) allocation
- Paid for, non conflicting commercial advertising
- Calendar of Events
- Promotional or social media announcements
- Safety announcement
- Wayfinding inventory
- National movement or celebration
- Breaking news or immediate venue instruction



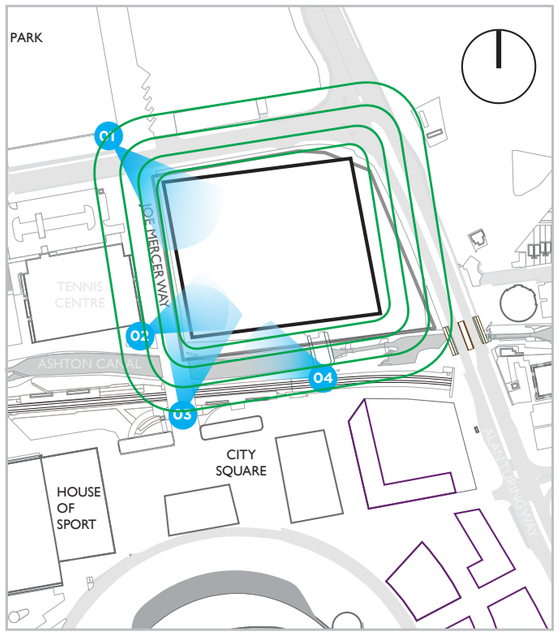


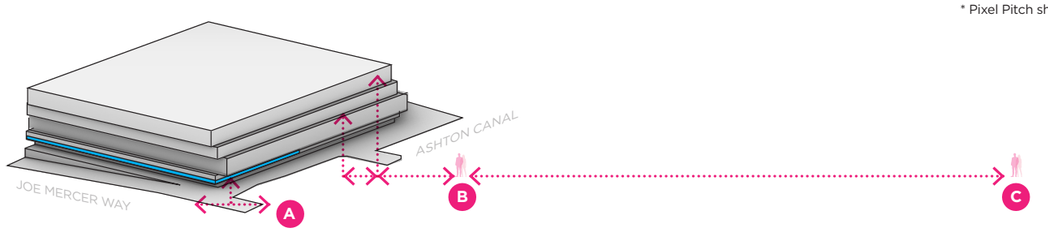
LED screen - Pixel Pitch 62.5mm x 50mm, 16 Pixels



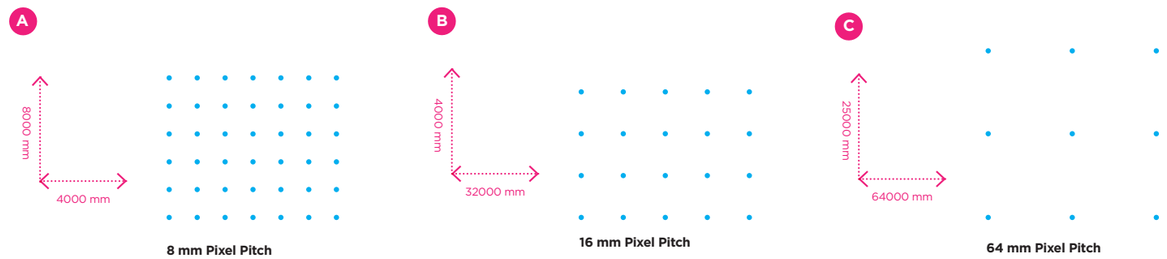
- LED screens

4.4.11 Facade - Tickertape





* Pixel Pitch shown for example only

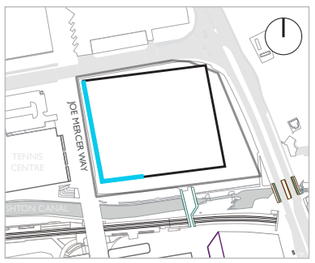


Tickertape viewing locations & distances

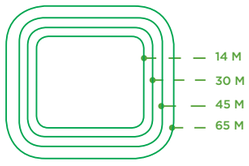
By looking at the venue from a range of angles on approach we can determine the best positions for the tickertape on the facade and a consideration for the type size recomended to be legible from these vantage points and their respective distances. The majority of angles maintain similar levels of angle against the distance you are to each level and what is legible to view, based on the field of vision diagram on page 450.

The pixel pitch distance can begin to increase in overall pixel spacing. This will allow for content to appear at the same visible resolution at each of the optimum distances.

The top tier at 64 meters distance will appear the same resolution as the first tier read at 16 meters distance.



Tickertape



Each distance is determined by the optimum angle of viewing on approach for each of the tiers.

Key
Viewing Distance
Views

Facade - Tickertape

Tickertape Variable Activation Messaging

The tickertape acts as a variable information platform as well as an activation opportunity in its own right.

The tickertape will be visible from optimum vantage points as guests approach the venue from the highest footfall of both the South and North entrance points.

The variable tickertape display allows the venue to present a range of communications including;

- Calendar of Events
- Venue Announcement
- Promotional or social media announcements
- Safety announcement or additional
- Wayfinding Announcment
- National movement or celebration
- Naming Rights Partner(s) allocation
- Paid for, non conflicting commercial advertising
- Breaking news or immediate venue instruction



Calendar of Events



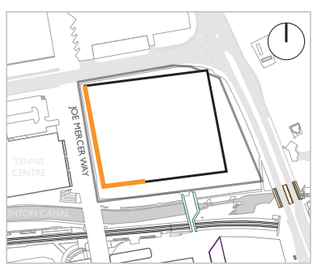
Naming Rights Partner (Indicative Sponsor)



Venue Announcement



Safety / Wayfinding Announcement



Tickertape

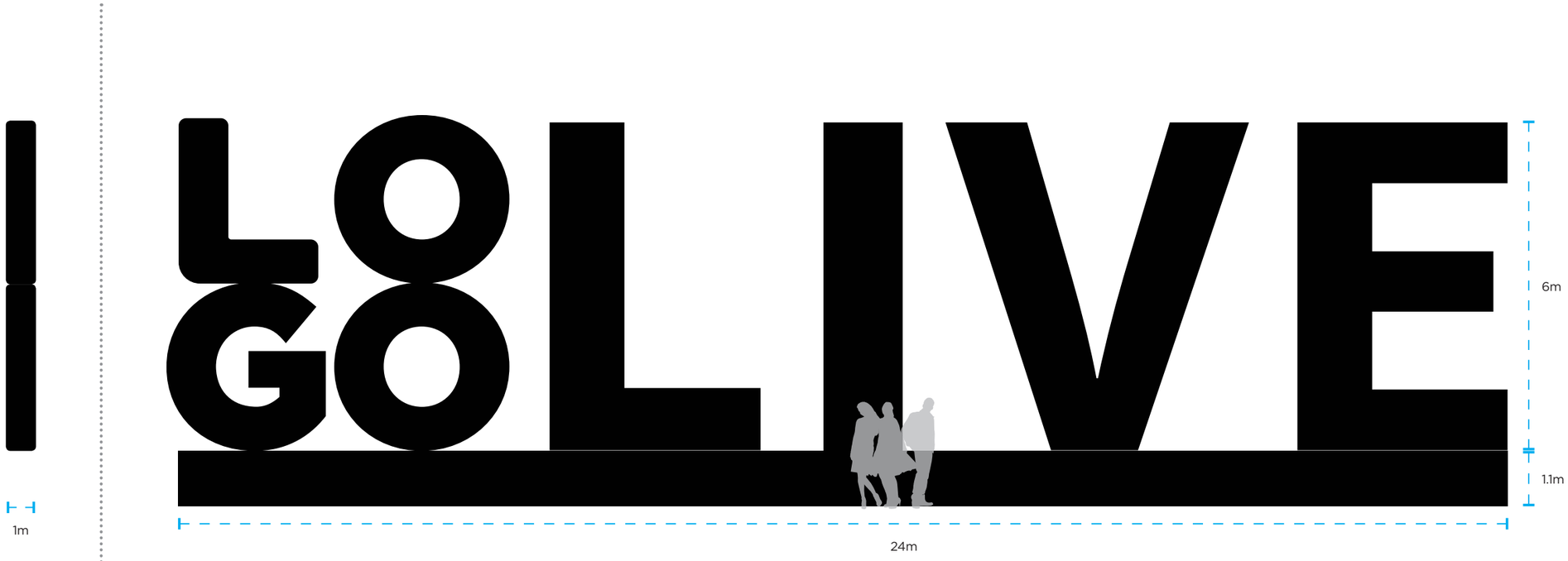


Pixel Pitch 62.5mm x 50mm, 16 Pixels

4.4.12 Level 01 Landscape - Fixed Activation

Side Elevation

Front Elevation



Venue Placemaking/Naming Right

As a key location for maximum footfall and exposure both event and non-event mode.

Additional exposure with substantial foot fall from Etihad stadium along Joe Mercer way.

Please refer to the landscaping section for details to power and data scheme.

Instagram moment

Creating 3D forms and lettering for place making. This forms a backdrop to capturing social media images while providing a marquee opportunity. Scale and materiality are key drivers in creating a captivating statement as well as a memorable identity for the venue and the City of Manchester.

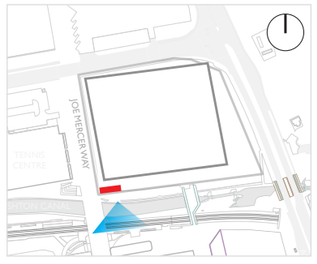
AR Discovery

Free standing brand mark as an activation trigger to augmented reality.

Wind mitigation

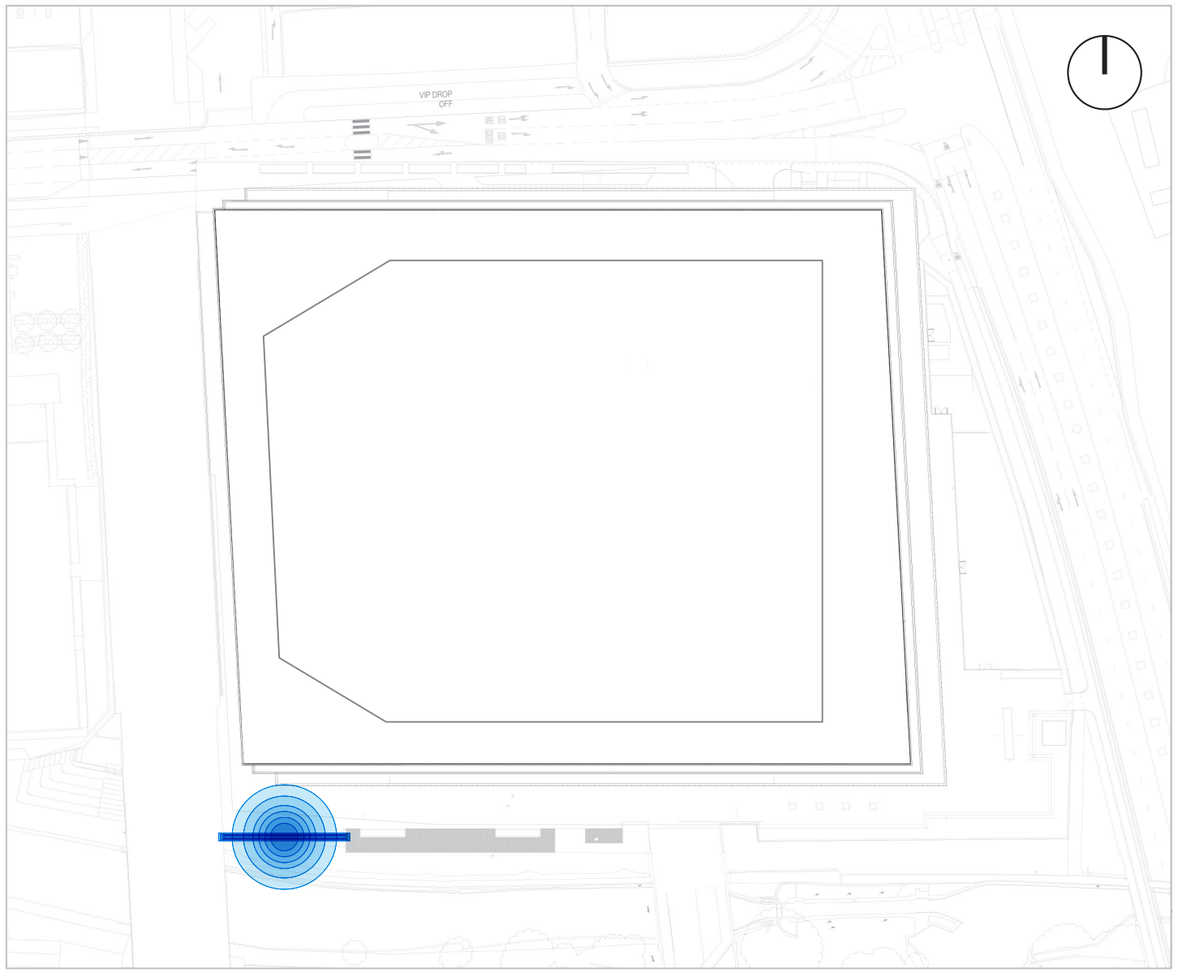
Providing part of the response to the wind study to mitigate air flow along the southern podium.

Please refer to the landscaping section for details for additional planting scheme in support of the fixed signage as part of the wind mitigation and information on the wind analysis study.



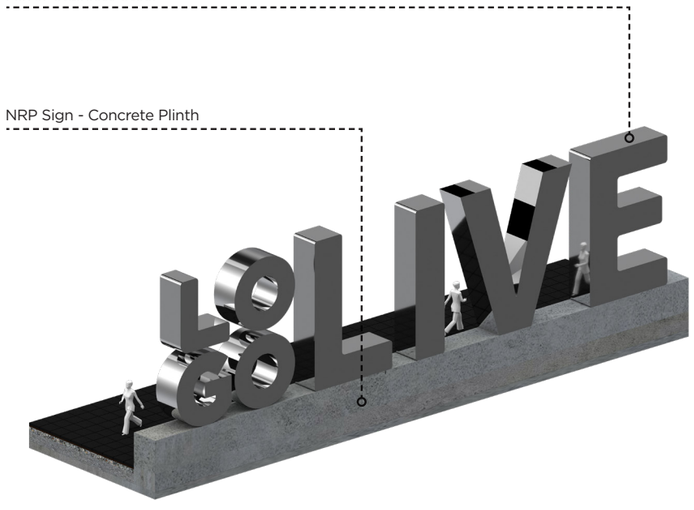
Landmark Fixed Activation

Level 01 Landscape - Fixed Activation









Naming Rights Partner - Fixed

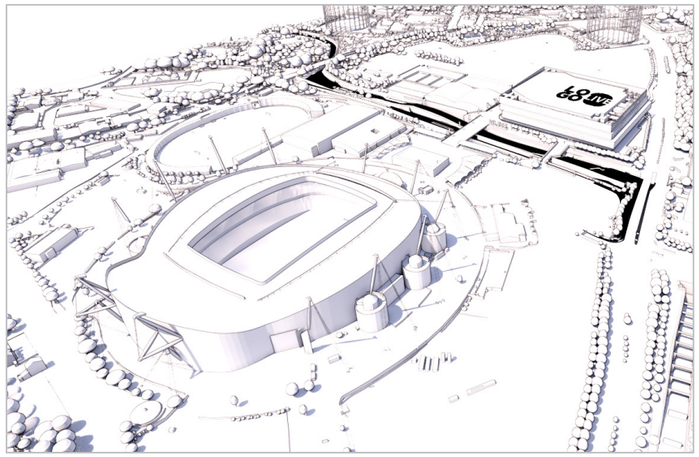
Creating 3D forms and lettering for place making. This forms a backdrop to capturing social media images while providing a marquee opportunity.

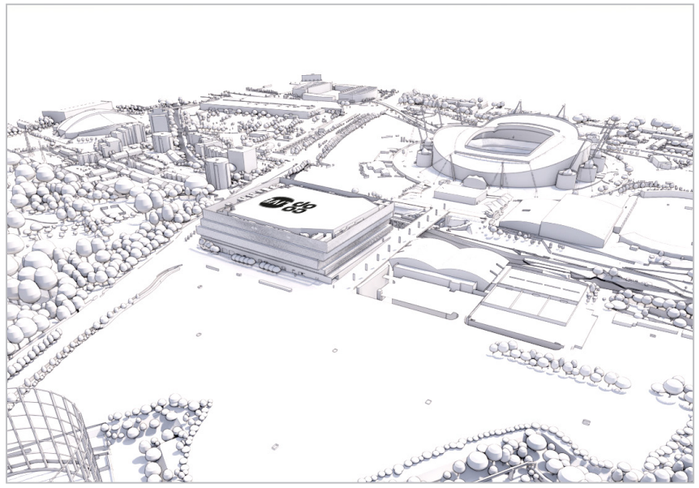
Built up of mirrored glass and polished steel the letters will appear solid and reflect its surroundings in the daytime, but feature a level of transparency on the front and rear facades.

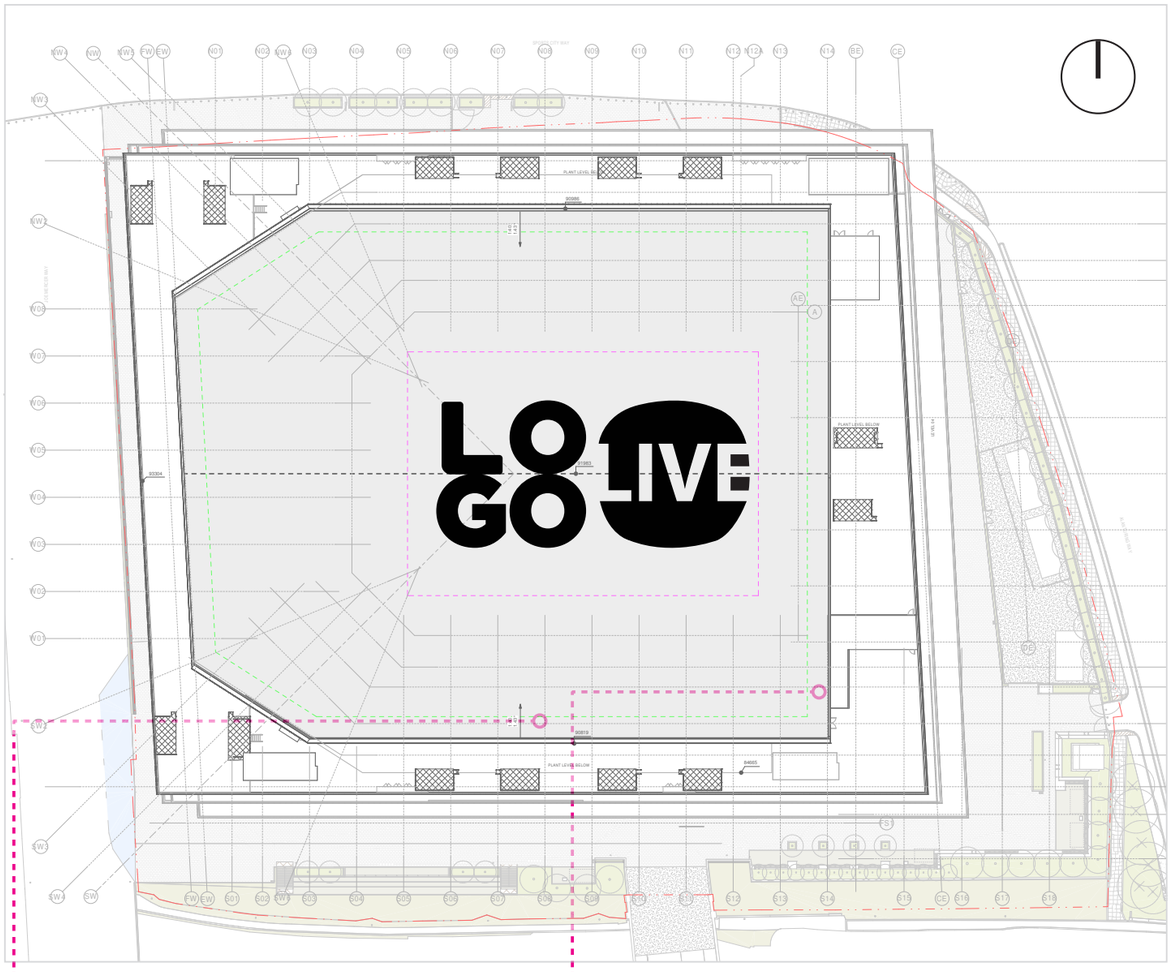
At night and in event mode it will appear to be semi transparent and will emit light from the internal LED fittings which are programed to elevate the brand positioning along the venue lighting system working in harmony.

Scale and materiality are key drivers in creating a captivating statement as well as a memorable identity for the venue and the city of Manchester.

4.4.13 Roof - Fixed Activation







The roof branding fixed activation has a set perimeter allowing a naming rights partner access to feature at the largest scale available, maximising both broadcast and landmark exposure.

Photovoltaics will be placed on the roof to utilise the large roof area which provides an ideal platform for generating electric power from solar energy. This transforms the building into a power generator, therefore reducing its CO2 footprint sustainably.

The naming rights partner brand mark will align flush on the pitched roof and will not alter the architectural aesthetic.

The Coolest White
The Coolest White is a coating system with very high total solar reflectance. Ensures the substrate heats up less and radiates less heat. Actively fighting against Urban Heat Island Effect by reducing the temperature inside and outside of buildings.



Lighting
Using supportive programmable RGB lighting to create a coloured wash of light that surrounds the brand mark. Using programmable lighting will allow for special events to be suitably lit.

4.4.14 Level 00-01 Landscape - Digital Activation



Egress Wayfinding Mode

Commercial Activation Mode

4mm Pixel Pitch screen

Up to 4 sides



Wayfinding



Event



Non-Event



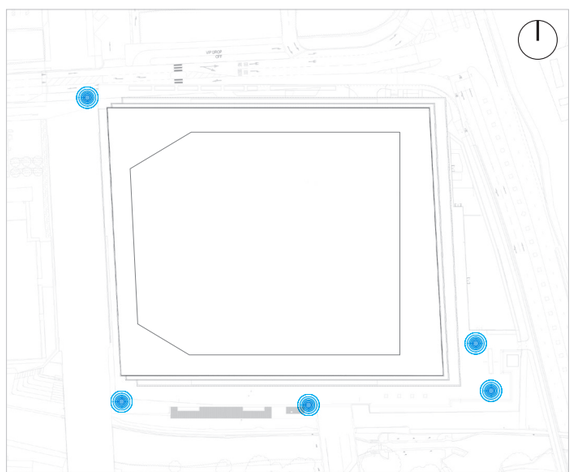
Commercial Take-Over

Non event Commercial application - Wayfinding

Allowing for commercial content to utilise the digital wayfinding system in non event mode for commercial and event information.

Ability for brand ownership through naming rights partner and founding partners.

Tech partner to imbed mobile and WIFI network into landscape providing a stronger signal for visitors and increasing site usability and dwell time.



CATERING DESIGN

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5

INTRODUCTION

5.1.1 FOOD & BEVERAGE 598

5.1

5.1.1 Food & Beverage

5.1.1.1 Introduction

This section has been prepared to provide a summary of the Tricon Stage 4 design for food and beverage areas.

For each offer, a narrative has been provided of the typical customer offer and the general assumptions on operational logistics.

This is considered to support the work conducted by both Populous and Delaware North.

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LEVEL 00/01 PREMIUM AREAS

5.2.1 LEVEL 00/01 PREMIUM AREA 602

5.2

5.2.1 Level 00/01 Premium Area

5.2.1.1 General

These areas are designed to be self-sufficient in terms of local storage and regeneration but will utilize the commissary kitchen for general food preparation. They receive mise en place in advance of the venue opening for an event and will 'finish' the dishes at the point of service.

5.2.1.2 Decibel (00)

Capacity

The Decibel will have the capacity for up to 200 guests and will fall into the 'Indulgence' level of user group classification. Services will be based around front-of-house activity, such as mixology and live action integration between staff and guest.

Seating will be a mix of lounge-style casual and some dining areas. The Decibel has the feel of a nightclub. The service style will be waited service to table.

Support Facilities

The Decibel Club has a support kitchen which will be used to finish food prepared in the commissary kitchen.

The functions of the finishing kitchen are:

- Receipt and storage of prepared food transferred in trolleys from the central commissary.
- Plating locally and holding plated.
- Regeneration and finishing of dishes.
- Garnishing of all dishes.
- Preparation of hot beverages.
- Storage and dispense via the bar of cold beverages. Draught beer will be offered.
- Collation and sorting of dirty service ware. Large service dishes coming from the commissary are returned to it.
- Ware washing will be limited to glassware with dishes, bowls, service ware and cutlery being returned to the main dish wash at Level 00.
- Temporary holding of plate/ service waste.

Indicative Menu Offer

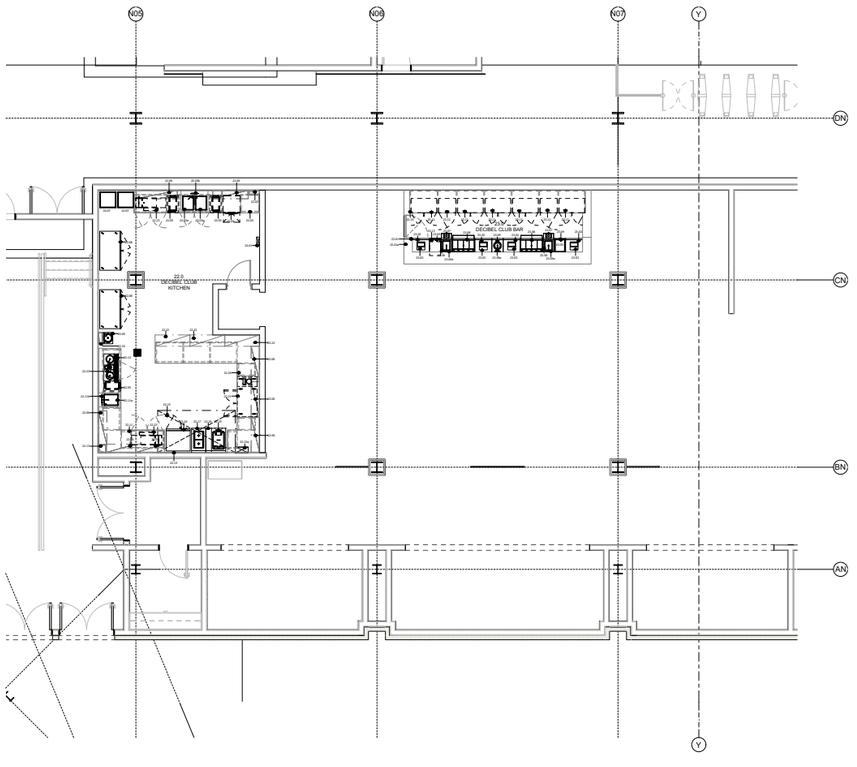
The menu is based around bowl food and sharing plates:

- Draught cocktails, wines and beers (draught available)
- Snacks such as samosas, popcorn, corn dogs & dips
- Choice of hot and cold sharing plates and tapas style dishes
- Coffee/Tea – waiter service

General Arrangement

Plan 5.2A - Level 00 Decibel Club, Bar & Kitchen

POS Count = 4



5.2.1.3 The Record Room (Level 00)

Capacity

The Record Room will act as the premium five-star offer within the Arena and will have the capacity for 100 guests. Services will be based around an element of live action generated from a kitchen and mixology station. The food offer is relaxed fine dining cooked to order in the kitchen and table served.

Inclusive drinks will include champagne, cocktails, premium spirits, wines, beers (not draught) and non-alcoholic choices.

Seating will be a mix of lounge-style casual seating and some dining areas. The service style will be tapas dishes waited to table.

Support Facilities

The Record Room has a supporting closed kitchen. This will receive food prepared in the commissary kitchen.

The functions of the finishing kitchen are:

- Receipt and storage of prepared food in trolleys from the commissary.
- Plating locally and holding plated.
- Regeneration and finishing of dishes.
- Garnishing of all dishes.
- Preparation of hot beverages.
- Storage and dispense via the bar of cold beverages.
- Collation and sorting of dirty service ware. Large service dishes coming from the commissary are returned to it.
- Ware washing will be limited to glassware with dishes, bowls, service ware and cutlery being returned to the main dish wash at Level 00.
- Temporary holding of plate/ service waste.

Indicative Menu Offer

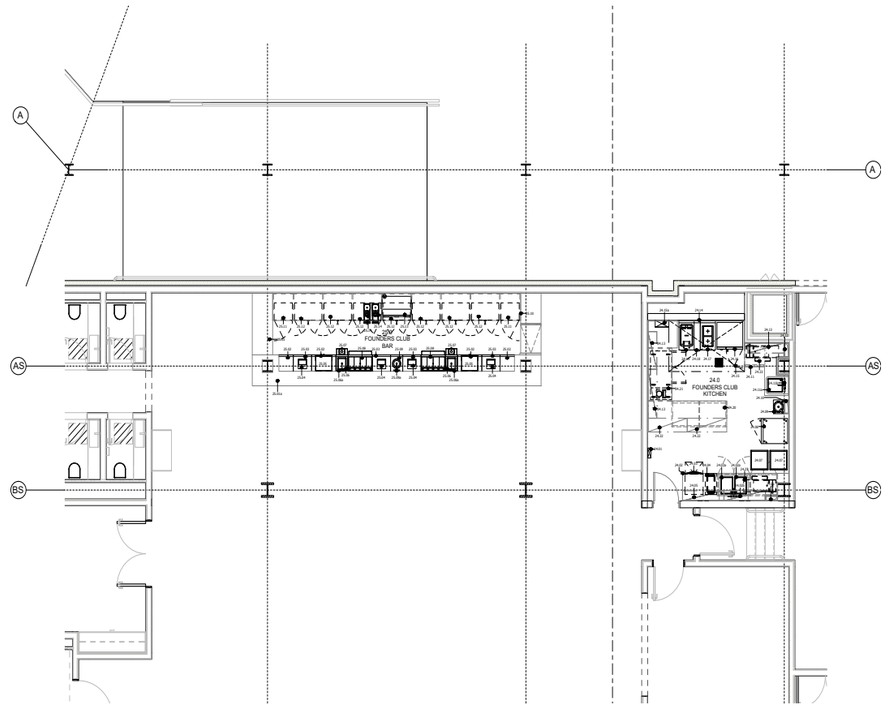
An indicative menu may be as below:

- Cocktails, wines and beers (draught not available)
- Appetizers –pre-plated on table or sharing platter
- Choice of tapas style dishes – waiter served to table (see Interior Design Presentation for example menus)
- Coffee/Tea or digestif – waiter service
- Fruit Juice, Soft Drinks, Beers, Cocktails and Water will be served via the bar.

General Arrangement

Plan 5.2B - Level 00 Record Room, Bar & Kitchen

POS Count = 4



5.2.1.4 Deck Suite North & Deck Suite West

Capacity

These suites will represent a mid-price point within the range of premium experience options. Each suite will have a capacity of 50 covers which will be a mix of lounge, with banquette seating, and high tables.

Support Facilities

The suites will be supported primarily from the main commissary kitchen in terms of prime food preparation. Local support space allows only a staging area which will be pre-loaded prior to an event.

This kitchen area provides the following:

- Refrigerated storage for foods
- Bulk beverage holding
- Heated and chilled trolleys for holding pre-prepared food prior to service.

Indicative Menu Offer

The service will be based around a suite-style buffet service with a range of premium hand-held foods. Craft beers, house wines and soft beverages will be included as well as opportunities being available for upgrading both food and beverage.

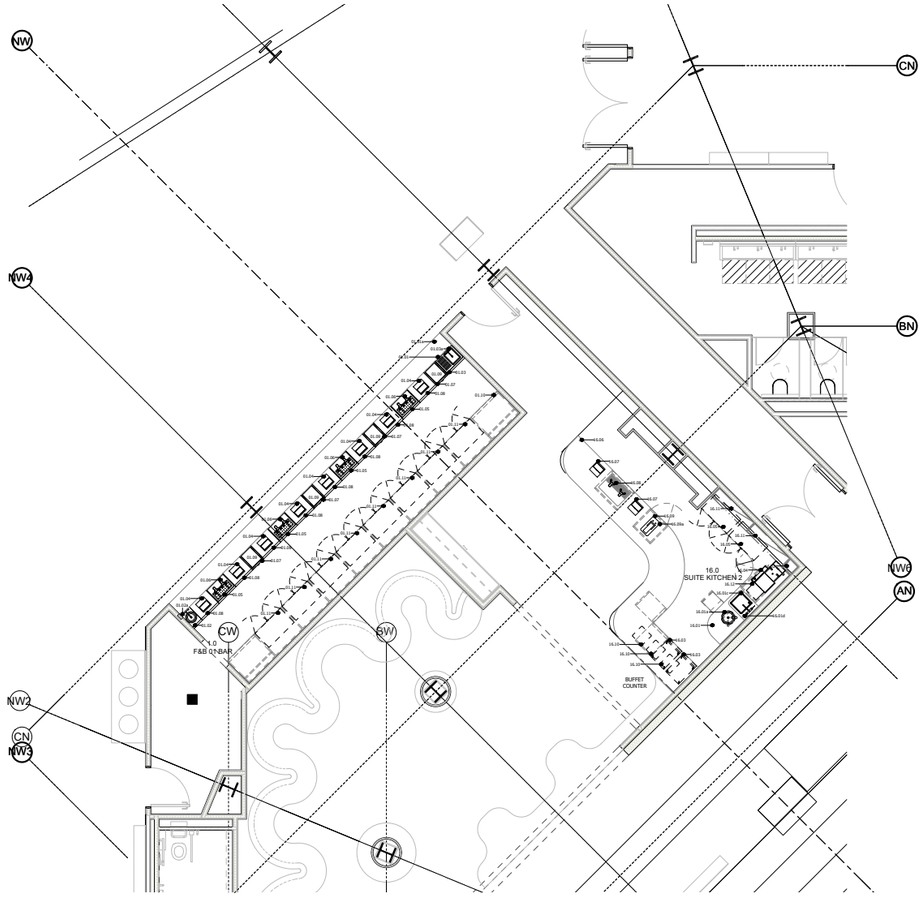
A simple menu framework is as follows:

- Draught and bottled beers, bottled cider
- House wines
- Coffee/Tea
- Fruit Juice, Soft Drinks and Water
- Hand-held ‘street food’ offers such as Asian pork buns, burritos, katsu
- Hot and cold dishes, bowl-food style
- Dessert selection (small dishes) or cheese board

General Arrangement

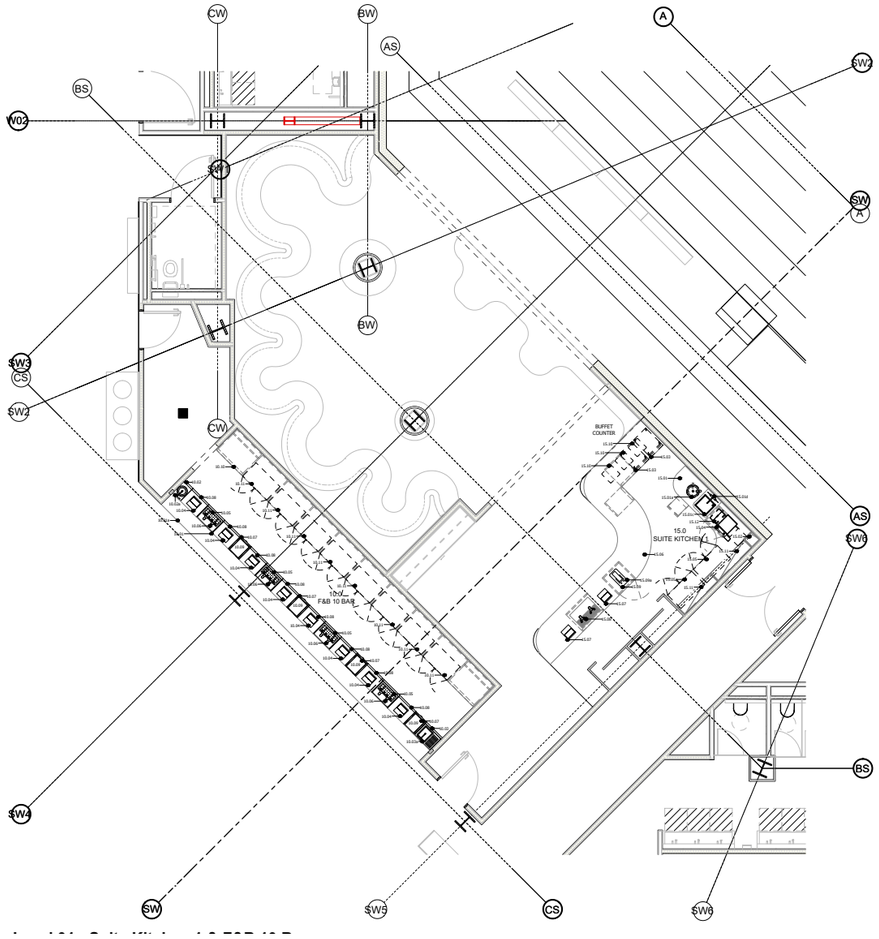
Plan 5.2C - Level 01 Deck Suite North

POS count = 2



Plan 5.2D - Level 01 Deck Suite West

POS count = 2



5.2.1.5 Backstage Club (01)

Capacity

This space will be vibrant, energetic and informal. A capacity of 700 will create a cool pre-show environment with regular pop-ups to add interest and aligning to the theme of the event. The area will be available for a range of uses on a non-event day, such as conferences/ meetings and exhibitions.

Support Facilities

The Backstage Club has a finishing kitchen, supplied from the central commissary. The kitchen will be visible to customers and will major on hand-held choices.

The features of this kitchen are:

- Receipt and storage of fresh and pre-prepared food in trolleys from the commissary. These will be held out of guests' view.
- Cooking of fresh dishes via a feature pizza oven, full cooking range with frying, plancha and induction.
- Temporary holding of service waste
- Ware washing will be limited to glassware with dishes, bowls, service ware and cutlery being returned to the main dish wash at Level 00.
- Additionally, a full-service bar will support a range of alcoholic and non-alcoholic drinks, along with facilities to prepare hot beverages. The bar will offer draught.

The bar has the following:

- Storage and dispense of cold beverages.
- Keg storage.
- Ice making facilities.
- Premium coffee making

Indicative Menu Offer

The service will be purchased on the day rather than as part of a package. The range of foods will be contemporary, easily eaten standing and with menus changing to reflect the event.

A simple menu framework is as follows:

- Draught and bottled beers, ciders
- Draught cocktails
- House wines
- Coffee/Tea
- Fruit Juice, Soft Drinks and Water
- Pizza to share, tacos, tapas
- Hand-held 'street food' offers such as Asian pork buns, burritos, katsu
- Small salads

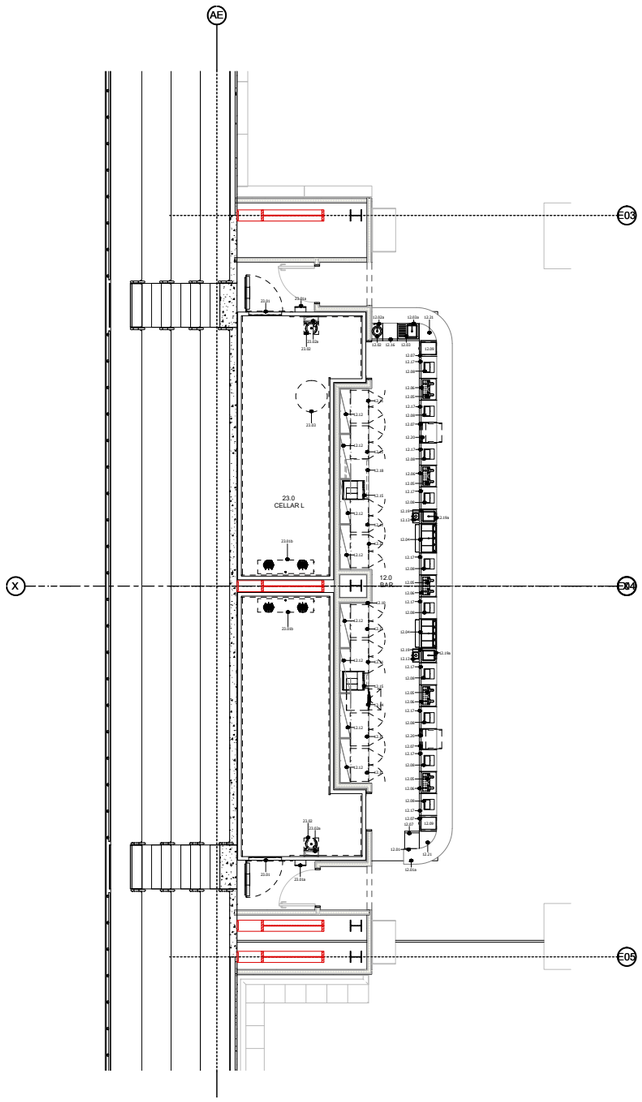
The bar will offer a broad range of drinks, including draught and speciality beers. Pop-ups such as gin bars, Aperol Spritz, and cocktails will be utilised to disperse queues from the main bar. Bar snacks may be offered – such as garlic crostini, mozzarella bites, olives & bread sticks

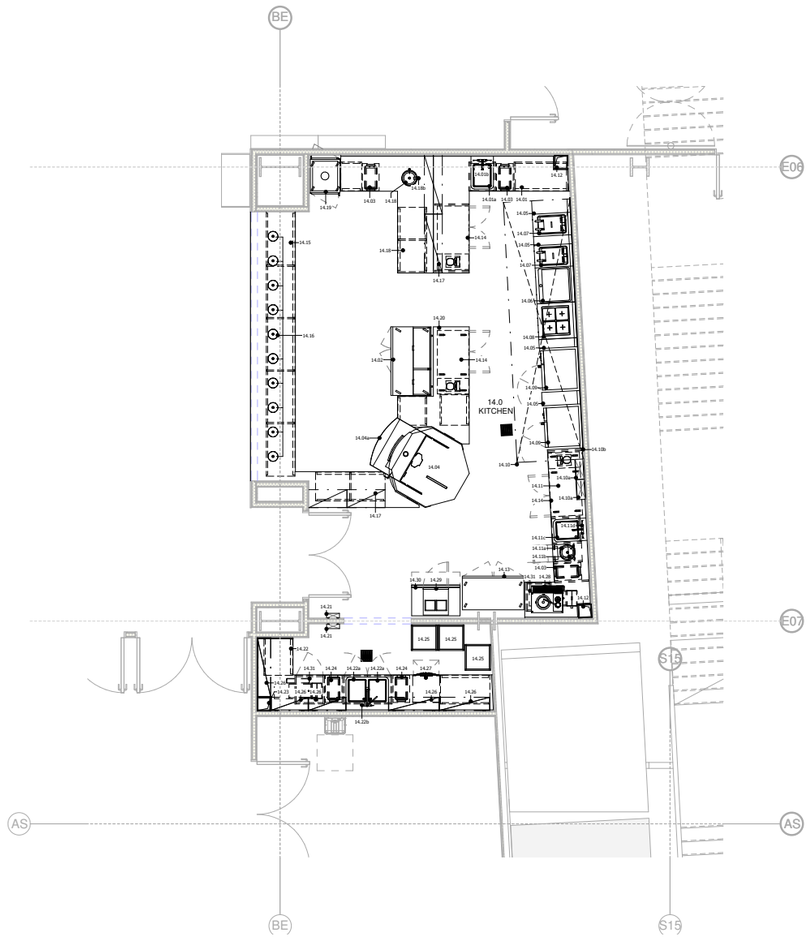
POS Count

POS Count = 12

General Arrangement

Plan 5.2E - Level 01 Backstage Club, Bar & Kitchen





LEVEL 02/04 PREMIUM AREAS

5.3.1 LEVEL 02/04 PREMIUM AREAS 610

5.3

5.3.1 Level 02/04 Premium Areas

5.3.1.1 General

The Level 02 premium offer has as an entry level of The Atrium Lounge with a series of loges and private suites also available as a progression of privacy. The feel will be vibrant and engaging with a diverse mix of offers creating an energetic environment and the place to be seen.

Customers utilising this space will have inclusive craft beers and wines as part of the package, along with small-plate mid-premium dishes. There will be the opportunity to upgrade beverages at the point of service for an additional charge.

Hangout North & Hangout South, each for 150 guests, have the potential to be sponsored spaces, subject to contract.

5.3.1.2 The Atrium Lounge (02)

Capacity

The Lounge has multiple zones and facilities spreading across the western and northern floorplate. In total, it is planned that the capacity for the Atrium Lounge will be around up to 680 across the various spaces. There is a mixture of standing, seating at tables and reserved private booths (to the west).

Support Facilities

The support for this area includes two feature bars with kitchens to the rear and passes adjacent. Additionally, there are two stand-alone bars; one is a dispense bar supporting the reserved booth seating (the Balcony Club) and the other is a volume bar. This may have a different identity, such as a cocktail bar.

The working methodology will be to utilise the commissary kitchen for preparation and the Lounge kitchens for final cooking/ assembly and service.

The features of each kitchen are:

- Receipt and storage of fresh and pre-prepared food in trolleys from the commissary.
- Cooking of fresh dishes via installed equipment. This includes a pizza oven. There is planned to be a full cooking range with frying, plancha and induction.
- Ware washing for dishes, service plates and cutlery will be done in the kitchens along with glassware.
- Temporary holding of service waste

The equipment in the North and West kitchens differs marginally, according to the menu offers. The North kitchen is larger and has a greater capacity.

Indicative Menu Offer

There will be a mix of enhanced and bookable seating spaces for a table-service option, along with multiple points for guests to order and collect food and beverages.

Reserved seating in the booths will receive a waited service. Other guests will order from app or at the bar, with the food being brought to where they are seated/ standing.

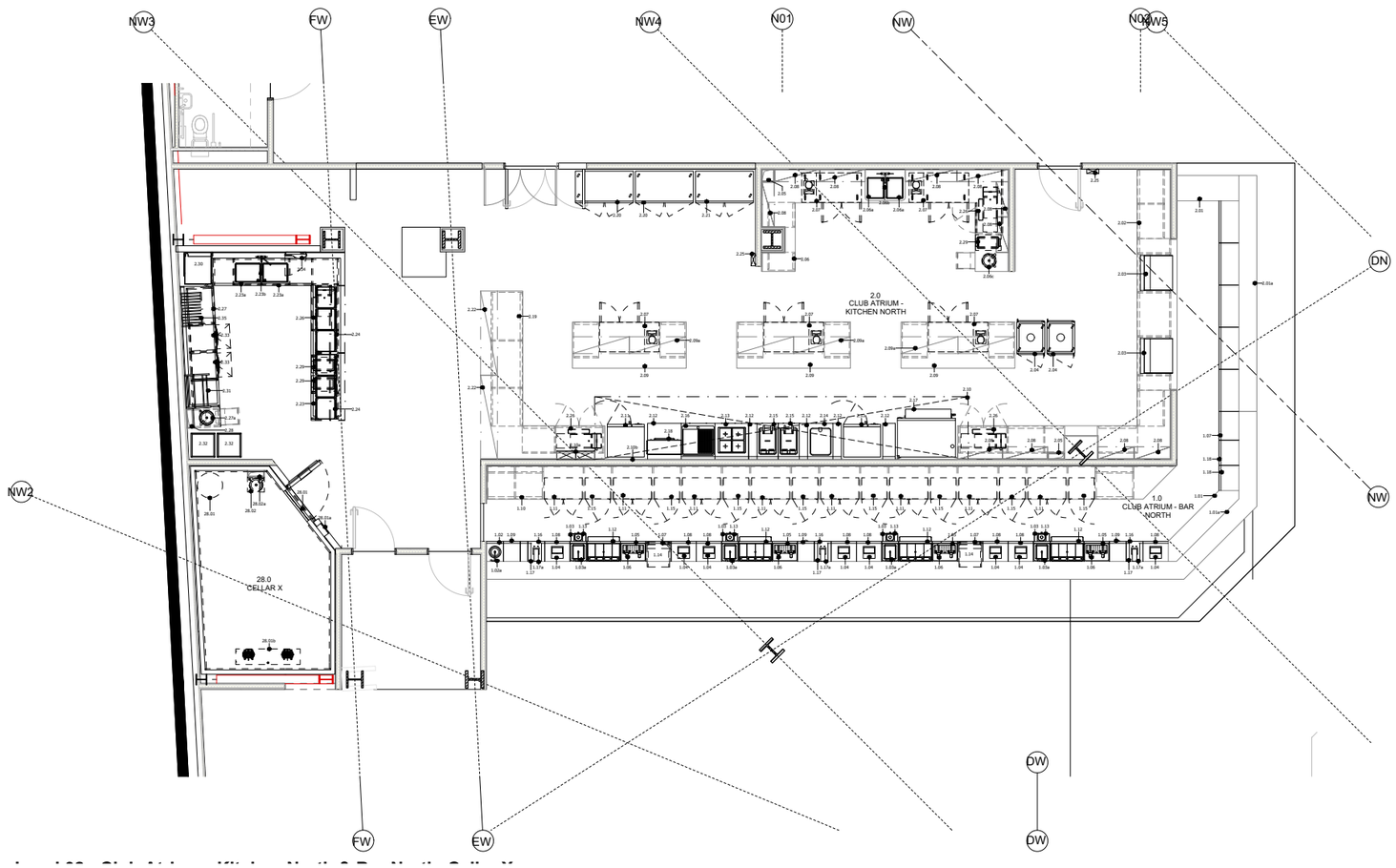
A simple menu framework is as follows:

- Draught craft beers, bottled beers, wines, draught cocktails, spirits & mixers
- Sharing deli platter starter or individual plated light dishes and small bowls.
- 3 or 4 main choices (incl. vegetarian & 1 light)
- Small dessert selection or cheese platter
- Coffee/Tea
- Fruit Juice, Soft Drinks and Water

General Arrangement

Plan 5.3A - Level 02 Atrium Lounge North Kitchen

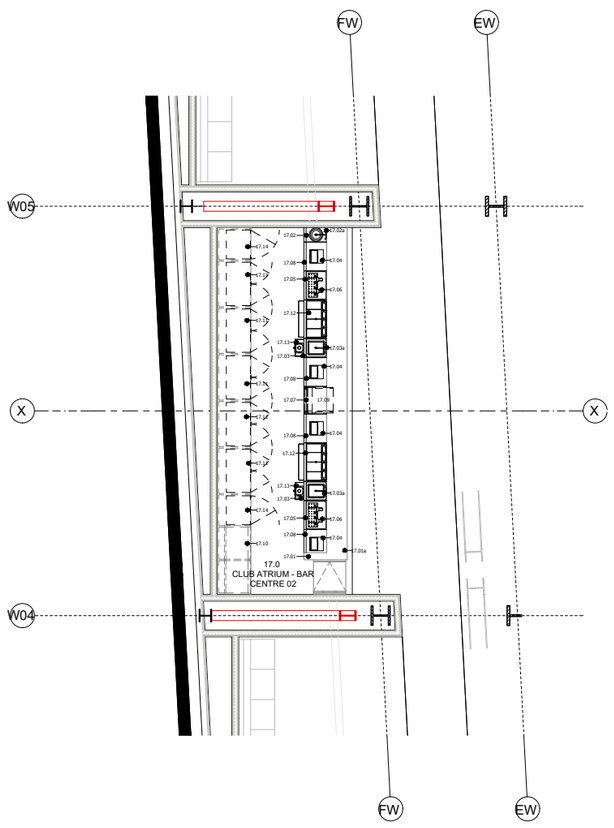
POS Count = 8



General Arrangement

Plan 5.3B - Level 02 Atrium Lounge Bars

POS Count = 4

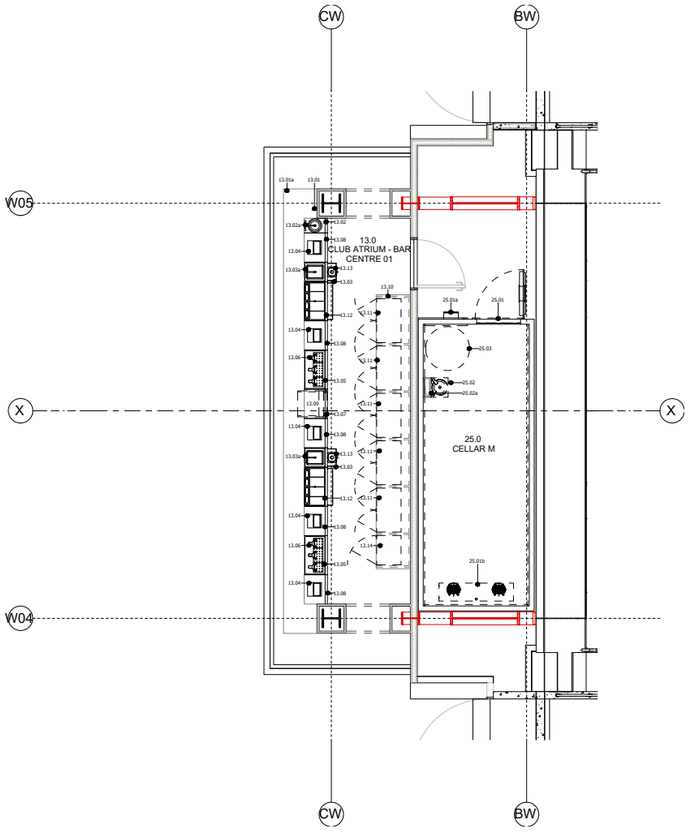


1 Level 02 - Club Atrium - Bar Centre 02
1 : 50

General Arrangement

Plan 5.3B - Level 02 Atrium Lounge Bars

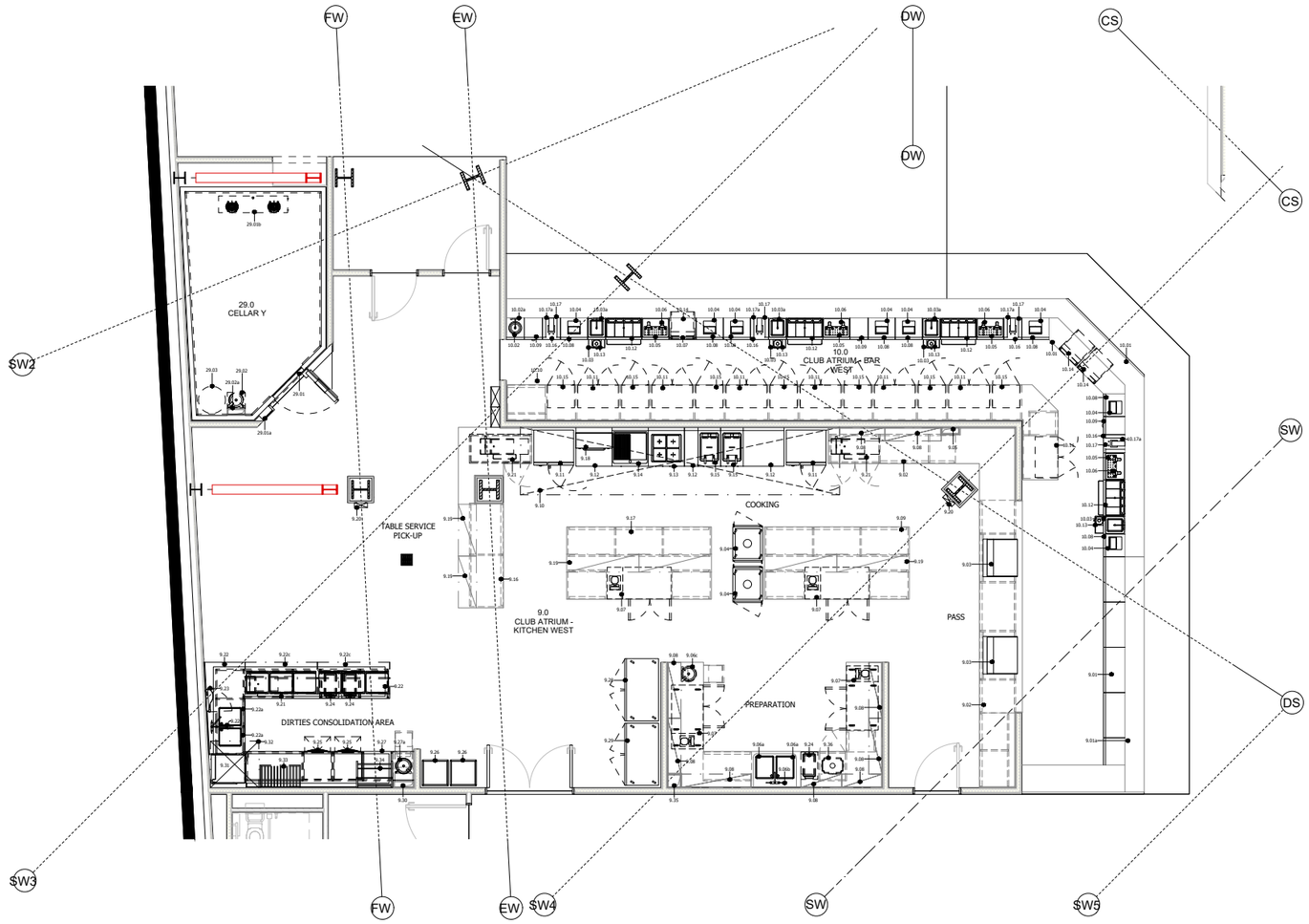
POS Count = 6



General Arrangement

Plan 5.3C - Level 02 Atrium Lounge West Kitchen

POS Count = 8



5.3.1.3 Loge North & Loge West (Level 02)

Capacity

Each Loge will have the capacity for 122 guests. The experience will provide intimate high-end networking and socialising through high-level service and an inclusive food and beverage offer. They offer a higher-level than the Loges South and East.

Support Facilities

Each Loge will be supported from the adjacent Loge kitchens or, if these are re-purposed to support the Atrium Lounge, from the same kitchen as the Boxes.

Indicative Menu Offer

The menu offer will revolve around buffet displayed bowl food for 'grazing'. Craft beer, wine and non-alcoholic beverages will be all-inclusive with customers able to trade up to cocktails, champagnes and fine wines if preferred.

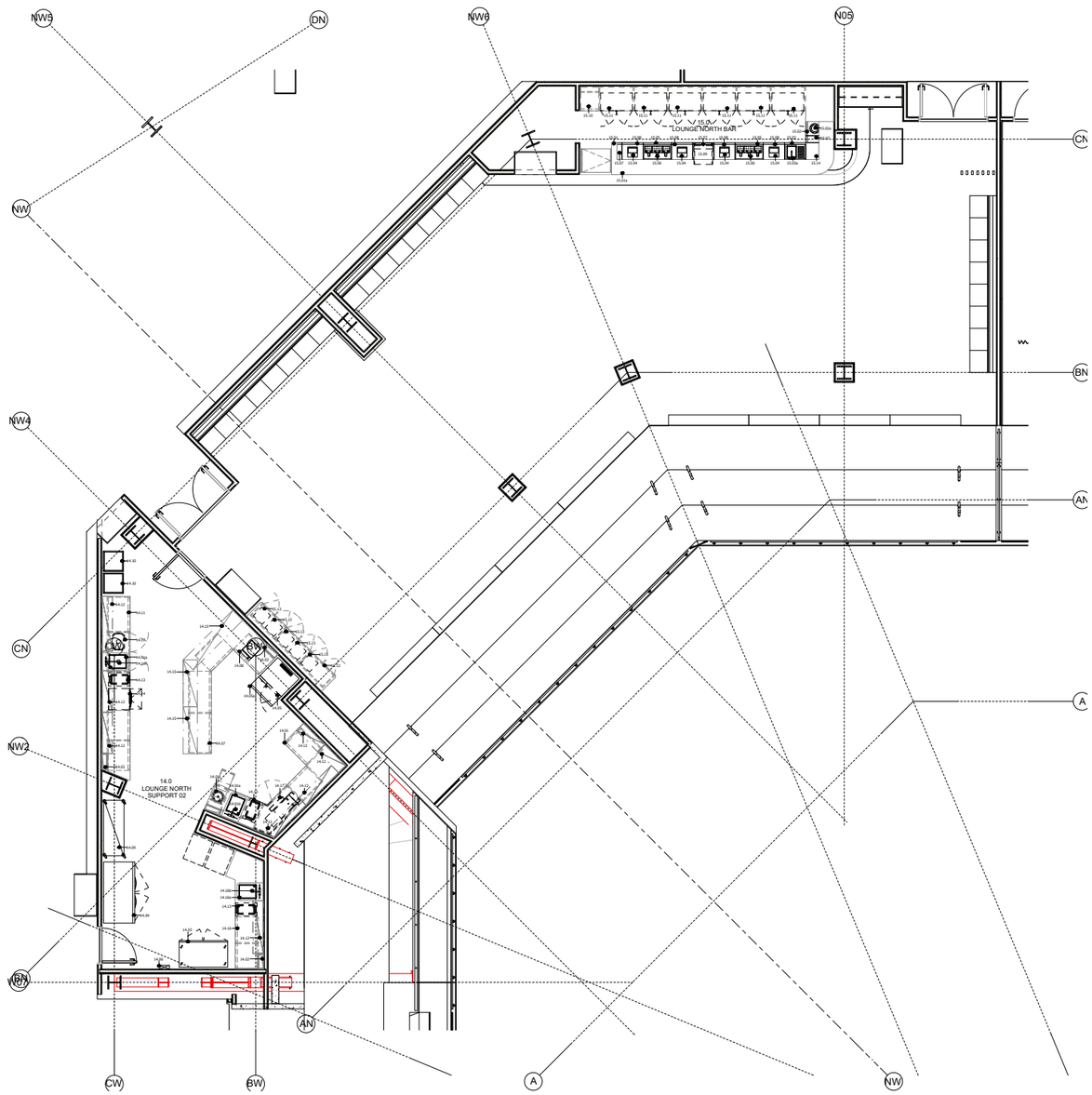
A simple menu framework is as follows:

- Draught beer, bottled and craft beers, wines, draught cocktails, spirits & mixers
- Buffet selection - choice of hot and cold (small bowl style)
- Coffee/Tea
- Fruit Juice, Soft Drinks and Water

General Arrangement

Plan 5.3D - Level 02 Loge North

POS Count = 4

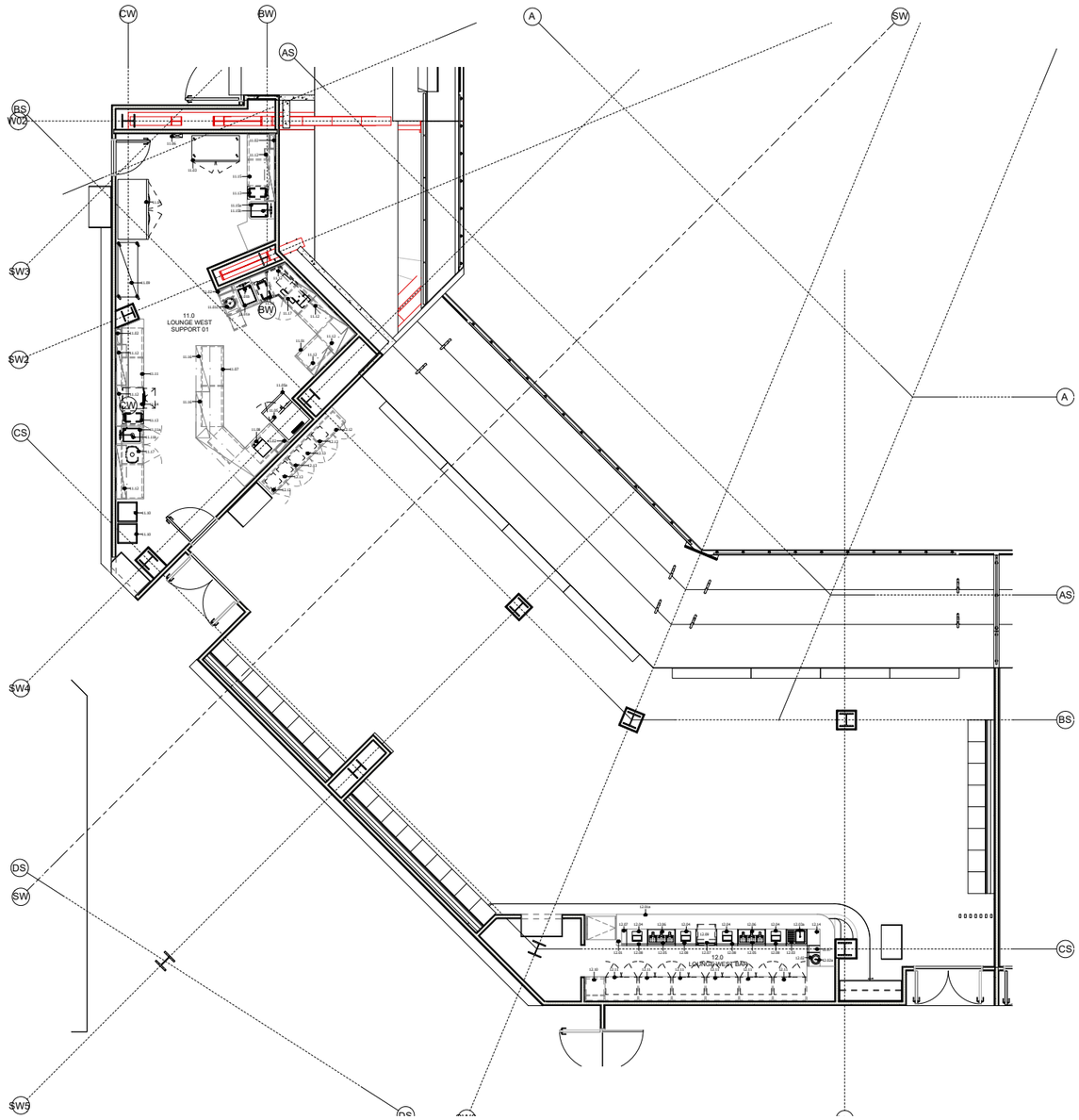


5.0 CATERING DESIGN

General Arrangement

Plan 5.3E - Level 02 Loge West

POS Count = 4



5.3.1.4 Loge East & Loge South (Level 02)

Capacity

Each Loge will have the capacity for 54 guests. The experience will reflect a suite style buffet service with an inclusive food and beverage offer. The offer will be at a slightly lower level than the Loges North and West.

Support Facilities

Each Loge has a support pantry and separate bar for the sole use of the loge. The working methodology is to use the commissary kitchen to supply to the Level 02 'Canteen Kitchen' both the mise en place and prepared menu items for finishing ready for service. Food will move to the Loge pantries in heated and chilled food carts ready for service. There is no cooking in the support pantry, simply the holding of foods, the collation of dirty ware and the service of hot beverages.

The areas will have no dedicated washing facilities, so all crockery, cutlery and service ware will be held in a consolidation area prior to being returned to the main dishwashing area as part of the Commissary Kitchen on Level 00.

Indicative Menu Offer

The menu offer will revolve around buffet displayed sharing plates and bowl food. Craft beer, wine and non-alcoholic beverages will be all-inclusive with customers able to trade up to cocktails, champagnes and fine wines if preferred.

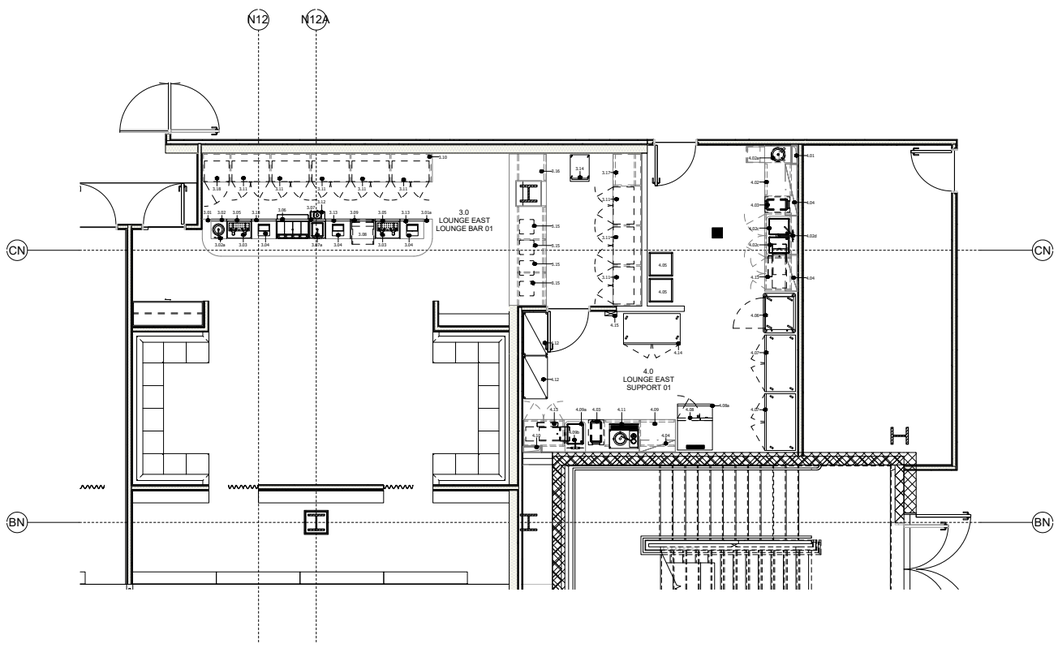
A simple menu framework is as follows:

- Bottled and craft beers, wines, draught cocktails, spirits & mixers
- Buffet selection - choice of hot and cold (small bowl style)
- Coffee/Tea
- Fruit Juice, Soft Drinks and Water

General Arrangement

Plan 5.3F - Level 02 Loge East

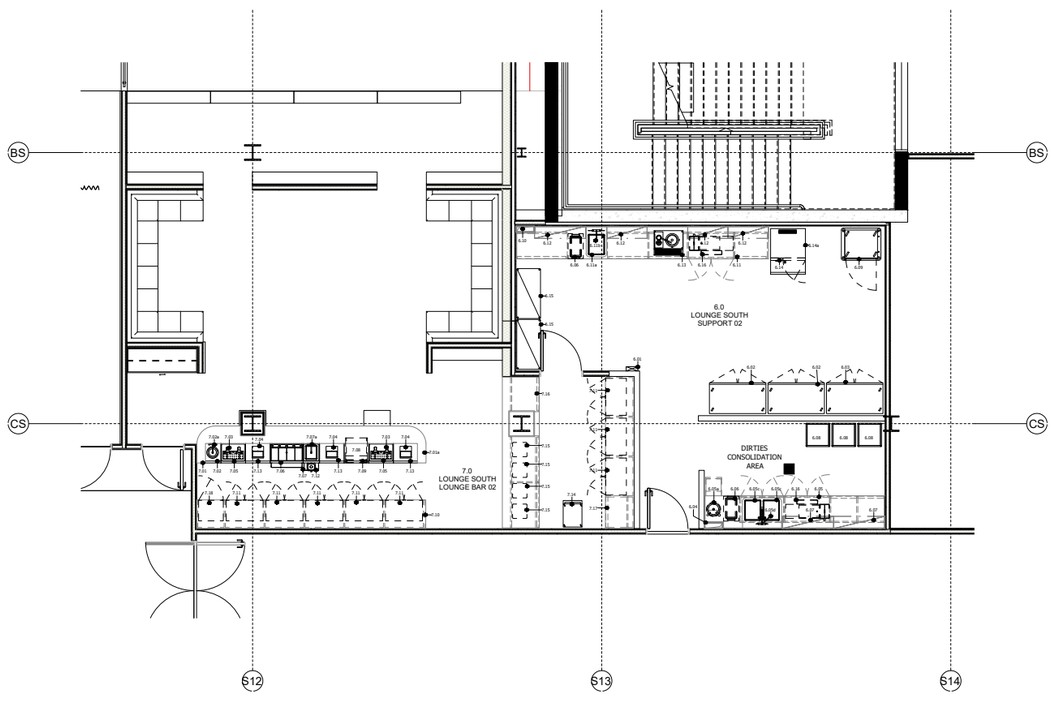
POS Count = 2



General Arrangement

Plan 5.3G - Level 02 Loge South

POS Count = 3



5.3.1.5 Boxes North & South (Level 02)

Capacity

The North and South Boxes represent a private and luxurious experience with the capacity for 248 guests in total including both sides.

Support Facilities

The proposed arrangement is for the Boxes to be supported by the Club Kitchen, which has been designed as a full finishing kitchen. This kitchen has cold room storage, dry storage and a full cooking and preparation space. The Club Kitchen receives both the mise en place and prepared menu items for finishing ready for service. Food will be distributed to the Boxes in heated and chilled food carts ready for service.

The functions of the Club Kitchen are:

- Receipt and storage of fresh foods or those prepared in the commissary in trolleys.
- Plating locally and holding plated.
- Regeneration and fresh cooking of dishes.
- Garnishing of all dishes.
- Placing of all dishes into the heated and chilled service trolleys ready for distribution.
- Temporary holding of service waste

Indicative Menu Offer

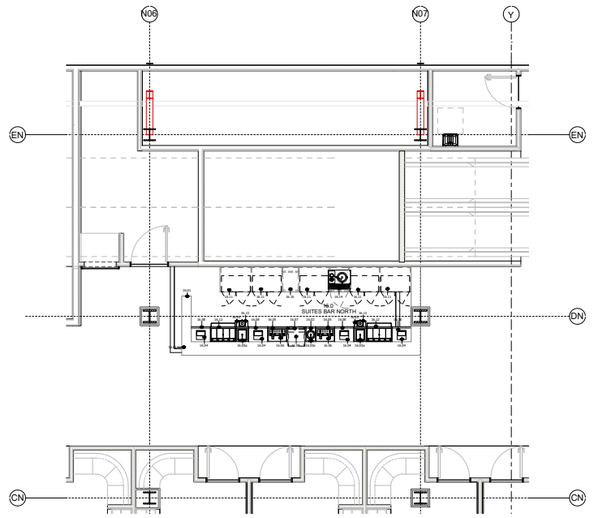
A range of curated menus utilising local and seasonal flavours. Food will be displayed on a counter in the box, with built-in hot holding via induction and refrigeration.

A refrigerator in each suite will offer a range of craft beers, wines and soft drinks. Any spirits will come from the Boxes Bar. Draught is not available within the suite; it will come from the Boxes Bar where draught is available.

General Arrangement

Plan 5.3H – Box Bar North

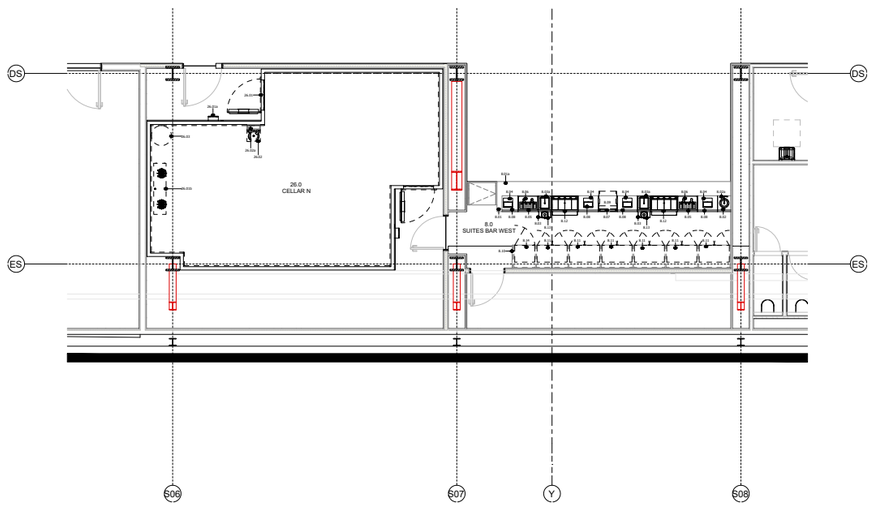
POS Count = 4



General Arrangement

Plan 5.3J – Box Bar South

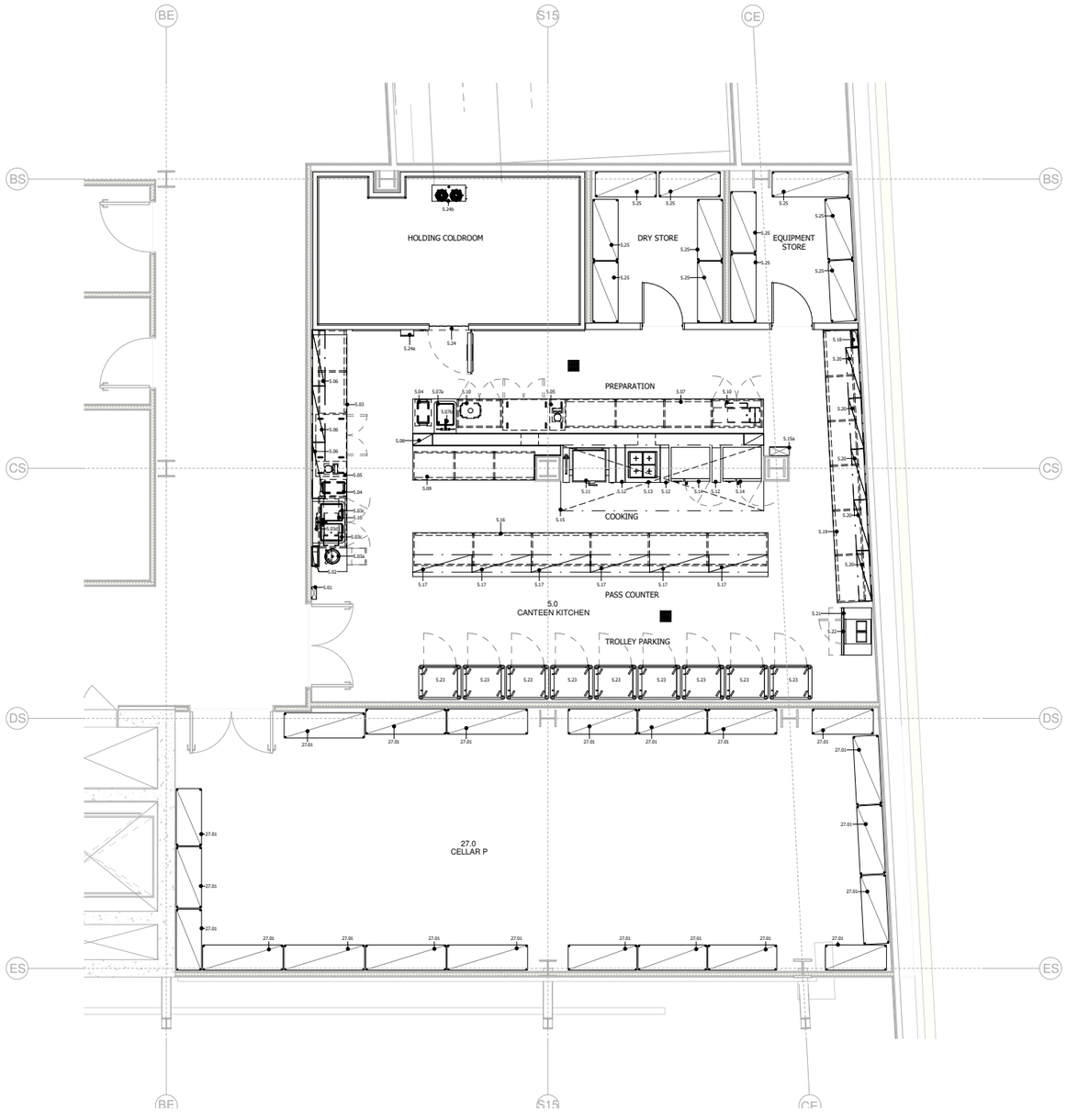
POS Count = 4



5.0 CATERING DESIGN

General Arrangement

Plan 5.3K – Club Kitchen



5.3.1.6 Hangout North (Level 04)

Capacity

The Hangout Bar experience is comparable to a premium GA area, but with an enhanced environment to the general concourse. The capacity of the space is 150 guests. It has the potential to be designated as a sponsor's area for the exclusive use of the sponsor's guests. The Hangout Bar is open to the seating bowl and internal venue space.

Support Facilities

The Bar will offer provide a similar experience to that in the Backstage Lounge in terms of foodservice, but on a smaller scale. The bar will be self-supporting with a small kitchen for the finishing of all foods.

The features of this kitchen are:

- Receipt and storage of pre-prepared food in trolleys from the commissary.
- Cooking of dishes using full cooking range with frying, griddle and induction hobs.
- Temporary holding of service waste
- Ware washing will be limited to glassware with dishes, bowls, service ware and cutlery being returned to the main dish wash at Level 00.

Additionally, a full-service bar will support a range of alcoholic and non-alcoholic drinks, along with facilities to prepare hot beverages. Draught beers, cider and draught cocktails will be available. The bar will have the following:

- Storage and dispense cold beverages.
- Ice making facilities.

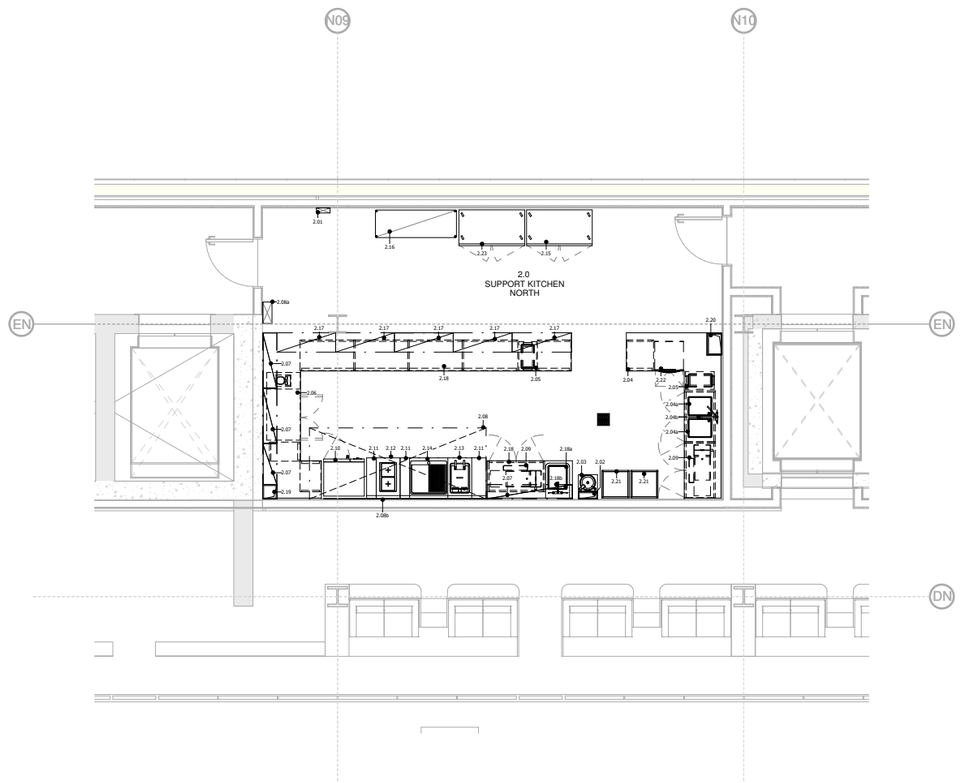
Indicative Menu Offer

The menu range will be premium hand-held foods capable of being eaten easily while standing.

General Arrangement

Plan 5.3L – Level 04 Hangout North

POS Count = 6



5.3.1.7 Hangout South (Level 04)

Capacity

The Hangout Bar experience is comparable to a premium GA area, but with an enhanced environment to the general concourse. The capacity of the space is 150 guests. It has the potential to be designated as a sponsored area for the exclusive use of the sponsor's guests.

Support Facilities

The Bar will offer provide a similar experience to that in the Backstage Lounge in terms of foodservice, but on a smaller scale. The bar will be self-supporting with a small kitchen for the finishing of all foods.

The features of this kitchen are:

- Receipt and storage of pre-prepared food in trolleys from the commissary.
- Cooking of dishes using full cooking range with frying, griddle and induction hobs.
- Temporary holding of service waste
- Ware washing will be limited to glassware with dishes, bowls, service ware and cutlery being returned to the main dish wash at Level 00.

Additionally, a full-service bar will support a range of alcoholic and non-alcoholic drinks, along with facilities to prepare hot beverages. Draught beers, cider and draught cocktails will be available. The bar will have the following:

- Storage and dispense cold beverages.
- Ice making facilities.

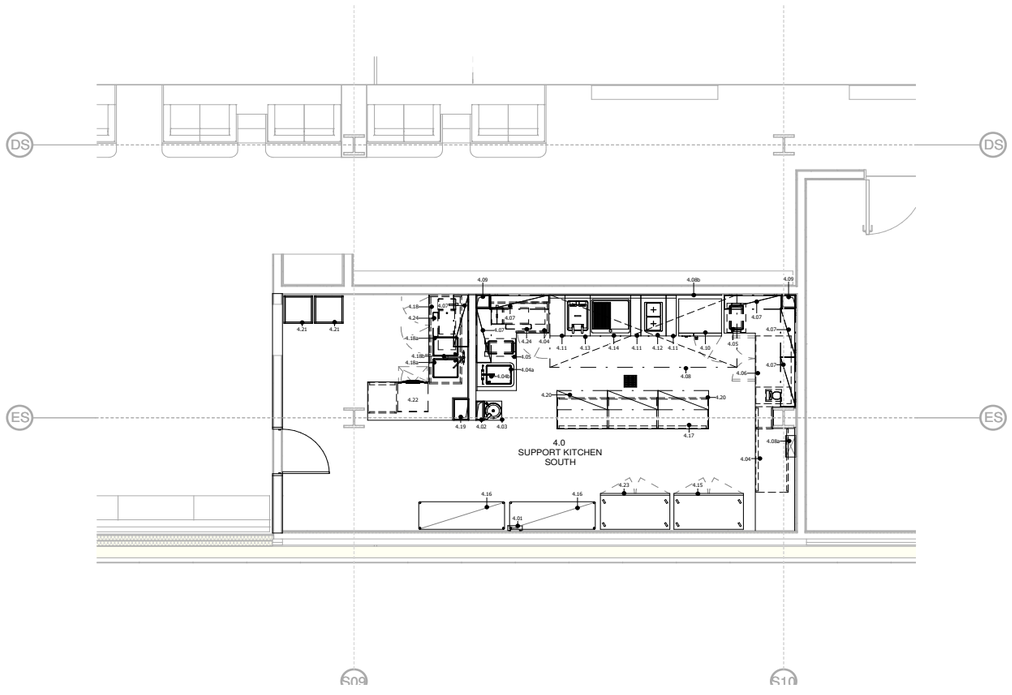
Indicative Menu Offer

The menu range will be premium hand-held foods capable of being eaten easily while standing.

General Arrangement

Plan 5.3M – Level 04 Hangout South

POS Count = 6



LEVEL 00 BASE ATRIUM

5.4.1 LEVEL 00 BASE ATRIUM 624

5.4

5.4.1 Level 00 Base Atrium

5.4.1.1 General

The GA spaces provide a variety of interactive and interesting spaces to encourage dwell, spend and ensure all event attendees have the ability for their food and beverage requirements to be met efficiently.

A summary of all GA offers and locations has been provided in earlier sections, but this section provides some additional details on the levels and operations of service

5.4.1.2 Long Bar

Offer

The feature bar built for large numbers and serving a range of draught beers, cans and bottles, draught cocktails, wines and spirits as well as soft drinks and packaged snacks. There will be no fresh food offer. As well as serving high volumes, it is a major feature of the space.

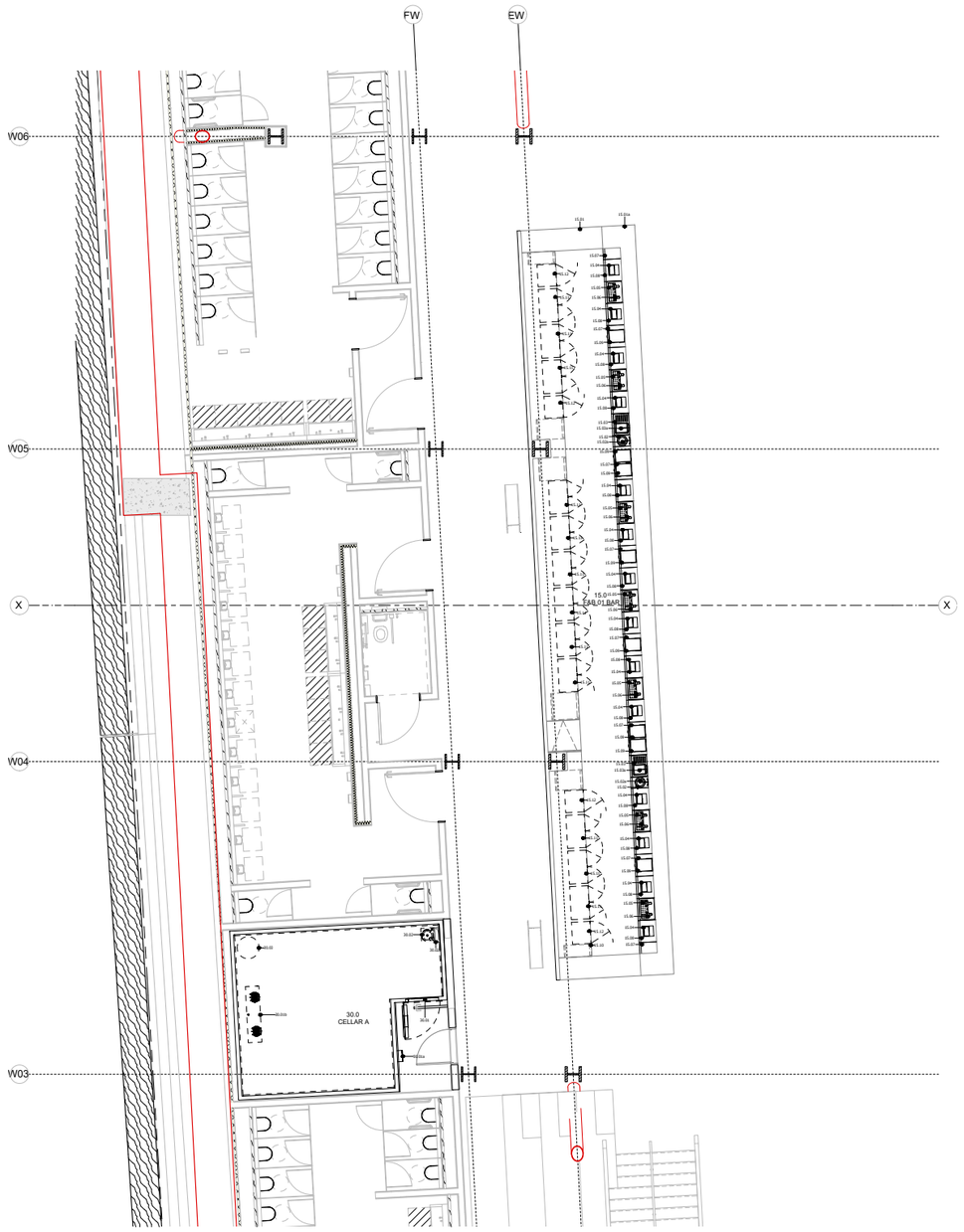
Support Facilities

The bar will have 7 sets of shared taps and 16 EPOS stations and will have local cellar storage for draughts.

Undercounter refrigerators will be loaded to meet the demand for bottles and cans.

General Arrangement

Plan 5.4A - Level 00 Long Bar



5.4.1.3 Volume Bars

A slightly enhanced service to the Main Bar with a reduced range of draught craft beers, supplemented with draught cocktails, wines, spirits and soft drinks.

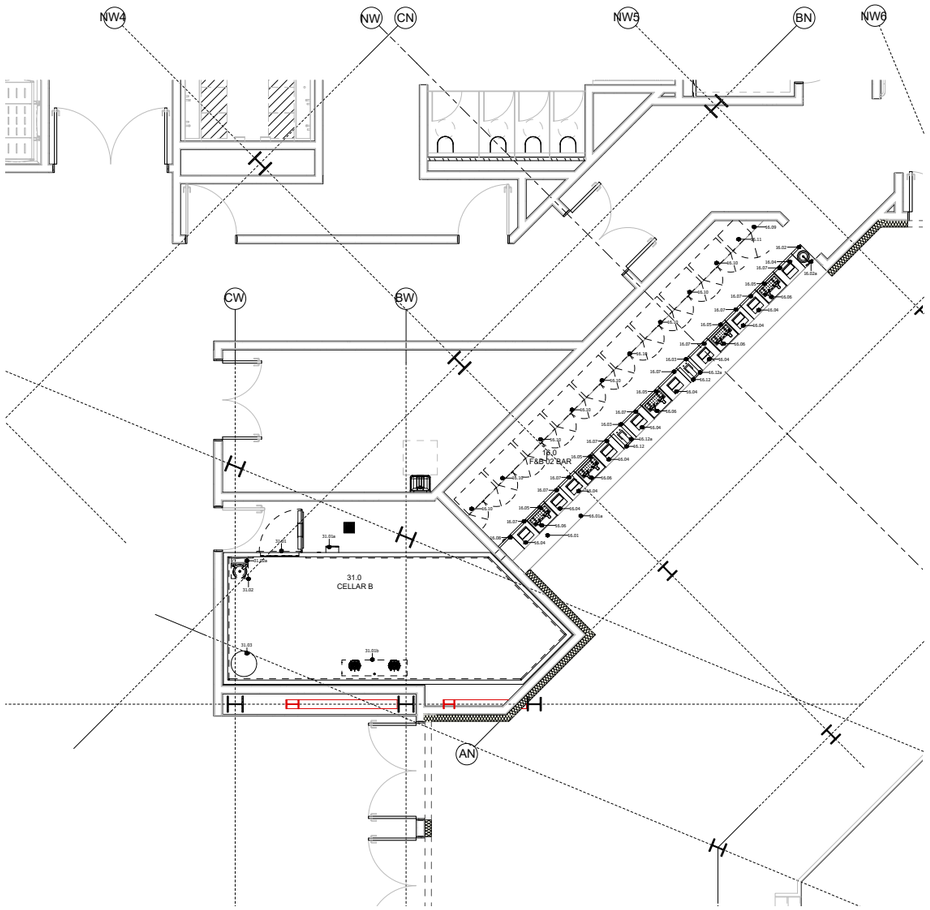
The volume bars will have no fresh food offer, but packaged bar snacks will be available.

Support Facilities

Simple support from adjacent stores, but reliant on in-unit refrigerated and ambient storage and a combination of local and central cellar facilities.

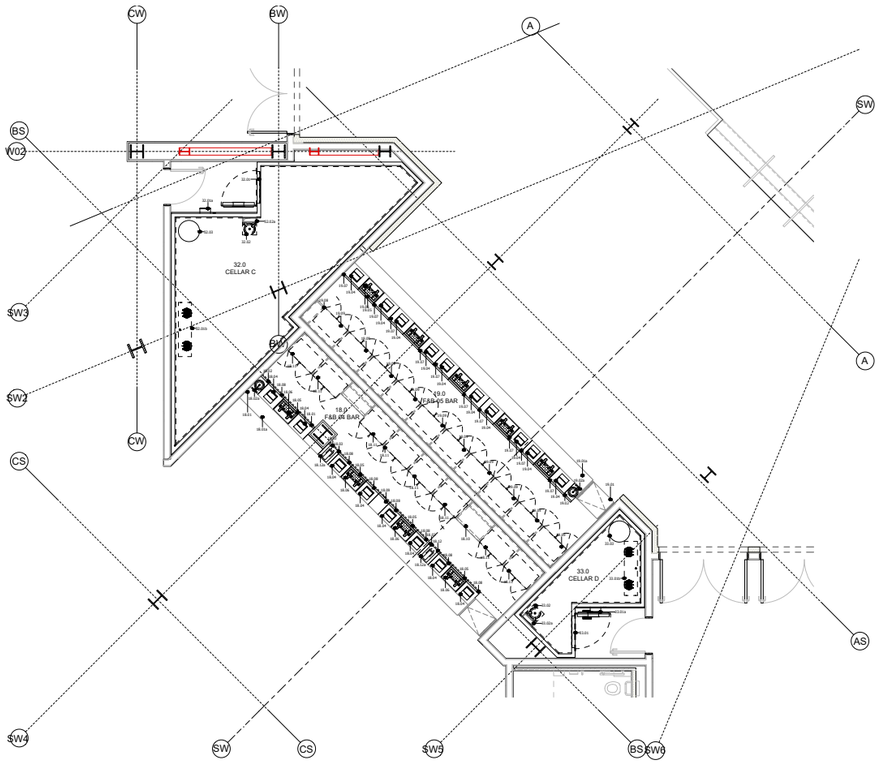
General Arrangement

Plan 5.4B - Level 00 Volume Bar serving the Auditorium Floor



General Arrangement

Plan 5.4C - Level 00 Volume Bar serving the Auditorium Floor and Base Atrium



5.4.1.4 Feature Market (Grab & Go)

Offer

A facility to create interest and allow both hot and cold food and beverages to be purchased. There will be two (or more) live cooking stations providing fresh hand-held snacks such as burgers, chicken wraps etc. as well as more traditional pies and other hot snacks. The stations will be equipped to give menu flexibility between events and throughout the year.

Beverages will include packaged beers and soft drinks. Some feature markets on other levels will offer draught beer.

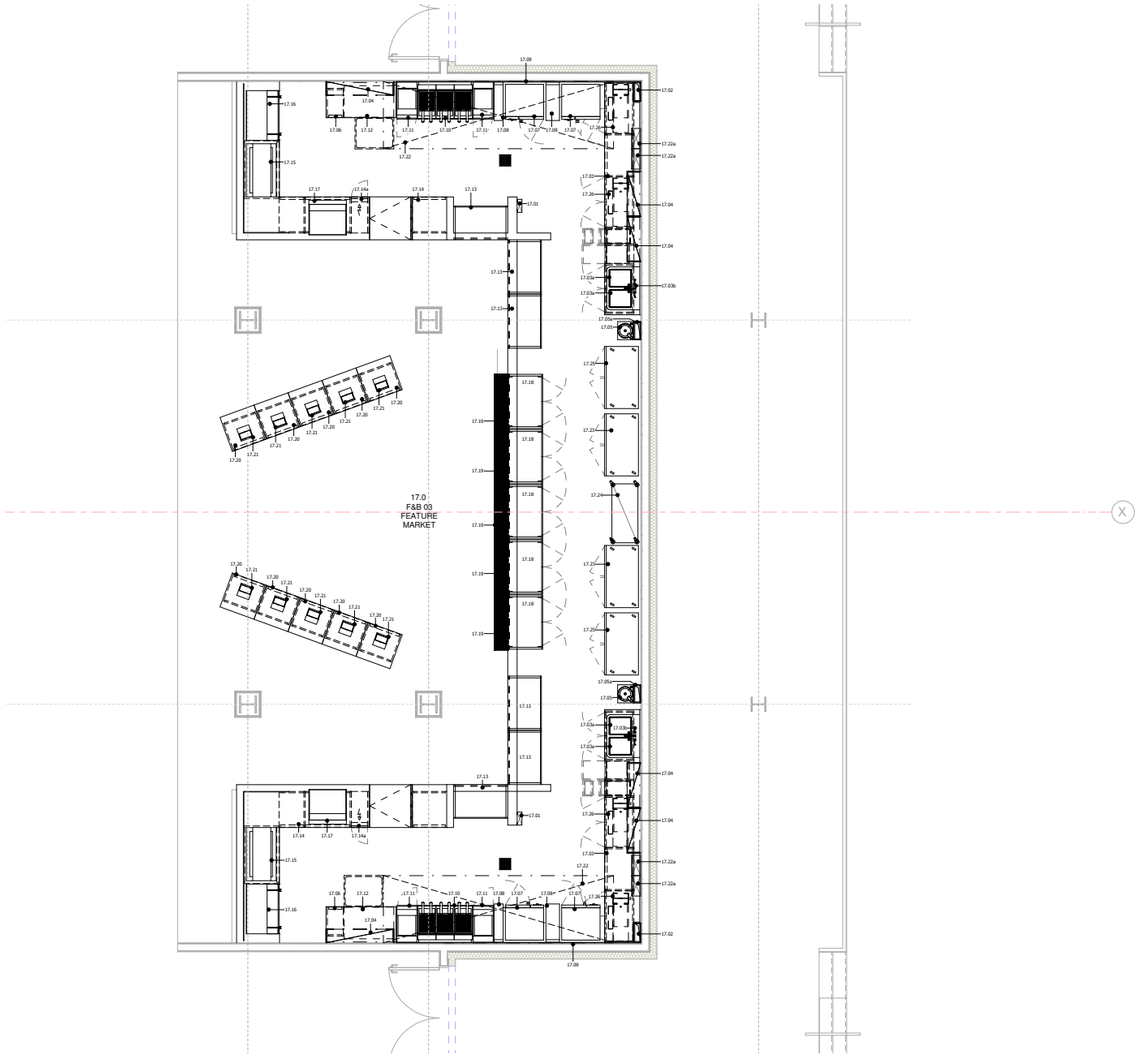
Support Facilities

All foods are initially prepared in the commissary kitchen and then pre-loaded into each Feature Market support space prior to service. There is an element of cooked fresh for show as well as amalgamation from ingredients prepped elsewhere. The Feature Markets are supported then during service from the local support, rather than being replenished from the central commissary.

In terms of equipment this unit can fry, griddle and utilise a feature 'theatre' cooking station.

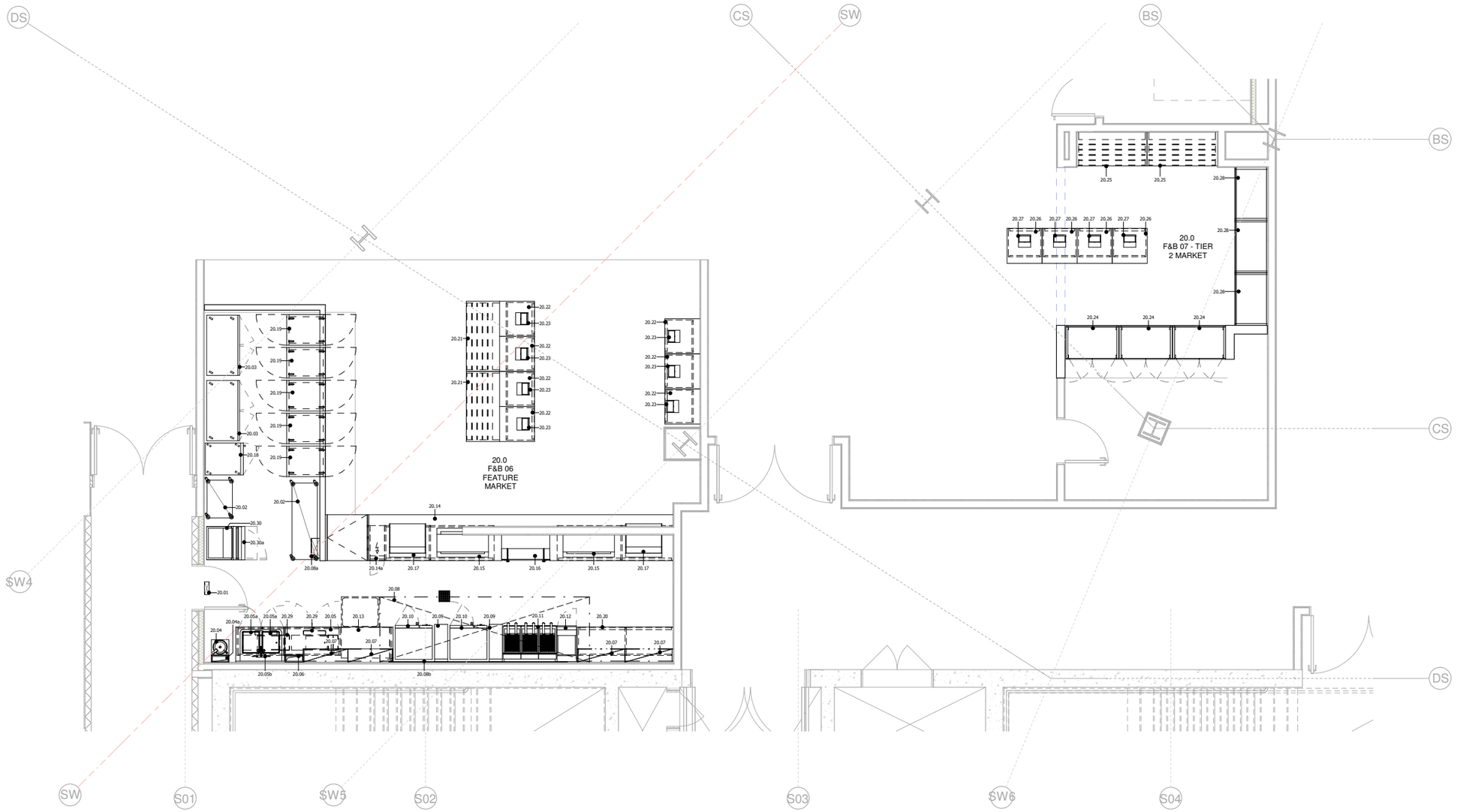
General Arrangement

Plan 5.4D - Level 00 Feature Market



General Arrangement

Plan 5.4E - Level 00 Feature and Tier 2 Markets



5.4.1.5 Tier 2 Market

Offer

The Tier 2 Market will be a high-volume grab and go offer for simple food and beverage requirements with a minimum of queuing.

The range will revolve around hot snacks (pies), packaged beers, soft drinks, single serve wines, and wrapped snacks. As opposed to the Feature Market, it does not have the live cooking stations.

Support Facilities

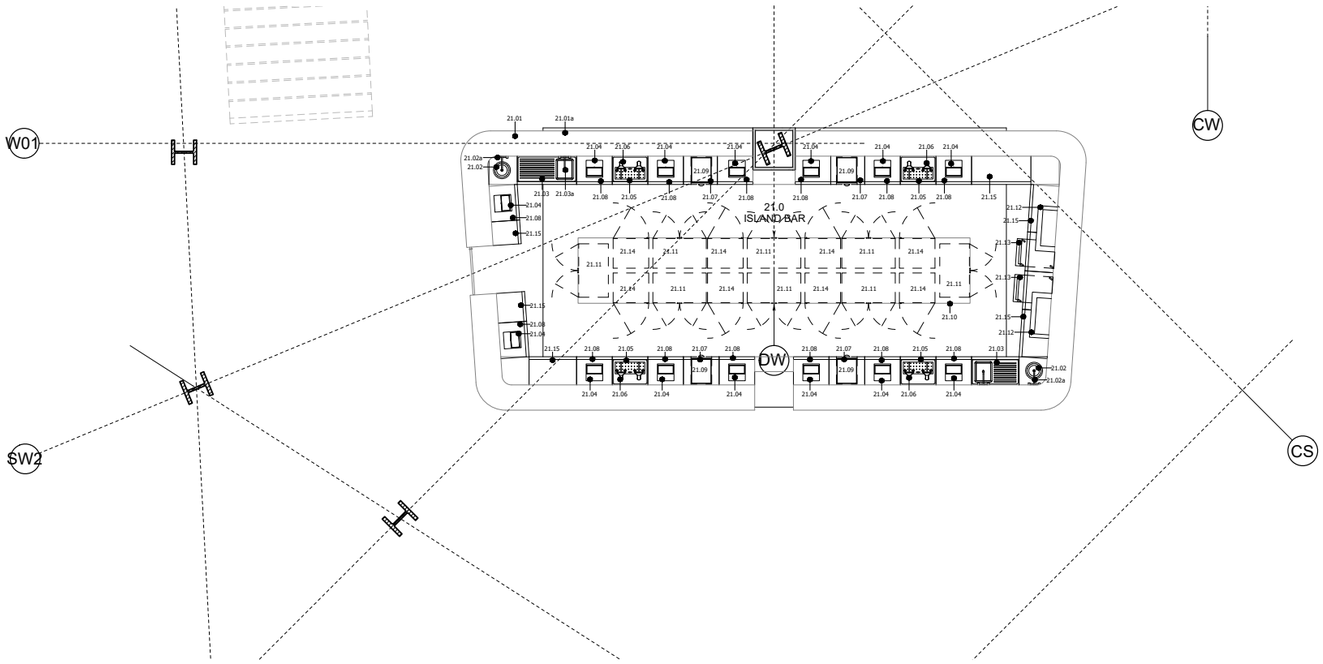
There is dedicated support space, with all units being loaded prior to the event and replenished when needed from the commissary.

5.4.1.6 Summary of Offers

UNIT	TYPE	EPOS	DRAUGHT TAPS
F&B01	Volume Bar	16	Yes
F&B02	Volume Bar	10	Yes
F&B03	Feature Market	10	No
F&B04	Volume Bar	8	Yes
F&B05	Volume Bar	10	Yes
F&B06/07	Feature Market & Tier 2 Market	12	No
F&B09	Island Bar	10	Yes

General Arrangement

Plan 5.4F – Level 00 Island Bar



LEVEL 01 DECK CONCOURSE

5.5.1 LEVEL 01 DECK CONCOURSE 632

5.5

5.5.1 Level 01 Deck Concourse

5.5.1.1 General

The Level 01 GA areas provide a mix of four food-based concessions and four bars. These are a mixture of Volume Bars, Feature Markets, Tier 2 Markets and Belly Up units as described for Level 00. Refer to Table 5.5.

5.5.1.2 'Belly-Up' Food Unit

Offer

The Belly-Up is a generic term for individually themed and traditionally styled food and beverage concessions that offer a more focussed range than a Feature Market or Tier 2 unit. Whereas in either of these units the customers self-select then pay on exit, in the Belly-Up unit the customer orders, is served and pays at the counter as in a traditional style concession.

The customer will be able to purchase a limited range of draught beer, packaged beers, soft drinks and wrapped snacks. There will be a hand-held hot snack, such as Indian or burgers/ chicken in each unit to give an identity to the offer.

All service will be in reusables or, as far as possible, in compostable packaging.

Support Facilities

Due to the larger fresh food offer, these concessions will have a supporting kitchen zone with limited stores.

The features of this kitchen are:

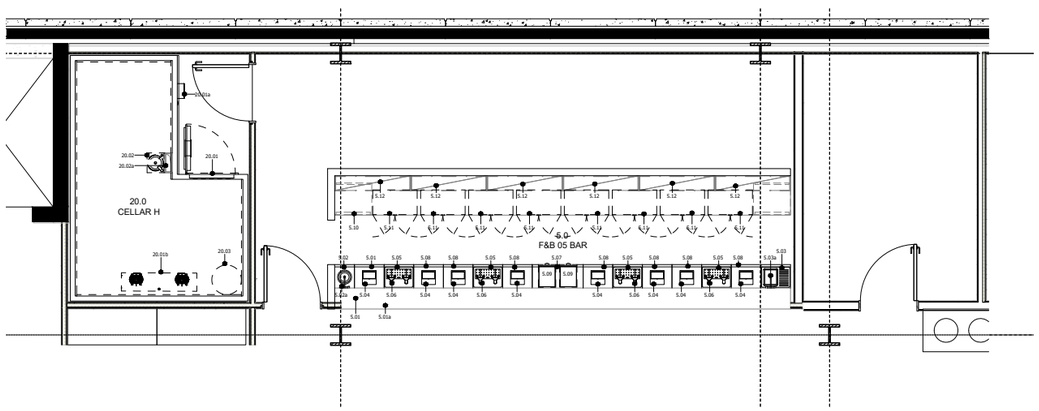
- Receipt and storage of some fresh and some pre-prepared food in trolleys from the commissary.
- Cooking of fresh dishes using full cooking range with frying, griddle and induction hobs as appropriate to the individual offers.
- Temporary holding of service waste

5.5.1.3 Summary of Offers

UNIT	TYPE	EPOS	DRAUGHT TAPS
F&B01	Bar	8	Yes
F&B02	Feature Belly-Up	6	Yes
F&B04	Feature Belly-Up	6	Yes
F&B05	Bar	8	Yes
F&B06	Tier 2 Market	6	No
F&B07	Bar	6	Yes
F&B08	Tier 3 Market	8	No
F&B10	Bar	12	Yes

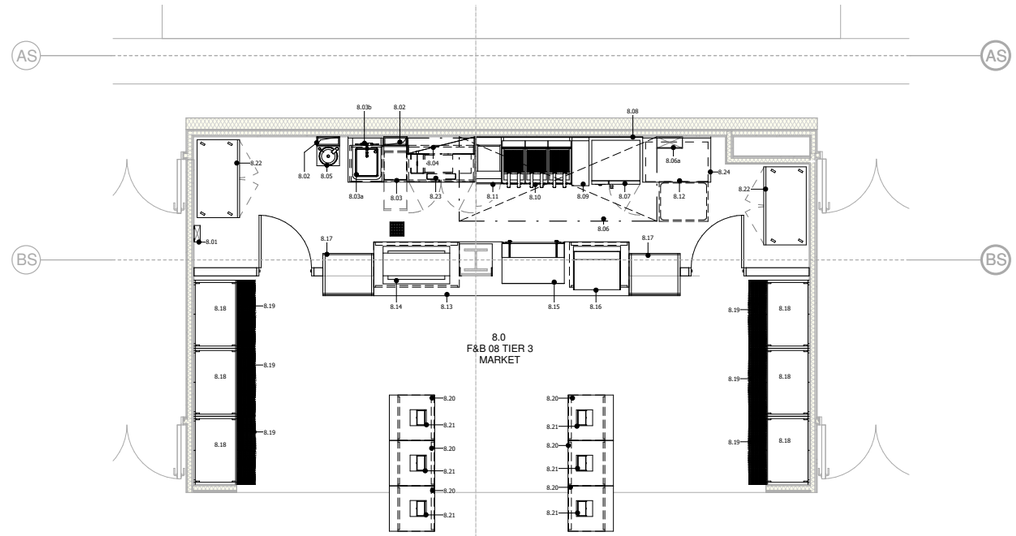
General Arrangement

5.5D - Level 01 Volume Bar, F&B 05



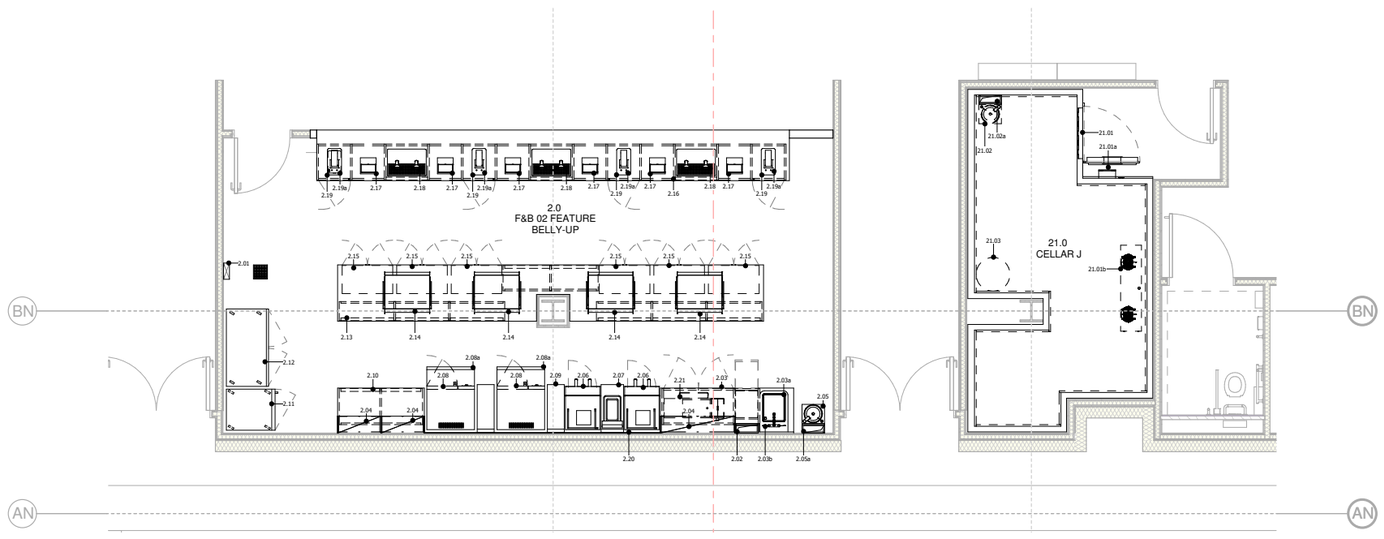
General Arrangement

5.5A - Level 01 Deck Concourse



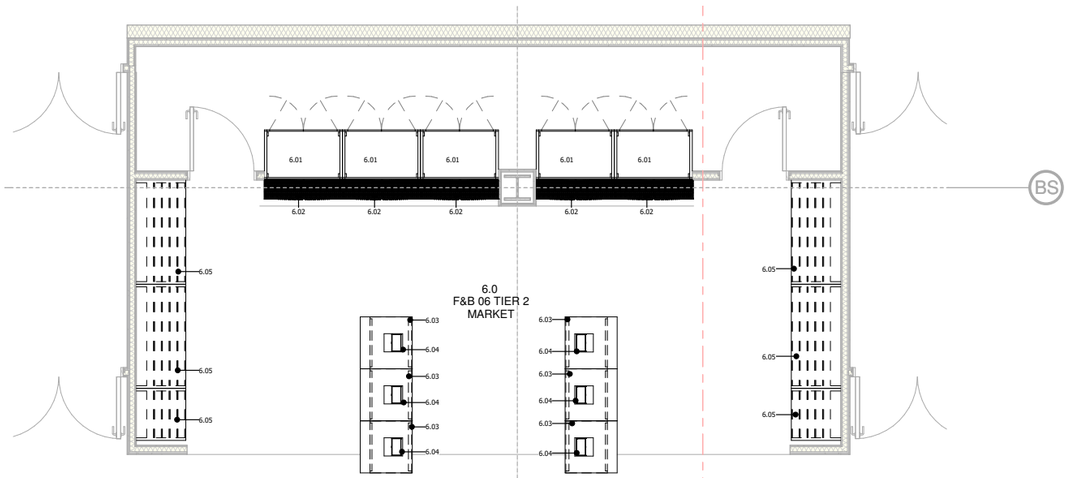
General Arrangement

5.5B - Level 01 Level 01 Deck Concourse



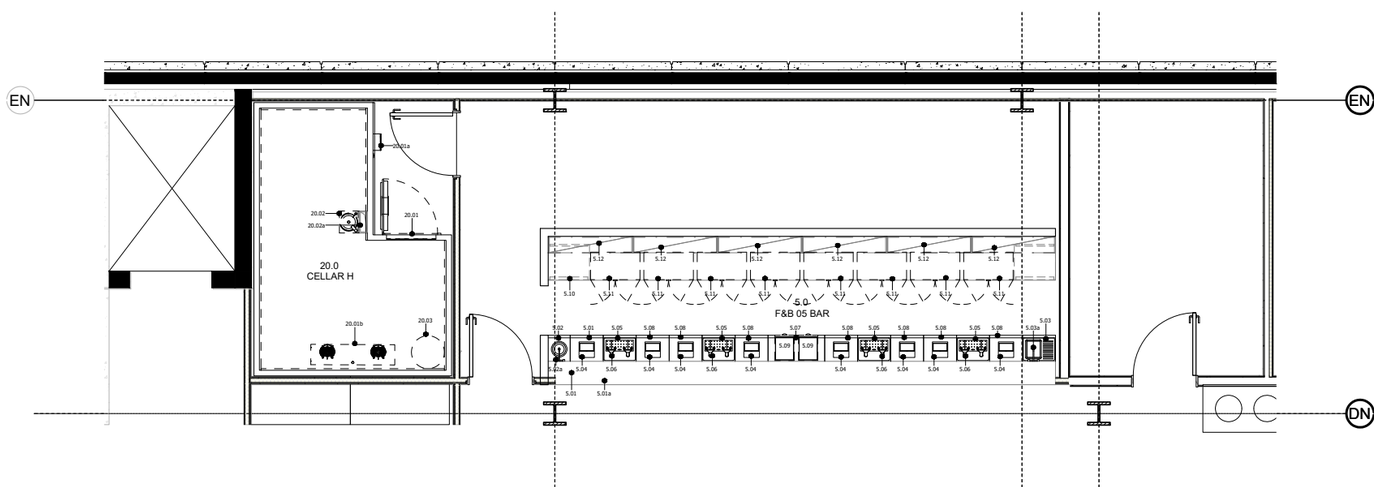
General Arrangement

5.5C - Level 01 Deck Concourse



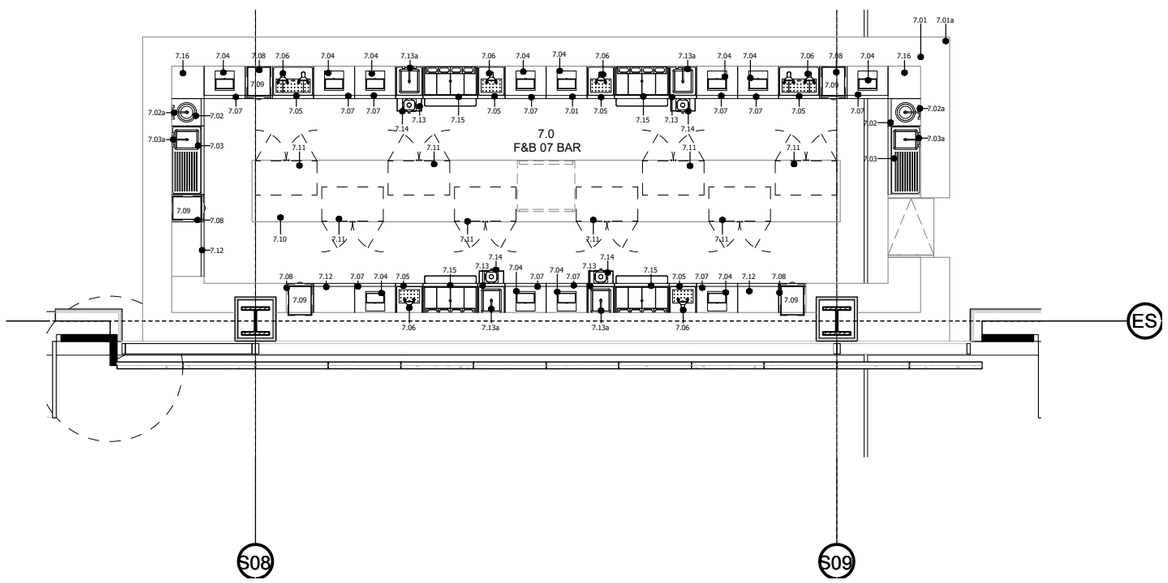
General Arrangement

5.5D - Level 01 Deck Concourse



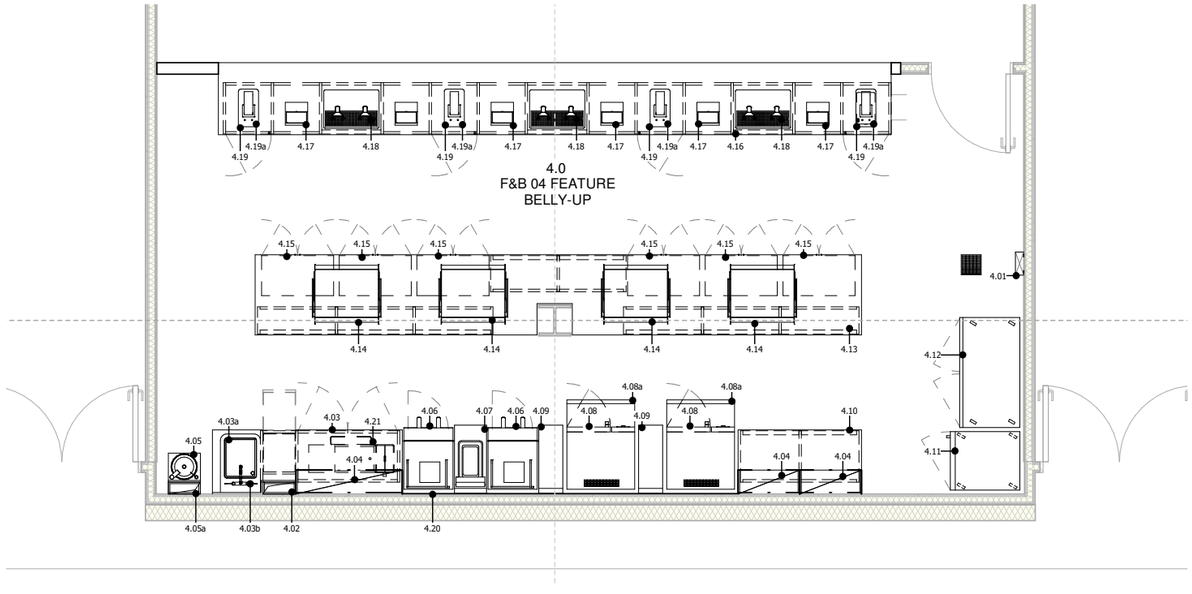
General Arrangement

5.5E - Level 01 Deck Concourse



General Arrangement

5.5F - Level 01 Deck Concourse



LEVEL 03 LOFT CONCOURSE

5.6.1 LEVEL 03 LOFT CONCOURSE 638

5.6

5.6.1 Level 03 Loft Concourse

5.6.1.1 General

The Level 03 GA areas provide the largest choice in volume within the Arena, numbering nine food-based concessions and seven bars. These are a mixture of Volume Bars, Feature Markets, Tier 2 Markets and Belly UP units as described for Level 00. Refer to Table 5.6.

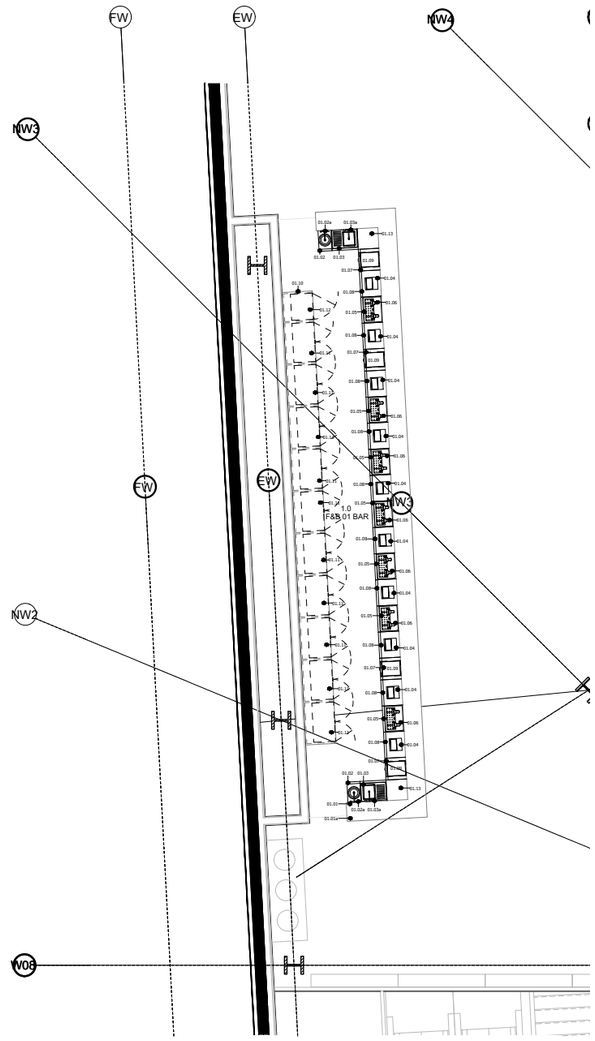
5.6.1.2 Summary of Offers

UNIT	TYPE	EPOS	DRAUGHT TAPS
F&B01	Volume Bar	10	Yes
F&B02	Tier 2 Market	4	No
F&B03	Belly Up	6	Yes
F&B06	Bar	12	Yes
F&B07	Feature Market	10	No
F&B09	Bar	12	Yes
F&B11	Bar	10	Yes
F&B13	Feature Market	12	No
F&B15	Bar	8	Yes
F&B16	Belly Up	6	Yes
F&B17	Tier 2 Market	4	No
F&B18	Volume Bar	16	Yes

5.6.1.3 General Arrangement

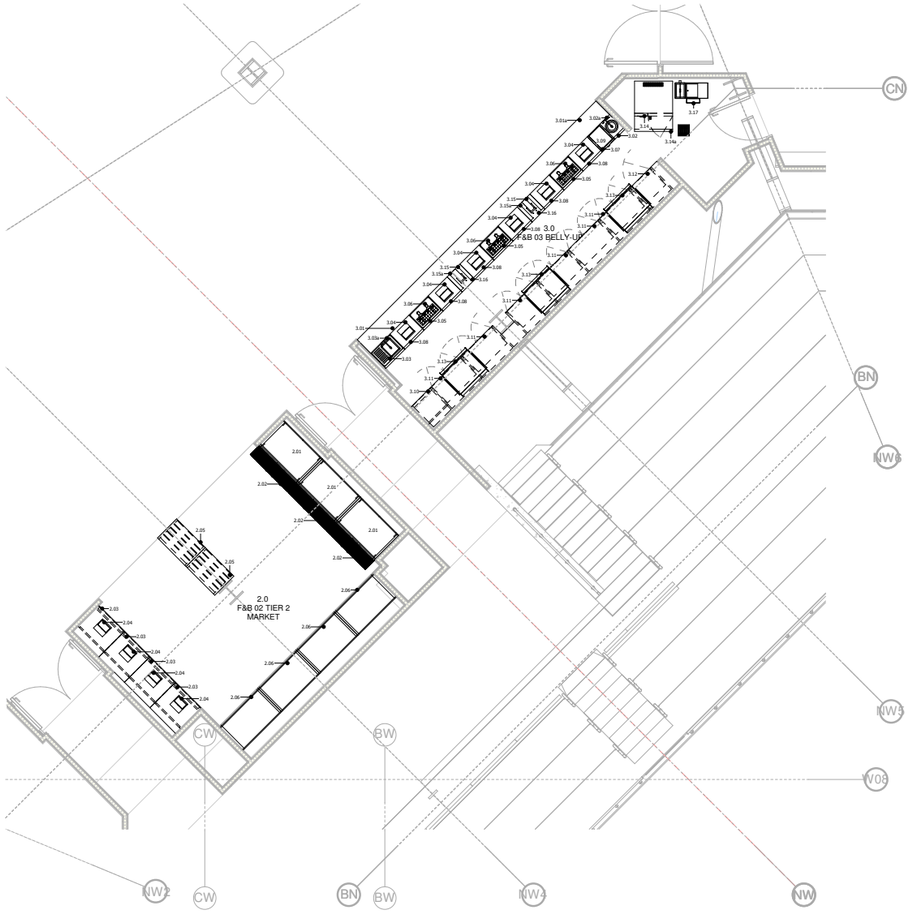
General Arrangement

5.6A - Level 03 Volume Bar, F&B 01



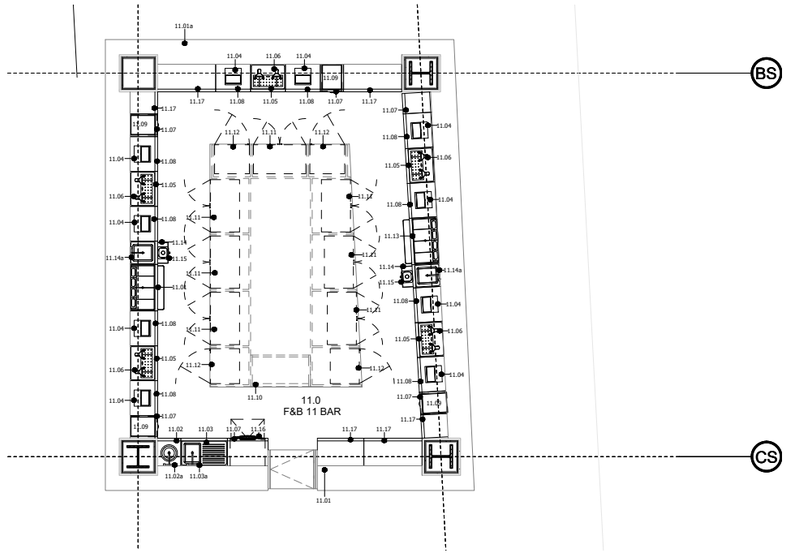
General Arrangement

5.6B - Level 03 Tier 2 Market, F&B 02, and Belly-Up, F&B 03



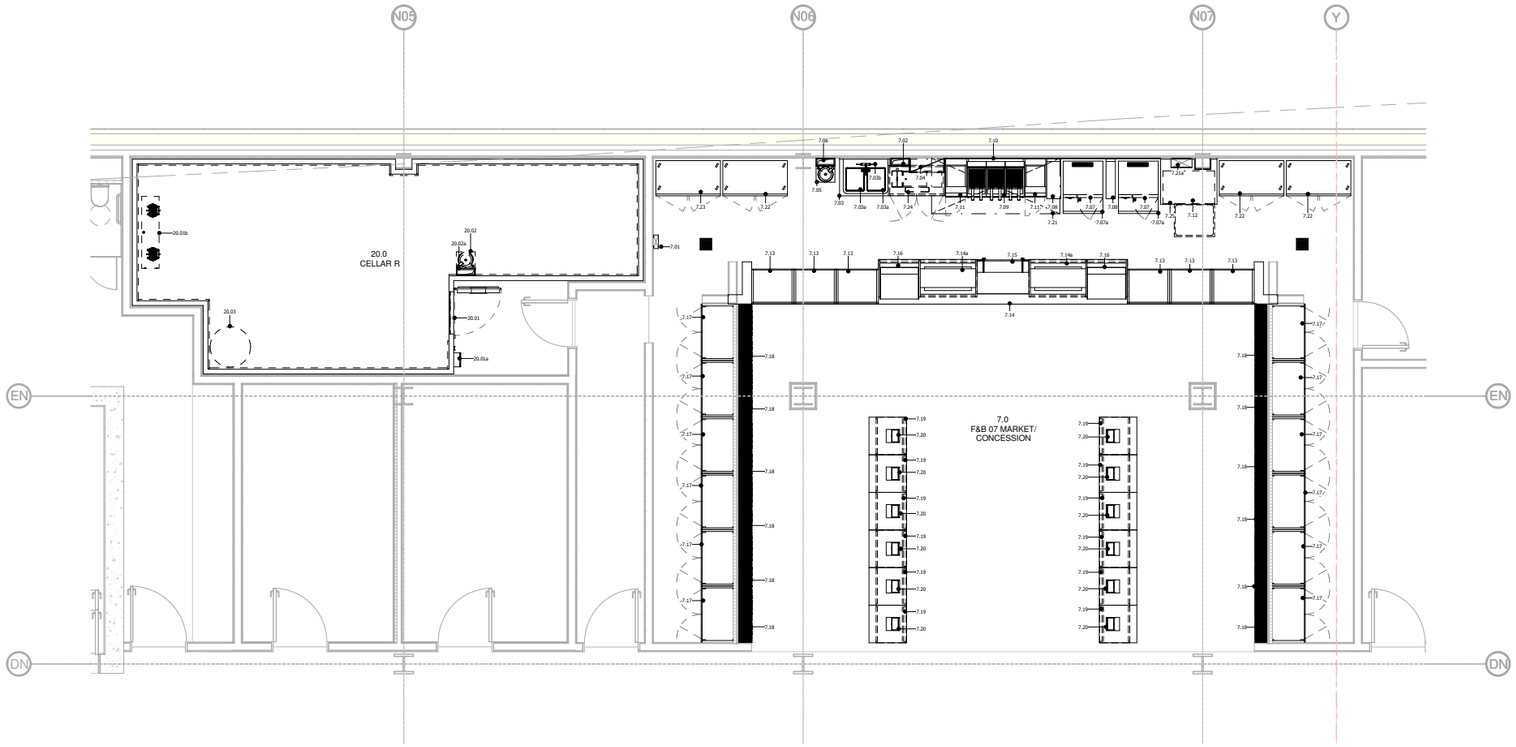
General Arrangement

5.6C - Level 03 Island Bar, F&B 11



General Arrangement

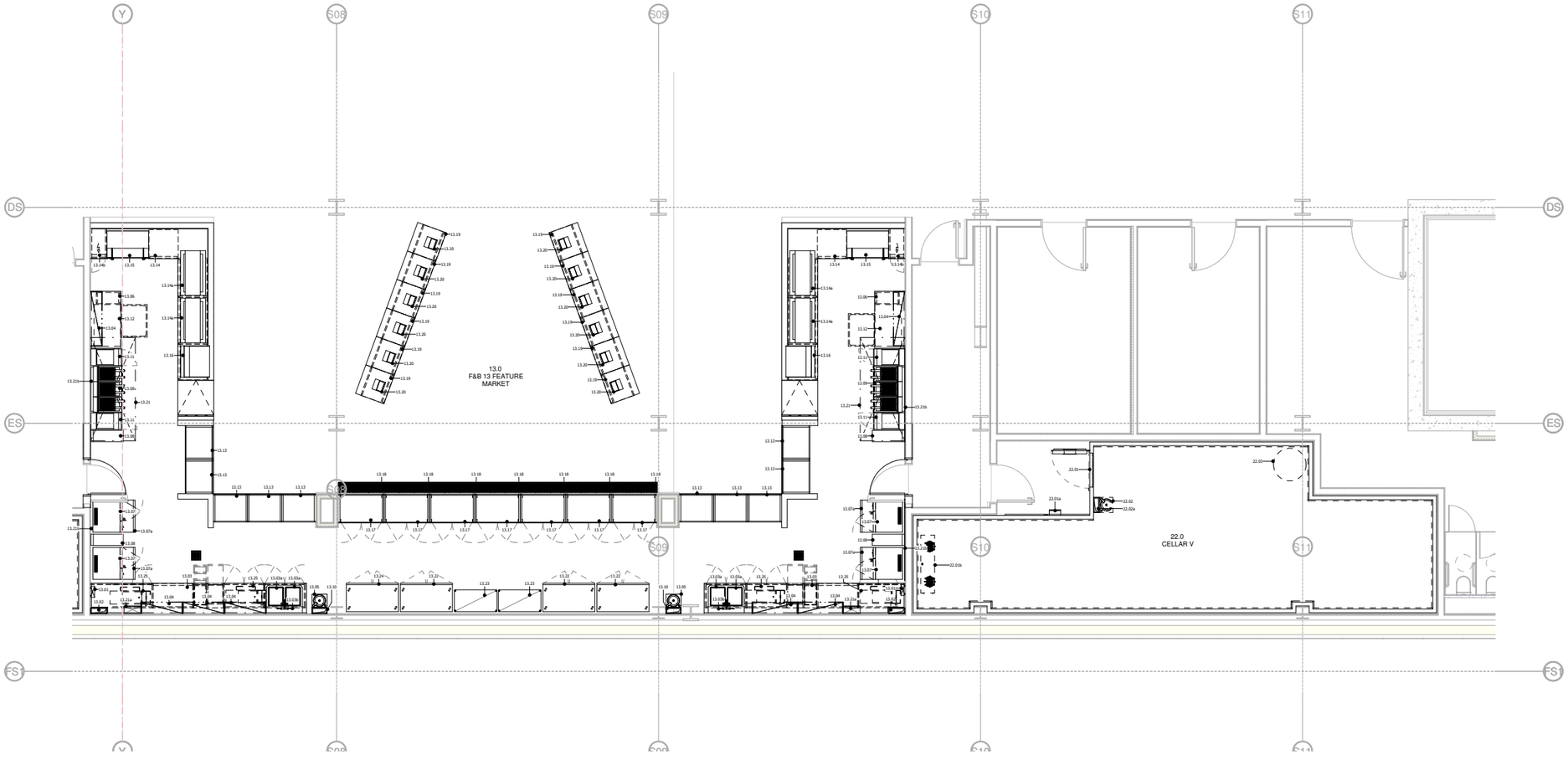
5.6D - Level 03 Feature Market, F&B 07



5.0 CATERING DESIGN

General Arrangement

5.6E - Level 03 Feature Market, F&B 13



MAIN KITCHEN

5.7.1 COMMISSARY KITCHEN 644

5.7

5.7.1 Commissary Kitchen

5.7.1.1 General

The commissary kitchen has been designed as a full production kitchen to work as the 'engine room' for the Arena.

The Commissary Kitchen receives raw produce, with areas for its preparation, holding and some cooking prior to onward transfer to the areas of service. Generally, it is sending out mise en place, foods ready for local finishing and plating. It is designed for a cook-chill service, which is very common in high volume establishments and for event catering. Dishes to be served hot can be fully prepared and part-cooked, then blast chilled for holding prior to local 'regeneration' at the point and time of service. The time of cooking up to the day of service, inclusive of both, can be a maximum of five days.

5.7.1.2 Activities & Main Areas

The main areas within the commissary kitchen are:

Goods-in & Decant

On entry to the Commissary Kitchen outer packaging is removed, held temporarily and then taken to the main waste holding area maintaining clean/ dirty segregation. Raw vegetables and fruit are washed in the Raw Wash area; fresh and chilled foods are placed into food safe containers then moved directly to the appropriate stores. All items will be quality checked on entry to the kitchen.

Stores

There are segregated storage areas according to types to meet HACCP/ ISO 22001 requirements. The main storage areas are:

- Dry Goods and Kitchen Disposables
- General Chilled Holding
- Chilled Meat, Poultry
- Frozen
- Fruit & Vegetables
- Bulk cold beverages
- COSHH Cleaning Materials/ Chemicals

The supply chain assumption is that meat and poultry will come predominantly fresh, but fish will be largely frozen or come as a prepared product.

Frozen product will be thawed in thawing cabinets in the preparation area.

Fruit & Veg Prep

Fruit & vegetables are washed on receipt and placed into a holding cold room. From there, they go through a preparation area and then into a cold room, from which they go to the cold and hot kitchens. This gives a one-way flow in compliance with HACCP and ISO 22001.

Cold Kitchen

The Cold Kitchen ('Garde Manger') will be equipped to carry out the following activities:

- Salad production
- Preparation of cold snacks and light cold dishes, such as for the GA areas and entry-level hospitality
- Packaged sandwiches and salads (if some are not bought-in)
- Premium area cold dishes

Hot Kitchen

All hot food will be prepared and cooked in the hot kitchen, with the majority on a cook-chill basis allowing it to be prepared ahead of the match day. In principle:

- Food is cooked.
- It is portioned hot and then blast chilled to 3C within 45 minutes.
- Or, alternatively, blast chilled in bulk and portioned chilled.
- Held for up to 5 days including days of production and service.
- Reheated immediately prior to service.
- It will be distributed chilled for regeneration in service pantries/ finishing kitchens using appropriate food

Distribution Cold Room

This area is used for the temporary holding of all finished food items prior to dispatch to individual service pantries/ finishing kitchen. It is sized to allow food to be prepared in the days before a major event and held there ahead of dispatch to the finishing kitchens where it will be held prior to the event. Cooked food on trolleys can go through the blast chillers directly into the cold room.

Utensil Wash

This provides pot and utensil washing for the commissary kitchen.

Central Dish wash

The dishwash is for washing all returning service ware, crockery and cutlery. This is supplemented by local glass washing to limit the movement of glassware, with a high risk of breakages. The dishwashing capacity has been based on:

- Supporting approximately 3,000 covers
- An average of 3 dishes plus cutlery applied to 75% of covers
- A 3-hour washing period
- Equating to around 200 racks per hour

Offices

There is a catering office provided by the Goods-In.

Refuse Holding

An area has been provided for the temporary holding of segregated refuse arising from preparation in the kitchen, waste from utensil wash and from the main dish wash. The waste will be transferred to the main waste area of the Arena for its onward transfer.

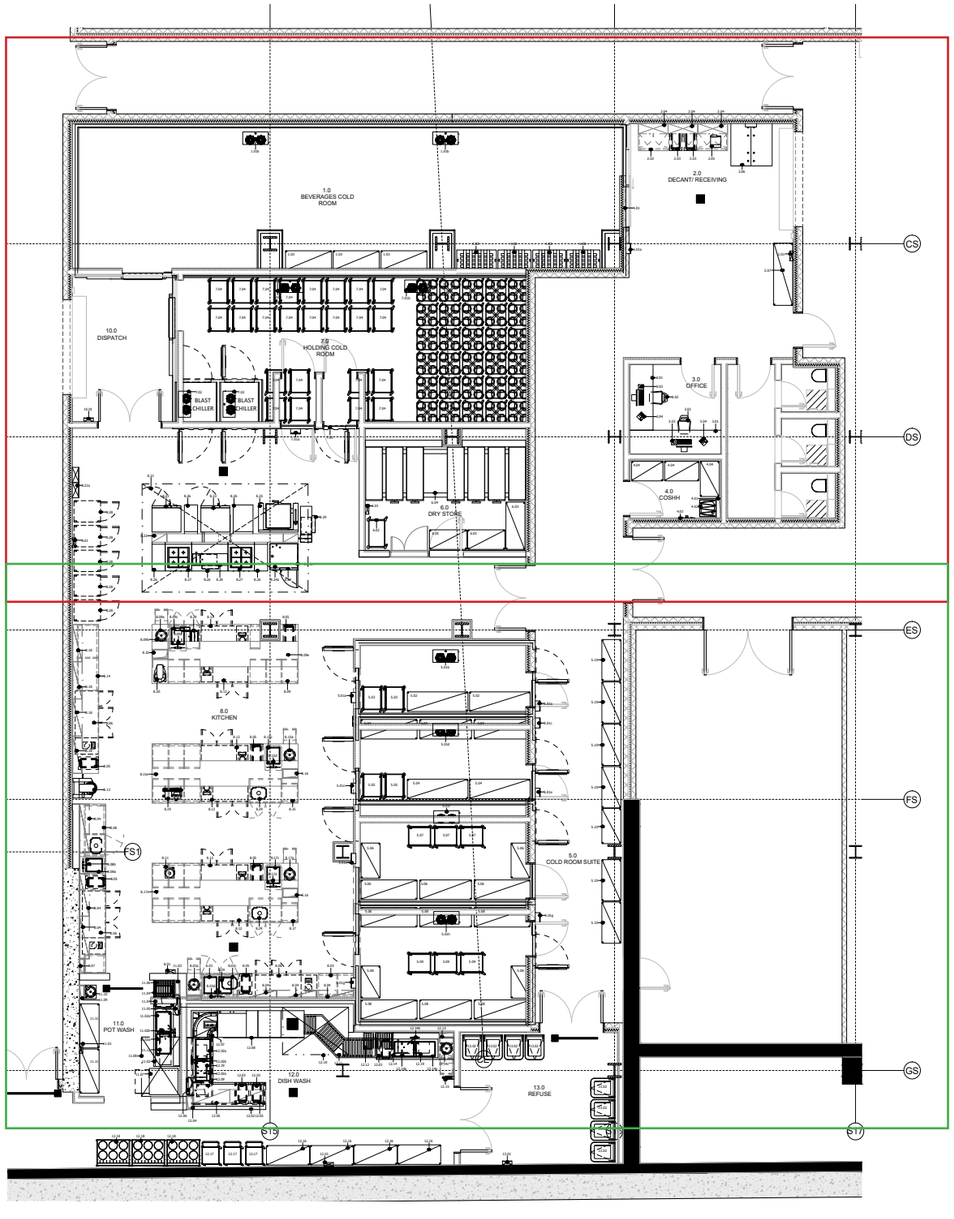
5.7.1.3 Flow of Goods

All food items will be accepted to the dedicated receiving and decant space and checked by catering staff prior to being stored in the appropriate bulk storage area.

A logical flow has been planned of goods-in, preparation and production and then storage prior to despatch to the required concession or unit.

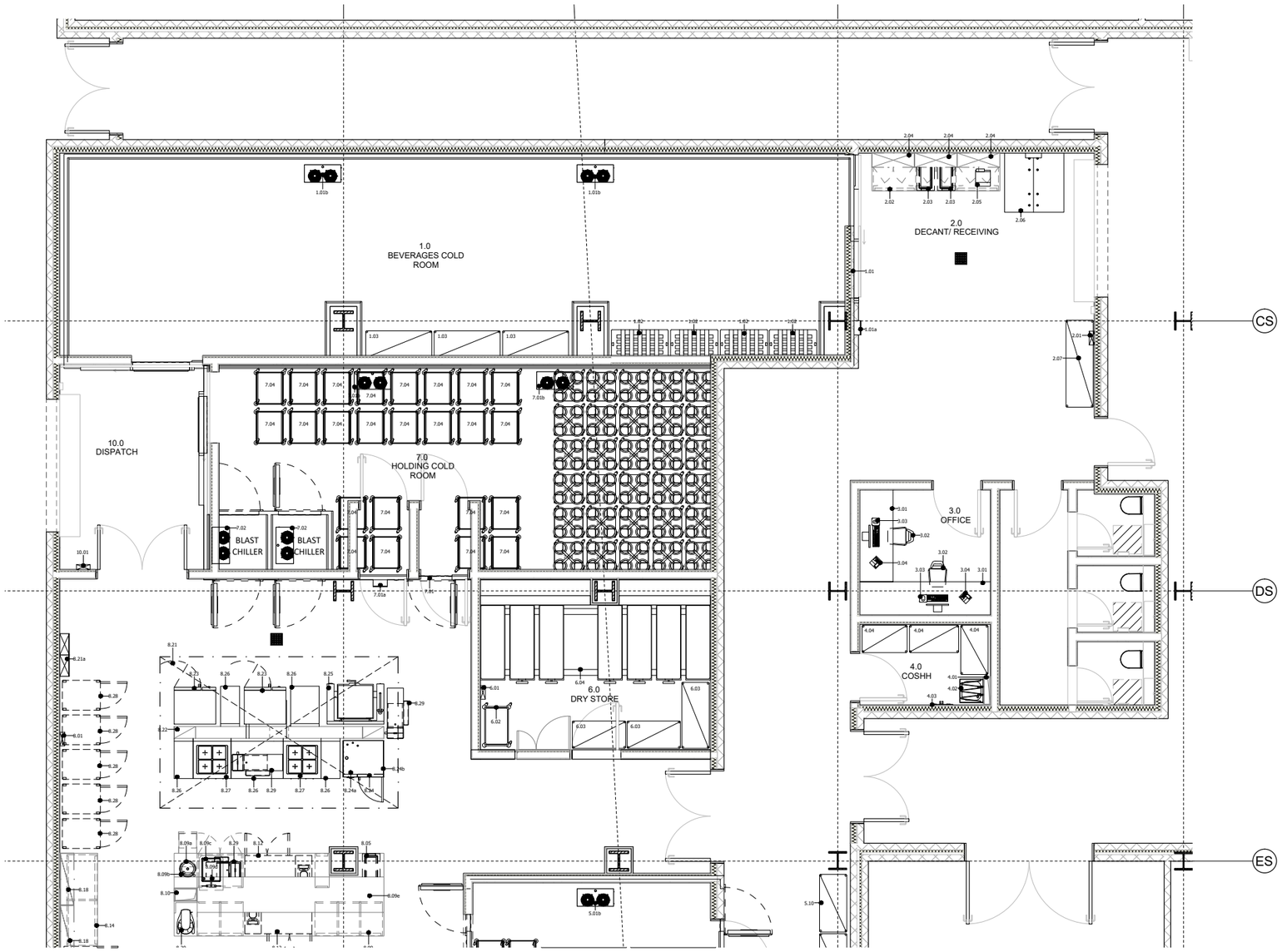
General Arrangement

Plan 5.7A – Commissary Kitchen **(whole area)**



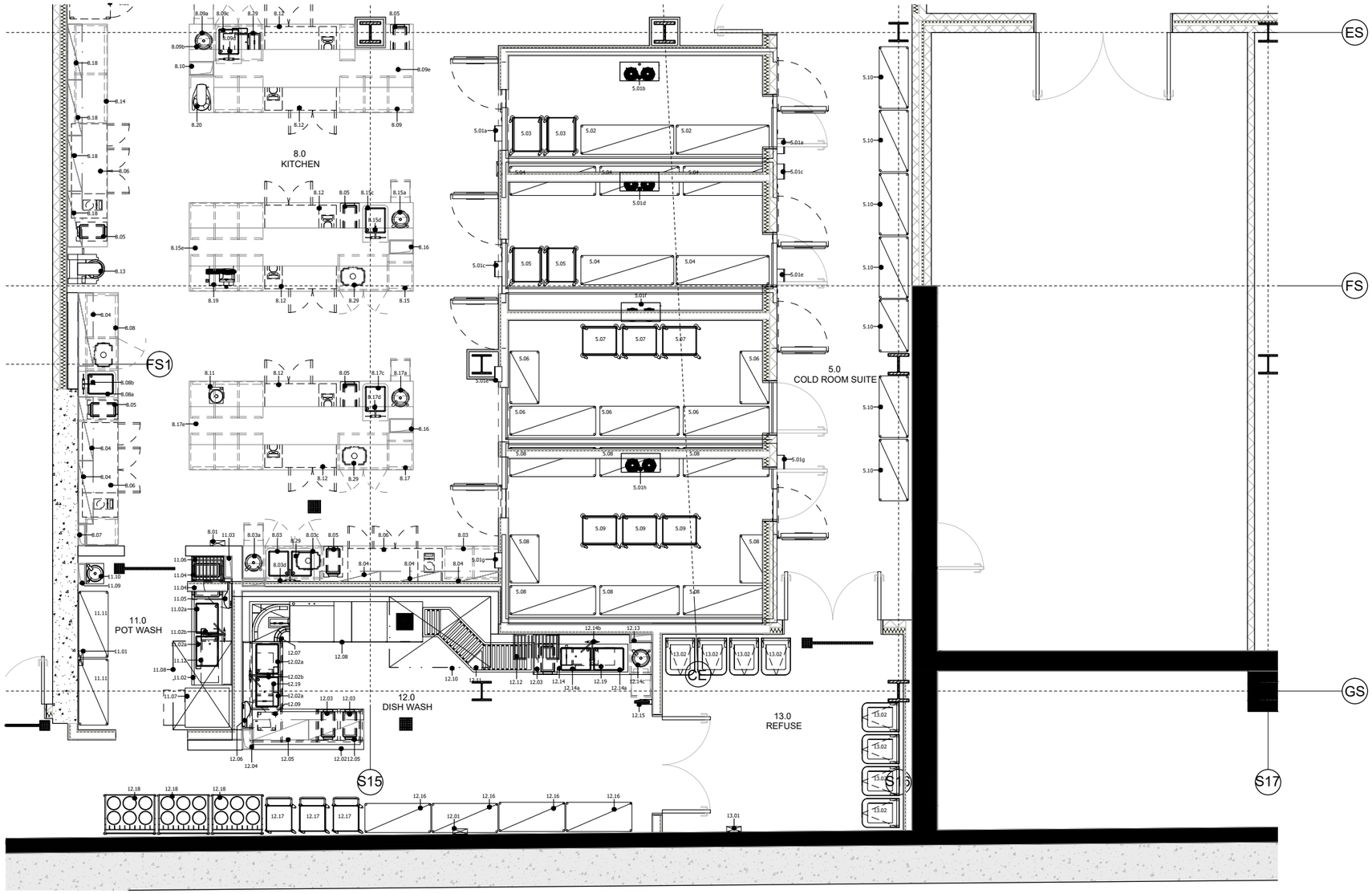
General Arrangement

Plan 5.7B – Commissary Kitchen **(area 1, red highlighted on Plan 5.7A)**



General Arrangement

Plan 5.7C – Commissary Kitchen **(area 2, green highlighted on Plan 5.7A)**



STAFF & ARTIST FACILITIES

5.8.1 STAFF & ARTIST MAIN FACILITIES 650

5.8

5.8.1 Staff & Artist Main Facilities

5.8.1.1 General

The ability for staff to be fed during shifts and change into working clothes in a controlled environment has been planned at L02 East staff facilities. The facilities can flex to accommodate the large number of casual staff on performance days.

5.8.1.2 Crew Catering

A dedicated facility for the provision of crew catering has been planned adjacent to the main commissary kitchen.

This will be capable of being operating independently from the main commissary kitchen and has limited preparation space. Cooking equipment will be provided by the various touring companies as per their own specific requirements.

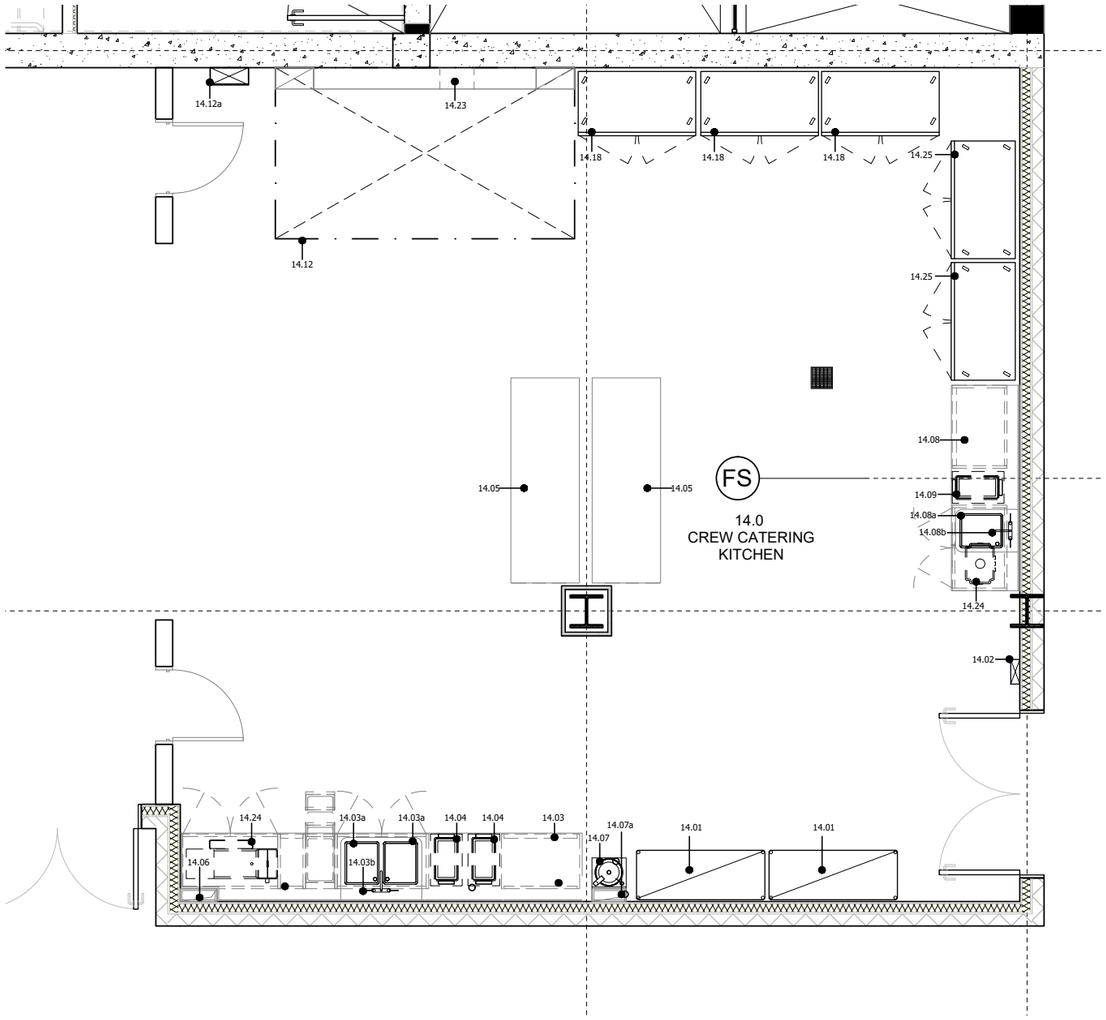
The operational principles of this kitchen are:

- Receipt and storage of some fresh and some pre-prepared food in trolleys.
- Cooking equipment and servery (if required) to be supplied by the crew caterer.
- Cooking of fresh dishes using imported equipment.
- Temporary holding of service waste

This area is provided with ducted kitchen extract.

General Arrangement

Plan 5.8A – Level 00 Crew Catering

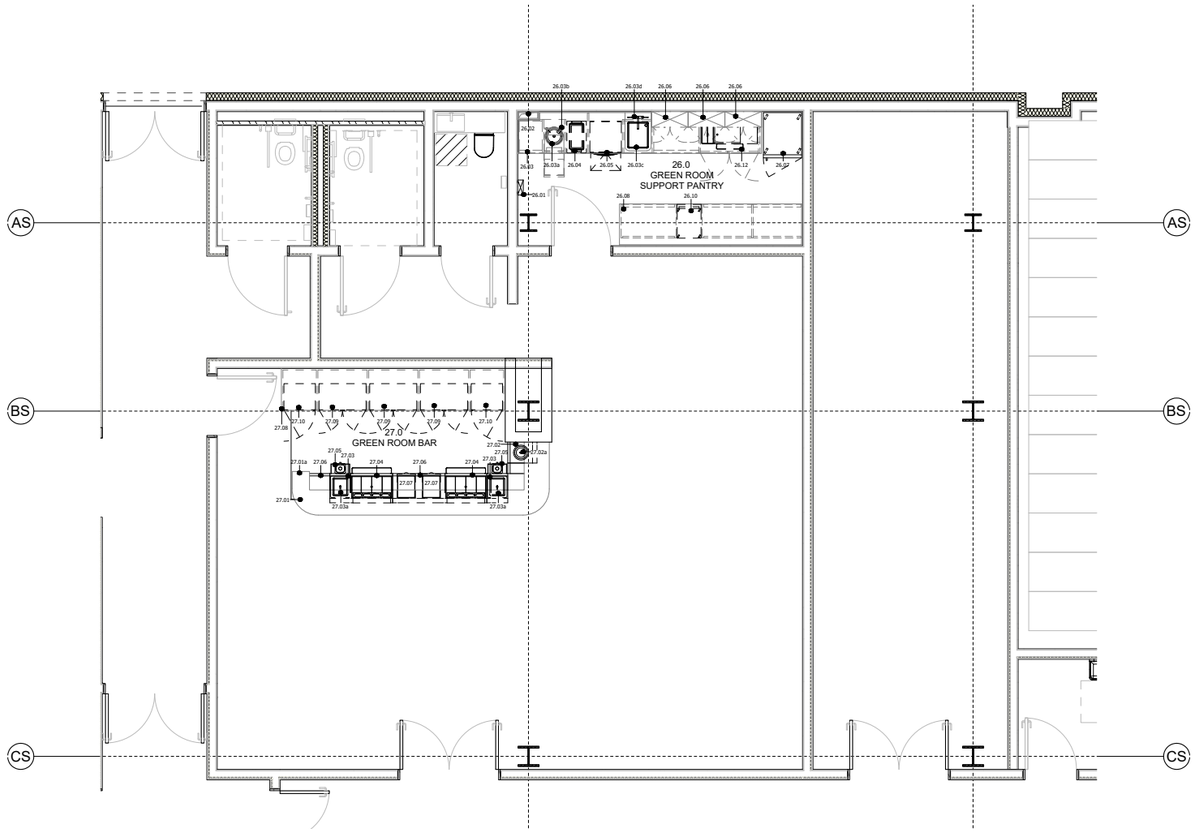


5.8.1.3 Green Room

The Green Room has beverage making facilities, but it is not planned to have any independent cooking facilities, such as if an artist wished to bring their own chef. In this instance, the crew catering kitchen would need to be used. When food is required., it will be supplied from the commissary.

General Arrangement

Plan 5.8B – Level 00 Green Room



5.8.1.4 Staff Dining

There is an event staff canteen for approx 80 staff members on L02 East.

5.8.1.5 Staff Facilities

Male and female toilets are provided adjacent to the Commissary for kitchen staff. All kitchen staff changing facilities are at L02. Refer to the architectural GA of Level 02

CELLAR STRATEGY

5.9.1 CELLAR STRATEGY 654

5.9

5.9.1 Cellar Strategy

5.9.1.1 General

The Arena will serve draught beer in most areas and, depending on the event, large quantities will be consumed, For a concert, and excluding a 'teen' band with a young audience, it could vary from 1.5 pints per person to 3 pints per person. The storage requirement has been calculated on the basis of the higher consumption. Consideration has been given also to the impact of back: back events between which it may not be possible to replenish the central keg store so sufficient stock for two events needs to be held.

5.9.1.2 Calculations

The approach to estimating volumes has been:

- Within GA areas to base on 2.5 pints per person as the average.
- Within Premium areas on 3 pints per person apart from the suites, which are on 2.5 pints
- To work on the maximum capacity, thus a standing event with an end stage.
- On account of the number of products being considered and the inevitable uncertainty over sales mix on any particular event, Delaware North recommended a stock overlap of 100% to be held onsite. Thus, if the event was to require 500 kegs, there is a requirement to have 1,000 kegs. However, in order to rationalise cellar space, 50% of this overlap (say 250 kegs) is held in local cellars and the balance is held centrally pre-chilled. This allows a rapid replenishment if required without then a 24-hour wait for the keg to come down to the required temperature.
- The overlap has been increased for the Decibel Club and reduced on the two temporary bars on Level 00.
- Using 88-pint standard kegs.

Cellar size has been based on double-stacking of kegs (applies to 2nd keg onwards in a row as the first keg connected to the keg board is always single-stacked).

Refer to the calculations in Table 5.9 over page and the cellar distribution plans which relate.

5.9.1.3 Product Offering

The basis of planning is on a maximum range of:

- Local craft lager
- Premium lager
- Local IPA
- Session lager
- Guinness
- Cider
- Local interest beer

Of these, the highest volumes will be the local, craft and the premium lagers. Draught cocktails will not be supplied through the pythons from the central cellars on account of the length of the python runs and the resultant cost of the wastage.

5.9.1.4 Cellars

Distribution

Plans 5.9A through 5.9D show the strategy against the Stage 4 architectural backgrounds. This arrangement has some consolidation of cellars, but the length of pythons has been kept down as far as possible. In addition, there is a bulk beverage and keg store for the 50% overlap held centrally of around 60m2, which is adjacent to the commissary kitchen.

Refer to Plans 5.9A – D for a summary of cellar locations, python runs, and the bars being supported from each.

Plan 5.9A – Level 00

Plan 5.9B – Level 01

Plan 5.9C – Level 02

Plan 5.9D – Level 03 (supports Level 04 also)

Python Cooling

Due to the length of some python runs, the pythons are chilled using glycol.

Gas

Planning has been progressed on the basis of local gas as Diageo, one of the potential brewery partners, could not progress with identifying the sizing of a central gas tank and the other potential partner would work with local gas in any event.

Empty Keg Storage

Empty kegs will be held pending collection in a compound to the southeast of the Arena.

Target Capacity

The objective is to have the capacity on site for two events back: back.

Post-Mix

Design has progressed on the principle of using post-mix where appropriate but retaining the option of using a fully packaged product.

5.9.1.5 Ice Making

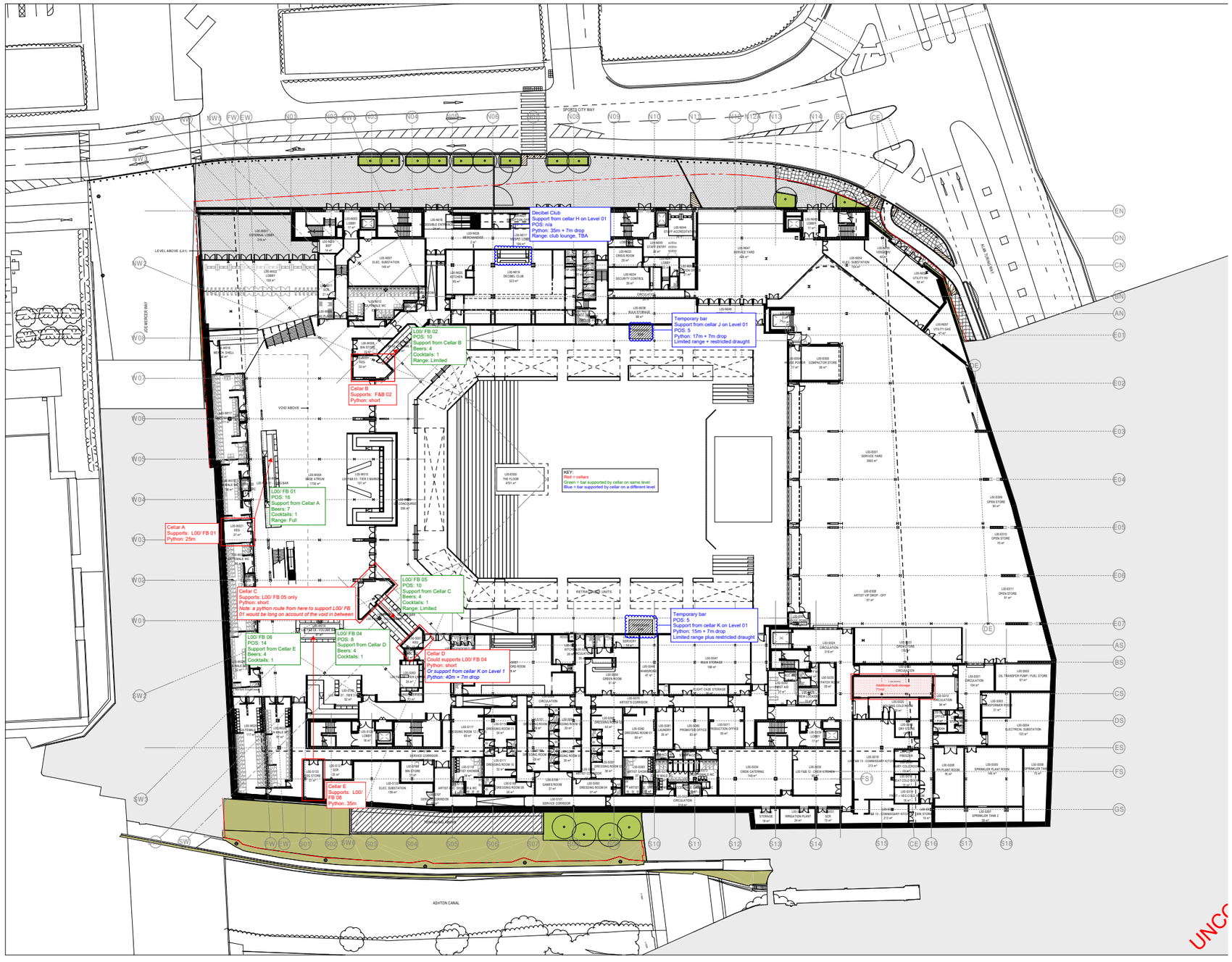
Ice making is distributed throughout the Arena with a series of undercounter ice makers in many locations and four higher volume ice makers in designated central locations. The four locations with the higher-volume ice makers are:

- Level 00 F&B 07
- Level 01 Backstage Kitchen
- Level 02 Club Kitchen
- Level 03 F&B 06

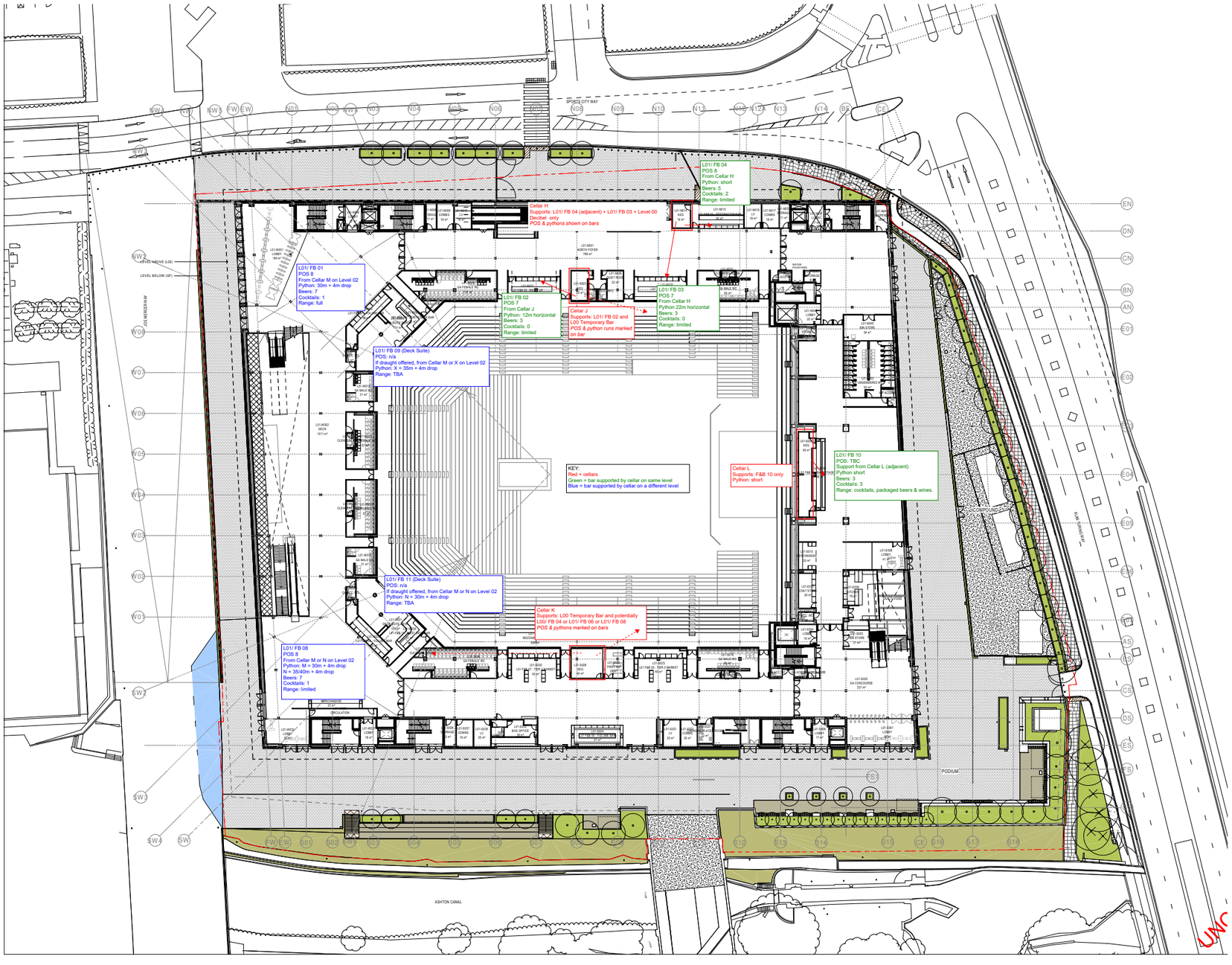
Undercounter ice makers are in the following areas:

- Level 00 Decibel
- Level 01 Backstage Lounge Bar
- Level 02 Atrium Lounge North (2), West (3), Balcony Bar and Volume Bar
- Level 02 Loge North and West
- Level 02 Loge East and South
- Level 02 Box Bars North and West
- Level 04 Hangout Bars North and South

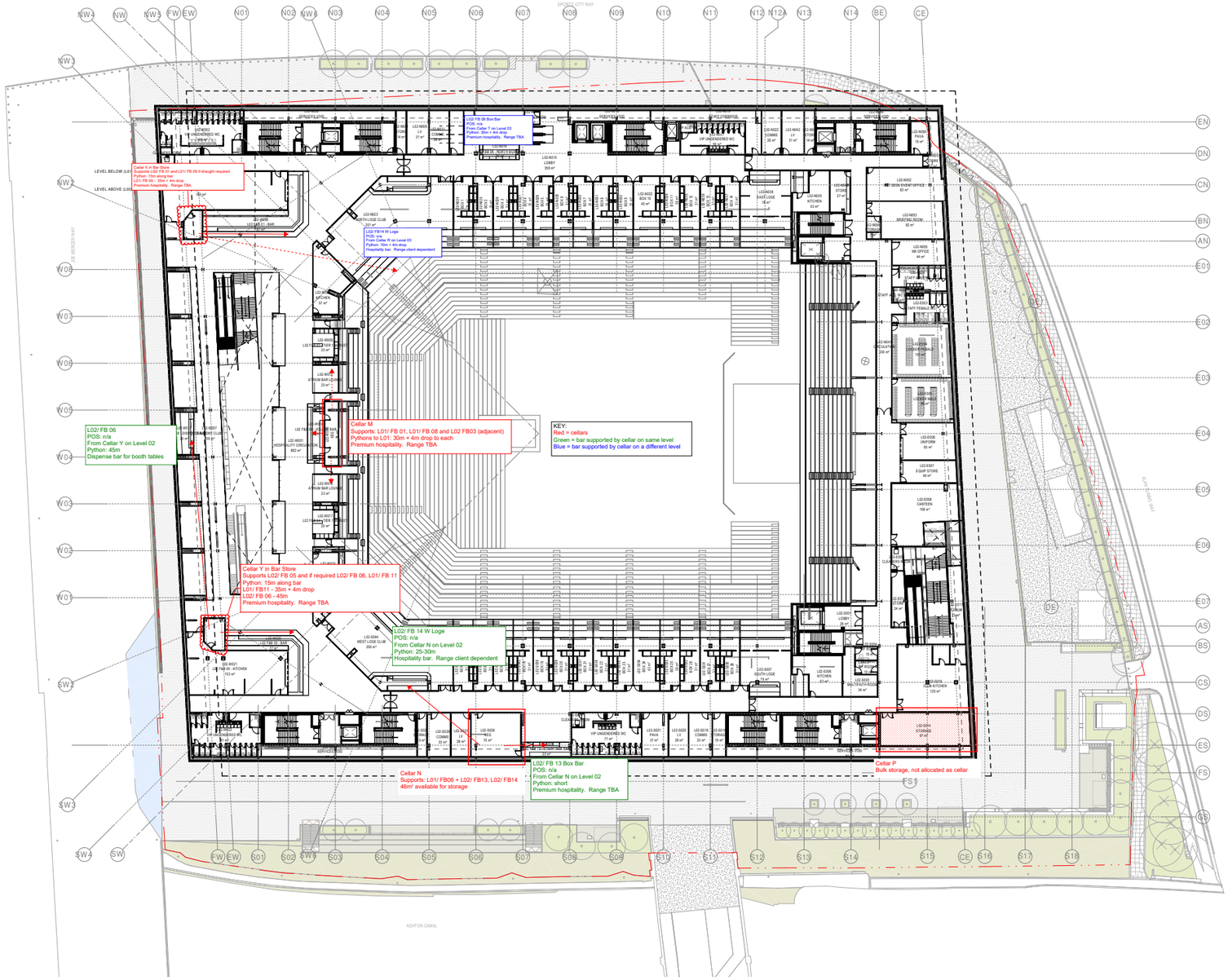
Plan 5.9A – Level 00



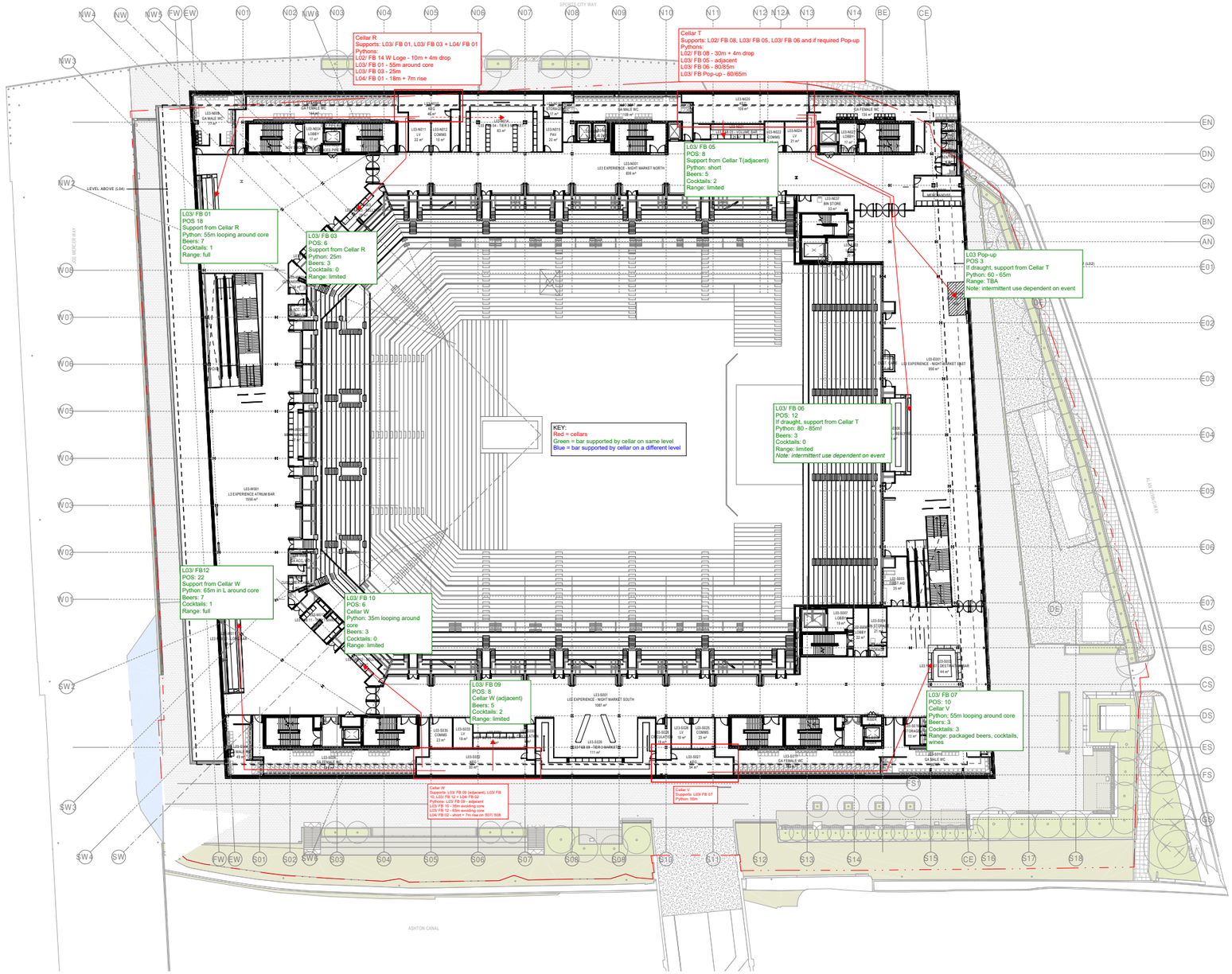
Plan 5.9B – Level 01



Plan 5.9C – Level 02



Plan 5.9D – Level 03



Plan 5.9E – Level 04

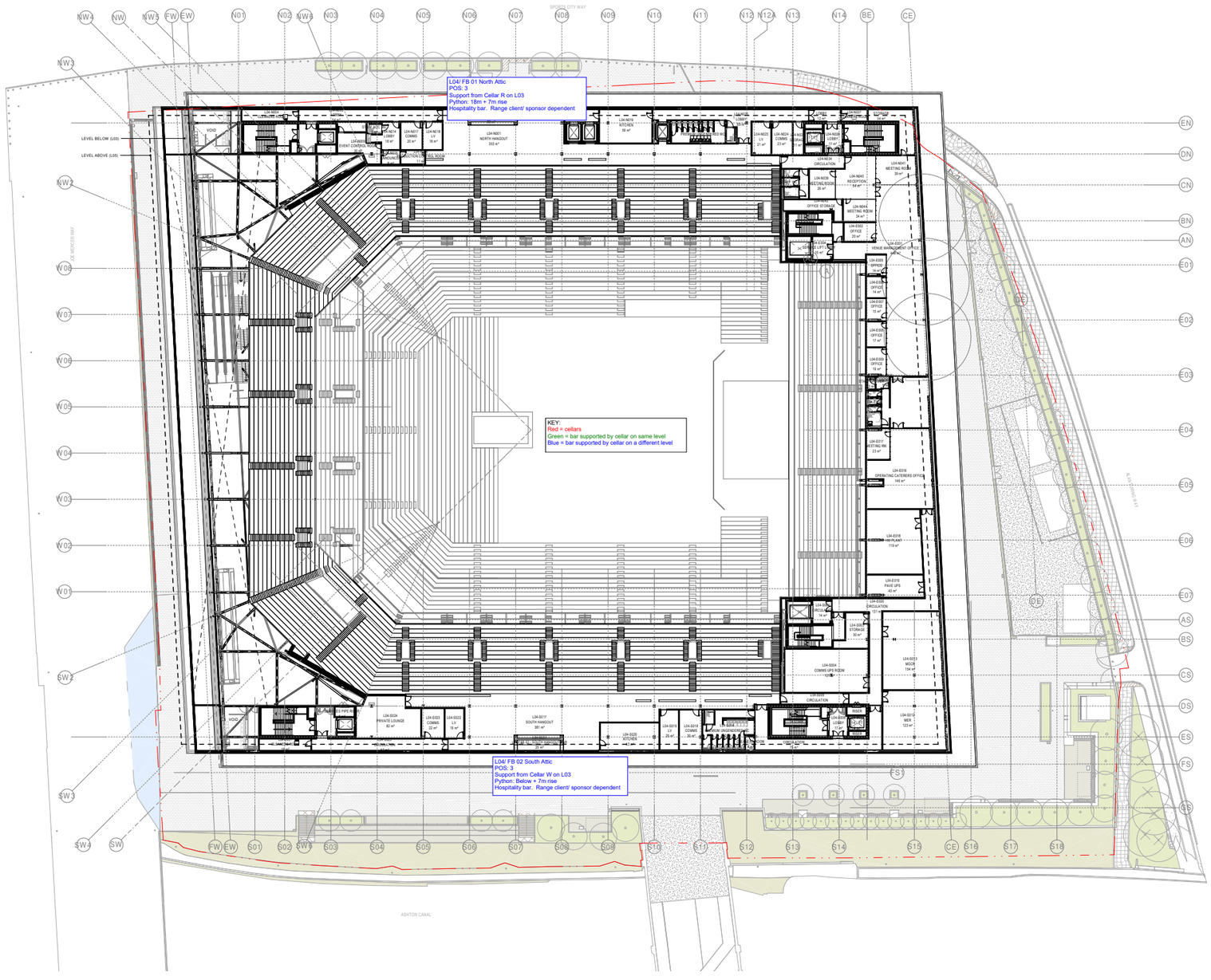


Table 5.9A – Calculations Levels 00, 01

LEVEL	AREA		Users	POS/ apptnd users	Pt/ Pers	Overlap	Kegs	Stacking	Cellar area	Cellar
L0	F&B 01 - Long Bar		1086	14	3	50%	56	1.5	24	A
	F&B 03 - Market		776	10						
	F&B 04 - Volume Bar	4500	621	8	3	50%	32	1.5	16	
	F&B 06 - T2 Market		466	6						
	F&B 07 - T3 Market		466	6						
	F&B 09 - Volume Bar		1086	14	3	50%	56	1.5	27	E
	Decibel		200		2	100%	10	1.5	5	H
	Record Room									
	F&B 11 - Green Room									
	F&B 12 - Crew									
	F&B 02 - Volume Bar		1667	10	2.5	50%	72	1.5	31	B
	F&B 05 - Volume Bar	5000	1667	10	2.5	50%	72	1.5	31	C+D
	F&B 14 - Temp Bar		833	5	2.5	25%	30	1.5	15	H
	F&B 15 - Temp Bar		833	5	2.5	25%	30	1.5	13	K
	F&B 13 - Main Kitchen storage									
L01	F&B 01 - Volume Bar	886	443	8	3	50%	23	1.5	12	
	F&B 08 - Volume Bar		443	6	3	50%	23	1.5	12	M on 02
	F&B 09 - Deck Suite N		36		3	50%	2	1.5	1	
	F&B 02 - Belly Up with Draft		279	6	3	50%	15	1.5	7	
	F&B 03 - Belly Up with Draft	975	325	7	3	50%	17	1.5	8	J
	F&B 04 - Destination Bar		371	8	3	50%	19	1.5	8	
	F&B 05 - T2 Market		146							
	F&B 06 - Volume Bar	975	683	6	3	50%	35	1.5	15	N on 02
	F&B 07 - T2 Market		146							
	F&B 11 - Deck Suite S		36		3	50%	2	1.5	1	M on 02
	F&B 10 - Backstage		1000	10	4.5	50%	77	1.5	37	L
Note: Keg numbers are driven from capacity per sector. POS numbers are used only to apportion within a sector.										

Schedule and scope information coordinatedto to 2020 04 09, with minor updates L00 atrium bar 202 06 30 - allocations subject to requirements of venue brewing partner

Table 5.9B – Calculations Levels 02 - 04

LEVEL	AREA	Users	POS/ apptnd users	Pt/ Pers	Overlap	Kegs	Stacking	Cellar area	Cellar
L02	F&B 01 - Atrium N	700	*210*	3	50%	11	1.5	6	X - Local
	F&B 02 - T1 Market								
	Atrium Centre Bar		*175*	3	50%	9	1.5	5	X - Local
	F&B 04 - T1 Market								
	F&B 05 - Atrium S		*210*	3	50%	11	1.5	6	Y- Local
	Atrium Balcony Bar		*105*	3	50%	6	1.5	3	Y- Local
	F&B 07 - North Loge	122		3	50%	7	1.5	4	R on 03
	F&B 08 - North Box Bar	248	4	2.5	50%	14	1.5	7	T on 03
	F&B 09 - North Box								
	F&B 10 - East Loge	68							
	F&B 11 - South Loge	68							
	F&B 12 - South Box	248							
	F&B 13 - South Box Bar		4	2.5	50%	14	1.5	7	N
	F&B 14 - West Loge	122		3	50%	7	1.5	4	N
	F&B 15 - Storage								P
L03	F&B 01 - Long Bar	1945	1167	10	3	50%	60	1.5	29 R
	F&B 02 - T1 Market		486	4					
	F&B 03 - Belly Up with Draft		292	6	3	50%	15	1.5	8 R
	F&B 04 - T3 Market	2014	806						
	F&B 05 - Volume Bar		1208	8	3	50%	62	1.5	30 T
	F&B 06 - Belly Up with Draft	1800	982	12	3	50%	51	1.5	25 T
	F&B 07 - Destination Draft		982	12	3	50%	51	1.5	25 V
	F&B 13 - Temp Bar		216	*3*	3	25%	10	1.5	5 T
	F&B 08 - T3 Market	2014	806						
	F&B 09 - Volume Bar		1208	10	3	50%	62	1.5	30 W
	F&B 10 - Belly Up with Draft	1945	1167	6	3	50%	60	1.5	29 W
	F&B 11 - T1 Market		486						
	F&B 12 - Long Bar		292	22	3	50%	15	1.5	8 W
L04	F&B 01 - Hangout North		150		3	50%	8	1.5	4 R on 03
	F&B 02 - Hangout South		150		3	50%	8	1.5	4 W on 03
Note: Keg numbers are driven from capacity per sector. POS numbers are used only to apportion within a sector.									

Schedule and scope information coordinatedto to 2020 04 09, with minor updates L00 atrium bar 202 06 30 - allocations subject to requirements of venue brewing partner

MULTIDISCIPLINARY ENGINEERING (BURO HAPPOLD)

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6

EXECUTIVE SUMMARY

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6.1

6.1.1 Introduction

This report is a summary of the Buro Happold [BH] Stage 4a design activities carried out in assisting Oak View Group (OVG) and City Football Group (CFG) to achieve their aspirations for OVG Manchester.

During this crucial stage of design, we have worked closely with the clients, other consultants and preferred contractor to finalise the brief, inform the costing process, and develop the design to a Stage 4a level of detail. Our design approach has been to provide strategies and solutions which are fully integrated between the engineering disciplines. This philosophy will ensure that the optimum solution is achieved for the Arena when it opens in 2023.

This chapter summarises the activities from the following Buro Happold services:

- Structural Engineering
- Civil Engineering
- Facade Engineering
- Ground Engineering
- Crowd Flow
- Fire Engineering
- Inclusive Design
- Security Consultancy
- Waste Consultancy
- BREEAM Assessment
- Sustainability

It is noted that the Environmental Impact Assessment (EIA) scope was completed at the end of Stage 3, with the nly Stage 4a activity being responding to planning comments as required.

The key client outcomes were established in our Stage 2 Report and remain the same as we enter Stage 4B.

The adjacent graphic summarises how each discipline is contributing to our outcome-driven design approach, derived via. the following interpretations:

Next Generation Venue
Engineering that relates to making the building as future-proof and economically sustainable as possible.

Be Better than the Competition
Engineering that relates to creating an enhanced fan experience

Touring Community's Favourite
Engineering that relates to operational effectiveness

Functional, Affordable, Delivered on Time
Engineering that relates to efficient design, compliance and the planning process

The outcome of "**Functional, affordable, delivered on time"** is particularly pertinent at this stage as the project team works closely with the preferred contractor to achieve the optimum contract price and to maintain the overall programme.



6.1.2 Buro Happold Multi-Disciplinary Engineering Document Suite

The adjacent graphic conveys the Buro Happold document suite as we conclude the Stage 4a design for OVG Manchester.

Within this overview diagram there are hundreds of individual tender status drawings and a large number of tender status reports.

This is a carefully established structure that we use across all of our Sports and Entertainment projects, developed to convey the design requirements and to provide the contractor and subcontractors with as much relevant information as possible.

To avoid confusion, we have endeavoured to limit any repetition and duplication of Tender information in this chapter, and the intention is to summarise and point towards the appropriate drawings and documents

Site

Civils Specifications

BRA-BHE-XX-XX-SP-C-0001
Below Ground Drainage Specification
BRA-BHE-XX-XX-SP-C-0002
Q10 Kerbs and Channels Specification
BRA-BHE-XX-XX-SP-C-0003
Q20 Sub Base Specification
BRA-BHE-XX-XX-SP-C-0004
Q22 Asphalt Paving Specification
BRA-BHE-XX-XX-SP-C-0005
Q25 Bricks and Slabs Paving Specification
BRA-BHE-XX-XX-SP-C-0100
Northern Car Park Access Highway s278 Specification
BRA-BHE-XX-XX-SP-C-0101
Emergency Access Highway s278 Specification

Civils Drawings

0200 – Highways
0300 – Surface Water
0400 – Foul Water
0500 – Combined Utilities
0600 – Tracking

Ground Engineering Specifications

BRA-BHE-XX-XX-SP-CG-0001
Ground Investigation Specification
BRA-BHE-XX-XX-SP-CG-0002
Project Specification for Piling and Embedded Retaining Walls
BRA-BHE-XX-XX-SP-CG-0003
Specification for Earthworks

Structures and Facades

Structures Specifications

BRA-BHE-ZZ-ZZ-SP-S-0100
Structural Concrete Specification
BRA-BHE-ZZ-ZZ-SP-S-0110
Structural Steelwork Specification
BRA-BHE-ZZ-ZZ-SP-S-0200
Below Ground Waterproofing Performance Spec.

Structures Reports

BRA-BHE-ZZ-XX-RP-S-0100
Structural Design Report
BRA-BHE-ZZ-XX-RP-S-0200
Structural Basis of Design
BRA-BHE-ZZ-XX-RP-S-0202
Secondary Structure Elements
BRA-BHE-ZZ-XX-RP-S-0203
Facade Support Steelwork
BRA-BHE-ZZ-XX-RP-S-0210
Structural Description - In-situ Concrete
BRA-BHE-ZZ-XX-RP-S-0220
Structural Description - Structural Precast Concrete - Bowl and Stairs
BRA-BHE-ZZ-XX-RP-S-0230
Structural Description - Superstructure Steelwork
BRA-BHE-ZZ-XX-RP-S-0240
Structural Description - Roof Steelwork
BRA-BHE-ZZ-XX-RP-S-0250
Structural Description - Laterally Loaded Partition Support
BRA-BHE-ZZ-XX-RP-S-0400
Retaining Wall Design Assumptions
BRA-BHE-ZZ-XX-RP-S-0500
Structural Movement and Tolerance
BRA-BHE-ZZ-XX-RP-S-0600
Structural Robustness and Systematic Risk Assessment

Structures Drawings

0001 – 0350 Notes, Schedules and Loadings
0500 – Isometrics
0700-1700 – Plans
2200 – South West podium Zone D
3000 – 3400 – Grids and Raker Sections
3500 – Substructure section details
3800 – Roof Truss Elevations
4100 – 4200– Core plans
4500 – 4600 – Core Sections
5000 – Substructure Details
5051 – Ground Floor Details
5100-5200 – Superstructure Details
5201 – Roof Details

Facades Specifications

BRA-BHE-ZZ-ZZ-SP-YF-0200
Facade Performance Specification

Health and Safety

BRA-BHE-ZZ-XX-RP-S-0301
Record of Significant Health and Safety Information Interpretative Report

Buildings

Crowd Flow Reports

BRA-BHE-ZZ-ZZ-PP-YC-0001 People Flow Study

Fire Reports

BRA-BHE-ZZ-ZZ-RP-YD-0001 Fire Strategy
BRA-BHE-ZZ-ZZ-RP-YD-0002
Stage 3.2 Structural Fire Engineering Assessment

Sustainability Reports

BRA-BHE-ZZ-ZZ-RP-YS-0001
BREEAM Pre Assessment Report
BRA-BHE-ZZ-ZZ-RP-YD-0010 Indoor Air Quality Plan

Security Specifications

BRA-BHE-ZZ-ZZ-SP-U-0002
Security Outline Specification

Security Reports

BRA-BHE-ZZ-ZZ-RP-U-0001
Security Employers Specification

Security Drawings/Schematics

BRA-BHE-ZZ-ZZ-DR-U-2031, 2032, 2033, 2034

6.1.3 Current Design Status

The tender status design (Stage 4A) is now complete, aside from responding to any errors and omissions identified during July 2020 and assisting in the understanding of any remaining value engineering proposed by subcontractors.

The remaining scope of all disciplines can be summarised as follows:

- Structural Engineering
    - Final design of lower tier.
    - Progression of drawings and documents from tender status to construction status.
    - Production of Final Design Revit model.
    - Conclusion of calculation chapters and submission to Building Control.
- Civil Engineering
    - Progression of drawings and documents from tender status to construction status.
    - Provide design information to assist contractor in submission for new drainage connection applicators (final applications assumed to be by contractor)
    - Addressing contractor queries and RFIs.
- Facade Engineering
    - No further agreed scope. (Note that our Stage 4B scope (reviewing tenderers technical proposals) has already been undertaken).
- Ground Engineering
    - Final review of piling and earthworks specifications in August to allow full handover to Skanska.
- Crowd Flow
    - OVG Manchester and Etihad Stadium simultaneous egress study
- Fire Engineering
    - One further update of the Fire Strategy Report after any Stage 4B General Arrangement drawing changes made by Populous.
- Inclusive Design
    - Develop the Part M Access Strategy for building control submission and any other third party submissions requiring consent with input from the design team. (delayed by C-19 situation)
- Security Consultancy
    - One further update of the Performance Specification if required.
- Waste Consultancy
    - No further scope.
- Sustainability
    - Completion of Embodied Carbon assessment, based on final 4A information from Populous and the BH Structural Engineering team.

Early and Additional Scope

At the time of writing Bam are advising on their need for additional 4B and 5 scope, as summarised below:

- Major Façade Support Steelwork (BHE CCF 33)
- Masonry & Partitioning (BHE CCF 34)
- Major Internal Secondary Elements (BHE CCF 53)
- Major External Secondary Elements (BHE CCF 54)
- Geotechnical support (BHE CCF 47)
- Geotechnical input to clear planning condition
- Geoenvironmental support (BHE CCF 48)
- S278 construction detailing
- Fire Engineering Stage 4B & 5 support (BHE CCF 44)
- BREEAM Stage 4B support (BHE CCF 37)
- BREEAM Stage 5 & 6 support (BHE CCF 38)
- Security Stage 4B & 5 support (BHE CCF 43)
- Inclusive Design Stage 4b & 5 support

Further items may be developed during July – relating to any proposed VE items that require the rework of Stage 4A material.

At the time of writing Bam are advising on the required BH design activities between July and September, prior to novation and start on site. This work will be crucial to finalising the contract cost and maintaining the current programme.

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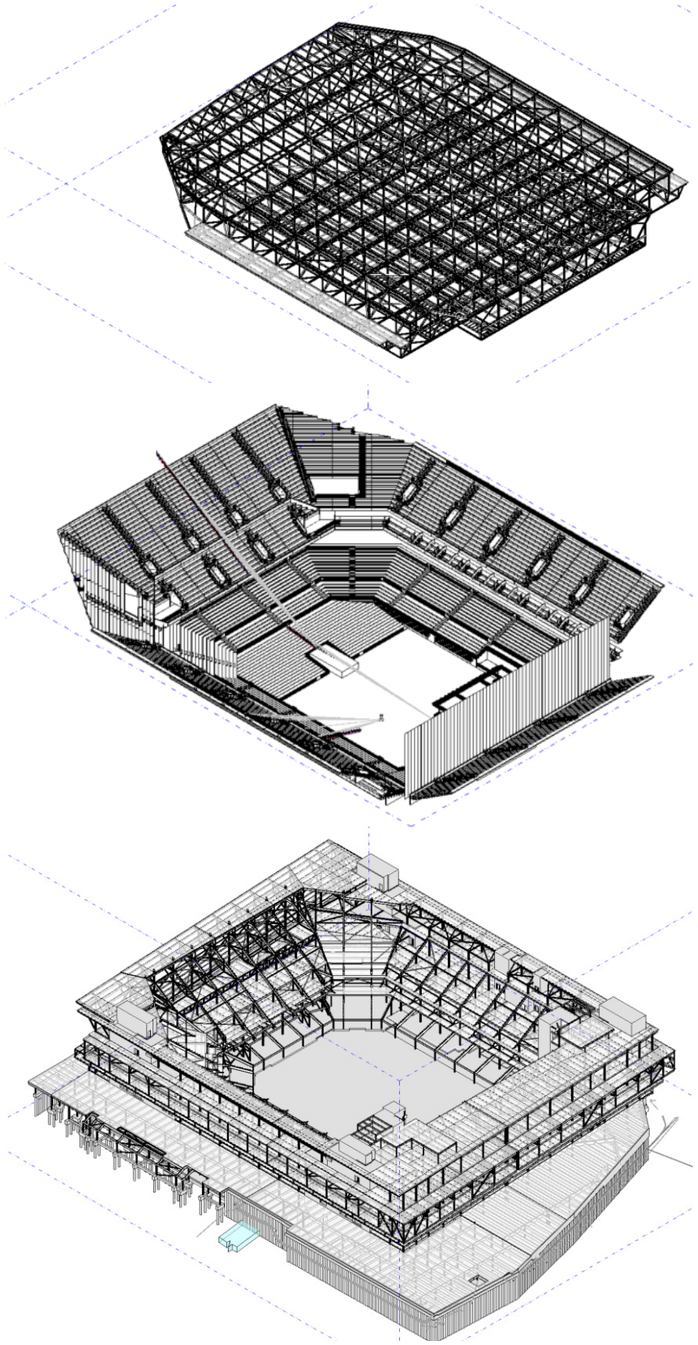
STRUCTURAL ENGINEERING

6.2.1 STRUCTURAL ENGINEERING 672

6.2

6.2.1 Structural Engineering

This section summarises the structural design at the end of Stage 4a and should be read in conjunction with the structural drawings. As conveyed at the end of this section, the design has been developed to facilitate the architecture, client requirements and value engineering proposals.



Main Structural Components

Overview

Roof Structure – Arrangement

Throughout this project we have sought to ensure that, where possible, the structural arrangement is as efficient as possible. A key part of this approach relates to the roof. The long span roof will be created from a series of planar trusses, spaced to match the superstructure grid below. This removes the need for any transfer structures to marry up the roof and bowl grids.

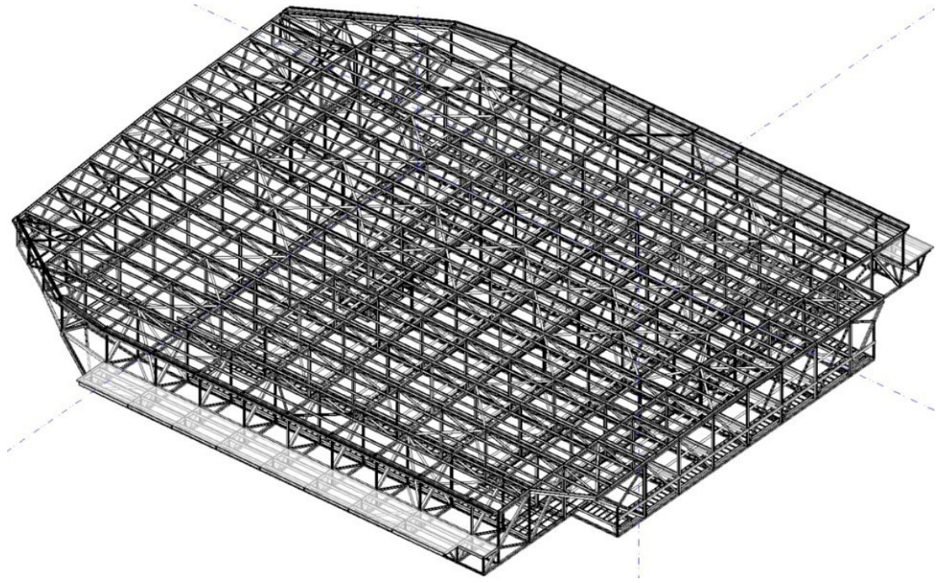
Planar trusses are considered the most economical way of spanning the 100m clear across the event floor and providing the capacity to support high rigging loads and acoustic build up on the roof.

The strategy for spanning the main bowl with planar trusses continues for the full length of the roof, with the last bay above the West back of bowl line being simplified to a series of light trusses supported off the back of bowl. This allows for maximum flexibility of the frame structure and associated spaces below.

The key aspects of the roof are as follows:

- Primary trusses, typically at an 8.5m spacing, span transversely across the arena.
- Primary trusses typically formed from off-the-shelf open section UC elements.
- Trusses supported on steel columns at the back of the bowl.
- Typical truss span is approximately 102m.
- Typical required truss depth is 10m
- The roof cladding system (by others) is based on a concrete layer to limit sound break-out, with additional insulation for thermal requirements and soffit treatment for acoustic reverberation performance.
- The roof structure has a flat bottom surface across the technical grid and is then angled to the back of bowl.
- The top surface is proposed to be a duo pitch roof to facilitate the drainage.

The following sub-sections describe the primary structural components in turn, starting from the roof and working downwards.



Main Roof Isometric

Roof walkways and rigging philosophy

An arena roof structure can be likened to a machine which enables the productions. For OVG Manchester we aspire to achieve the following: Faster, Safer, Higher, Stronger.

There are many different configurations of rigging structure and walking surfaces within arenas around the world. We have considered both fully walkable decks and individual walkways and at Stage 4a developed the following design philosophy;

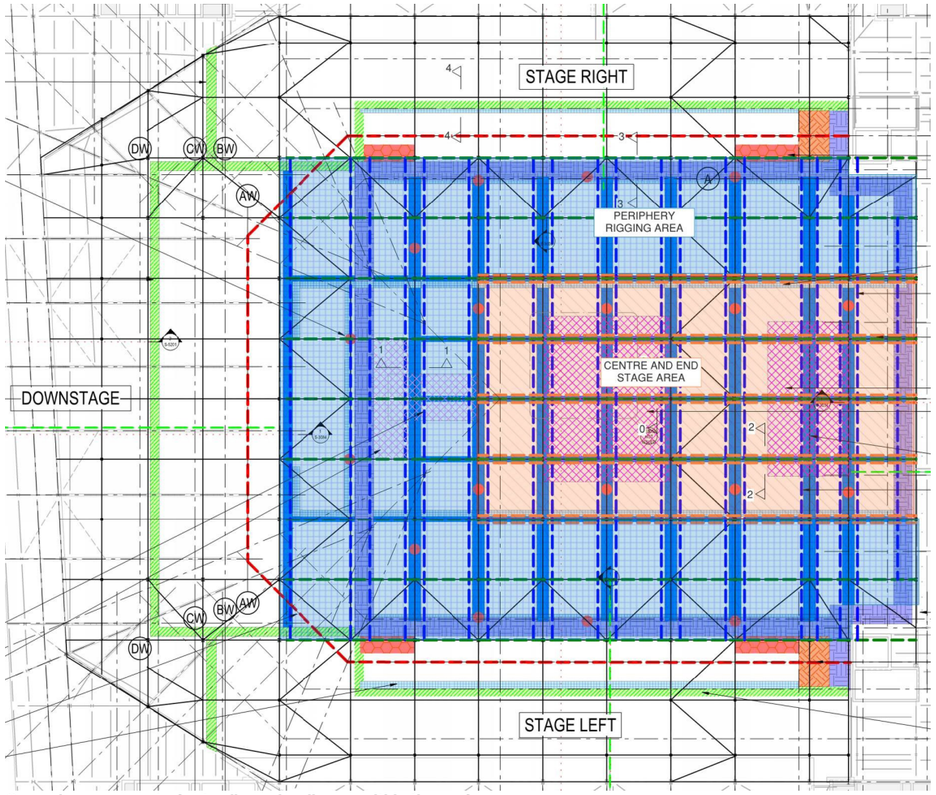
The general arrangement for access is shown in the image adjacent. There are several different categories of walkway, each serving a specific purpose. The colour scheme and associated terminology are as follows:

- Purple routes, termed Perimeter Catwalks, are 2500mm wide. These offer general access to roof space including access to PAVA systems, access catwalks and the rigging walkways.
- Green routes, termed Access Catwalks are 1200mm wide. These offer access to house lighting and house speakers.
- Orange and red areas are designated storage areas for PAVA systems and layby areas to unload from the service lifts.
- Blue routes, termed Rigging Walkways are 1600mm wide running cross stage (North South) and 800mm wide running down stage (East West). These are for rigging only and are intended for access by qualified rigging personnel only. The walkway surface will differ from the catwalks and will be formed through a series of perforated slats with nominally 75mm spacing between them to allow rigging access to the truss chord elements below if required.

Rigging Capacities

Within the rigging area each truss can be fully loaded with rigging at the same time. Each with a capacity of 30 tonnes, leading to a theoretical total rigging capacity of 330 tonnes. Within the rigging area there are two zones tailored to the expected demand in those areas.

- The central and end stage area which will be subject to the highest and most frequent rigging requirement as a result of the possible stage locations, In this area there are both down stage and cross stage rigging beams which can take a maximum of 6.5 tonnes and 5 tonnes in any direction respectively. As a result, this area can support a minimum of 19 tonnes (57.7 lb/ft2) in each bay.
- The periphery rigging area is likely to be subject to less intense rigging requirements. To account for this, only cross stage rigging elements, which can support 5 tonnes in any direction, are present in this area. As a result, the periphery rigging area can support a minimum of 8.5 tonnes (25lb/ft2) in each bay



General arrangement of catwalks and walkways within the roof

Superstructure - General

The superstructure is to be based on a steel frame with composite metal deck floor plates and pre-cast concrete terrace units. This is primarily to achieve value through programme and package simplification based on contractor preference. Radial grid spacing of typically 8.5m has been adopted to optimise the grid for a steel solution, minimise column and foundation count and improve internal space.

The Stage 4a design has reduced the number of global building movement joints so that there are four quadrants, each with a large stiff RC core. This is an update from Stage 3 and has been developed alongside the design team to a co-ordinated design.

During Stage 4a a portion of the lower tier has been changed from retractable seating on a mezzanine deck to permanent pre cast terracing. The current 4a design information has incorporated the change to a preliminary level to allow co-ordination and provide cost information. Final design of this area is to be completed following the Stage 4a package delivery.

Following the structural robustness and systematic risk assessment some localised additional steel has been added above the West atrium to provide a second load path in an accidental design scenario. Some other minor increases in steel sizes have been included as part of this assessment, primarily columns.

Superstructure - Bowl

The bowl structure is formed by steel rakers supporting pre-cast concrete terrace units spanning circumferentially. The rakers are typically fabricated I beams, stepping down in depth at their tip to support an inverted tee-section. In-plane bracing transfers lateral forces back to the steel frame and subsequently the RC stability cores and stabilises the rakers rotationally through moment fixity to web stiffener plates. Connection into the RC stability elements is through a combination of the diaphragm floorplate interface using rebar and floor beams connected through embed plates.

In the West Stand, significantly longer spans and interaction with the cantilevered façade requires a series of trussed rakers. This steelwork is visible above the atrium and architecturally expressed, so the regularity of the geometry is considered important.

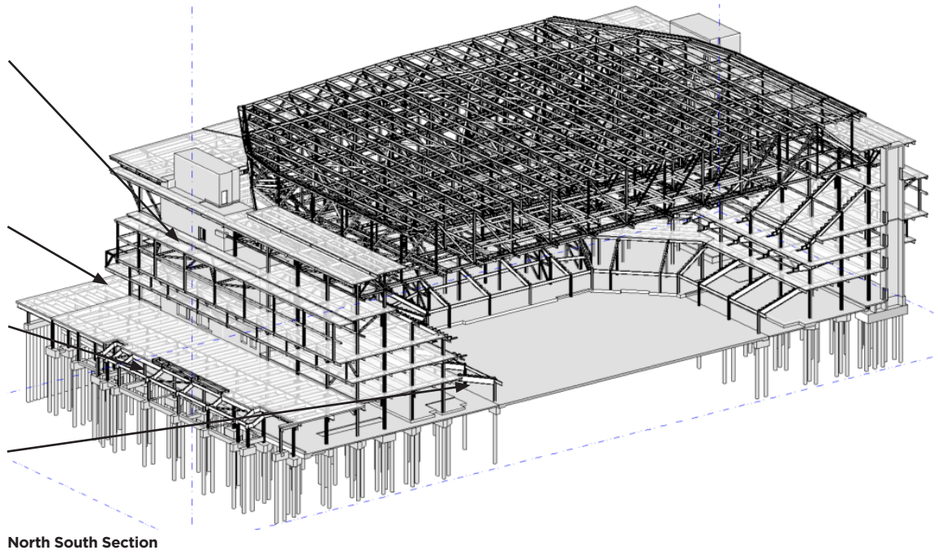
The description report for bowl pre-cast identifies some of the more complex areas of bowl structure which requires the package contractors for steel and pre-cast to understand and provide input in terms of buildability and fabrication. This will be key to ensuring cost efficiency for these interfaces.

STEELWORK PLAN TRUSS TO CORES TO SIMPLIFY STEEL TO CONCRETE INTERFACE

STEEL AND COMPOSITE DECK THROUGHOUT LEVEL 1 PODIUM AND INCREASED SPACING OF STEELWORK

SOUTH PODIUM TERRACING SUPPORT FRAMING INTRODUCED

LOWER TIER CHANGED FROM RETRACTABLE TO PERMANENT



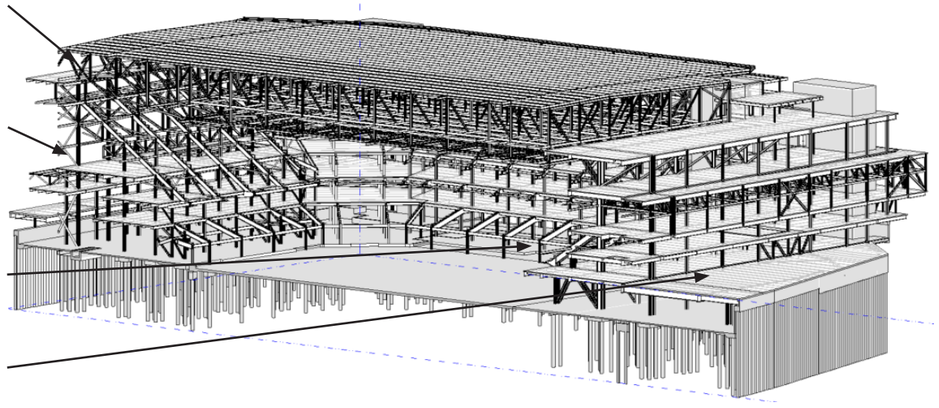
North South Section

WEST SUPPORT TO ROOF SIMPLIFIED TO LEVEL 5 INTERFACE

UPDATED PRIMARY STEELWORK SIZING INCLUDING FLOOR BEAM REVIEW

LOWER TIER CHANGED FROM RETRACTABLE TO PERMANENT

GLOBAL MOVEMENT JOINTS RATIONALISED TO FOUR QUADRANTS



East West Section

Event Floor

The event floor is key to providing a flexible space suitable for a myriad of different shows and productions. Events such as Monster Trucks can impart huge impact loads on to the event slab, which will need to be considered. The design criteria for this area is a uniform load of 30 tonnes per m2 or individual point loads of 10 tonnes.

400mm thick ground bearing slabs will transfer and distribute these large loads to the ground. Given the ground conditions, which are largely made ground at the event floor level, we have identified localised areas where additional piles are required to reduce future settlement due to secondary consolidation.

The event floor slab structure will be monolithic except for construction joints.

Outside the event floor the slab thickness is typically reduced to 200mm, except directly under the loading bay, which will be 300mm thick.

Piling

Piles supporting the arena superstructure and roof are proposed as a split of Continuous Flight Auger (CFA) and Rotary bored, in advance of detailed pile design and rig selection by a piling sub-contractor. The precise split is to be determined by the piling contractor.

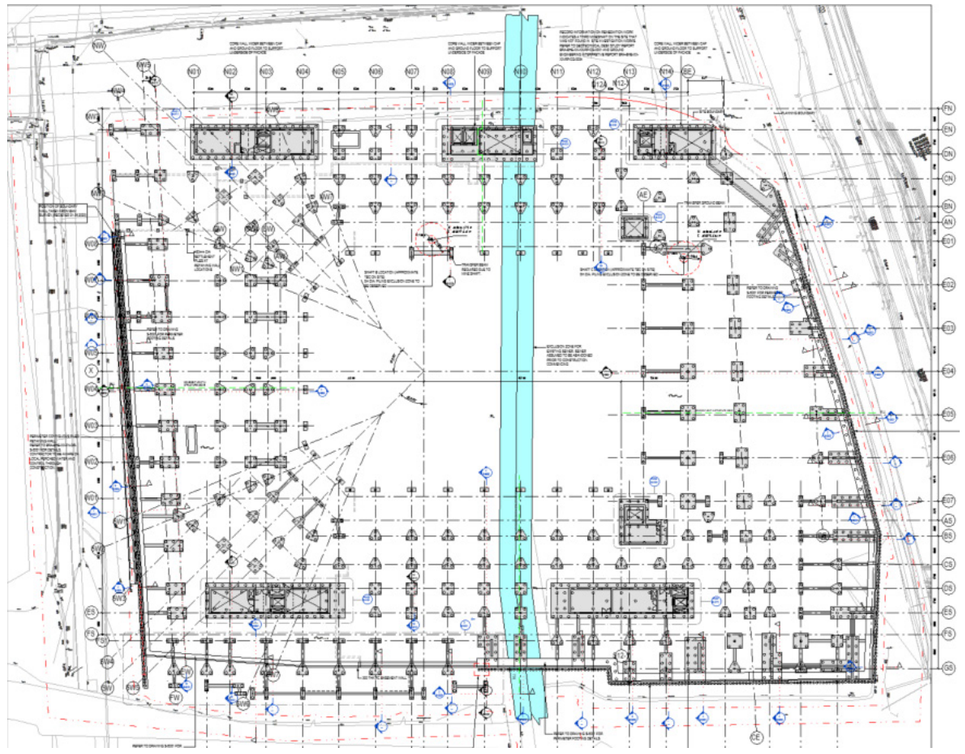
Rotary bored piling is the most suitable/flexible technique in these conditions. It is critical to avoid founding directly in a coal seam, and only with rotary bored piling is it possible to verify the condition at the toe of the pile.

The use of CFA piles in place of rotary bored is permissible and to contractor choice, pending satisfactory rig selection and trials/testing in accordance with the BH specification. There is a significant risk of locations where CFA piling will not be possible due to below-ground concrete obstructions and hard sandstone/ ironstone strata which the rig may not be able to penetrate. In addition, the length of bore within rock will be at the upper limit of what all but the most powerful CFA rigs can achieve.

Risks can be mitigated to an extent by keeping a standby rotary rig available for use in these locations.

Ultimately, the pile design and choice is by the contractor and a mix of pile types may be the strategy that best balances technical and commercial requirements.

The depth of coal seams across the site varies meaning final pile lengths may vary, so an estimate of pile length to avoid founding within a seam has to be made. We consider that on average, 25m long piles is considered a reasonable estimate based on the number of seams on site and shall be refined alongside piling contractor in Stage 4b. The final lengths and reinforcement will be determined by the piling contractor during Stage 4b, taking account of the variable depths of coal underlying the site and the vertical and horizontal pile loads from the pile schedule.



Piling plan

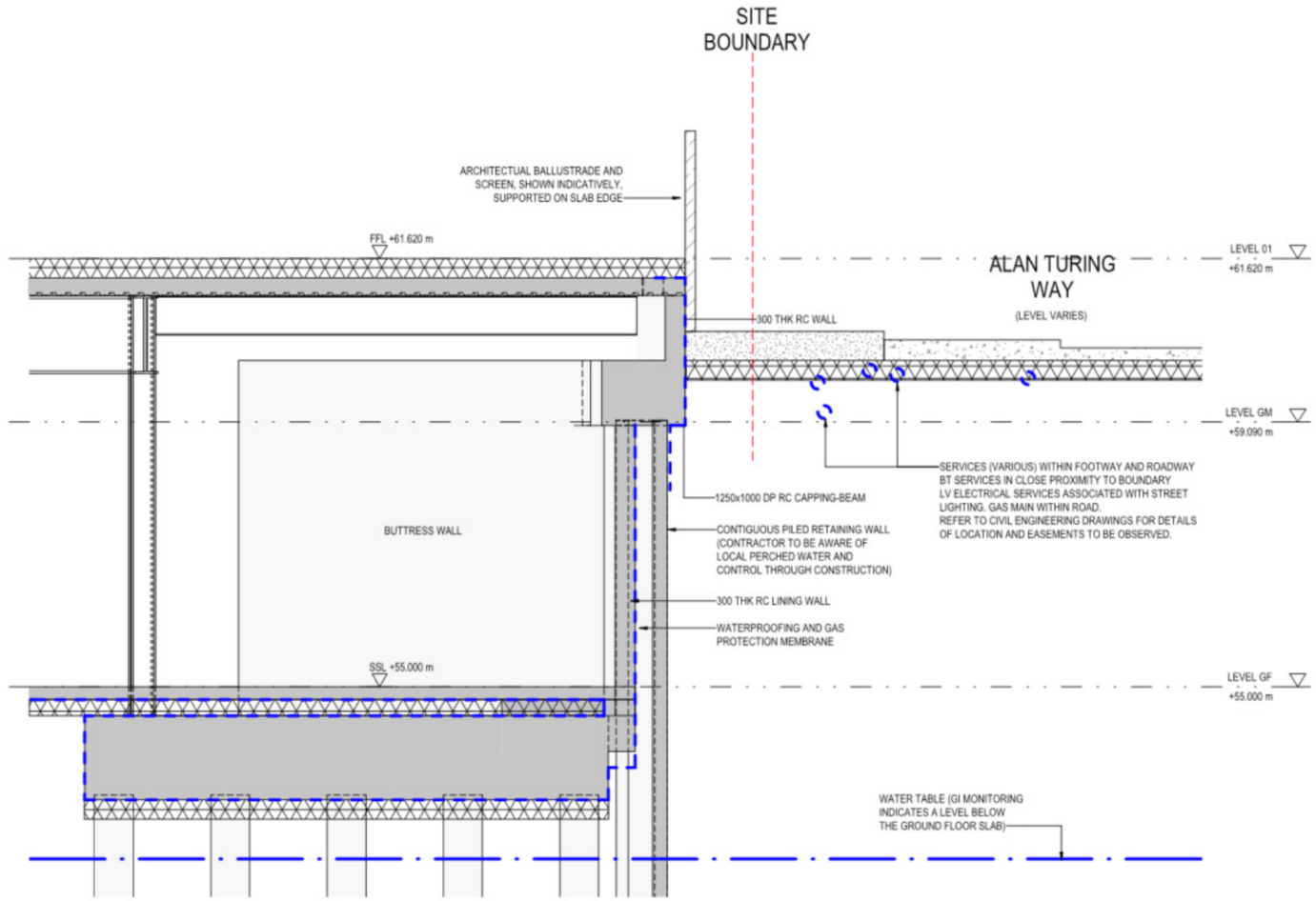
Retaining Walls

The arena is accessed from multiple locations around the perimeter and this naturally leads towards the ground and L01 levels shown within the Stage 4a drawings. The excavation results in the need for retaining structures around the majority of the perimeter of the building. These structures will retain material up to a maximum height of around 7m above the excavated level. Retaining structures of this height are significant engineering and construction elements and have considerable time, cost and complexity associated with them.

The Buro Happold reference design for the retaining wall is a 600mm dia. contiguous pile wall at 700mm centre to centre spacing of piles. The contiguous piles act as a propped cantilever, with the piles founded in the Glacial Till and Coal Measures underlying the Made Ground.

Contiguous piles are proposed as the typical permanent works retaining structure with a tanked reinforced concrete internal basement wall around the entire perimeter.

To keep the piled wall size economical, temporary propping will be required to prevent excessive movements of the wall, prior to propping by internal floor slabs and buttress walls in the permanent condition.



Typical retaining wall section

6.0 BURO HAPPOLD

Deliverables

BRA-BHE-ZZ-XX-RP-S-0100 Structural Design Report provides an introduction to the structural engineering document suite and provides the list of documents within the Stage 4a package.

Description reports are key documents which provide commentary on the key structural packages and should be read alongside the structural drawings and specifications. The description reports also indicate some areas where package contractor input would assist in developing more cost effective solutions through co-ordination of multiple package interfaces.

Current Status

Substructure

Substructure information was developed to Stage 4a draft level early in the Stage 4a design stage. This advanced work was carried out to help inform pricing, which needs to account for the Subcontractor design of CDP items that we expect to take place from August 2020 onwards. A pile schedule with loads was issued at this stage to enable Contractor design of substructure elements, this has subsequently been updated incorporating the southern landscaping structure and changes as a result of the lower bowl precast terracing.

Material specifications, waterproofing performance specification, and In-situ concrete description report have been issued as Stage 4a level information. An Approval in Principle document has also been produced for works adjacent to Alan Turing Way.

The retaining wall design has progressed during Stage 4a with the contiguous pile and buttress walls system.

The Buro Happold reference design has been described in a standalone document including geotechnical assumptions, details, retaining wall design assumptions, and construction sequence assumptions.

Superstructure

The superstructure is at a tender stage status whereby a more comprehensive suite of information has been compiled to enable the pricing process.

At Stage 4a the drawing pack now includes 1:100 zone GA drawings at each level, additional key sections, and details. Tonnage and quantity information has been included within the Description Reports which should be used as guidance in addition to the drawing suite.

Structural Description Reports for each package have been compiled to help the Contractor understand the status of some specific areas, and to illustrate where the Package Contractors input may provide cost benefit.

Roof structure

The roof design status is similar to superstructure with the Stage 4a package including 1:100 zone GA drawings at each level, additional key sections, and details. Tonnage and quantity information has been included within the Description Reports which should only be used as guidance in addition to the drawing suite.

The Roof Description Report will also provide commentary to some specific elements and additional information to assist the Contractor.

Roof structure, rigging & access

The arrangement of catwalks, walkways and rigging system philosophy for this project has been developed by Buro Happold through close collaboration with OVG, Populous, and specialist consultants. Throughout this process the key goals have been to develop a rigging system which is safer, faster, higher, stronger and more flexible than that of most comparable arenas in the world.

Intumescent paint

A Structural Fire Engineering analysis has been completed on a draft Stage 4a design which updates the initial analyses conducted at the end of Stage 3. This provides information to assist the costing exercise at Stage 4a.

Further analysis is required to finalise the study on the complete on final construction level information to provide confirmed intumescent requirements.

Secondary Elements

Buro Happold have developed preliminary information for multiple secondary elements. Specific documents provide information to assist costing purposes at this stage.

These are schematic only in terms of aiding costing and do not represent final design documentation due to the interfaces and reliance on co-ordination between packages and sub-contractors. Detailed design of these elements will be required to complete design intent for contractor final design.

Next Steps

It is expected that some Stage 4b activities will be required in advance novation to the preferred contractor and start on site. This is to facilitate the construction programme where substructure commences at a similar time to 4b.

Subject to agreement with the Client and the preferred contractor the following activities will be developed in advance of Stage 4b;

- Development of substructure information to Stage 4b level
- Development of core wall and foundation information at ground level to Stage 4b level
- Liaison with piling sub-contractor
- Liaison with substructure concrete sub-contractor
- Waterproofing and gas membrane information to inform sub-contractors
- Review of information on all structural packages to inform potential savings for VE items proposed by sub-contractors

The following activities are expected in Stage 4b following novation to the Main Contractor;

- Development of superstructure information to Stage 4b level
- Development of roof information to Stage 4b level
- Liaison with superstructure sub-contractors
- Commencement of additional items, if instructed, such as major façade support steelwork design

Contribution to key client outcomes

To create a '**Next Generation Venue'** that is economically sustainable the roof and rigging provision has been developed to be high and strong.

To be the '**Touring Community's Favourite**' the roof infrastructure has been developed to allow swift show changeovers – fast and safe.

The form of the bowl, suitability for retractable seating, and a high load capacity event floor will help to create an enhanced and flexible fan experience.

The use of a predominantly steel frame to minimise the construction programme.

The service yard has been designed to maximise operational effectiveness within the constraints of the site and the building form above.

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CIVIL ENGINEERING

6.3

6.3.1 Civil Engineering

This section summarises the civil engineering design at the end of Stage 4a and should be read in conjunction with the civil engineering drawings.

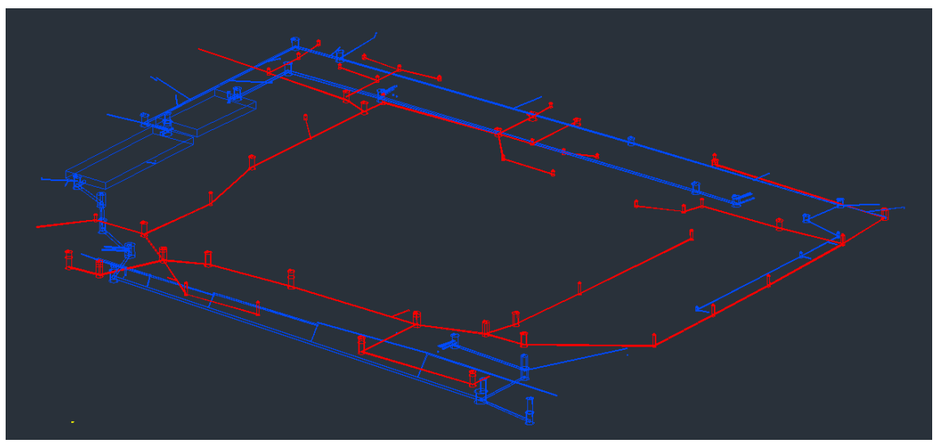
Overview

Below slab drainage

Drainage layouts have been further developed to co- ordinated with the above ground public health design (by MEE) and the sub-structure. Foul Water discharge can be achieved under gravity to the existing public sewer within the site boundary in the north-eastern corner of the site. United Utilities has confirmed that capacity is available for the arena to discharge feely to the public sewer.

The surface water drainage scheme has been further developed in conjunction with the MEP design and rainwater harvesting specialist. The attenuation tank has been split in two: 405m^3 is provided as a traditional attenuation tank, a further 275m^3 is then provided as an active rainwater harvesting tank. This allows the rainwater harvesting system to function as part of the attenuation system, so minimising the overall volume of tanks required.

Surface water is discharged under gravity to the existing, private campus drainage network in the north-west corner of the site.



Highways

Modifications to existing highways are proposed in three areas around the main Arena. Designs have been developed both for permanent modifications to the highways and temporary traffic management overlays for use in different scenarios on event days. The designs have been developed in liaison with CFG and MCC Highways and have been subject to independent safety audits. Design packages for all three areas have been submitted to MCC Highways to progress formal s278 technical approvals. The s278 legal process can then be progressed once the scheme has been granted planning permission.

• Gate 1 Access

It is proposed to modify an existing unused junction to allow left-in/left-out traffic to access the car parks. Works involve the widening of the route on approach to the junction to allow dedicated vehicle lanes, separate to the pedestrian areas. This removes the conflict caused by the shared spaced currently available, which is understood to be the reason for closure of the existing junction.

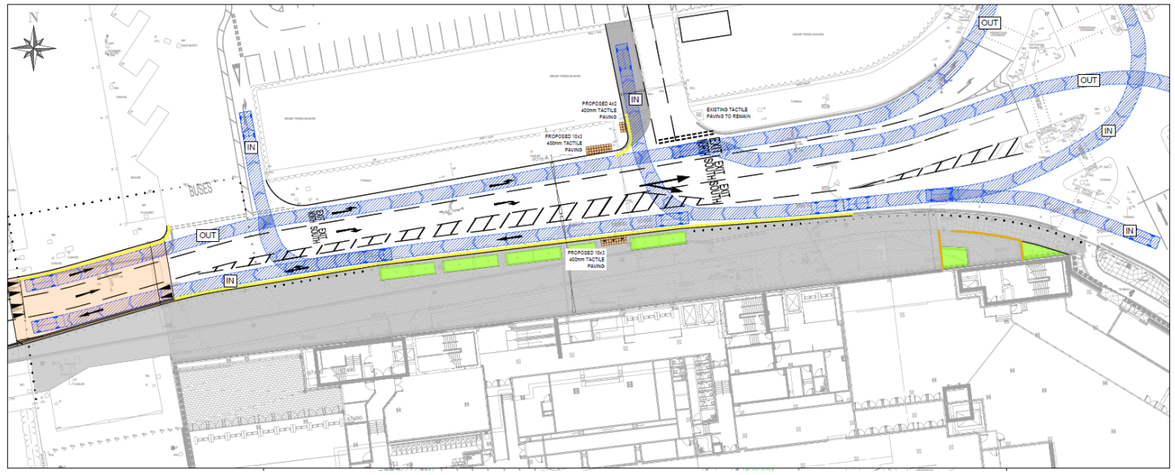


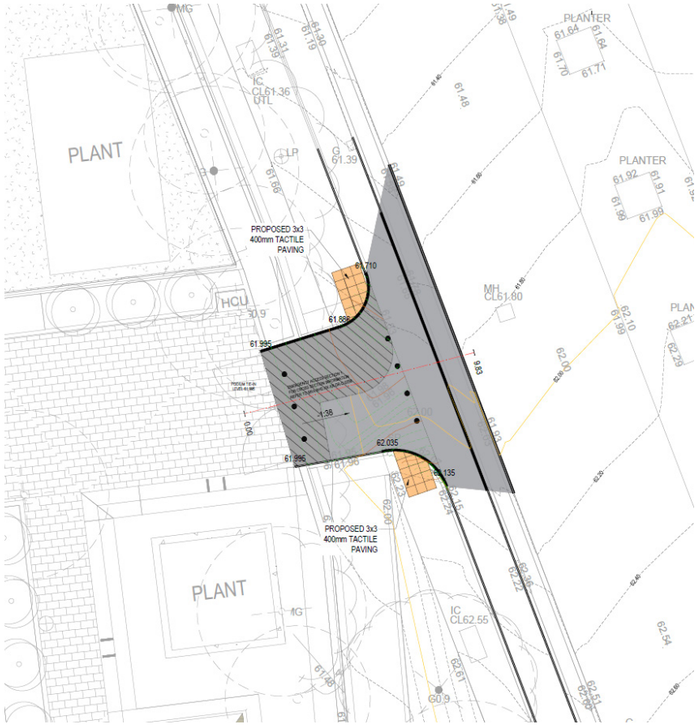
• Sportcity Way

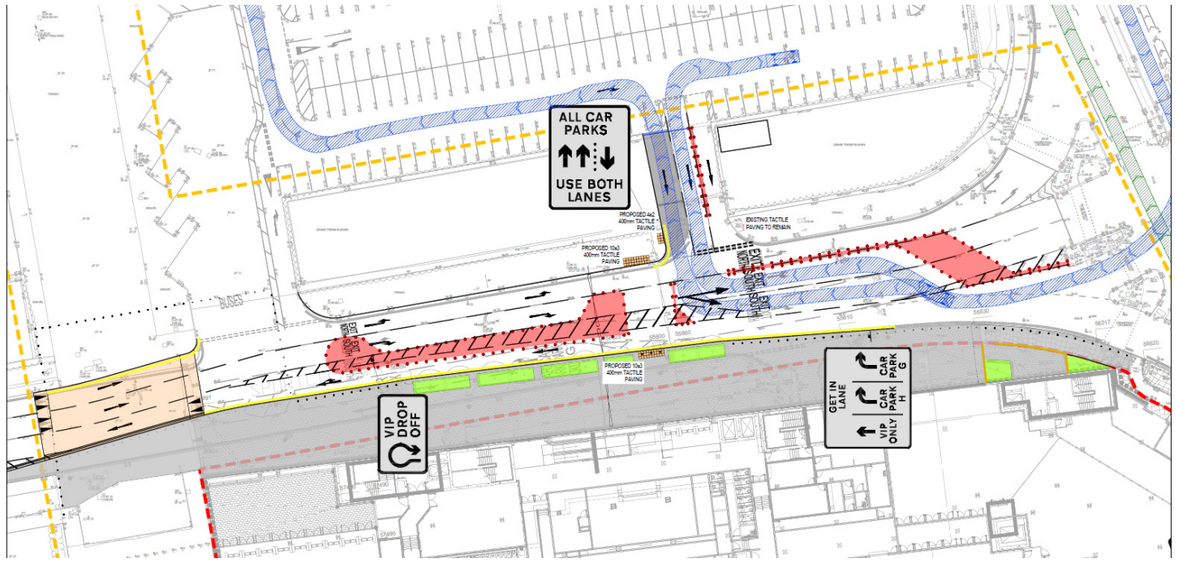
It is proposed to close Sportcity Way to vehicle traffic during an Arena event, in the interests of pedestrian safety and security. The footways of Sportcity Way also require widening to accommodate the anticipated crowd flows leaving the venue at the end of an event.

• Emergency Access

An access is to be provided directly from Alan Turing Way onto the south-eastern corner of the podium, to provide an emergency access point for fire tenders. The simple access is formed through modification of an existing cycle facility and traffic island.



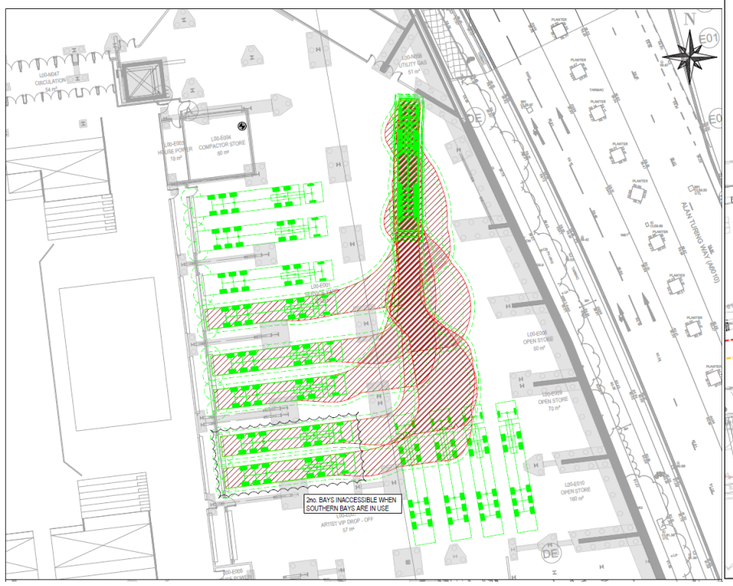


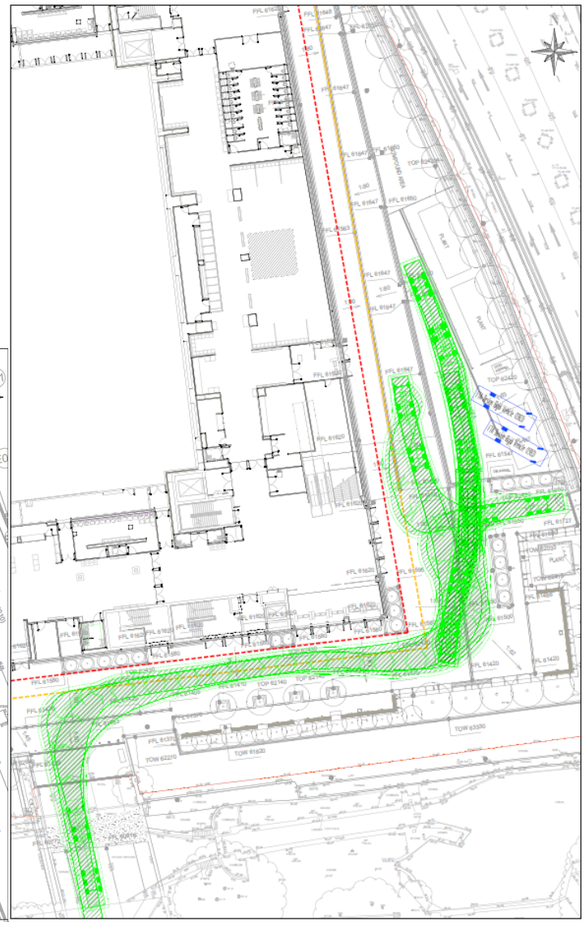


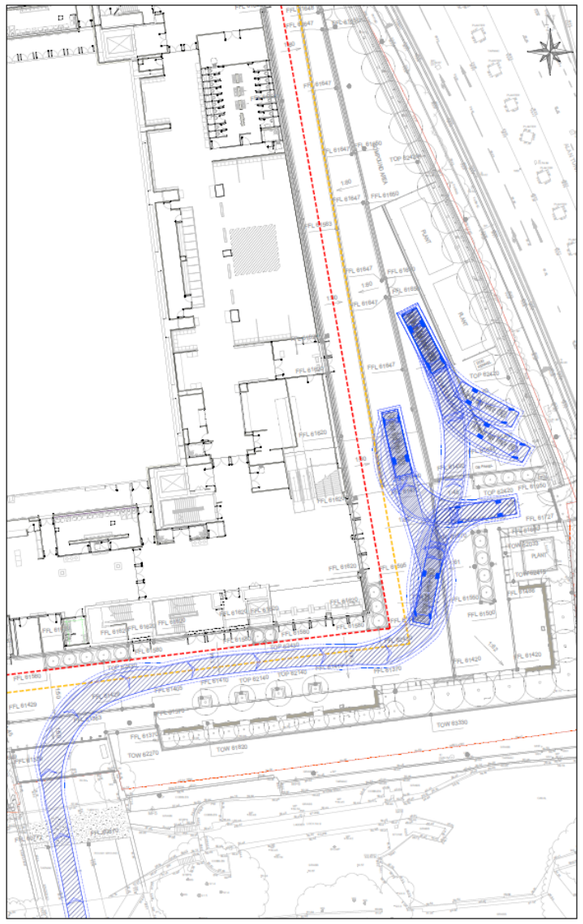
Vehicle Tracking Analysis

Vehicle tracking analysis has been iterated through the Stage 4a design period to verify the Architectural and Structural design of the L00 service yard and L01 podium. Design vehicles are able to enter each area, turn and park, then depart again in a forward gear.

The L00 service yard provides 12 parking spaces for full size articulated HGVs. Two of these bays can become blocked by parked vehicles so will need to be considered in the planning of loading operations in the yard, if all parking bays are required simultaneously.







Sewer Diversions

United Utilities sewer records and verification surveys have identified the presence of public sewers within the site boundary. A 375mm diameter sewer runs across the site from south to north at a depth of approximately 8-12m. Shallower sewers within the site boundary have been demonstrated by survey to be redundant and an application for closure of these sewers has been accepted by United Utilities.

Surveying of the deep sewer has demonstrated that there is only one live connection. The live connection serves MetroLink track drainage to the south of the site. United Utilities have stated that the track run-off should not be discharging to the public sewer and Transport for Greater Manchester (TfGM), the owners of the MetroLink, have been challenged to prove the legality of the connection. To date, TfGM have not been able to prove, to the satisfaction of United Utilities, that the connection is legal.

United Utilities have stated that, in order to enable the closure of the existing deep sewer, an alternative discharge route for the MetroLink track drainage must be provided. The preferred discharge route is a gravity connection to an overflow sewer to the south. Initial surveying of the overflow sewer has demonstrated that the connection is technically viable. Following consultation with United Utilities, separate applications have been made for:

- A new connection to the overflow sewer to serve the MetroLink track drainage.

- Closure of the existing deep sewer.

Further surveying of the overflow sewer is proposed in order to identify the alignment and condition of the sewer and the pipe material and allow the design of the connection to be finalised.

The diversion of the sewer remains a critical programme risk with potential impact on piling and grouting.



Utility Diversions

A number of utility diversions are required to provide a clear site for the Arena building, and to allow modification to surrounding highway extents.

Each is summarised in the table below:

Refer to drawing reference: BRA-BHE-XX-XX- DR-C-0020 for onsite diversions. Refer to drawings BRA-BHE-XX-XX-DR-C-0211, 0231 and 0240 for utilities affected by highway works.

Consultee	Enquiry Reference Number(s)	Requirement	Status
Main Site Diversions			
BT Openreach	ON-F01801809	Check of Openreach assets clearance from proposed retaining wall	Site meeting held in Dec. 2019. Openreach assets of sufficient clearance from proposed retaining wall. Openreach expect trial pits prior to boring of retaining wall. Trial pit results received confirming ducts are where are in anticipated location and unaffected. No Works Required
United Utilities	4200028804	Abandonment of sewers (S116)	Refer to sewer diversion section
United Utilities	None received	Abandonment of redundant water main	Water main identified on site from trial pit results. Confirmed as redundant by UU. To be removed from site free of charge by UU.
Vodafone	006549	Diversion of existing communications cables	Vodafone site survey has confirmed ducts are non-existent on site and that their assets are unaffected by the main site works. No Works Required
ENWL	None Received	Diversion of existing electricity cables	Diversion works provisionally programmed by ENWL to begin on 29th July. Excavation works to last until 21st August. Awaiting confirmation on jointing work dates.
Cadent	None Received	Locating of existing redundant gas main	Cadent provided asset information on possible redundant gas main through site. Trial pits were undertaken however no evidence of gas main was found. No Works Required
Cadent	NWGD215154 / 32969621	Removal of live LP gas main	C4 quote received for removal of gas main. Cadent to progress works once payment received with approximate 16-week lead-in time.
BT Openreach	Overhead cables	Removal of existing overhead cables	Quotation received for removal of overhead cables. Openreach to progress with works once payment received.
Gate 1			
Cadent	NW_GE1B_3FWP_052251 NW_GW1B_3SWP_625357	Possible diversion of Cadent Gas mains below widening of junctions into northern car park	Trial pit results over gas main received. Cadent have confirmed that gas main is deep enough to be unaffected at approx. 1.70m deep. No Works Required
ENWL	None	Possible diversion of cables below widening of junctions in northern car park	Trial pits results have shown that LV cables are at satisfactory depth – confirmed as unaffected by ENWL. No Works Required
BT Openreach	831199	Possible diversion of BT Openreach cables below Sports City Way junction into northern car park	Trial pit results received over the Openreach cables. Confirmed as being unaffected by Openreach due to satisfactory depth. No Works Required
Vodafone	006549	Possible diversion of Vodafone cables below Sports City Way junction into northern car park	Based on trial pits received over the cables, slew and lower confirmed as being required. Awaiting C4 quote from Vodafone.

6.0 BURO HAPPOLD

Consultee	Enquiry Reference Numbers(s)	Requirement	Status
Sports City Way – Junction Widening			
Cadent	NW_GE1B_3FWP_052251 NW_GW1B_3SWP_625357	Possible diversion of LP gas main	Trial pits results have located gas main. Cadent are satisfied that the gas main has adequate clearance from main site works and that security bollard foundation depths are satisfactory over the gas main. No Works Required
Cadent	NW_GE1B_3FWP_052251 NW_GW1B_3SWP_625357	Possible diversion of LP gas main	Trial pit has confirmed depth of gas main as approx. 1m. Cadent satisfied that main is deep enough to be unaffected by junction widening works. No Works Required
BT Openreach	ON-F01801809	Possible lowering of Openreach cables required	Trial pit results have confirmed that cables are at satisfactory depth below proposed junction widening. Results confirmed by Openreach. No Works Required
Gamma	None received	Possible lowering of Gamma cables required	Gamma have confirmed they do not have assets in the area. Ducts are owned by CFG. No lowering anticipated as ducts are deemed to be at satisfactory NJUG Specification depth of 730mm. No Works Required
Traffic signal cables	None received	Possible lowering of traffic signal cables	Trial pit results have identified ducts anticipated to be traffic signal cables as shallow. Quote received from MC to lower cables and work to be conducted at commencement of junction widening works.
Emergency Vehicle Access			
Cadent Gas	NW_GE1B_3FWP_052251 NW_GW1B_3SWP_625357	Possible diversion of Cadent Gas main below emergency access	Trial pit results received and identify LP gas main at 1.20m deep. Confirmed as unaffected by Cadent. No Works Required
ENWL	None	Possible lowering of cables below emergency access	Trial pit results have confirmed that cables are at satisfactory depth. Results confirmed by ENWL. No Works Required
BT Openreach	831199	Possible lowering of Openreach cables below emergency access	Trial pit results have confirmed cables are deep enough below proposed works to be unaffected. Results confirmed by Openreach. No Works Required
Vodafone	6549	Possible lowering of Vodafone cables below emergency access	Trial pit results have confirmed that Vodafone cables are shallow and require slew and lowering. C4 quote received from Vodafone. Payment has been processed by OVG and works are due to be undertaken by Vodafone. Lead-in time of 4 weeks anticipated.

Deliverables

Drawings:

Highways:

- Sportcity Way: BRA-BHE-XX-XX-DR-C-0210 to 0222
- Gate 1 Access: BRA-BHE-XX-XX-DR-C-0230 to 0241
- Emergency Access: BRA-BHE-XX-XX-DR-C-0250 to 0260

Internal Vehicle Tracking:

- Service Yard: BRA-BHE-XX-XX-DR-C-0600 & 0601
- L01 Podium: BRA-BHE-XX-XX-DR-C-0603 to 0605

Drainage:

- SW GAs: BRA-BHE-XX-XX-DR-C-0301 & BRA-BHE-XX-01-DR-C-0301
- FW GA: BRA-BHE-XX-B1-DR-C-0401
- SW Long Sections: BRA-BHE-XX-XX-DR-C-0320 & 0321
- FW Long Sections: BRA-BHE-XX-B1-DR-C-0401 to 422
- SW MH Schedules: BRA-BHE-XX-XX-DR-C-0391
- FW MH Schedules: BRA-BHE-XX-XX-DR-C-0491
- Construction Details: BRA-BHE-XX-XX-DR-C-0551 to 0559

Specifications:

- Below Ground Drainage Specification: BRA-BHE-XX-XX-SP-C-0001
- Q10 Kerbs & Channels Specification: BRA-BHE-XX-XX-SP-C-0002
- Q20 Sub Base Specification: BRA-BHE-XX-XX-SP-C-0003
- Q22 Asphalt Paving Specification: BRA-BHE-XX-XX-SP-C-0004
- Q25 Bricks & Slabs Paving Specification: BRA-BHE-XX-XX-SP-C-0005
- Northern Car Park Access Highway s278 Specification: BRA-BHE-XX-XX-SP-C-0100
- Emergency Access Highway s278 Specification: BRA-BHE-XX-XX-SP-C-0101

Calculations:

- Building Control Drainage Calculations: BRA-BHE-XX-XX-RP-C-0133

Current Status

The Civil Engineering design has been developed and co-ordinated to a RIBA Stage 4a level. Design development will be required to produce 'for construction' design during RIBA 4b and 5, once the design team is novated to the contractor.

The following enabling works packages are noted as being critical the programmed start on site, and will continue to be developed prior to novation and the start of Stage 4b:

- United Utilities sewer abandonment approval for redundant shallow sewers within the site.
- United Utilities sewer abandonment/diversion for the live, deep level sewer crossing the site.
- Utility diversions for on-site and s278 highway works area, including:
  - Electricity North West 6.6kv cable diversions.
  - Removal of overhead BT services
  - Lowering of Vodafone cables beneath s278 areas
  - Cutting back and capping off of gas main in north-west corner of the site.
- Progressing S278 technical approvals from Manchester City Council for the public highways works.

Contribution to key client outcomes

Civil Engineering provides key inputs to ensuring the building is **"Functional, Affordable and Delivered on Time**". Including, agreeing diversion and abandonment of existing utilities to deliver a clear site for construction and optimising of drainage strategies and integration with rainwater harvesting.

The arrangement of the service yard and ensuring access is simple, achievable and intuitive is also important to ensuring the building is "**Better Than The Competition"** and "**The Touring Community's Favourite**".

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FACADE ENGINEERING

6.4.1 FAÇADE ENGINEERING 692

6.4

6.4.1 Façade Engineering

Overview

During Stage 4a, Buro Happold Façade Engineering has focussed on supporting the architect in developing the façade design for OVG Manchester. This stage focused on:

•External Wall System (EWS) type definition.

•Suitability of the EWS systems and their respective coordination

•Establishing key performance criteria for each façade type and assessing achieving these performances.

•Review of material selection and assessing suitability.

•Development of key technical sketch details to inform the Architect's design and drawing tender pack (see next page for a selection of details prepared for main façade)

•Producing the Façade Performance Specification, outlining the technical performance requirements that form the Employers Requirements.

As in the draft Stage 3 report, a number of different façade types have been identified in the building. Predominantly precast concrete at the ground level, and above floors consisting of mineral wool filled composite panel façade with incorporated metal perforated fascia panels. The fascia panels extend to the parapet level incorporating lighting, with an aluminium back panel designed to achieve the lighting aspirations.

Each of these façade types have been considered for acoustic and thermal performance, as well as wind loading and air tightness. All of these factors, as well as fire performance and security ratings, are critical to balance in a final façade design, which also has integrated lighting at key locations.

It is noted that post the draft Stage 3 further development has been discussed in relation to the façade types, as well as dialogue on the extent of LED inclusion with the façade panels.

Similarly, lighting is now planned for inclusion at the upper tier of the building only, which simplifies items such as the provision of cavity barriers in the façade.

Current Status

The Design Stage and Tender activities related to Façade Engineering have now been completed.

Moving forwards, there will be involvement with the façade VE activities through attendance at targeted meetings.

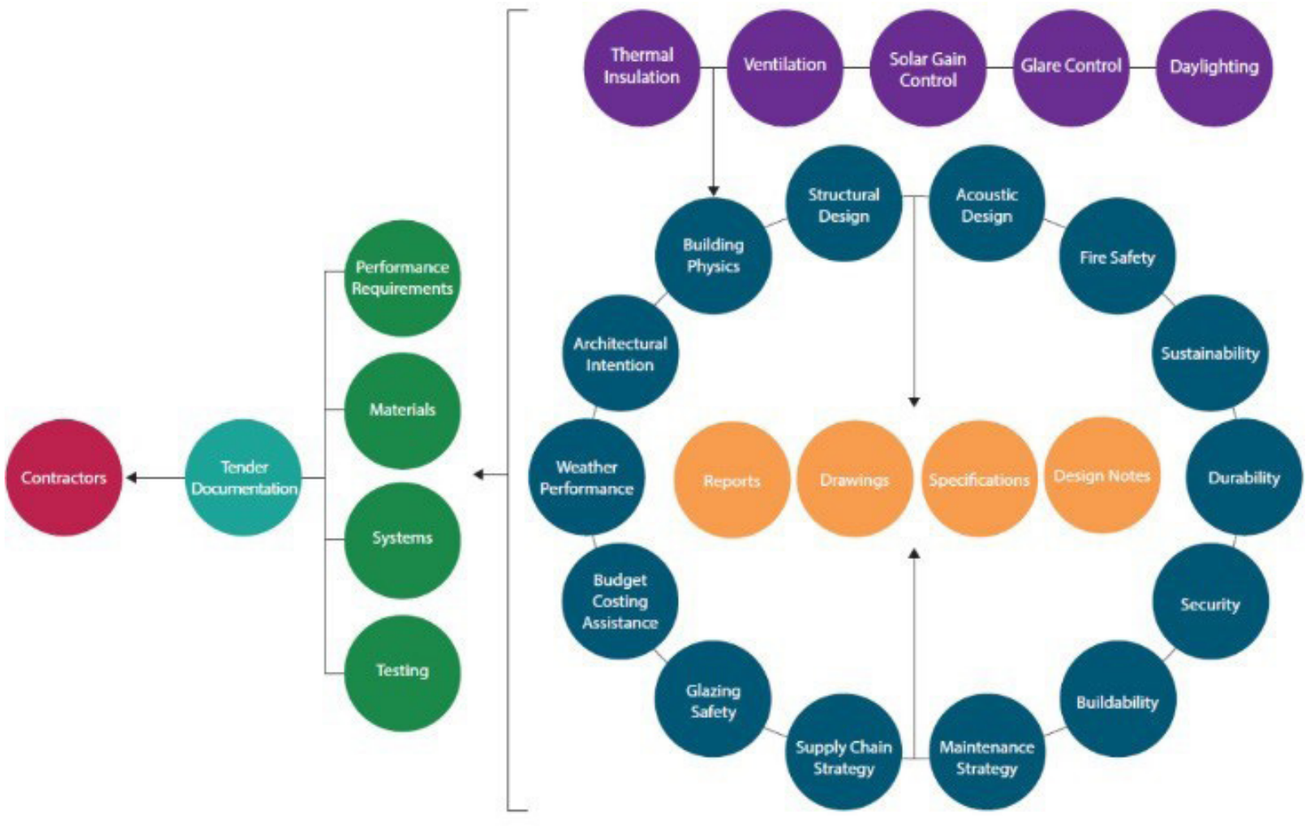
Any further involvement shall be expected through Novation to BAM, providing a review and monitoring role through contractor design, manufacture and construction. Confirmation of appointment pending.

Contribution to key client outcomes

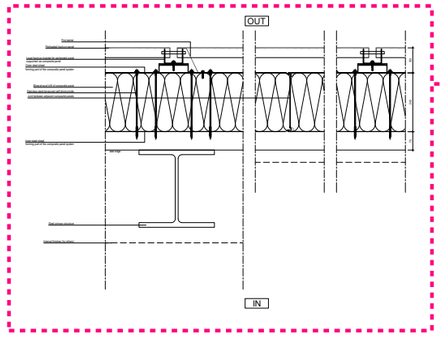
The façade of a building is a key part of the building's identity and an attractor for potential visitors. To make the venue "better than the competition", it should have a broad appeal to audiences and help promote the building as a next generation venue, something the integrated LED lights will contribute too. This activation of the façade will allow the venue's brand to be developed and promoted.

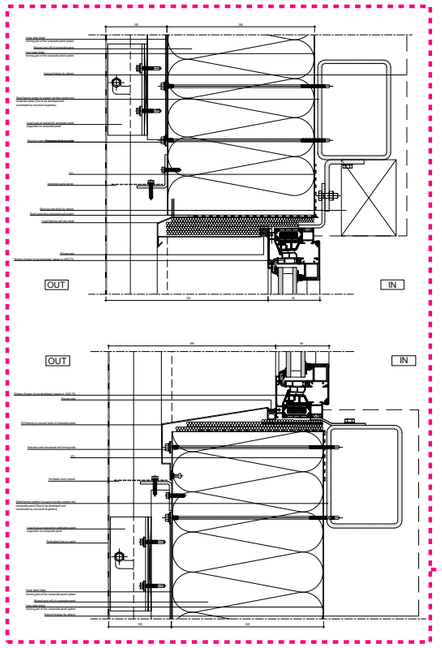
The façade is also a key part of ensuring the venue is safe and secure, both from an external threat assessment (refer to blast report) and from fire-based scenarios. For an assembly building, the safe and secure element is a particularly critical component of being a successful venue,

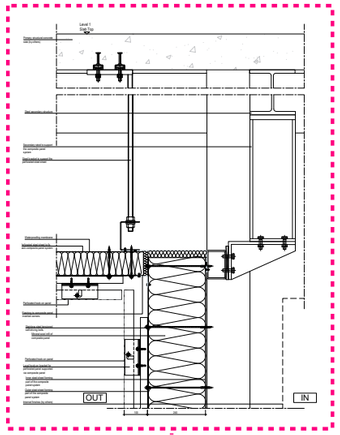
Finally, the façade type needs to remain affordable within the clients budget, which has been a focus throughout Stage 4a.

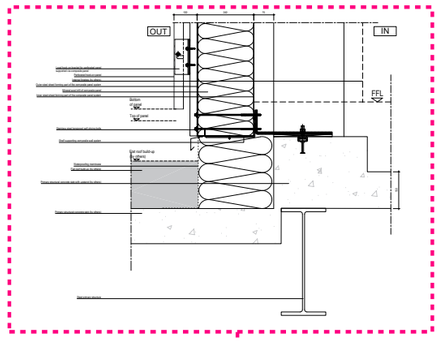


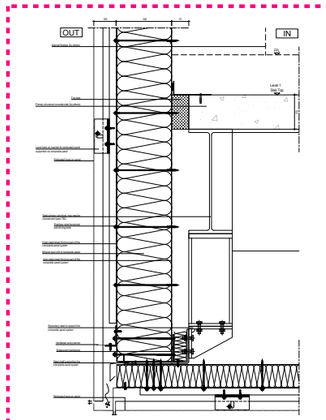
6.0 BURO HAPPOLD

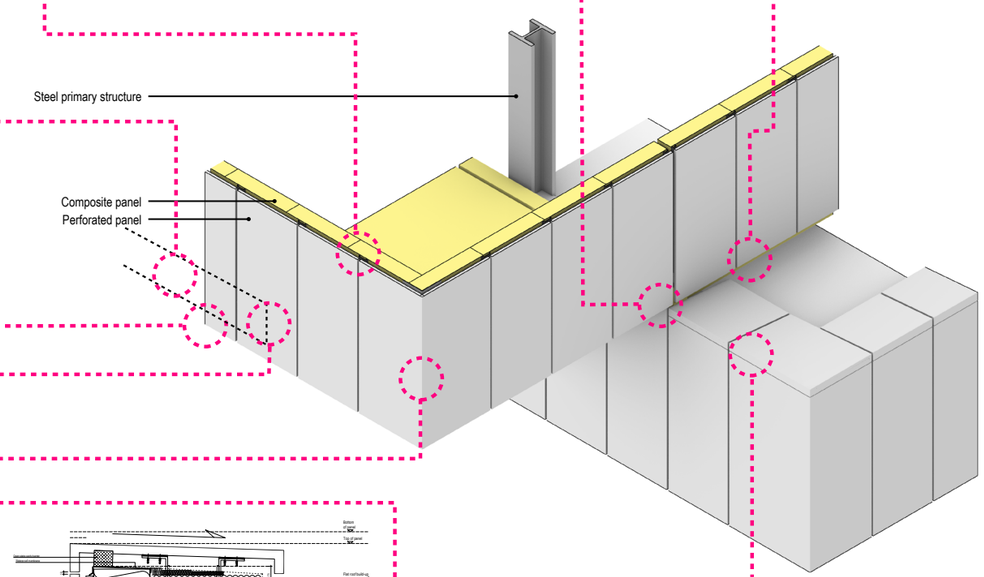




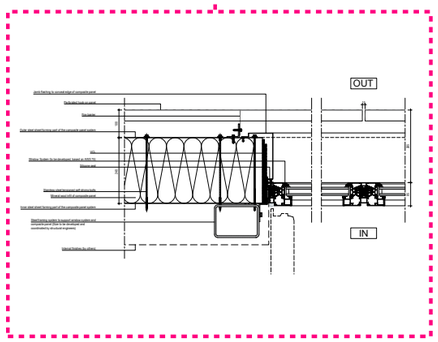


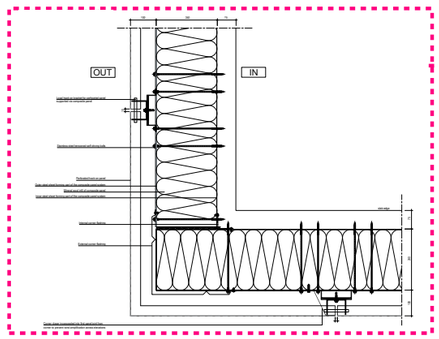


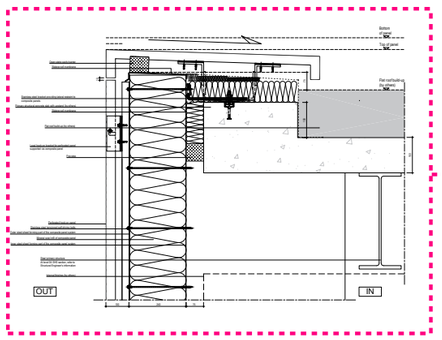




Isometric Top View







GROUND ENGINEERING

6.5

6.5.1 Ground Engineering

Overview

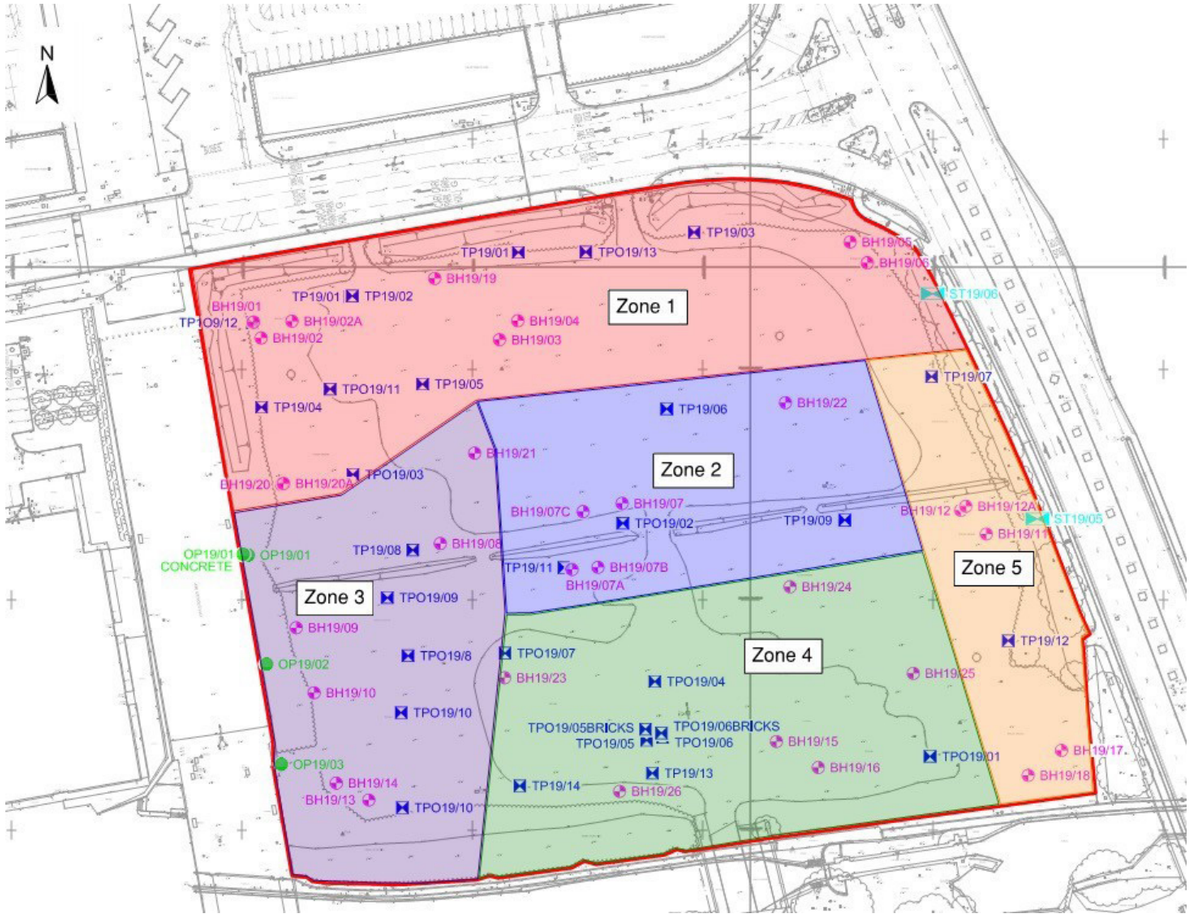
During Stage 4a Piling and Earthworks specifications have been produced. These are based on the Interpretive Report (ref BRA-BHE-XX-XX-RP-CG-0004). A summary of the site conditions and design are provided below.

Site Investigation Findings

An intrusive site investigation was carried out between 9th September 2019 and 31st October 2019. Following the main intrusive works, a programme of groundwater and ground gas monitoring was carried out and completed on 6th December 2019. The site investigation included a total of 26 boreholes, 14 trial pits and 3 structural observation pits to inspect Joe Mercer Way crib wall. An additional two days of trial pitting was carried out to investigate possible obstructions.

The ground conditions comprise variable thicknesses of Made Ground (Fill), ranging between 1.3m up to 17.2m thick. Typically, Made Ground was recorded to greater depths in the north and western parts of the site. The variations can be attributed to the development history (e.g. Bradford Road Gas Works), treatment to mine workings and numerous phases of enabling works across the site. Below the Made Ground the natural geological sequence is formed of Alluvium and/or River Terrace Deposits (<0.5m to 3.0m thick) to the west and north; Glacial Till (0.9m to 12.0m thick) to the east and south; the Pennine Upper, Middle and Lower Coal Measures (base not proven). The Coal Measures comprise interbedded layers of predominantly mudstone, with sandstone, siltstone and coal. Faulting has been recorded within the area, the nature and extent of the faulting is not known.

There are a number of coal seams that have been recorded on site based on the recent site investigation and the investigations carried out in 2009 by May Gurney. The main worked seams include Bradford ¾ and Bradford Four Foot. These seams were subject to treatment in 2004 and 2011. There are also two shafts that have been located on site and have either been plugged or capped.



Site Investigation Plan Showing Borehole & Trial Pit Locations

Summary of Site Geology

Strata	Zone 1 Level Top			Zone 2 Level Top	Zone 3 Level Top		Zone 4 Level Top			Zone 5 Level Top
	mbgl	mOD	mbgl	mOD	mbgl	mOD	mbgl	mOD	mbgl	mOD
Made Ground / Fill	GL	57.7	GL	59.0	GL	59.5	GL	60.2	GL	60.0
Alluvium	10.8*	46.9*	-	-	9.0	50.5	7.4	52.8	-	-
River Terrace Deposits			-	-	10.5	49.0	-	-	-	-
Glacial Till	12.3	45.4	9.0	50.0	11.0	48.5	8.2	52.0	4.0	56.0
Coal Measures	17.7	40.0	12.5	46.5	13.5	46.0	13.0	47.2	13.0	47.0

Foundation Design Considerations

The results of the ground investigation show a large variation in the thickness of the Made Ground as well as its constituents. Alluvium and River Terrace Gravels are present to the west of the site, where in places the Glacial Till is absent. The Glacial Till is present across the majority of the site overlying the Coal Measures which is predominantly Mudstone. Several coal seams have been identified. The adjacent graphic shows the ground zoning which corresponds to the above description.

Perched groundwater is present in the Made Ground however there does not appear to be a continuous perched water table. The groundwater level in the Coal Measures is relatively level and a design level of 41mOD has been adopted.

The results of the ground investigation show that the Made Ground has not been properly compacted. A review of the history of the Made Ground has been undertaken and an assessment of the ongoing secondary consolidation made. In some locations there may be a risk of large settlements of the Made Ground beneath the ground bearing slab and so the slab design has been updated to take this into account and a limited number of settlement reducing piles will be utilised where appropriate.

Piles taking their capacity from rock sockets are the adopted foundation solution. Historic grouting works have been undertaken on the site, and the Contractor is responsible for satisfying themselves as to their adequacy. Outside zones of grouting piles will need to found either 10 x seam thickness above or punch through any coal seam. All piling proposals will need to be agreed with the Coal Authority.

A large excavation is required to reach formation level and therefore retaining walls will be necessary. The Engineer's reference design is for contiguous piles walls and indicative construction sequences are provided.

Due to the varying geology across the site and the possible presence of obstructions, rotary bored piles are recommended, however there are opportunities to use CFA piling techniques where there is a reduced risk of obstructions.

Contamination Considerations

The risk assessment indicates the risks to construction workers from on-site contaminants is Moderate. It is considered that the potential risks to construction workers can be mitigated through good construction practice and adoption of suitable construction methodologies.

The potential risks to occupiers and users of neighbouring land is assessed as Moderate / Low. It is considered the potential risks to these users during excavation, earthworks and construction can be mitigated through standard good practice and adoption of suitable construction methodologies e.g. dust suppression measures.

The potential risk to future site users is assessed Moderate / Low reflecting the potential for exposure in limited areas of soft landscaping.

The potential risks to future site users can be mitigated by the incorporation of an appropriate thickness of subsoil and topsoil materials in these limited landscaped areas.

The risks to future site users and occupiers/ users of neighbouring land from ground gas has been assessed as Moderate and Moderate/ Low reflecting the nature of the ground gas regime (elevated concentrations of CH4, C02 and depleted oxygen) and the nature of the proposed development. Implementation of suitable remediation measures during the proposed development will mitigate this risk.

In accordance with the relevant British Standard, the gas protection score required for the proposed building on a site classified as Characteristic Situation 2 is 1.5. It may be possible to achieve this score through the existing building design without the need for any specific gas protection measures. The building substructure will (by default) provide protection against hazardous gas ingress. A reinforced waterproofed basement slab with minimal penetrations and cracking control (waterproofing additive / membrane within Grade 2 and Grade 3 areas) merits 2-2.5 points.

The assessment indicates the majority of the Made Ground arisings (2/3s) would be classified as Non-Hazardous Waste, but with a portion (1/3) of the material classified as Hazardous Waste. The underlying natural soil would likely be classified as Inert (unless exhibiting visual / olfactory evidence of contamination). It is the enabling / earthworks contractor's responsibility, in association with the operator and/or owner of the landfill to classify the materials appropriately and ensure disposal and / or re-use in accordance with the relevant regulations.

This assessment indicates that polyethylene (PE), poly-vinyl chloride (PVC) and copper pipes may not be appropriate for potable water supply in the redevelopment of the site within the Made Ground due to the elevated concentrations of contaminants. If Made Ground remains in-situ and the pipes are laid within the Made Ground, barrier pipe materials are likely to be required unless otherwise agreed with the utility company.

Deliverables and Current Status

The piling and earthworks specifications have been issued as tender status. We will undertake a final review of these specifications in August to allow full handover to Skanska.

Contribution to key client outcomes

Ground Engineering is a key consideration in the sub-structure and earthworks strategies. The Site Investigations and study have allowed geotechnical and geo-environmental risks to be quantified and factored into the designs, helping the Arena to be "**Functional, Affordable and Delivered on Time**".

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CROWD FLOW

6.6

6.6.1 Crowd Flow

Overview

Throughout Stage 4a, the crowd flow team have provided ongoing advice and assessment to the design team as the design has developed. This has included ongoing review and updated egress modelling to assess the impact of occupancy changes and VE proposals and developments throughout the venue and to the public realm around the venue. The team has also worked with the client team to review the queues for the Metro link for single-event and multi-event scenarios.

Deliverables

The final Stage 4a report and modelling is summarised in BRA-BHE-ZZ-ZZ-PP-YC-P05.

This study assesses the Stage 4a design to ensure the intent to minimise congestion and optimise spectator experience has been maintained throughout design development.

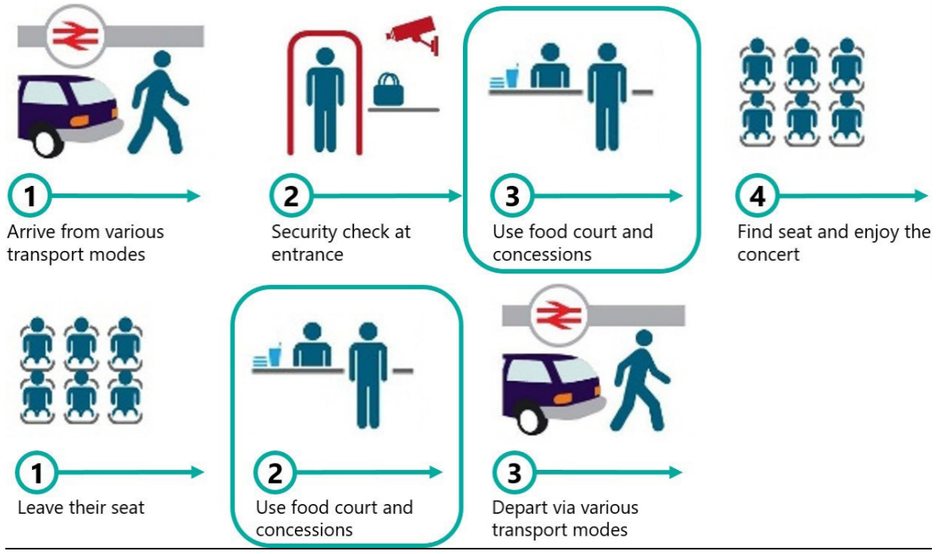
All analysis has been agreed and scoped alongside the client and design team to ensure the correct inputs are used. This includes occupancy numbers, route choices (including the inclusion of internal signage and behavioural considerations such as the proportion of spectators following signage) and discharge locations..

During Stage 4a the analysis has also been extended southwards, reviewing queue numbers and potential designated areas around the metrolink. This study has shown the extend of queues likely for a worst-case scenario and provided potential options for managing this scenario.

A further study will be undertaken upon completion of Stage 4a to assess the impacts of an arena and stadium event finishing simultaneously, as opposed to previous analysis which had focussed on offsetting the events.

This assessment will include City Square to the south of Joe Mercer Way.

As is common with crowd modelling, the final model has not been built on the frozen GAs from mid-June, rather a previous set of plans from 12th May. This is due to the time constraints needed to produce the appropriate deliverables by the end of stage deadline. This said, updates to the occupancy numbers since 12th May have been agreed with OVG and Laudation, and incorporated within our model, such that it requires no further revision.



Spectator Journey Models during arrivals and departures respectively.

Note: After-event activities within the arena concourses and external public realm (e.g. bars remaining open after event) that could prolong the spectator egress period have not been considered for general spectators.

Key outcomes of the work undertaken to date are:

- Total number of security units (MAGs) provided for the Arena is sufficient to cater most of the demand considered within the target queue times.
- Given the site constraints, the solutions finalised in December during Stage 3 provide improved circulation outside the building, particularly in the north, south and west, to optimise spectator experience.
- Sportcity Way, North-West and South-West corners of Joe Mercer Way are key areas of likely congestion. The updated occupancy numbers have slightly increased the congestion in these areas.
- Effective and efficient operational management and signage will be required to ensure safe and comfortable spectator flows - in particular during peak egress. It is noted that, for many events, venue capacity is lower and the levels of congestion will be comparatively reduced .

Our crowd flow assessment of the Etihad Station Westbound Metrolink provides the following high-level findings:

- During a single-event maximum number of spectators queuing for the metro is ~2,770 people and can be accommodated mostly within the existing queueing area on the City Square in front of the Metro station.
- During a multi-event scenario, maximum number of spectators queuing for the metro is ~5,000 people. This can be accommodated within the existing queueing area on the City Square in front of the Metro station and the additional contingency queueing area identified within the Orange Car park.
- An operational strategy (communications, signage, stewards etc.) needs to be developed to manage the multi-event scenario, to direct OVG Manchester spectators from Joe Mercer Way to the contingency queueing area and encourage spectators to use other means of transport (e.g. walk) to minimise the queues and waiting time.

Current status and Items for Approval

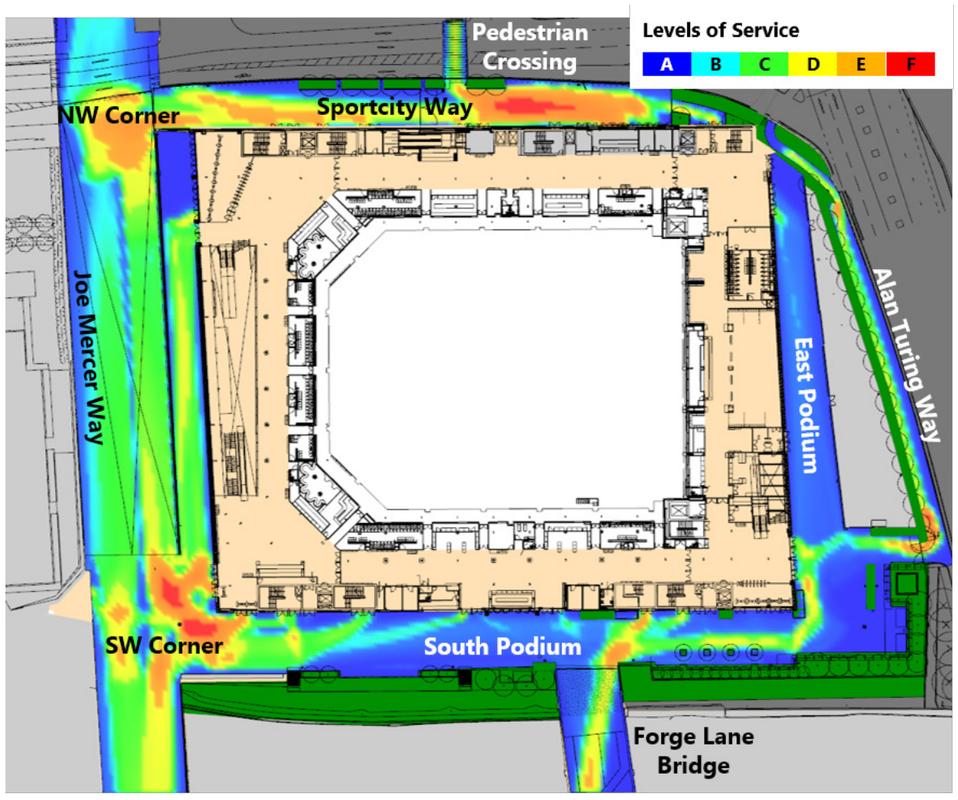
The remaining scope work is the additional multi-event study referenced above, which will be undertaken in July 2020.

Following completion of the Stage 4a modelling, including updated occupancies, there are slightly higher densities recorded around the public realm adjacent to the arena, which should be reviewed by the client for acceptability.

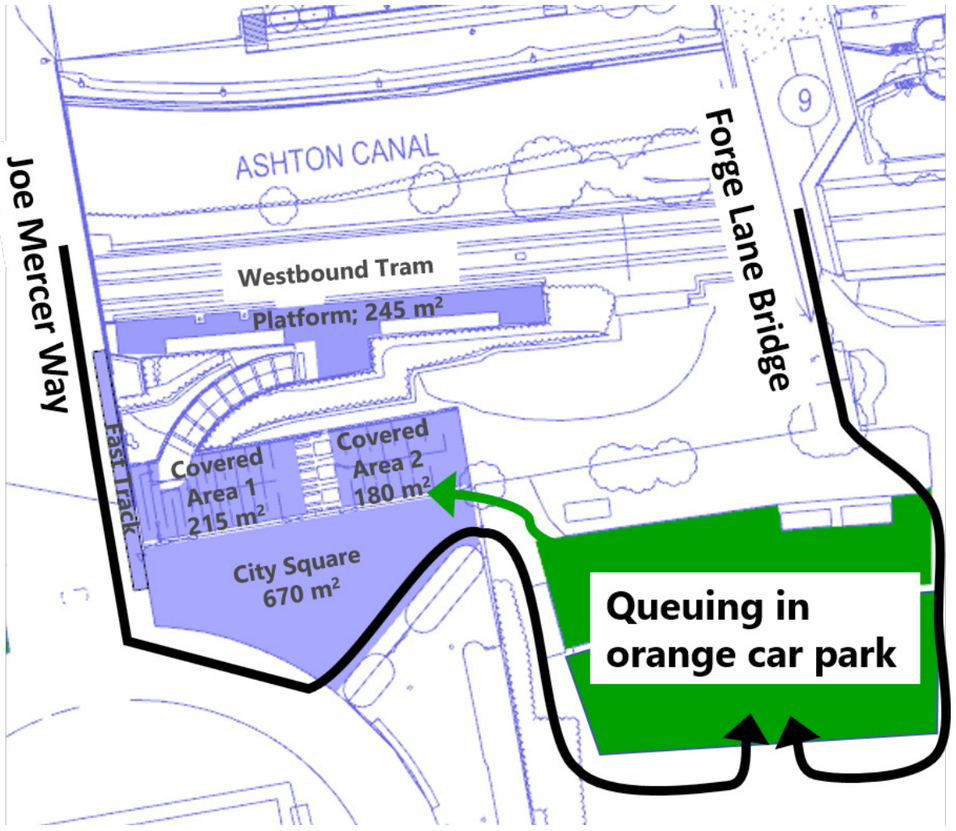
Contribution to Key Client Outcomes

Customers expect to access, enjoy and leave a show in safety and comfort. Positive experiences lead to repeat visits, improved reputation and increased spending by visitors to the venue. Conversely, negative experiences lead to complaints and the consideration of other venues in the future, as well as reduced reputation.

Our crowd flow studies have influenced the design of the external spaces, in particular, to make OVG Manchester **better than the competition**.



Public Realm – Cumulative mean density for 10 minutes of Centre Stage Standing Event egress



OVG Manchester spectator movement to Metro queuing area during multi-event scenario

FIRE ENGINEERING

6.7

6.7.1 Fire Engineering

Overview

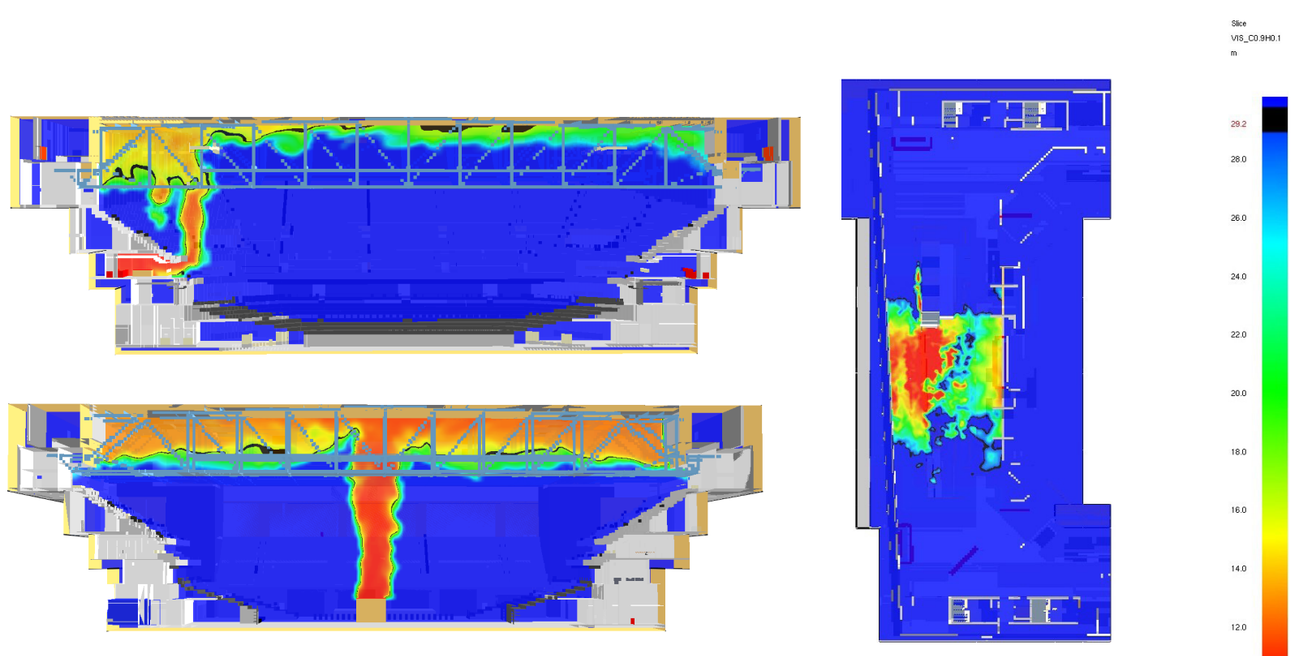
During Stage 4a, the fire strategy has been developed and refined to reflect the ongoing design changes and to incorporate feedback from Building Control.

The CFD Analysis has been completed to confirm the requirements around the venue for smoke extract, including incorporating changes to the architectural design and assisting MEE with placement of extract points.

This analysis has been undertaken in parallel with ongoing review of building occupancies and evacuation routes, to ensure tenable conditions are maintained at all times on evacuation routes. Similarly impacts of VE changes on the design have been assessed and fed into the design process.

Structural Fire Engineering (SFE) Analysis has been updated during Stage 4a to reflect the enhanced level of detail in the structural package to provide further detail on proposals for reducing fire protection to the structure in key locations.

There has been significant discussion with Building Control, both in formal meetings and informal calls between meetings, to bring them up to speed with the design and answer questions they have on the fire strategy. This has included discussion around several derogations from the fire strategy that have been raised by other members of the design team, notably around sprinkler protection in voids and plant areas. Where concluded, these items are included in the Stage 4a documentation. Others will require resolution at a later design stage once the appropriate detail is available to present to Building Control.



CFD smoke modelling in Bowl and Atrium

Deliverables

The primary deliverable from the fire engineering team is the Fire Strategy, which has been updated several times during RIBA 4a and has been further updated at the end of the Stage. This is Document Reference BRA-BHE-ZZ-ZZ-RP-YD-0001 Rev P06.

The fire strategy includes the outputs from the CFD analysis and revised occupancy assessments.

The SFE assessment is now included as a separate submission BRA-BHE-ZZ-ZZ-RP-YD-0002 Rev P03.

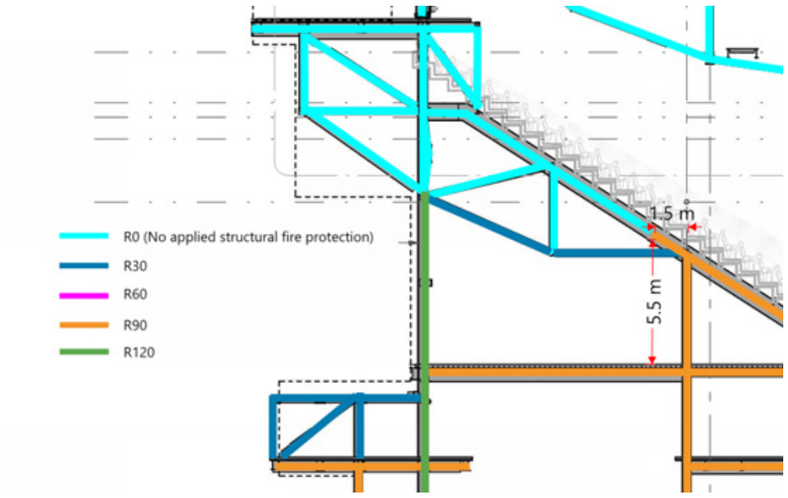
Key outcomes of the work undertaken to date are:

- Confirmation that internal layout and vertical circulation provisions are acceptable to support evacuation
- Input to external site layout to facilitate evacuation and fire tender access
- Development of fire scenarios with the client and discussion with Building Control
- Initial Assessments of structural fire protection requirements for key areas of the building

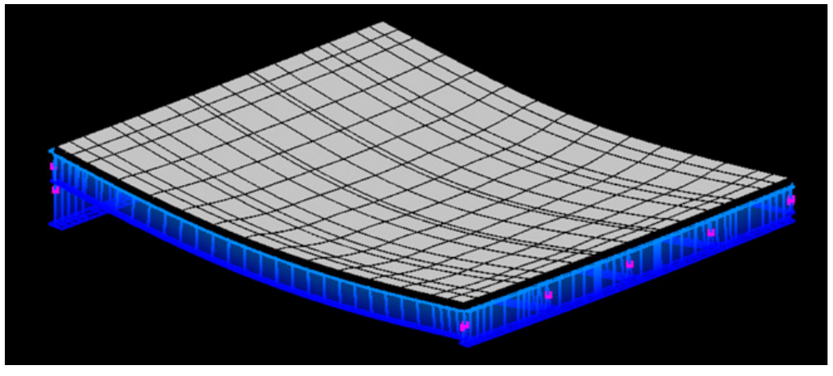
Current Status

The RIBA 4a Fire Strategy report provides a great deal of detail and identifies remaining areas under discussion with Building Control. Early input from the Fire Service has been fed back through the Building Control Officer, and further detailed meetings with them are planned for Stage 4b.

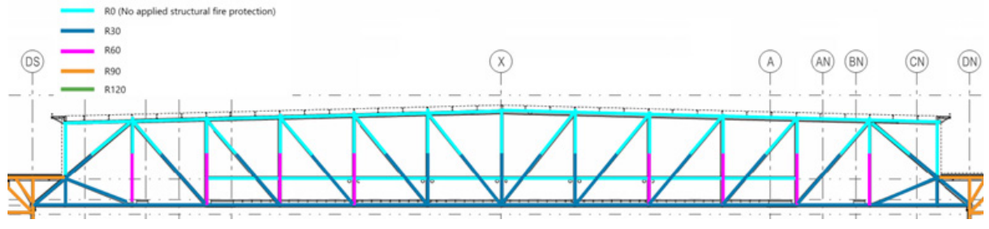
Following this the fire strategy will be updated to reflect any further changes to the design that impact the current strategy.



Initial Structural Fire Engineering Analysis of Roof and West Stand



Structural Fire Engineering Analysis of Slab



Intumescent Requirements for typical roof truss based on Structural Fire Analysis

Contribution to key client outcomes

The fire strategy has been developed in line with the client's aspirations for flexibility within the venue, with the focus on being a **next generation venue.** The combination of sprinklers and smoke control will allow fire load to be placed throughout the venue, rather than keeping circulation spaces "sterile". This unlocks revenue potential for the client, as well as opportunities to maximise visit experience outside of the main bowl space.

Overall this will allow the venue to be "**better than the competition**" both in terms of experience and operations and in terms of fire safety provisions within the building.

The design team work to adopt a fire engineered assessment of escape along with the use of active fire safety measures has allowed the potential occupancy to be maximised within the arena. This allows the venue to be "**better than the competition**" and the "**touring community's favourite"** venue by providing a larger capacity for touring events.

INCLUSIVE DESIGN

6.8

6.8.1 Inclusive Design

Overview

RIBA Stage 4a focussed on the ongoing provision of Inclusive Design advice to the architects and the design team, culminating in key accessibility inputs to the Building Control submissions.

People should be able to make effective, independent choices about how they use the venue without experiencing undue effort or separation. They must be able to participate with equality in the activities that the scheme offers. The design solution has considered not only those barriers that form physical constraints but also barriers experienced by people who are neurodivergent, have mental ill health issues, who are deaf, deafened and hard-of-hearing and people who are blind or partially sighted.

High quality design has been fundamental to achieving all of this, delivering an attractive place that will enable OVG Manchester to compete successfully with other major cities across the world and be regarded as the premier venue in the City.

Deliverables

Our team have reviewed the provision of wheelchair viewing positions in the venue and provided advice on both numbers and design criteria for these.

Furthermore, key areas have been considered around the venue and the surrounding public realm, including:

- Advice on public realm to ensure accessible routes are provided, as well as providing accessible seating as required by code guidance and adhering to BS 8300 and AD M advice on external stair design
- Review of accessible (step-free) entrances to the venue and input to their design parameters
- Input to horizontal and vertical circulation spaces throughout the venue, including stairs, escalators and lifts
- Advice on accessibility requirements for venue facilities, including sanitary accommodation
- Provision for assistance dogs
- Signage and wayfinding strategies
- Interface with the fire team with regard to emergency evacuation of disabled users
- Interface with Security team in terms of disabled access and security arrangements

Our team has also led discussions with Attitude is Everything who were appointed during Stage 4a to ensure alignment between the design approach and aspirations for Gold Charter Status.

Current Status

The current inclusive design scope concludes at the end of Stage 4a following the submission of the Part M strategy to Building Control by Populous.

Should further discussions be required with either Building Control or Attitude is Everything, our team are happy to provide ongoing advice to the contractor team during Stage 4b (if instructed).

In addition, as we move out of the Covid lockdown period there may be further engagement with local stakeholder groups. Should this move forward under the client's remit, Buro Happold are happy to provide ongoing support to consultation exercises (if instructed).

Contribution to key client outcomes

As part of Manchester's Core Strategy, there is an aspiration that by 2027 that 'Manchester will be a successful and accessible City in the front rank of cities in Europe and the world'.

Eastlands is well-placed geographically to become an international destination for tourism and culture - and the development of OVG Manchester is an opportunity to meet and exceed that aspiration through the adoption of the following four principles, which incorporate CABE's 'Principles of Inclusive Design'. These have been embedded as part of design deliberations and output to ensure that all parts of the built environment:

- Can be used safely, easily and with dignity by all regardless of disability, age, gender, ethnicity or economic circumstances.

- Are convenient and welcoming with no disabling barriers, so everyone can use them independently without undue effort, separation or special treatment.

- Are flexible and responsive taking account of what different people say they need and want, so people can use them in different ways.

- Are realistic, offering more than one solution to help balance everyone's needs, recognising that one solution may not work for all.

Good design need not result in additional costs, and indeed can lead to significant savings in the long-term, both for occupiers and society more generally. This means that to be 'better than the competition' it has been necessary to adopt a design approach based on good practice rather than the minimum standards set out in the Building Regulations. While AD M is an essential baseline, adoption of good practice guidance such as BS 8300:2018 'Design of an accessible and inclusive environment' is contributing to that outcome.

No matter how physically accessible a venue is, without clear operational policy mechanisms, the accessibility of the venue will be compromised and over time, diminish. Therefore, sufficiently robust provision, criterion and practices must be established by the building management and operators including the development of active management plans.

Engaging with Attitude is Everything (AiE) with an aspiration to achieve their Gold Charter status is a positive step towards the clients goals.. AiE's Charter is a combination of physical provision, service offering and operational practice. The Charter brings together all of the knowledge and good practice advice developed by AiE since they began working with the live music industry in 2000.

By adopting BS 8300 and other good practice guidance, we believe that obtaining silver Charter status should be achievable. AiE then has a three year probation period to judge whether a venue can then move from silver to gold Charter status (this can be reduced potentially to 1.5 years with the active involvement of AiE). The ambition to be a Gold-chartered venue ties in with the sustainability strategy aims of being vibrant and inclusive, open and connected.

The Gold level of the Charter could be viewed as the equivalent to a 'Lifetime Achievement Award'. Thus a key component of achieving this award is to demonstrate the ways in which your event or venue advocates for access and equality within the music industry.

SECURITY CONSULTANCY

6.9

6.9.1 Security Consultancy

Overview

The Security strategy and design has been furthered throughout Stage 4a with input from key collaborators, both internal and external to the design team.

The current assumed security environment for OVG Manchester is considered to be low to moderate as detailed in the Greater Manchester Police (GMP) Crime Impact statement (CIS). The development has been assessed against the principles of 'crime prevention through environmental design' (CPTED), in order to reduce the opportunities for crime and fear of crime.

The overall crime rate in the area is relatively low, but with serious wounding, theft and vehicle crime being the highest recorded offences. Th majority of these offences take place to the east of the proposed OVG Manchester site, in the local housing estate.

Outside of volume and expressive crimes noted above, this venue is considered under CPNI as a crowded space – and thus an attractive terrorist target. These forms of crime have been minimised through the careful location and design of Hostile Vehicle Mitigation, search and screening of vehicles and people, CCTV, gates, barriers and access control. Once the venue becomes operational, the combining of physical, technological, policies and procedures, security and stewarding during event periods, will see the venue a secure and safe establishment.

During event periods when the scalable security measures are operational, they will:

- Protect OVG Manchester's most vulnerable and valuable assets (visitors, talent and staff as well as the building).
- Enhance OVG Manchester resilience to major crime and terrorist attack.

Key stakeholders from the Greater Manchester Police (GMP), Manchester City group (MCG), Laudation, Populous and BAM have been consulted throughout the design and their inputs fed into the Stage 4 design.

Capturing the changes in design including Value Engineering (VE), an updated Employers Requirements (ER) report (Rev 3, dated 29 June 2020) has been issued.

The security design has also interfaced with the landscape design and crowd flow modelling to ensure that the highest risk areas for vehicle attacks on crowds external to the venue have been considered (Vehicle as a Weapon, VAW). Based on the highest risk, Hostile Vehicle Mitigation has been included along Sportcity Way and integrated into the landscape design.

In parallel a Crime Impact Statement from the GMP Architectural Liaison Officer has been received to support the planning application.

The security provision has been split during the Stage 4a design in that Buro Happold have provided the schematics and specifications (including the updated ER Rev 03 report), and MEE have completed the drawings in the 3D space.

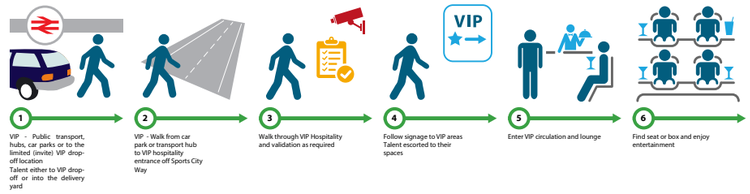
The suite of security measures described in this report have been designed to meet the needs of each user group and to provide a living environment that is safe and secure.

The security system design is based on proven technologies that will allow for reliable operation, but will also accommodate for further modification, expansion and upgrading when required.

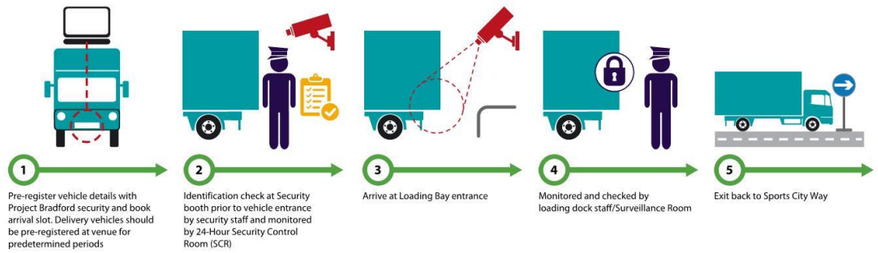
The engineering design and this report has been produced in line with the principles and guidance provided in the ER Rev 3 report (the security strategy). The engineering reports should therefore be read in conjunction with the ER Rev 03 report along with the following engineering documentation listed below:

Schematics for Hostile vehicle Mitigation (HVM), CCTV, Intruder Detection and Access Control, and the included specifications.

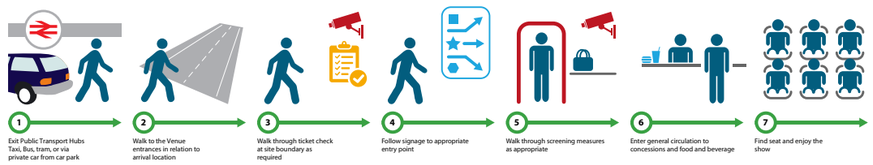
OVG Manchester - Journey Models **- VIP/Talent**



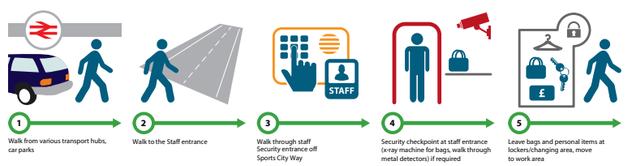
Project Bradford - Journey Models **- Deliveries and Contractors**



OVG Manchester - Journey Models **- Guests/Customers**



OVG Manchester - Journey Models **- Staff**



Purpose of Security System

An effective security system works as an integrated combined group of technologies allowing effective building management. This enables the venue operators to provide a safe and secure environment through a number of associated factors which include:

- Crime prevention through detection and identification of threats and events
- Crime deterrence through the noticeable presence of security systems and practises
- An audit trail of users actions and movements
- Immediate situational awareness allowing faster reaction to any situations that may occur
- Providing evidence which can be used where crimes have occurred

The benefits of these capabilities can be enjoyed by operators, employees and visitors. This can create a building which is more easily manageable and unobtrusive to move within, allowing a user experience which is in keeping with the development.

Access Control

The security design is intended to provide layered security measures that ensure mitigation of key risks such as bypassing of security measures. Detecting a threat at the earliest possible point acts to provide the security operatives with the greatest response time.

The security design has been implemented to allow flexibility in terms of venue use and operation and in terms of modification of user access rights in the future. Also the venue will be operated differently depending on time of day and if an event or hired function is hosted within the venue premises. For out of hours, the venue is secured through the security operators in the day-today control room and additional security officers who will patrol the site.

During event periods, access is via Walk through Metal detectors (WTMD) for all guests and the venue 'switches' control, command and communication responsibility to the event control room situated at Level 04.

The access control is offered via on-line electronic access control through Solenoid and magnetic lock configurations (depending on the doors location) and in other areas, through mechanical lock ways and keys.

In all areas of the venue an allowance has been made to ensure that emergency escape requirements are adhered to, in order to ensure safety and in compliance with the fire strategy.

Electronic Surveillance System

The CCTV systems have been developed in line with industry standards, specifically, the OVG solution has followed the UK Home Office Scientific Development Branch (now Centre for Applied Science and Technology - CAST) design methodology that requires the following for every device in that

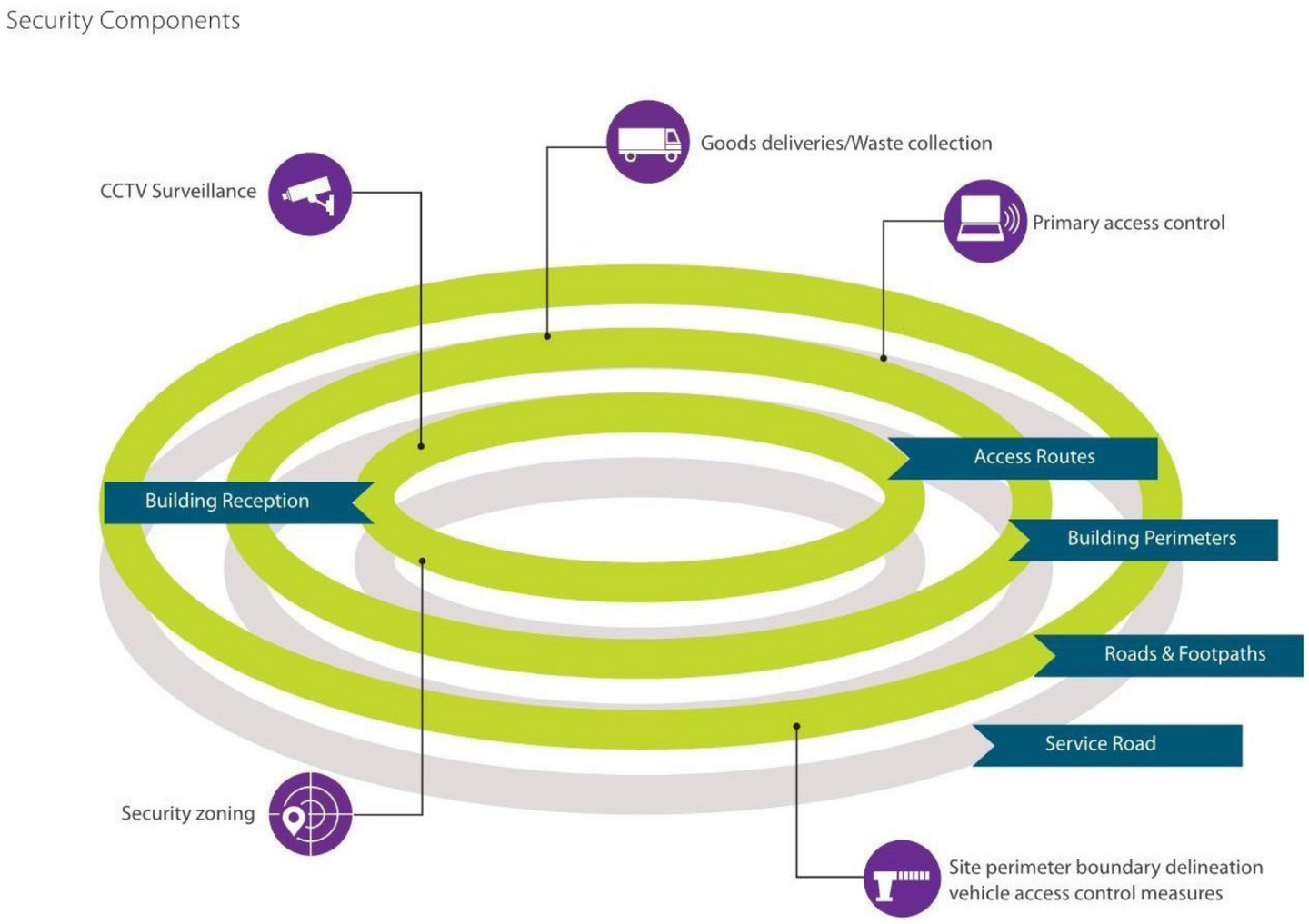
- A defined purpose of observation (Inspection, Identification, Recognition, Observation, Detect, monitor
- A defined activity of concern (loitering, unauthorised access)
- An indicative description of the required coverage
- An indication of the target speed

These elements together are referred to as the Operational Requirements (OR's) and are included in the ER Rev 03 report and are an important tool in evaluating whether a camera provides a valuable view they also provide guidance on the image an installed camera must eventually achieve.

The OR's (located in the security specifications) are the foundation of the CCTV equipment layout drawings by MEE. In addition to the drawing, a detailed equipment schedule shall be produced by MEE that provides specific installation details (mounting location), device specific performance and test requirements as well as a reference to specific OR. Together, the drawings, schedules and specifications provide a comprehensive description of the installation and performance requirements for each device as illustrated in the usage section.

Purpose of Observation - Each camera has a purpose which it is required to fulfil at a given range, which the CCTV schedule refers to as the 'distance metric'. Each purpose conforms to a measurable standard (BE EN 50132-7) which can be tested during the commissioning stage to show that the image quality is at least sufficient to achieve the task which it is required to meet. Each purpose is noted in the specification and the ER Rev 03 reports.

The deployment of CCTV closely resembles the defined risk and mitigation measures. Fixed cameras provide constant monitoring in most areas and this is supplemented with pan tilt zoom (PTZ) cameras to allow the ability to view areas at 360 degrees around these cameras in greater detail. Cameras have been designed to achieve identification of individuals at building entry locations and then recognition or monitoring of individuals at other locations though the buildings. Through this methodology it should be possible to identify and then track people as they move through the venue areas.



Security Components

6.0 BURO HAPPOLD

Deliverables

To date the security deliverables have included:

- Stage 2 threat, risk and vulnerability assessment and security principles report
- Stage 3:
    - Greater Manchester Police Crime Impact Statement to assist planning application (GMP CIS)
    - BRA-BHE-ZZ-ZZ-RP-U-0001 – Draft Stage 3– Security Operational Requirements
    - BRA-BHE-ZZ-ZZ-RP-U-0002 (rev 2)– Employers Requirements
    - Security equipment layout drawings (CCTV, HVM, IDS, Access control)
    - Access control Design Note
- Stage 4:
    - Integration of systems Design Note
    - Updated LOD 200 security systems layouts to enable MEE to place into the 3D model space
    - Updated BRA-BHE-ZZ-ZZ-RP-U-0003 (rev 3) – Employers Requirements capturing latest drawings and VE items, including additional security required items (HVM, security hut, gates)
    - Final specification

Current status

We will continue to liaise with the design team at Stage 4B:

- Any outstanding coordination
- Changes specifically as a result of late design modifications

Contribution to Key Client Outcomes

- A safe and secure environment for staff, visitors and talent to bolster public confidence in the venue and to increase revenue
- A venue that works for the community
- Safety for visitors to the new arena is paramount, with a robust security strategy developed with Greater Manchester Police, Counter-terrorism advisers, Prevent Advisors, OVG's own pioneering security advisory service, and the existing Etihad Campus operations team. The requirements of 'Martyn's Law' will be incorporated into the licensing conditions of the venue.

The OVG Manchester venue presents an opportunity to embrace modern smart technologies, building on the advancements in building design and digital technologies that have progressed rapidly in recent years. This ties in with the client's ambition to design a **next generation venue,** and be **better than the competition.**

WASTE CONSULTANCY

6.10.1 WASTE CONSULTANCY 720

6.10

6.10.1 Waste Consultancy

Overview

During Stage 4a the waste consultancy team have been working alongside the design team to ensure the Operational Waste Management Strategy (OWMS) and Site Waste Management Plan (SWMP) are incorporated into the venue design.

Deliverables

The future management of solid waste is an important element to consider when buildings are designed. Planning for future operational waste management will help the venue to operate efficiently, sustainably and safely, all while minimising impacts on building performance, the users of the site and the application site environment.

In line with this, the key objectives of the OWMS are as follows:

- To provide a suite of measures for integrating the principles of the waste hierarchy and circular economy into the proposed development's design and operations;
- To provide an estimate of the anticipated waste generation for the proposed development during operation;
- To provide guidance on the future management of waste to ensure that adequate spatial provision is made in the design for the clean and efficient storage and collection of waste;
- To allow waste and recycling to be easily collected, stored and managed by the Facilities Management (FM) team in a sustainable, efficient and discreet manner; and
- To ensure that national and local policies, as well as all of the applicant's waste management aims and aspirations, are met.

These policies are detailed in Appendix A of the OWMS).

The process for waste movement and collection has also been discussed with both OVG and CFG and the use of the existing Etihad Campus waste compound has been agreed to gain operational efficiencies.

In Stage 4a, the size of intermediate waste rooms and positioning of litter bins has been reviewed with the design team to ensure that there is adequate provision across the venue for storing waste.

To ensure that the waste management strategy offers sufficient resilience, provision has been made for a portion of the venue's waste to be compacted on-site and collected from the ground floor service yard.

A minimum head clearance of 5.0m has been provided above and in front of the compactors to enable the compactor lift. In Stage 4a, the positioning and orientation of the compactors has also been carefully assessed. The compactors have been rotated from their position in Stage 3 so as to mitigate any health and safety risks to staff and to ensure that the trucks do not obstruct the main servicing circulation route when making collections.

The remaining waste from the venue will be moved to the existing Etihad Campus compound via a bin compound on the Level 01 podium. The compound has been sized to provide sufficient space to accommodate the required number of bins. It has also been configured to allow room for the waste collection vehicles to turn and park.

Waste movements between the venue and the waste compound will utilise either Forge Lane Bridge or Joe Mercer Way bridge.



Current Status

The Waste Management scope concludes at the end of Stage 4a and the ownership of updating the OWMS going forward will sit with the client. This will ensure that new methods, attitudes and models in waste management are considered and implemented once the venue is operational.

Contribution to key client outcomes

The client aspires for the proposed development to set a new typology in sustainable venue operation, with a focus on achieving the climate change commitments set out in the Manchester Zero Carbon Framework 2020-2038.

The development's waste management strategy will facilitate staff and guests in making sustainable choices and will look to move beyond the traditional linear approach of 'make, use, dispose'.

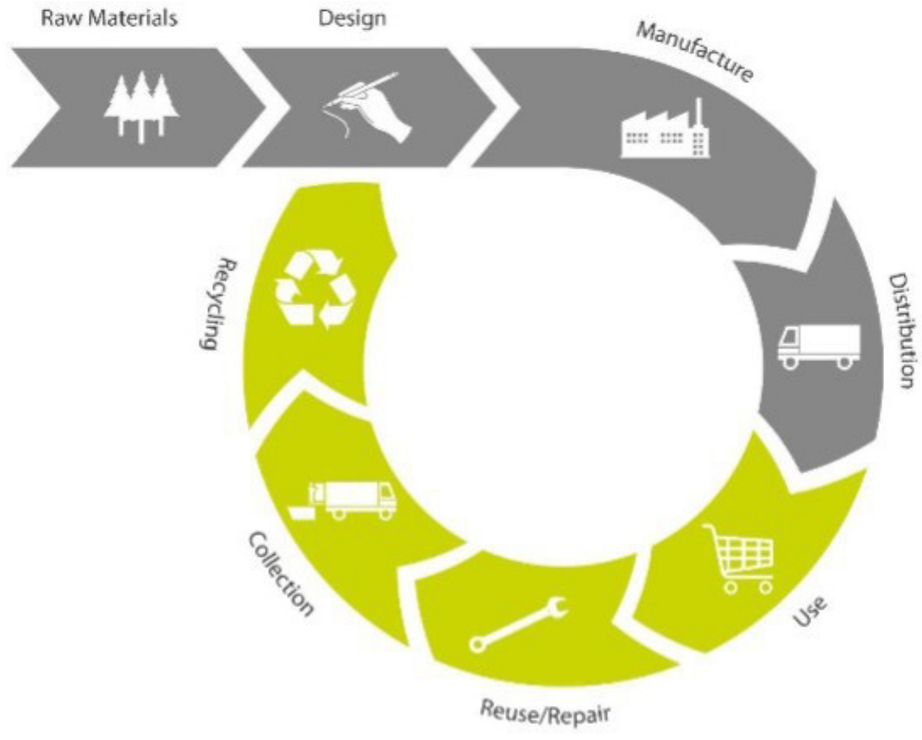
Instead, a circular economy model will be promoted, with the aim of keeping resources in use for as long as possible, so that the maximum value possible can be extracted from them. In Stage 4a, guidance has been developed to ensure that guests have the opportunity to segregate waste at source into different streams. Sufficient flexibility has been built into the design to ensure that additional waste streams (e.g. compostable food packaging) can be segregated in future, should the client desire it.

The client also aspires to make the venue as attractive as possible to the touring community.

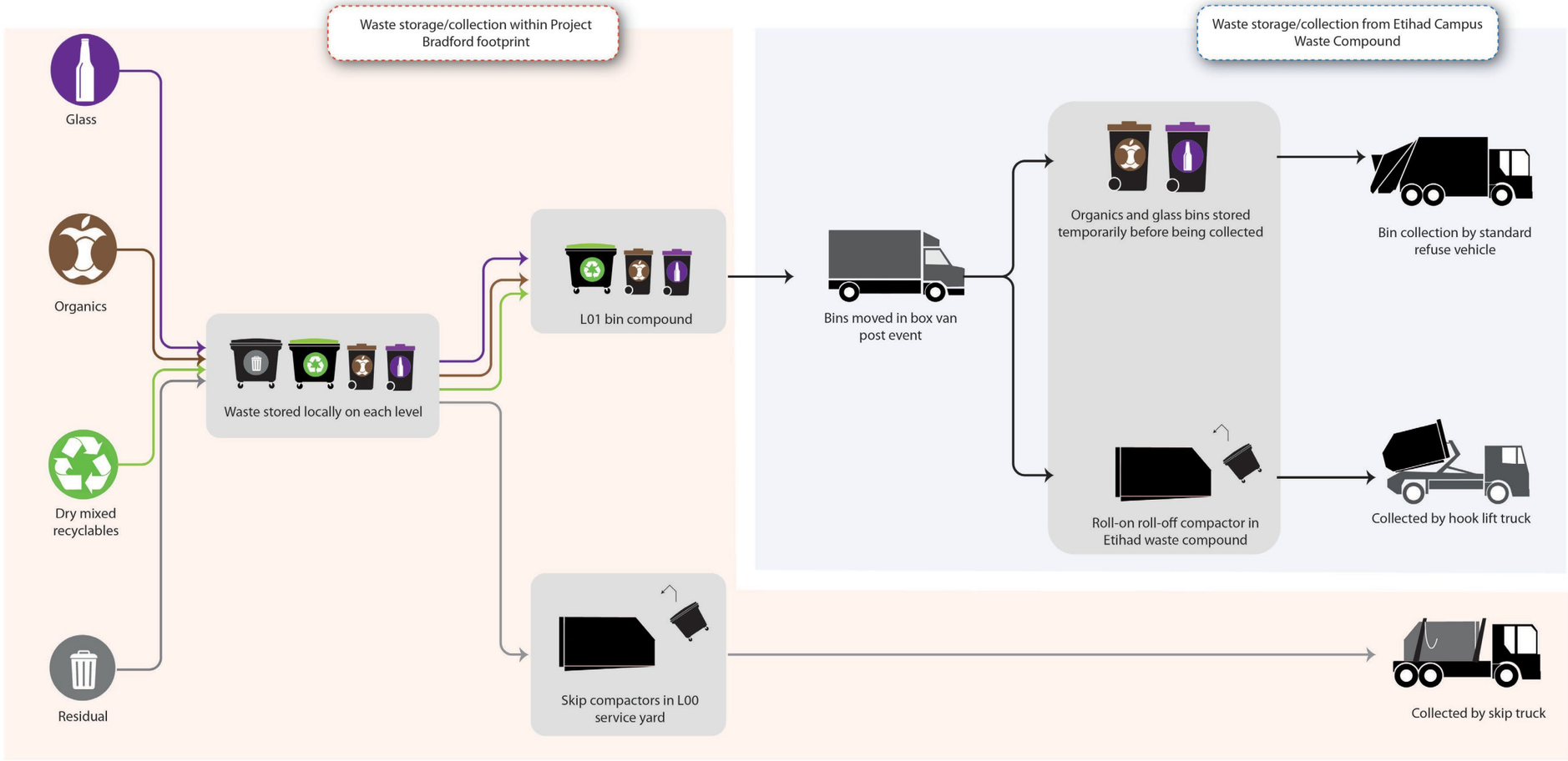
In line with this, the ground floor service yard has been designed so that the waste compactors are kept as far as possible from the artist drop-off area.

The compactors have also been positioned so that the trucks do not obstruct the main servicing circulation route when making collections.

This design also provides improved operational efficiencies to touring acts and shows.



Waste Management Cycle



OVG Manchester Waste Collection Process

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BREEAM ASSESSMENT

6.11

6.11.1 BREEAM ASSESSMENT SUMMARY

Overview

In line with the local planning officer's recommendations to go beyond planning policy to target BREEAM Excellent, Stage 4a has focused on further developing the BREEAM pre-assessment with the project team to confirm a score of 73.4%. This offers a nominal safety margin above the 70% threshold for Excellent.

Deliverables

A BREEAM Pre-assessment report has been prepared to form part of the Stage 4a tender information. This report confirms:

- The proposed route map to BREEAM Excellent, which has been discussed and agreed with the team to ensure BREEAM requirements are fully reflective in each design package;
- Most of the credits with Stage 2 and 3 time-dependant actions have been closed out. Where there are outstanding actions, these are concerning final paperwork for BREEAM evidence rather than specific design elements;
- Minimum standards for BREEAM Excellent have been met;
- Specific actions relating to the construction site processes; and
- Outstanding actions and clarifications to be addressed to enable the Design Stage Assessment to be submitted to the BRE for Interim Certification.

Current Status & Next Steps

Whilst the BREEAM requirements have been reviewed with the design team throughout Stage 4a and guidance provided to ensure requirements are reflected in the tender information, it is highly recommended that the formal evidence collation and QA process is undertaken prior to the start of Stage 4b to ensure the final contract price is fully reflective of a BREEAM Excellent building.

Aside from collation of the BREEAM design stage evidence, as above, there are a number of credits which still need action from the team:

Low Risk Credits that require further actions to close out the Stage 4a scope beyond signposting to Stage 4a tender information or final completion of a BREEAM calculator/ template:

- Mat 01 Embodied carbon appraisal (2.14%) – In discussion with the design team, it was agreed that the best approach would be to develop a baseline based on the material quantities in the Stage 4a cost plan. An option appraisal of 2-3 elements subject to Value Engineering should then form the basis of the embodied carbon appraisal to ensure this exercise has meaningful opportunity to influence the design.
- Ene 01 Prediction of operational energy (2.46%) – A draft TM54 assessment has been produced by MEE. The final report and results updated in line with Stage 4a are to be circulated for discussion as this should feed in to OVG's overall route map to zero carbon in operational energy by 2038.

Medium Risk Credits that have been agreed in principle but require final confirmation from the team:

- Hea 01 Indoor air quality testing (0.82%) – BAM to confirm this can be targeted, based on Populous' Stage 4a finishes specification.
- Wst 02 Sustainable aggregates (0.67%) – The preliminary Wst 02 calculator from BAM indicated these credits are possible. To be reviewed and finalised.

Additional potential credits under review to be concluded. These could provide alternative credits to those targeted or contribute to uplifting the score:

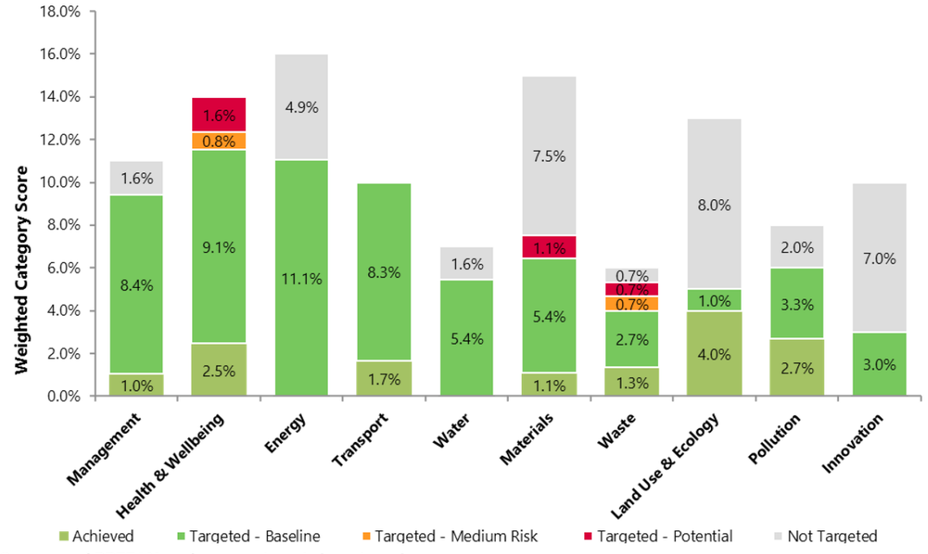
- Hea 01 Daylighting (0.82%) – MEE to undertake the daylight analysis for the management office. Initial review by MEE suggested credit could be available subject to the final analysis.
- Hea 01 View out (0.82%) – Perforations would need to be increased locally to the window to increase the free area for view out to 20%. This credit is unlikely but requires final review and conclusion.
- A number of bespoke innovation credits (worth 1.0% each) relating to catering are under

Contribution to key client outcomes

The Client has set the vision for the arena to be at the forefront of energy efficiency and best practice low carbon design, aspiring to be one of the most sustainable UK venues and amongst the world's leading. This responds directly to:

- Manchester City Council's challenge for the proposals to be best in class to demonstrate leadership in delivering the City's Zero Carbon 2038 commitments; and
- Eithad Campus' emerging sustainability vision to be a pioneer for the whole of Manchester in pursuing its twin objective of realising locally-inclusive, globally- competitive economic growth, whilst simultaneously transforming to a net zero- carbon campus

BREEAM has been a key tool, alongside the Sustainability Statement and EIA Climate Change Chapter for planning, to drive the sustainability detail into the project information. Figure xx-xx shows the broad range of sustainability issues covered by BREEAM, with Energy, Materials and Transport all responding directly to the zero carbon agenda.



Summary of BREEAM performance targets by categories

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SERVICING ENGINEERING (ME ENGINEERS)

7.1 MECHANICAL SYSTEMS 731

7.2 PUBLIC HEALTH SERVICES 745

7.3 FIRE PROTECTION SYSTEMS 753

7.4 ELECTRICAL SYSTEMS 767

7.5 STRUCTURED CABLING SYSTEMS 779

7.6 VERTICAL TRANSPORTATION 785

7.7 LIGHTING 791

7.8 BUILDING PHYSICS & SUSTAINABILITY 801

7

MECHANICAL SYSTEMS

7.1.1 MECHANICAL SYSTEMS 732

7.1

7.1.1 Mechanical Systems

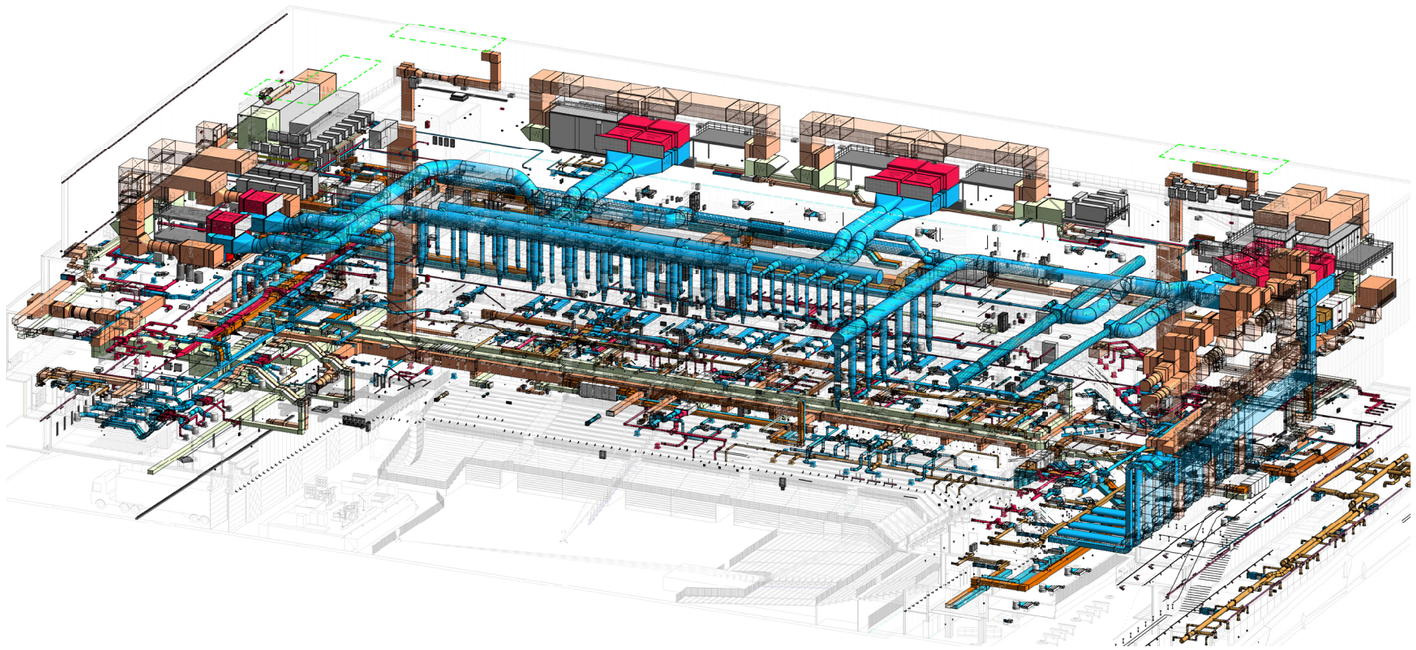
7.1.1.1 General

This mechanical systems report shall be read in conjunction with the separate mechanical drawings, specification and schedules, included within the ME Engineers Stage 4a Design information.

This section of the report discusses and explains the Mechanical systems and design strategies employed for OVG Manchester.

The mechanical engineering works include:

- Acoustic design and treatment to building services
- Air conditioning and mechanical ventilation services
- Air conditioning to the Hall
- Building Management Systems (BMS)
- Condensate removal
- Heating-water services
- Distribution mains
- Energy management systems / sub-metering
- Exhaust gas treatment and flues (generators and fire pumps)
- Frost protection
- Filtration (air)
- Kitchen / catering extract systems
- Refrigeration systems
- Smoke control systems
- Thermal insulation in connection with engineering services
- Trace heating
- Vibration control in connection with engineering services
- Water treatment and filtration



Mechanical Services Building Section 3D

7.1.1.2 Mechanical Ventilation Services

The ventilation strategies employed throughout the building generally align with the Manchester City Council document GD 03 and the DEFRA Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (Although this has been withdrawn and has not yet been replaced, it is directly referenced within GD 03).

Mechanical ventilation (supply and / or extract) will be included to the following areas:

- Hall
- Catering operations
- Kitchens
- Concessions
- Staircases
- Toilets / changing rooms
- Plant rooms
- Loading bay / fume extract
- Store / Ancillary areas
- Smoke control zones
- Atrium
- Bars / Clubs / Lounges
- Offices and production suites
- Concourses
- Talent and crew areas
- Refuse stores
- Comfort Conditioned Spaces

Environmental air conditioning will be included to the following areas:

- MER / SCR / UPS / Server Rooms / Technical Rooms
- Talent areas
- Hall
- Concession queuing areas
- Changing rooms
- Atrium
- Bars / Clubs / Lounges
- Offices and production suites
- Concourses
- Hospitality areas
- First Aid Rooms
- HVAC Main Plant

The heating and cooling demand throughout the building will predominantly be met by the provision of Air Source Heat Pump (ASHP) technologies.

For the Hall, this technology shall take the form of Air Handling Units (AHUs) with an integral reversible ASHP that utilises the Hall exhaust air as a heat source or heat sink, as required.

The ASHP AHUs serve to provide heating and cooling to temper the air from external conditions to meet the internal comfort criteria within the Hall.

For the rest of the building, heating and cooling shall be provided by local Variable Refrigerant Temperature (VRT) Fan Coil Units (FCUs) connected to external condenser units located either on the roof of the building or within the loading bay.

The VRT technology included within the design allows for the supply temperature from FCUs to be varied, reducing the risk of cold draughts being experienced.

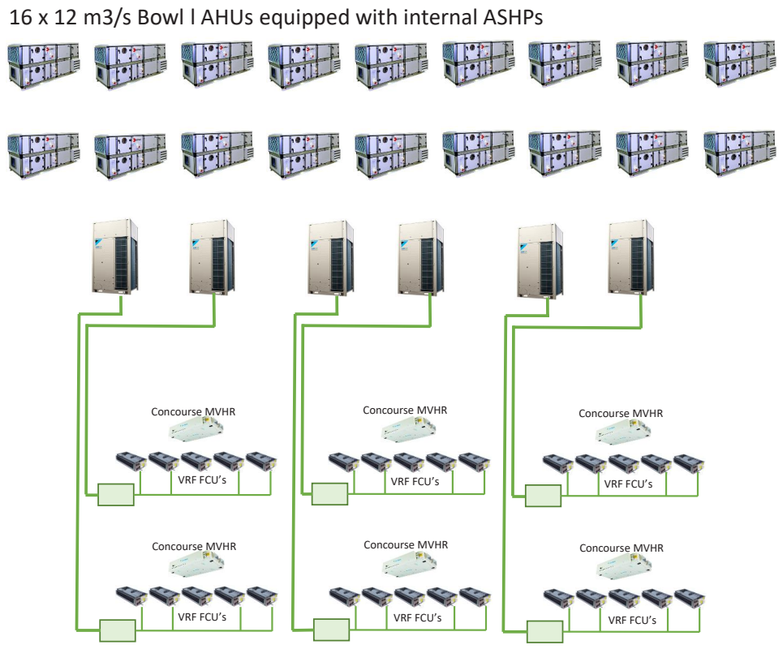
Supplementary background heating shall be provided to the stair cores exposed to ambient conditions by means of electric panel radiators.

This approach provides a high Level of flexibility of use throughout the building HVAC services. Additionally, this strategy allows carbon emission savings of 15.2% (against

Part L 2013) to be realised. This surpasses the Greater Manchester planning requirement

Of 15% beyond Part L 2010 (6% beyond Part L 2013) by 9.2%, meaning that PV's are not required to meet the planning carbon emissions requirements.

AHUs equipped with ASHPs with VRF / V FCUs and MVHRs to Concourses



Simplified schematic showing the main HVAC plant and connectivity

7.1.1.3 Cooling Plant

Initial thermal modelling identified a simultaneous peak cooling load of 13.1MW. This cooling load allowed for all spaces within the building to be simultaneously fully occupied, and is therefore in excess of what is realistically required. Experience, usage assessment and calculations of the proposed building spaces indicate that the calculated cooling load required shall be circa 9.8MW.

This figure has been used as the basis of the mechanical cooling provision to the building.

As described under HVAC Main Plant, the cooling provision is to comprise of two system typologies:

1 Integral ASHP within roof mounted AHUs serving the Hall;

VRT (refrigerant based) fan coil units serving the on-floor cooling demand.

This means that there is no centralised chilled water generation within the building.

Each VRT system will require Air Cooled Condensers located either within the "Roof Trench" around the perimeter of the building or within the loading bay with refrigerant run to appropriate sections of the building to reject heat to atmosphere.

The VRT FCU installations allow for a closer alignment between the zonal cooling (or heating) demands within the building and the operation of the associated condenser units, providing greater operational efficiency.

On-floor Cooling Provision

Mechanical ventilation heat recovery units (MVHR) units are provided to serve all concourse areas as well as any other occupied areas. Each MVHR serves to provide tempered air only with a supply air temperature based on the heat recovery efficiency. All areas served by MVHRs will be supplemented with VRT fan coil units to provide local control of temperature (heating or cooling) to meet the internal design criteria.

Hall Cooling

The Hall is to be conditioned via an all-air system delivering outside air to satisfy both internal air quality requirements and internal comfort conditions.

Hall AHUs with integral ASHPs shall provide tempered air as required. Refer to the ventilation section of this report for further details of the Hall ventilation system.

7.1.1.4 Heating Plant

Initial thermal modelling identified a simultaneous peak heating load of 13.8MW. This heating load allowed for all spaces within the building to be simultaneously fully occupied, and is therefore in excess of what is realistically required. Experience, usage assessment and calculations of the proposed building spaces indicate that the calculated heating load required shall be circa 9.0MW.

Low Temperature Hot Water (LTHW) generated by natural gas fired boilers within the Level 05 Boiler House serve the domestic hot water plant at Level 04 only. Space heating is provided via the incorporation of heat pump technology in the Hall Air Handling Units (AHUs) and supplementary heating provided by refrigerant based Variable Refrigerant Temperature (VRT) Fan Coil Units (FCUs) with background heating to stair cores provided by electric panel radiators.

As described within the cooling plant section of this report, VRT FCUs shall provide the majority of the heating load required throughout the building. Tempered air shall be provided via the MVHR units to the FCUs for final conditioning of the air to meet the internal design criteria.

The contractor is to investigate the practicality of the boiler house being prefabricated and commissioned off site and then craned in to position, installed at Level 05 and connected to distribution pipework throughout OVG Manchester.

Each boiler shall be connected to and controlled by the BMS to provide the most energy efficient heating solution regardless of the overall demand.

Each boiler shall be connected in series to separate flow and return headers, providing hydraulic decoupling between the Primary and Secondary LTHW systems. A number of “Run” pumps and one “Standby” pump shall be provided on the primary side of the return low loss header to ensure primary LTHW flow is maintained in the event of one pump failing.

1no. LTHW circuit shall emanate from the boiler house serving the domestic hot water calorifier plate heat exchangers located at Level 04.

The. LTHW circuit shall be served by a number of “duty” and one “standby” pump to allow for the full duty of the circuit to be met in the event of a pump failure.

7.1.1.5 Heating Systems

On-Floor Heating Provision

Electric panel radiators shall be provided to serve each stair core exposed to ambient conditions (via externally facing walls / floors / ceilings) to maintain the design temperature and overcome building fabric losses. Each heat emitter is to be provided with a tamperproof controller.

Local Mechanical Ventilation Heat Recovery (MVHR) units shall provide tempered outside air for occupants in strategic locations throughout the building. In addition, Fan Coil Units (FCUs) shall be tactically located throughout each floor to provide heating direct to areas of expected low occupancy levels or with high heat losses. First aid rooms, offices, staff accommodation etc. shall be provided with FCUs points.

MVHRs shall provide outside air tempered only as a result of heat recovery from extracted air. VRF / V FCUs shall provide heating based on both fabric heat losses and to compensate for the air load from winter tempered outside air which may be cooler than the design internal air temperature.

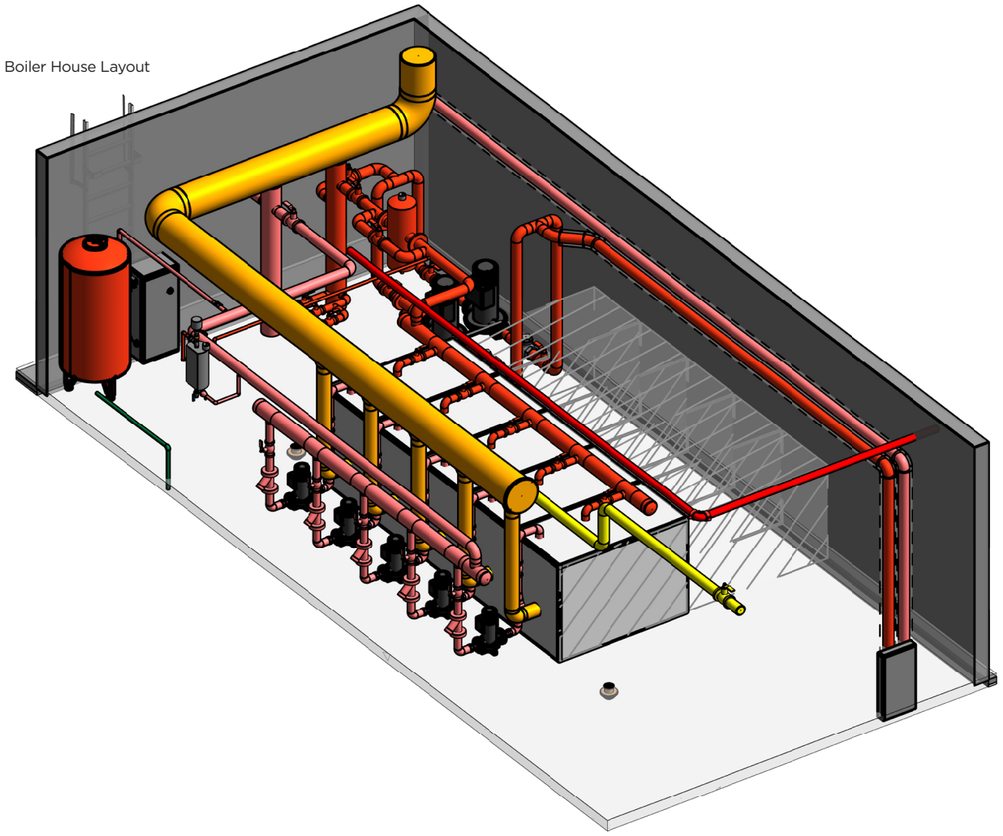
Talent Area Heating

Each dressing room is provided local heating / cooling via a VRT system. In order to allow for variable room set-points desired by the varying occupants, local simple controllers are to be provided to allow for adjustment of room set-points within each dressing room.

Staff Areas / Offices Heating

Staff areas, offices and general Back of House (BoH) areas provided with VRT systems shall be centrally monitored and controlled via the BMS.

Boiler House Layout



Local simple controllers shall be provided with limited control capabilities over sensible zones.

Concourse / FoH Heating

All concourse / FoH Heating systems are to be centrally controlled and monitored by the BMS. FCUs shall generally be located such as to condition areas with high levels of expected dwell time (concession / F&B / bar queuing areas).

General Installation

VRT pipework shall be routed throughout the building via galvanised steel cable tray.

Local leak detection systems shall be installed as required to ensure any refrigerant leak is detected and suitably contained. Upon detection of a leak, an alarm shall be raised via the BMS to the security control room located at Level GF.

Each FCU, MVHR, AHU, etc. Shall be connected to the BMS and monitored for run, fault, and status signals.

General LTHW Installation

LTHW shall run from the Level 05 boiler plant space to the Level 04 calorifier plant room.

LTHW shall distribute throughout the building via heavy grade steel pipework, with final run-outs and connections made in braised or soldered copper pipework.

A packaged pressurisation unit complete with expansion vessels is to be provided for the LTHW system, with adequate capacity for hydraulic expansion +10%.

A chemical dosing pot is to be provided within the boiler plant room to allow for adequate chemical dosing to the system.

Automatic air vents are to be included at all high points within the system.

Drain cocks are to be provided at all low points within the system.

All pumps are to be provided mounted on inertia anti-vibration bases, with matched invertors and shall be capable of soft-starting.

7.1.1.6 Ventilation

Concourses and Front of House Circulation

All concourses and Front of House (FoH) circulation areas shall be served by a decentralised ventilation strategy, allowing full flexibility of operation to areas within the building, allowing zones, sections and areas to be run independent of any others.

This approach will utilise local MVHR units, each provided with duct-mounted attenuation sized to maintain the noise criteria of both the MVHR's local area and the areas served by distribution ductwork. The MVHR units will draw intake air from the façade of the building via weatherproof louvres. Each louvre shall be partially concealed behind the architectural mesh cladding to the building and coloured to suit the surrounding structure, providing an element of "camouflage".

The intake air is passed through G4 and F7 filtration and a cross-flow heat exchanger / thermal wheel to temper the air. The supply air will be distributed via low pressure ductwork and introduced into the occupied space via supply air diffusers or FCUs. Where necessary, electric heater batteries shall be provided to ensure minimal impact on internal conditions is experienced during periods of low ambient temperatures.

Extract air shall be drawn directly from the space to the MVHR generally via bellmouth extract terminals. The extract air shall be passed through a G4 filter and then a cross-flow heat exchanger to provide free heating / cooling to the intake air.

The exhaust air shall be ducted from the MVHRs to the external wall of the building, rejected via louvres that are both local to the connected MVHR and allow for 10m separation from any intake louvres, as required by BREEAM. Each louvre shall be partially concealed behind the architectural mesh cladding to the building and coloured to suit the surrounding structure, providing an element of "camouflage".

This decentralised ventilation strategy reduces the need for vertical ventilation risers internal to the building, and allows less GIA to be absorbed by services risers.

All air intakes shall be positioned a minimum of 10m from exhausts, and 20m away from sources of pollution to achieve the available credit within section Hea 02 of BREEAM.

All MVHRs shall be provided with inverter driven fans and controlled via a network of temperature and air quality sensors as well as the central BMS system. This shall allow a variable volume system to be provided, thus allowing for maximum energy efficiency from these systems.

Where ductwork, pipework and all other HVAC services are to be installed in areas without ceilings or shall otherwise allow the services to be visible from Front of House (FoH) areas, ductwork shall be provided with a galvanised steel finish and pipework shall be neatly cladded abd cloloured black (RAL 9005) (pending confirmation of the architects aesthetic intent).

The contractor shall be required to ensure that all finishes and installations within these areas are finished to an exemplary standard and meet the architect's aesthetic intent rather than detracting from the quality of the space.

Toilets

Each toilet area throughout the building shall be provided with mechanical extract of 6 - 10 Air Changes per Hour (ACH) via extract air valves, extract air grilles, shadow gaps and / or bellmouths as appropriate to the area. Extracted air shall be drawn through galvanised low pressure ductwork to an extract fan / local MVHR and exhausted via weatherproof louvres in the façade of the building.

Where possible, extract air from toilets shall be extracted via local MVHRs to allow heat energy to be recovered from the extracted air.

Where MVHRs are not available, packaged twin extract fans shall be utilised, complete with auto-changeover functionality.

Make-up air to each toilet block shall be from adjacent spaces. Air paths shall be provided either by natural make-up from adjacent areas, such as the concourse, via transfer grilles or Air Transfer Fans (ATFs) for larger WC blocks. ATFs will allow for make-up air to be delivered to larger WC areas without enforcing excess pressure on the MVHRs / AHUs extracting from these areas.

This design allows for the WCs to be heated via the warm make-up air from the adjacent spaces. This strategy means that no further means of heating are expected to be required to WC areas within the building.

Generally all Toilet Extract systems discharge their exhaust air above external occupied zones, with the exception of the South West corner of Level GF. Here 3no. Systems discharge through the Level GF external wall, below podium level. In order to eliminate odours within these systems, the exhaust air shall be treated via in-line UV-C filtration to neutralise Volatile Organic Compounds within the air flow.

Concessions

The ventilation services to the concessions areas has been designed in alignment and conjunction with the catering specialist (Tricon).

As agreed with Tricon, the ME Engineers design includes for the ventilation plant and capped ventilation connections within each catering space, for future connection and extension by the catering fit-out specialist.

Each full-cook concession has been allocated an ecology AHU capable of extracting kitchen extract air at the rates advised by Tricon. The kitchen extract air is expected to be drawn from canopies located above the cook line within each concession. Each canopy shall include in-line grease baffles and UV-C filtration in addition to Ansul R202 fire suppression.

Kitchens provided with recirculation canopies are provided general ventilation at a rate of 10l/s/person as recommended by DW172. The recirculation canopy systems are expected to contain UV-C filtration, grease baffles, carbon filtration, HEPA filters and Ansul R202 fire suppression as necessary.

The kitchen extract air shall be ducted via low pressure ductwork to ecology AHUs located locally to each concession. Each ecology unit shall be provided with a UV filter, an Electrostatic Particulate (ESP) filter, a panel / bag filter and an activated carbon filter.

The filtered kitchen exhaust air shall then be ducted via low pressure ductwork to weatherproof louvres in the façade of the building. Wherever possible partial make-up air to each concession shall be drawn directly from the adjacent concourse areas.

Heating and cooling shall be provided to the concession queuing areas via VRT FCUs. This shall allow the make-up air to the concession to be cooled prior to entry to the concession allowing thermal comfort to be provided to the concession occupants and the queuing guests.

Commissary Kitchen

As agreed with Tricon, the ME Engineers design includes for the ventilation plant and capped ventilation connections within each catering space, for future connection and extension by the catering fit-out specialist.

Kitchen extract air is expected to be drawn from induction canopies located above the catering equipment. Each canopy shall include in-line grease baffles and UV-C filtration in addition to Ansul R202 fire suppression. From here, the kitchen extract air shall be ducted via low pressure ductwork to an ecology AHU located locally to the main commissary.

The ecology AHUs shall be provided with a UV filter, an ESP filter, a G4 filter, an F7 filter and an activated carbon filter. The filtered kitchen exhaust air shall then be ducted via low pressure ductwork to a weatherproof louvre in the façade of the building.

Filtered, tempered outside air shall be provided in part to the kitchen directly, via the induction canopies and supply air terminals co- ordinated with the kitchen layout, and additionally to

adjacent areas to ensure the cooking areas are maintained at a slight negative pressure.

Make-up air drawn from adjacent areas shall be provided via dedicated air paths via transfer ducts equipped with cross-talk attenuation.

FCUs shall provide spot cooling within the kitchen to maintain thermal comfort conditions.

Ductwork shall be installed in accordance with HVAC TR17 in terms of access for cleaning and insulated where required to prevent condensation of cooking vapours.

Dishwasher rooms will be provided with a dedicated extract system equipped with stainless steel ductwork. Horizontal sections of ductwork will be set to a fall to prevent condensation pooling within the ductwork.

Back of House Circulation Areas

BoH circulation areas, such as BoH lobbies shall be provided with mechanical ventilation via MVHR units in the same manner as FoH circulation areas.

These spaces are generally conditioned via heat recovery from the MVHR units.

Premium Areas

Premium areas within the building such as clubs, lounges, offices, talent areas and crew areas shall be provided with overhead FCUs with outside air derived from local MVHRs within ceiling voids.

The aesthetic intent within these areas is expected to be of a higher level, and it is expected that the HVAC services should align.

It is therefore currently assumed that low pressure ductwork from the MVHRs and FCUs shall connect to terminals such as linear slot diffusers integrated within the architectural ceilings.

Temperature control to clubs and lounges shall be centrally controlled via the BMS; offices, talent areas, crew areas and staff areas, shall be controlled centrally by the BMS with local set-point adjustment via simple controllers.

Back of House Circulation Areas

BoH circulation areas, such as BoH lobbies shall be provided with mechanical ventilation via MVHR units in the same manner as FoH circulation areas.

These spaces are generally conditioned via heat recovery from the MVHR units. Detailed assessment will be carried out during stage 4 to assess whether additional heating (via heater batteries, radiators or FCUs) is required.

The Hall – Central AHUs

Ventilation to the Hall is to be provided by 16no AHUs each equipped with integral heat pump technology located at roof level within the services trench.

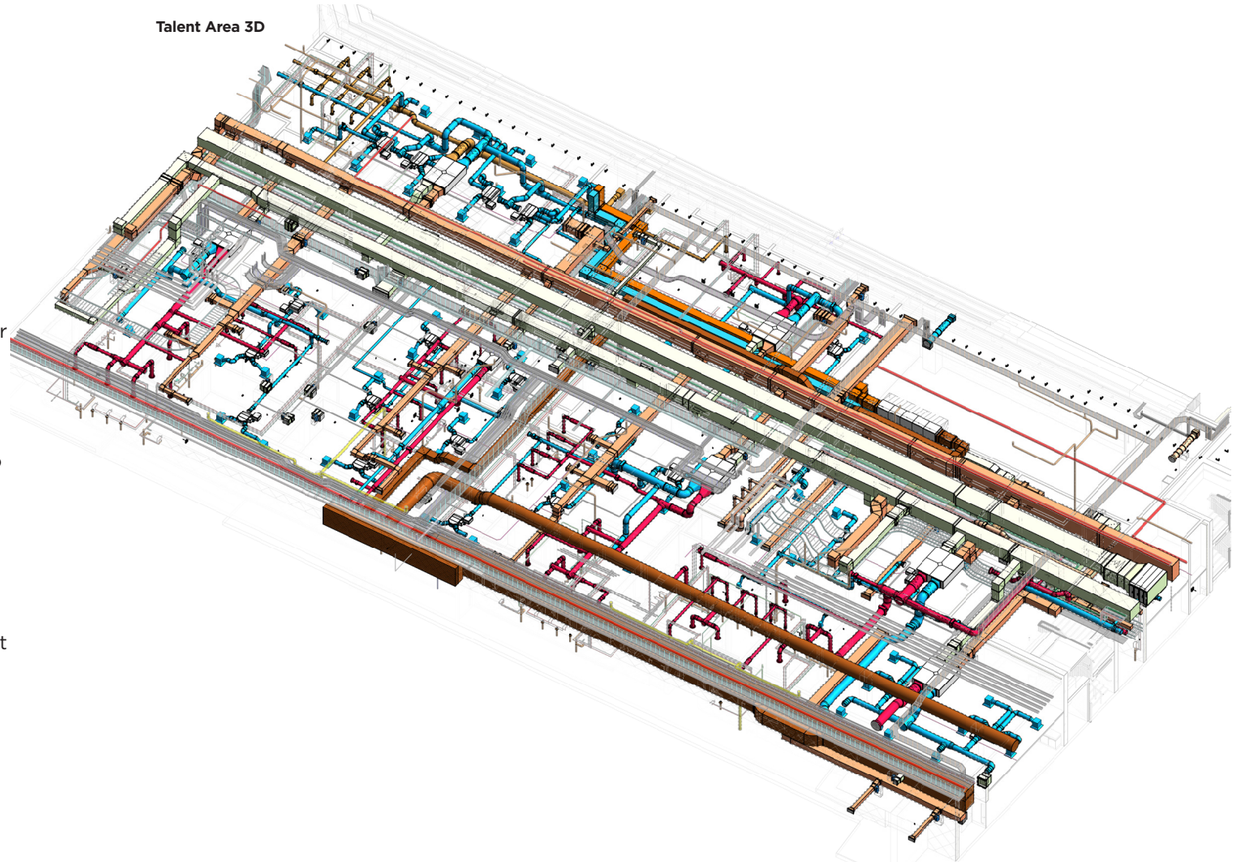
Each AHU is to be sized to deliver 12m^3/s of supply air, allowing for comfort conditions and internal air quality to be maintained for all event types within The Hall, as detailed within the Basis of Design section of this report.

The AHUs will be mounted on a Big Foot support system, and be provided with access gantries to allow ease of access to top and bottom decks.

In cooling mode, the integral ASHP and heat exchangers extract heat from the supply air stream within the Supply Unit located on the bottom deck of the AHU, and reject it into the air exhaust air stream within the Extract Unit located on the top deck of the AHU. This action cools the supply air stream being delivered to the Hall, by using the rejected exhaust air from the Hall as a heat sink.

If external conditions are appropriate, the AHU will not initiate the ASHP and condition the Hall environment with free cooling or heat exchangers alone for improved annual energy performance.

Talent Area 3D



In heating mode, the operation of the ASHP is reversed, whereby the Hall exhaust is used as a heat source for warming the supply air. Through effectively cooling the exhaust air within the Extract unit on the top deck of the AHU from the Hall, the heat from the exhaust air stream is transferred into the supply air stream in the Supply Unit on the bottom deck of the AHU.

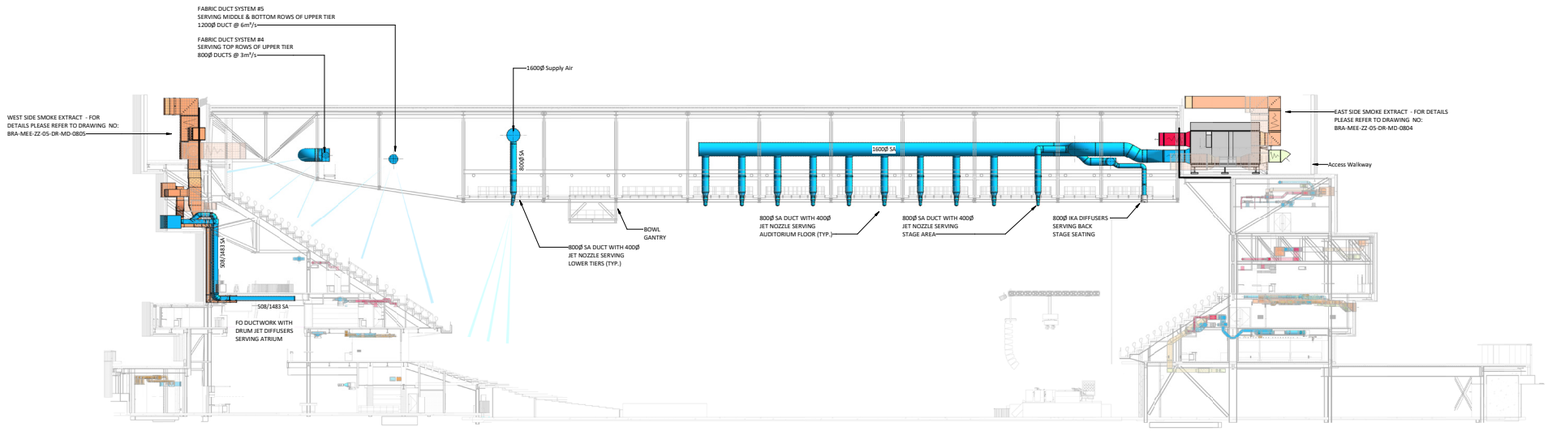
Intake air is drawn from within the Level 05 services trench in to the AHU via an inlet air attenuator. The inlet air attenuator is sized to ensure the noise breakout from the AHU complies with the site acoustic criteria.

The inlet air is then filtered before being passed through a thermal wheel, DX cooling coil 1, DX Heating / Cooling coil 2, Run-around heat exchanger coil and a backup electric heating coil for conditioning. A high efficiency array of plug fans with EC motors will deliver the air into The Hall via a supply side attenuator. The supply side attenuator will be sized and positioned to maintain the integrity of the acoustic properties of The Hall envelope, preventing a path for noise to breakout. The duct penetrations from outside into The Hall will be horizontal to allow for conventional methods of weatherproofing.

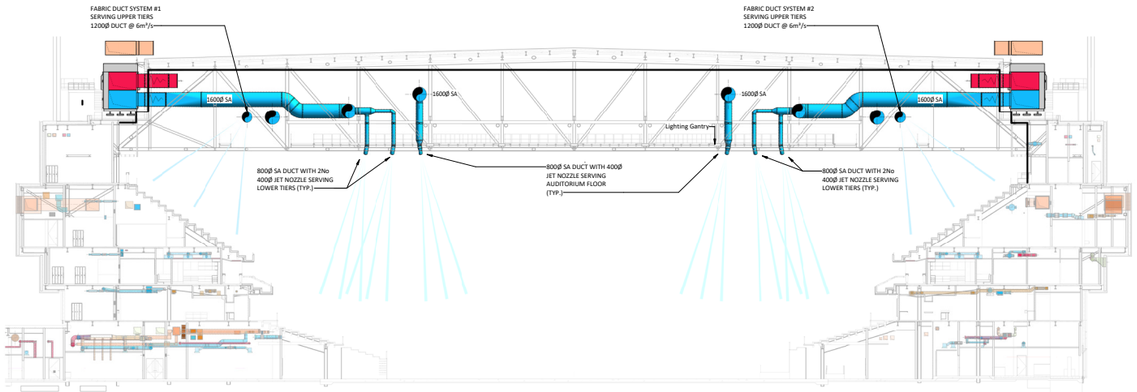
From within The Hall, the conditioned and filtered supply air will be distributed via a series of fabric and galvanised ductwork legs and delivered to The Hall via a range of diffusers and jet nozzles. Various ductwork legs will be provided with motorised dampers interlinked with corresponding flow grids to allow the ventilation system to accommodate a range of event types.

Supply ductwork has been coordinated with the access gantry ways to allow both for the airflow to be delivered to the occupants and for ease of commissioning / maintenance. All volume control dampers controlling the airflow to each nozzle will be accessible from The Hall gantries.

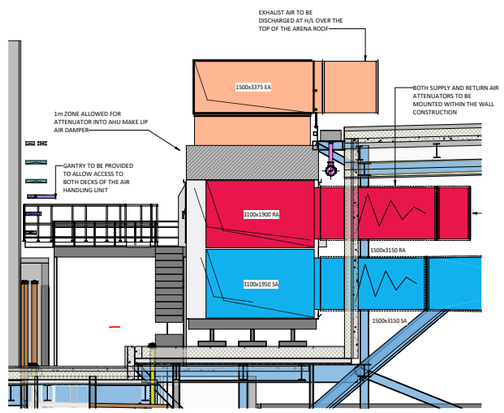
Air temperature sensors and air quality sensors shall be positioned within The Hall to ensure that comfort conditions and a good Level of indoor air quality is maintained to all zones within the space and dictate the control of the AHUs.



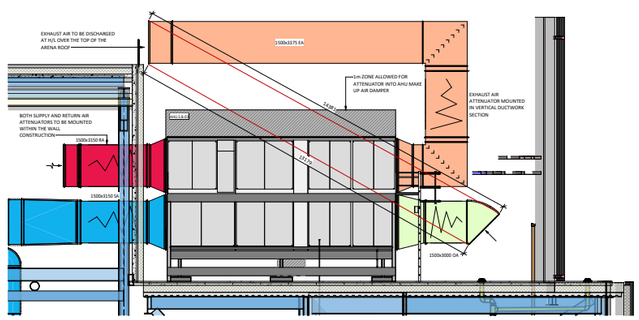
The Hall Ventilation Long Section



The Hall Ventilation Short Section



Typical Bowl AHU Section 1



Typical Bowl AHU Section 2

The return air will be extracted directly from The Hall via bellmouth extract terminals located at high level within the roof structure. The return air will route back to the AHU via a duct mounted attenuator mounted within the acoustic envelope of The Hall. The air will pass through a series of heat exchangers and refrigerant coils prior to being exhausted to atmosphere. There will be an air side attenuator to control the noise breakout from the AHUs in compliance with the site acoustic criteria. The Exhaust air will terminate via ductwork which raises the exhaust point to above the level of, and discharging over, the raised Hall roof.

All ductwork within The Hall will be pre-insulated, and finished in matt black (architect to specify RAL colour).

Event Modes

Whilst it is understood that the primary function of the OVG Manchester Arena is to provide the area with “The world’s best music venue”, the Hall Ventilation System has been additionally configured to service a “multi-purpose events arena”. This approach provides the greatest level of flexibility in commercial offering of events that can be held.

The ductwork configuration allows for specific areas within The Hall to have the ability to be turned on and off as required to accommodate a range of event types. The ventilation system can be tailored for each event type via the BMS. This approach will generate energy savings by only delivering conditioned ventilation to where it is required, and in the case of smaller shows, turning off entire AHU systems.

Concert Mode

Standard Concert Mode (Seated, Standing, Award Shows, and Touring Shows) consists of flat floor seating or standing and seating to the tiered banks facing the stage. The tier located behind the stage is not required, and as such, the jet nozzles to this area are switched off.

Sport Mode

Sport Modes (Boxing, Basket Ball and E-Sports) utilise the tier located behind the stage.
The ventilation nozzles serving this area are activated to accommodate this area. The supply air serving the central portion of The Hall is dialled down to accommodate the additional tiered bank.

Ice Pad Mode

Ice Pad Mode (Ice Hockey and “Disney on Ice”) allows for a temporary ice pad to be located in the centre of the event space. The central duct runs delivering air to the supply nozzles above the ice pad position are turned off to prevent ventilation air being blown directly over the ice pad. This will improve the quality of the ice surface and minimise risk of frosting occurring.

(Note: The building services included in this design DO NOT comply with NHL requirements)

EDM Mode

EDM Mode (Partial occupancy event, not utilising upper tier) consists of flat floor standing only, with the option of not using and partitioning off the upper tiers to create an intimate environment. This mode allows for the majority of the ventilation to the upper tiers to be switched off since they are not required allowing energy savings to be made.

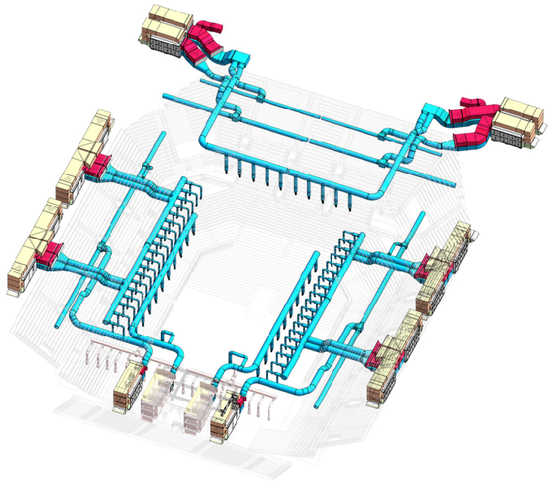
Short Hall Mode

Short Hall Mode (Seated and Standing) allows for reduced capacity concerts to be held. This is achieved by moving the stage forward within the venue and curtaining off the area behind the stage. In this mode, the AHU’s serving the areas behind the stage are switched off.

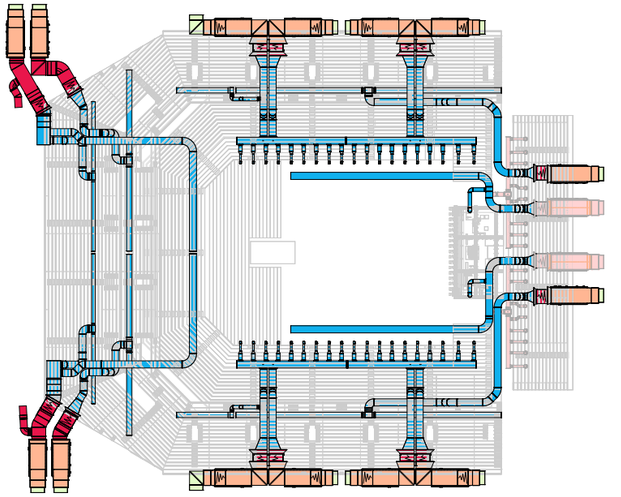
Pre-Show Mode (Ventilation to Atrium)

During Pre-show mode, it is anticipated that were will be a large occupancy (up to 3,000 people) within the Atrium before and after the show. During this period, conditioned air from the AHUs situated closest to the North East and South East corners (2no. Units) are diverted from The Hall to the Atrium, through the use of motorised volume control dampers.

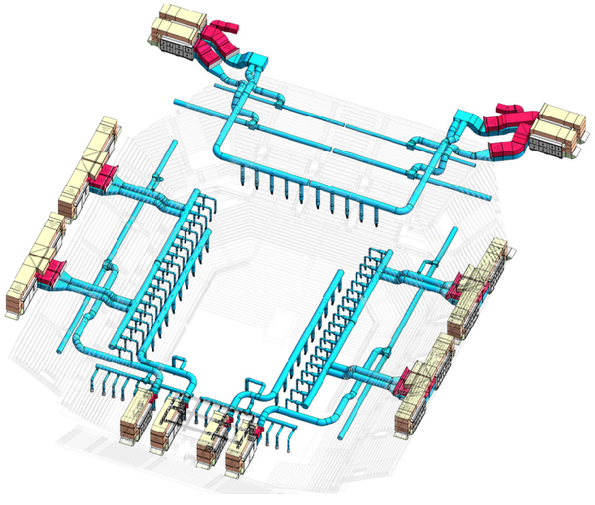
The supply air is routed down to the soffit of the Level 02 Atrium, utilising flat oval ductwork, and distributed into the space via drum jet



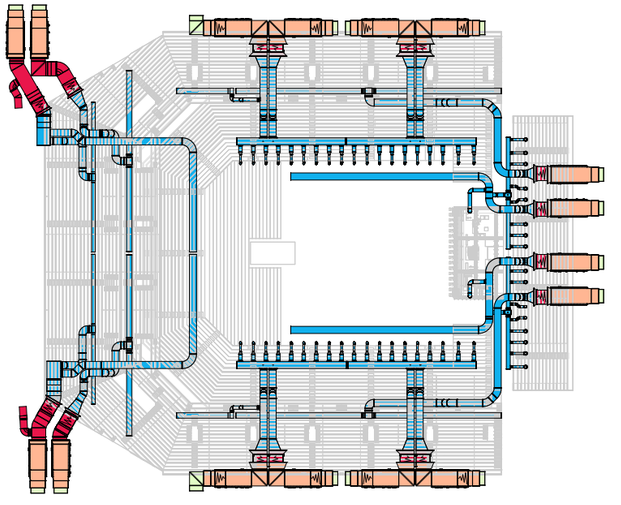
Concert Mode 3D



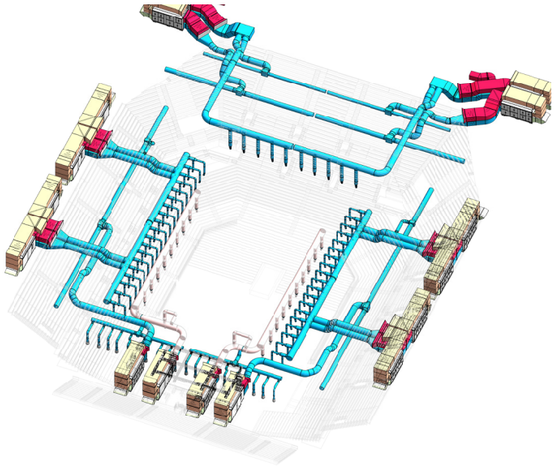
Concert Mode Plan



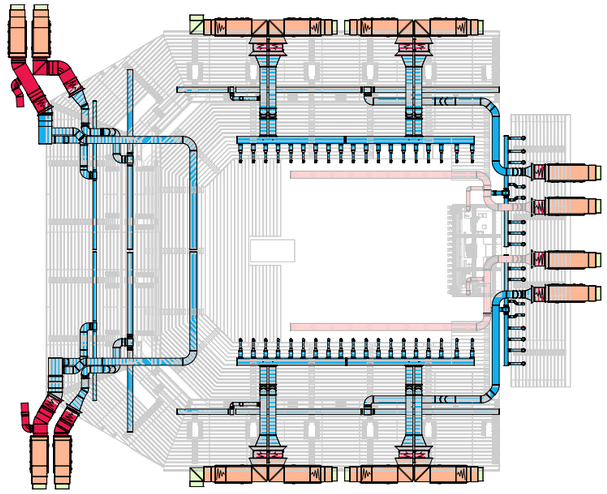
Sport Mode 3D



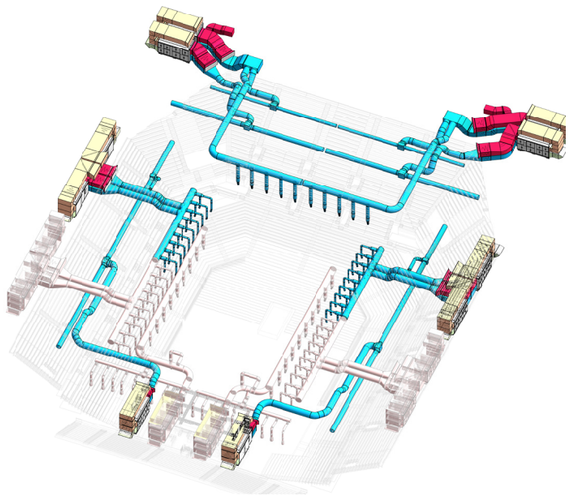
Sport Mode Plan



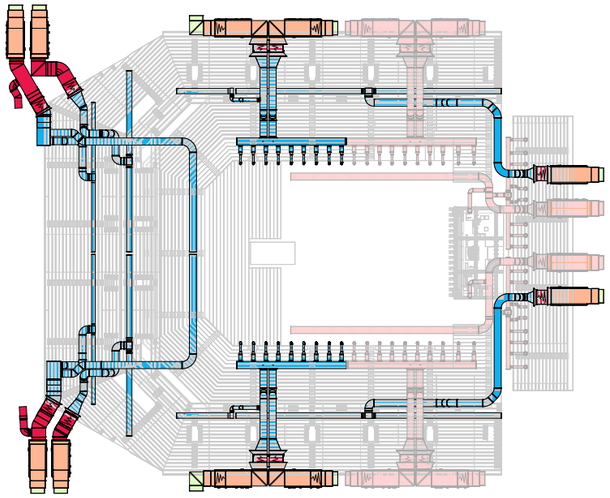
Ice Pad Mode 3D



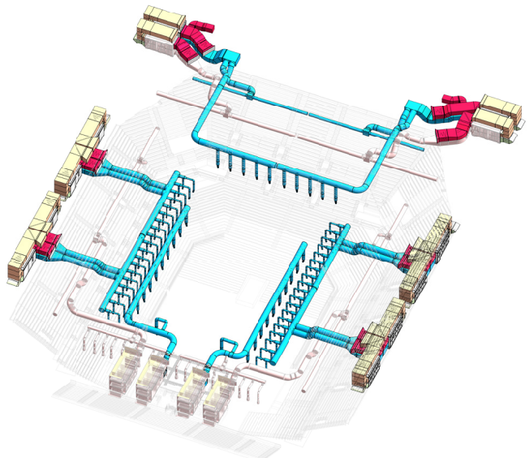
Ice Pad Mode Plan



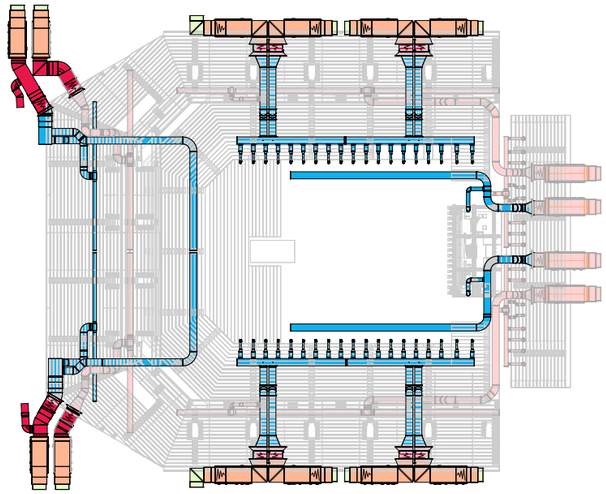
Short Hall Mode 3D



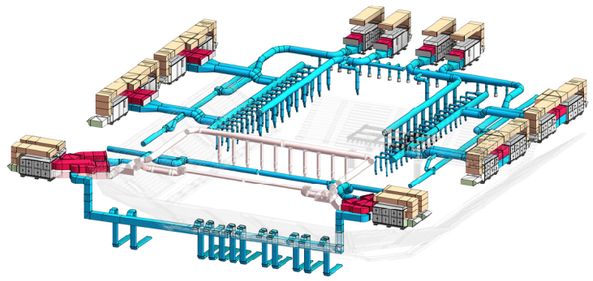
Short Hall Mode Plan



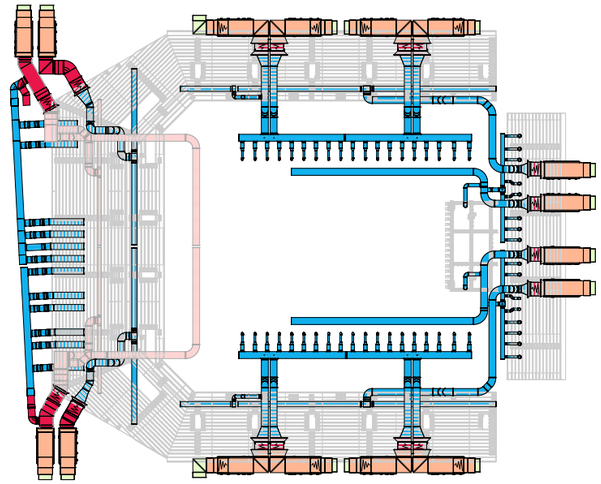
EDM Mode 3D



EDM Mode Plan



Pre-Event Mode 3D



Pre-Event Mode Plan

diffusers. High level bell mouth terminals within the Atrium will return the air to the AHUs. All exposed ductwork and nozzles will be finished in matt black (architect to specify RAL colour).

When the show starts, the motorised dampers will reconfigure diverting the majority of the air to The Hall, retaining a provision of make-up air to the Atrium for WCs, Concessions etc. Connected to the Atrium. The system is not intended to operate in Show and Pre-Show modes concurrently.

7.1.1.7 Cooling Systems

ICT Technical Rooms

Each ICT Technical Room throughout the building shall be provided with an air temperature sensor connected to the BMS; high and low level transfer grilles to allow for natural ventilation to occur; mechanical ventilation fans complete with filter boxes for forced ventilation; and VRF / V cooling (by wall mounted FCUs, Close Control Units (CCUs) or In-Row Cooling (IRC) units). These elements shall be controlled to allow for compliance with BREEAM Ene08, i.e. with the following control strategy:

Natural ventilation shall be allowed to occur via the high and low level transfer grilles until the room temperature reaches 20°C

Forced Ventilation shall be utilised once the room temperature exceeds 20°C until it reaches 24°C

Once the room temperature exceeds 24°C, the mechanical cooling shall be initialised and utilised to provide forced cooling to the room

All cooling to the ICT Technical Rooms shall be provided as an n+1 arrangement to ensure resilience.

MER Hot Aisle Scheme

The MER will incorporate a contained hot aisle scheme where the hot air rejected from active equipment is contained within the aisle. The hot air is directly processed via In-Row Cooling (IRC) units which in turn, return cool / conditioned air back into the cold aisle which in affect is the remaining MER space. This contained hot aisle arrangement provides a high efficiency in terms of energy consumption.

It is proposed that the IRC solution, equipment cabinets and aisle fabrication / components be provided from the same Manufacturer. This will ensure there are no compatibility issues when the hot aisle scheme is built.

IRCs shall incorporate an interface to achieve TCP/IP communications such that the units can be monitored via the BMS and / or Network Management Platforms.

Reference shall be made to the MEP specification for further details on the operating conditions of the IRCs.

Electrical Plant Room Cooling

Cooling shall be provided to each Transformer Room to maintain optimum conditions for these devices. Cooling shall be provided by DX cooling CCUs. All such provision will be as an n+1 arrangement to ensure resilience.

Talent Area Cooling

Each dressing room is provided local heating / cooling via a VRT system. In order to allow for variable room set-points desired by the varying occupants, local simple controllers are to be provided to allow for adjustment of room set-points within each dressing room.

Staff Areas / Offices Cooling

Staff areas, offices and general Back of House (BoH) areas provided with VRT systems shall be centrally monitored and controlled via the BMS. Local simple controllers shall be provided with limited control capabilities over sensible zones.

Concourse / FoH Cooling

All concourse / FoH cooling systems are to be centrally controlled and monitored by the BMS. FCUs shall generally be located such as to condition areas with high levels of expected dwell time (concession / F&B / bar queuing areas).

General Installation

VRT pipework shall be routed throughout the building via galvanised steel cable tray.

Local leak detection systems shall be installed as required to ensure any refrigerant leak is detected and suitably contained. Upon detection of a leak, an alarm shall be raised via the BMS to the security control room located at Level GF.

Each FCU, MVHR, AHU, etc. shall be connected to the BMS and monitored for run, fault, and status signals.

7.1.1.8 Smoke Exhaust Systems

Fire Fighting Stair Cores

Each firefighting stair core shall be provided with a mechanical smoke extract system to the lobbies and an Automatically Opened Vent (AOV) at the head of the stair core which shall be opened under fire condition.

The smoke extract system will consist of a duty and standby variable speed extract fans with inverter drives, linked to pressure sensors within the lobby at each level via a control panel. A motorised damper will be provided between the extract shaft and lobby at each level. A 1m² ventilator is needed in the stairwell for air inlet.

The pressure sensors maintain acceptable pressure difference between the lobby and stairs, typically 25Pa. This ensures that excess pressures do not draw extra smoke past door seals or cause excessive door opening forces.

The Hall

A mechanical smoke exhaust system shall be provided to The Hall. This system shall be capable of maintaining 150m³/s of smoke extract under a fire condition within the Hall in accordance with the Buro Happold fire strategy.

This will be provided by seven fire rated smoke extract fans, located externally within the Level 05 plant trench, with bellmouth extract points at high Level within the Hall. Makeup air will be provided from low Level via the vomitory access doors and Hall fire doors.

Level 3 Concourses

Mechanical smoke extract system is to be provided to the Level 3 North, South, East and West Concourses, where spaces are double height. The system is designed to extract 10 air changes per hour from each smoke compartment zone under smoke conditions.

The Fire rated smoke extract fans will be located at high level within the Level 3 concourses. All ductwork and fans to be finished in black (Architect to specify RAL colour).

Atrium

A mechanical smoke extract system is to be provided to the Atrium. The system is designed to extract 80m³/s from the Atrium under smoke conditions.

The Fire rated smoke extract fans will be located in the Level 05 plant trench and utilise the general extract ducts serving the Atrium. These extract ducts will be fire rated to allow for dual use and motorised smoke fire dampers shall be used to alternate use between AHU (general extract mode) and smoke fan (fire mode).

Level GF Talent Areas and Back of House

The Talent Areas and Back of House spaces to the southern end of the building on Level GF will be provided with a smoke extract system. Since this area is too large to be ventilated all as one area, the area has been broken down into several smoke control zones.

Each smoke control zones will typically consist of several rooms, but within a common fire compartment. When a fire is detected within a smoke control zone, all motorised dampers within the smoke control zone will open, and the common smoke extract fan will initiate. All other motorised fire smoke dampers will remain closed to ensure that the smoke extract occurs where it is required.

Under fire mode, the extract system will ventilate all rooms within the affected smoke control zone to 10 Air changes per hour. Where a portion of the exhaust ductwork system utilises the general extract system, this ductwork shall be fire rated.

Mechanical makeup air supply ducts have been allowed to each zone, terminating with a fire smoke dampers. In fire mode, dampers will open in the affected zone, and close elsewhere, maintaining fire partition integrity.

Loading Bay

The loading bay shall be provided with a fume / smoke exhaust system assisted by an induction fan system.

These systems shall, under normal conditions, provide continuous background ventilation at a rate of 6 Air Changes per Hour (ACH) to control levels of petrol and diesel vapours and toxic gasses produced during normal operation of the Loading Bay.

Under a fire condition, these systems shall provide a minimum of 10ACH to allow for removal of smoke from within the Loading Bay.

The induction fans shall promote air flow from the vehicle entrance and encourage air to flow throughout the loading bay and towards the extract terminals situated in the South end of the loading bay.

The roller shutter door providing security to the entrance to the Loading Bay during unoccupied hours will have vent openings at high Level equivalent to 42m2 free area, to allow the Loading Bay ventilation system to operate when the doors are closed.

The extracted air shall be exhausted to atmosphere via the Ventilation Turret mounted on the Level 01 podium. The smoke fans shall be dual speed, fully fire rated, and utilise a system of fire rated ductwork connected to high Level extract terminals.

3no. fans, arranged in parallel, are included in the design.

Each fan shall be capable of extracting 14.0m^3/s of air during normal conditions and increasing to 23.4m^3/s during fire conditions. This provides 42.0m^3/s of extract air during normal and 70.2m^3/s of extract air during fire conditions.

Each fan shall be inverter driven and rated to run at 300°C for a minimum of 60 minutes.

The ductwork, fixings, supports and ancillary equipment shall be suitable for handling hot gases of temperatures up to 800°C.

Each fan shall be mounted within the Level 01 podium ventilation turret and exhaust via weatherproof louvres at high level on the turret.

The fans shall be fed from a life safety electrical supply to ensure a power supply for up to 180 minutes in the event of a mains power failure.

In addition to the general loading bay extract system, additional hose reel extract connections shall be provided in the vicinity of the truck parking bays to provide the facility for truck engines to run whilst loading / unloading takes place. A product such as the Nederman Hose Reel 865 (or approved technical equivalent) will provide this facility. 1no. hose reel system shall be provided per parking bay (12no. total). Each hose reel shall connect to a common exhaust duct network, provided with an inline fan to mechanically extract vehicle exhaust fumes from idling trucks / vehicles. The exhaust shall be discharged in the vicinity and path of the Loading Bay extract air points.

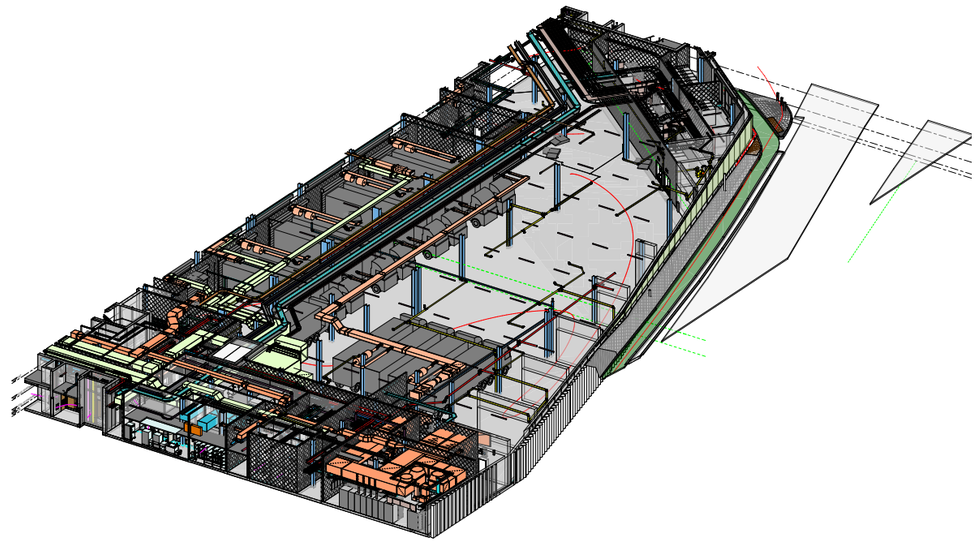
7.1.1.9 Condensate

A condensate pipework system shall be provided to remove condensate from FCUs, MVHRs, AHUs, etc. as necessary. The condensate drainage will be fully insulated and will be sent to drain via a suitable waterless trap. The contractor is to make due allowance for condensate pumps as required where a gravity-only system may not be practicable.

7.1.1.10 Natural Gas System

Natural gas shall be provided only to the boilers at Level 05 for generation of LTHW. All kitchens and concessions are to be provided with electrical cooking facilities.

The current design is for a new Low Pressure Gas connection to be made to the local gas network with the new incoming main and utility gas meter located in the gas intake room in the North-East corner of Level GF. From this location natural gas shall be conveyed within heavy grade steel pipework to Level 05 via the mechanical services riser located in Quadrant B. Each boiler shall be capable of reporting gas usage to the BMS.



Loading Bay Ventilation

Local wall mounted gas isolation panic buttons shall be located within the Level 05 boiler room, wired back to the control panel, and when activated will close the local gas solenoid valve.

Dependent upon the final transmission pressure available from local gas network, a gas booster has been provided to suit the equipment requirements during peak demand periods.

7.1.1.11 Fire Compartmentation

Fire compartmentation integrity (as designed by Buro Happold) shall be maintained by a mixture of fire rated ductwork, fusible link fire dampers and combined fire and smoke dampers as appropriate throughout the building.

7.1.1.12 Temporary Ice Pad Chiller

It is expected that events requiring an ice pad shall utilise temporary specialist low temperature chillers, provided by the event overlay team.

No allowance has been made within the permanent venue plant to provide cooling for an ice pad.

A designated location for the temporary overlay chillers has been allowed for externally within the Outside Broadcast area on the Level 01 Podium, on the East side of the building.

The overlay ice pad chiller plant is expected to require approximately 120m^2 of clear area to allow for 3no. Air Cooled Chillers, rated at 479kW (nominal) each to be temporarily located along with associated plant such as temporary pumps, buffer vessels and interconnecting pipework.

The temporary plant to be utilised is to comply with the acoustic requirements stipulated by others to ensure no noise nuisances result from the temporary chiller plant during Ice Pad event.

An external rated power supply and a water supply shall be provided within the vicinity of the temporary chiller plant to allow for powering of the temporary plant and filling of the ice pad chilled water system.

A designated route shall be provided from the temporary plant location to allow temporary pipework to route the chilled water from the chillers to the ice pad within the Hall. This route shall consist of a pipework riser allowing the pipework to drop from Level 01 to the loading bay directly beneath the temporary chiller plant. The temporary chilled water pipework shall be routed by the overlay specialists, and protected as necessary by them during the installation.

The riser is to be capped with a “dog kennel” type structure to allow for simplified weatherproofing of the penetration.

7.1.1.13 Automatic Control System (BMS)

General Overview

The building shall be provided with a Building Management control System (BMS) to control, manage and monitor the plant and equipment and to centrally record energy and water meters.

The system will be made up of a large number of discreet Intelligent Controllers located throughout the site. These standalone Controllers will be networked together to provide comprehensive control and monitoring for all Heating, Ventilation and Air Conditioning.

The system will be fully addressable via a head end arrangement with graphical display, remote web access and full data logging capabilities to allow for targeting of future energy savings.

The automatic controls system is to be comprised of the following:

- Communications network and communications peripherals.
- Outstations installed in motor control centre panels (MCCPs)
- Controllers, control sensors (eg temperature, humidity, pressure), actuators, (eg Valves, motorised dampers) and switches
- Motor control centre panels containing controllers, starters etc.
- Control and alarm panels
- All sensor and communications wiring and containment
- Supervisor terminal, software and database
- Connection to the site wide estate

Networking

The BMS will be made up of a CAT 6 Ethernet network, which will provide a network between all BMS control panels, outstations and Supervisor Stations. The equipment shall operate in an Open Protocol basis such as BacNet Protocol, to ensure the client has full flexibility in the future maintenance and modifications to the system.

This modular and versatile system will allow the user to simultaneously access a wide range of information from different areas of the system, whilst still maintaining a high degree of integrity. The system network will perform automatic self-checking for changes to breaks and record accordingly.

Controllers

Individual plant will be controlled and managed by standalone Controllers. The functions that are required to control, manage, and monitor these items of plant are contained within each discreet Controller. All Controllers will have peer-to-peer communications capability, and the individual controllers to be able to control their individual plant during either a BMS supervisor or transmitter failure.

Controllers will generally incorporate a Local Network Display Panel, which will allow local viewing of all Controller parameters to assist with routine maintenance and testing. All Controllers will be able to be interrogated and / or adjusted from remote locations.

Plant Motor Control Centres

A number of purpose built Motor Control Centres (MCCs) will be provided as part of the Building Management Controls Package. Each MCC will have its own dedicated BMS Controls Section housing, its related standalone BMS Controller and Local Display Panel.

All MCCs will undergo rigorous works testing and witnessing procedures and certification prior to delivery to site.

Penetration Testing – Data / Network Security

The Building Services Contractors shall ensure that all electronic field devices related to their systems are made secure in terms of cyber security and TCP/IP communications. Devices shall be hardened in order to prevent malicious activities which may affect/compromise confidentiality, integrity or availability of the system or service. Basic hardening examples would be:

- Disabling telnet
- Disabling HTTP interface
- Enabling SSH
- Removing local login for configuration

Building Services Contractors shall make reference to the following document with regard to their role and responsibilities in working collaboratively with the active network contractor(s) and the Penetration Testing Assessor in achieving a highly secure network infrastructure. (Document reference: Network Infrastructure - Information Security Testing)

Automatic Transfer Switches

All mechanical plant requiring Automatic Transfer Switches (ATSs) are to be provided with the ATS as part of the mechanical package.

7.1.1.14 BREEAM Man04

The contractor is to make due allowance for the appointment of an independent Specialist Commissioning Manager to assist the Contractors D&B team in programming, managing and executing the commissioning of all systems within the scope of OVG Manchester.

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PUBLIC HEALTH SERVICES

7.2.1 PUBLIC HEALTH SERVICES 746

7.2

7.2.1 Public Health Services

This section of the report shall generally identify and describe the key elements involved in the Public Health engineering strategy to OVG Manchester.

The Domestic Hot and Cold Water Systems shall comprise of:

- Cold Water Storage (Potable and CAT 5)
- Cold Water Boosting (Potable and CAT 5)
- Ultraviolet Disinfection and Water Conditioning.
- Hot Water Generation / Circulation
- Water distribution Network
- Metering / Valves / Controls / Fittings
- Non-potable (CAT 5) Water system
- Rainwater Harvesting System
- The Above Ground Soil and Waste Systems shall comprise of:
- Gravity Foul Water drainage system
- Foul Drainage ventilation system
- The Roof Drainage and Above Ground Rainwater Systems shall comprise of:
- Siphonic rainwater drainage system for main roof and Level 03 external areas.
- Gravity rainwater system for level 05 mechanical trench areas & Levels 04 exposed area
- Suspended drainage from Level 01 podium and external areas

All below ground drainage, including all below ground drainage works, including pipework, chambers, attenuation / rainwater harvesting tanks and pumps will be part of the civil / structural consultant's package of works.

All drainage of Level GF and Level 01 external areas of the site will be part of the civil / structural consultant's package of works.

Arena Areas to be served with water and drainage connections will include but will not be limited to:

- WC Blocks
- Artist Dressing Rooms
- Shower Areas
- Kitchens
- Food and Beverage Concessions
- Lounges / Bars
- Decibel and Founders Clubs
- Medical / First Aid Rooms
- Commissary Kitchen
- Crew Kitchen and Catering Areas
- Plant Rooms
- Service Yard

7.2.1.1 Utilities Connections

Mains Water

Domestic Water to OVG Manchester will be provided by a new incoming metered supply from the United Utilities Water Main in Joe Mercer Way.

An incoming 110mm MDPE main will enter the building from below ground in the Northwest corner, rise to internal high level, convert to 108mm copper, and run alongside the main pipework racetrack route to the east side of the building. The supply will rise to the Level 1 externa tank area, where it will provide mains make-up to the potable cold water storage tanks. The required flow rate will be 14 l/s, achieving a tank-fill time of 4 hrs.

Sewer Infrastructure

For details of connections and consents to the utility sewer network refer to Civil Engineer's package.

Domestic Water Services

The Domestic Water System design will deliver the efficient and safe provision and distribution of water throughout the venue.

Due to water being an increasingly valued commodity, the system employs re-use, and minimises water wastage. This is achieved by measures which include, leak detection, sub- metering, secondary circulation for hot water, and the harvesting of rainwater from the main roof and exposed areas. Harvested Rainwater will be used to serve WC cisterns, urinal cisterns, hose washdown points and the irrigation system.

Potable and non-potable (CAT5) cold water systems, and hot water service flow and return systems will be provided.

The Domestic Services scheme is indicated on the domestic water layouts, and schematics which cover plant, pipework distribution, sizing and control valves / fittings.

Cold Water Storage

Central potable cold water storage will be provided on the Level 01 podium area.

The storage tanks will provide sufficient potable storage for the duration of an event. This volume will enable continuation of an event should there be a failure of the mains supply.

Potable water will be stored in 2no. pre-insulated sectional GRP storage tanks. Each tank is sized at 11m(w) x 4m(l) x 2.5m(h). This will provide a total potable storage capacity of 200m^3.

Each tank will have a central division to allow for drain-down and maintenance, raised valve housing and will be mounted on a 150mm concrete plinth. All fittings to be suitable for external siting. Pipework to be trace heated to prevent freezing and all elements of this plant will be suitable to external conditions.

Tank controls to be configured to provide two operational water level scenarios within each Domestic Potable Water tank / compartment. The two scenarios are Event Day and Non-Event day, enabling an automated reduced total stored water capacity when no event is occurring, to reduce stagnation and water wastage.

A 30m^3 Category 5 non-potable cold water storage tank will also be provided in the Level GF public health plantroom (see details of CAT5 system within this section of the report).

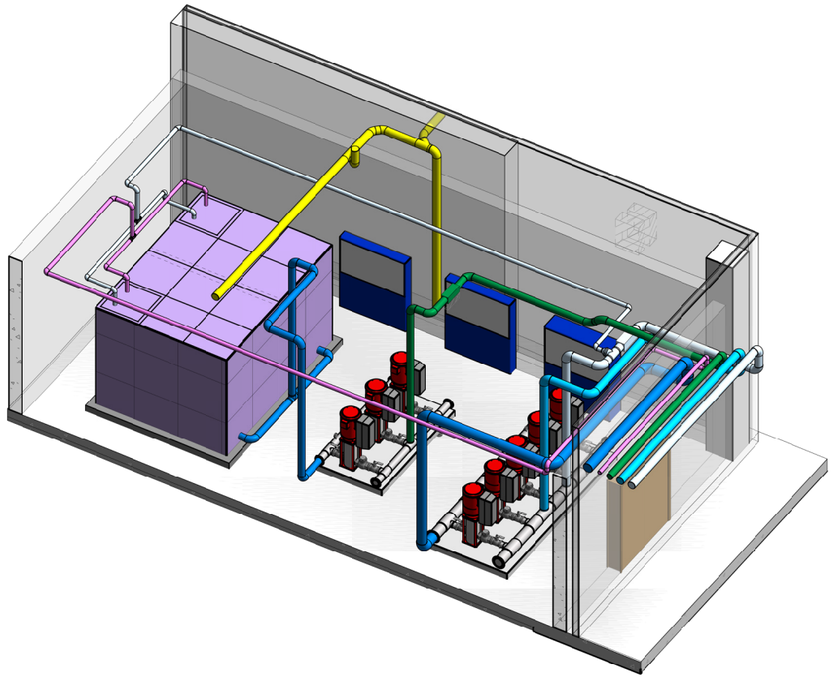
Boosting

Potable water will be distributed around the venue by a centralized Potable Cold Water Booster Set located in the Level GF plantroom. The set will consist of 5no. variable speed,

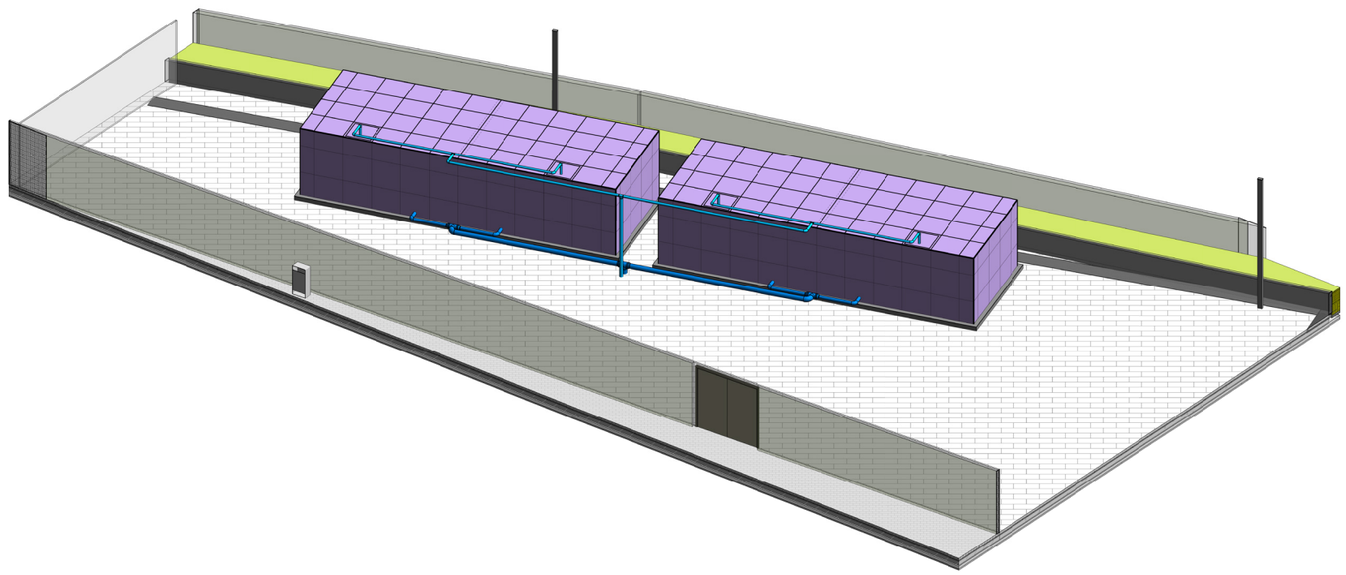
inverter driven pumps, an accumulator vessel and associated controls and fittings.

The potable booster set will supply the BCWS requirements of the Arena, a dedicated cold feed supply to the Level 04 HW plant, and a back-up supply to the CAT5 tank for periods when there is insufficient reclaimed rainwater available to fill it.

3D Public Health Plantroom (Level GF)



3D Potable Bulk Cold Water Storage Installation (Level 01)



The operational duty of this potable booster set is 54.5 l/s @ 9.2 bar.

The pumps will be variable speed and will be programmed to operate in the most efficient duty / assist / standby sequencing to reflect the large variations in demand likely for the venue's different usages / modes.

Ultraviolet disinfection will be provided to the boosted cold water service as an additional anti-bacterial safeguard to the potable system.

A non-potable cold water booster set will also be provided in the Level GF public health plantroom (see details of CAT5 system within this section of the report).

Domestic Hot Water

A centralised domestic hot water system will be utilised for the venue requirements.

A combination of storage and fast recovery will be employed to meet the variations in the Arena's hot water demands.

This will be provided by 4no. 4000 litre cylinders each fitted with a 230kW plate heat exchanger. The packaged plants will be capable of a recovery time of 1 hour. The hot water generation plant will be sited in the HW Plantroom at Level 04.

Plant will be fully packaged, complete with all required fittings including shunt pumps, expansion vessels, pressure / temperature relief valves, isolation, check, non-return and control valves.

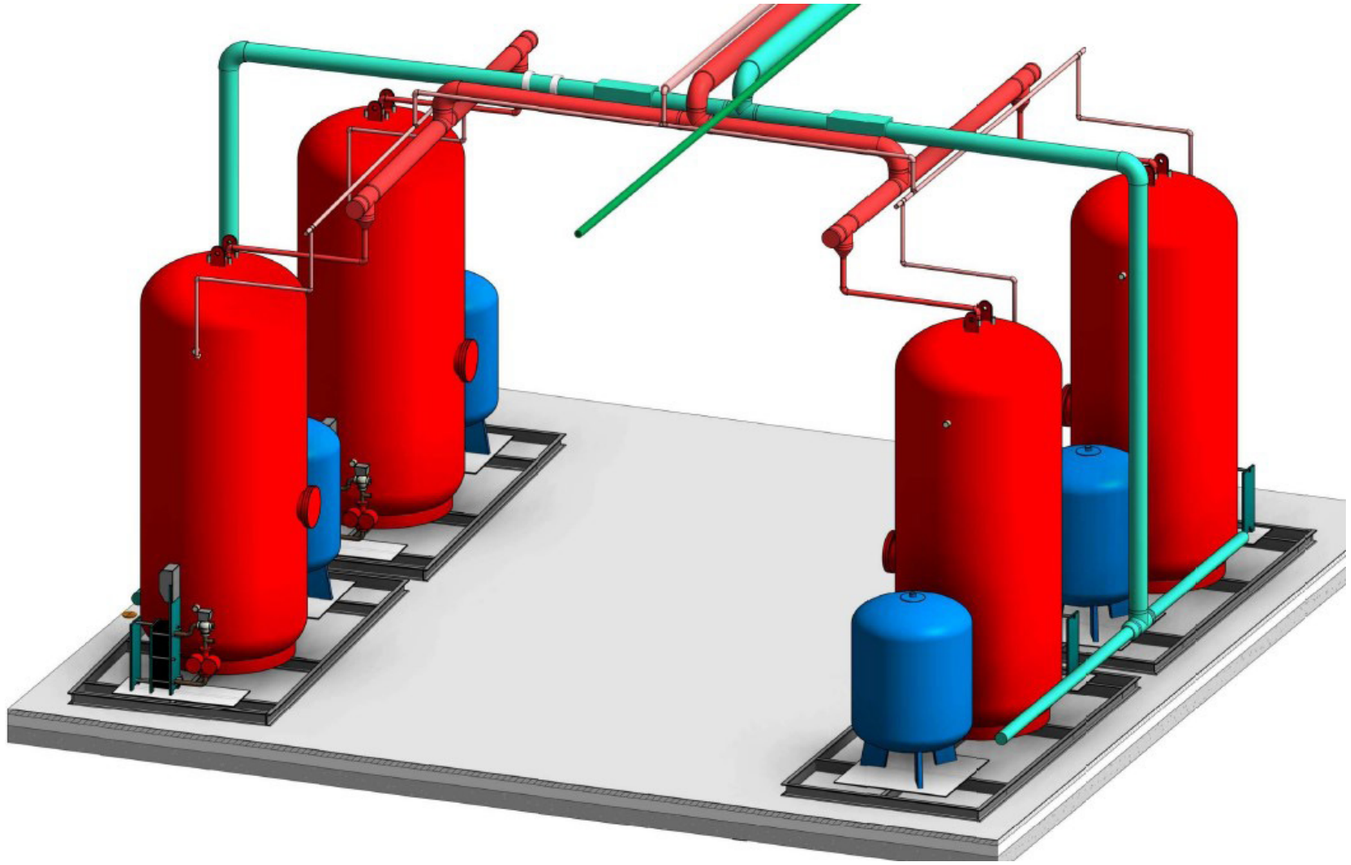
The central hot water system will be designed in accordance with the latest BS EN standards and water will be stored at 60°C. The HWS system will be distributed in a manner that provides a temperature of 55°C at the point of draw off.

To maintain hot water temperature in the system, preclude the risk of legionella growth, and to ensure a prompt delivery of hot water to fittings, a secondary circulation flow and return system will be employed. Hot water will return to the calorifiers at a temperature of 55°C.

Hot water return pipework will terminate outside of spaces / rooms – so that the venue operator retains full control and can isolate any space in the building from the corridor outside. Uncirculated hot water pipework runs within the rooms are to be provided with electric temperature maintenance trace heating tape.

The hot water system shall have the facility to enact regular pasteurisation to be carried out as part of a managed and monitored anti-legionella regime.

Cold feeds from the boosted potable supply to the hot water plant will be provided with pressure control valves, back flow protection, expansion devices, safety discharge valves and isolating valves. Each cold feed will also be fitted with an electromagnetic water



Hot Water Generation Plant (Level 04)

conditioner for the reduction of scale deposit and to provide protection of the system.

Distribution

Domestic water will be piped throughout the venue via main service routes and service risers, to supply all sanitary fittings and domestic hot water plant.

Configuration of the boosted cold water services will be a main ring at Level GF, with supplies rising in 4no. service risers. On each level, services will emerge from the 4no. risers and serve the local quadrant radially.

Hot water distribution will emanate from the Level 04 HW Plantroom Room, with hot water returns running back to that location. The return pipe to the hot water plant room will be fitted with a suitably sized hot water circulator.

The distribution system will be complete with isolation and control valves, test and chlorination points, metering, and thermal insulation outlined in the specification.
The system will be installed and tested as required for efficient operation and regulatory compliance.

A valve set providing isolation, pressure regulation, backflow protection and metering is provided outside of each room / space. This

enables the venue operator to retain full control of the system and isolate any room / zone as required.

Fittings which present a backflow contamination risk to the system will be provided with the appropriate category of protection.

All WHBs and Showers in the Arena will be fitted with thermostatic mixing valves to ensure a maximum temperature of 43°C is maintained at outlets. Sinks and fittings in catering areas will not require TMVs and are to be installed as per the manufacturers' requirements.

All unprotected hot water draw-off points are to be provided with clear labels which provide the warning "VERY HOT WATER".

All domestic water pipework to be in thermally insulated copper.

Non-Potable (CAT5) System – Incorporating Rainwater Harvesting

A category 5 (CAT5) cold water system will be provided to serve WC and urinal cisterns, and wash down points in the building. It is proposed that the CAT5 booster set can also serve the building's irrigation system – details of this arrangement are to be finalized.

This system will include a 30m^3 CAT5 cold water storage tank in the Level GF PH plantroom. The tank will be dual-fed from the boosted cold water service and a filtered harvested rainwater service from an external buried harvesting / attenuation tank.

The CAT5 tank is to provide full backflow protection to the boosted cold water service.

An incoming 108mm harvested rainwater supply will enter the plantroom, and pass through ultra- violet disinfection prior to entering the tank.

This supply will come from a buried rainwater harvesting tank complete with filtration. For details of the below ground elements of the system – including tanks, pumps and filtration refer to the civil engineer's package.

The inflow to the CAT5 tank will be controlled by an interface controller which will be part of the rainwater harvesting equipment. This will be a microprocessor control unit which will monitor water levels in both tanks (CAT5

and buried external), and control the interface between the pumps in the buried tank, and the intake of boosted water top-up via a solenoid valve.

CAT5 water will be distributed, via an ultraviolet disinfection unit, around the venue by a packaged CAT5 Cold Water Booster Set, adjacent to the CAT5 storage tank. The set will consist of 3no. variable speed, inverter driven pumps, an accumulator vessel and associated controls and fittings.

The operational duty of this booster set is 14 l/s @ 9.2 bar.

Domestic Plant Summary (for full details refer to the Equipment Schedules)

- 2no. Potable Cold Water Storage Tanks (Level 01 Podium) 11m x 4m x 2.5m (200m^3 Storage total)
- 1no. Potable Cold Water 5-pump Booster Set (Level GF PH Plantroom)
- 1no. CAT5 Cold Water Storage Tank (Level GF PH Plantroom) 4m x 3m x 2.5m (30m^3 Storage)
- 1no. CAT5 Cold Water 3-pump Booster Set (Level GF PH Plantroom)
- 3no. Ultraviolet Disinfection units (Level GF PH Plantroom)
- 4no. Plate and Cylinder packaged Hot Water generation plants (Level 04 Plantroom)
- 2no. Electro-Magnetic Water Conditioners (Level 04 Plantroom)
- Hot Water circulator (Level 04 Plantroom)
- Rainwater Harvesting Interface control panel (Level GF PH Plantroom)
- Storm Control Panel – for harvesting / attenuation control – for details refer to Civil Engineer's package. (Level GF PH Plantroom)
- Irrigation Control Panel – for details refer to Irrigation Specialist's package of information (Level GF PH Plantroom)

7.2.1.2 Above Ground Drainage

Soil and Waste

The above ground soil and waste drainage system will serve all user and plant areas in the venue. Items requiring drainage include, but are not limited to, the following:

- All sanitary fittings, to include WCs, WHBs, sinks, showers, urinals, washing machines, dishwashers and specialist catering fittings.
- All internal floor gullies, channels and outlets.
- Condensate drainage from mechanical plant – to be adequately trapped prior to connection to foul system.
- Expansion relief from hot water generation plant.

The foul drainage system will be a secondary ventilated gravity system. It will consist of a network of soil vent stacks with accompanying ventilating pipes.

Sanitary fittings will be served by low level floats and branch pipework – which will run to SVPs – connecting either at low level or at high level below via stub-stacks when run distances are too great.

SVPs will drop to Level GF, where they will connect to the below ground drainage system (by others).

SVPs will discharge to atmosphere externally at Level 05 – converging where appropriate as shown on the drawings.

Level GF sanitary fittings will discharge directly to drain via adequately ventilated stub stacks and will not connect to SVPs from above. All floor gullies will be trapped. Level GF drainpoint connections will vent via a high level ventilation pipe system – discharging to atmosphere at Level 05 – via ventilation stacks in the 4 Quadrants' main pipework risers.

All stacks and horizontal run-out pipework will be provided with ventilation and anti-siphon pipes to prevent the loss of water seals in the system caused by self- or induced siphonage. Branch pipework and Stub stacks on Levels 01 to 04 are vented with a network of anti-siphon runs, which connect to dedicated vent pipes running with SVPs or to the dry sections of the SVPs as indicated on the drawings.

Level 00 fittings are all drained to dedicated stacks for this floor – and no connections are made at Level 00 to SVPs from floors above.

Level 00 drainpoints are ventilated by a dedicated ventilation pipework system – which collect to 4no. 160mm vent stacks – one in each of the quadrant pipework risers.

Access to the foul drainage system will be provided at each level for stacks, at all changes of direction, at all penetrating stub stack wastes, and at all points of connection to below ground system. Where pipes pass through fire rated structural elements all penetrations will be fire sleeved.

Where F&B concessions come to be fitted out, capped drain and drain vent connections will be provided for extension. Local grease control is to be provided to all kitchen, bar and F&B concessions, designed by the catering specialist and installed as part of the fit-out works.

Stacks and stub-stacks will be prefabricated using HDPE pipework with fusion or electro-fusion welded joints, to provide a strong, durable and leak free solution with a long installation life.

All below slab drainage, including all drains and any foul water chambers / pumps will be part of the civil / structural consultant's package of works.

The Foul Drainage scheme is indicated on the Sanitation layouts, and schematics.

Surface Water Drainage System

Rainwater from the main roof and Level 03 external area, will be drained via a siphonic rainwater drainage system.

The benefits of a siphonic system include:

- Fewer outlets and downpipes – resulting in materials and installation savings
- Reduction in required below ground drainage
- Pipes are smaller and run level, aiding co-ordination
- Higher flowrates – resulting in increased efficiency
- Properly designed, a system is self-cleansing – allowing for reduced maintenance
- Greater flexibility in downpipe locations

The run-off will enter a roof gutter system, and will discharge via regularly spaced siphonic outlets. Rainwater will run from outlets, via individual tail pipes, to high level horizontal collector pipes.

The discharge from the main roof will be effectively divided between 4no. siphonic downpipes – with one in each quadrant riser.

Two additional siphonic stacks will be provided in the Northwest and southwest quadrant risers to serve Level 03 external areas.

During rainfall conditions, outlets will prime, and discharge full bore through the siphonic system – to Level GF – where they will connect to the below ground system. Siphons will be broken below ground in manhole chambers – where the system will return to atmospheric pressure.

Design and sizing of the siphonic system will be by a siphonic specialist to be engaged by the contractor– utilising specialist simulation software.

A gravity rainwater drainage will be provided within the plant trenches at Level 05 which will contain mechanical plant. This will take the form of evenly spaced rainwater outlets in a point drainage system. These outlets will discharge to a system of gravity rainwater pipework, to be routed down through the building – joining the below ground system at Level GF.

Additional exposed areas at Level 04 will be drained via a gravity system of outlets, joining the RW stacks in the riser – delivering run-off to the below ground system.

Level 01 podium and compound areas will be drained by gravity systems. For details refer to Civil engineer's package. Where pipework from this system drops into Level 00 internal spaces, they are picked up in M.E. package and are shown on M.E. design drawings

Where applicable – overflows in the architectural fabric (parapets etc) are to be provided to cater for situations where design rainfall intensity is exceeded, or where the primary drainage system surcharges.

Access to the surface water drainage system will be provided at each level for downpipes, at all changes of direction, and at all points of connection to the below ground system.

Where pipes pass through fire rated structural elements all penetrations will be fire sleeved.

Rainwater Harvesting

The size of the venue roof offers an opportunity to harvest rainwater for use in non-potable systems.

This will result in a reduction in mains water consumption and costs, and a reduction in surface water discharge to public sewers.

Water from the roof will be discharged to surface water attenuation tanks (by others). Captured water, held in a combined harvesting / attenuation tank, and having undergone pre-tank filtration, will be pumped from this tank to the Public Health plantroom on Level GF.

For details of all below ground elements of the rainwater harvesting system refer to the civil package.

Following ultra violet disinfection, the harvested rainwater will be held in a 30m^3 CAT5 day tank, with a boosted cold water service back up.

Water will be boosted from there, via an ultraviolet disinfection unit to locations around the building for various CAT5 uses – including WC / urinal flushing, wash down and irrigation.

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FIRE PROTECTION SYSTEMS

7.3.1 FIRE PROTECTION SYSTEMS 754

7.3

7.3.1 Fire Protection Systems

7.3.1.1 Introduction

To meet the statutory requirements of the Building Regulations, the functional requirements of Approved Document 'B', the recommendations of the Local Authority, and to support the approved fire strategy, the following fire protection systems will be provided:

- Automatic fire detection
- Sprinkler systems
- Dry riser system
- Foam spreader system
- Clean agent fire suppression systems
- Smoke control systems

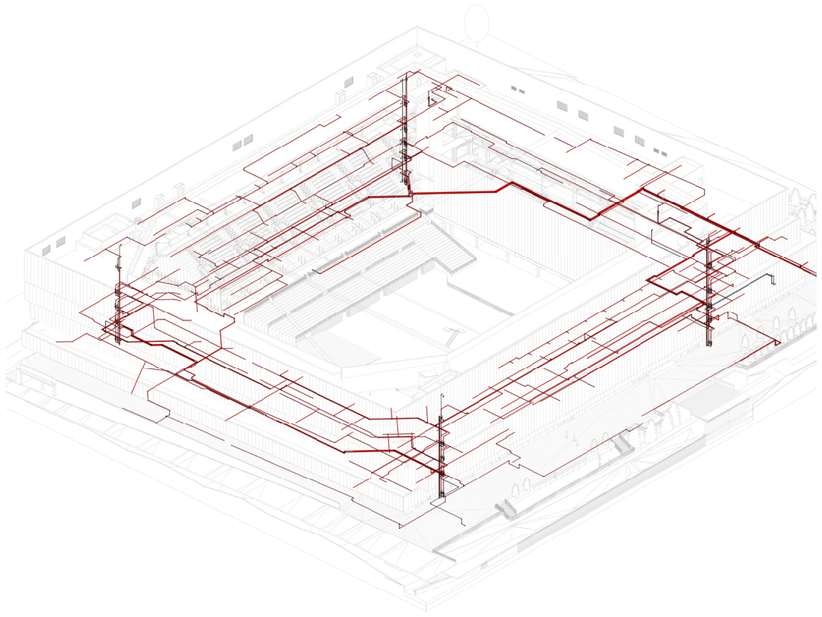
A Foam spreader system within the oil storage tank room has been allowed, but liaison with the Fire Service will be required to check that they carry the requisite equipment to operate this. In the event that they do not, this system will be removed in favour of wet pipe sprinkler protection.

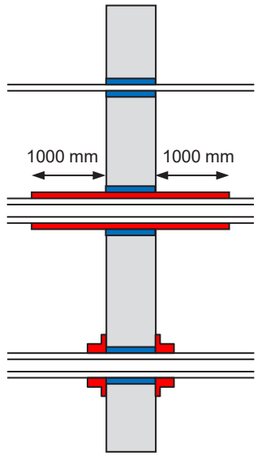
As the oil storage tanks are steel and double skinned plus will be located in a bunded space, it is not considered necessary to allow foam enhancement to the sprinkler water supplies. However, this will need to be confirmed with the fire service and added if needed. ME Engineers suggest that a cost provision be made for this at stage 4a to allow for this possibility.

Details of the fire protection systems provided at project completion to be included within the system Operating and Maintenance manuals and the Emergency Building Management Plan.

Please note:

- Smoke control systems are detailed within the Mechanical Services section of this document, so no further description is included here.
- The provision of any required private Fire Hydrants falls within the remit of the external infrastructure works package and so are not detailed within this document.





Fire separating element (wall/floor)

Fire stopping only – maximum allowable diameters:

- **160 mm** – non-combustible pipes.
- **110 mm –** pipes of lead, aluminium, aluminium alloy, fibre-cement or uPVC through protected shafts (excluding stairways and lifts shafts).
- **40 mm** – pipes of any other material or situation.

Sleeving –

- Pipes of lead, aluminium, aluminium alloy, fibre-cement or uPVC with a maximum diameter of 160 mm can be provided with a sleeve of non-combustible pipe.
- The Sleeving needs to extend 1000 mm either side

Proprietary seals – suitable for any pipe diameter.

- Install in accordance with manufacturer's instructions.

- Kitchen canopy fire protection systems would be specified under the Kitchen fit out works package and so it is not considered necessary to cover their provision in this document.

7.3.1.2 Building and development works

The activities undertaken as part of this scope of works relate to the design, manufacture, works testing, supply and delivery to site, erection, connecting up, site-testing, adjusting and setting to work of the fire protection systems as listed above.

The intent is to form these installations as complete and fully functioning systems as defined by the Employers Requirements, the design intent drawings, schedules, preliminaries documents and any other instructions issued by the Contract Administrator.

The building works for this development will be completed as a single operation, but with services installations and fit out works undertaken on a phased basis. All builders work will fall within the remit of the Contractor unless otherwise noted.

The Contractor will also be required to take cognisance of all services requirements both internal and external and any impact this will have on any existing services to complete and hand over the various phases of the project.

Additional Contractor design portion supplement requirements that relate to the fire suppression systems will be detailed in this document for information based upon our current knowledge of the project. These may be subject to change and addition in the next phase of this project.

Fire stopping is to be undertaken under a separate works package. The specialist fire systems Sub-Contractor is however to ensure that suitable pipe sleeves are included where services pipes pass through structural walls and fire compartments. Where pipes pass through structural floors, the pipe sleeve must have a raised profile plus be adequately fixed to the structure and supported.

7.3.1.3 Fire detection

The building will be provided with a digital addressable multi-zoned automatic fire detection alarm system that is fully programmable.

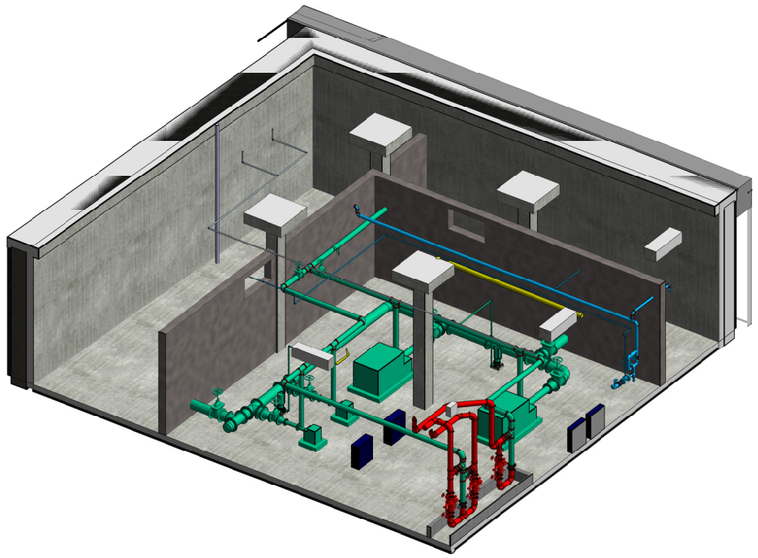
Please refer to the Electrical section of this document for main technical descriptions.

A certain element of Fire Detection works will be included within the Fire Protection works package, where detector actuation is required to actuate fire-fighting systems.

Fire detection / actuation systems will be incorporated within rooms protected by clean agent gas fire suppression installations under the fire protection works package. These shall be compatible with the main house fire detection equipment. Fire alarm and system status signals will be relayed from the gas extinguishing panel to a local relay connection (provided under the fire detection works package) for onward notification to the main house fire alarm panel. All upstream wiring to the panel will be within the fire detection works package, with the fire protection contractor responsible for making links to the relay connection interfaces.

A fire systems signals marshalling panel will be required to be located within the security control centre, immediately adjacent to the main fire alarm panel. The fire systems marshalling panel will be fitted with LED display as per the requirements of BS EN 12845:2015, BS 9990:2015 and BS EN 15004. The signals to this panel will be taken from the fire alarm network and all wiring plus provision of the marshalling panel will fall within the fire detection works package.

A cause and effect schedule will be developed by the fire engineer to ensure that the fire alarm system is managed and functions to the agreed fire strategy.



7.3.1.4 Sprinkler system

Automatic sprinkler systems are designed to detect the heat from a fire and then to either extinguish or hold the fire in check (pending Fire Service attendance) during its early stages, using water as the extinguishing agent. As such it is deemed to be a fire suppression system.

A sprinkler system consists of a reliable and verifiable water supply arrangement, to which one or more sprinkler installations are fitted.

Each sprinkler installation consists of a set of main Installation Control Valves (ICVs) and various distribution runs with range pipe arrays fitted with sprinkler heads.

The sprinkler heads are fitted at specified locations at the roof or ceiling, and where necessary between racks, below shelves, and low level obstructions, such as ducts and electrical containment runs.

The sprinklers operate at predetermined temperatures to discharge water over the fire affected part of the building in a local application manner. The operating temperature is generally selected to suit ambient temperature conditions.

Only sprinkler heads in the immediate location of the fire, i.e. those which become sufficiently heated, will operate - not the complete array.

The flow of water following a sprinkler head operation through the alarm valve and any subsidiary zone configurations initiates a fire alarm.

It should not be assumed that the provision of a sprinkler system entirely obviates the need for other means of fighting fires and it is important to consider the fire precautions in the premises in a holistic manner.

Structural fire resistance, escape routes, fire alarm systems, particular hazards needing other fire protection methods, provision of dry / wet fire mains, fire hydrants and portable fire extinguishers, etc., safe working and goods handling methods, management supervision and good housekeeping all need consideration.

The intention of this scope of works is to anticipate such requirements in association with the approved fire strategy for the development as a whole.

General design parameters:

- BS EN 12845:2015
- LPC Technical Bulletin TB210 only
- BS 6266: 2011 - Fire Protection for EDP Installations
- BS 7273:3:2008 - Electrical actuation of pre-action water mist and sprinkler systems
- BS 8519:2010 - Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice

Note: The LPC Rules and remainder of the Technical Bulletins will not be applied to this project as per the requirements of the Fire Strategy.

Performance objectives:

The intention is that this particular document is used to provide a general overview of the current requirements for the fire-fighting systems needed for statutory compliance and for the preparation of an initial project cost plan.

The design and installation of the fire protection systems will ultimately be based around a performance based specification, where the basis of design will be as described in this Scope of Works / Schedules document.

Since the works will be based around a performance based specification, we would recommend that this document and the proposed scheme as a whole be reviewed by a specialist fire systems contractor as part of the pricing exercise.

The new venue is to be fully sprinkler protected.

The only areas where sprinkler protection will be omitted will be:

- Within the Bowl area - due to the height between the Hall floor to the underside of its ceiling.

- Within areas where water discharge could be deemed to be a risk

Wherever the omission of sprinklers is proposed this must be formally agreed with the Authorities Having Jurisdiction (AHJ's).

The toilet areas will not be sprinkler protected providing they have a compartment fire separation of 60 minutes or more. Where not sprinkler protected care should be taken as there is a higher risk of arson, smoking or malicious intent within such public areas.

Structural fire separation will divide the sprinkler protected and non-protected areas as per the requirements of the Fire Strategy and Acousticians and generally in accordance with BS EN 12845:2015.

Particular care with the design and installation of the sprinkler system will be required due to the congestion of mechanical and electrical services within the building.

The system must be constructed to reflect the highest standards of design and installation workmanship. Any equipment, pipe or hanger condemned through bad workmanship must be replaced at no cost to the contract.

All sprinkler equipment used must be as listed in the latest published edition of the LPCB list of approved products and services (Red Book). This not only applies to sprinkler heads and alarm valves, etc. but also to all isolation valves and check valves.

It is a requirement of the LPS 1048 scheme, as specified in clause 3.8, that where available, LPCB approved specialist fire protection equipment shall be used in sprinkler systems carried out under the LPS 1048 scheme and designed to BS EN 12845.

The maximum distance of the sprinkler head deflector below the underside of the soffit, suspended ceilings or low-level services must not exceed 150mm wherever practicable.

The beam rule BS EN 12845:2015 clause 12.4.6 may be applied in exceptional circumstances to assist with areas of heavy services coordination or to protect around drop beams or other constructional elements. In considering low-level obstructions or deep / wide beams or ducts, the principles of providing additional sprinkler heads will apply.

Sprinklers shall be provided within the room spaces, floor voids and at the underside of false ceilings where fitted in accordance with the requirements of BS EN 12845.

Phasing of the installation works as a whole may be required to accommodate occupation requirements or site inspections.

Provision for pipe sleeves shall be made. The pipe sleeves are to be fire stopped to suit the resistance of the structure.

The use of flexible drops to connect sprinkler heads to the system distribution / range piping will be permitted provided that they are installed in accordance with Manufacturer's instructions. Flexible connectors shall only be used in accessible locations where third-party inspections are permissible. In any other instances, pipework drops shall be hard piped.

Cut off sprinkler heads are to be provided over any door to escape from sprinkler protected zones into non protected areas which have less than 1-hour fire rating with the heads located on the non-protected side.

Stairs will require protection below and sprinkler heads at close centres (2m max) around stair openings through the slab.

Escalators will require sprinkler protection both inside and below. The escalator supplier will allow for the sprinkler protection within the escalator and the sprinkler specialist sub-contractor shall allow a feed on the wet sprinkler supply main and for connecting to the escalator protection to make this live. Fitting the sprinklers below the escalator shall be by the sprinkler specialist sub-contractor (XL type).

All sprinkler heads are to be of the fast response type with an RTI of less than 50. As this is an enhanced protection system suitable for life safety purposes concealed type sprinklers with a removable cover cap cannot be used due to such sprinklers being RTI unrated.

Reliable model XL flush style pendent and horizontal sidewall sprinklers shall be used to protect under front of house feature ceilings. Semi-recessed pendent spray or conventional / upright (C/UP) shall be used to protect below suspended beings in back of house areas.

Standard actuation temperature shall be 68-72°C or 30 degrees above ambient in kitchens and other similar environments.

Any water filled piping running around the roadway and over the main loading bay at Level GF, or in any other areas where cold conditions can be expected, shall be frost protected by means of trace heating and insulation - See BS EN 12845 :2015 clause 11.1.2.2 – Protection by electrical trace heating.

Hazard classification:

The sprinkler system is to be configured to suit a range of occupancy risks, generally as detailed below:

- For the general population areas of the building (front and back of house), the design will be generally based around Ordinary Hazard Group 3 requirements. The OH3 systems shall be arranged to incorporate the additional measures necessary to improve system reliability and availability, (i.e. enhanced / life safety standard).

- There will be some areas in the building that will have a higher risk category; these being over the loading bay and parking areas plus the High Hazard (storage and process) risks across the site.

Sprinkler system water supplies:

The system water supplies are to be designed in accordance with the requirements of BS EN 12845:2015. Despite the LPC Rules and Technical Bulletins not applying to this project, special regard shall be taken of LPC Technical Bulletin TB210 and its requirements for power supply configurations.

Water for fire-fighting purposes will be stored within a concrete water storage reservoir located at GF level. LPCB approved pump sets, will draw water from the reservoir and deliver this, under pressure, to the Sprinkler Installation Control Valves (ICV's).

The sprinkler water storage reservoir will be provided with a 110mm infill supply from the Town's main reticulation system. A connection point will be brought to the boundary of the site and from here the sprinkler contractor shall run out below ground and above ground piping as may be necessary to make the connection to a Keraflow control valve located in the sprinkler tank room.

The infill connection shall emerge from the ground as a ductile iron change piece. From here, the tank infill supply shall be run in heavy quality galvanised pipework to the Keraflow control valve and also into the tank sections themselves.

A verifiable back-flow pressure device shall be fitted to the incoming supply main as it enters the building. This shall incorporate a double check valve arrangement with an electrically monitored gate valve on either side of the check valves that will relay partially closed status as a fault alarm to the fire alarm control panel in security control. The check valves shall be fitted with pressure gauges and low pressure alarms, with the low pressure alarms again relayed to the fire alarm panel in security control as a fault alarm.

All of the piping from the incoming connection to the discharge outlets inside the tank (and pilot lines) shall be certifiably chemically cleaned and chlorinated under the sprinkler works package. Confirmation certification and records shall be provided.

Individual pumping arrangements will be provided to serve:

- The OH3 Sprinkler system

- The High Hazard sprinkler system

The sprinkler installation control valves will be housed within the sprinkler pump room. They will be contained in a 750mm high waterproofed bunded tank/wall, with a drainage gulley at low level. The gulley is required to discharge system drain-down waters and the bund to prevent water back-up from this flow being over the capacity of the drainage system.

3No. sprinkler alarm gongs will need to be located on the outside of the structure, immediately adjacent to the sprinkler control valves chamber to allow external alarm.

Sprinkler system zoning and Synergy with the Fire Detection system

In such a complex building, it is important that the fire systems, both protection and detection, are arranged to work in a holistic manner. As far as is practicable the intent is for the sprinkler and fire detection zones to follow similar lines and cover commonly established areas.

Liaison between the specialist fire protection and fire detection Sub-Contractors will be necessary to achieve this goal. Allowance for the costs of any meetings to establish suitable zones and the preparation of an overall fire detection Cause and Effect document shall therefore be suitably allowed for in project costings.

Concrete Water Storage Reservoir

Water for fire-fighting purposes will be stored within a concrete water storage reservoir located at GF level. The reservoir will be divided into 2No. sections, but connected by means of a common 300mm header pipe.

The reservoirs are to be of builderswork construction and fall within an arrangement of shear concrete walls and infill block wall arrangements as may be necessary. Each chamber is to be internally lined by means of laminate spray coating to avoid the risks of leakage.

The structural arrangements of the reservoirs is to comply with BS EN 1992-3:2006 and the UK National annex to this standard.

Water turbulence within the tank sections will be controlled by a Vortex inhibitor plate fitted to each suction line entering the tank.

The reservoir lining should be of heavy duty quality and shall be formulated from either an isophthalic or epoxy vinyl ester / polyester based resin, reinforced with a chopped strand, glass fibre mat.

The lining shall be applied to a suitably prepared concrete substrate and steel pipework penetrations passing through the tank wall to a nominal thickness of 2.5 to 3mm. The SJ-01 GRP laminate system as provided by: Repair, Protection and Maintenance Limited, Roall Lane, Kellington, North Yorkshire DN14 0NY would be considered to be suitable for the intended works (or approved better).

The tanks are to be constructed to include all necessary pipework connections and accessories - supplied as free issue items by the fire protection specialist to the builder. These are to be provided with puddle flanges as may be necessary and all ancillary items necessary to prevent water leakage.

Each tank section is also to be fitted with main overflow piping running to drain and tell-tale pipes to indicate tank overfilling conditions. In addition, the tanks are to be fitted with high and low level alarms and contents gauges.

Each reservoir compartment shall also be supplied with manway access points at low level to facilitate internal tank inspection and maintenance works - Quick-opening hidden-hinged manway type CM1, Chase Associates PO Box 75 Edgecomb, Maine 04556, USA would be considered to be suitable for the intended works (or approved better). The manway access points are to be supplied as free issue items by the fire protection specialist to the builder for incorporation within the tank construction.

Each reservoir section will be fitted with a 65mm automatic infill supply outlet controlled by a Keraflow Type KP control valve and by means of individual pilot float valve units (or approved better). Water level balancing will be via a combined pump suction manifold.

Maintenance access platforms with safety access ladders are to be provided to allow ease of access to each of the Keraflow KP infill pilot valves and high level connections. This is to be supplied and fixed under the fire systems works package.

The tank infill supply is taken from the Town's Main reticulation system which is not under the control of the venue operators. Therefore, a permanent means of testing the tank infill using an approved direct reading flow meter with control valves, discharging directly into the tank and not via the ball valves shall be allowed for.

Water Supply Sizing - Initial Parameters

We have not allowed for sprinkler protection or deluge cover over the stage area as this falls within the unprotected Hall space.

Sprinklers are however required under the tiered seating areas within the bowl and served by the geographically most convenient sprinkler trunk main from either ICV No 1 or ICV No 2 – dependent on system zoning.

There will be 3 separate zones with a monitored isolation valve located in individual 60-minute fire rated enclosures within the Bowl area These 3 zones will be fitted with Zonecheck flow alarm equipment. A local 240-volt power supply and local fire alarm interface will be needed at each location.

Fire strategy for the circulation space under the fixed seating terrace (within the Bowl area):

There are no sprinklers to be provided at ceiling level within the bowl.

There will however be a requirement to provide sprinklers below the void space created by the fixed seating terracing

The approach for this space will be different based on the seating configuration.

When the ground floor is in standing mode:

- Sprinklers and detection are required to be fixed to the underside of the fixed seating
- Pop up bars can be used providing these do not block escape route widths

When the ground floor is in seated mode

- Sprinklers and detection are required to be fixed to the underside of the fixed seating
- The retractable seating is in place so this space is used as an escape route. As such, this should be maintained sterile.

This requires:

1) Fire curtains to the bars opening to this space (in the NW and SW)

2) No pop up bars in place during this mode (these would block escape routes and carry a high risk of smoke impeding multiple escape routes).

The main use of these will be in standing mode so omitting in seated mode should not pose a problem, providing.

- No fire load is located in this rear circulation area; or
- Limited fire load is located in this rear circulation area and smoke downstands in the middle of the north, west and south (to ensure not all routes are discounted)

Smoke extract is not required in this area due to limited fire load in seated modes and simple extract for the smoke from the bowl roof in standing mode.

Please note that the retractable seating actually functions as an escape route and as such should be provided with 30 minutes' structural fire resistance.

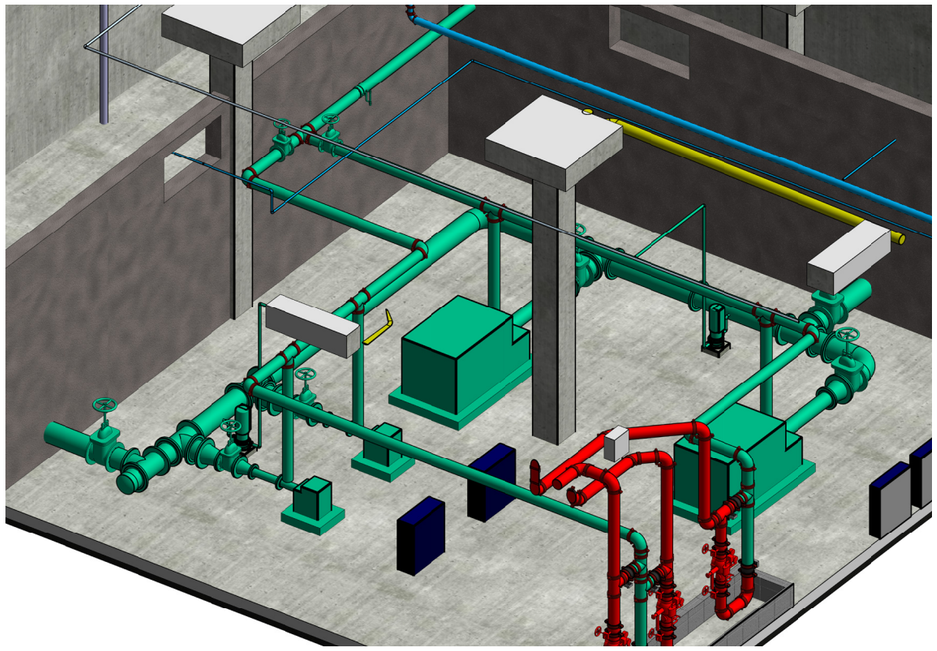
The storage of the retractable seating should be in an area protected by the High Hazard sprinkler system.

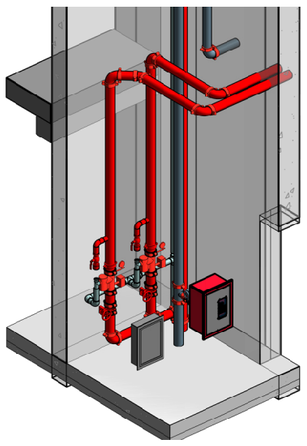
The worst case anticipated sprinkler demand therefore will involve High Hazard plastics storage and coverage of the loading bay up to a maximum 4.7m in height. The design density will be 15mm/min/m2 x 260m2. A total full holding supply of 460m3 will be required.

There are a number of designated storage areas in zones protected by Ordinary Hazard Group 3 sprinkler systems. It is important that the limitations on storage heights for Ordinary Hazard systems are not exceeded, these being:

- 1.7m for block storage (piled)
- 2.1m for goods on shelves or racks

Storage arrangements for goods that may be expected to have a higher fire loading (Aerosols, Theatrical paints and make- up or Pyrotechnics) shall be given special consideration and kept in stout metal boxes if held in Ordinary Hazard group 3 areas.





Fire Systems Pump Bases

- To be provided as may be necessary to suit builderswork drawing details provided by the fire systems specialist.
- Location: Basement level fire systems plantroom

Fire Systems Water Discharge Bund Tanks

Purpose:

- To retain waters during drain down or testing of the Sprinkler system to prevent the drainage system being over-run by the flow rate of discharge waters

Locations:

- Level GF Sprinkler installation control valve chamber (within sprinkler plant room)
- At the base of each main fire protection riser
- Wherever a pre-action subsidiary zone valve is located

Structural preparation of pre-action sprinkler bund tank:

- Floor slab: Main structural slab
- Sump: Not required.
- Bund walls: Height: +/- 750mm
- Bund walls core fabric: Class B engineering bricks
- Bund walls cavity width: Not applicable.

Sprinkler Pumps

Separate sprinkler pump sets will be required to serve the Ordinary and High Hazard sprinkler systems

- The OH3 Sprinkler system will be provided with water by an arrangement of duplicate end suction electrically driven pumps (SPP Eurostream KM08V). A jockey pump (Lowara 1SV11T) will be included to maintain system pressure to the system.
- The High Hazard will be provided with water again by an arrangement of duplicate end suction electrically driven pumps (SPP Unistream KP15Y). A jockey pump (Lowara 1SV15T) will be included to maintain system pressure to the system.

The suction pipework will be arranged so that any one pump can draw water from any one reservoir section. This is to ensure that there will always be a minimum half duration supply of water available for fire-fighting purposes (OH3 = 30 minutes; High hazard = 45 minutes), in the event that any one pump or tank requires maintenance.

The pump sets will be provided with all necessary controls and alarm status / monitoring equipment and arranged as would normally be expected to comply with BS EN 12845. Each pump will require a duplicate power supply with demonstrable diversity in the supply arrangements.

The pump signals shall be relayed, hard wired by the sprinkler contractor, to 2No. dedicated remote alarm panels located immediately outside the main entry door to the basement fire plantroom. From here the signals will be relayed by the fire alarm contractor, hard wired, via a common repeater facility on the remote alarm panel onwards to the fire systems marshalling (life safety) panel located in the security control room at level GF.

Sprinkler installation Control Valves (ICVs) and Subsidiary Zone Control Arrangements

The sprinkler control valves will be located within the sprinkler pump room.

Three sets of Sprinkler Installation Control Valves (ICV's) will be provided. This is based upon the current understanding of the building and its potential zoning:

- ICV No 1 – 150mm Wet with maintenance by-pass – fed by OH3 pumps
- ICV No 2 – 150mm Wet with maintenance by-pass – fed by OH3 pumps
- ICV No 3 – 150mm Wet with maintenance by-pass – fed by High Hazard pumps

These are to include isolation valve monitoring and pressure sensitive alarms to alert system discharge.

Water motor alarm gongs served by the various ICVs will be sited on the external face of the building adjacent to the sprinkler pump room and labelled appropriately to allow simple visual as well as audible confirmation of alarm.

Wet Pipe Subsidiary Zones

Subsidiary zone control valves taken from the OH3 wet pipe systems will be allowed at each storey level within the 4No. riser cores adjacent to the fire-fighting stairs, within the plant spaces located within the roof void space and at other strategic points within the building. This is to allow local control of the sprinkler installations by fire fighters in the event of an emergency.

This is to allow local control of the sprinkler installations by fire fighters in the event of an emergency.

A common heavy quality 50mm galvanised drain line with 50mm / 15mm drain / test valves shall be allowed in each main riser core and run to drain.

Flow sensitive alarm switch arrangements will be included on these connections to relay an alarm condition to the main fire systems marshalling panel and onward to the house fire detection system. The isolation valve will be electrically monitored to indicate a fault alarm upon partial closure.

As noted above three additional zone valves will be provided within the Bowl to protect below the seating tiers. These will have electrically monitored isolation valves and incorporate Zonecheck flow alarm arrangements – a 240 Volt power supply and fire alarm interface point will be required for each of these zones.

Provisional Schedule of Wet Pipe Sprinkler Subsidiary Zones

The number of zone valve / flow switch assemblies have been provisionally assessed as follows:

- Level L00 – 8no. - 2no. per Fire riser
- Level L01 – 8no. - 2no. per Fire riser
- Level L02 – 8no. - 2no. per Fire riser
- Level L03 – 8no. - 2no. per Fire riser
- Level L04 – 8no. - 2no. per Fire riser
- Level L05 – 4no. - 1no. per Fire riser and 1No. per goods lift lobby
- Level L00 - 3 No to protect below the tiered seating area.

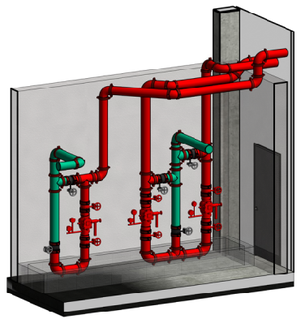
Pre-Action Subsidiary Zones

These are detector controlled dry pipe system zones that will be served with water from the nearest adjacent wet pipe system as opposed to a direct manifold connection from the main pumps.

These will generally be designed in accordance with the provisions of BS EN 12845:2015 clause

11.5. Being tail end zone valves as opposed to main installation control valves, only a single pre-action valve will be needed to actuate the system

The pre-action zone will cover the Security Control room only. There is a generator room at level 05 which would be protected by pre-action sprinklers if it were within the main building. As however the plant is located on the roof, sprinkler protection has been omitted. No water mist protection has been allowed for either as per the fire strategy.



Due to limits placed on the available space for plant generally, it is essential that the footplate take-up for the pre-action subsidiary zones is kept to an absolute minimum. For this reason, the use of modular units will be adopted in the system design. The Victaulic Fire Lock -Fire-Pac Series 745 pre-action assembly is considered suitable for this application with the following adaptions:

- The pre-action valve assembly shall be LPCB approved - The Victaulic Fire Lock –NXT Series 769 pre-action valve is considered suitable for this application
- An electrically monitored isolation valve is to be installed above the sprinkler pre-action alarm valve
- The packaged unit shall include an integral air compressor and air maintenance device
- The packaged unit shall include a system actuation / release panel, in a compact single enclosure, containing the power supply, standby batteries and a battery charger as well as connections for the detectors, water-flow and tamper switches, and the solenoid valve
- The system actuation / release panel shall be capable of being software-programmed for field setting as two area or single area cross-zoned control, with mounting slots provided for optional module boards

A local drainage gulley will be required to allow system drain down and trim waters to be discharged during testing / operation. *

* Should this not be possible then a waste water pump shall be installed adjacent to the pre action valve, and a waste pipe run up the wall and through the ceiling void to a local waste connection in the void. A 22mm polybutylene pipe would be suitable to avoid any inaccessible joints, supported from the soffit with stud hangers and Munsen rings.

System Power Supplies and Controls

The arrangements for power and signaling of the sprinkler system will be as described in BS EN 12845:2015 and LPC Rules / Technical Bulletins. Please take particular reference to the following sections of this document:

Power supplies:

- LPC Technical Bulletin TB210 – Automatic sprinkler pump installation
- BS 7671:2018 Corrigendum- Dec 2018 / 18th Edition IET Wiring Regulations

Signalling:

- LPC Technical Bulletin TB210 – Automatic sprinkler pump installation
- BS EN 12845:2015 Annex D – Zoning of Sprinkler installations
- BS EN 12845:2015 Annex E – Special requirements for High Rise systems
- BS EN 12845:2015 Annex F – Additional measures to improve system reliability and availability
- BS EN 12845:2015 Annex H – Sprinkler systems monitoring
- BS EN 12845:2015 Annex I – Transmission of alarms

Cable selection:

- BS 8519:2010 - Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice

Cables are to be run on tray and all essential cable runs shall be of the enhanced type - fire resisting. Please refer to the Electrical works scope of works / specification for additional requirements on relaying alarm signals on tray and conduit.

The sprinkler system electrical connections in all cases shall be presented as complete, with all low voltage electrical components tried, tested and signed-off.

Additional normative standards to consider

- BS 5839:1:2017 - Fire Detection and Alarm System for Buildings

- BS 6266: 2011 - Fire Protection for EDP Installations

- BS 7273:3:2008 - Electrical actuation of pre-action water mist and sprinkler systems

Power Supplies - General

Each fire pump will require a duplicate power supply with demonstrable diversity in the supply arrangements.

- 1no. taken from the mains power supply grid

- 1no. from a connection from the emergency generator sets.

These power supplies are to be controlled and relayed by independent Automatic Power Transfer Switches (ATS) – 1No. per pump unit. The ATS switches are to be supplied and mounted under the Fire protection services contract.

Power supplies are to be connected to the ATS switches under the electrical services contract and tested accordingly. The interconnecting wiring of the sprinkler water supplies equipment will begin downstream of the ATS switches.

The ATS references are:

- Ordinary Hazard duty pump - FP/ATS.01

- Ordinary Hazard standby pump - FP/ATS.02

- High Hazard duty pump - FP/ATS.03

- High Hazard standby pump - FP/ATS.04

The fire protection contractor and the electrical contractor are to liaise to ensure the terminals in the ATS's are suitable for the cables being installed.

Power supplies to the subsidiary equipment within the plantroom are to be served by a distribution board supplied and fitted under the electrical services contract. An additional distribution board for power distribution will be required in the sprinkler installation control valve chamber.

Power supply connections taken from the ATS switches are to be taken from and terminated within the Sprinkler pump control panels under the fire protection works package. Interconnecting wiring of the fire pumps and ancillary equipment within the plantroom is also to be undertaken by the fire suppression contractor.

Power supply connections will be required across the site to serve various items of kit, such as control panels, air compressors trace heating and any other fire protection equipment as may be necessary – see general schematic. The power supply connections are to be supplied and fitted under the electrical services contract. Interconnecting wiring of the fire equipment within the plantroom is to be undertaken by the fire suppression contractor.

Power to the trace heating systems shall be taken by the sprinkler contractor from connections to locally sited electrical un-switched fused spurs provided under the electrical contract.

The trace heating and thermal insulation and power cable linking itself is to be provided under the sprinkler contract.

Signaling Arrangements - General

Please refer to these notes, the system drawings and the system schematics to establish requirements. Compliance with the recommendations of BS EN 12845:2015 is necessary.

Combined Marshalling / Life Safety Panel

All fire system alarm and monitoring signals will be relayed, hard wired, to a combined marshalling / life safety panel (sprinkler, dry riser and gas fire suppression) to be located in the Security Control room.

This marshalling / life safety control panel is required to show the location of the incident and status of all automatic fire protection installations and facilities, as is required by BS9999. The panel is to incorporate LED display as per BS EN 12845:2015 requirements.

This panel is predominantly for the benefit of the fire service when attending an incident, but also to advise maintenance staff of any valve isolations throughout the building or any equipment defects / flow switch operations. This will also assist with annual testing of the sprinkler monitoring and alarm devices generally undertaken on an annual basis.

It shall be provided as part of the Fire detection / Electrical works package to ensure equipment compatibility.

Fire Pump Remote Alarm panels

The fire pumps will be supplied with remote alarm panels (1 per duplicate pump set) that will be located immediately outside of the main entrance door to the fire protection plantroom. These remote alarm panels are primarily for maintenance purposes, but also for the use of the Fire Service in the event of an emergency condition.

The remote alarm panels shall be configured to accept both pump status signals, plus the monitoring signals from the water supply equipment valves and alarm devices (located within the plantroom) that are associated with the water supplies equipment.

Signals from the remote alarm panels are to be to be relayed hard wired to the main fire systems marshalling (life safety) panel located in the security control room

Sprinkler Installation Control Valve Sets (ICVs) & Pre-Action Zone

Mechanical alarm bells linked to each sprinkler alarm valve shall be supplied and fitted in an external location. A pressure switch will signal operation of the alarm gong electronically.

Electrical monitoring signals from the sprinkler main Installation Control Valve sets (ICVs), tamper, pressure and flow, are to be relayed directly to the fire systems life safety panel located within the security control centre.

The wet installations will operate without any detection interface, simply as a result of a loss of system pressure caused by a sprinkler head opening.

The pre-action zone valve will require detection interface in order to actuate. This will be provided via a dedicated pre-action system control panel – all provided under the fire protection works package. From here the pre-action system will interface with the main house fire alarm system, with signals also taken to the fire systems marshalling panel in Security Control.

Point detector spacing's shall be arranged to suit the requirements of BS 5839 and /or BS 6266 as may be appropriate to suit the system design criteria and Cause & Effect matrix (By others).

Power connections to the pre-action control valve panels are to be linked to adjacent un-switched fused spur points by the fire suppression specialist.

The pre-action panel is to incorporate 24-hour battery backup power supplies.

Remote Signaling

There will be various sprinkler system subsidiary zones where the monitored equipment is remotely located from both the sprinkler pump room and the sprinkler main installation control valve plant room.

Predominantly, these signals will comprise alarm and status notifications from the remote sprinkler subsidiary isolation valves (tamper) and flow alarm switches located in or adjacent to:

- Fire Fighting lobby (SE)

- Fire Fighting lobby (SW)

- Fire Fighting lobby (NE)

- Fire Fighting lobby (NW)

Additional signals will also be relayed from the 3 No zone valves and Zonecheck flow switches

controlling the sprinklers beneath the tiered seating in the Bowl area.

7.3.1.5 Dry Riser system

Dry Rising mains are installed to allow the Fire Authorities a readily available means of quickly delivering considerable quantities of water to either extinguish or to prevent the spread of fire within the building.

Combinations of dry rising and falling main are to be positioned as generally indicated on the system drawings. Pipework runs must be fully coordinated with the building structure and other electrical and mechanical services.

Approval from Building Control as to the design and layout of the dry fire main system must be obtained prior to installation.

General design parameters:

- BS 9990:2015 - Non-automatic fire-fighting systems in buildings –Code of practice
- BS 5839 Part 1:2017 - Fire detection and fire alarm systems for Buildings
- BS 8519:2010 - Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice

Performance objectives:

- Internal hose coverage of the building is to be allowed as per BS 9990:2015
- An additional dry riser outlet is to be allowed, accessed from the podium level to allow coverage to the space

Description

Dry rising fire mains are to be provided and positioned as per the fire strategy requirements, in the location as generally indicated on the system drawings.

The inlet positions at Ground floor are intended to be close to the riser position within the stair cores, although final locations and signage requirements are to be finally confirmed with Building Control and the Fire Officer.

The inlet breechings shall be contained in a purpose built cabinet - nominally painted red. All finishes are however to be agreed with the Architect prior to procurement and installation.

Provision of secondary breeching inlets to serve a rising main stack was considered, but this was not deemed necessary for this application.

The dry fire mains are to rise within the stair core and shall incorporate Landing Valve outlets at all storey levels including ground floor.

The Landing Valves and in-line isolation valves shall be fitted with a padlock and leather strap to prevent tampering.

Due care shall be taken in the positioning of the Piping and Landing Valves to ensure maximum clearance for building occupants using the stair, especially under emergency conditions. This will include any provision for disabled access made.

The top two Landing Valve outlets are to double as test points to allow for flow testing.

An automatic air release valve is to be incorporated at the highest point on the rising main, with this being suitably positioned to avoid risks to building users upon operation.

Provision for pipe sleeves shall be made. The pipe sleeves are to be fire stopped to suit the resistance of the structure.

In line isolation valves are to be allowed at 10 metre intervals on the riser pipework. These shall be set in the open position for normal operation and shall be electrically monitored.

The new system is to be tested and commissioned to suit BS 9990:2015 and the requirements of the Fire Officer / Building Control. Both static pressure tests and running flow tests shall be allowed to prove the adequacy of the system to meet Building Control requirements.

7.3.1.6 Provisional schedule of dry riser landing valves

The number of dry riser landing valves have been provisionally assessed as follows:

- LGF – 5no.
- L01 – 4no.
- L02 – 4no.
- L03 – 4no.
- L05 – 4no.

In order that a fire occurring during the construction of a building can be dealt with effectively, (especially in high or extensive buildings where large quantities of combustible materials might be stored), fire mains should be in an operational condition as soon as any floor of the building reaches 11 m above fire service access level. These mains should be extended and commissioned progressively as work on the building proceeds to provide fire-fighting facilities at all stages of construction.

Provision for the design, supply, installation and subsequent removal and alteration involving temporary fire service pumping in breechings shall be made in any project costings

7.3.1.7 Private fire hydrant system

Two additional fire hydrants are to be connected into the external Town's Main reticulation system.

These fall on un-adopted roads, namely Joe Mercer Way and Sports City Way.

The Water Company will provide a 110mm blank connection for the new hydrants to be connected to at the northern end of Joe Mercer way. From here, below ground mains run in HPPE piping will be run to the hydrants, with a ductile iron change piece forming the connection from the HPPE piping to the steel flange of the hydrant unit.

Before undertaking installation works, a soil test shall be undertaken to check the toxicity levels of the earth below ground. This area for 200 or more years was used for heavy industrial purposes. It is possible that contaminants could be present and so all necessary safety measures shall be taken by the Contractor to ensure operative well-being and safety.

The hydrants are to be of the below ground type, as per BS 750: Type 2, and will be fitted in purpose built valve pits with heavy duty hydrant covers painted yellow for ease of identification. A hydrant plate shall be located immediately adjacent advising the connection size and approximate distance from the sign.

The contractor shall allow for licensed chemical cleaning and chlorination of the mains runs to the satisfaction of the Water Company and provide suitable certification of the works undertaken.

The new system is to be tested and commissioned to suit BS 9990:2015 and the requirements of the Fire Officer / Building Control. Both static pressure tests and running flow tests shall be allowed to prove the adequacy of the system to meet Building Control requirements. Annual certificated service and maintenance shall be undertaken by the Venue operator as a statutory requirement.

7.3.1.8 Foam spreader system

A foam spreading system has been allowed to protect the diesel oil storage tank room. Liaison with the Fire Service is required to ensure they carry the requisite equipment to operate such a system. If not, sprinklers alone will protect the hazard area.

General design parameters:

- BS 5306:1:2006. Fire extinguishing installations and equipment on premises–Code of practice

Performance objectives:

- Oil risks situated at or below ground level that might not be directly accessible for fire-fighting and search and rescue operations,

might require foam inlets so that foam can be applied to a fire from outside a building by means of a system of fixed piping and suitable outlets.

- The fire authority should be consulted on this matter.

- Foam inlet delivery pipes in a transformer chamber shall be electrically earthed in accordance with BS 7671 and BS 7430. Those joints which do not provide electrical continuity should be bonded.

Design description:

- Not more than three outlets, having an aggregate cross-sectional area of not more than 3,200mm2, should be supplied by one inlet and one line of delivery pipe.

- Where there are more than three outlets, or the aggregate cross-sectional area of the outlets appreciably exceeds 3,200mm2, additional inlet(s) and delivery pipe(s) should be installed

- The external connection should normally be housed in a box conforming to BS 5041-5 built into an external wall of a building, or into a boundary wall so that the bottom of the box is at a level between 400mm and 600mm above the ground. There should be at least 2.50m of clear working space in front of the box, and it should be clear of openings from the space protected by the foam system, so that the inlet can be used without undue exposure of personnel to heat and smoke. Access to these connections should also conform to the recommendations given in BS 9999.

- The external connection fitted in the inlet box should be either:

a) An instantaneous male coupling conforming to BS 336;

b) Or a foam inlet adaptor conforming to BS 336

- The delivery pipe from each foam inlet to the space protected should not exceed 18m in total length and should be 65mm or 80mm nominal bore pipe, threaded and socketed, and of suitable heavy quality steel to meet the pressure, robustness and durability requirements of the system in question. The run of pipe should be as direct as possible with a fall away from the inlet provided on all sections of it, and any changes of direction should be made with standard bends, springs or long turn fittings; elbows should not be used. The pipe from one inlet should serve only one space.

- The delivery outlets should terminate in an oil storage tank chamber at about 150mm above the estimated level of the oil should the total contents of the tank(s), when full, be discharged into the chamber

7.3.1.9 Clean agent gas suppression systems

The following rooms are to be protected by clean agent gas suppression systems in lieu of Sprinklers:

- PAVA UPS Room - Level 04

- Communications UPS Room – Level 04

- MOCR Room - Level 04

- MER Room - Level 04

- Event Control rack room - Level 04

- PAVA rack room NW - Level 02

- PAVA rack room NE – Level 02

- PAVA South rack room - Level 02

The gas type shall be FK-5-1-12, (otherwise known as Novec 1230). Sapphire Extinguishing Systems have been incorporated within the system design and are deemed suitable for the application proposed.

General design parameters:

- BS EN 15004:2008 Parts 1 and 2. Fixed Fire-fighting systems (Gas extinguishing systems)

- BS 5839 Part 1:2017 - Fire detection and fire alarm systems for Buildings

- BS 8519:2010 - Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice

- BS 6266: 2011 - Fire Protection for EDP Installations

7.3.1.10 Performance objectives

Protection of Mission Critical IT Spaces

The systems shall be of the total flood FK-5- 1-12, (25 and 42 Bar – dependent of the distance of the gas canisters from the risk), clean agent type, discharging a minimum design concentration of 5.6% (see BS EN 15004:2:2008) in all areas and / or protected spaces, at the minimum anticipated temperature within the protected area.

The system design shall not exceed 10% concentration for normally occupied spaces, adjusted for maximum hazard temperature anticipated, with provisions for room evacuation before agent release.



The systems shall be fully installed by the fire protection contractor, inclusive of:

- Mechanical and electrical installation
- All detection and control equipment
- Agent storage containers
- FK-5-1-12 extinguishing agent
- Discharge nozzles
- Pipes and fittings
- Extinguishing control panels
- System status indicators
- Manual release
- Timer delay devices
- Audible and visual alarms
- Auxiliary devices and controls shutdowns
- Advisory signs
- Functional checkout and testing
- Training
- O&M's and Record drawings and calculations

The main contractor shall be responsible for sealing and securing the hazard areas against agent loss and / or leakage during the "hold" period, which is a minimum period of 10 minutes or a time period sufficient to allow for response by trained personnel.

A room integrity test shall be undertaken by the Fire Protection contractor to confirm the gas holding capability of the structure and to check the size of the pressure vent damper is correct.

Two-way pressure relief dampers (positive / negative) will be required from each room, discharging / drawing from the adjacent corridor. An additional damper shall be installed at the end of the corridor linking to the adjacent plantrooms for cascade vent.

Each room shall be fitted with a manually operated gas extract unit which is vented to outside for discharge via a duct that terminates with a weatherproof louvre. Operation shall be via key switch by the fire service or appointed responsible person.

Control sequence:

Automatic operation of each protected area shall be as follows:

a) Actuation of one detector, within the hazard area, shall:

- Illuminate the "ALARM" lamp on the control panel face
- Sound an alarm
- Transfer auxiliary contacts, which can perform auxiliary system functions such as: Operate door holder / closures on access doors; Transmit a signal to a fire alarm system; Shutdown HVAC equipment
- Light an individual lamp on a status unit

b) Actuation of a second detector on a second zone, within the hazard area, shall:

- Illuminate the "PRE-DISCHARGE" lamp on the control panel face
- Sound a pre-discharge alarm which shall be distinct from the alarm raised on operation of the first detector
- Shut down the HVAC system and / or close dampers if not shut down upon operation of first detector
- Start time-delay sequence (not normally to exceed 30 seconds)
- System count-down timer sequence is enabled at this time
- Light an individual lamp on a status unit

c) After completion of the time-delay sequence, the total flood FK-5-1-12 System shall discharge and the following shall occur:

- Illuminate a "SYSTEM RELEASED" lamp on the control panel face
- Energise a visual indicator(s) outside the hazard area in which the discharge occurred
- Energise a "System Fired" audible device (Optional)

d) The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above. The manual discharge station shall require two distinct actions to effect release.

e) The system will be provided with a hold off device which shall interrupt the discharge sequence. Hold devices shall stop the discharge sequence when pressed and held. Upon release the discharge time delay shall start again from zero.

7.3.1.11 Fire Systems generally

The material specifications are to be generally as per the schedule details above & below – LPCB compliant as may be appropriate / required.

Design Responsibilities

The fire protection specialist Sub-Contractor shall be fully responsible for the design of the fire protection systems.

This scope of works document, plus any accompanying system drawings are provided to indicate the preliminary design intent for the fire protection systems and to allow initial pricing of the systems for inclusion in the project cost plan.

The Specialist Sub-Contractor is to verify the design intent for the fire protection systems given herein for pricing purposes, so as to ensure that this will comply the relevant British Standards requirements; as well as satisfying Employer's and Building Control requirements.

The intention is for the fire protection works package at RIBA Stage 4 to be covered by a performance based specification and indicative tender drawings.

Performance based specifications require a specialist Contractor Design Portion input as part of the work content.

Informative details relating to all MEP services are scheduled within a preliminary Contractor Design Portion Supplement (CDPS) document that has been issued under separate cover for pricing purposes. This will be developed and formalised at RIBA Stage 4b.

That particular document, being general in nature, does not however support in full the specialist and statutory provisions for fire protection systems that are necessary to consider under this scope of works. Additional CPDS design responsibilities are therefore scheduled within this scope of works, based on the statutory requirements for fire protection systems.

There may be additional contractual requirements that may affect CDPS allowances. Details on how these relate to the form of contract employed can be obtained from the Contract Administrator.

Pricing details shall be fully compliant with this scope of works document to allow competitive commercial review. Any queries with regard to this scope of works and the accompanying system drawings, say with regard to areas protected, equipment type and quantities, controls arrangements or any other matters that could be reasonably anticipated by a specialist contractor shall be raised at pricing stage with cost options (+ or -) provided for review.

The standards listed below, as well as all other applicable codes and good engineering practices, shall be used as "minimum" design standards.

The Contractor & Fire protection sub-contractor shall also refer to the following additional documents to establish the full extent of design responsibilities for the sprinkler installations:

- The Main contract document and its preliminaries

- The project Health & Safety file
- Asbestos register (below ground works)
- Ground toxicity report (below ground works)
- The Fire Safety Strategy for the development
- The fire alarm / detection cause and effect document covering the project
- Statutory requirements
- Local Authority and Fire Service requirements
- Insurance Company requirements
- Water Company requirements

Contractor Design Portion

Contractor elements of design development for the fire systems works package include, but are not limited to:

- The design and risk assessment of the works involved to achieve the design intent for the sprinkler systems – both mechanical and electrical services
- All system calculations deemed necessary to achieve the design intent for the installations
- Any Electrical Services works associated with the sprinkler systems
- Fire detection interfacing - as may be required to allow individual system actuation
- Provision of full and accurate "as installed" drawings, calculations, supplementary information, certification and O&M manuals
- Any site surveys or investigations needed to allow the design of the fire systems to progress at both tender and design / installation / commissioning stage
- Fire system installation and fabrication details
- Fire system hangers, bracings, supports and fixings plus any secondary steelwork support systems required
- Builders work (i.e. the design and subsequent preparation of drawings detailing all supports, bases, plinths, fixings, penetrations and secondary steelwork that may be required to allow the services installation to be undertaken)
- Detailed spatial co-ordination and integration with other services and structural elements
- Design development of the reflected ceiling plans / lighting scheme with the sprinkler head locations
- Keep full and proper records of all meetings and negotiations attended or conducted and make the same available upon request as may be reasonably required
- Comply with the project execution plan and such other procedures as may be issued by the Contractor to ensure satisfactory delivery of the works
- Actively participate in capturing and managing strategic, project and operational risks in connection with the project
- Provide an update at project meetings on management actions taken and identify any new risks. If necessary, participate in a risk management workshop
- Ensure that all drawings issued "hazard awareness" boxes, that identify any hidden, unusual or difficult to manage risks and supply specific information in support of safe working practices to mitigate the risks identified
- Give such general advice and assistance (consistent with the scope of the services as may reside within the field of the Contractors qualifications, competence and experience) as may from time to time be reasonably required
- Print, reproduce or purchase all documents, drawings, maps, photographs and other records necessary for the proper performance of the services and additional services (refer to schedule of exclusions)
- Make presentations in an agreed format and at such intervals as may be requested throughout the course of the contract. Participate in brief development and design approval exercises and assist in addressing queries raised by stakeholders of the project
- Attend all meetings called by the Contractor, relevant to the particular service, with regard to the project

Construction, Design and Management Regulations:

Projects undertaken within the UK are subject to the requirements of the Construction (Design and Management) Regulations 2015 (CDM).

The formal RIBA Stage 4 works specification defines the design intent for meeting the functional and performance requirements for the fire protection installations.

For the purposes of this scope of works document, CDM issues have been initially assessed and are scheduled as follows:

i) Design Risks with regard to the Fire protection installations:

- The work will need to be undertaken in places where some areas could be defined as confined spaces (see the Confined Spaces

Regulations 1997). Appropriate measures shall be taken to mitigate risk.

- Working at height will be required. Appropriate measures shall be taken to mitigate risk.
- Potential for toxic gas /ground conditions in the installation of the new private fire hydrants
- Heavy lifting that may be required with regard to the manhole covers for fire hydrants and sprinkler connections.

ii) Residual CDM Risks with regard to the Fire protection systems design and installation:

- There appear to be no unusual elements of work that would be outside the scope of a competent and experienced Contractor.

7.3.1.12 Documentation

- System completion certificate: Please provide for sprinkler system, listing any identified non-compliances.
- Test records: Submit a record of inspections and tests.
- Record drawings: Submit drawings showing location of pipe runs, sprinklers and valves.
- Operation and maintenance instructions: Submit.
- All drawing and model content will be coordinated with all services in the 3D

working environment for use in the Facilities Management Operation & Maintenance model. The model may be used for maintaining, altering and expanding the building, within the terms of any license agreements agreed with the model originator(s). All drawings to be generally in accordance with BSRIA Guide - A design framework for building services. Design activities and drawing definitions BG 6/2018.

- Record drawings are to be provided in PDF, DWG (AutoCAD) and Revit formats and all CAD data to be generally in accordance with BS 1192.
- Refer to the Main Contractors BIM protocol for all project specific model deliverables.

7.3.1.13 Training of end user's staff

Before Practical Completion, explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual:

- To the Building maintenance engineers
- To any other appointed responsible person Ensure that:
- Training is completed before the system is handed over
- That each trained operator signs a training acceptance certificate(s)
- Appropriate reference and training manuals for the operator are provided

The period allowed for the training of the Clients maintenance staff in the use and operation of the installations shall be nominally between 1 to 2 days.

A detailed planned maintenance and service proposal is to be provided by the installer / manufacturer for separate consideration by the Client. This shall include for the provision of a full and comprehensive emergency call out service, where attendance times are measured in hours.

7.3.1.14 Witness testing requirements

a) Pre-commissioning:

- The Fire systems shall be subject to pre-commissioning checks prior to handover
- Prior to being offered for witness testing and handover, the system shall have been shown to be fully commissioned and tested with records made available proving full compliance with BS EN 12845 / LPC requirements

b) Testing and commissioning:

- The fire systems tender shall include for the costs of factory testing, manufacturer's isolated site testing and integrated site testing (IST testing).
- Factory testing: Shall include full functional live and dead testing of plant and equipment, controls and any simulation of alarms required. All control functions shall be proved as working, including instrumentation which shall be calibrated and demonstrated. All alarm and monitoring points shall be simulated and proven by means of indication lamps as working for each alarm. Each lamp shall be labelled with its function for testing purposes.
- Manufacturers isolated site testing: Shall include the required testing of the equipment to ensure correct operation and system handover, in accordance with this scope of works. These works shall be undertaken in isolation from other packages except for the fire alarm system which by necessity interfaces with the sprinkler installation.
- Integrated site testing (IST): Shall include the required testing of the equipment to ensure correct operation in accordance with this specification integrated with the other packages to ensure full system operation. IST testing shall only be started once the main contractor is satisfied that all the works packages have successfully tested the complete system and all operation is as per the specification and Employer's requirements. All alarm and control points shall be proved during the IST testing.

The fire systems package shall make allowances for all necessary interfaces and test interfacing for all commissioning activities as described above.

The fire systems package shall also include for the input to an IST testing schedule detailing causes and effects for all scenarios. Upon completion prior to the integrated site testing, the records will be documented and will be co-ordinated with the other packages.

Please note that a minimum period of 5 Days (out of hours) for sufficiently trained personnel to provide adequate demonstration of all systems shall be allowed for IST testing as part of the tender price.

ELECTRICAL SYSTEMS

7.4.1 ELECTRICAL SYSTEMS 768

7.4

7.4.1 Electrical Systems

7.4.1.1 General

This electrical systems report shall be read in conjunction with the separate electrical outline specification and schedules document.

Electrical Supply Characteristics

HV, 6,600 Volts	3 Phase
LV, 400 Volts	3 Phase
LV, 230 Volts	1 Phase
Frequency	50 Hertz
Power Factor	0.9

Incoming Electrical Service

The electrical system maximum demand is anticipated to be 7MVA. Initial discussions have taken place with the local utility provider, Electricity North West Ltd (ENWL). This figure is based upon comparable power loads for similar venues around the world. Load calculations have been developed during Stage 3 to assess the maximum demand in more detail.

7.4.1.2 Utility Supply

The supply characteristics shall be 3 phase/ 6,600 Volts / 50Hz derived from the Electricity North West Ltd, ENWL, network. The incoming supply is a "Teed" supply from an HV cable fed from Stuart Street Primary ENWL substation.

Dependant on the option chosen on the quotation received from ENWL will depend on the amount of works carried out by ENWL or a separate contractor. ME Engineers would advise that Option 1 is agreed with ENWL so that they carry out all works and Not Option 2 which would mean that ENWL only carry out non-contestable works.

All wayleaves and legal's are to be agreed with ENWL as part of ongoing works and agreed before a supply will be provided to site.

Due to cost implications, the option of having dual supplies to OVG Manchester have been discounted, therefore on a failure of this supply there will be a loss of all systems other than those fed of a UPS/Central battery system and the life safety systems connected to the life safety generator.

Utility Medium Voltage Switch Room

The incoming utility supply shall terminate within a three (3) or four (4) way 6.6kV switch board or an RMU to be confirmed by ENWL dependant on the metering arrangement. The ENWL room will require 24-hour access and shall be suitable for facilitating utility replacement and maintenance, all to be agreed with ENWL.

The final access and finish to the ENWL room, located in the North East corner at level 00, requires further discussion and approval by ENWL.

OVG Manchester Medium Voltage Switch Rooms

The ENWL supply, serving the ENWL switch panel, shall provide a supply into a single OVG Manchester MV switch panel which shall be a five (5) section MV switch panel, located with the OVG Manchester MV room, which has external access, adjacent the ENWL room.

From the OVG Manchester MV switch panel, MV radial supplies shall be taken to each of the 4 number OVG Manchester sub stations, 1 per quadrant as indicated below.

For outline details of the arrangement refer to the single line primary distribution schematic.

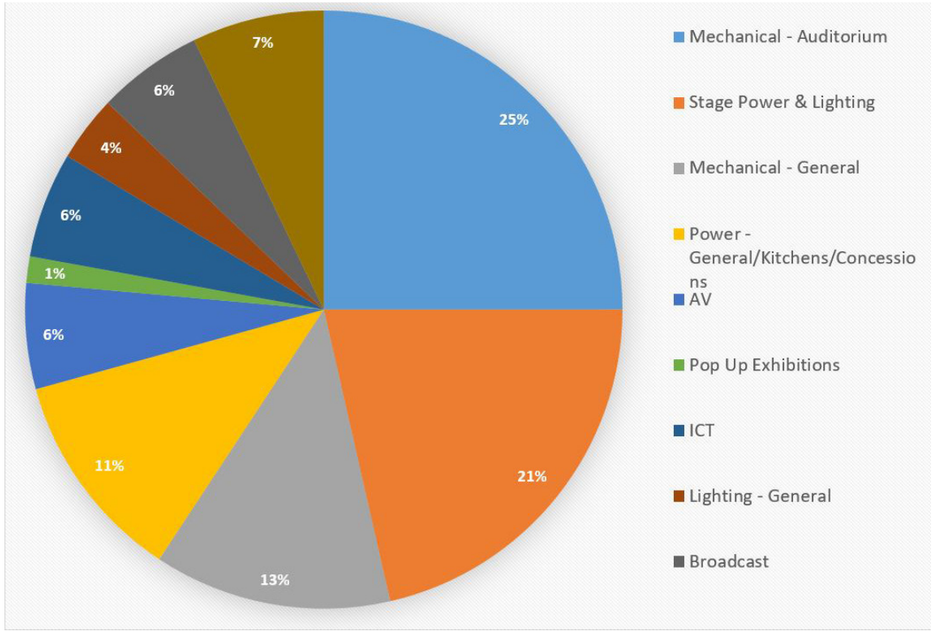
Medium Voltage Cable Distribution

6.6kV electrical distribution cables from the OVG Manchester MV switch panel to the 4 quadrant electrical substations shall be via appropriately rated MV cables run at high level, level 00, using dedicated cable ladder. All MV cables shall be coloured red.

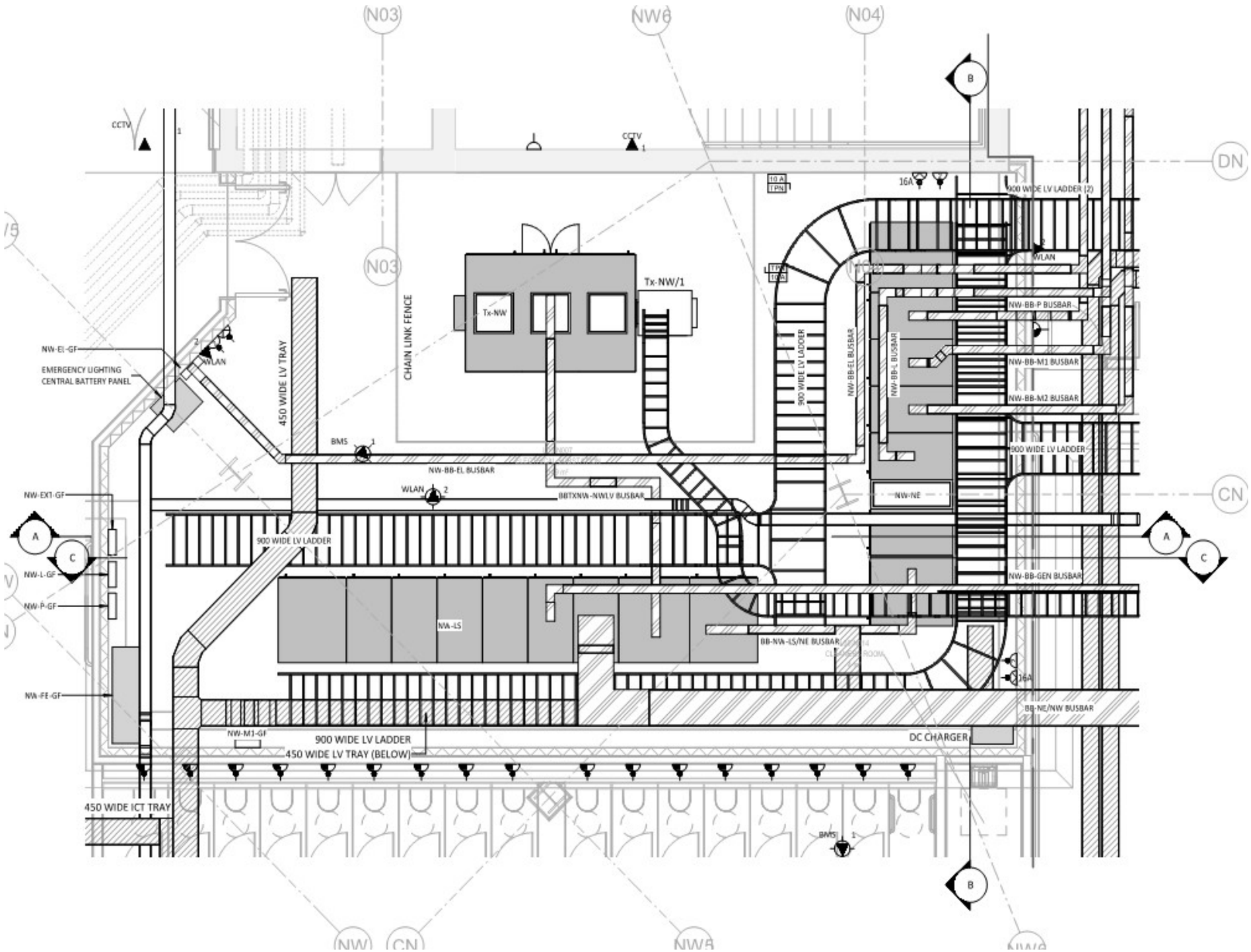
The MV cables from the OVG Manchester MV switch panel shall be fire protected so in the event of a fire they shall continue to operate and maintain circuit integrity.

Electrical Load Breakdown

Indicative breakdown of the anticipated 5.6MVA maximum demand



Level 00 Medium and Low Voltage Switch Room locations



7.4.1.3 Electrical Substations

The substations shall house

The MV/LV transformers (6600/400V)

The Low voltage (LV, 400V) switch boards fed from the transformers.

- Substation “NW” shall be located in the North West portion of the building
- Substation “NE” shall be located in the North East portion of the building
- Substation “SE” shall be located in the South East portion of the building
- Substation “SW” shall be located in the South West portion of the building

The LV Switchboards shall be designated as Life Safety and Non-Essential sections.

For outline details of the arrangement refer to the single line primary distribution schematic.

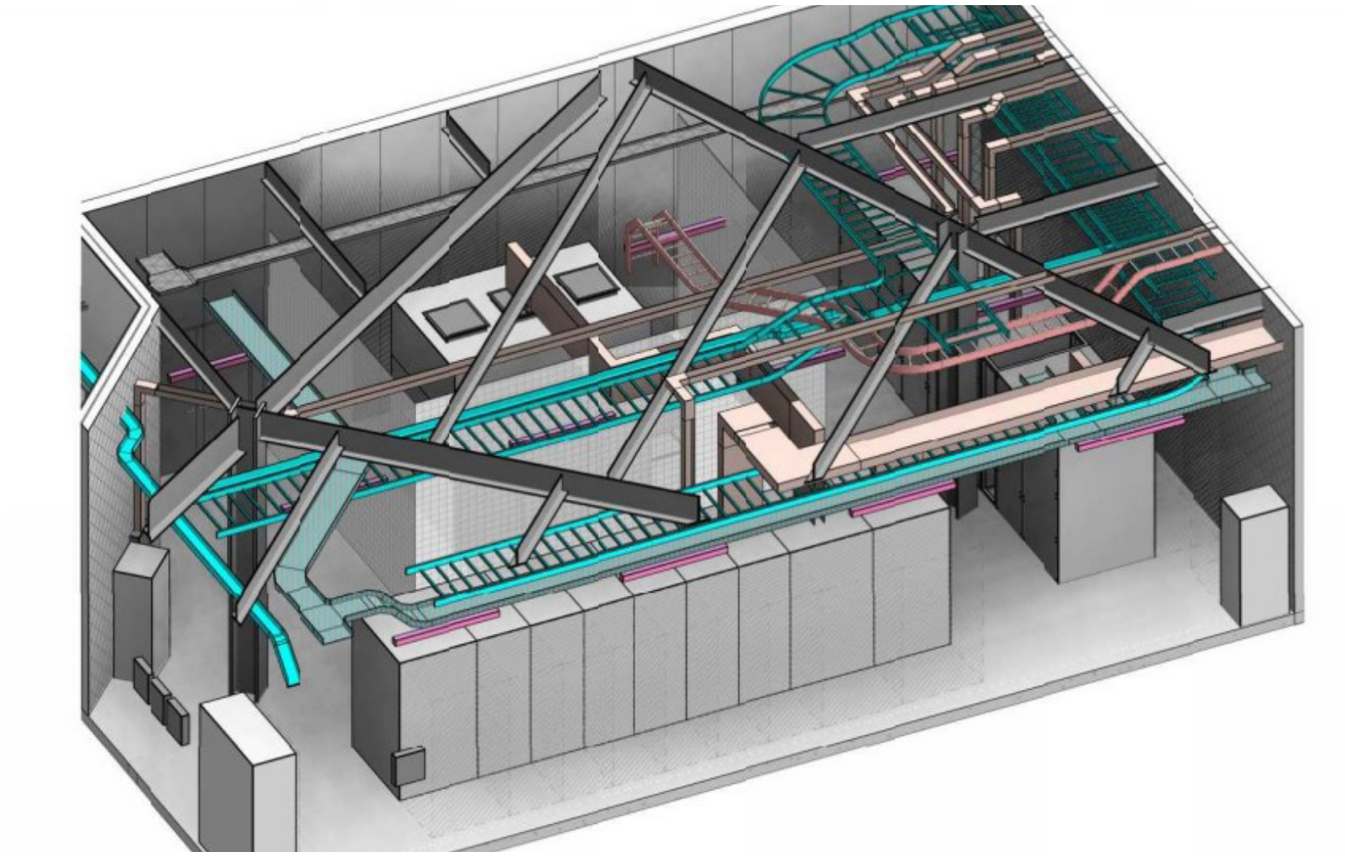
Transformers

The transformers which shall be located in each quadrant substations “NW”, “NE”, “SE” and “SW”, 1 per quadrant, 4 in total. The transformers shall be oversized in each quadrant so as to provide some resilience to the system in the event of a transformer failure.

The NW quadrant and NE quadrant are interlinked, with the SE quadrant linked to the SW quadrant, therefore in the event of a transformer failure the interlinked transformer can pick up part of the load.

If a transformer has failed the electrical system is not designed for an event to continue, however in this scenario with consent from the relevant authorities and due diligence by OVG Manchester the building is able to operate on a non-event day procedure.

The transformers shall be of the cast resin encapsulated dry type 6.6kV-0.4kV (on load) step down Delta/Star type within IP31 metal enclosures.



Level 00 Medium and Low Voltage Substation Plan view and 3D view

The transformers shall be located in the same room as the main LV switch panels with a chain link fence provided around them so as to avoid untrained personnel entering and MV area.

Main Low Voltage Switch Boards

The main Low Voltage switch panels shall be located in each quadrant substation “NW”, “NE”, “SE” and “SW”.

The LV switch boards shall be designated as either Life Safety or Non-Essential. The switch panels shall be arranged such that a failure of a transformer shall allow the capability of maintaining its associated loads, with a short break, by implementing a predetermined breaker switching sequence, where the non-essential switch board sheds its load through the opening of the motorised circuit breaker between the essential and non-essential panels. Once the sequence has completed and the life safety loads are at a steady state, the non-essential loads can be reinstated manually, on a priority basis, load permitting.

All LV switch panels shall be Form 4b, Type 6 to BS EN 61939-2 Classification for separation. Switchboards shall be rated at a capacity that is greater than its associated supply transformer rating.

The fault rating of the primary switch panels shall be a minimum of 80kA.

An additional 20% of spare outgoing ways shall be provided for future requirements. All LV switch panels shall be supplied and installed with comprehensive integral metering equipment in line with the UK Building Regulations.

Standby power generation

The standby generator power requirements are based upon supporting life safety loads only using an 1770kVA LV generator. NO event continuation allowance is provided in the generator loadings. The generator shall be housed in an external enclosure, ie containerised type generator, with the inlet and outlet attenuators bolted to each end of the housing so as to achieve 75dBA 1metre from the external face of the façade. Combustion and cooling air shall be derived from the within the service trench adjacent the façade and discharged the opposite end so as to avoid short circuiting.

Based upon a containerised generator it shall be provided with anti-vibration mounts to avoid vibration through the building and shall also be complete with an exhaust system with a primary and secondary silencer system mounted on the roof of the container.

The generator power/control panel shall be connected to an external mounted interface for the connections from the generator to a separate generator LV switch panel located in a separate room adjacent the containerised generator.

The generator LV switch panel shall serve the 4 quadrant switch panels. We have proposed the use of busbars compliant with IEC 60331 which is a European standard and is rated to IP68 which means it can be run externally and does not require additional fire protection. This is run from the generator to the generator switch panel and from the generator switch panel to the life safety switch panels in each quadrant. We have proposed this as the size and quantity of fire rated cables would be prohibitive due to the lengths of run required. The use of this type of busbar must be agreed with the fire officer otherwise a standard busbar could be used which will have to run within the building and be boxed in to provide the required fire integrity.

No allowance has been provided for the connection of a temporary generator to be connected into the electrical infrastructure.

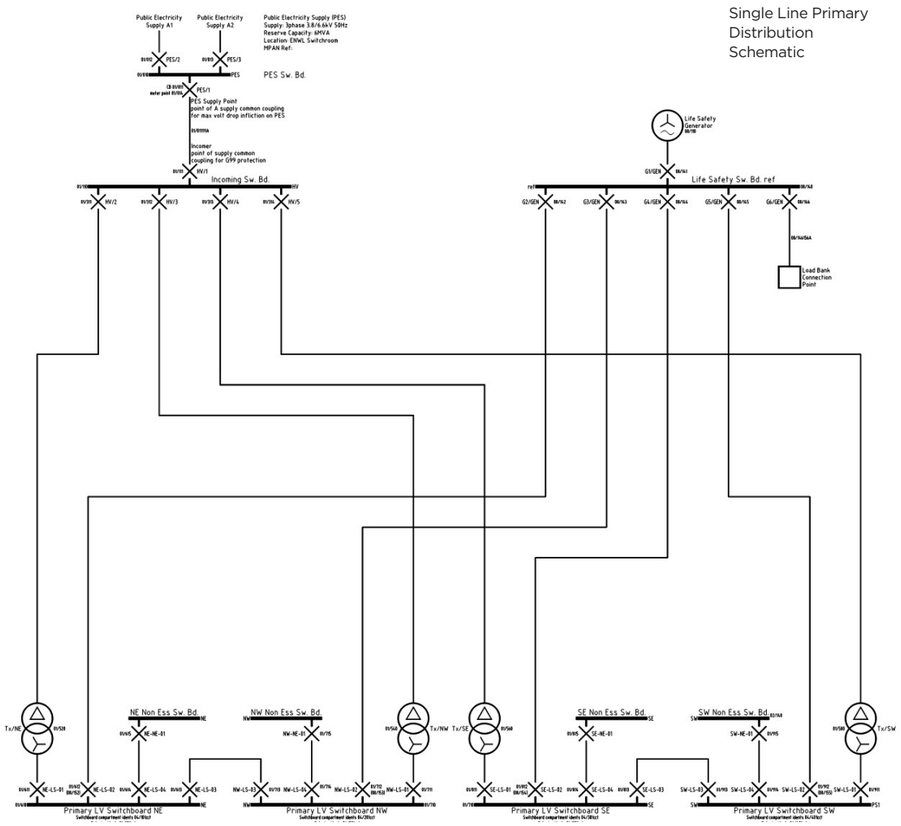
An automatic generator start-up sequence shall be employed in the event the normal service fails and shall bring power from the generator on line within 15 seconds. Life safety loads shall be systematically brought on line, avoiding large step loads.

A bulk diesel fuel tank shall be sized to support 10 hours of continued operation at full load. The bulk tank shall contain 8 hours of fuel with 2 hours of fuel stored in the containerised generators daily service tank. The bulk tank shall be sized for 10 hours of fuel so that in the event of a fire in the containerised generator the fuel shall automatically dump back to the bulk fuel tank.

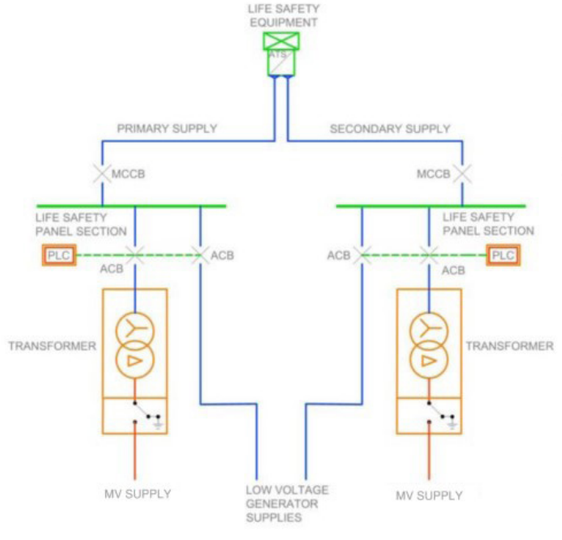
The bulk tank, complete with fuel pumps, oil fill and dump line pipework shall be provided by the generator supplier so as to ensure that a full and complete system is by a singl provider for this life safety system.

For outline details of the arrangement refer to the single line primary distribution schematic.

With the generator set running, a substantial air flow will be needed for continued operation of the generator set and heat from a generator fire is expected to be moved at high velocity by the cooling air flows. To retain fire compartmentation of the containerised generator, fire/smoke rated motorised dampers will be installed on both the air inlet and extract ducts arrangements. The dampers when open shall maintain the 70% free air requirement of the generator. On detection of a fire within the container the generator shall shut down and a signal sent to close the dampers.



Single Line Primary Distribution Schematic



Standby Power Simplified schematic indicating the arrangement to life safety equipment

7.4.1.4 Emergency Power loads (EMP)

EMP loads shall be supported by the standby generator in the event of a failure of the normal supply.

These supplies shall include, where applicable, in the event of a fire (not all the following will be required at the same time):

Life Safety Only (generator only back-up power)

Sprinkler pumps and associated equipment.

- High Hazard Sprinkler Pumps plus jockey pump.
- Ordinary Hazard Pumps plus jockey pump.

Smoke ventilation systems.

- Auditorium, 7 fans.
- Loading Bay, 3 fans.
- Loading Bay, 8 Jet fans.
- General Accommodation Ground Floor, 1 fan.
- Concourse level 03, 5 fans.
- Atrium, 3 fans.
- Fire fighting stair cores. 4 fans.

Central battery/UPS back-up power then generator back-up power when running

ICT/Comms rooms (UPS/battery system). 3 number rated at 200kVA each (N+1).

- MER room, MOCR room (part load) & SCR rooms
- Event control room.
- Security room.
- Security monitoring, ticketing and card access.
- BMS.
- SCADA.
- Lighting control.

Fire Alarm panels

Motorised damper monitoring control panel

7.4.1.5 Uninterruptible Power Supply (UPS)

Multiple UPS systems shall be provided within the building, each dedicated to a separate function. These include:

Communications – A dedicated communications UPS room is provided at level 04. This shall supply the Main Equipment Room (MER) located on level 04, part load of the Mobile Operators Control Room (MOCR) located on level 04 and Satellite Communications Rooms (SCR) located on various floors.

Event control room. Shall be fed from the ICT/ Comm's LV panel therefore having a UPS back-up supply.

Security room. Shall be fed from the ICT/ Comm's LV panel therefore having a UPS back-up supply

PAVA system – Refer to Vanguardia Stage 3 report.

7.4.1.6 Supervisory Control And Data Acquisition (SCADA)

A SCADA system shall be installed to perform control and remote monitoring of electrical equipment.

The SCADA server shall be located within the MER with a central host master terminal unit (MTU) located within the security room and in the event control room.

The network shall use open protocol(s) so as to not limit devices and flexibility.

The SCADA system shall carry out the switching requirements of the breakers on the main LV switch panels as identified on the main breaker schedule drawing.

The SCADA system shall be connected to the power monitoring devices which are fitted to monitor all the electrical metering devices to comply with the current Building Regulations Part L2.

To enable at least 90% of the electrical energy consumption to be allocated to specific end uses such as lighting, small power, mechanical power, it shall be necessary to install sub-metering on some distribution boards to comply with the latest regulations as set out in CIBSE TM-39.

7.4.1.7 Power Factor Correction (PFC)

The electrical distribution shall include for Active Power Factor Correction to bring the Power Factor to a minimum of 0.95. This figure has been used to derive the electrical load figures for stage 4a design.

The PFC equipment shall be connected at the main primary switchboards in each substation.

The full extent of the PFC requirement is unknown at present, therefore an estimation has been included. The overall allowance for the PFC is 600kVAr connected to a 1250Amp breaker within each main LV switch panel. For the day one installation, at handover, 300kVAr of PFC will be provided and connected.

After 6 months or before if the readings from the SCADA system indicate there is an immediate requirement for additional PFC, the readings will be reviewed to ascertain if the remaining allowance of 300kVAr is required at each main LV switch panel. NOTE: The cost for the remaining 300kVAr PFC will be an underline cost so not to be expended unless required.

Items of plant with large motors shall be provided with integral power factor correction.

7.4.1.8 Active Harmonic Filtering (AHF)

The electrical distribution shall include for Active Harmonic Filtering to eliminate unwanted harmonic distortion arising from non-linear power electronic devices (such as variable speed drives, inverters, LED lights).

The AHF equipment shall be connected at the main primary switchboards in each substation.

The full extent of the AHF requirement is unknown at present, therefore an estimation has been included. The overall allowance for the AHF is 600Amp connected to a 1000Amp breaker within each main LV switch panel. For the day one installation, at handover, 300Amp of PFC will be provided and connected.

After 6 months, or before if the readings from the SCADA system indicate there is an immediate requirement for additional AHF, the readings will be reviewed to ascertain if the remaining allowance of 300A is required at each main LV switch panel. NOTE: The cost for the remaining 300Amp AHF will be an underline cost so not to be expended unless required.

7.4.1.9 Low Voltage Distribution

From the quadrant substations main LV switch panels, distribution panel boards and distribution boards shall be fed which shall supply the general electrical and mechanical plant.

The LV distribution within OVG Manchester shall generally be divided into quadrants to reduce the size of the sub main and final circuit cabling. The distribution will be up through electrical risers in each quadrant which will contain the main distribution cables, busbars distribution panels and distribution boards for the quadrant floor.

Panel boards where located in the electrical risers shall generally serve the various food and beverage concessions and keg rooms, where the supply shall terminate in an isolator for future fit-out of the area by a specialist.

The panel boards shall also serve the merchandise areas, where the supply shall terminate in a small distribution board to serve that area only.

Distribution panels and distribution boards shall be supplied with integral incoming switch disconnector's and a complement of miniature circuit breakers or RCBO's to serve the general lighting, small power, mechanical plant and items of equipment. Spare breakers and RCBO's and blank section plates will complete the boards as required.

All main LV switch panel circuit breakers shall be complete with either micro logic protection or thermal magnetic protection dependant upon requirements.

All main LV switch panel circuit breakers shall either be of the withdrawable type or plug-in type, so as to reduce replacement time and switch panel shut downs in the event of a failure.

All cables shall be of the LSOH type.

Bus bars shall be at least IP55 rated in accordance with BS EN 60529. The bus bars shall be 5 pole type, L1, L2, L3, N & E, complete with all necessary tap-offs, fixings, bends and elbows to provide a complete system.

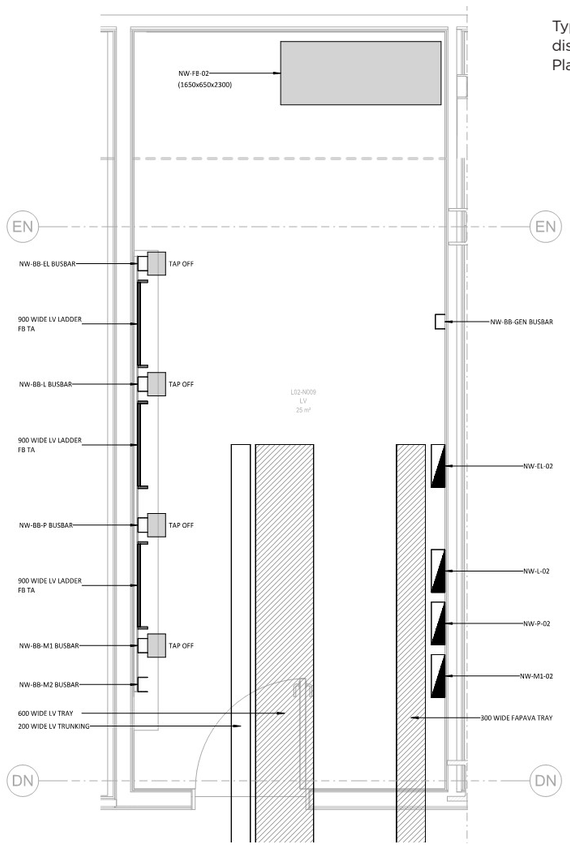
All bus bars from transformers to the LV switch panels shall be of the cast resin type rated to IP65 and shall be 5 pole type, L1, L2, L3, N & E. No tap off provision shall be provided as these will be feeder busbars.

As noted previously we have proposed the use of IEC 60331 compliant bus bars for fire integrity purposes which are rated at IP68. The busbars shall be 5 pole type, L1, L2, L3, N & E. No tap off provision shall be provided. The use of these must be agreed with the fire officer.

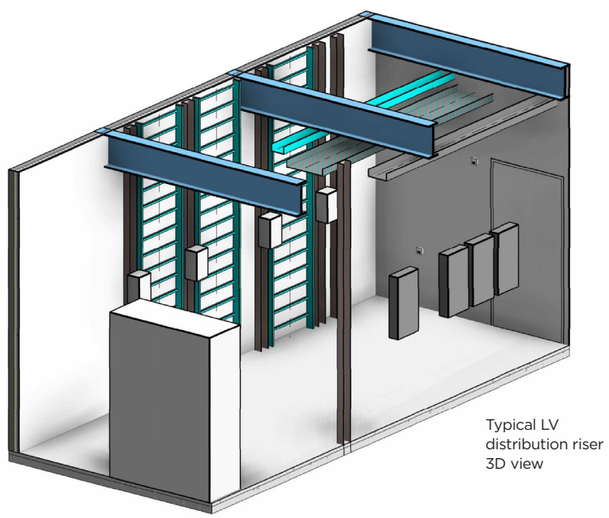
Cables that are to deliver Life Safety support shall be fire rated and compliant to BS7846, BS8491 and BS8519.

Double rated neutrals shall be provided on all supplies to Stage/Production outlets on Level GF and Level 04M.

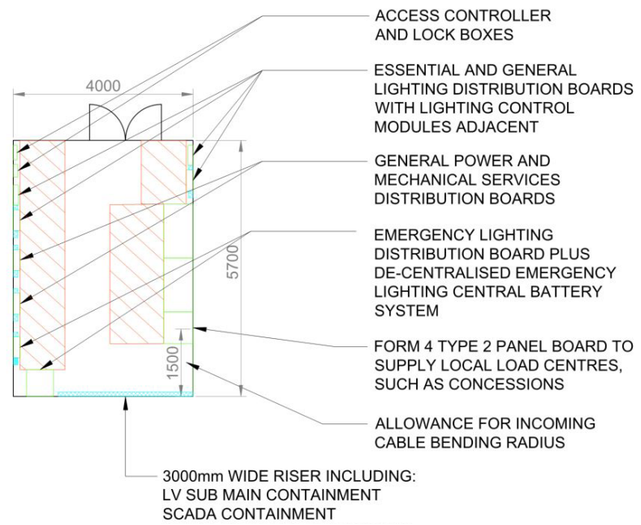
Final circuit cabling shall be carried out in double insulated cables run within trunking or on cable tray and provided with an LSOH sheath.



Typical LV distribution riser Plan View



Typical LV distribution riser 3D view



Typical LV distribution room & riser. Indicative room layout for upper levels

7.4.1.10 Containment Strategy

The Containment systems shall generally comprise cable ladder, cable tray, cable trunking and conduit for the support and protection of the main, sub main and final circuit wiring systems comprising armoured and double insulated cables, communications cables comprising fibre and Cat 6A cables and fire system cables for the fire alarm system and PAVA speakers.

Cable ladders shall be provided from the substations to the riser and up the electrical risers for the sub main cabling. The ladders shall be galvanised, heavy duty or medium duty dependant on locations installed and shall be utilised for the support of sub main supply cables.

Cable trays shall be provided at high level on all floor levels around the floor but mainly following accessible corridor routes, for the support of sub main cables serving concessions, finishing kitchens, lifts, escalators, auxiliary distribution boards and the like. They shall also be provided for the support of final sub circuits to lighting, general power, mechanical systems. The cable trays shall be galvanised, medium duty type.

Cable trays shall also be provided for the support of fibre optic cables, outside broadcast cables. Data Cat 6A cables serving RJ45's which feed TV's, CCTV, security systems, WiFi, DAS system, fire alarm and PAVA systems, etc.

Multi compartment cable trunking shall be provided on all floors levels around the floor for the final circuit single core cables to lighting and general power systems, segregation of systems DAS, mobile operators and Client Data cables, which in turn connect to the cable trays on the open concourses.

Conduits shall be provided for the protection of cables run from the primary and secondary containment to serve final outlets, cast in walls, behind brickwork etc, to suit the installation. Conduits and all back boxes shall be galvanised type.

Cable trays shall be provided for the python lines between the keg rooms and the bar area's in agreement with the catering consultant.

The complete containment strategy shall be interconnected so as cables are always supported and protected to meet the requirements of the BS 7671 IEE Wiring Regulations and manufacturers installation recommendations.

7.4.1.11 Small Power systems

Power outlets at 400 Volts and at 230 Volts AC, shall be strategically located throughout the venue for general purpose use, to serve specific items of equipment, turnstiles, security arches, laundry equipment, vending machines, TVs, roller shutters, hydraulic bollards, etc.

Other specific supplies have also been provided as below:

- 8 x 32A TP&N for bus power.
- 1 x 63A TP&N for private artist's chef.
- 1 x 63A TP&N in Artists rooms 1 & 12.
- 1 x 32A SP&N for level GF Base Atrium.
- 1 x 32A SP&N for level 01 Back Stage Lounge.
- 1 x 32A SP&N for level 01 North Concourse.
- 1 x 32A SP&N for level 01 South Concourse.
- 1 x 32A SP&N for level 01 West Concourse.
- 1 x 63A TP&N for level 02 Loge East.
- 1 x 63A TP&N for level 02 Loge South.
- 1 x 63A TP&N for level 02 Atrium.
- 1 x 32A SP&N for level 03 Experience Night Market East.
- 1 x 32A SP&N for level 03 Experience Night Market West.
- 1 x 32A TP&N for level 03 North West Wheel Chair for follow spot provision.
- 1 x 32A TP&N for level 03 South West Wheel Chair for follow spot provision.

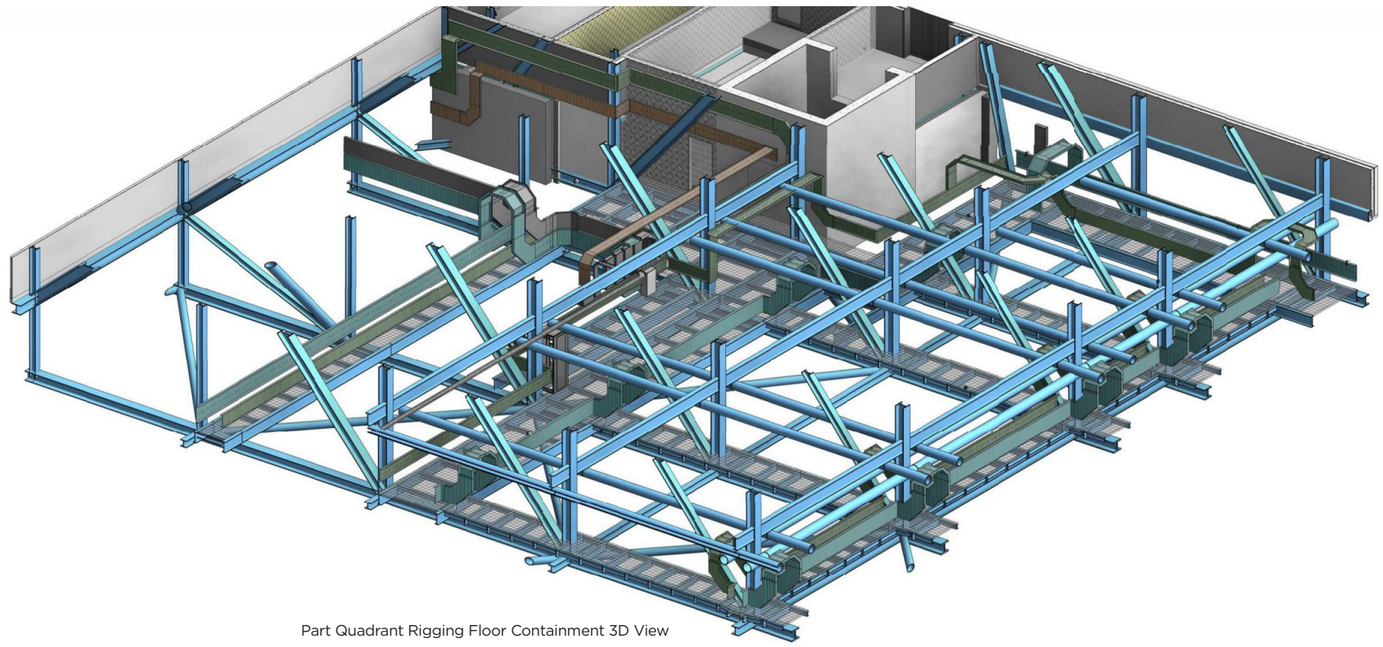
Power distribution shall be arranged to enable isolation of power to each zone and or area independently. Cables shall be routed across concourse areas or concealed above suspended ceilings.

For the small power provision refer to the small power floor plans.

7.4.1.12 Stage and Production Power

Electrical panels for the Stage and Production power shall be provided complete with PowerLock connections. The PowerLock connections shall be semi-recessed in the panels and shall be angled downwards so that cables are facing to the floor and NOT straight out.

"J" hooks shall be provided around the Auditorium for show power cables to be run from the electrical panels to locations required.



Part Quadrant Rigging Floor Containment 3D View

The Stage panels left and right are made up of an incoming 1200A TP&N supplies with 3 outgoing ways each rated at 400A TP&N. One of the outgoing ways will be complete with ground and isolated ground within each panel.

Located adjacent the level 00 central entrances into the auditorium and at level 4M, rigging floor, separate 400Amp or 250Amp TP&N switches with power lock connectors shall be provided.

7.4.1.13 Charging Points

Charging points for vehicles, cleaning machines, access/maintenance machines have been provided in the loading bay mounted on the East wall. These include

2 x Standard charging: typically delivered over AC at 13A single-phase with a 3kW power output. Method of connection is via a three pin BS1363 plug as is fitting for household applications.

2 x Fast charging: typically delivered over AC at 32A single-phase with a 7kW power output. Method of connection is typically a detachable cable suitable for use with the EV being connected with a type 2 plug on the infrastructure end.

2 x Fast charging: typically delivered over AC at 32A three-phase with a 22kW power output. Method of connection is typically a detachable cable suitable for use with the EV being connected with a type 2 plug on the infrastructure end.

7.4.1.14 Mechanical Services (Electrical Feeds)

Mechanical services plant and equipment shall be supplied directly from the main LV switch panels or from local distribution boards located within the electrical risers.

Where mechanical plant control panels are provided these shall be fed directly from the main LV switch panels and the supplies shall terminate within the control panel.

Where mechanical plant is required to be part of the life safety systems, smoke extract plant, sprinkler plant etc, these shall be supplied from two separate main LV switch panels with the cables terminated directly into Auto Transfer Switches which shall be provided as part of the mechanical plant/equipment.

Where mechanical equipment is supplied from local distribution boards the supply shall terminate within a local fused connection unit or rotary isolator switch, IP protected for the environment they are installed within, before final connection to the item of equipment.

7.4.1.15 Lifts and Escalators (Electrical Feeds)

Lifts and Escalators shall be supplied directly from the main LV switch panels and the supplies shall terminate within the lift or escalator control panel.

Where the lifts are part of the life safety strategy, and/or firefighting lifts, these shall be supplied from two separate main LV switch panels with the cables terminated directly into Auto Transfer Switches, which shall be mounted in the vicinity of the lift. From the auto transfer switch a single fire rated supply cable shall be taken and terminated in the firefighting lift control panel.

All lighting and power requirements for the lifts associated shafts and the escalators shall be from the lift/escalator supply control panel.

7.4.1.16 Lightning Protection

OVG Manchester shall be provided with a lightning protection system in full compliance with BS EN 62305. Design of the air termination network and down conductors shall be developed during the Stage 4b design as part of a contractor design portion of works.

The resistivity readings of the ground conditions shall be investigated at an early stage so that adequate planning of locations of earth mats and pits can be accommodated within early groundwork construction activities.

Where possible the structure shall be utilised for the down conductors from the lighting protection grid run at roof level. All plant located at roof level shall be connected to the lightning protection system.

The lightning protection system shall be interconnected to the overall grounding system by connection to the LV system earth bars located in the quadrant substations.

7.4.1.17 Surge protection

The main LV switch panels in each quadrant shall be designed complete with Transient Voltage Surge Suppression (TVSS) equipment on each of the incoming supplies to protect the electrical equipment, in the event of a local lighting strike to suppress transients.

7.4.1.18 Earthing

The building shall have an earth (ground) system which shall comply with BS 7430: 2011 and BS EN IEC 61936-1:2011. This shall consist of a network of earth bars to create an equipotential plane for the building:

- Each room containing MV equipment (including transformer rooms) shall be provided with an MV earth bar.
- Each Level GF substation shall be provided with an LV earth bar.
- All MV earth bars shall be interconnected to the nearest LV earth bar.
- All LV earth bars shall be interconnected to create a ring arrangement at Level GF.
- All LV earth bars shall be interconnected to the lightning protection system, water and gas installation pipework (where constructed in conductive materials), local extraneous metalwork and metallic structural elements (including reinforcing bars in floor slab and walls) to provide protective equipotential bonding
- All earth system connections shall be run using separate conductors, green/yellow insulated, and shall be installed on primary and secondary containment.

7.4.1.19 ICT/AV Earth

All ICT/AV rooms shall be supplied with a dedicated earth facility and shall comply with EN 50310. The earth system shall be connected to the Lightning Protection system and the overall grounding system generally comprising driven rods and mats below ground level.

7.4.1.20 Utility Earthing

Earthing requirements for the Utility supply are generally provided by the Utility supplier. This is envisaged as being provided via an earth pit within the ENWL switch room.

7.4.1.21 Fire Detection & Evacuation Systems

The building shall be provided with a digital addressable multi-zoned automatic fire detection alarm system that is programmable from site.

General design parameters:

- BS.5839:1:2017 - Fire Detection and Alarm System for Buildings
- BS EN 54- Fire detection and Fire Alarm systems
- BS7671:2018 Corrigendum- Dec 2018/ 18th Edition IET Wiring Regulations
- BS 8519:2010 - Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice

Performance objectives:

The category of fire detection identified by the Fire Engineer is Category L2 with the exception for low risk areas subject to a risk assessment.

The master fire panels shall be located within the OVG Manchester security room (for non-event control) and within the Event Control room (for event control). Subject to fire risk

assessments and final strategy documentation, the digital addressable fire detection systems would include, as a minimum, and where relevant:

- Open protocol system
- 1 No. Master fire alarm panel, located in the Event Control room, for monitoring and control of all fire alarm devices
- 1 No. Repeater fire alarm panel located in the venue Security room
- Multi Sensor detectors shall be used throughout for the detection of Smoke/Heat/Carbon Monoxide except where an aspiration system is used.
- Aspiration system at high level in the auditorium, providing coverage of the entire open plan Bowl
- Door holders that release under fire conditions
- Loop connection devices within concessions, kitchen & finishing kitchens for extension by tenant's or as part of the fit out.
- During events, alarm indication would be provided to the stewards by an agreed format of: visual indication during events.

Wiring internal to the building shall be fire-rated to BS 8519 and run on a dedicated cable tray, with the PAVA system or concealed within the building fabric in a dedicated conduit system.

Gas solenoid valves will be linked back into the fire alarm system interface unit and will shut off in the event of a fire alarm.

Roller shutters, where required, shall be linked to the fire alarm system to be activated to contain smoke and fire.

In addition to the general building fire alarm systems, gas suppression systems shall be provided. Refer to Fire Protection section for description.

Evacuation Strategy

A detailed Cause and Effect schedule is to be developed either by by the Fire Engineer or the contractor in coordination with the site Fire Strategy Report, by others.

To minimise disruption due to false alarms, the operation of single automatic device in a defined operational zone shall initiate a staff intervention period. Confirmation of an alarm condition, or the delay period timing out, shall produce evacuation in line with the agreed strategy. If two smoke detectors (double knock) within a common zone are actuated inside the search/intervention period, the system shall go immediately into the evacuation sequence. If a manual break glass contact is actuated, the system shall go into immediate evacuation sequence.

Control System

2 No. fire alarm panels shall be provided, 1 No within the Event Control Room and 1 No within the Security Office.

The control and indicating panel shall conform to the requirements of BS 5839: Part 4 and the requirements of EN 54 Part 4 with the provision of an LED zonal fire, fault indication and event printer.

The main control panel shall be of multi-loop design with a LCD display to indicate clearly FIRE or FAULT condition/location. The panel shall also be provided with an audible warning alarm and visual status indication.

The fire alarm system shall be interfaced with all items of plant sending appropriate signals during fire mode. This shall be either to start life safety systems such as extract systems and stop other plant such as air handling units.

The fire alarm control panel shall have an integral standby battery to enable the system to function for a minimum for 48-hours, with another 30 minutes under full/alarm/control conditions.

Remote Monitoring

The system shall have an automated auto-dial facility to link to the local Fire Authorities. The signal relayed to the external control centre shall identify the zone or area of the building in alarm to allow the Local Fire Authority to plan their arrival location at the building.

Additional Connections/Interfaces

The system shall be linked to other systems such as the SCADA system, BMS system, mechanical plant, lifts, smoke ventilation, fire shutters, disabled refuge, PA/VA, security and communications systems to facilitate implementation of the safety strategy.

Within the commissary kitchen and each finishing kitchen, food kiosk and bar kiosk, shall be provided with a fire alarm interface and shall be linked into the building fire network. Each tenant shall fit out their respective areas in line with the building fire strategy guideline, including all associated interfaces with any associated roller shutters.

Gas solenoid valves shall be linked back into the fire alarm system interface unit and shall shut off in the event of a fire alarm.

Detectors

Automatic detectors shall be provided in all areas in accordance with the requirements of BS 5839 Category L2 and the 'Fire Strategy' document, being produced by others, for the protection of escape routes and all enclosed rooms adjoining the escape route. Additional automatic detection is provided in areas where the presence of a fire would lead to a significantly high life or property hazard. Detectors shall be considered in voids within the structure in accordance with BS 5839.

The detectors shall have interchangeable heads to enable the detection system to respond to changes in the built environment. Any changes to the operating system necessitated by head changes shall be user programmable.

The following detection devices shall be installed, as required;

- Multi-Sensor Carbon Monoxide detectors.
- Aspiration type smoke detection systems.

Manual Break Glass Call Points

In accordance with BS 5839 manual break glass contacts should be provided at all exit doors from the floors, on all exit routes and at each final exit from the building. The operation of a break glass contact shall cause an immediate alarm and initiation of the cause and effects sequence. No intervention period shall be allowed following the actuation of a break glass unit.

It is proposed that manual call points are not located in general areas accessed by members of the public and only provided in back of house/staff areas due to the high risk of false or malicious activation.

The location of manual break glass call points shall however be agreed with the fire engineer and require discussion with Building Control.

Automatic Door Holders

Door holder/release units shall be provided and installed, as part of the door ironmongery package, within designated corridors/circulation spaces. On a signal from the fire alarm system these door holder/release units shall de-energise, releasing the door. A loop powered fire alarm interface unit shall be provided to control each set of doors.

Occupant Notification

The fire alarm system shall be interconnected to the PA/VA system (refer to separate section).

The fire alarm system operation on a non-event day shall raise an alarm on the activation of a smoke/heat/aspiration detection or break glass unit, by indication on the alarm panels and sending either a message or agreed fire alarm signal over the PA/VA system and operate the visual aid devices installed.

The fire alarm system operation on an event day shall raise an alarm on the activation of a smoke/heat/aspiration detection or break glass unit, by indication on the alarm panels, for the

Fire Officer to decide the action to be taken. No alarm shall be raised over the PAVA system or visual aid devices, until decided by the Fire Officer.

Once the Fire Officer decides to operate the alarm, the PAVA system shall send a message, the visual aid devices shall operate and a message shall appear on any TV's as required.

The final operation of the system shall be confirmed by the Fire Engineer or contractor, with a cause and effect schedule, so that the correct operation can be programmed into the system, with final agreement with Building Control.

Cabling

System cabling shall be in red sheathed fire-resistant cabling (FP200) on designated containment or clipped direct to the fabric of the building for a single loop pair.

The fire alarm system shall be wired to meet the legal requirements of EMC directive and maintain system operation and integrity. All cabling associated with the system shall be MICC Fire or FP Plus, coloured red with an LSOH oversheath, manufactured, tested and installed to comply with the following; BS 5839 Part 1:2002, BS 6387: 1994, BS 6425 Part 1: 1990, BS 7211, BS 7346-6:2005, BS 7622 Part 2: 1993, BS 7629 Part 1: 1997, BS 8434 Part 2: 2003, EN 50200: 2000 (PH120), EN 50267-2-1: 1999, BASEC & LPCB approved.

7.4.1.22 Facilities for the Disabled

For people with impaired hearing, increased intelligibility of audio shall be provided. Refer to Vanguardia report for details.

Disabled call systems consisting of a ceiling pull cord with reassurance lamp, combined reset and emergency buttons and over-door indicator lamp shall be provided for each accessible WC. Each device shall be connected back to a building wide system with indicator head ends located in both the Level 04 event control room and Level 00 security room.

A network of disabled refuge call points and fire/steward telephones shall be located at the refuge points on each floor adjacent the firefighting lifts.

Fire telephone master control panels shall be located within the Event Control room at Level 04 and the Security control room at Level GF. Both Master Control panels shall be capable of answering any emergency call within the building (simultaneous answer is not possible) with each control panel having a ring network serving their own half of the building and interconnecting cabling to answer calls connected to the alternative panel.

7.4.1.23 Public Address and Voice Alarm (PAVA) System

Dedicated power supplies shall be provided for PAVA equipment. This shall include dual supplies to each PAVA rack room.

Refer to Vanguardia report for exact details of the PAVA system.

7.4.1.24 Audio Visual systems

Audio visual systems including LED screens, LED ribbon boards and an IPTV/Digital Signage system shall be provided with all necessary signal wiring and power.

Refer to Vanguardia report for exact details of the AV system.

7.4.1.25 Broadcast

A dedicated LV panel shall be provided for Outside Broadcast equipment. This shall include a supply to the outside Broadcast Technical Connection Room (OBTCR), connection for satellite uplink lorries in the external broadcast area and outside broadcast lorries in the loading bay. These supplies shall have power lock connections for extension of the system service the lorries.

Broadcast containment shall be provided for the permanent cable infrastructure between cameras and Broadcast Connection Panels and the OBTCR.

Refer to Vanguardia report for exact details of the OB requirements.

7.4.1.26 Ethical Hacking

During testing and commissioning it shall be the responsibility to test if it is possible for penetration testers (ethical hackers) to enter the systems provided. If during testing and commissioning and after handover it is found that penetration testers (ethical hackers) find fault with various systems software or configuration of devices, then it is the responsibility of the manufacturer/supplier/ contractor to rectify.

Building Services Contractors shall ensure that all electronic field devices related to their systems are made secure in terms of cyber security and TCP/IP communications. Devices shall be hardened in order to prevent malicious activities which may affect/compromise confidentiality, integrity or availability of the system or service. Basic hardening examples would be:

- Disabling telnet
- Disabling HTTP interface
- Enabling SSH
- Removing local login for configuration

Building Services Contractors shall make reference to the following document with regard to their role and responsibilities in working collaboratively with the active network contractor/s and the Penetration Testing Assessor in achieving a highly secure network infrastructure.

Refer to testing document - Information Security Testing Specification.

7.4.1.27 Testing and Commissioning

The testing and commissioning of all systems shall be carried out by the contractor, for which a commissioning plan shall be provided.

The results of the contractors testing and commissioning of the systems shall be verified by an independent testing and commissioning specialist employed by the contractor.

STRUCTURED CABLING SYSTEMS

7.5.1 STRUCTURED CABLING SYSTEMS 780

7.5

7.5.1 Structured Cabling Systems

7.5.1.1 Definitions, Documents & Drawing References

- ME Engineers mechanical and electrical documents and drawings
- ME Engineers ICT schematics and drawings
- Populous architectural layouts
- Vanguardia AV, TV and broadcasting layouts

Abbreviation	Definition
AV	Audio / Visual
ACS	Access Control System
ANSI	American National Standards Institute
API	Application Programming Interface
BEF	Building Entrance Facilities
BICSI	Building Industry Consulting Service International
BS	British Standards
BT	British Telecoms (Carrier)
CCTV	Closed Circuit Television
CNS	Common Network System
CPU	Central Processing Unit
DAS	Distributed Antenna System
ECR	Event Control Room
EIA	Electronic Industries Alliance
EN	European Norm
FOC	Fibre Optic Cable
IEC	International Electrotechnical Commission
IoT	Internet of Things
IP	Internet Protocol
IT	Information Technology
ISO	International Standards Organisation
KVM	Keyboard Video Management
LAN	Local Area Network
MER	Main Equipment Room
MOCR	Mobile Operators Communications Room
O&M	Operations and Maintenance
ONVIF	Open Network Video Interface Forum
OWNER / CLIENT	JV between Oak View Group (OVG) and City Football Group (CFG)
PoE	Power over Ethernet
PTZ	Pan, Tilt and Zoom
QR	Quick Response
RAID	Redundant Array of Independent Drives
RU	Rack Unit
SCR	Satellite Communications Room
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
TC	Telecom Carrier
TCP	Transmission Control Protocol
TIA	Telecoms Industry Associations
TVL	Television Lines
VMS	Video Management System
WAN	Wide Area Network
5G	Fifth Generation (A type of wireless cellular technology)

7.5.1.2 Request For Proposals (RFP)

Alongside development of the Venue, the following specialist systems were issued for tender.

- Distributed Antenna System (DAS)
- Common Network System (CNS)
  - Active Network
  - VoIP system
  - Wireless System
  - Incoming service provider

The tenders were issued on the 25/10/2019 with returns recieved on the 20/12/2019.

FreshWave Group have been appointed as the DAS specialist and Ideal Networks have been appointed as the CNS specialist.

Details of these systems have not been included within this report, however the appointed specialist has developed the design and assisted with co-ordination of their systems dependencies in conjunction with the design team during Riba Stage 4.

Scope

This section covers ME Engineers scope of works which include:

- ICT technical spaces
- Backbone cable pathways for the Venue - Fibre and copper
- Horizontal cable pathways for the Venue – Fibre and copper

The scope incorporates the above systems with a host of brief descriptions for the Structured Cabling System added in later sections of this report, in order to consider the overall integrated nature of the technology strategy and physical/logical system interfaces required.

General design objectives

The Structured Cabling System has been designed to support all IP systems and co-ordinated with system specialist data applications operating over a multi-media. Infrastructure includes single-mode fibre optics and twisted pair copper. The technology infrastructure shall be supported by dedicated technical spaces, risers and cable pathways.

Incoming Utilities supporting infrastructure

The CNS contractor is responsible for the selection and application of the Technology service provision.

A physically diverse site routing of underground ducts from two points on the project boundary interface have been co-ordinated with BuroHappold. This will ensure redundancy and security for carrier communication to the Venue. Within the Venue, the Primary and Secondary Building Entrance Facilities (BEF-GF-01 and BEF-GF-02) are located at diagonals to each other on level GF. Service provider cables shall be terminated in passive carrier racks/wall mounted distribution points within the BEF's (racks within the BEF will be supplied by the service provider). Service Provider Active equipment will be located in the Main Equipment Room on level 04. 24 core OS2 fibre optic service ties are routed from the primary and secondary building entrance facility to Rack 01 in MER-04-01 on level 04. The service routes shall be routed to ensure that the diversity is maintained to the point of room entry.

Technical Spaces

Dedicated technical spaces have been provided to specifically support technology and other low voltage systems as required. Low voltage systems include voice, data, wireless, security access control, video surveillance and Audio/ Visual (A/V), Point of Sale systems, BMS, ticketing.

Currently, the infrastructure proposed within the arena shall include the following technical spaces:

Level	Technical Spaces
GF	3 No. Satellite Communications Rooms (SCR-GF-01, SCR-GF-02 & SCR-GF-03) 2 No. Building Entrance Facilities (BEF-GF-01 and BEF-GF-02)
01	4 No. Satellite Communications Rooms (SCR-01-01/02/03/04)
02	4 No. Satellite Communications Rooms (SCR-02-01/02/03/04)
03	4 No. Satellite Communications Rooms (SCR-03-01/02/03/04)
04	4 No. Satellite Communications Rooms (SCR-04-01/02/03/04) 1 No. Mobile Operators Communications Room (MOCR) 1 No. Main Equipment Rooms (MER-04-01)
04M	2 No. technology racks (TE-05-01/02)
05	N/A

Main Equipment Room (MER)

The Main equipment room (MER-04-01) is located at 04 of the venue. This houses the main distribution for the primary and secondary fibre optic backbone, core network equipment, dedicated system servers etc. There is 18 No. of

Equipment Racks/cabinets at 800mm (width) x 1200mm (depth) x 42 RU (height). The MER is the location for core A.V equipment. All racks shall be standardised for shared space ICT and A.V equipment.

The Equipment Racks shall contain the following:

- Rack 01 – ICT Core & Backbone Infrastructure
- Rack 02 – ICT & Active Equipment
- Rack 03 – DMZ
- Rack 04 – Ticketing Equipment
- Rack 05 – Point of Sale Equipment
- Rack 06 – Building Services Equipment
- Rack 07 – Building Services Equipment
- Rack 08 – A.V
- Rack 09 – A.V
- Rack 10 – A.V
- Rack 11 – Security Equipment
- Rack 12 – Security Equipment
- Rack 13 – Client Servers
- Rack 14 – Spare
- Rack 15 – Spare
- Rack 16 – Spare
- Rack 17 – ICT Core & Backbone Infrastructure
- Rack 18 – ICT & Active Equipment

Two 32A PDU shall be included for each rack with the MER. The PDU are to be Intelligent, individual remote power on/off to sockets and metered to allow monitoring of power consumption for individual equipment.

A hot isle containment system has been included within the MER, please refer to Mechanical drawings and schedules of the in row cooling units (IRC).

A clean agent gas suppression system has been included within the MER, please refer to fire suppression scope of works for further details.

Satellite Communication Room (SCR)

A total of nineteen (19) Satellite Communications Rooms, spanning across various levels of the venue, have been designated in support of telecom/IT/Security/AV applications. Where space limitations are met and SCR are not provided on adjacent floors, horizontal distribution shall be provided from the above/below SCR. The SCR's are located within the venue in order to maintain the industry standard for horizontal length limits of 90m. A few of the SCR's will house A.V distribution equipment (refer to Vanguardia . All racks shall be standardised for shared space ICT and A.V equipment.

The SCR accommodate (but not be limited to) the following elements:

- Between 2 No. to 3 No. of equipment cabinets 800mm (w) x 800mm (d) 42 RU (h). Quantity will be finalised based on further co-ordination alongside the appointed CNS specialist and A.V design.
- Passive cable termination equipment
- Network edge switch equipment
- AV distribution equipment
- Access control central controllers
- Rack space for future technology requirements.

Two 12 way 16A PDU shall be included for each rack with the SER's. The PDU are to be Intelligent, individual remote power on/off to sockets and metered to allow monitoring of power consumption for individual equipment.

Building Entrance Facility (BEF)

- Areas of BEF-GF-01 and BEF-GF-02:
- 2 x BEFs for primary and diverse service provider entries
- All incoming Service cable and demarcation terminals will be provided by the Service Provider included in the CNS package.

The BEFs will accommodate:

- Incoming external duct/s serving telecommunication services to the arena
- Passive cable infrastructure for the termination of the Service Providers/Telecom Carriers (TC)

Mobile Operators Communications Room (MOCR)

The MOCR is located on level 04 of the arena and shall house the Distributed Antenna System (DAS) equipment.

The DAS room design strategy is shell and core with the fit out included in the DAS specialist package.

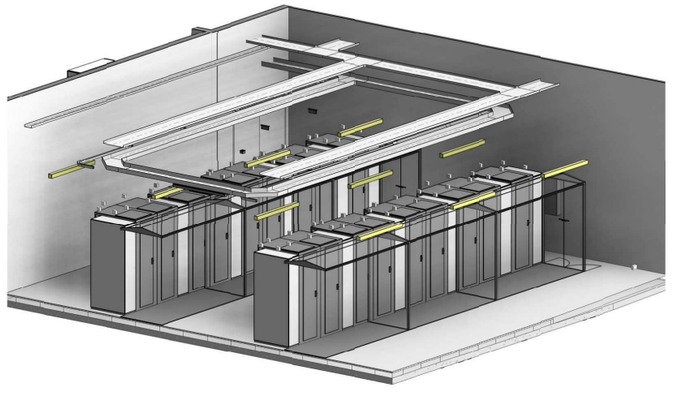
Earthing

A dedicated telecommunications earthing system has been provided for the technology equipment. All required technology components shall be earthed to the system including, but not limited to:

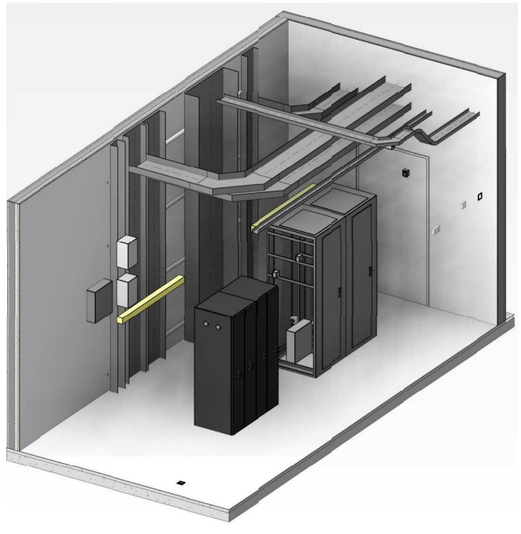
- Equipment racks, enclosures, cabinets
- Containment.
- Anti-static floor finishes.
- Suspended floor grid.

Cable Routes

Cable runs for CAT 6A f/ftp will not exceed 90m in length (permanent link) and 100m length (channel) as per the current cabling



Main Equipment Room (MER) location



Typical Satellite Communication Room (SCR) location

standards. The current distribution zone are planned as below.

Cable pathways

Cable trays shall be routed horizontally out of all communication rooms (MERs and SCRs) to allow horizontal distribution.

A Containment raceway has been designed in a ring configuration, making connection within each SCR around the concourse on each level of the venue to allow flexibility of diverse routing.

Cable trays shall be steel or aluminium type.

Solid Bottom tray shall be provided at all locations exposed to public view.

Enclosed tray shall be used for segments routed through electrical rooms or other points which pose a risk in terms of electrical or radio interference. Cable pathway routes shall minimise the need for enclosed tray sections to be used.

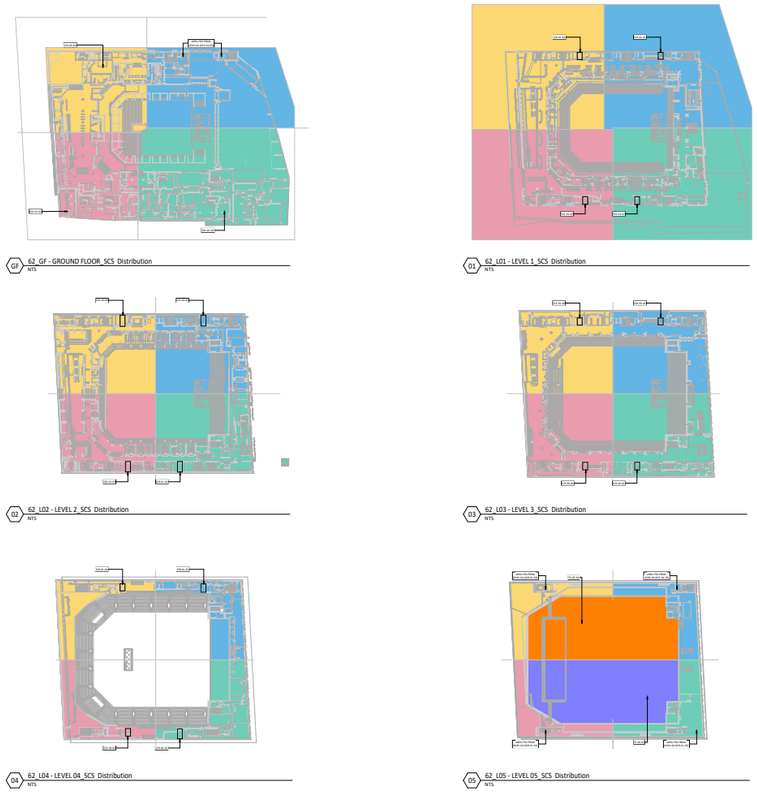
Cable trays will be routed horizontally on various levels in corridors and concourses to interconnect the Communication Rooms for routing horizontal technology systems and AV cables including voice, data, sound, TV broadcast production, distributed TV, and security.

All raceway and cable routing shall be located to minimise cable length.

All pathway penetrations and openings through fire rated walls shall be sealed with appropriate firestop material.

MERs, SCRs, BEFs and MOCR – Architectural, electrical and mechanical fit out

All technical spaces will be secure and environmentally controlled/monitored as required to protect the integrity of the equipment installed with the space.



SCS Zone distribution layout

Structured Cabling System (SCS)

The structured cabling system shall be proposed to implement physical hierarchical star topology comprising of:

- OS2 Fibre cabling backbone distribution
- Category 3/CW1308 Copper cabling backbone distribution
- CAT 6A f/ftp Horizontal distribution

All cabling shall be Euroclass CCA.

Fibre Backbone Cabling

A 24 core OS2 Single mode fibre optic backbone cabling shall be installed to serve the interconnection of active network switches located within the MERs and SCRs. This shall be used to support the IP connectivity for the various technology systems.

The Primary fibre optic backbone cable system shall consist of single-mode fibre optic cables (to support pure data applications) routed to the SCRs, BEF from the MER. The single-mode fibre optic backbone shall be capable of supporting 40/100Gbps Ethernet. All fibre shall be installed within fibre optic patch panels mounted in equipment cabinets.

The Secondary fibre optic backbone will be a duplication of the Primary system with the fibre optic taking a diverse route to and from each equipment room.

Refer to Fibre Optic Backbone Schematic Diagram for more information.

A 24 core SM fibre connection direct from the MER has been provisioned to connect to the Etihad Stadium. Confirmation of the inclusion of this connection is subject to OVG & CFG operational discussions.

Cabinet-to-cabinet structured cabling in the MER is required. A 12 core Multimode fibre optic from Rack 01 & Rack 17 will be installed to the top of each rack. Copper 'keep-alives' between duplicated network equipment such as Core Supervisors have also been included.

Copper Backbone Cabling

Category 3/1308bw telephony cabling shall be installed to support the distribution of any required analogue direct exchange line services such as:

- Lifts
- Fire alarm panel
- Security alarm panel
- Fax machines (if used)

Cables will be terminated on voice grade RJ45 panels housed within the equipment cabinets.

CAT 6A f/ftp horizontal cabling and cable distribution.

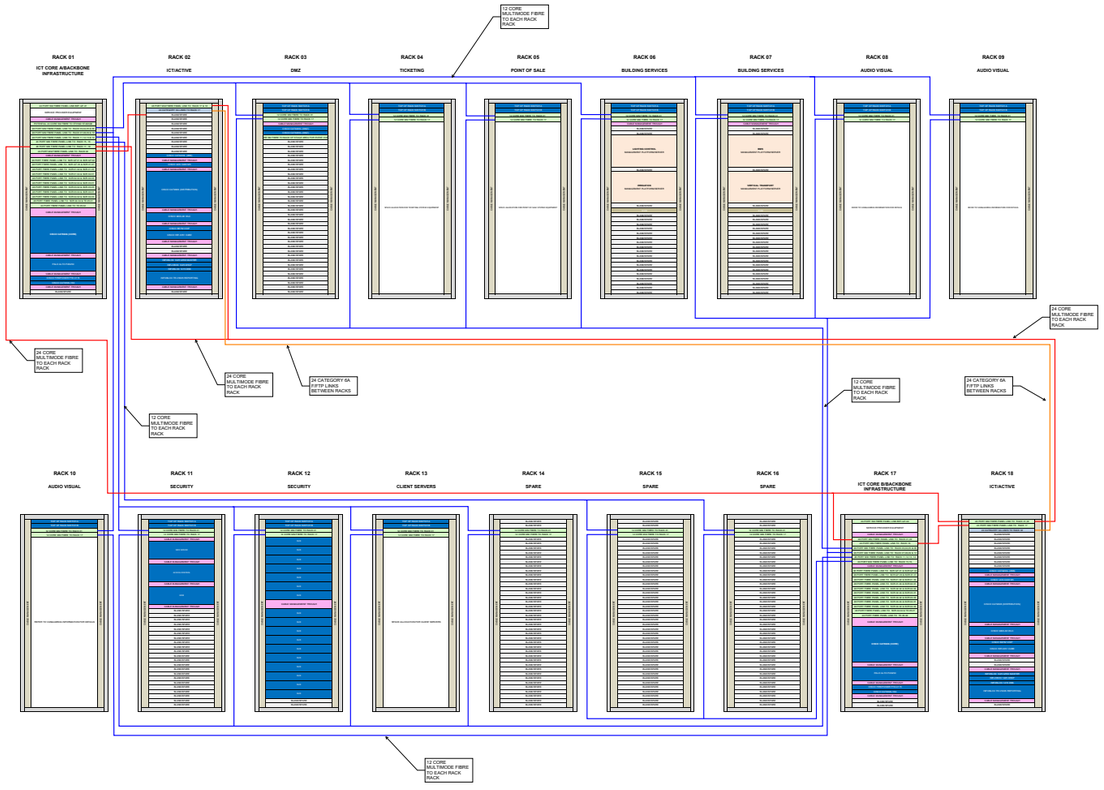
The horizontal cabling scheme includes Category 6A f/ftp to serve all required voice and data outlets (I/O). This can be used to serve the distribution of network cabling where each SCR will cover required zone levels of the Venue, ensuring that cable run out shall be within the 90m limit.

Data outlets shall provide connection but not limited to following systems,

- General Data connections, P.C's
- W-Lan
- VoIP
- IPTV
- EPOS

7.0 SERVICING ENGINEERING

MER infrastructure schematic



• BMS

• Ticketing

• CCTV

• Access Control

• Hostile Vehicle Mitigation

• Lighting Control

• Wayfinding

Physical security shall be provided to CCTV outlets in the form of enclosed patching boxes with security screws to prevent un-patching of CCTV cameras.

Some external outlet connections at the VIP drop off, external perimeter and Podium to W-Lan, CCTV, HVM and A.V totems are currently 2 core OS2 fibre optic connections.

These will be presented in a fibre termination box that will connect directly into a media convertor. Co-ordination of equipment within lighting columns, A.V totems shall be completed at RIBA stage 4.

A direct 4 core SM fibre connection from the MER has been provisioned for the connection of the security hut.

Direct fibre connections to external façade displays that cable back directly to A.V rack & equipment within the SCR shall be provided by Vanguardia.

All Data outlets have been located in co-ordination with specific system specialists & operational requirements.

An 8 core SM fibre optic cable has been located in the loading bay behind the stage area. This is directly cabled back to the MER. This is an allowance for an overlay event such as e-gaming that bring their own network (mobile data centre).

Broadcast System

The design of the Broadcast infrastructure such as SMPTE, fibre, coax etc. is by Vanguardia.

Data outlet locations and quantities that require connection to the SCR have been coordinated in conjunction with Vanguardia.

Security

CCTV and Access control requirements have been modelled in line with the security and access strategy set out by Buro Happold.

Commissioning dependency

There are a number of client direct items such as the DAS system and CNS system that are key to the overall commissioning of systems.

The installation and configuration of the CNS (common network system includes but not limited to the following system that are part of the base tender.

• CCTV system

• Access control system

• BMS system

• Epos

• IPTV

• Ticketing

To achieve a smooth commission process and reduce client risk the following rooms, containment and cabling will need to be programmed for early handover.

• BEF

• BEF to MER cable routes

• BEF to MOCR cable routes

• MER

• MOCR

• SCRs

• Fibre optic backbone

• Horizontal cabling

The early handover within the rooms also includes mechanical cooling, electrical systems and interiors fit out to create the correct working environment for the equipment.

The MER and SCR's shall be subject to a computer room grade clean, ISO 14644-1 class 8 prior to CNS equipment being installed.

VERTICAL TRANSPORTATION

7.6.1 VERTICAL TRANSPORTATION 786

7.6

7.6.1 Vertical Transportation

7.6.1.1 Introduction

This document provides a summary of the RIBA Stage 4 vertical transportation strategy for this development and should read in conjunction with Technical Specification BRA-MEE-ZZ-ZZ-SP-Y-7001.

7.6.1.2 Public

User Movement

See adjacent table.

7.6.1.3 Escalators

Introduction

Escalator use is limited to able-bodied persons, no mobility impaired use is considered, and escalators are not used for evacuation mode.

All escalators are based on the following:

Step Width	1000 mm
Angle of Inclination	30°
Rated Speed	0.50 m/s

It is assumed that each escalator operates in the upward direction during ingress and downward direction during egress.

7.6.1.4 VIP / Hospitality

VIP/Hospitality is addressed through the provision of 1 off pairs of escalators, 2 off in total:

• VIP/Hospitality, North Core Escalators, 2 off

The arrival profile is based on people flow information provided by Buro Happold Engineering, refer to extract below. An admission rate of 48 persons per minute has been advised based on the provision of 8 MAGs.

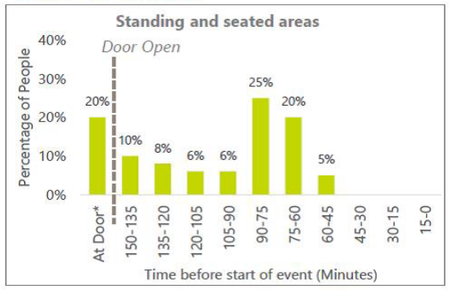
Level	Type	Group	Population	Building Mode		
				Ingress	Egress	Evacuation
00	GA	AB	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
		WCU	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
		AMB	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
01	GA	AB	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
		WCU	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
		AMB	[N/a]	[Horizontal]	[Horizontal]	[Horizontal]
02	VIP	AB	1498	00↗02 [VIP] 100%	02↘00 [VIP] 100%†	[Via Stairs]
		WCU	24+24	00↑02 [VIP] 100%	02↓00 [VIP] 100%	02↓01 [SW] 41.5% 02↓01 [NW] 41.5% 02↓00 [NE] 8.25% 02↓00 [SE] 8.25%
		AMB	24+24	00↑02 [VIP] 100%	02↓00 [VIP] 100%	02↓01 [SW] 41.5% 02↓01 [NW] 41.5% 02↓00 [NE] 8.25% 02↓00 [SE] 8.25%
03	GA	AB	5803	01↗03 [W] 100%	[N/a]	[Via Stairs]
			3727	01↗03 [E] 100%	[N/a]	[Via Stairs]
			2650	[N/a]	03↘01 [W] 100%†	[Via Stairs]
			1800	[N/a]	03↘01 [E] 100%†	[Via Stairs]
		WCU	8+8	01↑03 [NW] 50% 01↑03 [SW] 50%	03↓01 [NW] 50% 03↓01 [SW] 50%	03↓00 [NE] 50% 03↓00 [SE] 50%
		AMB	8+8	01↑03 [NW] 50% 01↑03 [SW] 50%	03↓01 [NW] 25% 03↓01 [NE] 25% 03↓01 [SE] 25% 03↓01 [SW] 25%	03↓00 [NE] 50% 03↓00 [SE] 50%
04 (Attic) North	GA	AB	150	00 ↑[VIP] 04	[Via Stairs]	[Via Stairs]
		WCU	2+2	00 ↑[VIP] 04	04↓00 [VIP] 100%	04↓00 [NE] 100%
		AMB	2+2	00 ↑[VIP] 04	04↓00 [VIP] 100%	04↓00 [NE] 100%
04 (Attic) South	GA	AB	150	01↑04 [SE] 50% 01↑04 [SW] 50%	[Via Stairs]	[Via Stairs]
		WCU	2+2	01↑04 [SE] 50% 01↑04 [SW] 50%	04↓01 [SE] 50% 04↓01 [SW] 50%	04↓00 [SE] 100%
		AMB	2+2	01↑04 [SE] 50% 01↑04 [SW] 50%	04↓01 [SE] 50% 04↓01 [SW] 50%	04↓00 [SE] 100%

Key: GA – General Admission, VIP – VIP/Hospitality, AB – Able-bodied, WCU – Wheelchair User + Companion, AMB – Ambulant Disabled + Companion, ↗ – Upward Escalator Journey, ↘ – Downward Escalator Journey ↑ – Upward Lift Journey, ↓ – Downward Lift Journey, † – Split with stair use, refer to report content for details

Ingress Calculations

Egress Calculations

Hospitality spectators:



Calc	Issue	Date	Description	OK	Comment
01	04	06/04/2020	VIP Seated/Standing Ingress	✓	Performance is acceptable

Calc	Issue	Date	Description	OK	Comment
06	04	06/04/2020	VIP Seated/Standing Egress (100% Leaving)	►	Where the is a requirement to clear the vomitory within 8 minutes then the escalators can address a total population of 891 persons, a minimum of 607 persons should be managed through stairs (41% stair use).
09	01	06/04/2020	VIP Seated/Standing Egress (50% Remain)	►	Where 50% of the vomitory vacate immediately then the escalators are generally sufficient, there is an initial backlog of 192 persons in the first 5-minutes of escalator operation that would require management through stairs; this backlog is cleared in the following 5-minutes of operation.

General Admission

General admission is addressed through the provision of 2 off pairs of escalators, 4 off in total:

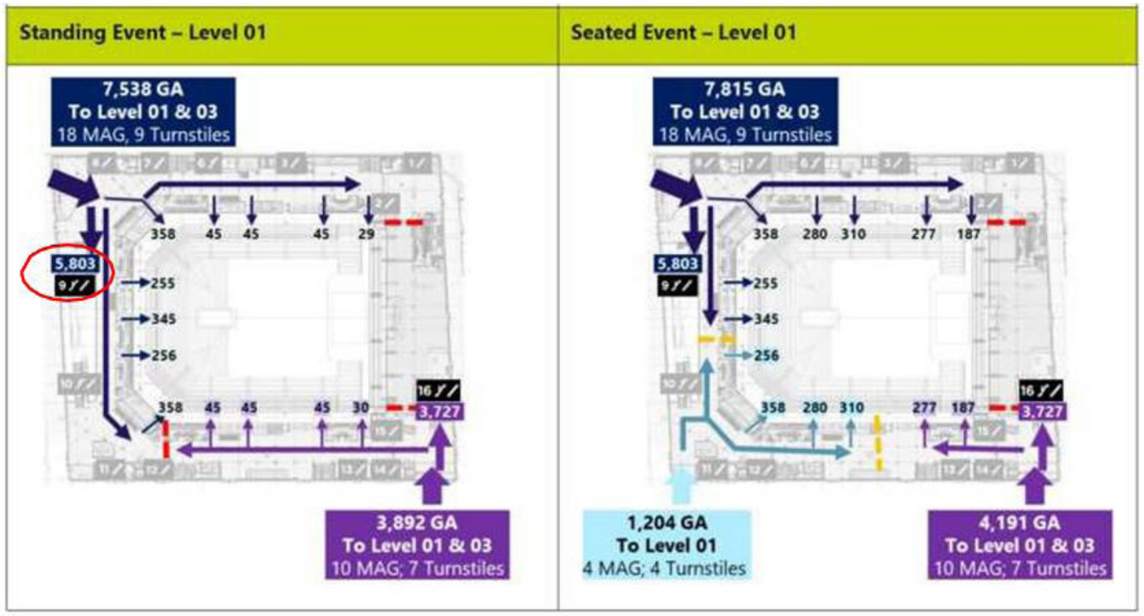
• General Admission, West Core Escalators, 2 off

• General Admission, East Core Escalators, 2 off

The arrival profile is based on people flow information provided by Buro Happold Engineering, refer to extract below.

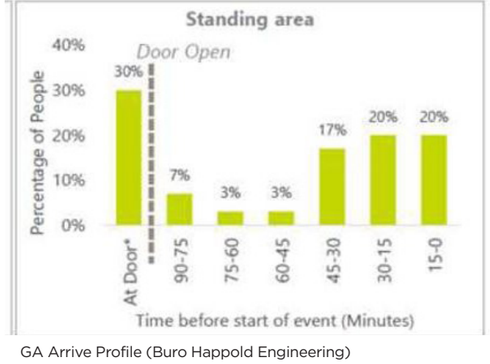
The West Core Escalators are fed from the North West Entrance with an advised admission rate of 108 persons per minute based on the provision of 18 MAGs.

The East Core Escalators are fed from the South East Entrance with an advised admission rate of 84 persons per minute based on the provision of 14 MAGs.

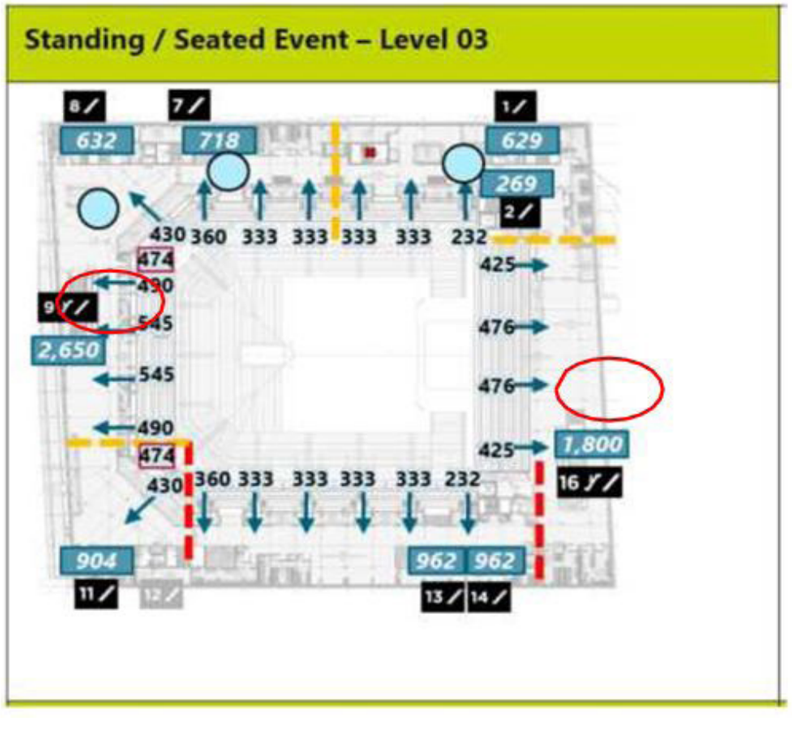


GA Ingress Population Split (Buro Happold Engineering)





GA Arrive Profile (Buro Happold Engineering)



GA Egress Population Split (Buro Happold Engineering)

Ingress Calculations

Calc	Issue	Date	Description	OK	Comment
02	03	11/11/2019	GA North West Entrance Standing Ingress	✓	Performance is acceptable
03	03	11/11/2019	GA South East Entrance Standing Ingress	✓	Performance is acceptable
04	03	11/11/2019	GA North West Entrance Seated Ingress	✓	Performance is acceptable
05	03	11/11/2019	GA South East Entrance Seated Ingress	✓	Performance is acceptable

Egress Calculations

Calc	Issue	Date	Description	OK	Comment
07	04	06/04/2020	GA West Bank Egress	▶	Where the is a requirement to clear the vomitory within 8 minutes then the escalators can address a total population of 891 persons, a minimum of 1759 persons should be managed through stairs (66% stair use).
08	03	11/11/2019	GA East Bank Egress	▶	Where the is a requirement to clear the vomitory within 8 minutes then the escalators can address a total population of 891 persons, a minimum of 909 persons should be managed through stairs (51% stair use).

7.6.1.1 Lifts

Lift use is limited to mobility impaired persons, able-bodied persons utilise escalators or staircases.

This is except for Attic North and Attic South where lifts are also used for able-bodied access during ingress.

Space occupation is based on the following:

Wheelchair User	A wheelchair is assumed to comply with the 90% requirement given in BS 8300-2 Table G.3 (750 mm Wide x 1250 mm L)
Ambulant Disabled	0.42 m² (Normally 0.21 m² according to CIBSE, accounts for mobility aids)
Companion[1]	0.30 m² (Normally 0.21 m² according to CIBSE)
Able-bodied Person	0.30 m² (Normally 0.21 m² according to CIBSE)

A loading and unloading time of 12 seconds has been assumed for a mobility impaired person + their companion. A time of 2 seconds has been assumed for able-bodied users where relevant.

All lifts in these assessments are based on the following:

Capacity	2500 kg / 33 Persons
Car Internal Plan Dimensions	1800 W x 2700 D mm
Rated Speed	1.60 m/s
Other Information	Direct into Floor Approach Included

During evacuation, it has been assumed that persons will arrive at the lift between 90 and 120 seconds after giving of the evacuation signal. This information should be confirmed by people movement specialists.

All mobility impaired companions travel with their respective user, none are moved via able-bodied routes or in separated lift journeys.

Lift Performance

	Lift Quantity	Value	Mode			
			Ingress		Egress	Evacuation
VIP Lifts (N)	2 off	AWT	9.0 s	7.4 s	172 s (2'52")	[N/a]
		LWT	37.7 s	40.8 s	375 s (6'15")	[N/a]
		ATT	30.5 s	49.4 s		
		PQL	3 off	6 off		
FF Lift (NW)	1 off	AWT	6.1 s	6.1 s	52 s (52")	241 s (4'1")
		LWT	8.1 s	8.1 s	96 s (1'36")	472 s (7'52")
		ATT	43.0 s	43.0 s		
		PQL	2 off	2 off		
FF Lift (NE)	1 off	AWT	[N/a]		7 s (7")	206 s (3'26")
		LWT			15 s (15")	400 s (6'40")
		ATT				
		PQL				
FF Lift (SE)	1 off	AWT	14.9 s	17.4 s	42 s (42")	206 s (3'26")
		LWT	25.4 s	74.3 s	87 s (1'27")	400 s (6'40")
		ATT	28.5 s	33.5 s		
		PQL	1 off	6 off		
FF Lift (SW)	1 off	AWT	11.2 s	13.6 s	78 s (1'18")	241 s (4'1")
		LWT	29.6 s	65.3 s	171 s (2'51")	472 s (7'52")
		ATT	23.8 s	29.0 s		
		PQL	1 off	6[2] off		

Key: AWT – Average Waiting Time, LWT – Longest Waiting Time, ATT – Average Travel Time, PQL – Peak Queue Length

7.6.1.2 Staff

User Movement

The following arrival and departure information has been provided:

Staff Arrival Profile

Staff Type	Time Period						
	06:00 – 10:00	10:00 – 12:00	12:00 – 14:00	15:00	16:00	17:00	Total
Stewards/ Security	10	10	20	50	150	130	370
Cleaners	6	8	10	10	-	-	34
F&B	25	25	25	75	90	100	340
Other (Facilities, Tech, Ops, etc.)	10	10	5	-	-	-	25
Total	51	53	60	135	240	230	769

Staff Departure Profile

Staff type	Time Period						
	20:00 – 22:00	22:30	23:00	00:00	01:00	02:00 – 03:00	Total
Stewards/ Security	20	40	270	20	10	10	370
Cleaners	-	-	34	-	-	-	34
F&B	75	75	90	60	40	-	340
Other (Facilities, Tech, Ops, etc.)	-	-	15	5	-	5	25
Total	95	115	409	85	50	15	769

The following assumptions have been made for the purposes of calculation:

- It is not clear from the above where staff are located once inside the premises, so for the purposes of calculation it is assumed that they are spread evenly over all levels.
- Staff at Level 00 and Level 01 arrive/depart horizontally.
- Those located at Levels 02, 03 and 04 arrive/depart via Level 00.
- Where a time range is indicated above, staff arrive/depart in a distributed pattern over the time range.
- Where a fixed time is indicated above, staff arrive/depart in a distributed pattern over a period of 20 minutes leading up to the time in respect of arrive and from the time in respect of departure.
- Averaged stair uses of 20% and 40% for arrivals and departures respectively. It should be confirmed by others that these assumptions are correct.

Subject to addressing of the foregoing, the vertical transportation needs of this development may be satisfied by lift equipment and escalator equipment as indicated in the appendices of this report.

7.6.1.3 Lifts

Introduction

Space occupation is based on the following:

Able-bodied Person	0.21 m² according to CIBSE

A time of 1.2 seconds has been assumed for able-bodied user.

The lift in this assessment is based on the following:

pacity	1600 kg / 21 Persons
r Internal Plan Dimensions	1400 W x 2400 D mm
ted Speed	1.60 m/s
her Information	Direct into Floor Approach Included

Lift performance

	Lift Quantity	Value	Mode		
			Ingress	Egress	Evacuation
Staff (N)	1 off	AWT	78.4 s	472.1 s	[N/a]
		LWT	364.8 s	1874.2 s	[N/a]
		ATT	50.9 s	54.2 s	[N/a]
		PQL	40 off	167 off	[N/a]

Key: AWT – Average Waiting Time, LWT – Longest Waiting Time, ATT – Average Travel Time, PQL – Peak Queue Length

7.6.1.4 Mezzanine Vertical Lifting Platforms

IN ABEYANCE
Preliminary proposals presented to Populous for review.

7.6.1.5 Goods-passenger Lifts

Lift use is limited to staff and generally in connection with goods movements. No particular performance analysis has been performed; the Operator should ensure that the equipment proposed is dimensionally suitable for the loads being carried.

The equipment is based on the following:

Capacity	5000 kg / 66 Persons
Car Internal Plan Dimensions	2400 W x 3500 D mm
Rated Speed	0.50-1.00 m/s

7.6.1.6 Findings and Recommendations

The following changes from the design (as recently discussed) are required:

- Normal egress from level 04 (Attic North) for able-bodied should be via the stairs; the space cannot be egressed for MIPs within 8 minutes if able-bodied persons are permitted to use the VIP passenger lifts.

The vertical transportation needs of this development may be satisfied by lift equipment as indicated Technical Specification BRA-MEE-ZZ-ZZ-SP-Y-7001.

Appendix A – Design Information Used

- Populous
- SKETCH- 0100 - LEVEL GF- ALL ZONES.pdf
- SKETCH- 0101 - LEVEL 01- ALL ZONES.pdf
- SKETCH- 0102 - LEVEL 02- ALL ZONES.pdf
- SKETCH- 0103 - LEVEL 03- ALL ZONES.pdf
- SKETCH- 0104 - LEVEL 04- ALL ZONES.pdf
- SKETCH- 0105 - LEVEL 05- ALL ZONES.pdf
- BRA-POP-XX-ZZ-EL-A-0300.pdf
- BRA-POP-XX-ZZ-EL-A-0301.pdf
- BRA-POP-ZZ-01-PL-A-0101.pdf
- BRA-POP-ZZ-02-PL-A-0102.pdf
- BRA-POP-ZZ-03-PL-A-0103.pdf
- BRA-POP-ZZ-04-PL-A-0104.pdf
- BRA-POP-ZZ-05-PL-A-0105.pdf
- BRA-POP-ZZ-GF-PL-A-0100.pdf
- BRA-POP-ZZ-RF-PL-A-0106.pdf
- BRA-POP-ZZ-XX-PL-A-0050.pdf
- BRA-POP-ZZ-XX-PL-A-0051.pdf
- BRA-POP-ZZ-ZZ-SE-A-0200.pdf
- BRA-POP-ZZ-ZZ-SH-A-8000.pdf
- Buro Happold Engineering
- Crowd Flow study_Arrivals and Departures Scenario Definition_R1

LIGHTING

7.7.1 LIGHTING 792

7.7

7.7.1 Lighting

A strategic design approach to the full development of the lighting design, provides the opportunity to recommend and apply lighting principles and techniques for a cohesive and thoughtful solution.

The following are recommended lighting principles for a site wide lighting solution.

- Create a lighting story, influencing movement and supporting hierarchy
- Holistic approach to the lit environment at every level, carefully integrate light into fabric of architecture (distinctive and subtle)
- Communicate a cultural appreciation, expressing innovation and design
- Encourage evening socialising and stimulate residents and visitors
- Adopt appropriate sustainable design principles to meet aspirations

Through manipulating the basic elements of the lighting design, the overall scheme should assist and help influence vehicular and pedestrian movement throughout the site. By establishing a lighting hierarchy and selectively using feature lighting techniques, the lighting installation can subconsciously choreograph movement and stimulate a user's experience. The nightscape lighting experience should coordinate with key focal points and nodes identified in the urban and landscape planning conceptual framework.

7.7.1.1 Internal Lighting

The lighting design will provide a vibrant and exciting ambiance, and assist in the intuitive movement of the users. The lighting approach will be holistic at every level, creating a visual hierarchy and a 'lighting story' that is both distinctive and subtle. There will be layers of light from integrating luminaires into the architectural fabric to providing bold theatrical projections.

The lighting design for the internal spaces shall comprise of a mixture of lighting techniques and effects. The lighting shall be designed such that it is flexible and can be adapted to reflect the user requirements of various event modes. The lighting scheme will be designed to provide high quality illumination, visual comfort and low energy consumption to all occupied spaces.

The general lighting parameters are to comply to BS/ EN 12464-1 (2011) Lighting of Indoor Work Places, other applicable national/local standards, and any relevant project adopted sustainable design requirements. All luminaires and lamp types shall be 'fit for purpose' and suitable for the environment in which they are used.

All luminaires will be low energy and efficient LED. The lighting design shall compliment the functional and aesthetical requirements of each space. The lighting should work in close coordination with the interior design scheme in order to integrate within the fabric of the design, enhance feature materials and artwork, complement wayfinding and set the correct mood in each space.

It is encouraged to take the approach of 'layering the light', so that lighting treatments work in combination to create the overall atmosphere. The lighting treatments should be separately controlled, allowing lighting scenes to be created, i.e. functional ambient downlights should be controlled separate to signage lighting.

This philosophy of control groups also allows for implementation of practical energy conservation techniques, i.e. turn off feature lighting treatments during late night operational hours, etc.

7.7.1.2 Performance Bowl

At present, there are several proposed uses which include Concerts, E-sports, Cirque du Soleil, Disney On Ice, Basketball and Ice Hockey. The lighting systems associated with each of these event modes is temporary and provided under an event overlay package.

All lighting fixtures shall be installed on the gantry. Bespoke brackets and other mounting accessories shall be specified by the contractor.

The electrical infrastructure allows for a 200Amp switch with power lock connectors in each quadrant at technical floor level for connection of future equipment to facilitate the installation of temporary sports lighting.

The Venue requires a permanent house lighting installation which will comprise of an array of fully dimmable, high output RGBW LED projectors. The system will have to be designed to provide smooth, flicker-free and dimmable, yet also generate up to a uniform 50 - 150lux maintained average ambient lighting within the upper to lower Hall, and 300lux to the event floor for cleaning and trade show scenarios. The maintained average shall be achieved for the white output and dim down for the red, green and blue light.

For touring shows and certain events such as boxing, the electrical distribution and performance lighting control system shall be adaptive in order to accommodate temporary lighting installations specifically designed for their respective show.



Disney on Ice



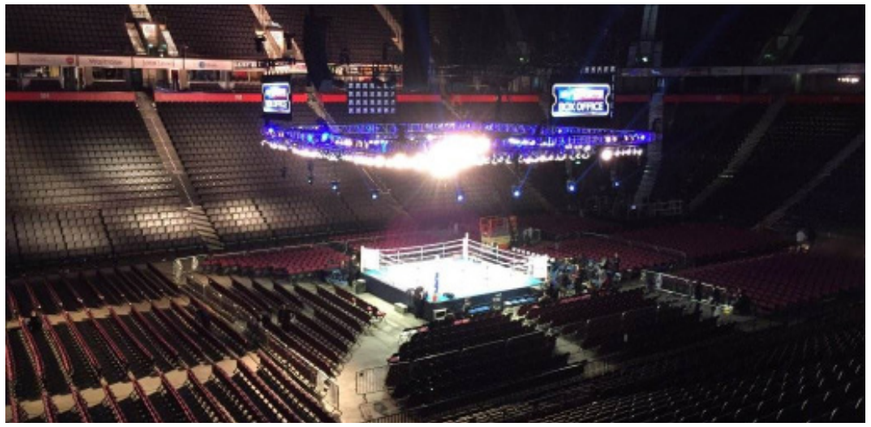
Concert Lighting



Cirque du Soleil

7.7.1.1 Display Screen Control

The lighting control system shall control power to the distributed IPTV devices throughout the venue. Equipment shall be zoned to allow for use of areas of the building without the need to operate displays serving areas beyond those intended to be operated for a given event.



Boxing steup at an Venue



E-Sports setup at an Venue



Pearl Jam i'in the round' concert

7.7.1.2 Interior Ligting

The interior lighting installation shall support and enhance the architectural design aspirations for the Venue.

General ligting for circulation areas shall be provided by LED downlights which will remail unobtrusive while providing the required light levels.

LED handrails will be utilised for the illumination of the staircases. Luminaires incorporated in the handrails can efficiently illuminate the threads of each step with minimum energy and maximum flexibility. Seperating the staircase lighting from the general lighting provides additional flexibility to the design as the two systems can dim indipentandly and create various light scenes.

The success of the venue will largely depend on the ability of the hospitality areas to generate excitement and create long lasting memories. The lighting installation will be designed to support the interior design aspiration to implement trendy, eye-catching decorative and feature lighting treatments, but also utilise theatrical projection lighting to create dynamic effects. The theatrical illumination is expected to be a feature within the Basement Club and the atrium area.

The food kiosks, concessions and lounge illumination will include a high-level of integrated joinery lighting, decorative, functional and feature lighting, illuminated signage and graphics along with supplementary functional illumination for general use.



Canalside



L01 Backstage Club



Base Atrium



Base Atrium- Bar

7.7.1.3 Exterior Lighting

The exterior lighting shall comprise LED columns, linear LED RGBL Lighting under the soffit and linear LED strip along the west parapet wall as well as handrail lighitng. LED strips incorporated in street furniture and a few uplights are considered to provide areas of interest for the visitors.

The architectural aspiration is to minimise the visual clutter and rely on building mounted lighting to 'fill-in' the illumination between the Venue and the adjacent Joe Mercer Way, canal waterway, Sportcity way and access roadways. Illumination in these areas shall be provided mainly by a linear continuous LED RGBL luminaire intalled at the soffit in the perimetre of the building. The fittings will be linked to the LED Screene and top box Feature lighting

Additional functional lighting in the form of lighting columns is required particularly along the canal side. The columns considered are of a simple design which will seamlesly integrate with the architecture. Other equipment Wifi and CCTV cameras shall be mounted on the lighting columns.

To aid to the creation of social gathering spaces selected landscape lighting elements have been suggested. Uplights shall be installed, illuminating selected tree canopies while under bench lighting will provide a soft wash of light around the seating areas.



Lighting Layout



Columns and soffit mounted luminaire



Proposed Lighting Columns



Landscape Lighting

7.7.1.4 Media Screens

It is suggested that three LED screens shall be installed at the top elevation. An LED video product shall be incorporated between the perforations of the cladding. This design detail will allow the least disruption on the appearance of the facade.

The LED media screens will be set to display various dynamic content that includes architainment illuminations (colour-changing, colour chasing, sparkle effects, etc), advertising, live video feeds and bespoke artistic content (produced by third party developers). The client team will be responsible for the content design, procurement of bespoke content and ongoing content management services.

The illuminated portions of media façade shall be designed to be visible during the day, however, it is accepted that the visibility of a media façade system is largely dependent on the sunlight conditions. Direct sunlight and bright days can wash out LED video graphics on buildings, and the visibility is particularly dependant on the colour, brightness and density of the content on display. It is recommended that the LED media façade system shall be capable of 5,000-nits (cd/sqm) brightness to maximise the client's capability of providing a daylight viewable system.

The façade lighting controls shall facilitate high definition video capable playback with a dedicated an MS Windows based operating system, pixel management software, and DMX control.

7.7.1.5 Façade Illumination

The illumination of the Venue façade shall comprise of a dynamic architectural lighting system installed at the top elevation of the building and the soffit right below it.

In order to provide a well integrated design it is suggested that the luminaires are installed behind the perforated decorative cladding system grazing the surface behind it. The contrast between the bright surface and the perforated panels will create the illumination effect.

Media Facades

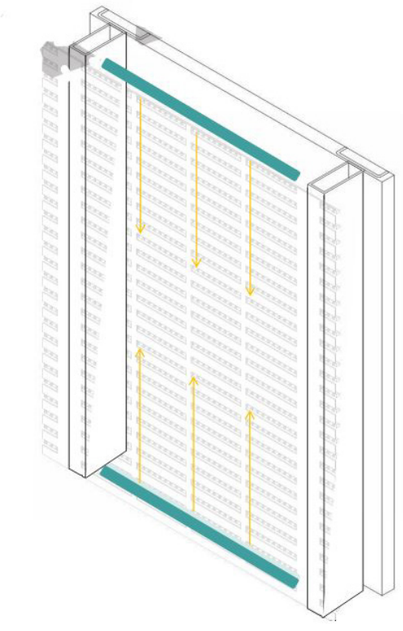






Facade illumination- Backlit panels





There are two cladding panel types on the top level. Those that are designed to carry LEDs, displaying video content (media screens) and those which do not. The design detail of the media screens shall allow for the uniform illumination of the entire perimeter of the facade, when the screens are off.

The LED facade fittings as well as the L01 perimeter LED lighting will be controlled via RDM lighting control and will be linked to the Media Screene control so that the colour output can vary depending on the screene content.

7.7.1.6 Emergency Lighting

Emergency lighting shall be provided throughout all relevant areas of the venue to enable safe evacuation of the premises, in accordance with the requirements of BS 5266 and the Purple Guide.

Emergency lighting shall comprise of designated non-maintained and maintained, high output emergency LED escape route/ anti-panic luminaires. The autonomy of the system will be three hours. A decentralised strategy will be used for general areas with localised Central Battery Systems (CBS) located within each LV room at each level (Level 01 and above) and each substation at Level 00. Central Battery Systems will also be provided in the gantry UPS rooms for spectator lighting (providing a duration of 10 minutes). All cabling associated with the emergency lighting system will be fire rated in accordance with BS 5266, BS8519 and BS EN 50171.

In addition, maintained emergency LED exit luminaires are to be provided, and also fed from the local central battery system. The colour and luminance contrast shall be selected in accordance with BS EN 1838, with the factor of viewing distance coordinated with the Architect to provide flexibility within the space.

The emergency lighting level requirements will be different for various areas of the building:

- The Bowl aisles shall be provided with 20 lux average and 5 lux minimum, in line with the recommendations of the Purple Guide. Exit signage will not be located in the seating bowl vomitories, subject to building control approval.
- The main engress routes from the public concourses shall be provided with 20 lux average and 5 lux minimum, in line with the recommendations of the Purple Guide
- All high risk task areas, likely to include event control room, security room, kitchens, loading bay and selected plant areas, shall be provided with 15 lux or 10% of normal lighting levels, whichever is greater, in line with BS EN 1838
- All Back of House open areas shall be provided with emergency lighting not less than 0.5 lx at the floor level of the empty area, in line with BS EN 1838
- All Back of House escape routes shall be provided with emergency lighting on the floor along the centre line of an escape route shall be not less than 1 lux, in line with BS EN 1838

The emergency lighting system shall be self-monitored and self- tested capable to feedback reporting to the lighting control system.

7.7.1.7 Lighting Control

A lighting control system will be provided throughout the Venue. The system will comprise of a head end capable of providing all necessary programming and operation interfaces to all interior, exterior, facade and media screen fittings. The system shall provide control in a highly responsive way, coordinated with the various event taking place. The system shall provide intelligent and addressable control of individual luminaires and groups, creating the variety of lighting scenes required.

The lighting control system will have a computer based graphical interface screen provided to mimic the switching patterns of the luminaires, so as to allow the operator to interrogate operations and lamp life for maintenance purposes. It should also be capable of monitoring the lamp hours run by individual light fittings and to automatically switch between light fittings accordingly to even out lamp use. The system will be required to allow daylight linking where applicable, and to allow the use of presence detection. Lighting to public areas will be zoned to permit different levels of illumination and will be switched centrally from staff controlled areas.

Staff and other non-public back of house areas will be provided with occupancy detection and/ or locally switched. Refer to the colour coded area treatment drawings for further lighting control strategy information.

Lighting for public and large spaces will be controlled from the central control room with local overrides at the associated distribution boards. The lighting will have two levels being 25% and 75%. The 25% being generator backed and for use as set up or maintenance lighting and the remaining 75% (100% total) being for public use. PIR with time delay switching will be used as appropriate in toilets, back of house areas etc.

Lighting control including dimming and time or daylight control systems will be provided for exterior lighting.

Feature facade illumination will be provided with a media video playback control system linked to the clients central technical control room. This system will facilitate the control of creating architectural lighting / colour sequencing effects. Individual luminaires shall be addressable to facilitate colour effects. A variety of light scene settings shall be provided to cover match days, none match days and other event settings.

A dedicated theatrical lighting control system shall be provided for the performance bowl. This system will control all lighting associated with the performance hall and any areas open to view of the bowl such as vomitories. The system will control the house lighting, aisle lighting, stage lighting, spectator lighting and be fully compatible to sports lighting control systems and temporary luminaires and control systems hired or used in a touring performance. It is anticipated a venue theatrical performance consultant will define the theatrical lighting control system.

For external lighting control, a responsive and intelligent lighting control system allows for variable lighting scenes and the potential to reduce energy consumption. A simplistic system can be made up of photo-cells and astronomic time clock facilities in order to switch on and off certain groups of luminaires. For example, after a designated time all feature lighting can be turned off and functional lighting maintained to provide a basic level of light for safety and security. Investment into a more advanced system can achieve increased energy savings through dimming control of LEDs illuminating the streetscape. Ultimately, an agreed pre-curfew and post-curfew operation times should be determined to allow selected decorative and feature lighting elements to switch off.

Being able to offer the best appealing images for TV broadcasts is one of the key marketing requisites for a world class venue.

Proposed Bowl Lighting Fittings

The light fittings shall be LED and shall operate at a supply voltage of either 400V or 230V, 50Hz.

All fittings shall conform to LM-79 and LM-80 published standards. They shall have a colour temperature binning that does not exceed +/- 200K. LED Lamp life shall be rated at 70% of initial lumens remaining. LED drivers shall be used at 100% output for lumen output rating and not be under-driven or overdriven.

Initial delivered lumens – thermal losses should be less than 10% when operated at a steady state at an average ambient operating temperature of 25°C, and optical losses should be less than 15%.

Average Delivered Lumens – Average delivered lumens over 50,000 hours should be minimum of 85% of initial delivered lumens. Each LED shall have a reflector to control light and limit glare.

LED boards, drivers and associated components shall have a Warranty of 5 years on the LEDs, 5 years on the driver, 10 years on the paint finish.

7.7.1.8 Drivers

- Driver shall be capable of dimming the LED array from 0% to 100%.
- Driver shall have DMX input capable of dimming and controlling fixtures.
- Driver casing shall be constructed from aluminium.
- Driver shall have universal voltage input – 230 to 415 volt.
- All drivers shall comply with IEC 61347-2-13.
- Drivers may be installed either at the LED array or may be remotely mounted.

The fittings shall be mounted to dedicated structure support railing and shall have a safety cable that is attached to both the railing and the fitting. All of the sports light fixture shall be connected and controlled by the lighting control systems.

7.7.1.9 Manufacturers

Only manufacturing firms regularly engaged in manufacture of high output LED Venue lighting for performing arts and sport events functions, whose products have been in satisfactory use in similar professional stadia and installed within the last 5 years shall be considered.

Lamp Properties:

Lamp Colour Temperature (Tk) >4,000 K

Lamp Colour Rendering (Ra) ≥ 80

Other design criteria:

Glare Rating ≤ 40

Flicker Factor≤ 2%

7.7.1.10 Lighting Power Distribution

The lighting Power Distribution will be dependent upon the level of Event Continuity required, which will be agreed with the client at the next stage. The design currently includes for short duration UPS units, located in gantry mounted lighting UPS rooms, to support a proportion of the stage and sports lighting with battery back-up to allow the event to end in a safe manner before the event lighting stops completely. This is independent to the Bowl spectator lighting, which will be designed to allow all occupants to evacuate in a fire scenario.

7.7.1.11 Sustainability in Lighting

A lighting scheme shall minimize the impact of energy use on the environment, promoting lighting design principles and technologies that improve lighting quality, energy efficiency, and environmental sustainability.

Objectives:

- make a positive contribution to the protection of the environment
- go beyond compliance with local environmental regulation to meet internationally accepted best practice
- reduce to the minimum practicable any adverse effects of our operations on the environment
- implement new and proven energy efficient, long-life technologies
- implement a lighting control strategy

The challenge is to ensure a new external lighting scheme effectively addresses concerns about climate change and other impacts of human activities on the environment. How can we minimise our environmental impact? Sustainability in lighting can take several forms:

- Use of recyclable materials and specify manufacturers implementing responsible manufacturing and disposal methods
- Minimise energy consumption by using efficient luminaire and lamp sources
- Use long-life lamp LED sources to minimise operating costs and waste
- Comply with good practice guidance documents, i.e. minimising light pollution and designing to recommended minimum light levels
- Create an environment that induces well-being and contentment and implement a lighting control strategy

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BUILDING PHYSICS & SUSTAINABILITY

7.8.1 BUILDING PHSYICS & SUSTAINABILITY 802

7.8

7.8.1 Building Phsyics & Sustainability

7.8.1.1 Building Physics

This section of the report shall provide an update and overview of the building physics modelling undertaken for Stage 4a, and summarise the resulting outputs.

Updated Building Physics Modelling

The building physics model was reproduced based on the updated Stage 4a architectural model.

The updated model geometry had thermal properties applied in accordance with the architect's and structural engineer's designs to accurately simulate the thermal performance of the building.

All internal rooms were modelled and provided with building services systems aligned with the MEP design, and all systems efficiencies were aligned with the known manufacturer's information.

Following this exercise, the model was simulated for each of the following stages of the energy hierarchy applied to the project:

- Baseline – As per the normal and agreed method of modelling carbon emissions and savings, the building was initially simulated with thermal performance and building services systems that align with the Notional figures stipulated within Part L of the Building regulations. This stage provides the baseline carbon emissions figure for comparison against the next simulation stages.
- Reduced Energy Demand – Thermal properties, air tightness etc. improved over and above the Part L limiting factors, and align with the actual design. This stage provides an understanding of the carbon emissions saved by improvement of the thermal performance of the building.
- Utilising Reversible Cycle Heat Pumps – As described in the mechanical services section of this report, Air Source Heat Pumps (ASHPs) have been utilised as the primary source for heating and cooling within the building. This stage provides the further carbon emissions saved by improving the performance of heating and cooling systems over and above the notional requirements.
- Utilising PVs – An Organic PhotoVoltaic (OPV) array has been modelled across the roof. It is understood that this element of the design is still underway, and discussions are ongoing between the client and various PV manufacturers / providers. Therefore, for the purposes of this report and the Stage 4a design, an array in alignment with the Stage 3 design has been assumed. This stage provides an understanding of the additional carbon emissions savings that could be achieved by incorporation of an OPV system.

Building Physics Modelling Results

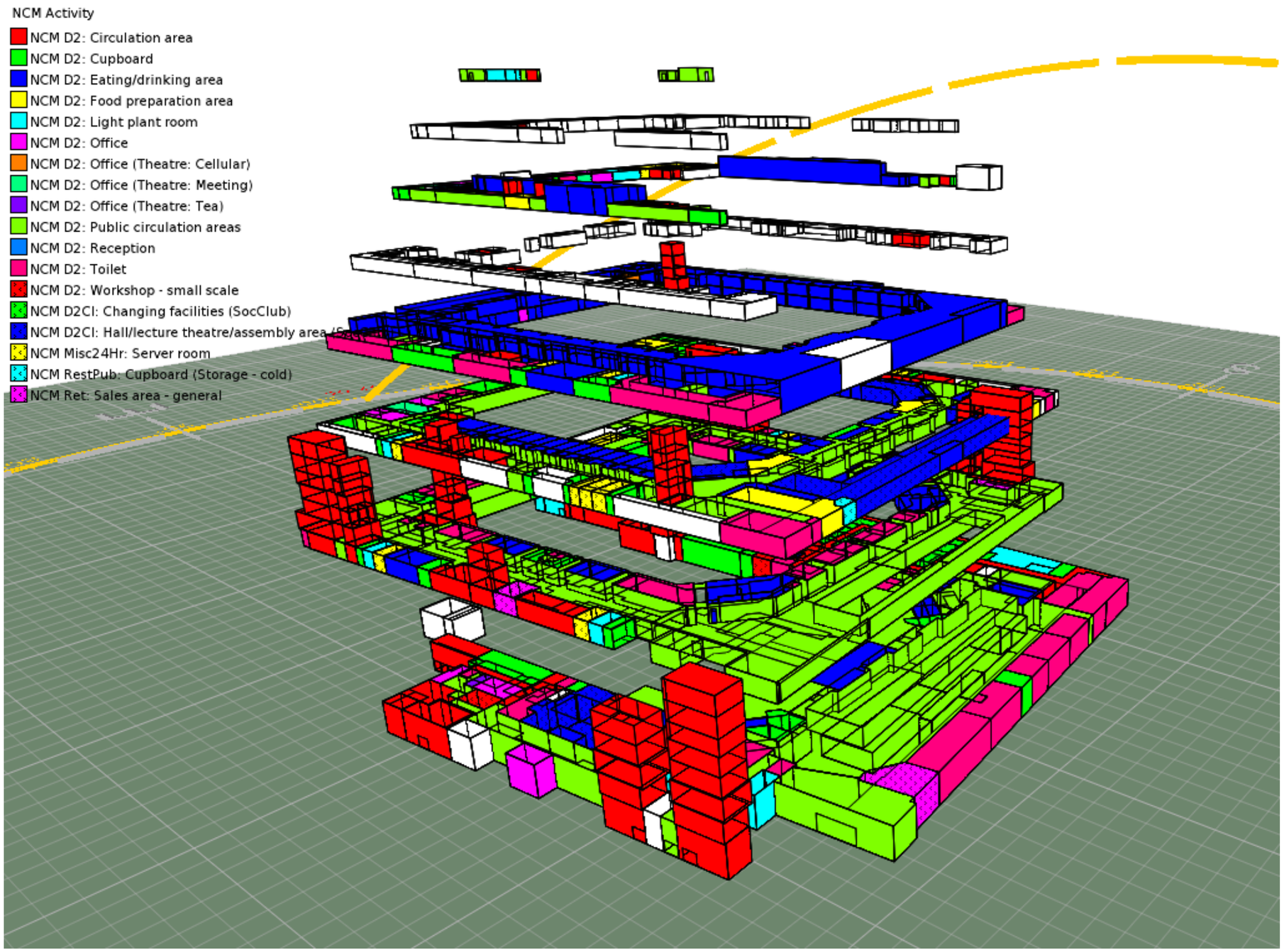
The resulting figures and their associated carbon emissions savings can be seen in the adjacent table.

These figures indicate that with all energy saving measures incorporated into the design, the building is expected to surpass the requirements of the Building Regulations Part L (2013) by 24.9%.

In relation to the Greater Manchester County Council planning requirement to surpass Part L (2010) by 15% - the equivalent of surpassing Part L (2013) by 6% - the building is predicted to not only meet the planning requirements, but to exceed them by a further 18.9% reduction in carbon emissions.

Treated Floor Area (m^2)	Carbon Emissions ($kgCO_2/m^2.year$)				Reduction
	TER	TER Annual CO_2 Emissions (tonnes)	BER	BER Annual CO_2 Emissions (Tonnes)	
Reduced Energy Demand:					
53,451	40.3	2,156	36.6	1,956	**9.3%**
Utilising Reversible Cycle Heat Pump:				-127	
53,451	40.3	2,156	34.2	1,828	**15.2%**
Utilising PV's:				-211	
53,451	40.3	2,156	30.3	1,620	**24.9%**

Summary of Building Physics Simulation Results



Building Physics – Exploded Model

ACOUSTICS AV & BROADCAST

8.1 DESIGN CRITERIA 807

8.2 ENVIRONMENTAL 811

8.3 BOWL ACOUSTICS 819

8.4 INTERNAL ACOUSTICS 831

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8

DESIGN CRITERIA

8.1.1 ACOUSTIC DESIGN CRITERIA 808

8.1.2 PAVA DESIGN STANDARDS 809

8.1

8.1.1 Acoustic Design Criteria

- BS 8233:2014, Guidance on sound insulation and noise reduction for buildings.

- BS EN ISO 12354-1:2017 Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation between rooms.

- BS EN ISO 12354-2:2017 Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Impact sound insulation between rooms.

- BS EN ISO 12354-3:2017 Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound.

- BS EN ISO 12354-5:2017 Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Transmission of indoor sound to the outside.

- BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures.

- ISO 140-18:2006 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 18 Laboratory measurement of sound generated by rainfall on building elements.

- ISO 9613:1996 – Attenuation of sound during propagation outdoors

- BREEAM UK New Construction

8.1.2 Pava Design Standards

- BS 7827:2011, Code of practice for designing, specifying, maintaining and operating emergency sound systems at sports venues.

- BS 5839-8:2008, Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems.

- BS 7671, Requirements for electrical installations – IEE Wiring Regulations.

- BS EN 60268-16:2011, Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index [BS 6840-16, IEC 60268-16].

- BS 6259:2015, Code of practice for the design, planning, installation, testing and maintenance of sound systems.

- BS EN 50849:2017, Sound systems for emergency purposes.

ENVIRONMENTAL

8.2.1 NOISE BREAKOUT / BREAK-IN 812

8.2.2 EXTERNAL PLANT NOISE 813

8.2.3 PLANT SELECTION 814

8.2.4 NOISE PREDICTIONS 815

8.2.5 NOISE BREAKOUT / BREAK-IN 816

8.2

8.2.1 Noise Breakout / Break-In

8.2.1.1 ARENA NOISE BREAK-OUT

An Arena breakout noise study has been carried out to determine the noise impact during concert events. Calculations have been based on a concrete roof option. This has been coordinated with the Environmental Impact Assessment being carried out by Buro Happold.

The internal noise levels have been based on a typical unrestricted concert event of 104 dB(A)

	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**A**
Internal concert noise level, $L_{Aeq,5min}$ dB	116	110	104	101	100	92	88	104

TABLE 1 - INTERNAL CONCERT NOISE LEVELS

A summary of the environmental noise survey carried out by Buro Happold is included below to identify the existing ambient and background noise levels.

	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**A**
L_{eq} Day (07:00 - 23:00)	70	65	64	63	67	60	51	69
L_{eq} Night (07:00 - 23:00)	63	60	59	58	61	53	43	63
L_{90} Day (07:00 - 23:00)	57	52	52	51	52	42	29	54
L_{90} Night (23:00 - 07:00)	51	46	44	42	42	32	26	45

TABLE 2 - AMBIENT AND BACKGROUND NOISE LEVELS FROM EIA

It is proposed that the arena design shall satisfy the following criteria;

Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location. The minimum values have been capped in line with Manchester City Council guidance on low frequency. This limits the internal noise levels in the 63Hz and 125Hz octave bands to 47dB and 41dB respectively. An attenuation of 5dB has been allowed for a facade containing an open window - refer to the EIA for more details.

	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**A**
Arena Day Target (07:00 - 23:00) $L_{eq,15min}$ dB	52	46	42	41	42	32	19	44
Arena Night Target (23:00 - 07:00) $L_{eq,15min}$ dB	52	46	34	32	32	22	16	35

TABLE 3 - TARGET EXTERNAL NOISE LEVELS AT RESIDENTIAL RECEIVERS

The nearest existing noise sensitive receivers have been identified approximately 100m to the West of the proposed arena bowl location - refer to the EIA for details.

The breakout study has identified that the laboratory sound insulation performance of the arena roof and back of bowl is required to provide a minimum acoustic performance to control the breakout noise as detailed below to achieve the daytime noise criteria.

	OCTAVE BAND FREQUENCY (Hz)						
	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
SOUND REDUCTION INDEX FOR NOISE BREAKOUT	40	38	32	27	22	36	25

TABLE 4 - REQUIRED SOUND REDUCTION INDEX (BREAK-OUT)

8.2.1.2 ARENA NOISE BREAK-IN

The sound insulation of the building envelope shall ensure the internal noise levels within the stadium bowl do not exceed $L_{Aeq,15\ mins}$ 40 dB(A) from external noise sources. This shall include the inclusion of traffic, train, aircraft and any other external noise sources.

Based on the noise study provided by Buro Happold the maximum external noise levels have been identified below;

	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**A**
Target internal noise, L_{Amax} dB	60	48	40	35	30	30	30	40
Measured L_{Amax}	80	74	75	76	76	67	68	79
Laboratory Sound Reduction Index for noise break-in, dB	22	27	36	42	47	38	39	-

TABLE 5 - MAXIMUM EXTERNAL NOISE LEVELS & REQUIRED SOUND REDUCTION (BREAK-IN)

8.2.1.3 COMBINED SOUND INSULATION

Combining the minimum requirements for noise breakout (dominated by the low frequency) and the noise break-in (dominated by the mid-high frequencies) the following sound insulation envelope is required for the arena bowl. Although a single weighted R_w value has been provided, it is likely that this will be significantly exceeded to achieve the low frequency requirement.

	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**Rw**
Overall laboratory sound insulation for combined break-out and break-in, dB	40	38	36	42	47	38	39	43

TABLE 6 - COMBINED BREAK-IN/OUT SOUND INSULATION REQUIREMENTS

8.2.2 External Plant Noise

8.2.1.4 ROOF SOUND INSULATION

Refer to bowl acoustic section for the required acoustic performance of each of the bowl envelope elements. The resulting break-out maps obtained through acoustic modelling are shown in Figures 1 and 2.

8.2.1.5 PLANT NOISE BREAK-OUT

The impact of noise from mechanical services and plant is informed by BS4142:2014, with the following criterion:

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB(L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

Based on the noise survey described earlier, the plant noise break-out criterion is as described in Table 7 at the nearest noise sensitive receiver.

	dB(A)
Arena Day Target (07:00 - 23:00) $L_{Aeq,15min}$ dB	49
Arena Night Target (23:00 - 07:00) $L_{Aeq,15min}$ dB	40

TABLE 7 - TARGET EXTERNAL PLANT NOISE LEVELS AT RESIDENTIAL RECEIVERS

The main bowl AHU's and cooling packs are located on an external plant deck at L05.

The bowl AHU design requires significant attenuation to maintain the performance of the building envelope as detailed below.

8.2.2.1 BOWL ATTENUATORS

Bowl attenuators are required to achieve the internal noise levels and more importantly provide the attenuation of music noise through the building envelope to AHU's and smoke extract. To achieve the required attenuation a combination of the roomside and atmosphere side attenuators is required. Additional lagging (Eg.Muftilag R31) is required to external ductwork to minimise breakout through the ducts. The noise impact from the bowl ductwork penetrations has been designed to be 10dB below the target criteria at each frequency to ensure no increase in the breakout noise levels.

Bowl attenuators also apply to the bowl smoke extracts.

8.2.2.2 EXTERNAL PLANT

The plant deck at L05 has an acoustic barrier running around to minimise case radiated and any excess duct breakout noise. The barrier shall provide a minimum surface mass of 10kg/m^2.

The following major plant items have been identified relating to external noise breakout.

- Ecology units
- L03 Air Handling Units (AHU)
- L05 Air Handling Units (bowl AHU)
- Mechanical Ventilation with Heat Recovery (MVHR)

The following page provides a schedule of the major current external plant selection along with the specified atmospheric attenuator requirements. Items with * are estimated as sound spectrum unknown at time of assessment. All values should be reviewed based on the final plant selection. A number of condenser units are also to be located at roof level, however these are relatively low noise levels (nominally <50dBA at 5m).

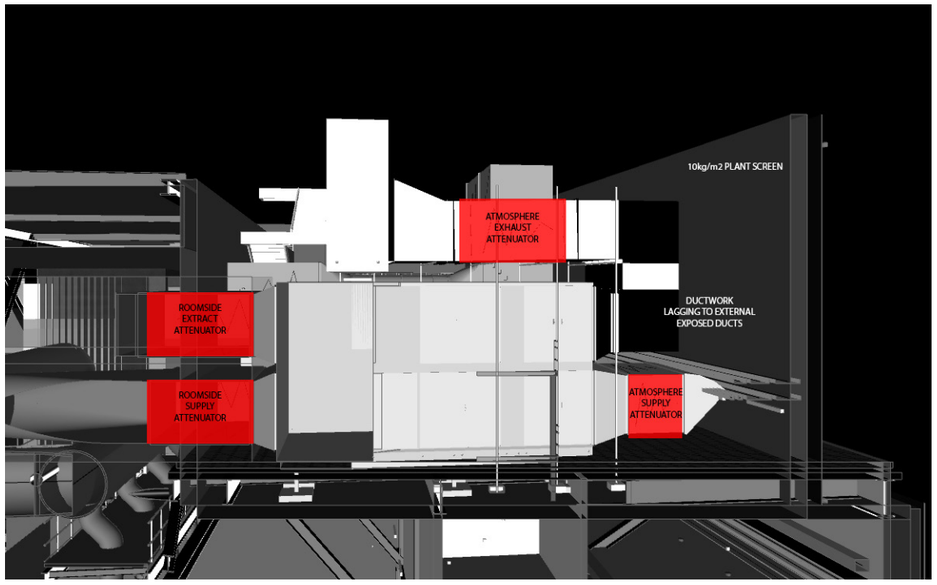


FIGURE 3 - L05 BOWL AHU ATTENUATORS

	OCTAVE BAND FREQUENCY (Hz)						
	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TOTAL REQUIRED BOWL ATTENUATORS INSERTION LOSS, dB	27	27	20	23	27	29	27
SPECIFIED BOWL ROOMSIDE SUPPLY ATTENUATORS	18	26	39	55	55	55	45
SPECIFIED BOWL ATMOSPHERE SIDE SUPPLY ATTENUATORS	11	18	29	43	49	45	33
SPECIFIED BOWL ROOMSIDE EXTRACT ATTENUATORS	20	29	43	55	55	55	49
SPECIFIED BOWL ATMOSPHERE SIDE EXHAUST ATTENUATORS	15	26	42	55	55	55	45

8.2.3 Plant Selection

EQUIPMENT REF:		EQUIPMENT ITEM	FAN SOUND POWER, dB						SCREENED?	ATMOSPHERE SIDE INSERTION LOSS, dB					
			125Hz	250Hz	500Hz	1KHz	2KHz	4KHz		125	250	500	1K	2K	4K
EAHU.0.C.01 B - G/F - Comissionary Kitchen 1	Fresh Air	Ecology Unit	83.7	87.3	87.4	84.9	81.8	74.2	NO	10	19	29	35	30	21
EAHU.0.C.01 A - G/F - Comissionary Kitchen 1	Exhaust	Ecology Unit	91.9	83.8	84.3	86.9	86.9	82.2	NO	16	30	42	45	31	17
EAHU.0.C.02 B - G/F - Comissionary Kitchen 2	Fresh Air	Ecology Unit	86.6	88	89.1	85.9	84.8	79.4	NO	10	19	29	35	30	21
EAHU.0.C.02 A - G/F- Comissionary Kitchen 2	Exhaust	Ecology Unit	89.7	82.2	81.5	85.4	85	80.7	NO	16	30	42	45	31	17
EAHU.0.C.03 - G/F - Crew Kitchen	Fresh Air	Ecology Unit	78.1	75	72.1	70.9	65.9	62.2	NO	10	19	29	35	30	21
EAHU.0.C.03 - G/F - Crew Kitchen	Exhaust	Ecology Unit	79.8	94.1	90.1	90.3	86.1	82.3	NO	16	30	42	45	31	17
EAHU.0.C.04 - LV1 - F&B 06	Fresh Air	Ecology Unit	75.6	71.3	67.7	64.3	63.3	60.1	NO	10	19	29	35	30	21
EAHU.0.C.04 - LV1 - F&B 06	Exhaust	Ecology Unit	93.4	94.1	89	89.2	84.5	79.6	NO	16	30	42	45	31	17
EAHU.0.D.01 - LV GF - F&B 06/07	Fresh Air	Ecology Unit	74.6	84.8	81.8	77	74.7	72.3	NO	10	19	29	35	30	21
EAHU.0.D.01 - LV GF - F&B 06/07	Exhaust	Ecology Unit	79.9	94	90.2	90.3	86.1	82.3	NO	16	30	42	45	31	17
EAHU.0.D.02 - GF - F&B 03	Fresh Air	Ecology Unit	77	74.4	71.3	69.1	64.5	60.9	NO	10	19	29	35	30	21
EAHU.0.D.02 - GF - F&B 03	Exhaust	Ecology Unit	79.7	94.4	90.1	90.4	86.2	82.4	NO	16	30	42	45	31	17
EAHU.3.A.01 - LV 03 - F&B 07	Fresh Air	Ecology Unit	64.6	69.4	68.1	66.7	64.1	61.5	NO	10	19	29	35	30	21
EAHU.3.A.01 - LV 03 - F&B 07	Exhaust	Ecology Unit	95.8	95.7	90.6	90.6	85.9	80.9	NO	16	30	42	45	31	17
EAHU.3.C.01 - LV 03 - F&B 13	Fresh Air	Ecology Unit	63.9	69.7	68	65.1	63.2	60.9	NO	10	19	29	35	30	21
EAHU.3.C.01 - LV 03 - F&B 13	Exhaust	Ecology Unit	80.4	88.5	85	86.8	83	78.6	NO	16	30	42	45	31	17
EAHU.3.C.02 - LV 01 - Backstage Kitchen	Fresh Air	Ecology Unit	74.6	84.8	81.8	77	74.7	72.3	NO	10	19	29	35	30	21
EAHU.3.C.02 - LV 01 - Backstage Kitchen	Exhaust	Ecology Unit	79.9	94	90.2	90.3	86.1	82.3	NO	16	30	42	45	31	17
EAHU.3.C.03 - LV 02 - Canteen Support	Fresh Air	Ecology Unit	68.5	77.9	73.3	69.1	67.8	65.7	NO	10	19	29	35	30	21
EAHU.3.C.03 - LV 02 - Canteen Support	Exhaust	Ecology Unit	79.3	89.5	86.1	86.9	83.6	79.6	NO	16	30	42	45	31	17
EAHU.4.A.01 - LV 02 - Atrium Kitchen North	Fresh Air	Ecology Unit	77.5	74.4	71.7	70.2	65.5	61.7	NO	10	19	29	35	30	21
EAHU.4.A.01 - LV 02 - Atrium Kitchen North	Exhaust	Ecology Unit	97.3	92.6	91.8	88.7	85.8	80.7	NO	16	30	42	45	31	17
EAHU.4.D.01 - LV 02 - Atrium Kitchen West	Fresh Air	Ecology Unit	68.5	77.9	73.3	69.1	67.8	65.7	NO	10	19	29	35	30	21
EAHU.4.D.01 - LV 02 - Atrium Kitchen West	Exhaust	Ecology Unit	79.7	94.3	90.1	90.4	86.2	82.3	NO	16	30	42	45	31	17
	Outlet	LM3 MVHR	78	77	78	74	69	64	NO						
MVHR.3.C.02*	Inlet	LM3 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM3 MVHR	78	77	78	74	69	64	NO						
MVHR.3.B.01*	Inlet	LM3 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM3 MVHR	78	77	78	74	69	64	NO						
MVHR.3.B.02*	Inlet	LM3 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM3 MVHR	78	77	78	74	69	64	NO						
MVHR.3.B.03*	Inlet	LM3 MVHR	73	69	63	59	51	40	NO						
MVHR.3.A.01	Outlet	LM3 MVHR	78	77	78	74	69	64	NO						
	Inlet	LM3 MVHR	73	69	63	59	51	40	NO						
MVHR.3.A.02	Outlet	LM3 MVHR	78	76	77	73	67	62	NO						
	Inlet	LM3 MVHR	72	68	61	58	50	39	NO						
MVHR.3.D.01	Outlet	LM3 MVHR	78	76	77	73	68	62	NO						
	Inlet	LM3 MVHR	72	68	62	58	50	39	NO						
MVHR.3.D.02	Outlet	LM3 MVHR	78	76	78	74	68	63	NO						
	Inlet	LM3 MVHR	72	68	62	59	51	40	NO						
	Outlet	LM4 MVHR	78	77	78	74	69	64	NO						
MVHR.4.A.01*	Inlet	LM4 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM4 MVHR	78	77	78	74	69	64	NO						
MVHR.4.A.03*	Inlet	LM4 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM4 MVHR	78	77	78	74	69	64	NO						
MVHR.4.A.04*	Inlet	LM4 MVHR	73	69	63	59	51	40	NO						
	Outlet	LM4 MVHR	78	77	78	74	69	64	NO						
MVHR.4.B.01*	Inlet	LM4 MVHR	73	69	63	59	51	40	NO						
AHU.5.A.01	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.A.02	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.A.03	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.A.04	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.B.01	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.B.02	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.B.03	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.B.04	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.C.01	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.C.02	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.C.03	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.C.04	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.D.01	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.D.02	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.D.03	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
AHU.5.D.04	Intake	L05 AHU	86	79	72	65	60	56	YES	18	29	43	49	45	44
	Exhaust	L05 AHU	89	81	81	73	68	64	YES	26	39	55	55	55	45
4No. ROOF MOUNTED CO2 PACK UNITS			51dB(A) SPL at 10m						YES						

EXTERNAL PLANT NOISE SELECTION

8.2.4 Noise Predictions

8.2.4.1 SERVICE YARD NOISE

An assessment of the associated noise during load-in/out in the service yard has been carried out. It suggests typical noise levels from the service yard area are unlikely to cause a significant impact. Typical service yard noise levels are based on an average of previous measurements of $L_{Aeq,T}$ 67 dB and L_{Amax} 88 dB at 10m.

The roof of the service yard consists of a concrete slab and concrete facade which provides significant attenuation.

Refer to the EIA for details on external traffic noise.

On the basis that the arena line of acoustic integrity falls outside this area there is no specific requirement for any acoustic louvres passing through the service yard facade.

8.2.4.2 IMMI NOISE MODEL PREDICTIONS

Industry standard noise mapping software IMMI has been used to model the noise breakout from the arena. Each of the radiating elements has been entered to provide prediction plots at the nearest noise sensitive receivers.

The nearest noise sensitive locations as identified in the Buro Happold environmental assessment are located approximately 100m to the East of the arena along Alan Turing Way.

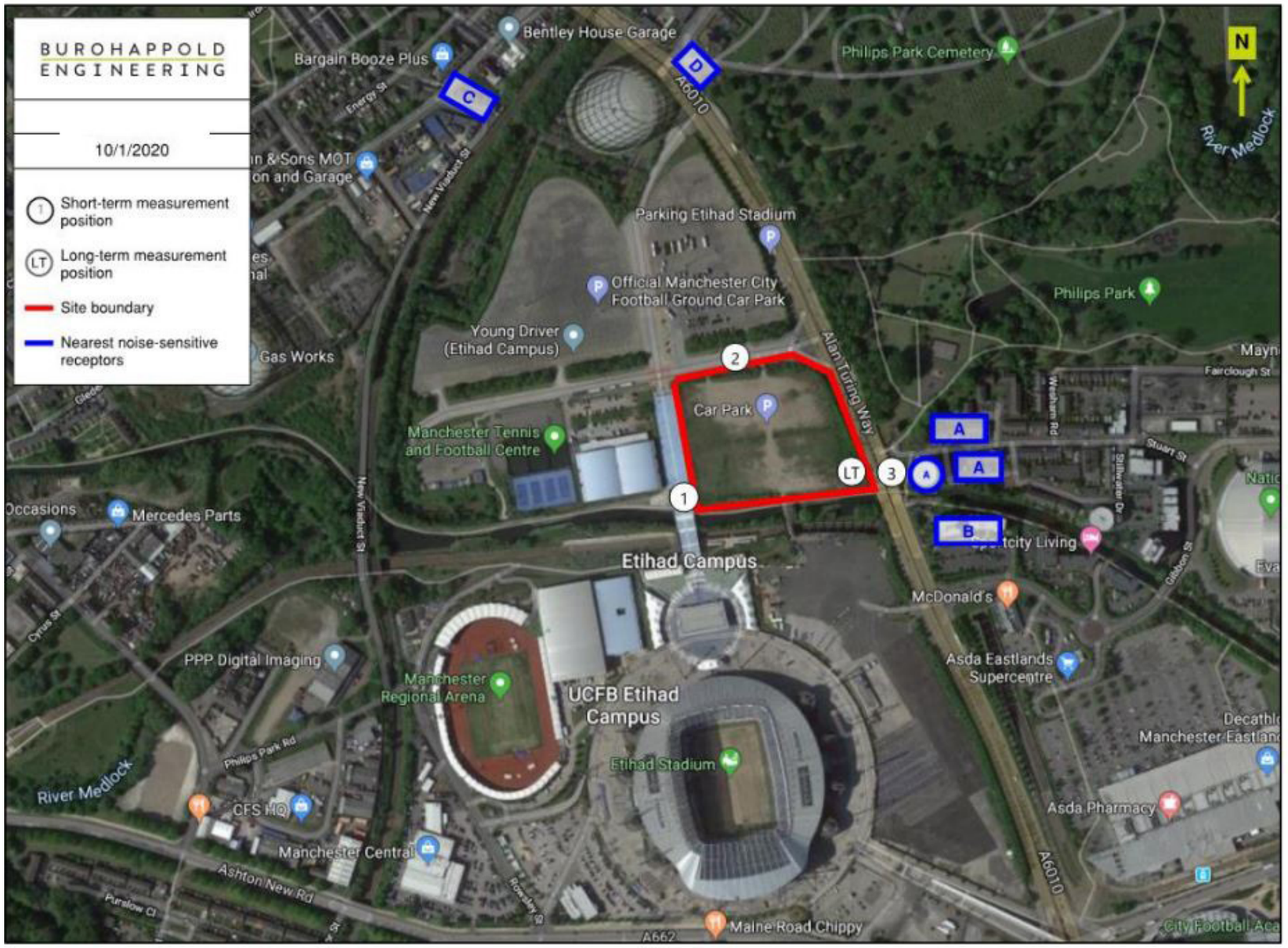
Residential properties at Stuart Street (A)

Residential properties at Gibbon Street (B)

Residential properties at Broxton Street (C)

Residential properties at Briscoe Lane (D)

Due to the proximity the design has been dictated by the residential receivers on Stuart Street (in particular the circular building on the corner of Alan Turing Way) Predictions have been carried out at ground floor and at 15m to capture any changes in noise levels with varying heights.



Noise monitoring positions and noise sensitive receivers (Source: BuroHappold, January 2020)

8.2.5 Noise Breakout / Break-In

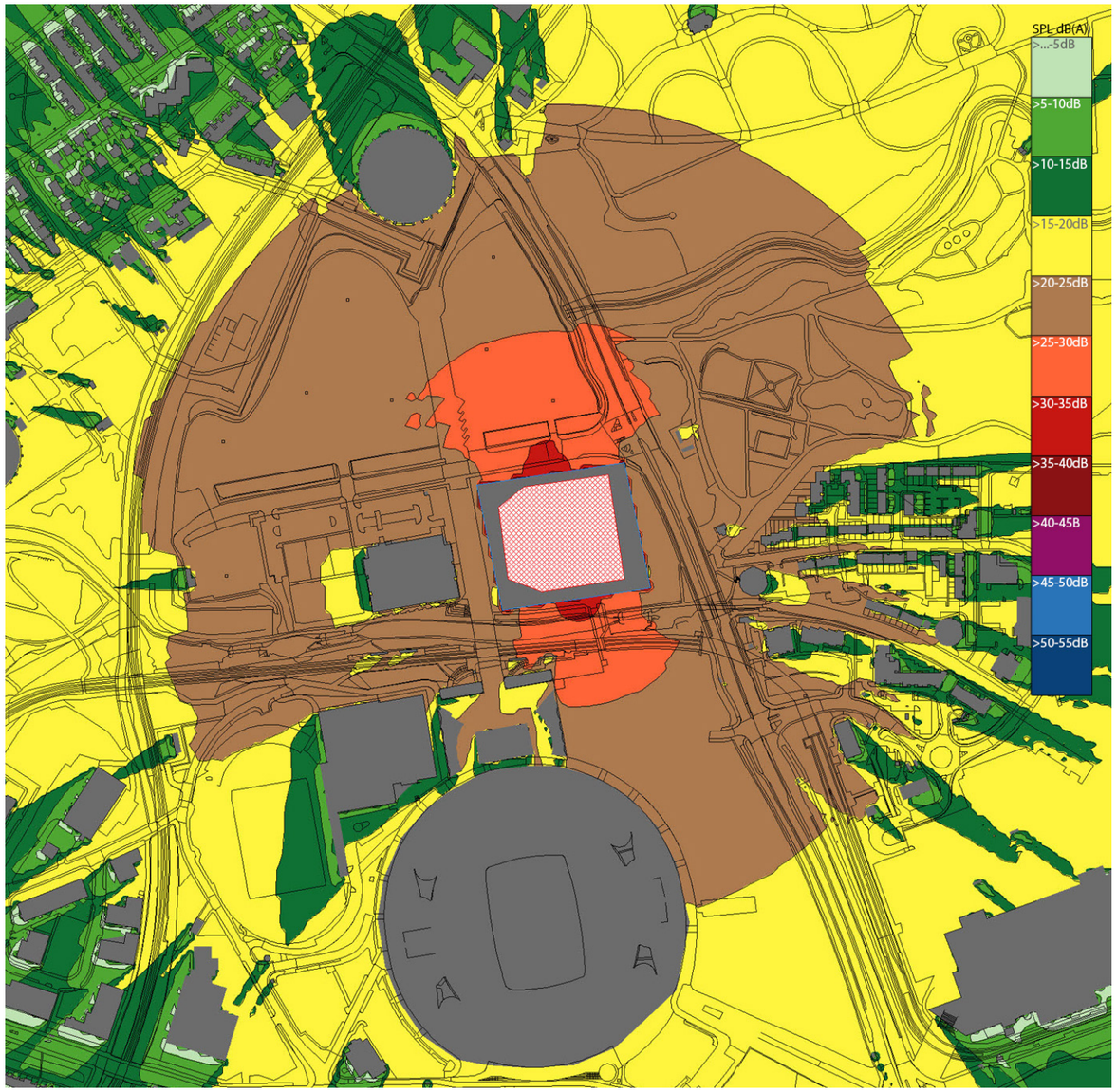
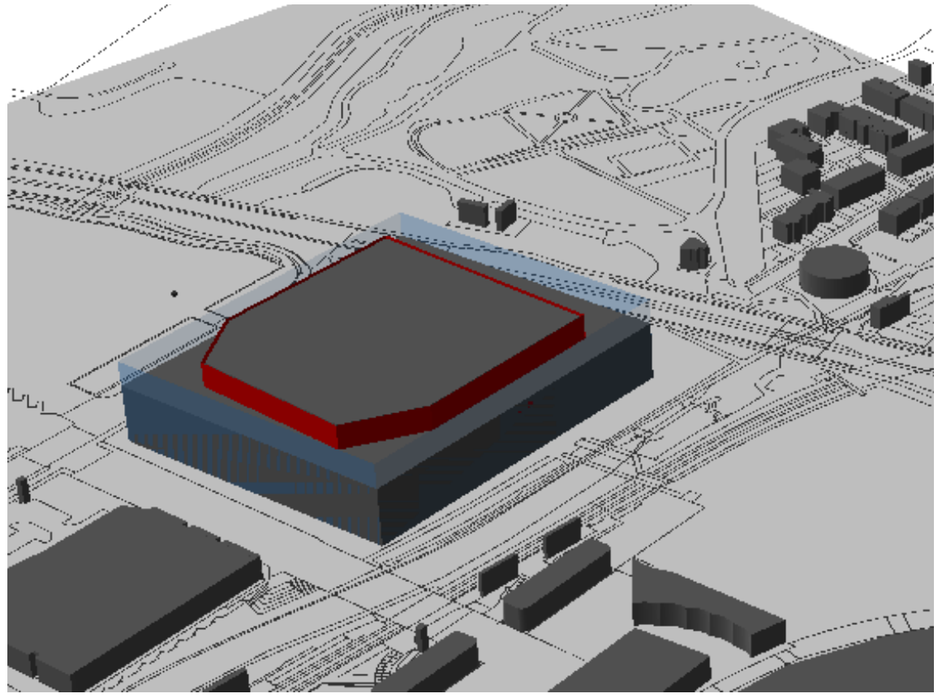


FIGURE 1 - BREAK OUT FROM ARENA WITH PROPOSED CONSTRUCTIONS



	OCTAVE BAND FREQUENCY (Hz)							
	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	A
PREDICTED NOISE LEVELS AT NEAREST NSR FROM MUSIC (1.5m HEIGHT)	48	22	7	0	0	0	0	22
PREDICTED NOISE LEVELS AT NEAREST NSR FROM MUSIC (15m HEIGHT)	51	25	11	9	0	0	0	25

The results demonstrate compliance with the planning conditions at the nearest noise sensitive receiver on the corner of Stuart Street and Alan Turing Way.

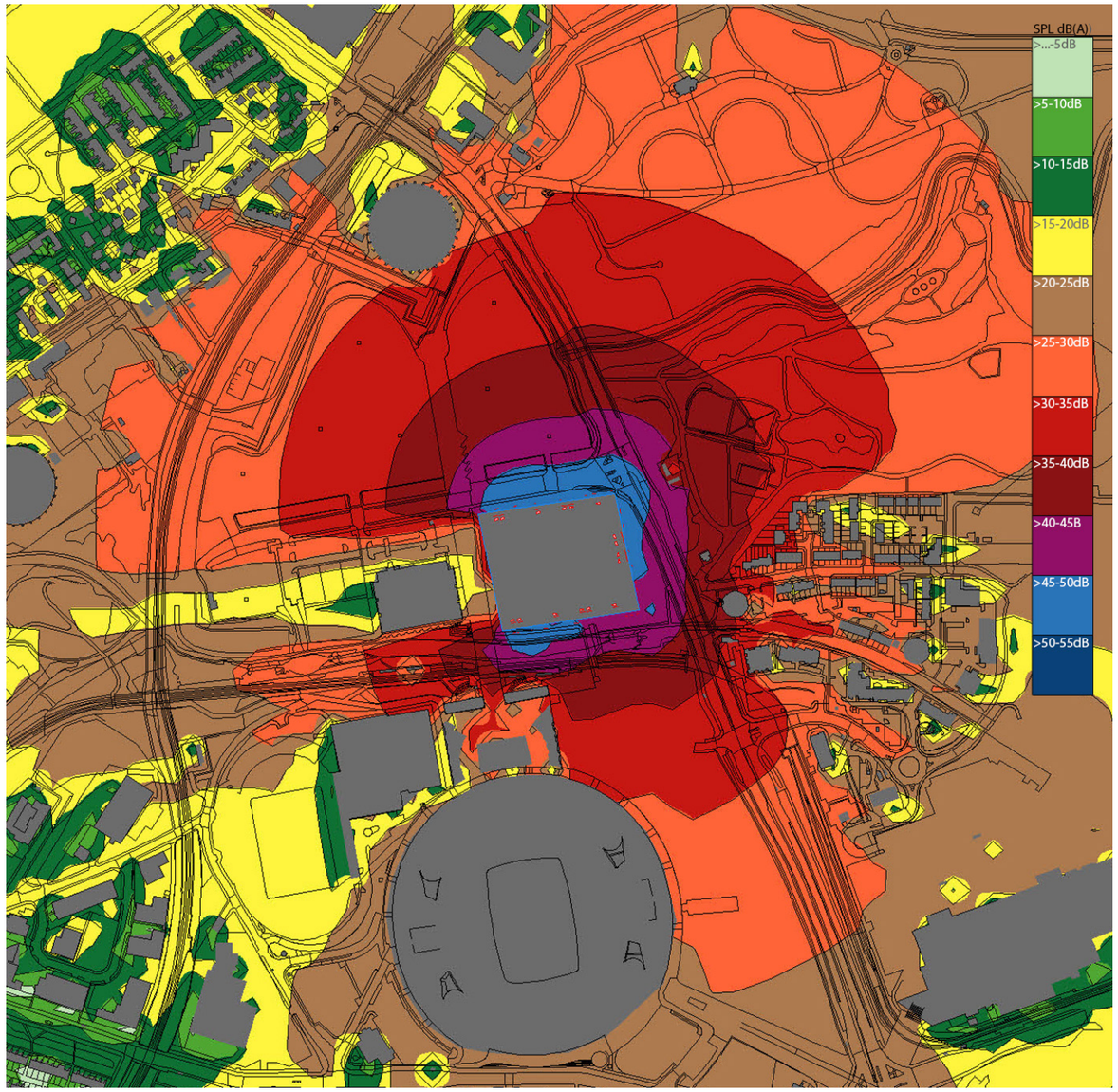


FIGURE 3 - BOWL ATTENUATORS (AHU x 16 + smoke extract x 7)

EXTERNAL PLANT NOISE FROM ARENA

	OCTAVE BAND FREQUENCY (Hz)						
	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	A
PREDICTED NOISE LEVELS AT NEAREST NSR FROM PLANT (1.5m HEIGHT)	40	36	36	32	26	20	37
PREDICTED NOISE LEVELS AT NEAREST NSR FROM PLANT (15m HEIGHT)	41	36	36	32	26	20	37

Assuming a rating penalty in accordance with BS4142:2014 of 5dB the external noise rating levels are demonstrated during the daytime with all equipment operating.

Outside operational hours the equipment continuing to operate consists of CO_2 pack units and comms/ICT room condensers where the predicted noise levels at night fall comfortably below L_{Aeq} 35 dB(A) at the nearest noise sensitive receiver.

BOWL ACOUSTICS

8.3.1 ARENA SOUND INSULATION 820
8.3.2 ACOUSTIC INTEGRITY 821
8.3.3 BOWL ENVELOPE 822
8.3.4 DUCTWORK PENETRATION DETAIL 823
8.3.5 BOWL ACOUSTIC TREATMENT 824
8.3.6 REFLECTION STUDY 826
8.3.7 REFLECTION STUDY 827
8.3.8 ECHOGRAMS 828
8.3.9 BOWL REVERBERATION TIME 829

8.3

8.3.1 Arena Sound Insulation

8.3.1.1 BOWL TO INTERNAL SOUND INSULATION

Suitable sound insulation of the arena envelope is critical in ensuring the proposed design noise criteria are achieved and to minimise disturbance to noise sensitive receivers.

The development currently consists of a two areas with expected high levels of noise: the main arena and the backstage bar.

The sound insulation of this bowl area has been defined to ensure the acoustic integrity is maintained.

These are shown in the following acoustic integrity sketches.

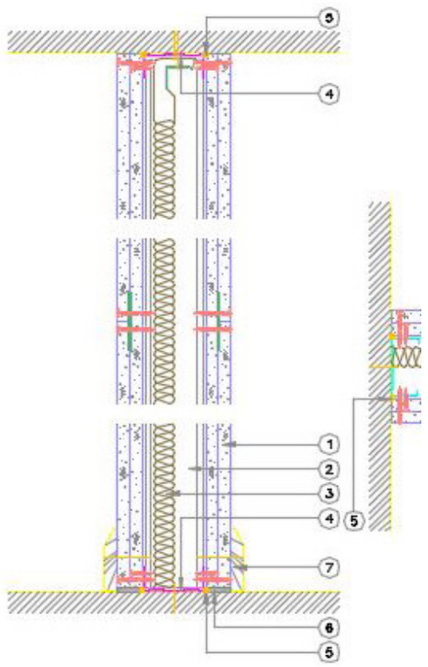
The internal bowl partitions should provide a minimum acoustic rating of R_w 55dB. The current design achieves this using the lightweight partition as shown.

Where masonry constructions are used in lieu of lightweight partitions a lower laboratory rating of up to 2dB can generally be accepted due to more favourable acoustic conditions. Refer to walls and partitions.

Where the precast terracing forms part of the bowl envelope then this shall provide the minimum acoustic performance as shown below.

	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	Rw
Internal bowl walls SRI, dB	18	34	47	56	60	57	56	55
Precast terrace SRI, dB	42	40	41	50	55	60	60	53

Internal bowl walls sound insulation requirements



Acoustic Performance - Rw 55dB

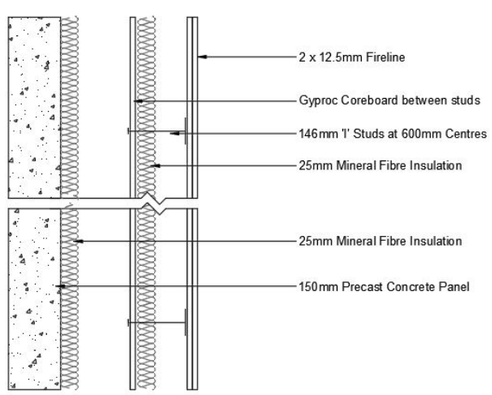
1. 2 layers 15mm Soundbloc
2. 70mm 'C' studs at 600mm centres
3. 50mm mineral fibre insulation
4. Floor channel
5. Flexible acoustic sealant
6. Jointing material bulk fill where gap exceeds 5mm
7. Indicative skirting

8.3.1.2 FACADE SOUND INSULATION

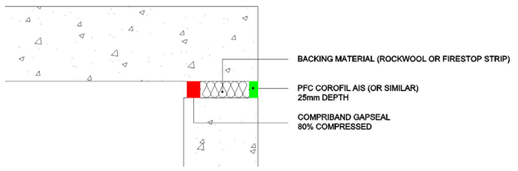
The typical facade detail consists of a 240mm composite panel with an internal shaftwall lining as detailed in the general facade image. The backstage bar has an increased sound insulation performance where the facade consists of a precast concrete panel.

	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	Rw
Facade (General) SRI, dB	22	25	30	30	35	35	35	34
Facade (backstage bar) SRI, dB	42	44	42	49	57	63	68	79
Internal Shaftwall Lining SRI, dB	18	34	45	55	55	55	55	53

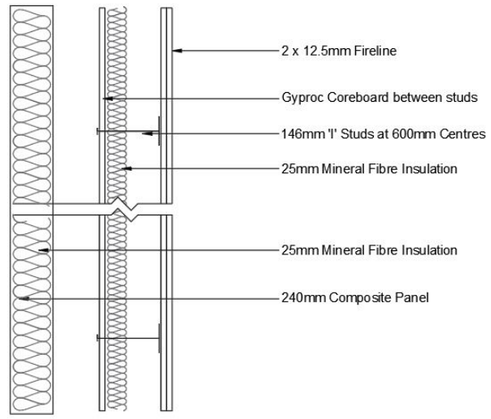
Facade And Shaftwall Sound Insulation Requirements



Enhanced backstage bar Facade - 150mm concrete

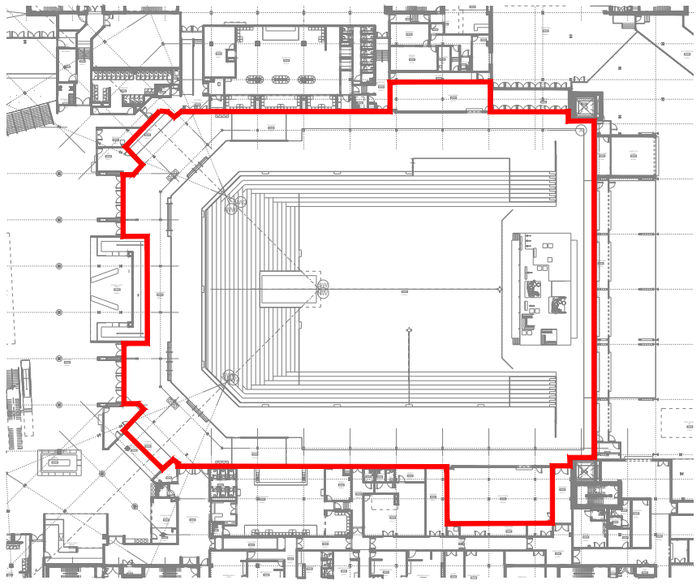


Precast Terrace Acoustic Detail

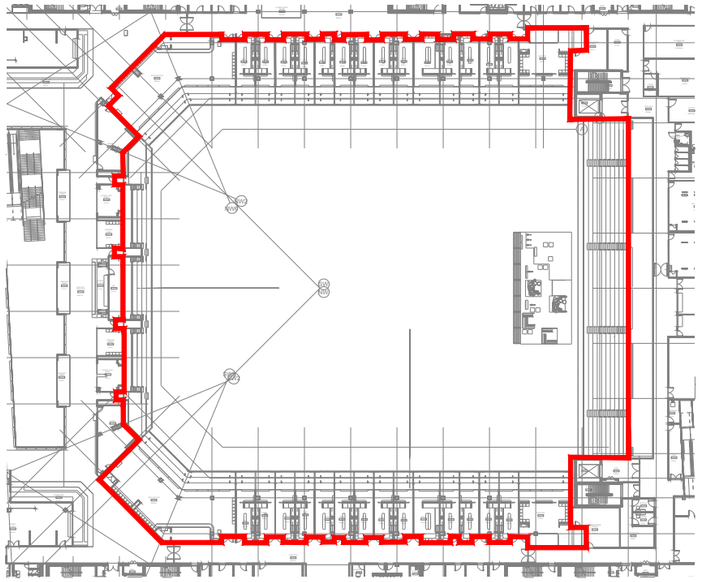


General Facade - 240mm Composite Panel

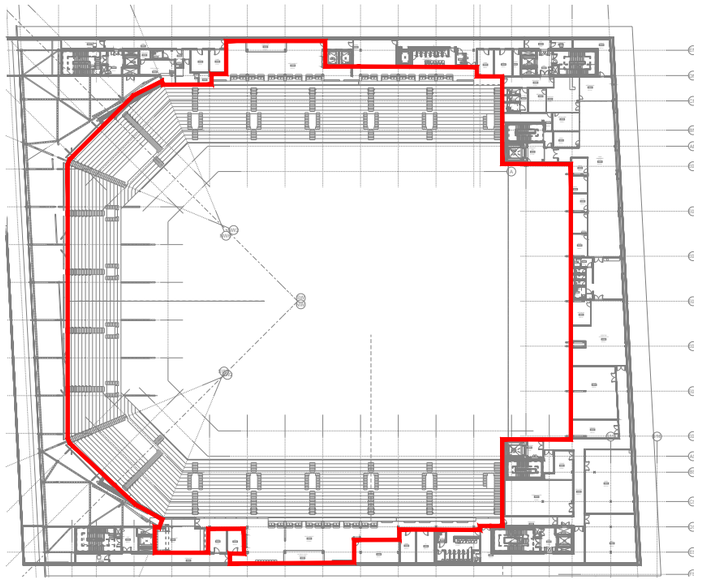
8.3.2 Acoustic Integrity



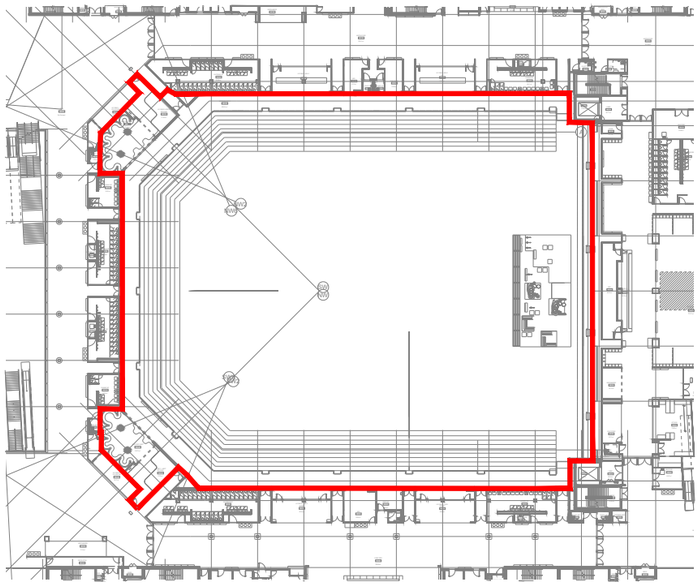
LEVEL 00 - ACOUSTIC LINE OF INTEGRITY



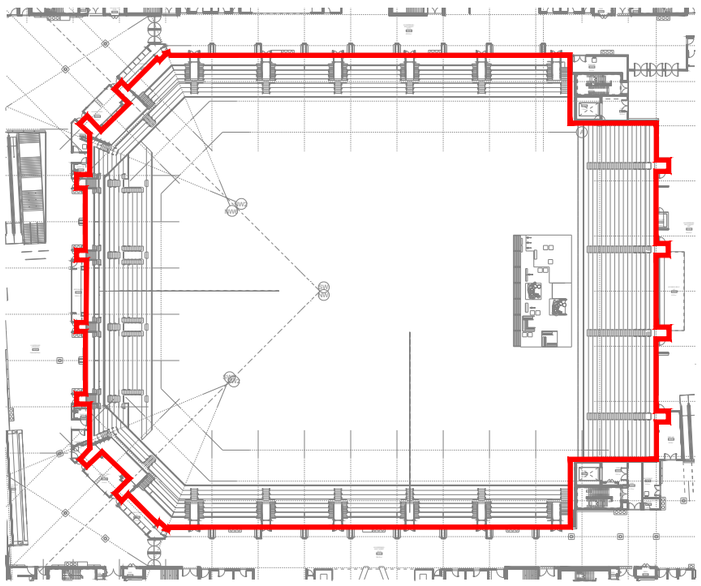
LEVEL 02- ACOUSTIC LINE OF INTEGRITY



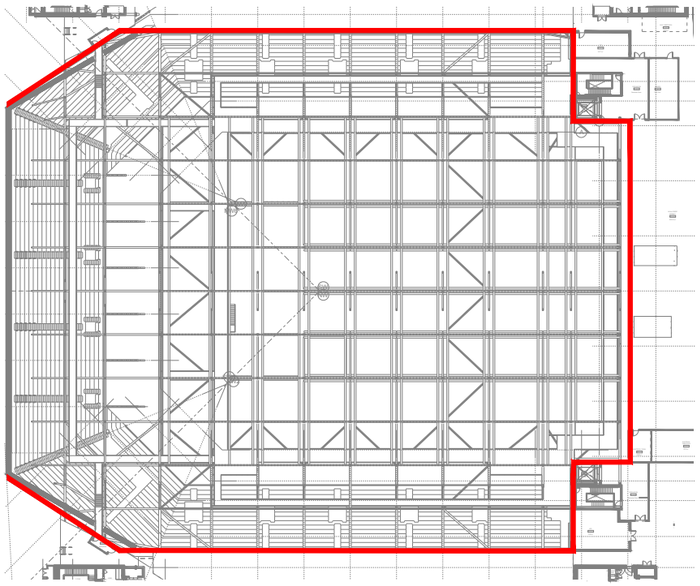
LEVEL 04- ACOUSTIC LINE OF INTEGRITY



LEVEL 01 - ACOUSTIC LINE OF INTEGRITY



LEVEL 03- ACOUSTIC LINE OF INTEGRITY



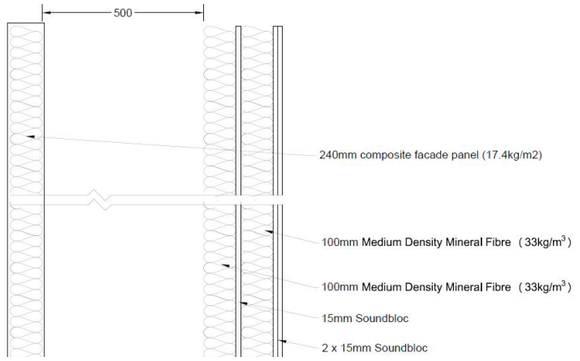
LEVEL 05- ACOUSTIC LINE OF INTEGRITY

8.3.3 Bowl Envelope

8.3.3.1 BOWL TO EXTERNAL SOUND INSULATION

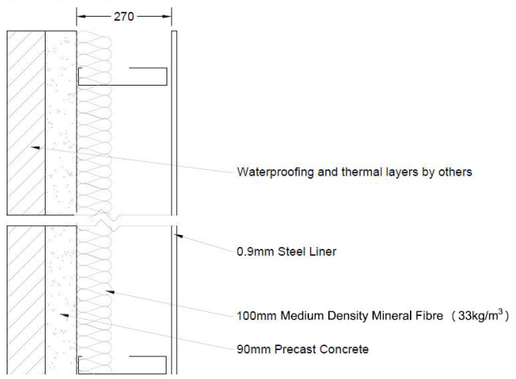
Where there is a direct connection between the arena and the external then the sound insulation performance shall satisfy the overall environmental requirements. This relates to the upper bowl wall at L05, wall at the rear of the L04 suites, loading bay doors and the arena roof.

L04 LOUNGE FACADE



	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
SRI, dB	36	58	63	60	68	75	80

L05 BOWL WALL



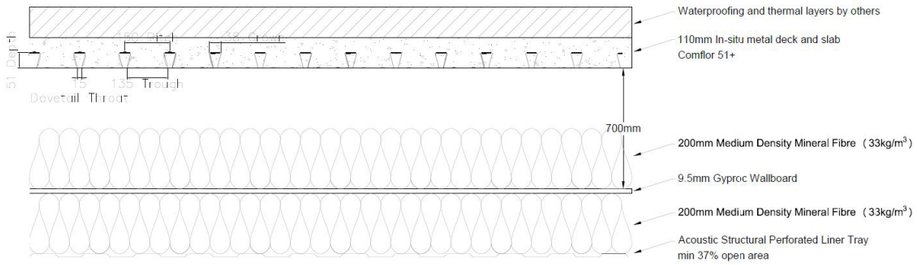
	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
SRI, dB	40	58	63	60	68	75	80

8.3.3.2 ROOF SOUND INSULATION

The roof performance has been based on a concrete roof solution. This has been assessed in conjunction with the other radiating elements to ensure the environmental conditions are achieved.

The arena roof is required to not only reduce the noise breakout to the surroundings but also to provide the required broadband absorption for the reverberation control - refer to arena roof soffit.

ARENA ROOF



	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
SRI, dB	46	68	78	>80	>80	>80	>80

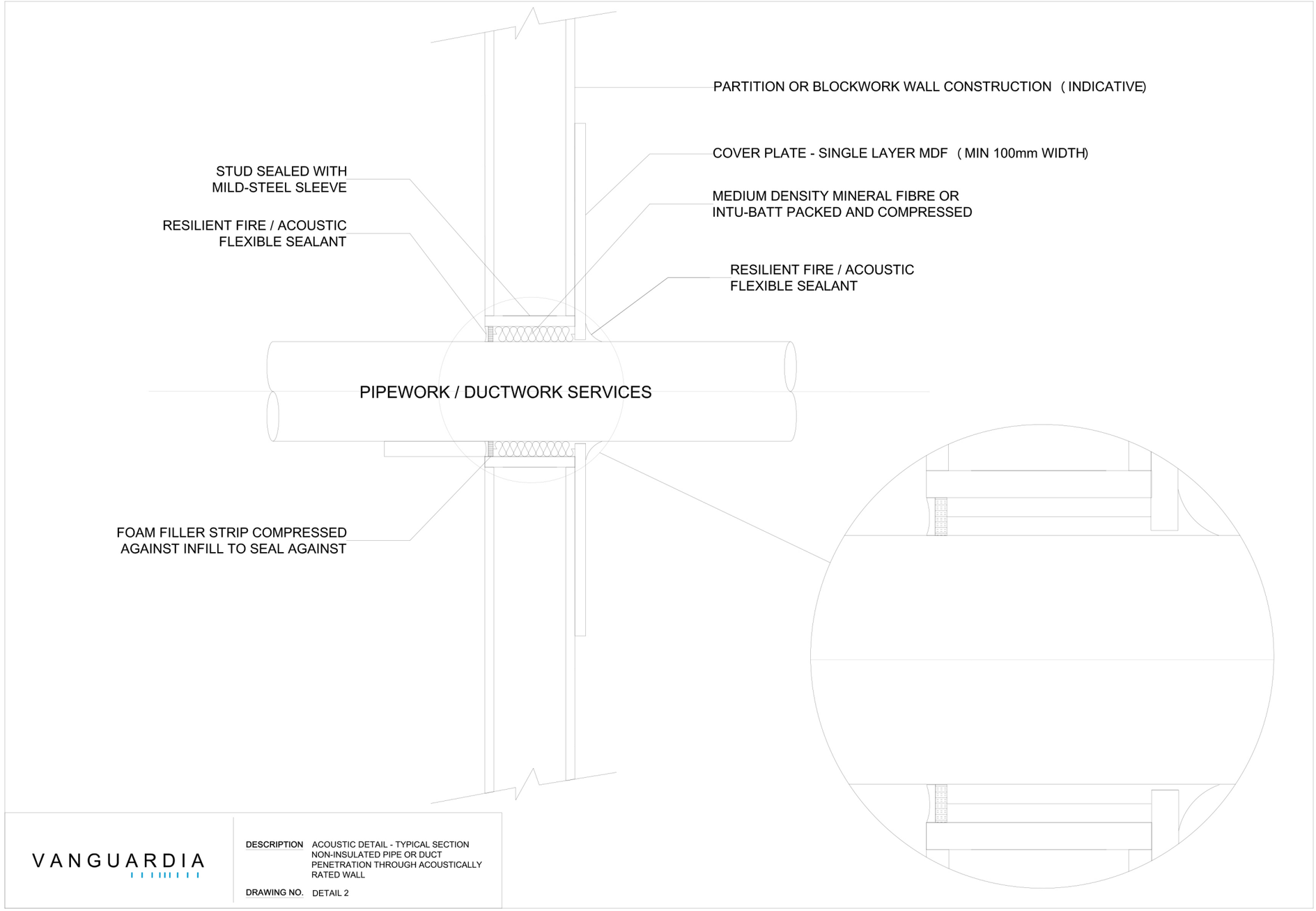
8.3.3.3 ARENA LOADING DOORS

Lobbied doors to the arena loading bay are provided and these must provide the required acoustic performance as a combined unit. These are currently spaced at approximately 2.1m apart.

LOADING DOORS

	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	Rw
Loading bay door (inner) Eg. Quietstar Soundroll 53	32	40	43	43	55	60	60	51
Loading bay door (Outer) Eg. Quietstar Soundroll 30	15	22	25	25	30	40	40	31

8.3.4 Ductwork Penetration detail



8.3.5 Bowl Acoustic Treatment

8.3.5.1 BOWL ACOUSTIC TREATMENT

Large, hard and flat surfaces found in arenas (such as concrete walls, balustrades, glazing etc.) can often create sound reflections. At higher frequencies where the wavelengths are smaller than the surfaces, reflections tend to be specular. In arenas specular reflections typically tend to occur above 500 Hz.

In large arenas these reflective surfaces can be up to 50 – 100 metres from a listener. Resulting sound reflections can arrive at the listener 100 – 300 ms after the direct sound arrival. This is typical in most arenas. If the sound level of the reflection is less than approximately 15 dB below the direct sound it can be heard as a discrete echo known as “slap-back”. This can be detrimental to the listener experience and in the worst case can lead to complaints from audience, artists and sound engineers alike.

For the optimum sound quality for concerts any first order reflections greater than 100ms should be avoided from the arena surfaces. Acoustic absorption alone only provides a real world reduction in the reflection of up to about 13dB, assuming 95% of the sound is absorbed.

When the seating configuration is retracted or removed to provide the high capacity standing configuration then further vertical surfaces are created and require further mitigation to minimise unwanted reflections.

Any spaces open to the arena bowl (suites, lounges etc.) all require significant acoustic treatment to the rear walls and ceilings to ensure that no unwanted acoustic artifacts are created from coupled spaces.

Any glazing to the arena bowl shall be designed to ensure no sound reflections are directed back into any audience or performer area. Where possible bowl glazing should be avoided.

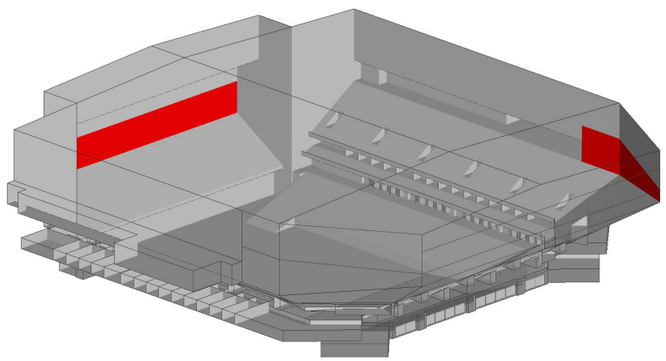
Although coefficients down to 125Hz have been provided, the impact of the lower frequencies has been reviewed and estimated to provide the overall reverberation time balance.

TYPE 0 ACOUSTIC TREATMENT (DRS-901)
Used for ground floor arena doors

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 0 ABS COEFF.	0.10	0.20	0.35	0.70	0.80	0.70

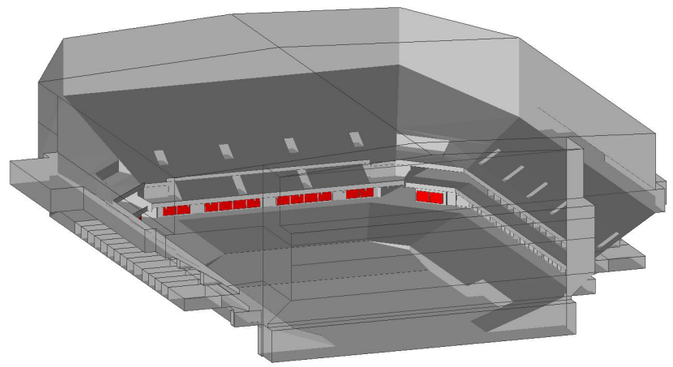
TYPE 1 (LIN-911) / TYPE 5 (LIN-915) ACOUSTIC TREATMENT
Panels to ground floor walls
Panels to East Stage Wall
Continuous on L04 Walls

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 1 ABS COEFF.	0.25	0.65	1.00	0.95	0.95	1.00



TYPE 2 (LIN-912) ACOUSTIC TREATMENT
L01 angled arena rear wall

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 2 ABS COEFF.	0.65	1.00	0.90	0.90	0.90	1.00

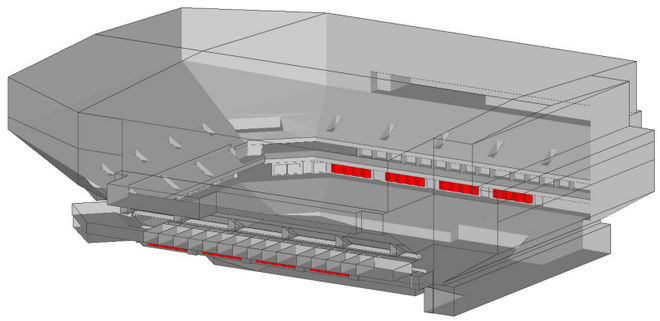


Detailed sound absorption details can be found in the following drawings:

Drawing Title	Drawing Number
Acoustic Absorption Requirements - BOWL Level 00	BRA-VAN-ZZ-00-DR-YA-8000
Acoustic Absorption Requirements - BOWL Level 01	BRA-VAN-ZZ-01-DR-YA-8001
Acoustic Absorption Requirements - BOWL Level 02	BRA-VAN-ZZ-02-DR-YA-8002
Acoustic Absorption Requirements - BOWL Level 03	BRA-VAN-ZZ-03-DR-YA-8003
Acoustic Absorption Requirements - BOWL Level 04	BRA-VAN-ZZ-04-DR-YA-8004
Acoustic Absorption Requirements - BOWL Level 05	BRA-VAN-ZZ-05-DR-YA-8005
Bowl Acoustic Absorption Details	BRA-VAN-ZZ-ZZ-DR-YA-8006

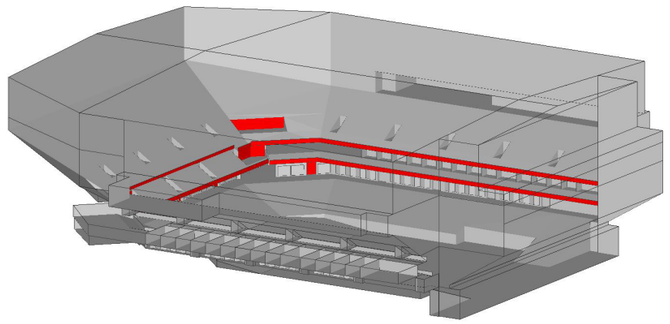
TYPE 3 (LIN-913) ACOUSTIC TREATMENT
L01 concertina arena side walls

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 3 ABS COEFF.	0.65	1.00	0.90	0.90	0.90	1.00



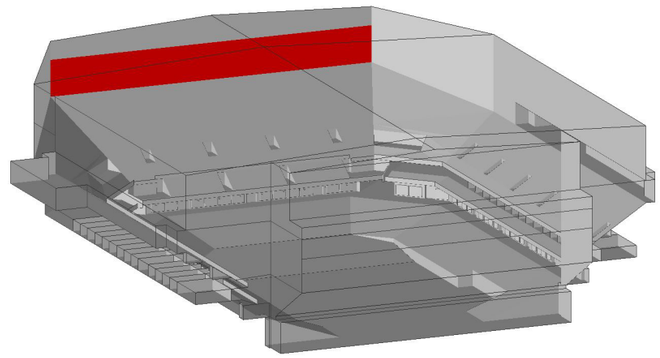
TYPE 4 (LIN-914) + (DRS-905) ACOUSTIC TREATMENT
L01 Doors
Vomitory walls
Parapet edges

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 4 ABS COEFF.	0.10	0.30	0.75	1.00	0.85	0.95



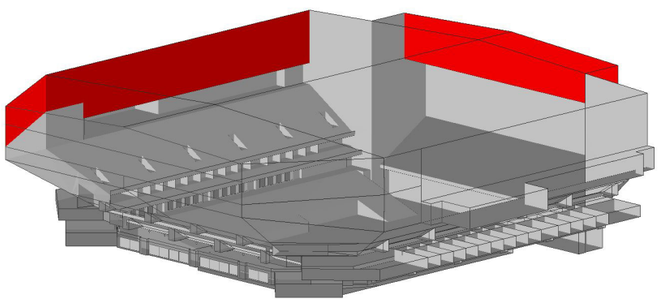
TYPE 6 (LIN-916) ACOUSTIC TREATMENT
L04/L05 rear wall bass trap

	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 6 ABS COEFF.	0.65	0.95	0.95	0.95	0.95	0.95	0.95



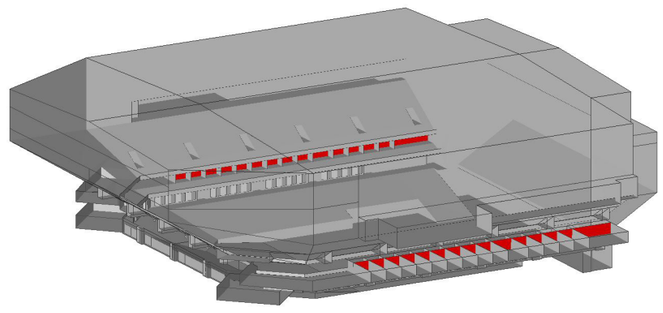
TYPE 7 (LIN-917) ACOUSTIC TREATMENT
L05 Resonant wall panel, tuned around 40Hz.

	30Hz	40Hz	50Hz	60Hz
TYPE 7 ABS COEFF.	0.40	0.90	0.60	0.40



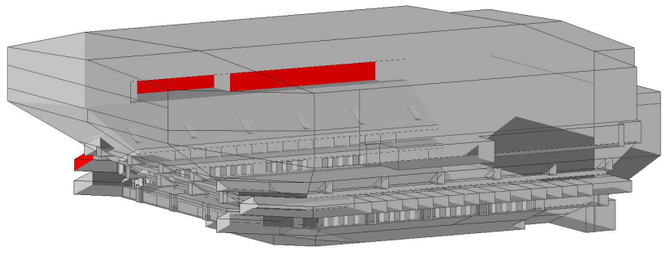
TYPE 8 (FX-115) ACOUSTIC TREATMENT
L02 Acoustic curtains to box fronts

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 8 ABS COEFF.	0.20	0.40	0.60	0.60	0.60	0.50



TYPE 9 ACOUSTIC TREATMENT
Serge Ferrari Alphalia printed fabric + mineral fibre to Loge walls.

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
TYPE 8 ABS COEFF.	0.30	0.80	1.00	1.00	0.95	0.90



8.3.6 Reflection Study

8.3.6.1 REFLECTION STUDY

A reflection study has been carried out to identity any potential surfaces where 1st order reflections are likely to give rise to unwanted late reflections in the audience and stage areas.

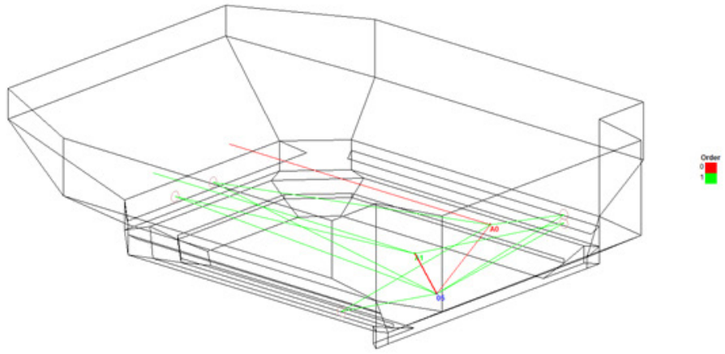
With the lower seating extended 1st order reflections have been identified off the Level 01 rear and side walls. Additional measures to mitigate the reflections in addition to acoustic absorption is required through the use of diffusion and profiling of the wall surface.

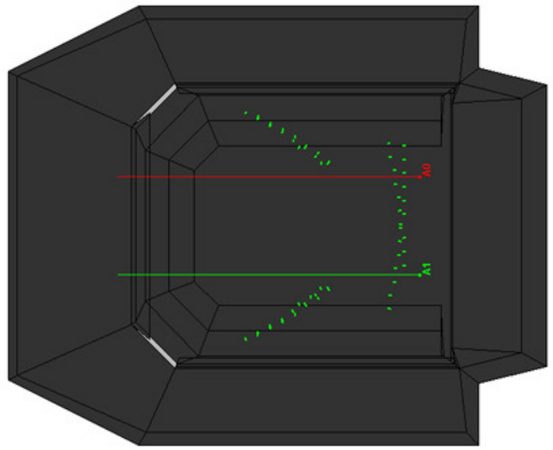
Any substitute of acoustic materials should be reviewed in conjunction with the latest sound system proposals to ensure that no audible reflections are predicted. Also any changes to the sound system design should be fully coordinated with the acoustic design.

8.3.6.2 BOWL ACOUSTIC CRITERIA

The acoustic design shall ensure the following performance parameters are achieved for sports and concert events;

- Clarity - Average C_{50} (500Hz, 1KHz and 2KHz) to exceed 4 for 95% of audience areas for end stage concerts
- Clarity - Average C_{50} (500Hz, 1KHz and 2KHz) to exceed 4 for 90% for sports events.
- STI to exceed 0.6 STI for 95% of audience areas
- Echograms to demonstrate no discrete reflections outside 80ms
- Reverberation Times to fall within the specified targets.

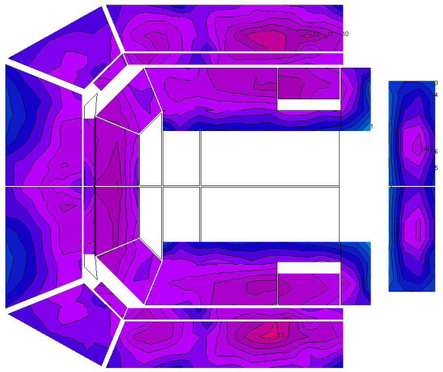


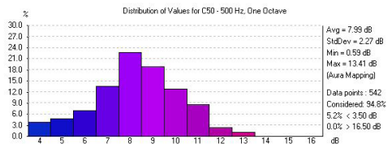


Reflection study off L01 perimeter wall identifying significant reflections up to 400ms after the direct sound.

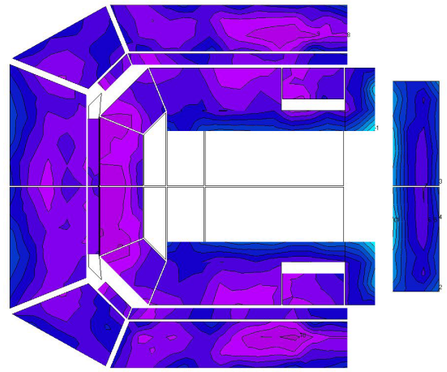
8.3.7 Reflection Study

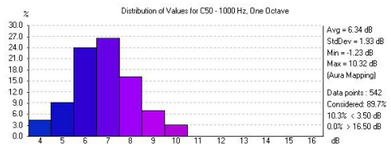
SPORTS CLARITY, C50 (500HZ)



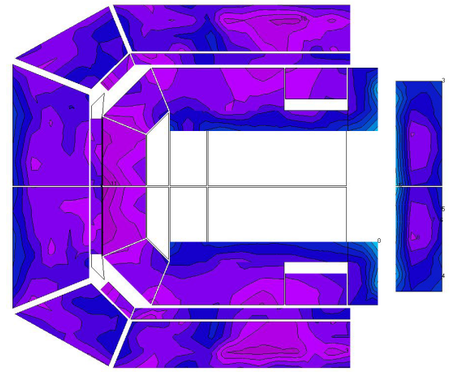


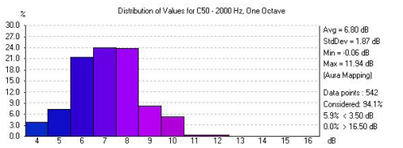
SPORTS CLARITY, C50 (1000HZ)



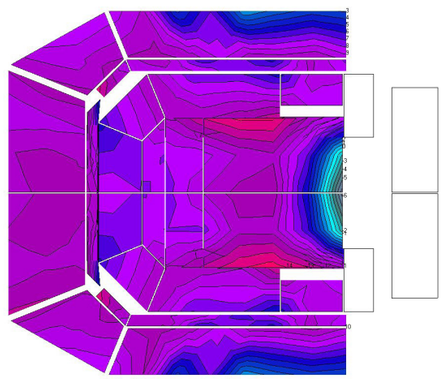


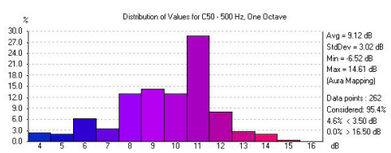
SPORTS CLARITY, C50 (2000HZ)



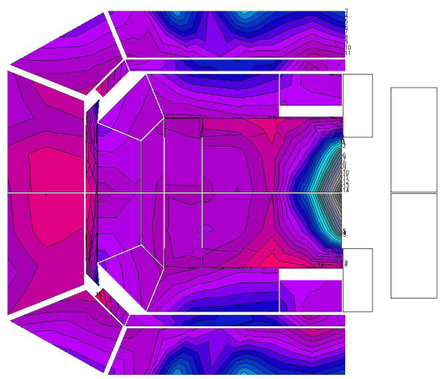


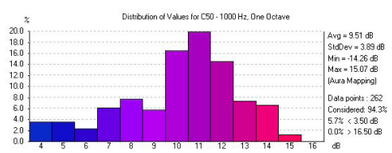
CONCERT CLARITY, C50 (500HZ)



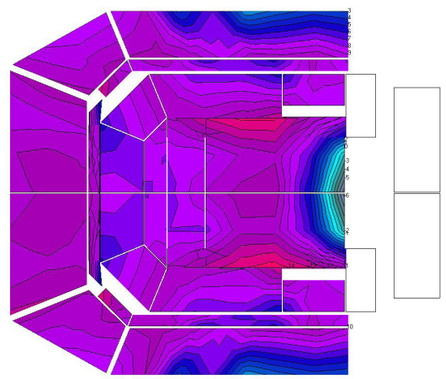


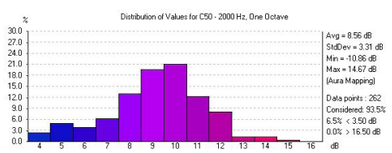
CONCERT CLARITY, C50 (1000HZ)





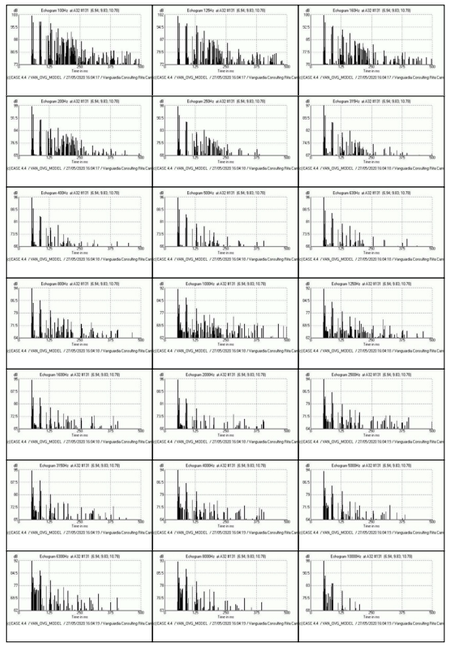
CONCERT CLARITY, C50 (2000HZ)



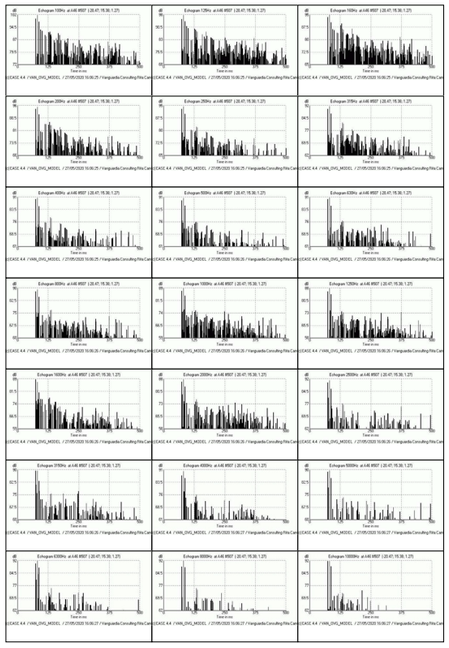


8.3.8 Echograms

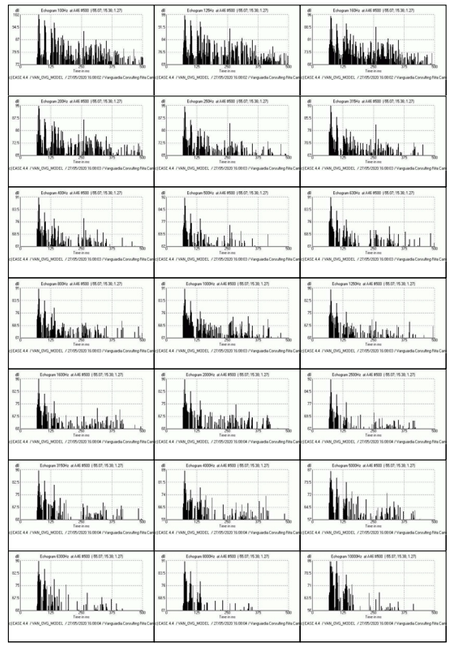
ECHOGRAMS (100HZ-10,000HZ) EAST STAND



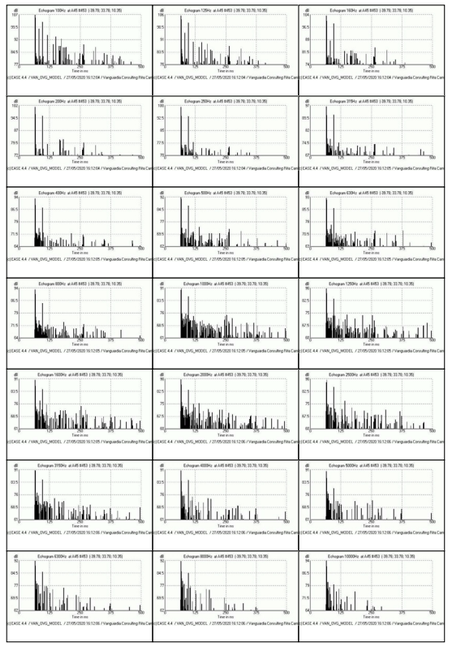
ECHOGRAMS (100HZ-10,000HZ) NORTH LOWER 1



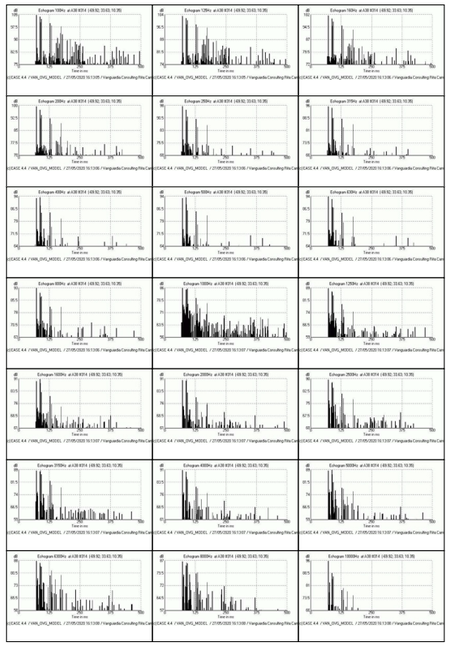
ECHOGRAMS (100HZ-10,000HZ) NORTH LOWER 2



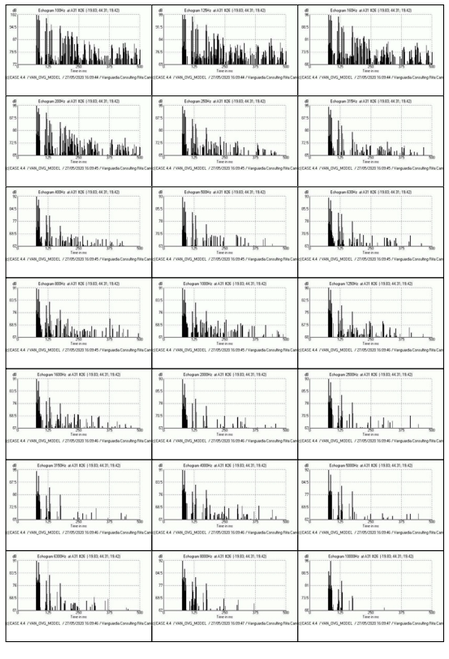
ECHOGRAMS (100HZ-10,000HZ) NORTH MID 1



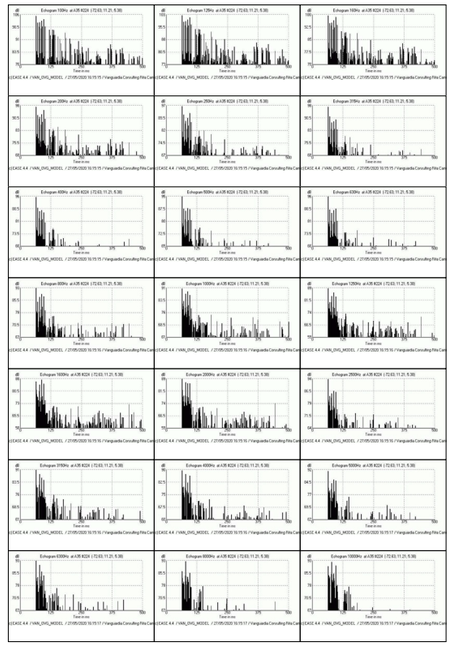
ECHOGRAMS (100HZ-10,000HZ)NORTH MID 2



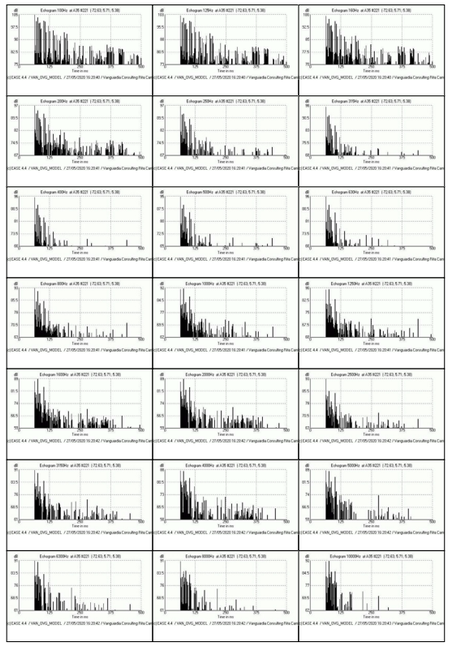
ECHOGRAMS (100HZ-10,000HZ) NORTH UPPER 1



ECHOGRAMS (100HZ-10,000HZ) WEST LOWER



ECHOGRAMS (100HZ-10,000HZ) WEST UPPER



8.3.9 Bowl Reverberation Time

8.3.9.1 BOWL REVERBERATION TIME

The arena bowl reverberation time (250Hz to 4kHz) shall be demonstrated to fall within 1.5s - 2.0s during concert configuration, which provides an excellent acoustic environment for high quality concerts. The frequency balance is important to ensure no tonal colouring of the space.

Material selections shall ensure a flat reverberation time in the unoccupied arena from 250Hz-2KHz with a maximum 20% rise at 125Hz and a further 50% rise at 63Hz octave bands. No adjacent octave bands (250Hz - 4KHz) shall vary by more than 0.2 seconds.

Any spaces open to the bowl shall have low reverberation times to ensure no audible reverberation tail in the bowl.

*The 63Hz octave band falls outside the range of the computer model and an estimate has been calculated on a statistical basis relative to the 125Hz band.

	63Hz*	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
Upper T30 Limit Unoccupied (s)	3.6	2.4	2.0	2.0	2.0	2.0	2.0
Lower T30 Limit Unoccupied (s)	2.5	1.9	1.5	1.5	1.5	1.5	1.5
Current design T30 Unoccupied (s)	3.5	2.2	1.9	1.7	1.7	1.7	1.5

8.3.9.2 ARENA SEATING

The arena seating shall provide an appropriate level of upholstered acoustic surfaces.

The final seat selection has not been made, but it shall ensure that the seats shall provide the minimum absorption coefficients below.

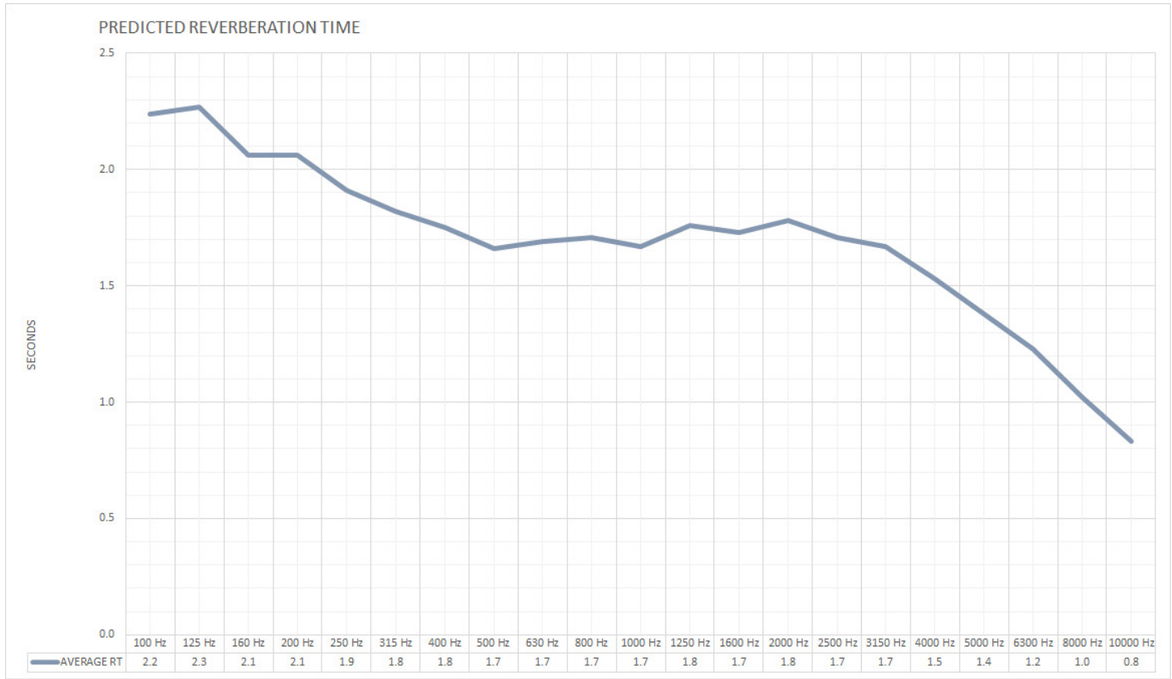
This can typically be achieved with a 33kg/m³ upholstered foam seat with an acoustic fabric cover and a perforated acoustic infill to the underside.

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
SEAT ABS COEFF.	0.20	0.20	0.60	0.70	0.70	0.60

8.3.9.3 BOWL DRAPERY

The design shall provide allowance for temporary drapes and hanging system to allow multiple configurations of the arena for different capacity events.

Stage drapes shall be provided with a minimum weight of 625g/m2. Drapes shall provide Class A acoustic absorption when located a minimum of 100mm from a wall surface.



INTERNAL ACOUSTICS

8.4.1 WALLS, FLOORS AND DOORS 832

8.4.2 REVERBERATION TIME 833

8.4.3 BUILDING SERVICES NOISE 834

8.4

8.4.1 Walls, Floors And Doors

8.4.1.1 WALLS AND PARTITIONS

All internal partitions shall be full height where possible. Where this is not possible, cavity barriers shall be provided to maintain the acoustic performance of the wall.

The sound insulation performance of partitions between occupied acoustically sensitive spaces is required to achieve a minimum on-site performance (R'w) as measured in accordance with BS EN ISO 140-4. Where there is a door or opening in an internal partition then a laboratory (R_w) performance shall be demonstrated. The performance of partitions shall demonstrate that the on site apparent sound reduction index (R'w) is not less than 7dB lower than the laboratory values (Rw) defined on the acoustic requirement drawings. This does not apply to walls containing doors.

Where masonry constructions are used in lieu of lightweight partitions a lower laboratory rating of up to 2dB can generally be accepted due to more favourable acoustic conditions. This shall still demonstrate an on site apparent sound reduction index as defined above.

An occupied space is defined as a room or space that is likely to be used for 30 minutes or more by a building user.

The minimum airborne sound insulation between vertical partitions shall be specified, as shown on the acoustic requirement drawings.

It is essential that all penetrations in walls, floors, and ceilings provided for pipes, ducts, conduits, etc. are acoustically isolated and sealed around their penetrations. If ducts are running across rooms, either in a floor plenum or in a ceiling void, cross-talk issues can arise so this should be designed out wherever possible.

Openings for ductwork and cables should be acoustically sealed. Where possible, penetrations should be located above doors.

All penetrations shall be rendered imperforate and effectively sealed between the service and the wall on both sides of the wall.

8.4.1.2 FLOORS

The following minimum airborne sound insulation between horizontal elements (floors) shall be provided.

AREA	ACOUSTIC REQ. (dB)	CURRENT DESIGN
LEVEL 00 SLAB	N/A	N/A
LEVEL 01 SLAB	R_w 54	150mm Concrete R_w 54
LEVEL 02 SLAB	R_w 54	200mm Concrete R_w 59
LEVEL 03 SLAB	R_w 54	150mm Concrete R_w 54
LEVEL 04 SLAB	R_w 54	300mm Concrete R_w 65
LEVEL 05 SLAB	R_w 60, R_{63Hz} 46	275mm Concrete R_w 63, R_{63Hz} 47

The acoustic requirement drawings indicate where acoustic ceilings are required to reduce impact noise. An $L_{n,w}$ of 65 dB is required in these areas. This can be achieved using a solid or perforated (with mineral fibre backing) suspended ceiling.

8.4.1.3 DOORSETS

Solid core doors with acoustic seals are required in all acoustically sensitive spaces. Double doors shall include meeting stiles.

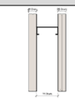
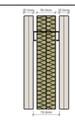
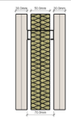
The minimum sound insulation for door-sets shown on the acoustic requirement drawings shall be provided. Door-sets are to include all perimeter framing and seals.

The acoustic performance of doors shall be verified by laboratory measurement and certification.

8.4.1.4 ACOUSTIC REQUIREMENT DRAWINGS

Refer to the following drawings for sound insulation, noise rating and reverberation time requirements;

Drawing Title	Drawing Number
Internal Acoustic Requirements L00	BRA-VAN-ZZ-00-DR-YA-1000
Internal Acoustic Requirements L01	BRA-VAN-ZZ-01-DR-YA-1001
Internal Acoustic Requirements L02	BRA-VAN-ZZ-02-DR-YA-1002
Internal Acoustic Requirements L03	BRA-VAN-ZZ-03-DR-YA-1003
Internal Acoustic Requirements L04	BRA-VAN-ZZ-04-DR-YA-1004
Internal Acoustic Requirements L05	BRA-VAN-ZZ-05-DR-YA-1005

Drywall and Masonry Partition Construction Examples	Weighted Sound Reduction Index, R_w (dB)	Indicative construction detail
25 mm (2 x 12.5mm) plasterboard (minimum surface weight 8 kg/m²) each side of 70 mm metal studs (total thickness 122 mm)	45	
100 mm fair-faced solid concrete block (min. 1450 kg/m3)		-
25 mm (2 x 12.5mm) plasterboard (minimum surface weight 8 kg/m²) each side of 70 mm metal studs, 50 mm mineral wool (minimum density 24 kg/m³) in the cavity (total thickness 122 mm)	50	
140 mm solid concrete block (min 1450 kg/m3) with 13 mm lightweight plaster either side		-
30 mm (2 x 15mm) high density plasterboard (minimum surface weight 12.5 kg/m²) each side 70 mm metal studs, 50 mm mineral wool (minimum density 24 kg/m³) in the cavity, (total thickness 132 mm)	55	
Double leaf 140 mm dense concrete block (density > 1740 kg/m3) (overall thickness 280mm).		-
MASONRY ONLY CONSTRUCTION ONLY FOR ADDITIONAL LOW FREQUENCY PERFORMANCE	65	-
15mm plasterboard (minimum surface weight 8 kg/m²) lining 100 mm fairfaced solid concrete block (min. 1450 kg/m3) either side of 70mm acoustic studs, 50 mm mineral wool (minimum density 24 kg/m³) in the cavity (total thickness 300 mm)		

INDICATIVE WALL CONSTRUCTIONS

8.4.2 Reverberation Time

8.4.2.1 REVERBERATION TIME

In corridors, concourses and typical single height rooms, a Class C sound absorption area equal to an equivalent of 80% of the floor area shall be provided. This area may be reduced if a higher sound absorption class of treatment is used. Absorption in larger spaces can be provided using treatments such as perforated acoustic walls and acoustic baffles. The ceiling finishes have been coordinated with the architectural specification.

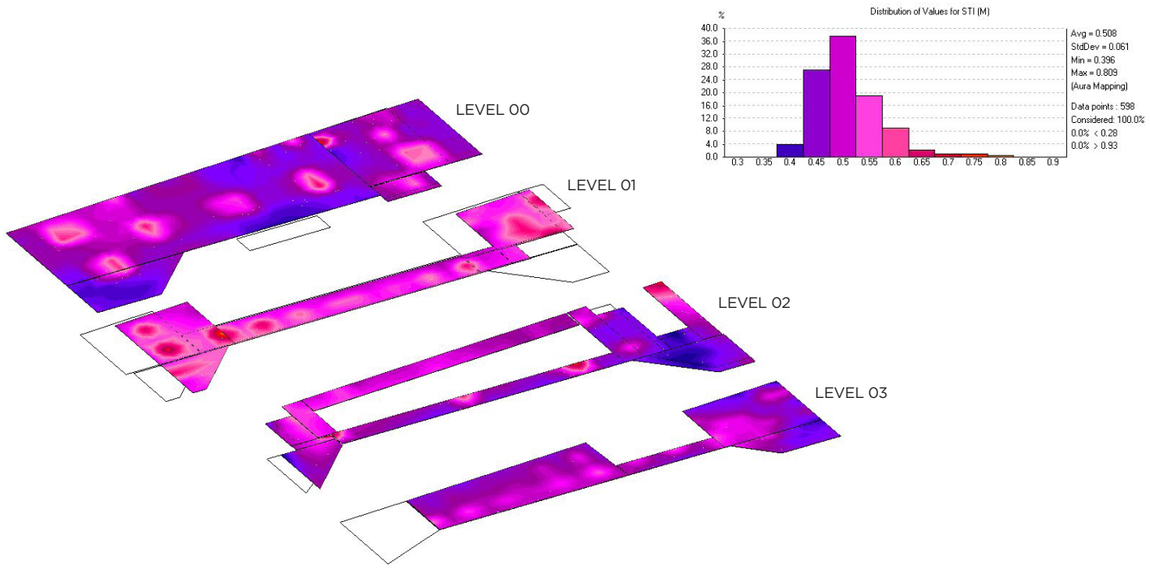
Large volume spaces will require reverberation control in order to enable PAVA intelligibility to be achieved for life safety purposes. Any changes to the proposed audio systems should be reviewed in the acoustic environments to ensure compliance with the intelligibility.

8.4.2.2 WEST ATRIUM REVERBERATION TIME

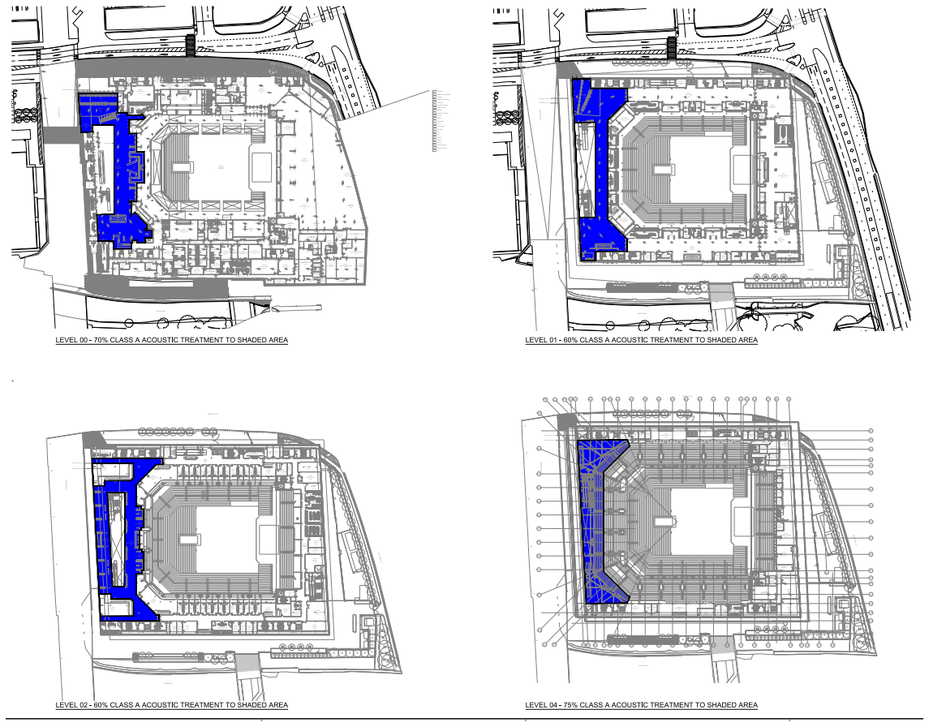
The West atrium has been verified using computer modelling to ensure appropriate reverberation times are achieved to meet the intelligibility requirements. This is based on the current sound system proposals and it should be noted that any changes in the loudspeaker design will require verification.

The proposed acoustic treatment provides the following average reverberation time in the West Atrium.

	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
AVERAGE ATRIUM RT, s	2.5	2.4	2.6	2.7	2.6	2.1



SPEECH INTELLIGIBILITY (STI) IN WEST ATRIUM



PERCENTAGE AREA OF ABSORPTION REQUIRED IN WEST ATRIUM

8.4.3 Building Services Noise

The maximum allowable noise levels, specified in terms of Noise Rating (NR), shall not exceed those shown on the acoustic requirement drawings

The NR levels do not include noise from activities within the building or temporary equipment used in the space (eg. machine tools, CNC machines, dust and fume extract equipment, computers etc.).

Refer to the following drawings for reverberation and building services noise requirements.

Drawing Title	Drawing Number
Internal Acoustic Requirements L00	BRA-VAN-ZZ-00-DR-YA-1000
Internal Acoustic Requirements L01	BRA-VAN-ZZ-01-DR-YA-1001
Internal Acoustic Requirements L02	BRA-VAN-ZZ-02-DR-YA-1002
Internal Acoustic Requirements L03	BRA-VAN-ZZ-03-DR-YA-1003
Internal Acoustic Requirements L04	BRA-VAN-ZZ-04-DR-YA-1004
Internal Acoustic Requirements L05	BRA-VAN-ZZ-05-DR-YA-1005

8.4.3.1 AIR HANDLING UNITS

The casing of air handling units should be double skinned to reduce noise breakout to the plant room or in the case of exposed units, the immediate area.

Risers running from plant rooms should be sealed appropriately to control airborne transmission to other parts of the building of plant room noise. This may require the use of highly rated acoustic dry wall constructions.

Doors to plant rooms will need to have enough sound insulation performance as not to exceed the ambient noise requirement in adjacent spaces.

8.4.3.2 DUCTWORK ATTENUATORS

Primary attenuators should be incorporated into ductwork near to plant to reduce airborne noise transmission to the building to an acceptable level. In noise sensitive rooms secondary attenuators should be introduced in order to reduce in duct noise levels and achieve the required background noise levels within rooms.

If ductwork is supplying or extracting air to adjacent rooms via a mutual duct run, cross talk attenuators should be installed in order to preserve the level of sound reduction, which is achieved through the partition.

Refer to noise breakout section for arena attenuator insertion loss required for the building envelope.

The final plant and attenuator selection has not yet been provided, however manufacturers have been issued with the target Noise Rating for each area. This is required to be reviewed prior to installation.

8.4.3.3 DUCTWORK LAGGING

Duct lagging may be required to control noise breakout from ductwork where high in-duct noise levels exist. This would usually be before primary silencers. There may also be a requirement for external lagging where ductwork passes through noisy areas to control break-in to the ductwork.

The lagging requirement may range from heavy wrap-around mineral wool with impervious backing to an independently supported multi-layer plasterboard construction. This requirement can usually be minimised by efficient routing of ductwork.

High level ducted ventilation provided into the arena bowl shall be installed such that no noise source generates audible tones or rattles in any occupied spaces including the arena bowl.

8.4.3.4 AIRSPEEDS AND REGENERATED NOISE

All ductwork elements will contribute to regenerated noise within ductwork. Attenuators, dampers, vanes will disrupt the airflow and generate noise within the ductwork and should therefore be kept to a minimum. Air systems should therefore be naturally balanced.

The air speed within each system zone should be selected to limit regenerated noise levels as follows:

Room Type	Maximum airspeed (m/s)
Main branches from plant up to and including primary silencer	10
First split from header duct	8
NR 35 room at terminal	2.5
NR 30 or less	1.5

All ducts should be sized to achieve these levels.

Terminal elements such as grilles should be selected that will enable the required background noise level criterion within rooms to be met.

8.4.3.5 DUCTWORK SUPPORT

Ducts should be resiliently supported to ensure no vibration transfer occurs into the building structure. Normally, it is sufficient to resiliently support ductwork within plantrooms up to and including the primary attenuator.

8.4.3.6 PENETRATIONS

Ducts passing through structures should be acoustically sealed within the structure.

Holes for ducts should be cut slightly larger than the size of duct and the inside surface smoothly finished. The space between the duct and structure should be packed with mineral wool and then faced on each side with plasterboard or similar.

8.4.3.7 PIPING AND VELOCITIES

There are four primary acoustical concerns with piping systems.

- Excessive water flows and pressures causing high levels of broadband noise.
- Inadequate vibration isolation for noise and vibration from pipes and pumps.
- Unsealed penetrations through sound rated walls and slabs.
- Undersized valves or their actuators causing cavitation, chatter or whistle.

Good space planning is imperative. Plumbing should be kept away from critical spaces as much as possible and vibration isolation should be used to ensure no rigid contact between piping and surrounding structures or walls. The table below gives recommended maximum water flow velocities for piping systems.

Nominal pipe size (mm)	Maximum water flow velocity (m/s)
25	1.0
50	1.3
75	1.7
100	1.8
150	2.4
200	2.7
300 or more	3.0

Cast iron pipe should be used for waste/drain lines in preference to PVC piping. Where cast iron pipe is not possible, pipe lagging may be required. Maximum water pressure should be regulated to 3.5 kg/cm^2 in main risers and lines, and to 2.5 kg/cm^2 in distribution branches.

BREEAM

8.5.1 POL 05 AND HEA 05 838

8.5

8.5.1 POL 05 and HEA 05

8.5.1.1 POL 05

Refer to standalone BREEAM report for full details.

One credit can be achieved by carrying out a noise impact assessment in accordance with BS 4142:2014 assessment.

The noise level from the assessed building, when measured at the locality of the nearest noise sensitive development must be at least 5dB lower than the background noise throughout the day and night.

If the noise sources from the assessed building are greater than 5dB below the existing background noise then suitable measures to attenuate the noise at the source should be implemented.

The requirement for planning is the same requirement for BREEAM Pol 05 as detailed below;

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 dB(L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location".

All external plant has been designed to these target levels as a requirement for planning and therefore the BREEAM credit can be awarded.

8.5.1.2 HEA 05

It is envisaged that 3 BREEAM credits will be targeted for HEA 05.

Credit 1 - sound insulation

Credit 2 - Indoor ambient noise levels

Credit 3 - Room acoustics

Sound insulation, indoor ambient noise and reverberation times will all be designed in accordance with the guidelines in BS 8233.

Credit 1 - Sound insulation

One credit can be awarded where the sound insulation between rooms and other occupied areas complies with the performance criteria given in section 7 (Table 3) of BS 8233:2014.

Comparison of the design targets and criteria demonstrate that the BS8233 design targets are satisfied.

Credit 2 - Indoor ambient noise levels

One credit can be awarded where the indoor ambient noise levels comply with the design ranges given in section 7 (Table 6) of BS 8233:2014.

Based on the environmental noise levels provided in the Environmental Noise section, the proposed building envelope and the target noise ratings the internal ambient noises are to achieve those specified.

Credit 3 - Room acoustics

One credit can be awarded where the requirements relating to sound absorption and reverberation times, where applicable, set out in section 7 of BS 8233:2014 are achieved.

BS8233 does not provide any specific target values for reverberation time, however in spaces where speech is important (meeting rooms etc.) a Class C ceiling has been specified. The arena bowl is a specific case and is discussed in the bowl acoustic section of this report.

In this instance specific requirements are applicable to the medical rooms within the building, which as specified in BREEAM are required to be designed in accordance with the criteria in HTM 08-01. This criterion is as follows:

Acoustically-absorbent materials should have a minimum absorption area equivalent to a Class C absorber (as defined in BS EN ISO

Source Space	Privacy Requirement	Activity Noise Source Room	Design airborne sound insulation R_w	Receiver Space	Sensitivity of Receiver Space	Required criteria $D_{nt,w}$ according to 8233	Nominal Criteria Sound Reduction Index R_w
Changing/training/locker rooms	Moderate	High	50	Changing rooms	Medium	42	49
Auditorium/press conference	Moderate	Typical	55	Concourse	Low	47	54
Studios/production rooms Meeting rooms	Confidential	Typical	60 55	Meeting room	Medium	52 47	59 54
Cellular offices Open plan offices	Moderate	Typical	45 45	Concourse	Low	37 37	44 44
Cafes/restaurants VIP restaurants	Moderate	typical	45 55	Kitchen	Medium	37 47	44 54
Kitchens Toilets	Not private	High Typical	50 45	Restaurant	Medium	42 37	49 44
Retail	Not Private	High	45	Concourse	Low	37	44
VIP lounges/green rooms VIP boxes	Moderate	High	55 55	VIP box	Medium	47 47	54 54
Venue management/control rooms Medical/physio areas	Confidential	Typical	55 55	Concourse	Low	47 47	54 54
Plant areas	Not private	To not exceed adjacent internal noise level					

HEA 05 CREDIT 1 COMPLIANCE

11654:1997) covering at least 80% of the area of the floor, in addition to the absorption that may be provided by the building materials normally used. If a Class A or B absorbent material is used, less surface area is needed. (See Appendix B for an example of how to calculate the absorption area required for materials with different absorption class).

The acoustic requirement drawings indicate that these spaces have been specified to have Class C absorption covering 80% of equivalent floor area.

8.5.1.3 TESTING

A programme of pre-completion acoustic testing should be carried out by a compliant test body in accordance with the acoustic testing and measurement procedures described in BREEAM.

Item	Credit	Design Stage Compliance Demonstrated
HEA 05	Credit 1: Sound Insulation	✓
	Credit 2: Indoor Ambient Noise Levels	✓
	Credit 3: Reverberation Time	✓
POL 05	Credit 1	✓

SOUND SYSTEMS

8.6.1 PUBLIC ADDRESS AND VOICE ALARM 842
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8.6.3 PAVA RACKS AND CONTROL LOCATIONS 844
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8.6

8.6.1 Public Address And Voice Alarm

8.6.1.1 INTRODUCTION

The bowl sound system shall be designed to provide the high quality of sound reproduction intended for sports events and foreground music. The audio system must also be suitable for integrating as a concert delay system.

The production audio system shall be able to provide as a minimum the following system performance values:

- An average 0.60 STI (unoccupied, all zones active) over minimum 95% of the audience area with a minimum speech transmission index (STI) of 0.50.

- Target SPL (Continuous 120 seconds Pink Noise) Total Sound 105dBA for 95% of bowl seating areas.

- Target SPL (Continuous 120 seconds Pink Noise) Total Sound 103dBA for 90% of bowl floor areas.

- Evenness of coverage ± 3 dB over minimum 95% audience area;

- Frequency response minimum 80 Hz – 18 kHz (-6dB)

The sound system shall be designed with audio source priorities so that any non-emergency sound systems used at the venue will be interrupted by safety announcements made over the PAVA system.

A concert mixing console shall be provided in the Production Control Room. An additional facility shall be provided in the Event Control Room, with an opening window to the arena bowl.

The back of house PAVA systems shall be designed to be fully compliant with BS 5839, with an uplift in performance in hospitality and VIP areas.

Refer to BRA-VAN-ZZ-ZZ-SP-YA-9008 for full PAVA specification.

8.6.1.2 ELECTROACOUSTIC MODELLING

The electro-acoustic design and room acoustics for major/complex areas within the venue shall be modelled with proprietary computer software using hybrid ray-tracing techniques.

Electro-acoustic modelling has been carried out for complex spaces (bowl and atrium).

Climatic conditions must be inputted.

It is important any changes to the sound system design are fully coordinated with the acoustic design.

8.6.1.3 LOUDSPEAKERS

Loudspeakers shall be selected on their ability to produce intelligible results over their aesthetic considerations.

Loudspeaker emissions shall not be compromised by the following surroundings

- Enclosures with insufficient volume and/or absorption
- Grilles with insufficient open-air holes
- Coves and/or drop ceilings obstructing loudspeaker radiation patterns

Proposed back of house loudspeakers are as detailed in the table below.

Reference	Type	Freq Response	Weight	Dimensions (L x D or W x L x H)
C1	Bosch LBC 3086/41 Ceiling Loudspeaker	90Hz - 20KHz	1.3Kg	70 x 216 mm
C2	Yamaha VXC8-VA Premium Ceiling Loudspeaker	55Hz - 20KHz	6.6Kg	295 x 325 mm
H1	Bosch LBC 3482/00 Horn Loudspeaker	550Hz - 5KHz	3.6Kg	425 x 355 mm
S1	Bosch LB1-UM06E-1 Metal Cabinet Loudspeaker	160Hz - 20KHz	1.2Kg	105 x 199 mm
S2	Yamaha VXS8-VA Premium Cabinet Loudspeaker	51Hz- 20KHz	8.2Kg	278 x 239 x 430 mm
S3	Bosch LP1-BC10E-1 Bi-directional Sound Projector	75Hz - 20KHz	3Kg	297 x 185 mm
S4	Yamaha VXS5-VA Premium Cabinet Loudspeaker	80Hz - 20KHz	3.6Kg	176 x 163 x 280 mm
P1				

8.6.1.4 CONTROL ROOM/ RACK ROOM

Rack room locations have been provided in the following areas.

- 3no. Level 02 (Equipment & UPS)
- 1no. Level 04 (UPS Only)
- 4no. Gantry Racks (Equipment Only)

Rack room space has been coordinated as indicated on BRA-VAN-ZZ-ZZ-DR-YA-3007.

Rack rooms will require temperature and ventilation management. The rack rooms shall only be accessible by authorised personnel.

There shall be two control points in the arena. The primary control point shall be located in the Event Control Room on Level 04. The secondary control point shall be located on the ground floor, at the muster point where the fire and police service would enter the building and set up their control point.

The announcers microphone position should be located in an acoustic booth to minimise noise ingress to the system.

The production audio shall be controlled from the Production Control Room located adjacent to the Event Control Room.

Audio tielines shall be provided from a courtside location to the Production Control Room for sports production inputs

8.6.1.5 SYSTEM INPUT/OUTPUT

It may be necessary to allow the audio output to be used in broadcast applications. The system will be designed to necessary broadcast standards.

It is proposed that touring systems make use of the in house delays systems and underbalcony fill to ensure the optimum coverage throughout the arena.

8.6.1.6 DRAWINGS

Refer to the drawings indicated in the following tables for :

- PAVA zoning layouts

Drawing Title	Drawing Number
PAVA Zones Level 00	BRA-VAN-ZZ-00-DR-YA-2000
PAVA Zones Level 01	BRA-VAN-ZZ-01-DR-YA-2001
PAVA Zones Level 02	BRA-VAN-ZZ-02-DR-YA-2002
PAVA Zones Level 03	BRA-VAN-ZZ-03-DR-YA-2003
PAVA Zones Level 04	BRA-VAN-ZZ-04-DR-YA-2004
PAVA Zones Level 05	BRA-VAN-ZZ-05-DR-YA-2005
PAVA Bowl Zones	BRA-VAN-ZZ-ZZ-DR-YA-2006

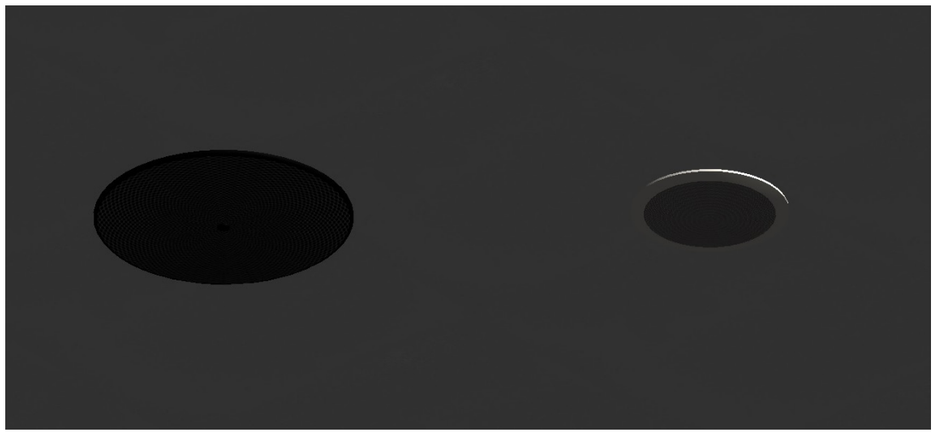
- PAVA equipment layouts

Drawing Title	Drawing Number
PAVA equipment layout Level 00	BRA-VAN-ZZ-00-DR-YA-3000
PAVA equipment layout Level 01	BRA-VAN-ZZ-01-DR-YA-3001
PAVA equipment layout Level 02	BRA-VAN-ZZ-02-DR-YA-3002
PAVA equipment layout Level 03	BRA-VAN-ZZ-03-DR-YA-3003
PAVA equipment layout Level 04	BRA-VAN-ZZ-04-DR-YA-3004
PAVA equipment layout Level 05	BRA-VAN-ZZ-05-DR-YA-3005
PAVA Bowl equipment layout	BRA-VAN-ZZ-ZZ-DR-YA-3006

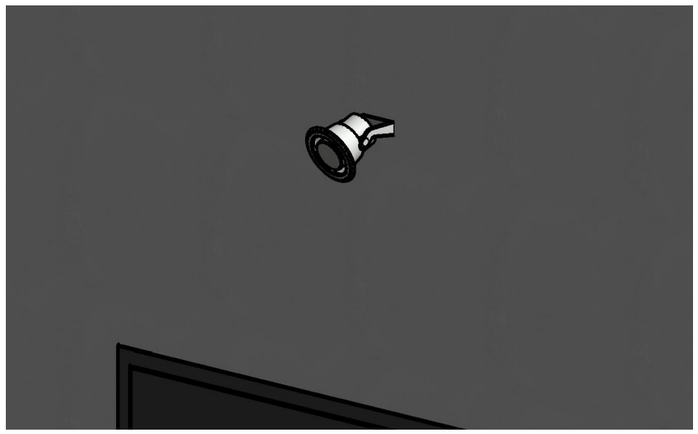
- PAVA Schematics

Drawing Title	Drawing Number
PAVA system schematic	BRA-VAN-ZZ-ZZ-DR-YA-6000
PAVA network schematic	BRA-VAN-ZZ-ZZ-DR-YA-60007

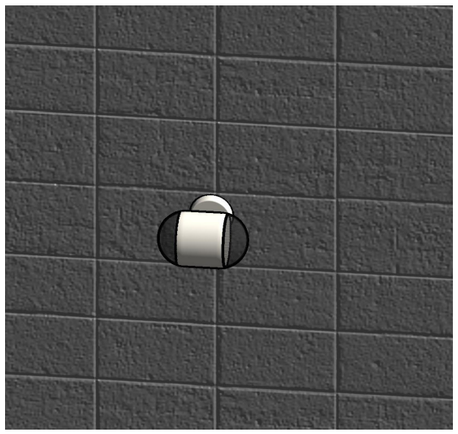
8.6.2 Loudspeaker Types



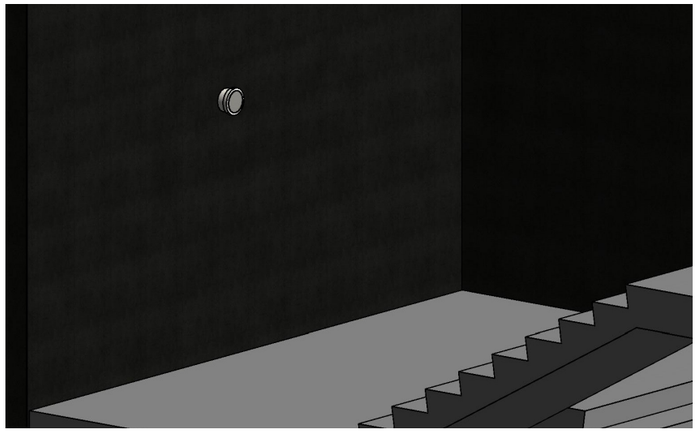
TYPE C2 and C1 loudspeakers



TYPE H1 loudspeaker



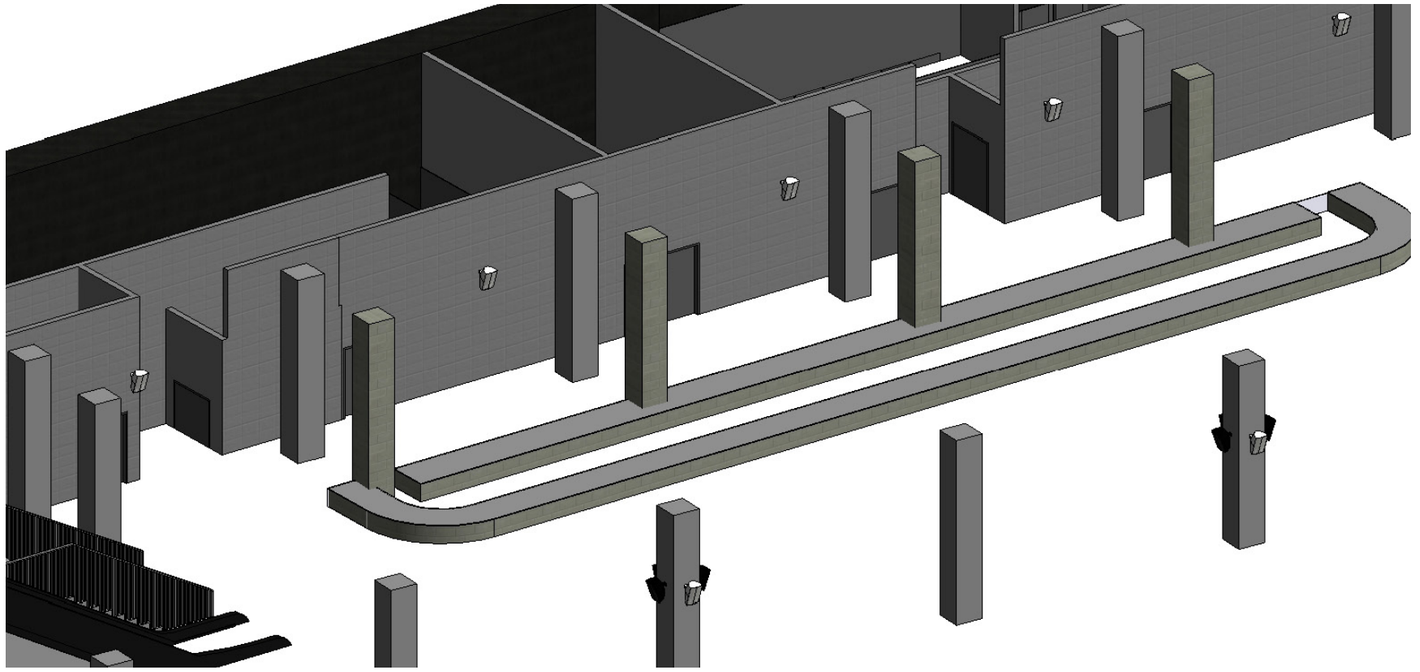
TYPE S3 loudspeaker



TYPE S1 loudspeaker

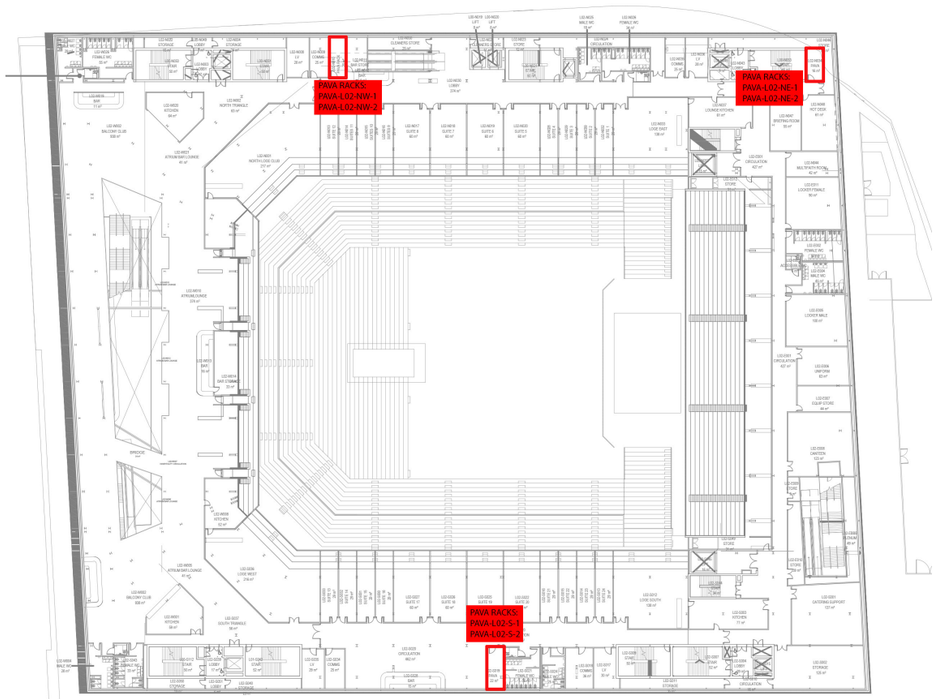


TYPE S4 (external) loudspeakers

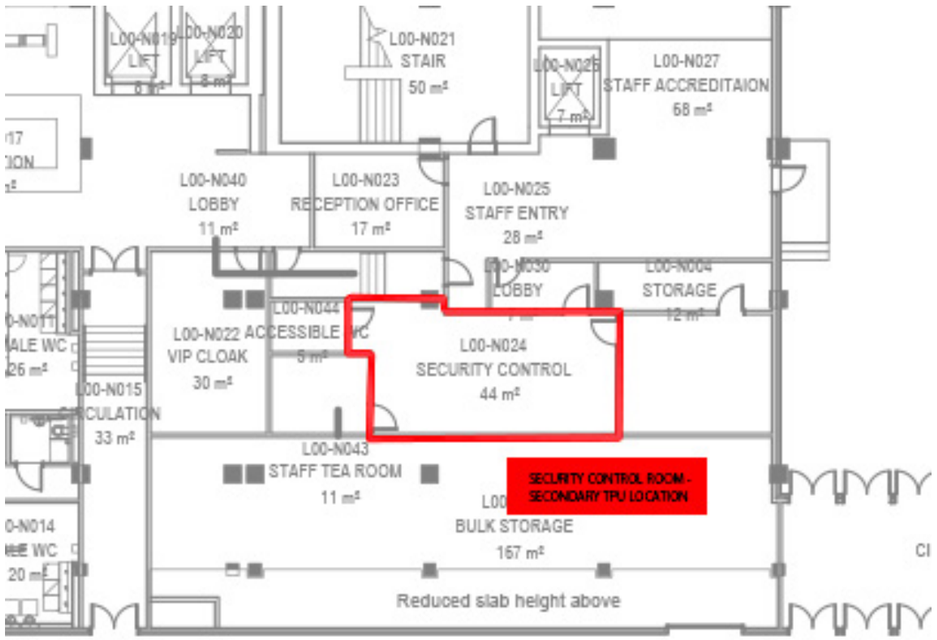


TYPE S2 loudspeakers

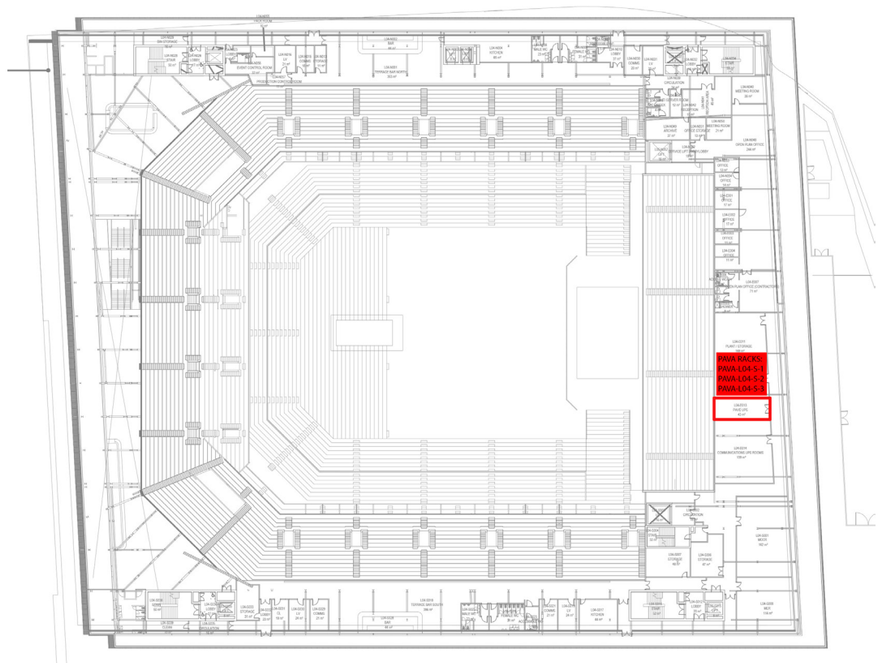
8.6.3 Pava Racks And Control Locations



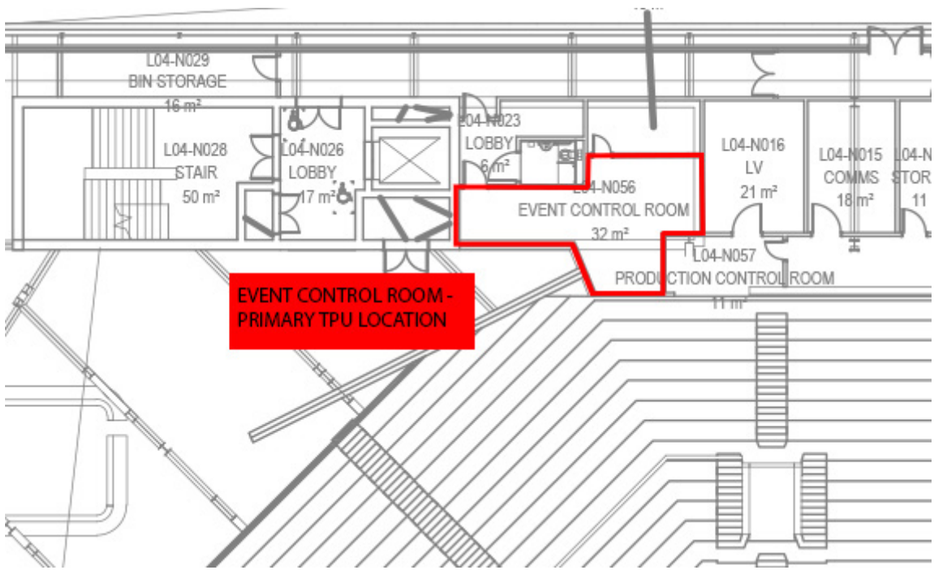
LEVEL 02 PAVA RACKS



SECURITY CONTROL TPU LOCATION

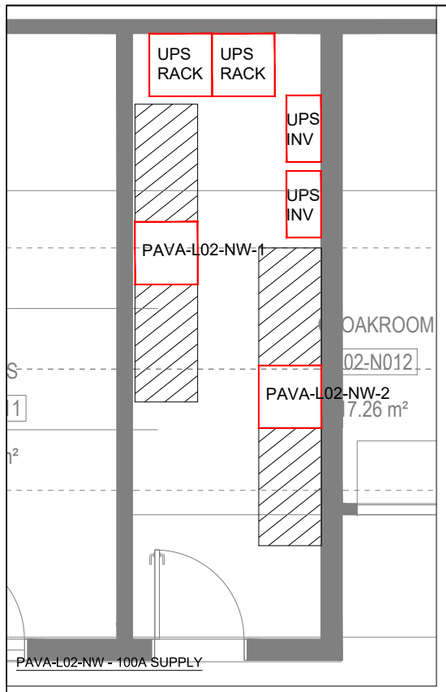


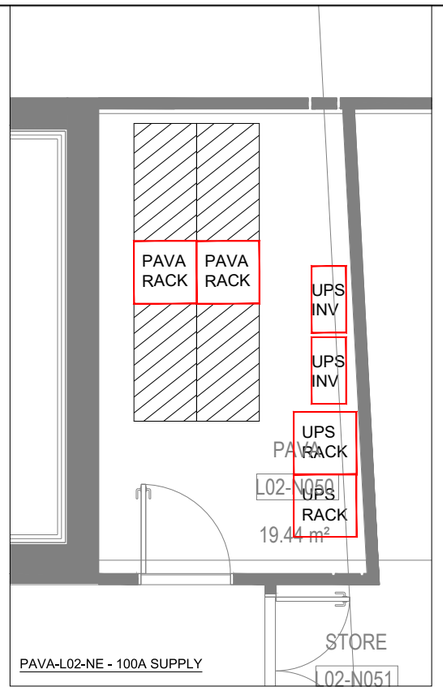
LEVEL 04 PAVA RACKS

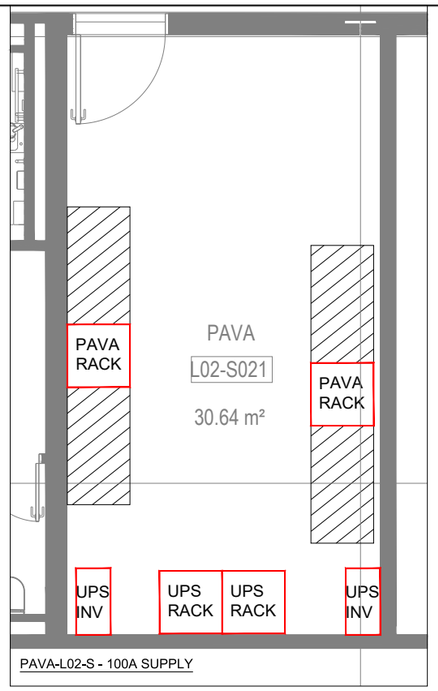


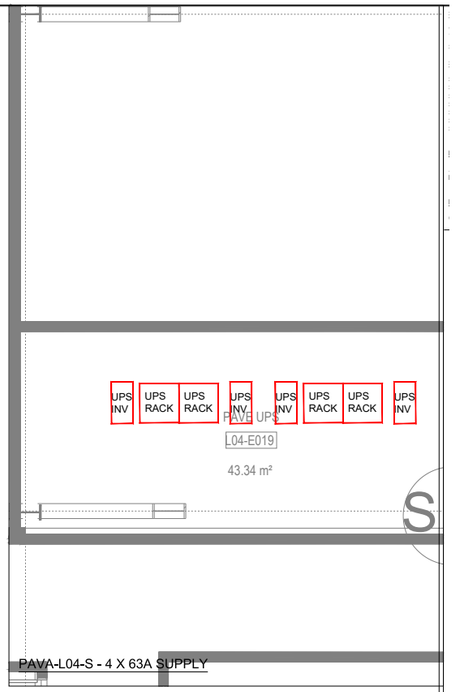
EVENT CONTROL TPU LOCATION

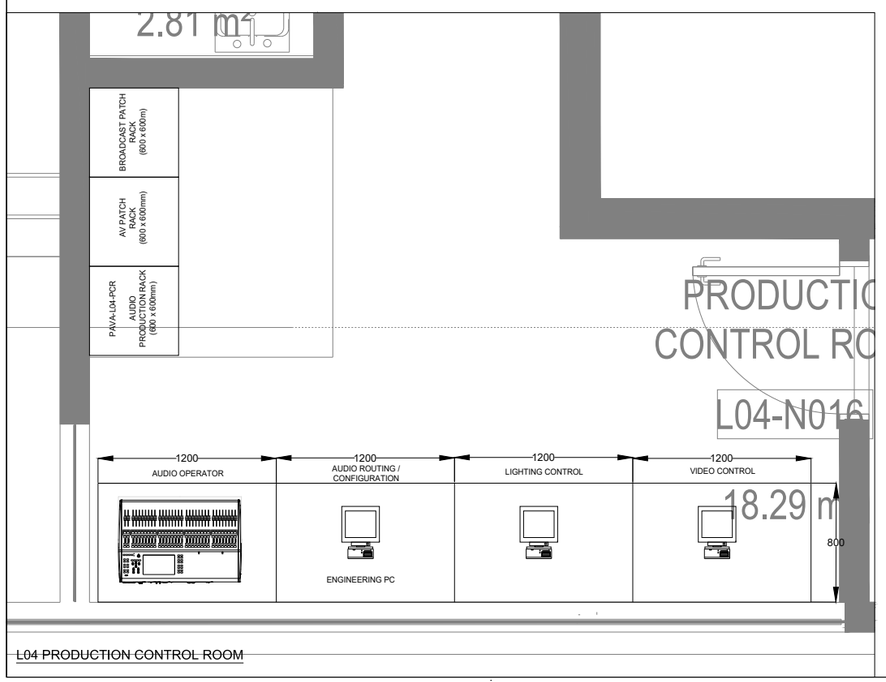
8.6.4 Pava Racks And Control Locations

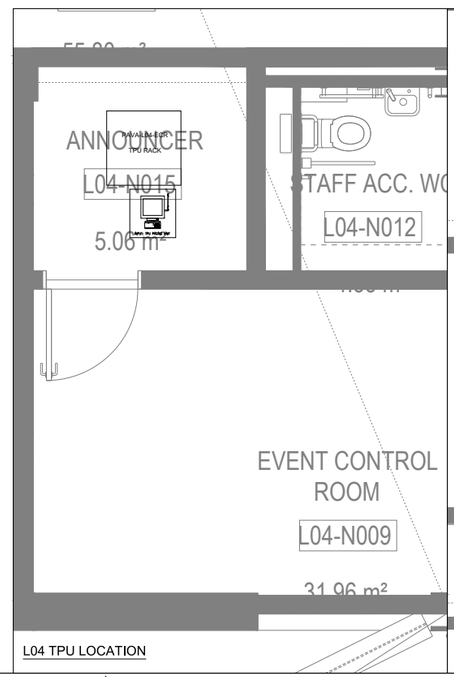


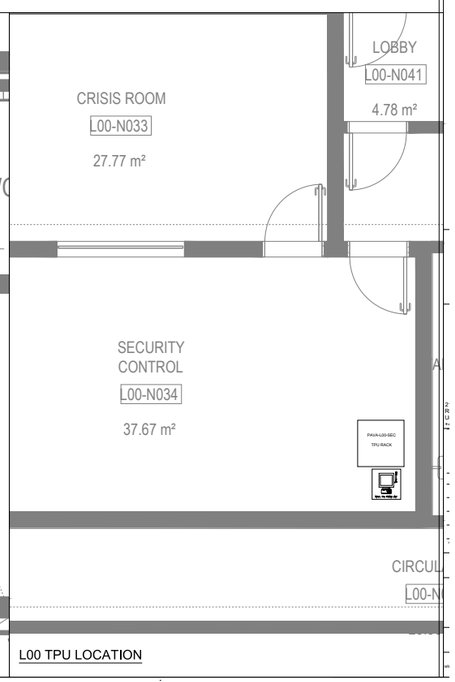












8.6.5 Bowl Sound System

The bowl sound system design provides bowl audio for PAVA and sports events. Upper tier delay loudspeakers can be implemented by touring artists to provide coverage to the rear upper tiers.

The bowl zone can provide independent upper and lower tier zoning and loudspeaker locations have been coordinated with the acoustic treatment locations and rigging grid.

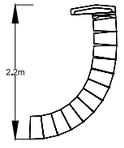
Additional loudspeakers are provided to provide coverage to the arena floor.

LOUDSPEAKER TO NORTH, SOUTH AND WEST TIERS

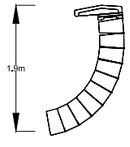
LOUDSPEAKER TO EAST TIER

LOUDSPEAKER TO FLOOR

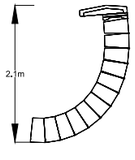
TYPE 1
12 x JBL VTX A8



TYPE 2
10 x JBL VTX A8



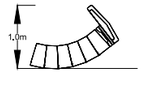
TYPE 3
12 x JBL VTX A8



TYPE 6
1 x JBL AC16

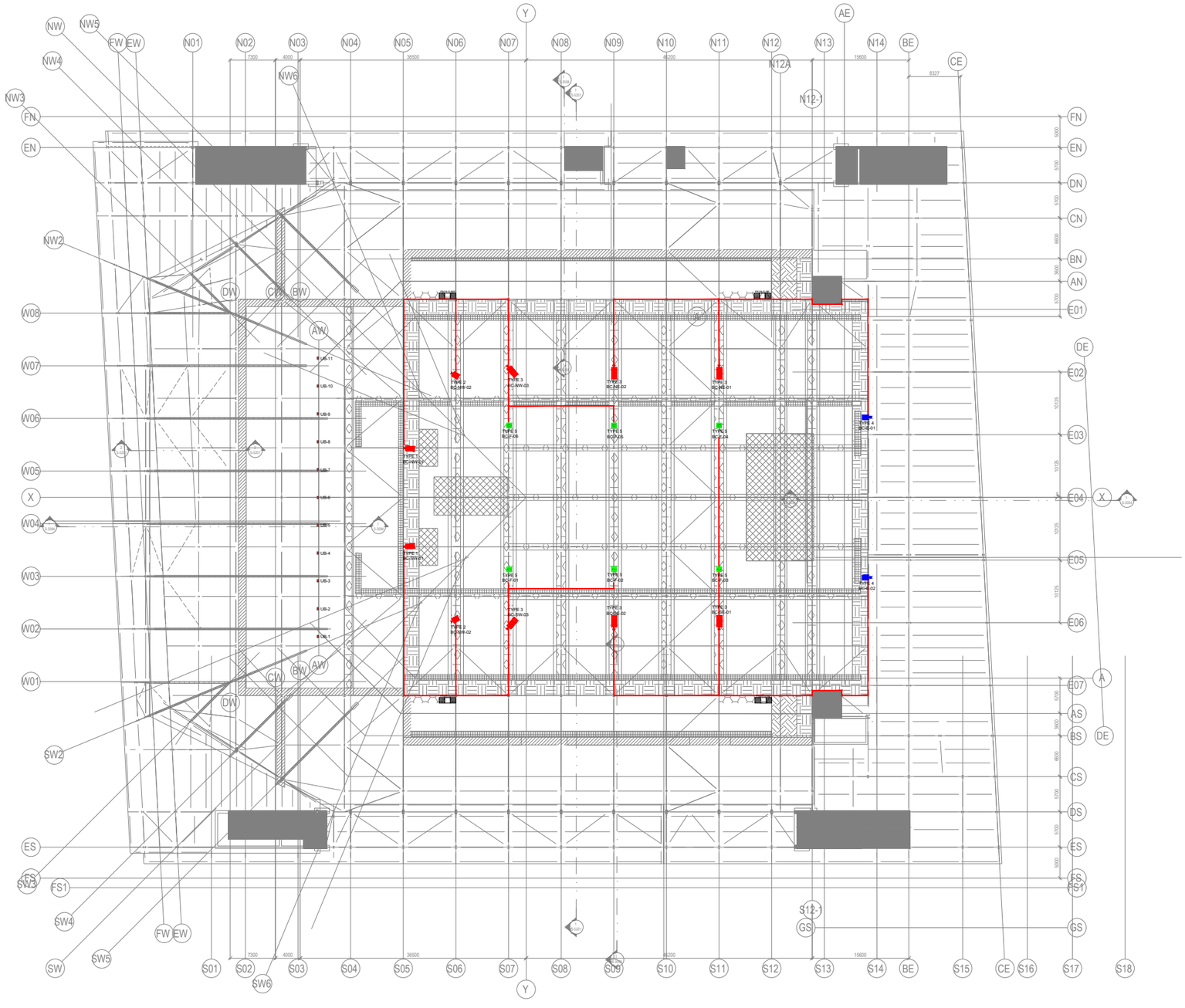


TYPE 4
6 x JBL VTX A8



TYPE 5
1 x JBL PD 6322

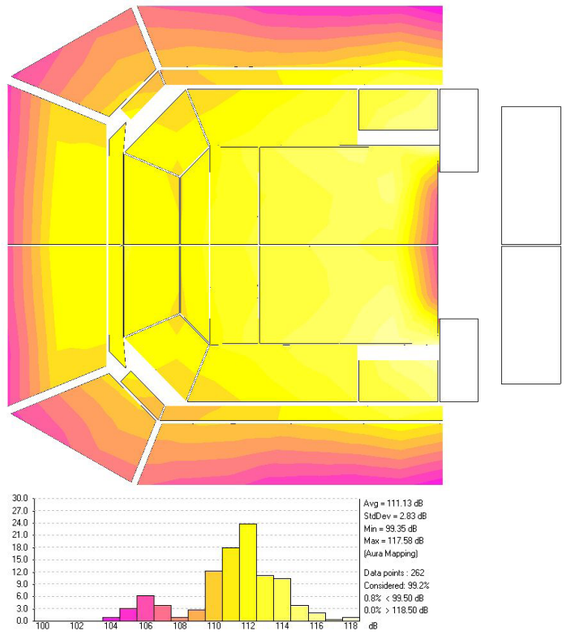




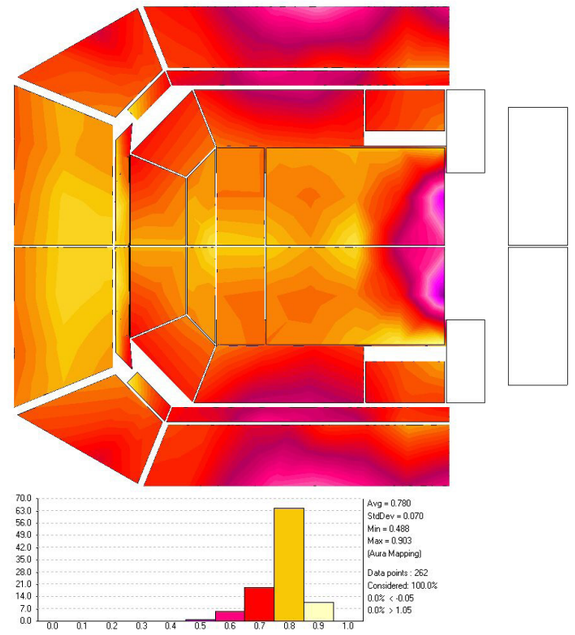
BOWL PAVA LOCATIONS

8.6.6 Bowl Coverage

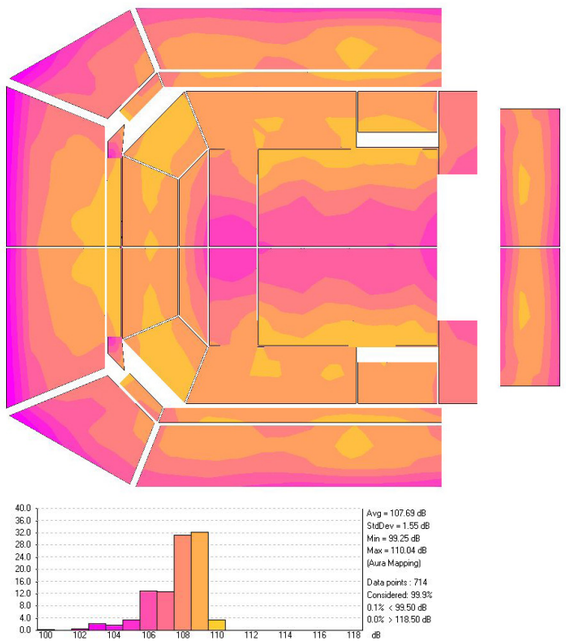
CONCERT SPL, dB(A) (END STAGE OVERLAY + IN HOUSE DELAYS)



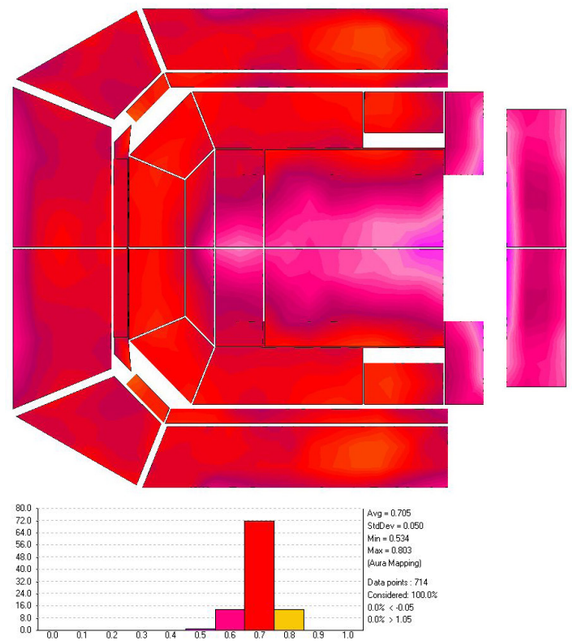
CONCERT STI (END STAGE OVERLAY + IN HOUSE DELAYS)



PAVA / SPORTS SPL, dB(A)



PAVA / SPORTS STI



8.6.7 Bowl Loudspeaker Clusters

CLUSTER TYPE 1

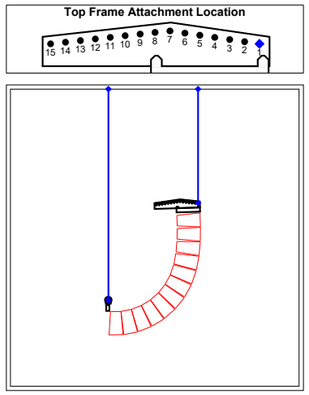
Array Statistics		Array Weight		Array Frame		Other	
Number of Boxes:	12	**Array Weight:**	387	**Array Frame Type:**	A8-AF	**Extension Bar:**	None
Total Array Size:	2.2 m	**Front Point Load:**	249	**Number of Points:**	Dual	**Extension Bar Position:**	A
Total Array Depth:	1.48 m	**Rear Point Load:**	138	**Front Attachment Point:**	1	**Pull Back Type:**	A8-SB
Elevation Top:	25.2 m	**Attachment Span:**	1.45 m	**Rear Attachment Point:**	A8-SB		
Elevation Bottom:	23 m			**Array Frame Orientation:**	Normal		

Box #	Type	Actual Angle	Pin Position
1	A8	2	4
2	A8	-1	3
3	A8	-5	4
4	A8	-11	6
5	A8	-19	8
6	A8	-29	10
7	A8	-39	10
8	A8	-49	10
9	A8	-59	10
10	A8	-69	10
11	A8	-79	10
12	A8	-89	10

Wiring Layout



Array Overview



Double - point suspension with even load distribution on array frame is recommended for minimized risk. ANSI Standard E1.8-2005
(LOUDSPEAKER ENCLOSURES INTENDED FOR OVERHEAD SUSPENSION), Section 5.3.4 specifies minimum 5:1 design factor. Consult a qualified rigger.

CLUSTER TYPE 2

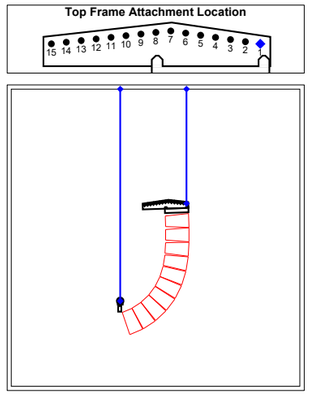
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Number of Boxes:	10	**Array Weight:**	327	**Array Frame Type:**	A8-AF	**Extension Bar:**	None
Total Array Size:	2.18 m	**Front Point Load:**	218	**Number of Points:**	Dual	**Extension Bar Position:**	A
Total Array Depth:	1.07 m	**Rear Point Load:**	109	**Front Attachment Point:**	1	**Pull Back Type:**	A8-SB
Elevation Top:	25.2 m	**Attachment Span:**	1.07 m	**Rear Attachment Point:**	A8-SB		
Elevation Bottom:	23.1 m			**Array Frame Orientation:**	Normal		

Box #	Type	Actual Angle	Pin Position
1	A8	2	4
2	A8	0	2
3	A8	-3	3
4	A8	-9	6
5	A8	-17	8
6	A8	-27	10
7	A8	-37	10
8	A8	-47	10
9	A8	-57	10
10	A8	-67	10

Wiring Layout



Array Overview



Double - point suspension with even load distribution on array frame is recommended for minimized risk. ANSI Standard E1.8-2005
(LOUDSPEAKER ENCLOSURES INTENDED FOR OVERHEAD SUSPENSION), Section 5.3.4 specifies minimum 5:1 design factor. Consult a qualified rigger.

CLUSTER TYPE 3

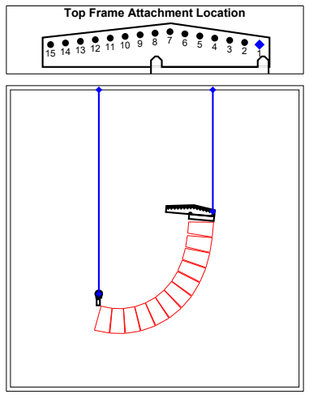
Array Statistics		Array Weight		Array Frame		Other	
Number of Boxes:	12	**Array Weight:**	387	**Array Frame Type:**	A8-AF	**Extension Bar:**	None
Total Array Size:	1.89 m	**Front Point Load:**	227	**Number of Points:**	Dual	**Extension Bar Position:**	A
Total Array Depth:	1.82 m	**Rear Point Load:**	160	**Front Attachment Point:**	1	**Pull Back Type:**	A8-SB
Elevation Top:	25.2 m	**Attachment Span:**	1.72 m	**Rear Attachment Point:**	A8-SB		
Elevation Bottom:	23.3 m			**Array Frame Orientation:**	Normal		

Box #	Type	Actual Angle	Pin Position
1	A8	-5.00	4
2	A8	-9.00	4
3	A8	-15.00	6
4	A8	-23.00	8
5	A8	-31.00	8
6	A8	-41.00	10
7	A8	-51.00	10
8	A8	-61.00	10
9	A8	-71	10
10	A8	-81	10
11	A8	-91	10
12	A8	-101	10

Wiring Layout



Array Overview



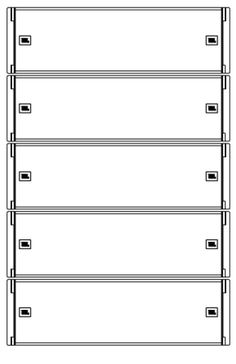
Double - point suspension with even load distribution on array frame is recommended for minimized risk. ANSI Standard E1.8-2005
(LOUDSPEAKER ENCLOSURES INTENDED FOR OVERHEAD SUSPENSION), Section 5.3.4 specifies minimum 5:1 design factor. Consult a qualified rigger.

CLUSTER TYPE 4

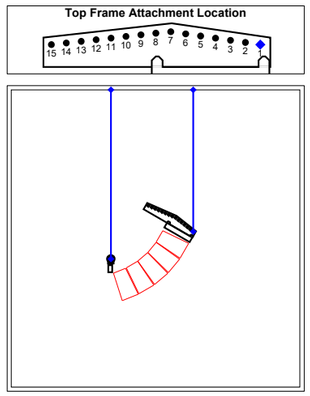
Array Statistics		Array Weight		Array Frame		Other	
Number of Boxes:	5	**Array Weight:**	177	**Array Frame Type:**	A8-AF	**Extension Bar:**	None
Total Array Size:	1.27 m	**Front Point Load:**	90	**Number of Points:**	Dual	**Extension Bar Position:**	A
Total Array Depth:	1.1 m	**Rear Point Load:**	87	**Front Attachment Point:**	1	**Pull Back Type:**	A8-SB
Elevation Top:	25.4 m	**Attachment Span:**	1.07 m	**Rear Attachment Point:**	A8-SB		
Elevation Bottom:	24.3 m			**Array Frame Orientation:**	Normal		

Box #	Type	Actual Angle	Pin Position
1	A8	-30	4
2	A8	-40	10
3	A8	-50	10
4	A8	-60	10
5	A8	-68	8

Wiring Layout



Array Overview



Double - point suspension with even load distribution on array frame is recommended for minimized risk. ANSI Standard E1.8-2005
(LOUDSPEAKER ENCLOSURES INTENDED FOR OVERHEAD SUSPENSION), Section 5.3.4 specifies minimum 5:1 design factor. Consult a qualified rigger.

8.6.8 Construction Design And Management Regulations

8.6.8.1 RESPONSIBILITIES

Under the CDM regulations 2015 the designer shall ensure that any risks are reduced during construction and operation of the building.

The music and entertainment industries are unique in that high noise levels are essential elements to the success of an event. Loud sound can cause temporary or permanent damage to the hearing and measures to reduce the risk should be implemented as far as practically possible.

For further information refer to HSE Sound Advice - Control of noise at work in music and entertainment.

8.6.8.2 THE NOISE REGULATIONS

The Control of Noise at Work Regulations 2005 (the Noise Regulations) require employers to prevent or reduce risks to health and safety from exposure to noise at work, so far as is reasonably practicable. Employees have duties under the

Noise Regulations too. The Regulations specify the minimum requirements for the protection of workers from the risks to their health and safety arising, or likely to arise, from exposure to noise at work.

The Noise Regulations require employers to take specific action at certain action values. These relate to:

- the levels of exposure to noise of employees averaged over a working day or week; and
- the maximum noise (peak sound pressure) to which employees are exposed in a working day.

The values are:

Lower exposure action values (LEAV):

- daily or weekly exposure of 80 dB;
- peak sound pressure of 135 dB;
- upper exposure action values (UEAV):
- daily or weekly exposure of 85 dB;
- peak sound pressure of 137 dB.

There are also levels of noise exposure which must not be exceeded (but take account of any reduction in exposure provided by hearing protection):

exposure limit values (ELV):

- daily or weekly exposure of 87 dB;
- peak sound pressure of 140 dB.

The primary responsibility for complying with the Noise Regulations rests with the employer. Employers in the music and entertainment sectors may include, for example, concert promoters, event organisers, theatrical producers, contractors and publicans. Employers must:

- assess the risks to employees from noise at work;
- take action to reduce the noise exposure that produces those risks;
- provide employees with hearing protection if the noise exposure cannot be
- reduced enough by using other methods;
- make sure the legal limits on noise exposure are not exceeded;
- provide employees with information, instruction and training. It is important that employees understand that the Noise Regulations also apply to them;
- carry out health surveillance where there is a risk to health.

To help meet the requirements of the Noise Regulations employers are advised to;

- consult with their staff and with employee or safety representatives where they exist;
- ensure their documented health and safety policy makes clear the specific
- noise responsibilities of staff from senior management downwards;
- ensure their health and safety policy specifies the arrangements for managing noise risk assessments and controlling the risk;
- communicate this policy to their staff, management colleagues and boards and trustees.

8.6.8.3 NOISE RISK ASSESSMENT

During events and sound checks in the arena bowl, noise levels in excess of 100dB(A) are expected. This limits the time in which an employee can spend time in the arena bowl to less than 15 minutes before the upper exposure action value is exceeded.

The bowl area is to be clearly signed as a hearing protection zone (HPZ) where hearing protection is mandatory to staff. Disposable hearing protection shall be available at all staff entry points to the arena.

Where staff are required to communicate compressible earplugs might not be suitable and uniform attenuation earplugs may be required.

The L00 bars in the arena have been located as far as possible from the stage to minimise noise levels for bar staff.

Acoustically absorbent panels have been used throughout the venue which minimises any indirect noise.

Employers should provide protection that reduces the noise exposure to below 85dB. For workers in the arena this relates to hearing protection that provides an SNR of greater than 30dB.

Training should promote the use of hearing protection and management should ensure it is properly used.

AUDIO VISUAL & BROADCAST

8.7.1 AUDIO VISUAL SYSTEMS 852

8.7.2 BROADCAST 857

8.7

8.7.1 Audio Visual Systems

8.7.1.1 INTRODUCTION

The OVG Arena is primarily designed to host music concerts however it will also be able to accommodate sport and other event types.

Multiple audio-visual systems will be installed in the Arena to enhance visitor experience as well as support day to day Arena operations.

Broadcast permanent and overlay infrastructure will allow for TV production from outside broadcast vehicles parked in the broadcast compound or using an overlay production equipment setup on the field of play within the Arena.

8.7.1.2 AV INFRASTRUCTURE

The key element for the AV Production System will be the fibre tie-line infrastructure.

It will be used to connect the overlay event production apparatus located on L00 and patch it to the LED displays (both overlay and permanently installed) within the Arena.

The tie-line system will be terminated and presented on so called AV Connection Panels (AVCP). Based on the AVCP location and functionality there are six (6 No.) as shown overleaf.

Type A and Type C panels will be used for production crews for connecting video, audio, timing and scoring and other event related equipment on the field of play L00. There will be three panels in total, two Type A panels located in the middle of the floor on opposite sides and one located at the back of the floor, opposite the stage area.

Type C panel will be located in the stage area. It will be used for sending signals to and from the stage.

Type B and Type D panels will be installed on the upper levels around the Arena. They will be used mainly to receive signals from the production system and pass it on to the LED screens or IPTV system.

Type E and Type F panels will be installed in the Backstage Bar, Record Room and the Decibel Club. Their purpose is to send audio signals to and from the stage to the control position located in the bar area. Panels type E and F have no interconnectivity with the rest of the tie-line system. They provide local point to point connectivity within the room.

For AVCP panel locations refer to drawings 5007 – 5013 within the AV package.

All connections from AV panels Type A, B, C and D will terminate in the AV patch rack, located in the Media Control Room on level 04. Event operators will have to cross the signals as required.

Dedicated fibre tie lines will be provided between the AV patch rack and the Broadcast patch room.

Media converters will be provided as a part of the tie-line system, to allow sending and receiving specific signal formats.

8.7.1.3 PRODUCTION CONTROL ROOM

The Production Control Room will be provided within the Arena on level 04. It will be used to support event production.

The room will accommodate four (4 No.) technical operator positions:

- Audio Operator
- Audio Routing Configuration
- Lighting Control
- Video Control

Each technical position will have a desk space at least 1200mm wide and 800mm deep.

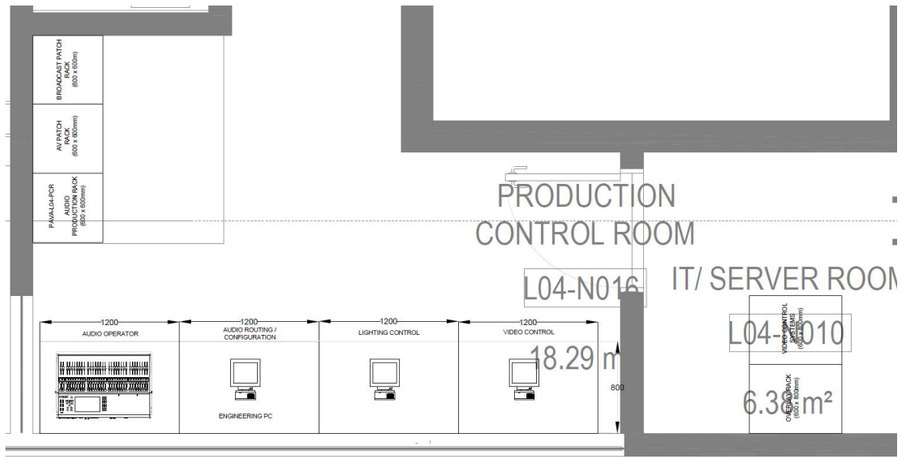
Three (3 No.) patch rack will be placed in the Production Control Room:

- Audio Production Rack
- AV Patch Rack
- Broadcast Patch Rack

All active equipment as well as overlay production equipment will be located in a dedicated rack room next to the Production Control Room.

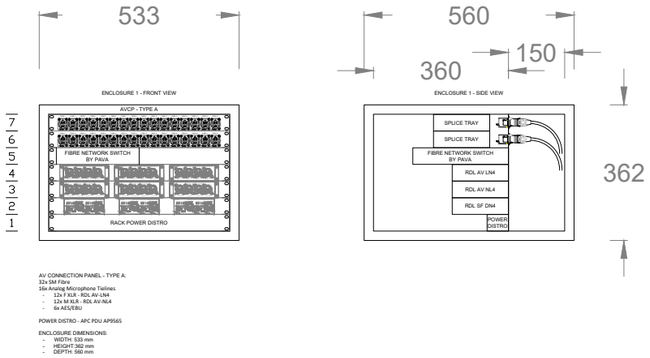
The PCR will have an operable window to allow the sound operator to hear the audio inside the Arena.

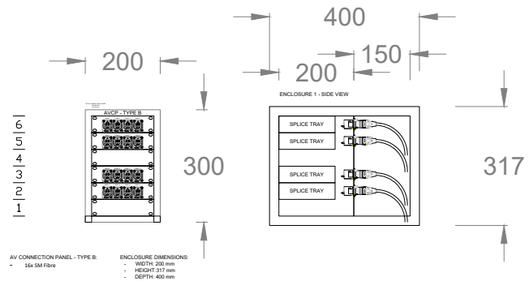
All systems installed in the PCR will be powered from the UPS.

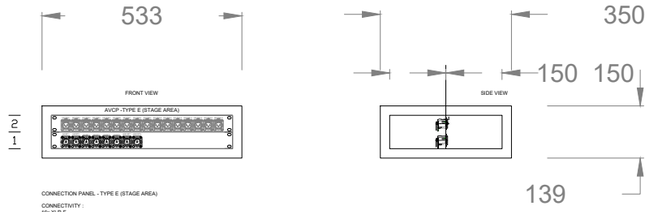


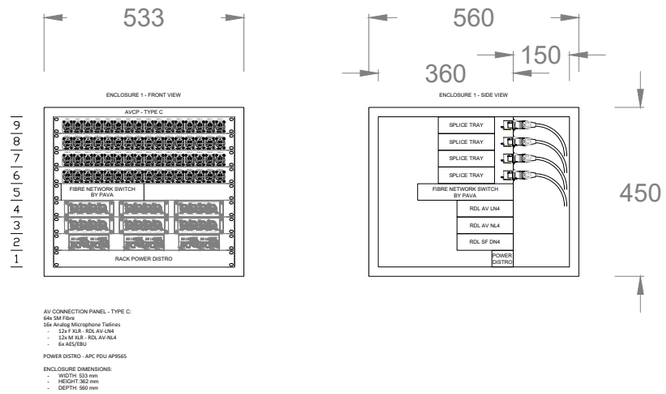
PRODUCTION CONTROL ROOM

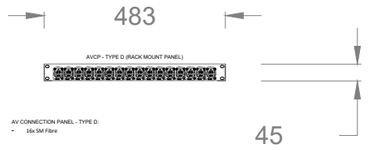
8.0 ACOUSTICS AV & BROADCAST

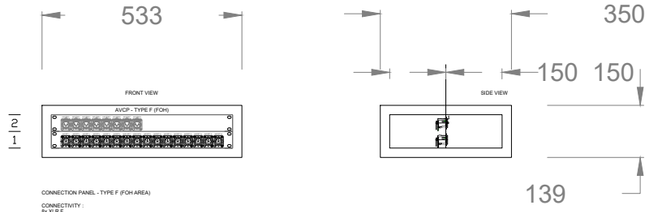












Connection	Type A	Type B	Type C	Type D	Type E	Type F
FIBRE	32	16	64	16	0	0
XLR – M	12	0	12	0	8	16
XLR – F	12	0	12	0	16	8
AES/EBU	6	0	6	0	0	0

AVCP TYPES

8.7.1.4 PRODUCTION CONTROL SYSTEM

The Production Control System will be used to control the video content displayed on permanently installed large format LED displays:

- Atrium LED display
- External façade displays
- Wayfinding Totem LED signs
- Wayfinding internal door LED signs.

The system does not provide means for video production required for live sport or music events. This will be achieved using overlay equipment, connected using the AV infrastructure (AV connection panel system).

The Production Control system will be based on a modular video matrix/video processor unit. It will be responsible for routing video sources to the designated locations. It will also provide video processing of the signals, including but not limited to scaling. The video matrix will be also capable of layered video composition of multiple video sources, including picture in picture.

The system will have the following inputs:

- 2x IPTV decoders
- 6x Local PCs – one PC will be dedicated to play the active wayfinding content.
- 8x Auxiliary video inputs
- The system will have the following outputs:
- 3x outputs to the Atrium LED screens
- 3x outputs to the External Façade LED screens – one output per LED screen
- 16x outputs to the active wayfinding totem LED screens – one output per LED screen
- 2x outputs to the active wayfinding door LED signs
- 2x multi viewer cards – used for video input and output signals monitoring

Local PCs will be installed with two graphics cards. Both cards will display the same signal. Output from one card will be connected to the video matrix and the output from the second graphics card will be connected to the KVM transmitter.

All PCs as well as the video matrix will be controlled from the Production Control Room. The operator will be able to access the PCs and the video matrix through the KVM system.

8.7.1.6 LARGE LED DISPLAYS ATRIUM

A large format (21.1m x 3.8m) LED wall will be installed in the Atrium. The LED pixel pitch will be 2.5mm.

8.7.1.5 GIANT SCREENS/ SCOREBOARDS – ARENA BOWL

Depending on the event, large format LED screens will be used as scoreboards or event related video production display. The LED screens will be provided as overlay equipment and positioned to meet the event requirements:

- For stage events the LED screens will be positioned on either side of the stage area

- For sport events the LED screens will be positioned either in the centre point above the field of play or on both ends of the field of play

In all configurations the LED screens will be clearly visible from every seating position.

Dedicated 63A 3P power outlets with local RCDs will be provided on the gantries above the field of play for the overlay LED screens. All sockets to be supported on UPS.

The LED wall aspect ratio is 48:9, which is three 16:9 images put side by side. This provides flexibility for content production.

On a day to day operations the content displayed on the Atrium LED display will originate from local PCs or IPTV/Digital Signage decoders installed as part of the Control Production system.

Auxiliary video inputs in the Production Control system will allow for patching and displaying content created by production teams operating the event in the Arena bowl.

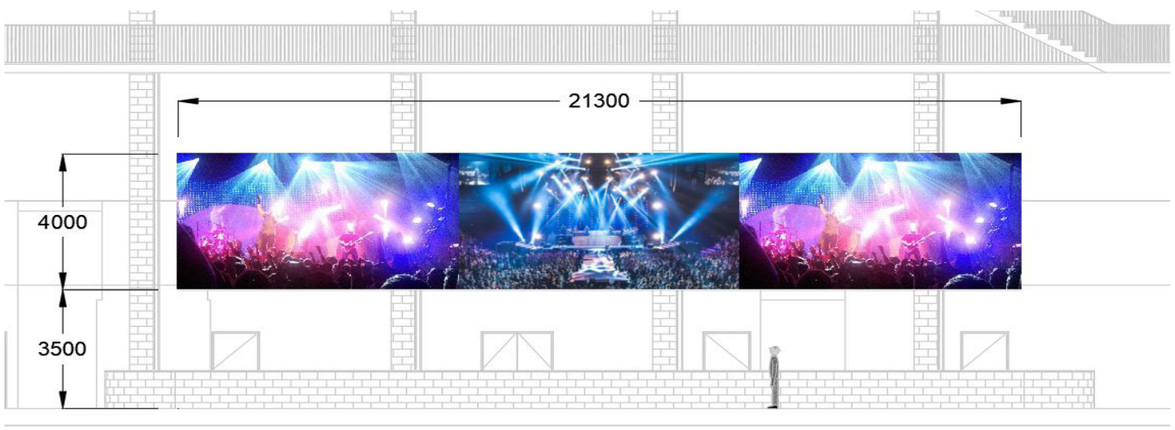
LED video controllers will be installed in a dedicated rack in a Comms room on level 01.

8.7.1.7 MID-TIER RIBBON LED DISPLAY

Mid-tier Ribbon LED display fibre infrastructure will be installed for any potential future upgrades.

Two AV connection panels will be provided with fibre connectivity linked to the Production Control Room for video signal distribution.

The Mid-tier Ribbon display will be approx. 215m x 0.6m. The recommended pixel pitch is 10mm.





8.7.1.8 EXTERNAL ACTIVATION AREA SCREENS

There is an ongoing study to find a suitable solution for the Activation Areas on the external building façade. Multiple design options have been presented.

The current design intent is based on installing a transparent LED video wall. For this purpose so called LED sticks will be used. A custom cut metal façade will be designed to be put on top of the LED screen. The façade will be perfectly aligned with the LED pucks as well as the gaps between the LED sticks. This will allow for the displayed image to be visible.

All LED screens will be installed on the top tier of the building – two on the southern side (south east and south west) and one on the west side (south west). Both screens in the south west corner will create one big screen covering the corner.

A lighting system will be installed behind the LED screen. In a situation where the LED screens are switched off the lights will shine through the screen. The lights will be installed around the whole building.

Two equipment racks with the LED controllers will be installed in the Comms rooms on L04. One rack will serve the LED screens in SW corner and one rack will serve the screens in SE corner.

8.7.1.9 WAYFINDING TOTEM LED SCREENS

There will be active Wayfinding Totem LED signs installed in the external areas of the building. Refer to the Wayfinding package for the Wayfinding Totem design details and locations.

Each Wayfinding Totem will have LED screens incorporated into the design. The screen dimensions are: 750mm wide x 1500mm high. Pixel pitch 3.9mm

There will be three (3 No.) Totem types depending on the number of the screens:

- 2x Totems with LED screens on four sides
- 2x Totems with LED screens on three sides
- 1x Totem with LED screens on two sides

The Wayfinding Totem LED screens content will be played from a dedicated PC installed as part of the Production Control System. It will be possible to display different content on each LED side of the Totem.

The video content will be distributed to the LED screens over the IPTV/DS platform.

8.7.1.10 WAYFINDING DOOR SIGN SCREENS

There will be two active Wayfinding Door LED signs – refer to the Wayfinding package for the design and location details.

The Wayfinding LED door sign dimensions will be: 3500mm wide x 500mm high. Pixel pitch 3.9mm.

The Wayfinding LED door sign screens content will be played from a dedicated PC installed as part of the Production Control System. It will be possible to display different content on each LED screen.

The video content will be distributed to the LED screens over the IPTV/DS platform.

8.7.1.11 IPTV/Digital Signage

There will be an IPTV/Digital Signage system installed across the Arena. The system will provide TV channels and digital signage content distribution using one platform.

The IPTV/Digital Signage system will be capable of streaming:

- 2 simultaneous SKY TV channels
- All free-view channels
- Multimedia content played from three local PCs
- Content from five (5 No.) auxiliary video inputs

Audio feeds from the SKY TV channels will be de embedded and sent to the PAVA system over Dante platform.

IPTV/Digital Signage head end equipment will be installed in the MER on L04. The rack room will accommodate three equipment racks and allow for front and rear access. The racks shall be in line with the IT rack strategy for cooling purposes. The racks will be forced air cooled and powered up by UPS.

Multiple displays will be installed in public areas around the Arena as part of the IPTV/Digital Signage system. The locations will include:

- Public areas
- Concessions and merchandise
- Boxes & Suites
- Bars

IPTV decoders will form part of the AV systems:

- Meeting rooms
- Briefing rooms
- Production Control System

Displays will be mounted in locations easy to be seen by a maximum number of spectators but not obstructing their movement around the venue.

IPTV/Digital Signage screen sizes have been matched with the maximum viewing distances. Where applicable large format, bespoke videowalls have been proposed and coordinated with the architects.

IPTV/Digital Signage decoders will also form part of all other Audio-Visual systems, allowing users to select it as one of the video/audio sources – refer to the other AV system briefs below.

An IPTV/DS system management platform will be provided allowing for but not limited to:

- Video and static images content creation, editing, deleting
- Grouping displays based on their physical location
- Creating schedules for content playback
- Providing proof of play for specific content

Dedicated video servers will be provided as part of the IPTV/DS system for content storage.

A bank of control processors will be installed in the IPTV head end equipment rack to allow global and local control over all IPTV decoders and TVs.

The global IPTV system control will be provided from the Production Control Room. The operator will be able but not limited to:

- Turn all the IPTV displays ON/OFF
- Set the TVs to the specific video input to which the IPTV decoder is connected
- Set a specific channel on the IPTV decoder
- The global IPTV control will include:
- IPTV decoders in public areas, bars and merchandise
- Boxes – where local control option will also be provided

The local IPTV control will be achieved via local control panels which will form part of the other AV systems and is described later in the report.

8.7.1.12 MEETING ROOM AV SYSTEM

The Meeting Room system is designed to provide presentation and basic video conferencing facilities.

Users will be able to present their content on the screen using their laptops, mobile devices or local PC installed in the room. A wireless mouse and keyboard shall be used to control the local PC.

All equipment will be installed in a pull-out credenza rack. Credenzas will provide adequate ventilation for cooling purposes.

In each meeting room there will be one screen installed. The screen size will be matched based on the maximum viewing distance. The screen will be visible from all seating positions. The screen will have integrated loudspeakers for program audio playback.

Two (2 No.) laptop video inputs (presented as HDMI) will be provided at the table.

A wireless (BYOD) connection will be provided.

USB table microphones and a USB video camera will be provided for the video/audio conferencing. The camera and the microphones will be connected to the local PC, which shall be used for video conferencing purposes. Video conferencing software will be installed on the PC as per venue operator requirements, in line with the IT strategy.

An IPTV/Digital Signage decoder will form part of the system and will be installed in the equipment rack.

A video switcher will be installed in the AV equipment rack to allow for video source switching. The switcher will be capable of switching video and corresponding audio sources.

The Meeting Room system will be controlled using a wall mounted touch panel. The control functions will cover but not be limited to:

- AV system ON/OFF
- Video input selection
- Audio control
- Video/audio conferencing control
- IPTV/DS

8.7.1.13 BRIEFING ROOM AV SYSTEM

The Briefing Room system is designed to provide presentation facilities.

Users will be able to present their content on the screen using their laptops, mobile devices or local PC installed in the room. A wireless mouse and keyboard shall be used to control the local PC

All equipment will be installed in a pull-out credenza rack. Credenzas will provide adequate ventilation for cooling purposes.

There will be one screen installed in a briefing room. The screen size will be matched based on the maximum viewing distance. The screen will be visible from all seating positions.

Two (2 No.) laptop video inputs (presented as HDMI) will be provided at the top table.

A wireless (BYOD) connection will be provided.

An IPTV/Digital Signage decoder will form part of the system and will be installed in the equipment rack.

A video switcher will be installed in the AV equipment rack to allow for video source switching. The switcher will be capable of switching video and corresponding audio sources.

Two wall mounted loudspeakers will be installed on both sides of the TV for program audio playback. The loudspeakers shall be fed from an audio amplifier installed in the AV rack.

The Briefing Room system will be controlled using a wall mounted touch panel. The control functions will cover but not be limited to:

- AV system ON/OFF
- Video input selection
- Audio control
- Video/audio conferencing contro
- IPTV/DS

8.7.1.14 L02 SUITES

All Boxes will be equipped with an AV system to enhance the event experience.

The Box AV system will provide means for IPTV/DS content viewing as well as allow to use the space for ad hoc meetings.

The Box will have a TV with integrated speakers installed. A local video input will be provided for laptop connectivity. Additionally, a wireless (BYOD) laptop connection will be provided.

The Box system will be controlled using a control touch panel. The control functionality will include but not be limited to:

- AV equipment ON/OFF
- IPTV/DS channel control
- Audio volume control
- Lights

It will be possible to control the Box system locally from each room and globally from the Production Control Room.

Backstage Bar/Record Room/Decibel Club Systems

There will be large format displays installed in the Backstage Bar, Record Room and Decibel Club, mainly to display IPTV and Digital Signage content. There will be:

- Four 55” TVs shall be installed in the Backstage Bar
- Two 86” TVs shall be installed in the Record Room
- One 86”TV shall be installed in the Decibel Club

A local IPTV encoder will be provided with the HDMI lead in the bar area for a local laptop connectivity if required.

Audio tie lines will be provided between the stage area and the bar area. This will be used for connecting overlay audio equipment as specifically required for events. AV Connection panel Type F will be installed in the bar area and the AV connection panel Type E will be installed in the stage area.

It will be possible to control the screens and IPTV decoders using a touch control panel. The control panel will connect to the control processor in the IPTV head end equipment rack.

8.7.2 Broadcast

The Arena will provide broadcast facilities for TV crews operating during the events.

Broadcast compound will be located on two levels. A space for two (2 No.) production expander vehicles and two (2 No.) support vehicles will be provided on level L00. A space for broadcast uplink vehicle and generator truck will be provided on level L01. All vehicles will have an easy access and sufficient space to manoeuvre into and out of their position without disturbing other units.

An easy access from the OB compound to the Broadcast Patch Room (OBTCR) located within the Arena will be provided for an overlay cable infrastructure.

The OBTCR will be able to accommodate ten (10 No.) equipment racks (800mm x 600mm). In addition 2.5m x 1m space shall be provided for the electrical boards.

Broadcast infrastructure will consist of:

- Permanent cable infrastructure
- Empty pathway system for an overlay infrastructure

8.7.2.1 Permanent Broadcast Infrastructure

Permanent infrastructure will consist of:

- Broadcast connection panels (BCPs)
- Cable infrastructure

8.7.2.2 Broadcast Connection Panels (BCPs)

BCPs will allow broadcast crews to connect cameras. BCP locations are specified based on the camera location requirements for multiple sport disciplines such as:

- Basketball
- Volleybal
- Hockey
- Boxing

BCP locations will also support concert event productions.

There will be seven (7 No.) BCP types, to serve multiple numbers of cameras:

Analogue to fibre transmitter/receiver boxes will be used to send audio signals over the long distances.

All Cat6 cables will be connected to the nearest IDF room – their length must not exceed 95m.

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Connection	Type A	Type B	Type C1	Type C2	Type D	Type E	Type F
SMPTE	6	8	3	0	4	6	4
HD-SDI	10	16	6	0	8	10	8
XLR – M	16	20	6	0	16	16	16
XLR – F	12	16	6	0	8	12	8
Cat 6	12	16	6	0	8	12	8
Duplex fibre	12	16	6	0	8	12	8
16 Amp	4	6	0	2	4	4	4
13 Amp	4	4	0	2	4	4	4

8.7.2.3 Power

BCPs will provide power for the cameras. The power will be provided from the inhouse supply or broadcast generator trucks parked on L01. The Broadcaster will be able to select the power source. An electrical switch board will be provided by the electrical contractor to allow switching and power synchronization between the power sources.

All terminations for power outlets will be in fully enclosed earthed enclosures.

8.7.2.4 Permanent Cable Distribution

Horizontal cable distribution will be carried out using two (2 No.) 200mm x 50mm trays.

Vertical cable distribution will be carried out using two 1000mm x 500mm risers located in the north and south sides of the Arena.

8.7.2.5 Overlay Broadcast Infrastructure

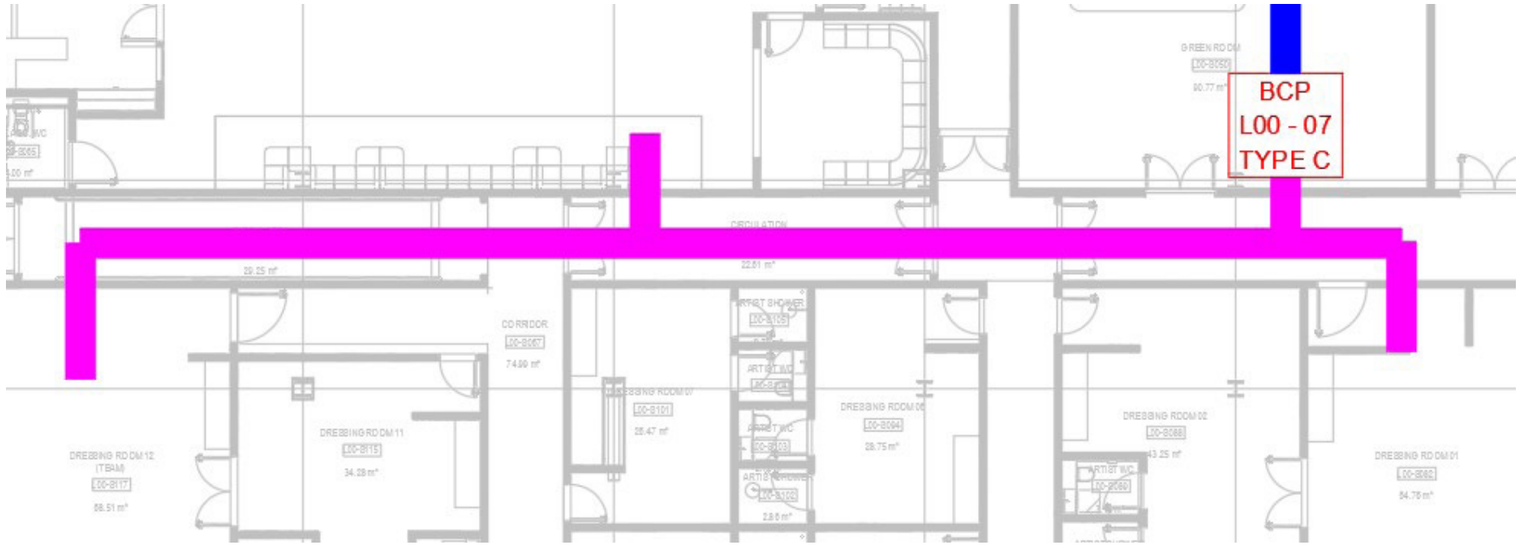
Broadcast Overlay infrastructure will be provided in a form of cable hooks and cable trays in the following areas:

- Link between carparks on L01 and L00, where the broadcast vehicles shall be parked
- Link between the carparks and the OBTCR – 7 rows of cable hooks.
- Link between the BCP L00-07 and Dressing Room 01, Record Room, Dressing Room 12 – 2 rows of cable hooks.
- Link between the BCP L00-02 and the Atrium – two rows of cable hooks.
- Link between the BCP L00-04 and the vertical ladder to the upper levels – two rows of cable hooks.

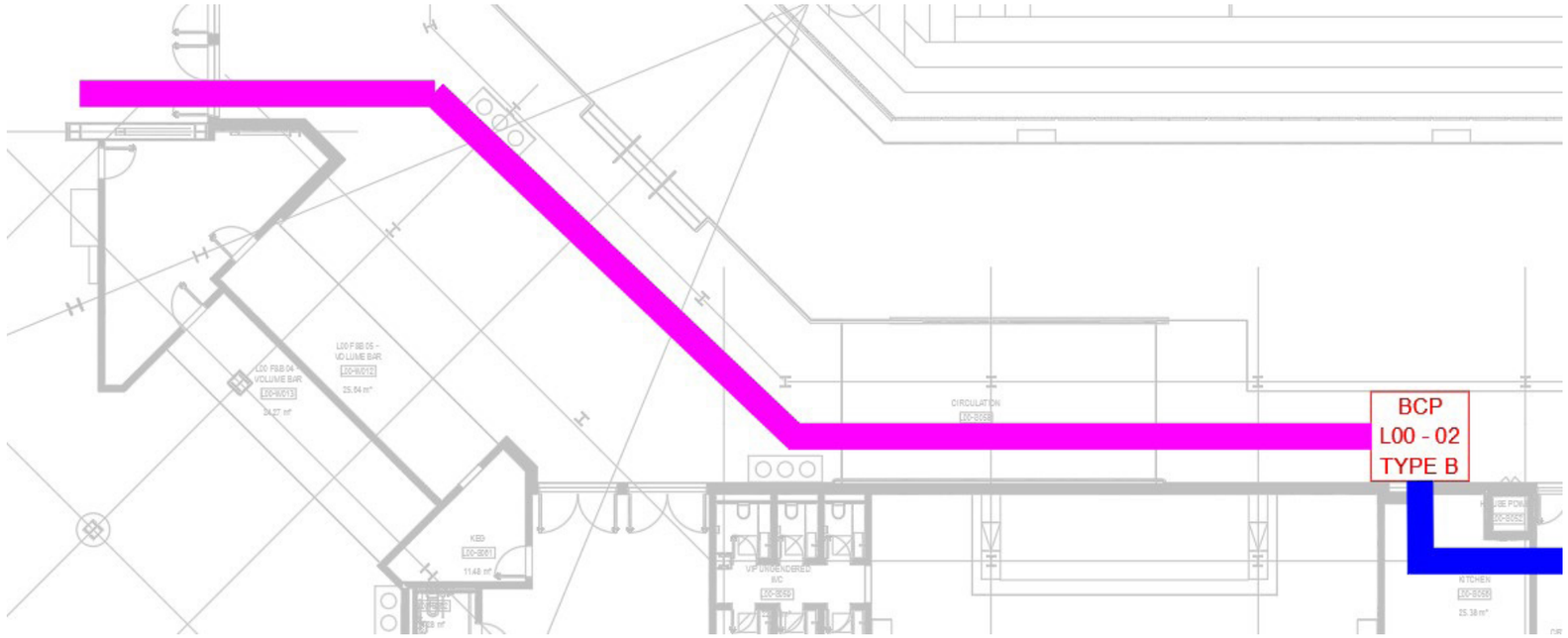
8.0 ACOUSTICS AV & BROADCAST

Horizontal cable distribution will be carried out using hooks and trays. These shall be accessible along the 100% of the route.

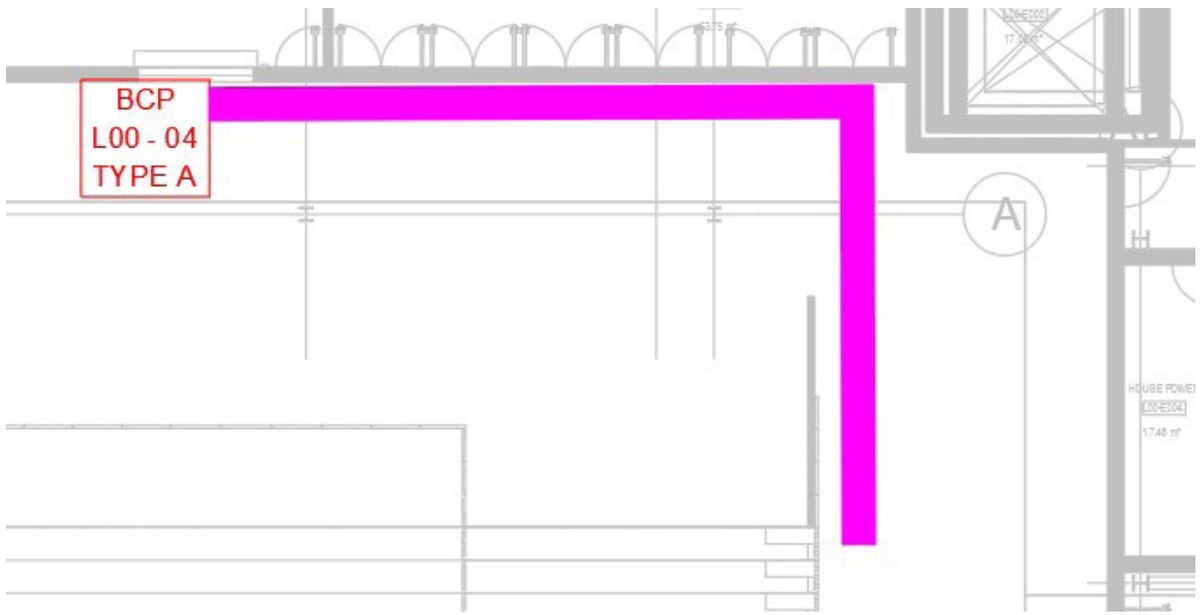
Fire and acoustically rated wall penetration socks will be used in line with the venue fire strategy. The wall penetration internal diameter will be 190mm.



BROADCAST OVERLAY
CABLE PATH BETWEEN
BCP L00-07 AND
DRESSING ROOM 1,
RECORD ROOM AND
DRESSING ROOM 12`



BROADCAST OVERLAY CABLE PATH BETWEEN BCP L00-02 AND THE ATRIUM



BROADCAST OVERLAY CABLE PATH BETWEEN BCP L00-04 AND THE VERTICAL LADDER TO THE UPPER LEVELS


LO
GO
LIVE

POPULOUS