Façade Access Strategy Report – North Tower

Martin Place Metro

Macquarie

Stage 43 Design stage.

Prepared for
Lend Lease

Date: 4 February~~15 September~~ 20~~20~~19

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Surface Design

Document prepared by:

Surface Design Pty Ltd
ABN 19 570 343 498
68 York Street, SYDNEY NSW 2000 Australia
T: +61 2 9249 1400
E: info@surfacedesign.com.au

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1	25/02/19	Updated to comments from Lend Lease and JPW	RM		
2	05/04/19	Updated	RM		
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4	4/02/20	Stage 4 Design 75% Submission	RM		

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1. Executive Summary

Surface Design have been engaged as Façade and Façade Access Consultant by Lend Lease for the development at Martin Place Metro towers, Sydney.

This report describes the Façade Access Strategy for the North Tower, a separate report has been prepared for the South Tower.

This report relates to the external and internal facade access systems required for both heavy (including glass replacement) and light maintenance (including cleaning and sealant maintenance).

The design has been based on the Design drawings prepared by the architects (JPW).

The buildings are described in various zones and the access system options for each of these building zones are summarised below.

Most of the external facades for both towers are to be accessed via dedicated Building Maintenance Units (BMU's). With adequate design considerations, maintenance and operation, BMU access is generally more suited to the project for the tower for the external facades light and heavy maintenance.

The North Tower has been designed with a centrally located BMU at level 39. The BMU is to be concealed within the plant rooms when parked. The BMU includes an extendable mast or screw jack arrangement (to raise nominally 10 m vertical extension) and a four-stage telescopic and slewing boom nominally 45m at full extension and requires nominal 360^0 slewing capacity. When parked the BMU is anticipated to be nominally 4m wide and 20m long and park within the height of the plant room as allocated. The roof of the plant room is to either be an openable door element or attached to the BMU and to raise out above the building with the BMU. This door design is to be developed further. The use and function of the BMU is to be designed to consider safety, this includes access in and around generator exhaust to the east elevation at level 28, and to the flues at the roof dome.

The North Tower will have a second BMU at the south elevation of the Level 28 Plant room. This BMU is to include a shunt rig and/or rail system to extend horizontally through the south elevation façade (doors to be incorporated). When parked the BMU is to be concealed within the L28 plant room. The boom is to include telescopic boom, knuckle jibs and slewing rings to enable access to the extent of the façade below level 28.

Access to the internal face of glass within the western lift core is to be from the top of the lift cars as well as IRA access where relevant.

The terrace and lower floor facades may be accessed via EWP, industrial rope access (abseil) using monorail systems concealed in the soffits or temporary scaffold systems.

The north tower lower level awnings will require access from ground level using ladder and ladder hooks and with appropriate safety line systems. ~~Additionally~~Additionally, the canopies to the north east corner and south corner are to be access from industrial rope access (abseil) using concealed monorail within the soffit. Access to the monorail in the soffit is to use concealed 'loop box' within the finishes zones to walls and/or columns with locations and details to be developed and agreed with the Architect.

The bridge and light well spaces to the south of the North Tower can be accessed via integrated Industrial Rope systems using permanently fixed monorail systems and rope fixing points.

The internal North Tower Atriums can be accessed via integrated Industrial Rope systems and EWP systems.

~~The southern atriums will include access via overhead monorail systems with integrated ledges for IRA personnel on the structural steel beams that support the facades Further EWP systems can be used on the basis that there are no permanent obstructions in the fitout design such as fixed furniture or landscape, this is to be developed with the interior designers.~~

The design has considered safety in design requirements.

Lend Lease have sought market feedback on the BMU and access designs including detailed design input and costing for further review.

Appendix A outlines the current BMU proposals as documented. We have included example equipment as discussed with access contractor (Lend Lease Trade Partner).

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2. Introduction

Surface Design has been engaged by Lend Lease to provide a Facade Access Strategy report for the building facades and interior atrium spaces of the proposed development at Martin Place Metro, Sydney CBD.

This report relates to the external and internal facade access systems for the North Tower that will be required to facilitate both ongoing building maintenance and external facade repairs.

Due to the varying geometries and floor plates of the entire development, a combination of different access systems will be required to gain access to all external areas needed for maintenance.

The access strategies that Surface Design has investigated and included within the design include:

- Building Maintenance Units
  Industrial Rope access including through Recessed monorail systems or rope access points or davit arms
- Elevated work platforms/knuckle booms (including truck mounted cherry picker)
- Ladder access and safety lines
- Temporary scaffold

This report focuses on the access strategy and is not intended to be used as a specification for implementation. Separate Performance Specifications are already provided and will be developed during the Detailed Design Phases.

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3. Project Description

The proposed development is located at Martin Place Metro, Sydney. The development is intended to include two high rise towers. The North Tower is being designed by JPW, The south is being designed by Tzannes Architects. Grimshaw Architects are the lead Architect for the station development underground. This report is related to the North Tower only.

For facade maintenance, the following areas need to be addressed, these have been labelled in Zones:

North Tower

- Zone N1 - Tower facades
- Zone N2 – Tower facades to south
- Zone N3 - Terrace facades including soffits
- Zone N4 – Ground floor facades
- Zone N5 – Awnings
- Zone N6 – Atrium (~~south and~~ central atriums)
- Zone N7 – Link bridge, light well and
- Zone N8 - Northern elements of 50 Martin Place
- Zone N9 – Internal face of the lift core glazing

Refer to Architectural drawings for geometry and façade types including drawings:

- ~~*Drawing list to be added upon finalisation by*~~*Refer to drawings by JPW*

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4. Required Maintenance

4.1 Facade Maintenance

Maintenance can be categorised into two sectors, light maintenance and heavy maintenance.

4.1.1 Light Maintenance

Light maintenance refers to:

- Routine cleaning of all the different facades and finishes
- Routine inspection of facade
- Facade service life repairs (replacement of sealants, gaskets etc.)

As a reference, the frequency of cleaning of glass and frames is every 3 – 4 months whereas the frequency of cleaning masonry (if required) is yearly. The expected frequency of service life to sealing repairs is every 10 – 20 years. Light maintenance will need to occur internally and externally. Regular inspections of the façade components is required during light maintenance.

4.1.2 Heavy Maintenance

Heavy maintenance refers to any process of maintenance which requires mechanical lifting:

- Replacement of materials (glass, cladding panels etc.)

The access system chosen for this purpose (eg. Lifting glass panels) will need to occur externally if internal measures are not viable. The choice of the final heavy maintenance strategy will be directly impacted by the size and weight of the panels. The heavy maintenance strategy must be able to support, and manoeuvre panel sizes up to 6.4m long.

The materials will be manoeuvred by the following equipment

- Tower and podiums – BMU mounted lifting systems
- Terraces – BMU and temporary scaffold (if required)
- Ground floor – EWP or temporary scaffold (if required)

Plant equipment replacement

The BMU's are to be utilised for plant replacement, the design of these elements is ongoing.
The size and weight of these elements is to be confirmed and accommodated by the BMU lifting device. It may include components of the following:

- Cooling towers located at roof plant room
- Other minor plant equipment from roof plant room

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5. Proposed Access Strategy

5.1 Influencing factors

The following are some factors that should be taken into consideration when selecting both maintenance equipment and access strategies:

- Height of building
- Wall geometry
- Building feature elements (orientation, size and weight)
- Potential obstructions and access points (rigging positions etc)
- Cleaning regime (frequency, cycle times, material warrantees)
- Materials and finishes
- Glass replacement methodology (internal and external)
- Feature and other materials replacements
- Cost of system
- Integration with facade systems (restraint points and loads)
- Garage and storage requirements
- Compliance with legislation and authorities
- Safety in design
- Rescue methodology (injury, damage, breakdown or power outage situation)
- Internal landing zones for emergency egress and access
- Working above the public zones (ie footpaths and terrace)

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5.2 North Tower façade access

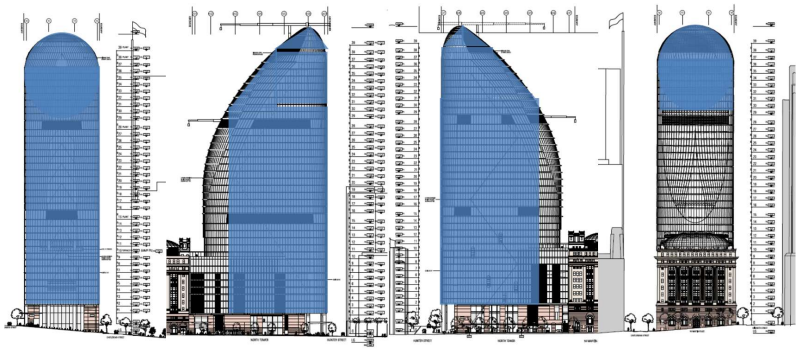
The tower is 40 storeys high. The facades generally consist of an aluminium framed curtain wall system with glazing and integrated shading. The facades vary in geometry from vertical panels to sloped and faceted panels forming the geometry of the tower. The North Tower Roof encroaches on the height limitations of the project, thus needing a BMU system that can be used and stored discreetly with minimum disruption and below the height limitations.

5.3 North Tower Façade Access Summary

5.3.1 ZONE N1 and ZONE N2 - North tower façade

Refer to Appendix A, B, C and H for further information.

Access System	Installation/storage	Light maintenance (eg. Cleaning and sealant maintenance	Heavy Maintenance (eg glass and plant replacement)
Zone N1 **BMU 1 (level 40)** - BMU with telescoping mast or screw jacks for raised mast, and 4-stage telescoping and slewing (360º) jib (nominal 40m long) - Cradle and glass lifting equipment - Also plant room equipment lifting capacity required. - Soft Rope System	- Large permanent system; needs to be stored/parked in the plant room. - Needs maintenance - Needs skilled personnel to operate - Door or attached façade to BMU to be incorporated.	Adequate	Adequate Lifting of glass to occur from street level using the BMU Is required for plant equipment maintenance replacement. To be designed for these loads as well as glass lifting loads



Zone N1 (in blue shading)

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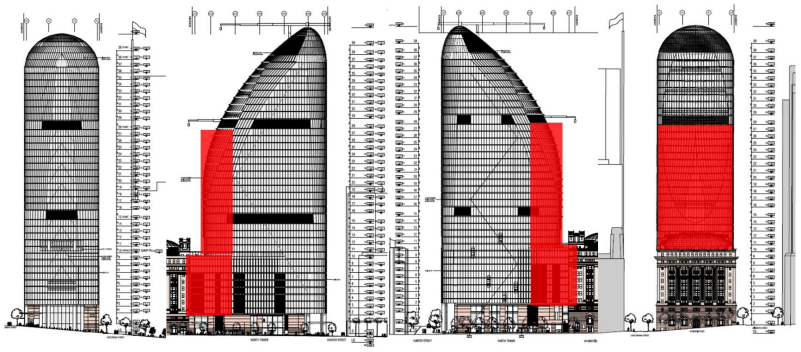
Zone N2 **BMU 2 (level 28 south)** - BMU with shunting rig or rails, articulated knuckle and slewing 4 or 3-stage telescoping jib - Cradle and glass lifting equipment - Doors to be incorporated into the southern façade. - Soft Rope System	- Large permanent system; needs to be stored/parked in the plant room. - Needs maintenance - Needs skilled personnel to operate - Door or attached façade to BMU to be incorporated.	Adequate	Adequate Lifting of glass to occur from street level using the BMU. May be required for plant equipment maintenance replacement. To be designed for these loads as well as glass lifting loads.
			

Zone N2 (in red shade)

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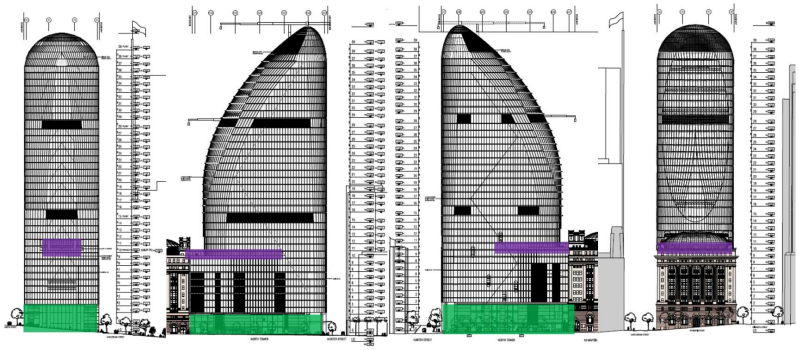
5.3.2 ZONE N3, N4 and N5 - Terrace, lower floor facade and awnings

Refer to Appendix A, D and H for further information.

Note:

- N3 is level 10 terrace.
- N4 is ground floor facades
- N5 is the awnings at the lower floors.

Access system	Installation/Storage	Light Maintenance	Heavy Maintenance
ZONE N3, N4 and N5 EWP access or temporary scaffold.	Hired or permanent stored on site.	Adequate where reach is possible, (consider scissor lift or cherry picker)	Adequate
ZONE N3, N4 Monorail IRA access to soffits	Permanently installed to soffits	Adequate	Adequate
ZONE N5 Awnings access from ladders and safety line on awnings. Canopies to the south east, north east and south west zones to be accessed from above with IRA using concealed monorail to soffit	Hired or permanent stored on site. Monorail installed to soffits with concealed 'loop box' to column or wall finishes zone as to be agreed with the architect for locations.	Adequate	Adequate



Zone N3 (in purple shade)
Zone N4 and N5 (in green shade)

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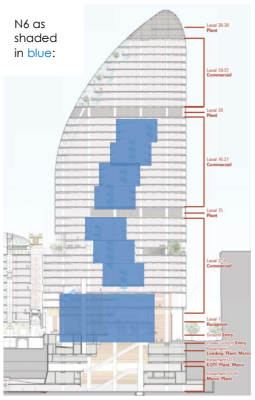
5.3.3 ZONE N6 – Central ~~and South~~ Atrium space

Refer to Appendix A, E and H for further information.

Access System	Installation /Storage	Light Maintenance	Heavy Maintenance	Zone N6
Recessed monorail system and walkways	Monorail need to be incorporated in the soffits of the atrium spaces. Access from floors for access to monorail system. Monorail system to be designed to allow access to all soffits (including for any services in soffits), balustrades and stairs.	Adequate	Can be used to rig panels from ground level	N6 as shaded in blue: 
EWP for maintenance	Non-permanent Note that any fixed furniture or landscaping to be considered, this will required to be coordinate with the interior designers.	Adequate for some levels	Adequate for some levels	

5.3.4 ZONE N7 – Link Bridge, light well

Refer to Appendix A, F and H for further information.

Access System	Installation /Storage	Light Maintenance	Heavy Maintenance
Monorail system	Monorail need to be incorporated near the top of the light well (as per existing monorails). Additional monorails required to the top edges of the bridge for access, typically double rope system to be adopted for safe access. Need opening from floors for access to monorail system, this requires relevant doors above the bridges. Note artwork in the light well to be considered, this requird coordination with Macquarie and the artist.	Adequate	Can be used to rig panels from ground level
Temporary scaffold	Hired equipment for large maintenance operations	Adequate although typically not required.	Adequate.

5.3.5 ZONE N8 – Northern elements of 50 Martin Place

Refer to Appendix A, F and H for further information.

Access System	Installation /Storage	Light Maintenance	Heavy Maintenance
Monorail system and fixed access points as per the existing systems in place.	Monorail need to be incorporated near the top of the light well (as per existing monorails, to be coordinated with Zone N7) Need opening from floors for access to monorail system (refer Zone N7). Existing rope access systems to be maintained where possible.	Adequate	Can be used to rig panels from ground level

5.3.6 ZONE N9 – Internal face of lift core glazing

Refer to Appendix A, G and H for further information.

Access System	Installation /Storage	Light Maintenance	Heavy Maintenance
Fixed rope access restraint points on the steel structure	Need opening from floors for access to rope access restraints on the steel structure.	Adequate	Can be used to rig panels from ground level
Stand on top of lift car	After hours working from the top of the lift car allows access to clean most of the internal glazing.	Adequate for most of the faces, noting that the steel structure may inhibit access to some surfaces.	Yes in combination with BMU.

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5.3.7 Tower BMU Systems (Zone N1 and N2)

The North Tower has been designed with a centrally located BMU at level 39. The BMU is to be concealed within the plant rooms when parked. The BMU includes an extendable mast or screw jack arrangement (to raise nominally 10m vertical extension) and a four-stage telescopic and slewing boom nominally 45m at full extension and requires nominal 360^0 slewing capacity. When parked the BMU is anticipated to be nominally 4m wide and 20m long. The roof of the plant room is to either be an openable door element or attached to the BMU and to raise out above the building with the BMU. This door design is to be developed further.

The use and function of the BMU is to be designed to consider safety, this includes access in and around generator exhaust to the east elevation at level 28, and to the flues at the roof dome.

The North tower will have a second BMU at the south elevation of the Level 28 Plant room. This BMU is to include a shunt rig and/or rail system to extend horizontally through the south elevation façade (doors to be incorporated in the facade). When parked the BMU is to be concealed within the L28 plant room. The boom is to include telescopic boom, knuckle jibs and slewing rings to enable access to the extent of the façade below level 28.

BMU Cycle times

The estimated BMU cycle times have been calculated and included in Appendix B.

The required cleaning regime of 4 times a year can be met with the two tower BMU's.

The below listed the general cycle times required for the key elements of the façade, also refer to the Mechanical Services documentation for the plant room equipment requiring replacement:

Element	Light Maintenance (cleaning, inspections)	Heavy maintenance (replacement etc)
DGU Glazing	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of breakages. Life span for panels is nominally 20-30 years subject to performance of edge seals of DGU
Monolithic or laminated glass	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of breakages. Life span for panels is nominally 20-30 years subject to performance of laminates
Aluminium cladding	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for panels is nominally 50 years subject to performance of coatings
Aluminium sunshades	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for panels is nominally 50 years subject to performance of coatings
Aluminium framing	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for panels is nominally 50 years subject to performance of coatings
Aluminium louvers	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for panels is nominally 50 years subject to performance of coatings
Stone cladding	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for panels is nominally 50 years

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Sealants/gaskets	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of local damage. Life span for sealant and gaskets is nominally 20-30 years
Motors for operable windows and doors	Clean 4 times per year Inspect regularly, during cleaning cycle	Periodic in case of operation damage.

BMU Reaction loads to structure

Initial loadings have been provided for coordination with the structural engineer. These are to be confirmed and verified by the BMU contractors and coordinated with the Project Structural Engineer.

BMU Rescue strategy

A rescue strategy is to be developed for all access methods and in particular the BMU's. This strategy is to include consideration of the following:

- Reasons for rescue required:
  - Damage or break down of BMU system while in use
  - Injury of workers within the BMU
  - Power outage
  - Internal fire within the building during use of the BMU

Landing zones

Consider landing zones and mechanisms to lower or raise the BMU cradle, safely and efficiently

- A landing zone diagram is to be provided in BMU Performance Specification, the relevant plans have been listed below for clarity.
- Consider potential break through glass to allow rescue service prompt access to injured workers in the BMU

The key levels are:

- Level 10 terrace
- Level 1 and ground (noting the awnings on the eastern, northern and western elevation)

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Appendix A

Relevant Architectural Drawings with all Zones marked up

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Zone N1 (blue) serviced by Roof BMU
Note the flues, the BMU must avoid these, the BMU design and safe work method management strategy is to be developed to accommodate this.
Note the generator exhaust, the BMU must avoid these, the BMU design and safe work method statement is to be developed to accommodate this.
Zone N6 (Various Atriums inside building)
Zone N2 (red) serviced by L28 BMU
Zone N3 (purple) (terrace)
Zone N7 and N8 (Link Bridge, light well and north face of 50 Martin Place)
Zone N4 (ground floor), N5 (awnings) (green)
SIGNAGE ZONE SHOWN DASHED
LATERAL BRACING SHOWN DASHED
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CSWSMP-MAC-SMN-AT-DRG-611201
CSWSMP-MAC-SMN-AT-DRG-409910
INTERNAL DEMOUNTABLE FACADES TBC (CHILLER PLANT)
INTERNAL DEMOUNTABLE FACADES TBC (TENANT GENERATOR)
GENERATOR + CHILLER PLANT)
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L30 FFL 147790
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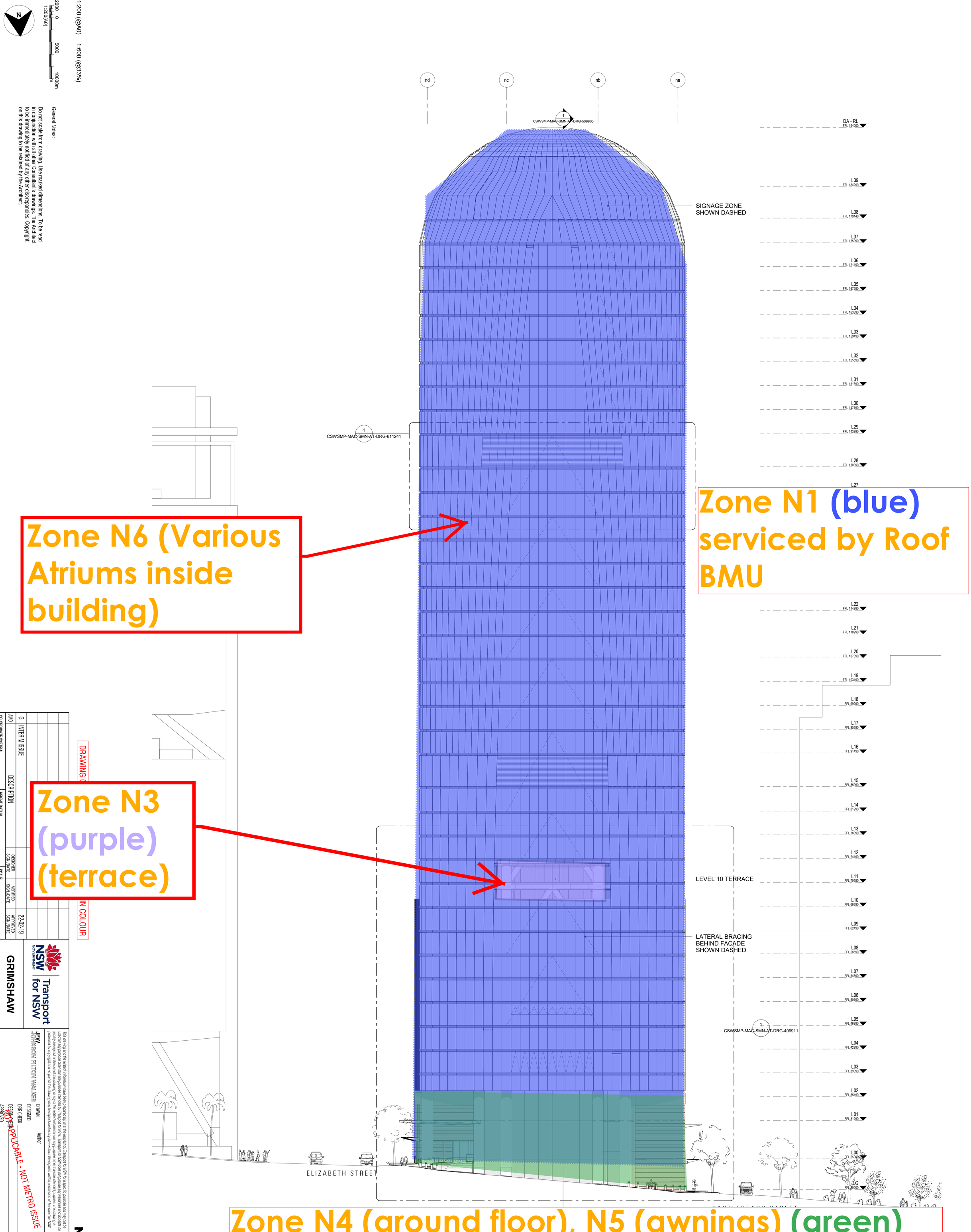

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CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE: 22-02-19

GRIMSHAW

NSW GOVERNMENT Transport for NSW

JPW JOHNSON PILTON WALKER

DRAWN Author
DESIGNED
DRG CHECK
DESIGN CHECK
APPROVED

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SYDNEY METRO - MARTIN PLACE

NORTH ELEVATION
40 Elevations

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Zone N2 (red) serviced by L28 BMU
Zone N6 (Various Atriums inside building)
Zone N1 (blue) serviced by Roof BMU
Zone N3 (purple) (terrace)
Zone N7 and N8 (Link Bridge, light well and north face of 50 Martin Place)
Zone N4 (ground floor), N5 (awnings) (green)
INTERNAL DEMOUNTALBE FACADES TBC (COOLING TOWER)
SINAGE ZONE SHOWN DASHED
LATERAL BRACING BEHIND FACADE SHOWN DOTTED
INTERNAL DEMOUNTALBE FACADES TBC (STATION CHILLER PLANT)
INTERNAL DEMOUNTALBE FACADES TBC (STATION PLANT)
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General Notes:

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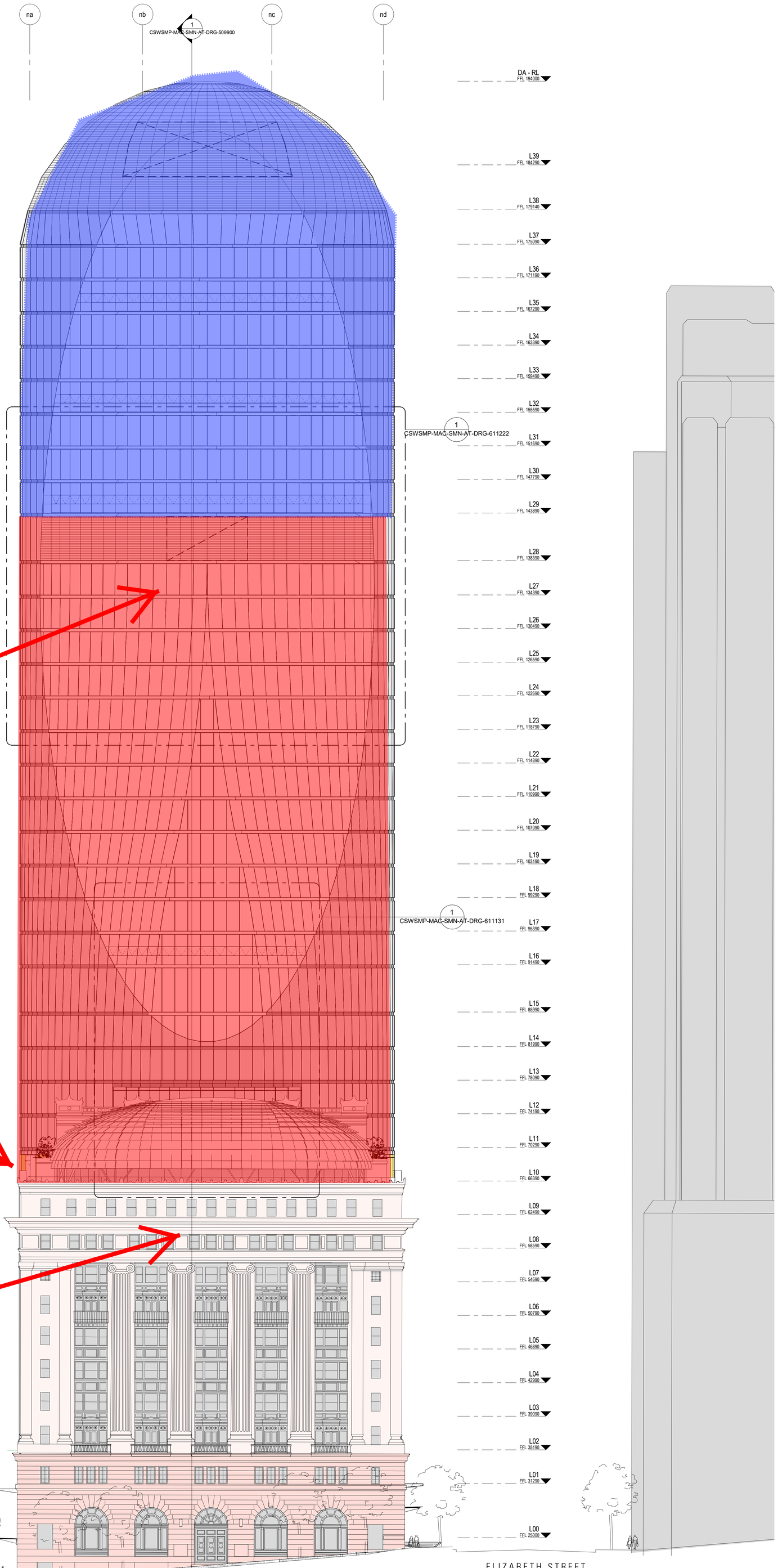
Zone N1 (blue) serviced by Roof BMU

Zone N6 (Various Atriums inside building)

Zone N2 (red) serviced by L28 BMU

Zone N3 (purple) (terrace)

Zone N7 and N8 (Link Bridge, light well and north face of 50 Martin Place)



DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	INTERIM ISSUE			22-02-19

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

GRIMSHAW

NSW GOVERNMENT Transport for NSW

JPW JOHNSON PILTON WALKER

DRAWN Author
DESIGNED
DRG CHECK
DESIGN MGR APPROVED

NOT APPLICABLE - NOT METRO ISSUE

NOT FOR CONSTRUCTION

SYDNEY METRO - MARTIN PLACE

SOUTH ELEVATION 40 Elevations

FILE No. SHEET: 1 OF 1 A0

STATUS: INTERIM ISSUE ©

DRG No. CSWSMP-MAC-SMN-AT-DRG-409803 F EDMS No.

Plot Date & Time: 2/22/2019 5:04:17 PM

UP-807-534

Appendix B

BMU Cycle time calculations (Zone N1 and N2)

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North Tower

BMU 1

Drop description	Set up time per drop (min)	Freefall height	Time of free fall at 8m/min	Height of cleaning drop (m approx)	Time of drop (@ 2m/min)	Area per drop (m2)	Time to clean (@ 3m2/min) 3m Cradle width	Number of Drops per Elevation North	East	South	West	Total Drops	Time to clean
Level Roof to ground	60	0	0	150.00	75.00	450.00	150.00	14.00	15.00	0.00	15.00	44.00	12540.00
Roof to 28	60	0	0	40.00	20.00	120.00	40.00	0.00	0.00	14.00	0.00	14.00	1680.00
	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Total time (min)	14220.00
												Hours	237.00
												Days (6 hours per day)	39.50
												Plus 100% downtime (bad weather etc)	79.00

BMU 2

Drop description	Set up time per drop (min)	Freefall height	Time of free fall at 8m/min	Height of cleaning drop (m approx)	Time of drop (@ 2m/min)	Area per drop (m2)	Time to clean (@ 3m2/min) 3m Cradle width	Number of Drops per Elevation North	East	South	West	Total Drops	Time to clean
Level 28 to 10	60	0	0	70.00	35.00	210.00	70.00	0.00	0.00	14.00	0.00	14.00	2310.00
Level 10 to ground	60	70	8.75	40.00	20.00	120.00	40.00	0.00	8.00	0.00	8.00	16.00	2060.00
	0	0	0	0.00	0.00	0.00	0.00	4.00	0.00	4.00	6.00	14.00	0.00
												Total time (min)	4370.00
												Hours	72.83
												Days (6 hours per day)	12.14
												Plus 100% downtime (bad weather etc)	24.28

Appendix C

BMU additional information (restraint pins, BMU doors) for Zone N1 and N2

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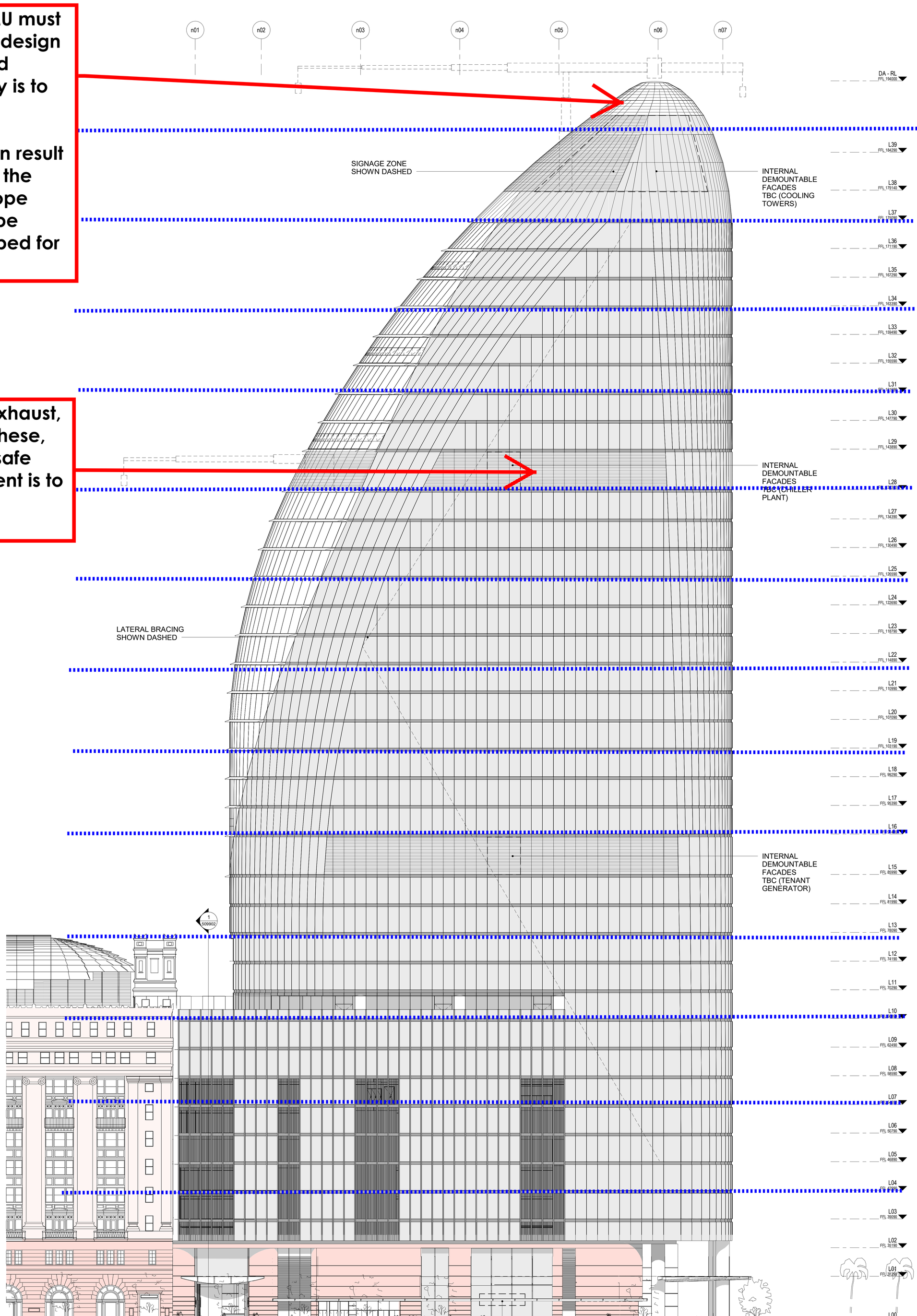
Note the flues, the BMU must avoid these, the BMU design and safe work method management strategy is to be developed to accommodate this.
Should the BMU design result in a 'blind spot' under the BMU, an alternative rope access strategy is to be included and developed for the project.

Note the generator exhaust, the BMU must avoid these, the BMU design and safe work method statement is to be developed to accommodate this.



The blue dotted lines indicate the levels where the BMU restraint pins are required, this is to be coordianted and confirmfed with the BMU contractor, nominally at every third floor and every second panel.

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	INTERIM ISSUE	25.01.2019	25.01.2019	25.01.2019

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

GRIMSHAW

NSW GOVERNMENT Transport for NSW

JPW JOHNSON PILTON WALKER

DRAWN: Author
DESIGNED:
DRG CHECK:
DESIGN CHECK:
APPROVED:

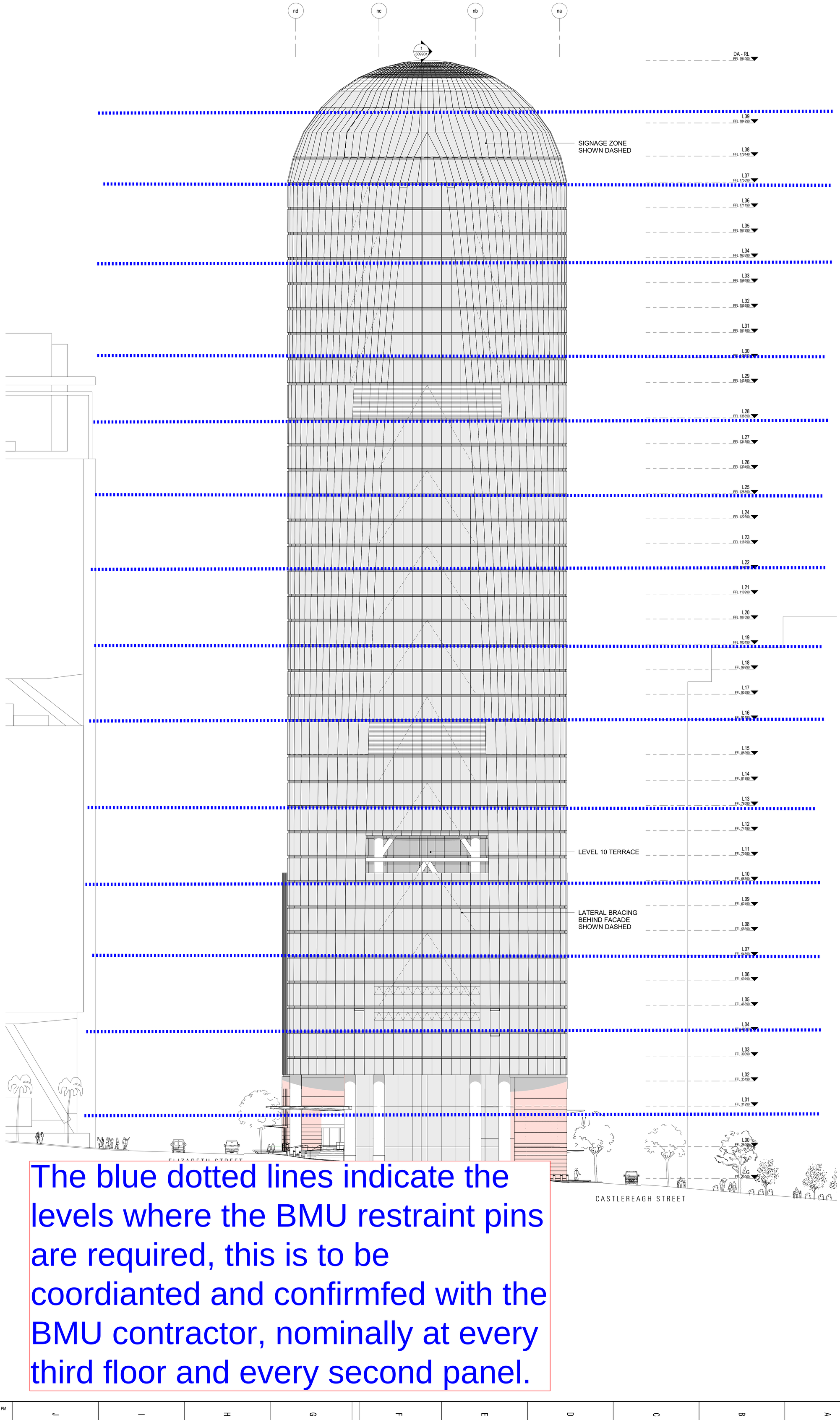
SYDNEY METRO - MARTIN PLACE

EAST ELEVATION
BUILDING ELEVATIONS

FILE No.
STATUS: INTERIM ISSUE
SHEET: 1 OF 1
A0
©
EDMS No.
F
DRG No. CSWSMP-MAC-SMN-AT-DRG-409900

Plot Date & Time: 1/25/2019 5:41:18 PM

DF 801-1504



The blue dotted lines indicate the levels where the BMU restraint pins are required, this is to be coordianted and confirmfed with the BMU contractor, nominally at every third floor and every second panel.

N

2000 0 5000 10000mm
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General Notes:

Do not scale from drawing. Use marked dimensions. To be read in conjunction with all other Consultant's drawings. The Architect to be immediately notified of any other discrepancies. Copyright on this drawing to be retained by the Architect.

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NOT FOR CONSTRUCTION

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	INTERIM ISSUE	25.01.2019	25.01.2019	25.01.2019

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

GRIMSHAW

NSW GOVERNMENT Transport for NSW

JPW JOHNSON PILTON WALKER

DRAWN: Author
DESIGNED:
DRG CHECK:
DESIGN CHECK:
APPROVED:

NOT APPLICABLE - NOT METRO ISSUE

SYDNEY METRO - MARTIN PLACE

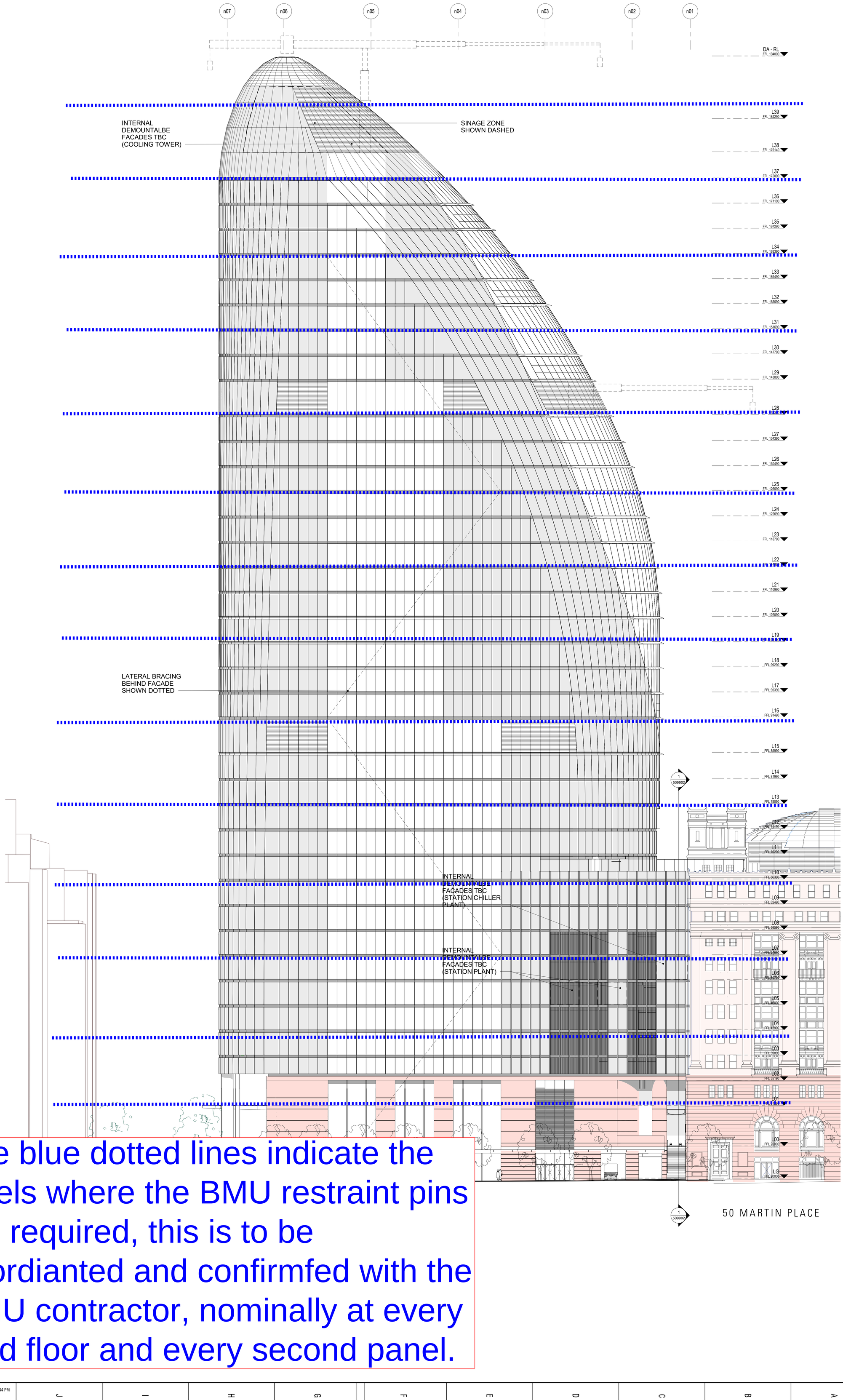
NORTH ELEVATION
BUILDING ELEVATIONS

FILE No.
STATUS: INTERIM ISSUE
SHEET: 1 OF 1
A0
©
EDMS No.

DRG No. CSWSMP-MAC-SMN-AT-DRG-409901 F

Plot Date & Time: 1/25/2019 5:41:56 PM

DF 801-1504



The blue dotted lines indicate the levels where the BMU restraint pins are required, this is to be coordianted and confirmfed with the BMU contractor, nominally at every third floor and every second panel.

N

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General Notes:

Do not scale from drawing. Use marked dimensions. To be read in conjunction with all other Consultant's drawings. The Architect to be immediately notified of any other discrepancies. Copyright on this drawing to be retained by the Architect.

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AMD	DESCRIPTION	DESIGNER SIGN. /DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
G	INTERIM ISSUE	25.01.2019	25.01.2019	25.01.2019

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

NSW GOVERNMENT Transport for NSW

GRIMSHAW

DRAWN Author
DESIGNED
DRG CHECK
DESIGN CHECK
APPROVED

NOT APPLICABLE - NOT METRO ISSUE

NOT FOR CONSTRUCTION

SYDNEY METRO - MARTIN PLACE
WEST ELEVATION
BUILDING ELEVATIONS

FILE No.
STATUS: INTERIM ISSUE
SHEET: 1 OF 1
A0

DRG No. CSWSMP-MAC-SMN-AT-DRG-409902 G
EDMS No.

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509901

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L38 FFL 179140
L37 FFL 175090
L36 FFL 171190
L35 FFL 167290
L34 FFL 163390
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L32 FFL 155590
L31 FFL 151690
L30 FFL 147790
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L28 FFL 139990
L27 FFL 134390
L26 FFL 130490
L25 FFL 126590
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L13 FFL 78090
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L11 FFL 70290
L10 FFL 66390
L09 FFL 62490
L08 FFL 58590
L07 FFL 54690
L06 FFL 50790
L05 FFL 46890
L04 FFL 42990
L03 FFL 39090
L02 FFL 35190
L01 FFL 31290
L00 FFL 25000
LG FFL 20000

ELIZABETH STREET

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The blue dotted lines indicate the levels where the BMU restraint pins are required, this is to be coordianted and confirmfed with the BMU contractor, nominally at every third floor and every second panel.

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
E	INTERIM ISSUE	25.01.2019	25.01.2019	25.01.2019

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

Transport for NSW
NSW GOVERNMENT
GRIMSHAW

JPW JOHNSON PILTON WALKER

DRAWN: Author
DESIGNED:
DRG CHECK:
DESIGN CHECK: NOT APPLICABLE - NOT METRO ISSUE
APPROVED:

NOT FOR CONSTRUCTION

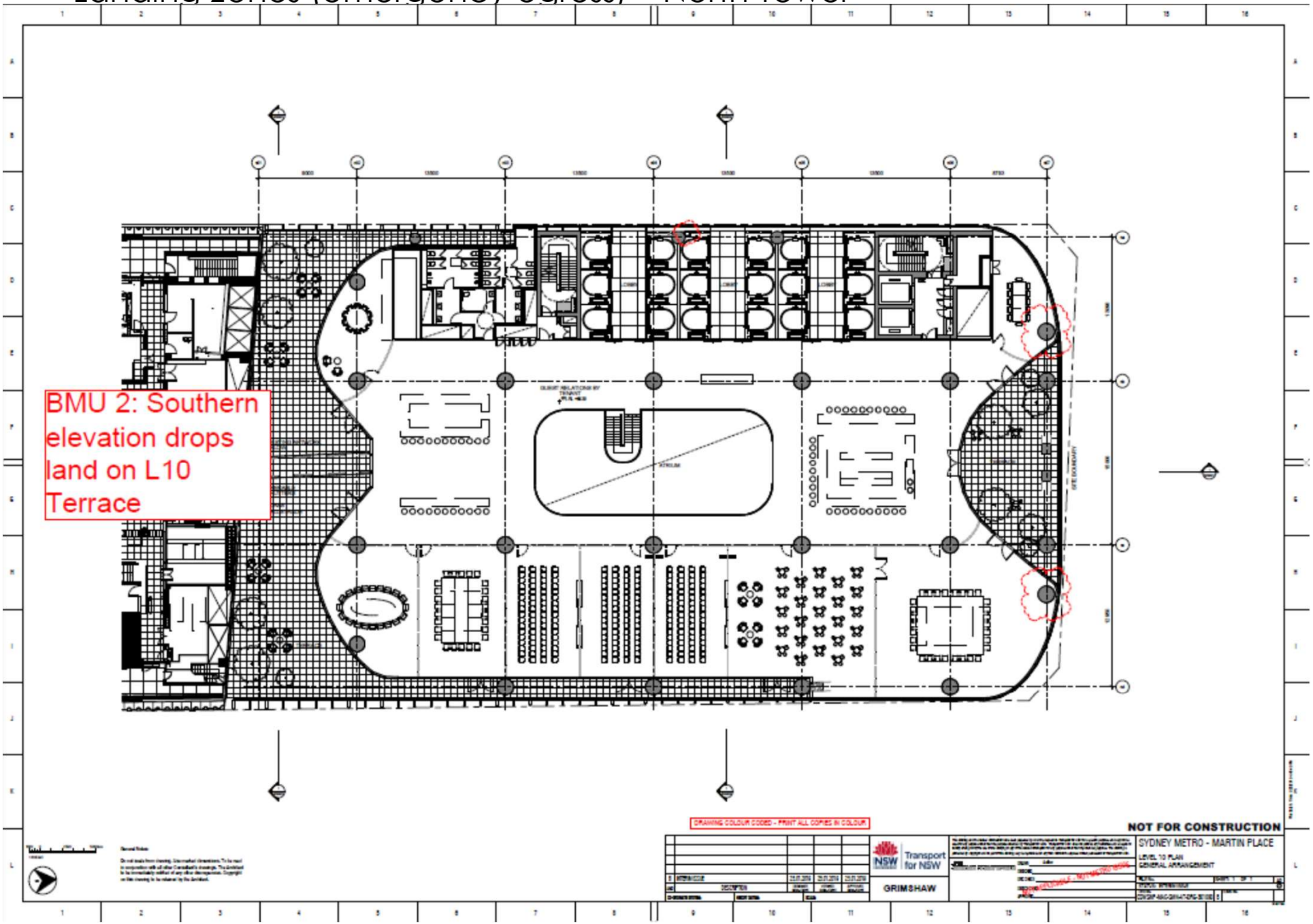
SYDNEY METRO - MARTIN PLACE
SOUTH ELEVATION
BUILDING ELEVATIONS

FILE No.
STATUS: INTERIM ISSUE
SHEET: 1 OF 1
A0
EDMS No.
DRG No. CSWSMP-MAC-SMN-AT-DRG-409903 E

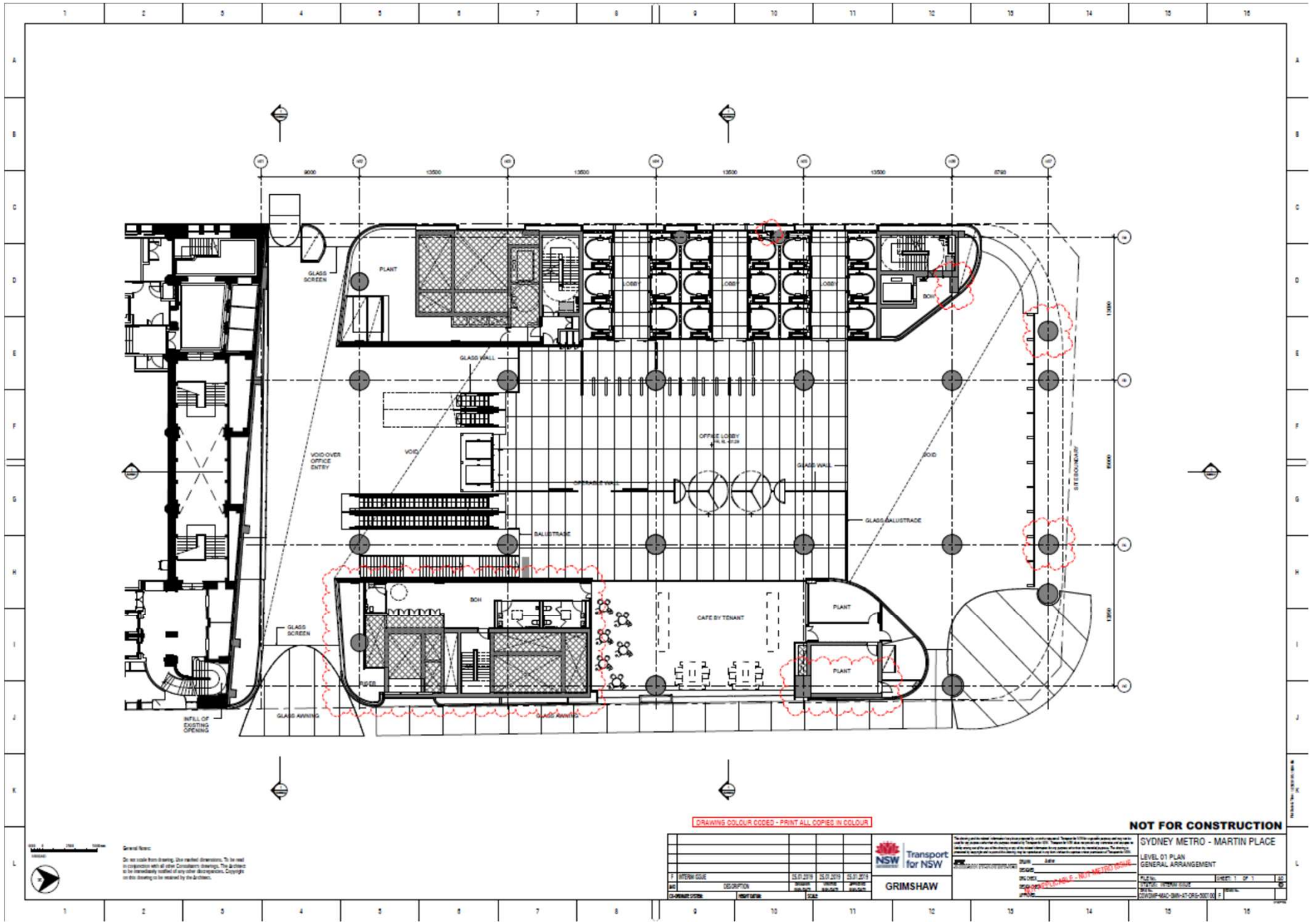
DF 807-334

Plot Date & Time: 1/25/2019 5:43:46 PM

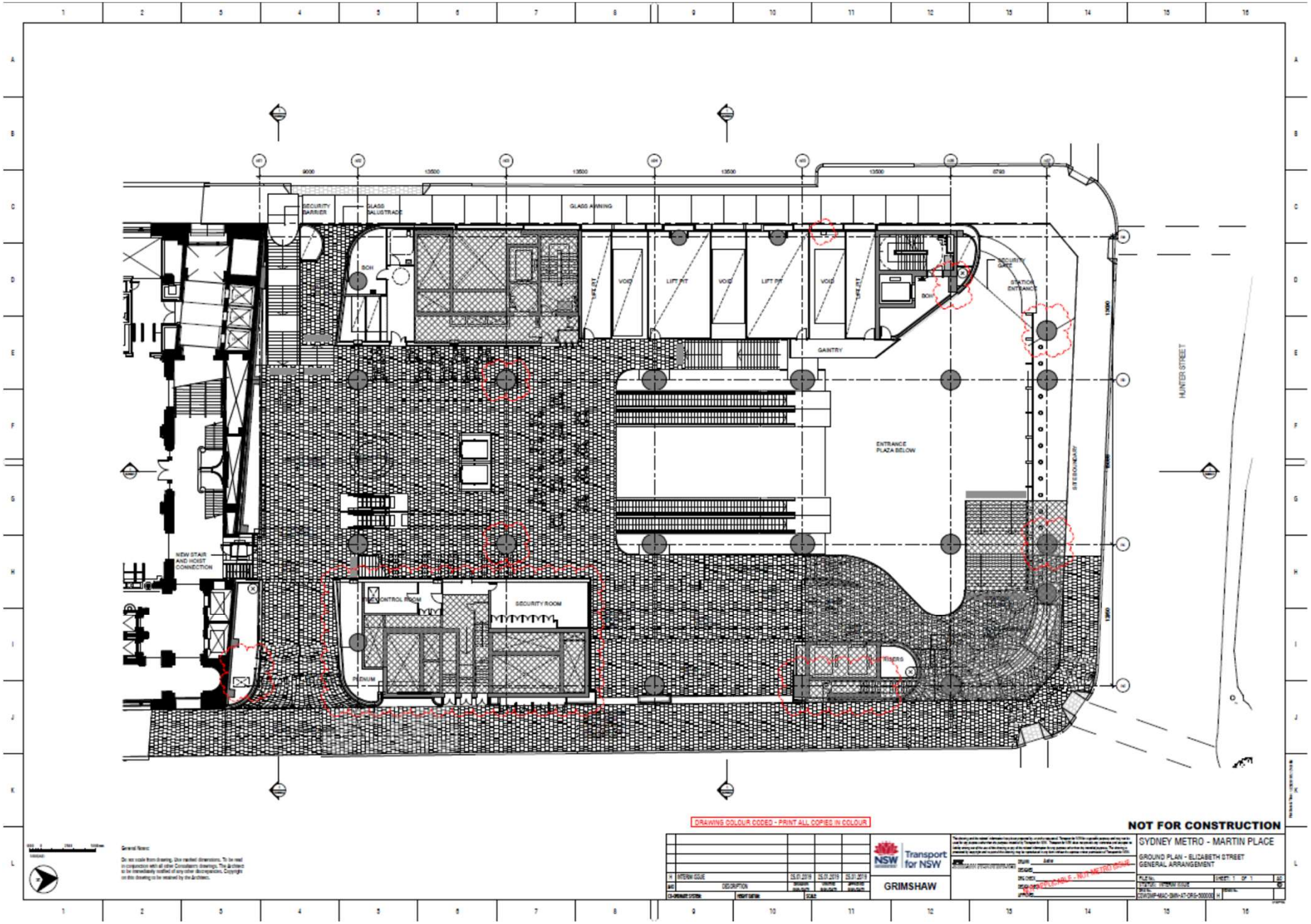
Landing Zones (emergency egress) – North Tower

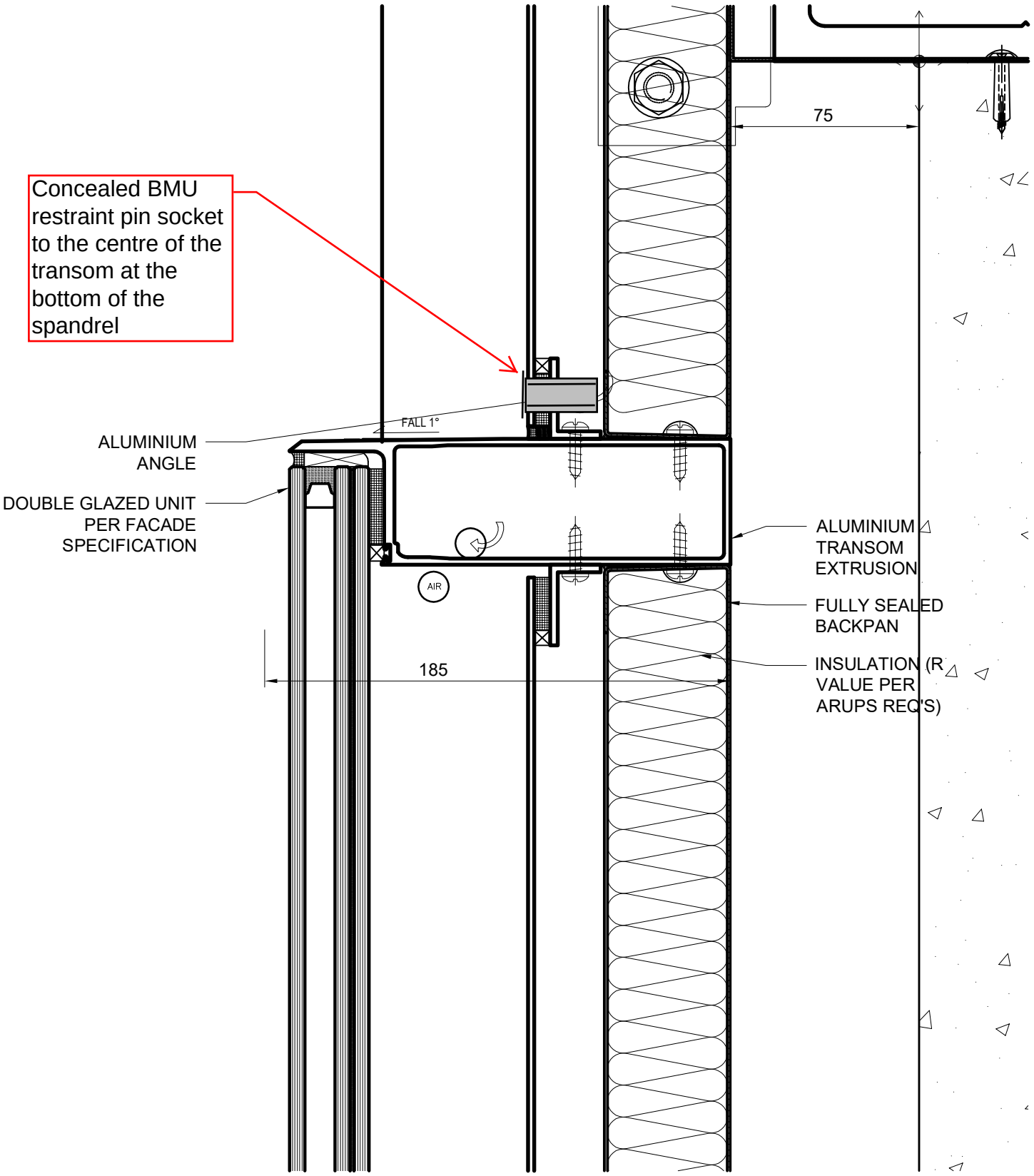


Landing Zones (emergency egress) – North Tower

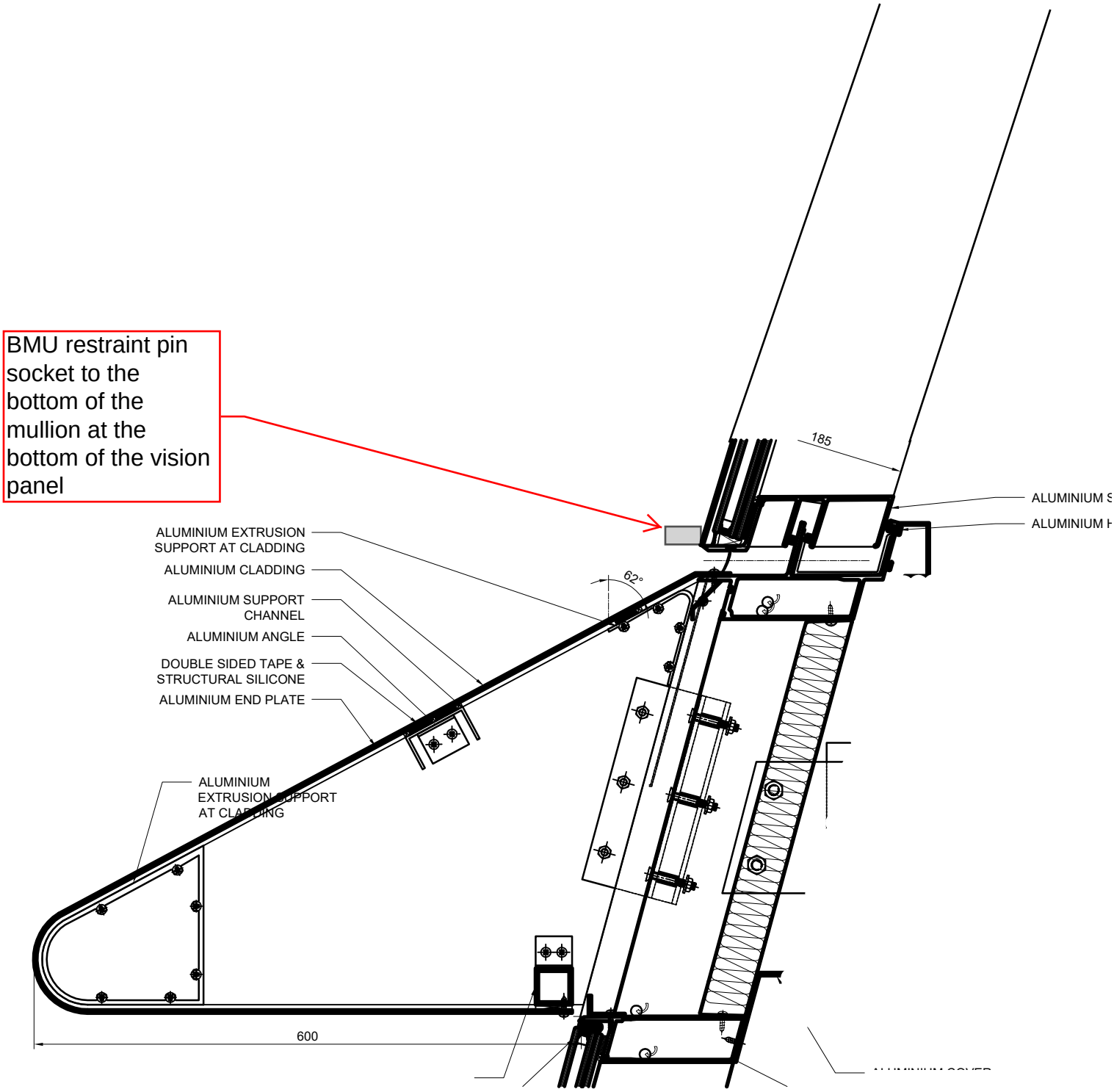


Landing Zones (emergency egress) – North Tower

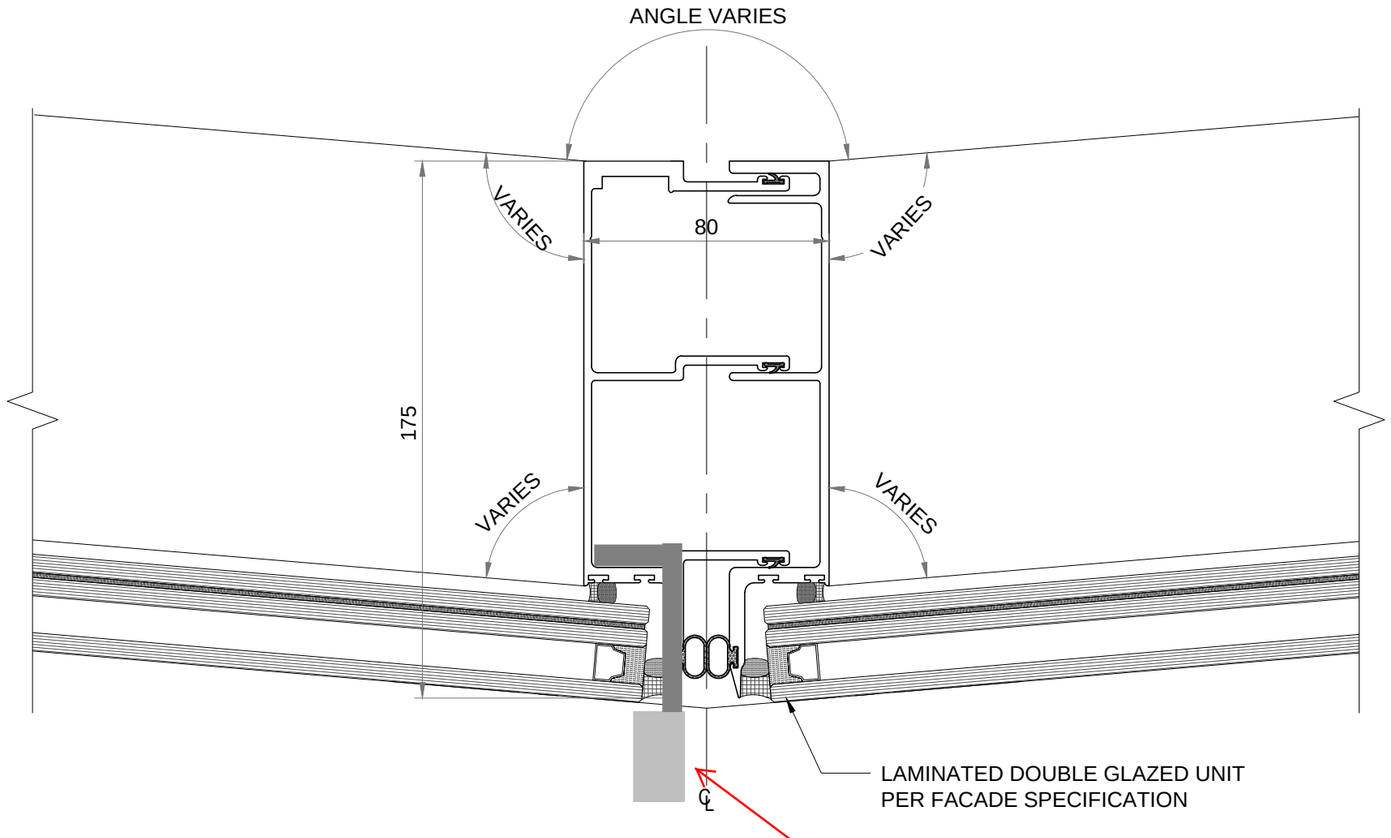




Typical Design Intent detail for concealed BMU restraint pin socket to typical facade spandrel



Typical Design Intent detail for concealed BMU restraint pin socket to typical South Lens facade spandrel



01 — HORIZONTAL SECTION
TYPICAL MULLION VISION - OPTION 1

02 — HORIZONTAL SECTION
TYPICAL MULLION VISION - OPTION 2

NOTES:
1. FOR ALL FINISHES REFER TO ARCHITECTS EXTERNAL FINISHES SCHEDULE
2. REFER TO FACADE PERFORMANCE SPECIFICATION DATED 15/02/2019 FOR ALL TECHNICAL REQUIREMENTS

FOR INFORMATION
NOT FOR CONSTRUCTION

Rev	Date	Revision Details	Drn	Ver.	App.
1	22/03/2019	FOR DISCUSSION	TZ		
0	01/03/2019	DRAFT	JR	RM	

Surface Design
ABN 19 570 343 498
68 York Street, Sydney
New South Wales 2000 Australia
T: +61 2 9249 1400 **E:** Info@surfacedesign.com.au

Architect:
GRIMSHAW
JPW
JOHNSON PILTON WALKER

Client:
MACQUARIE BANK
lendlease

Project:
SYDNEY METRO MARTIN PLACE
OSD
NORTH TOWER

Drawing Title:
N-FT-04
TYPICAL MULLION VISION
ANGLE 1

Drawn	Signed	Date	Verified	Signed	Date
TZ					
Designed	Signed	Date	Approved	Signed	Date
RM					

Project No.	Scale:	Sheet Size:
17032	1:2	A3

Drawing No.	Rev:
CSWSMP-MAC-SMN-FA-DRG-990451	1

20 10 0 10 20 30 40 50 100mm

Appendix D

Additional details for Terrace and Ground Plane access (Zones N3, N4 and N5)

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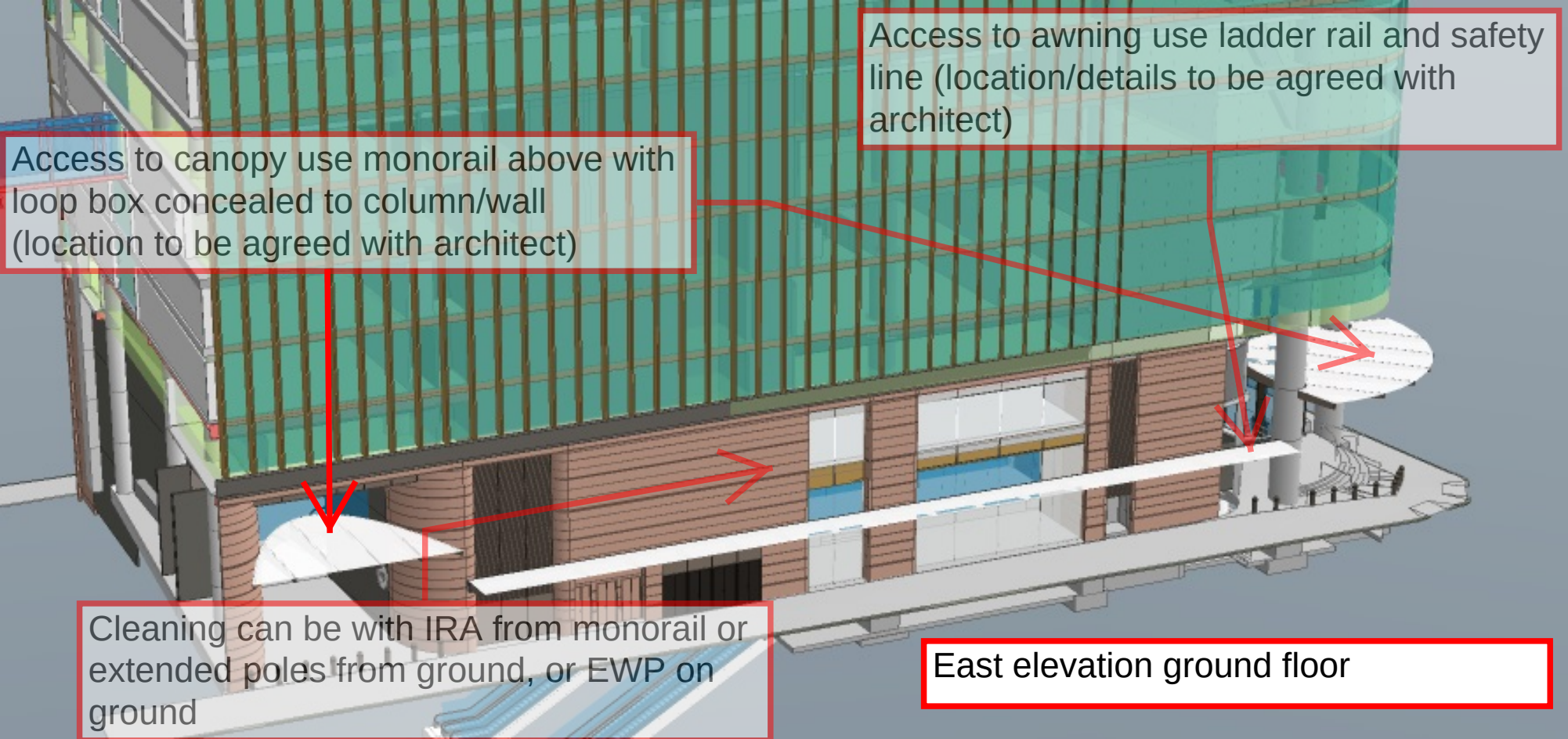
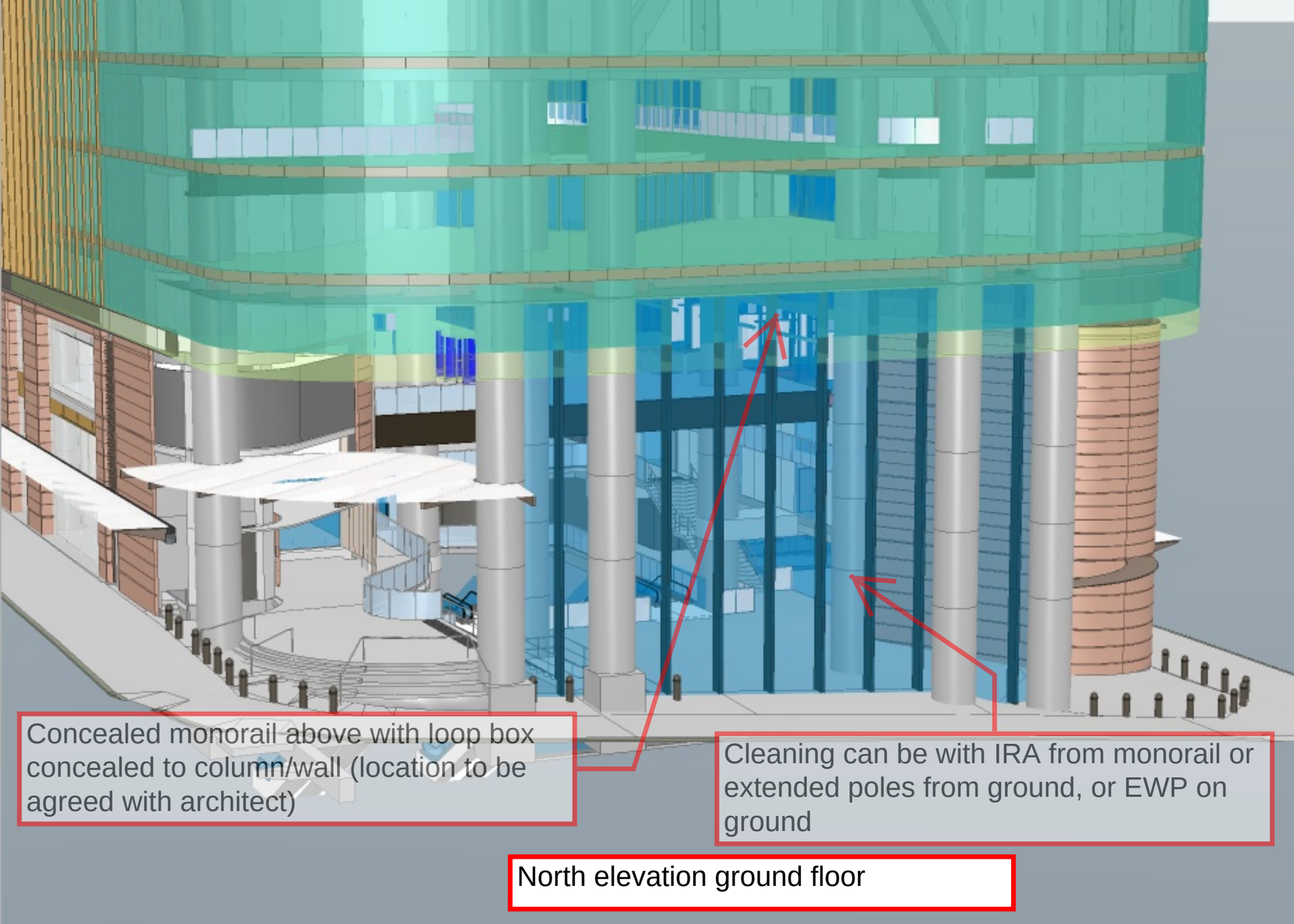
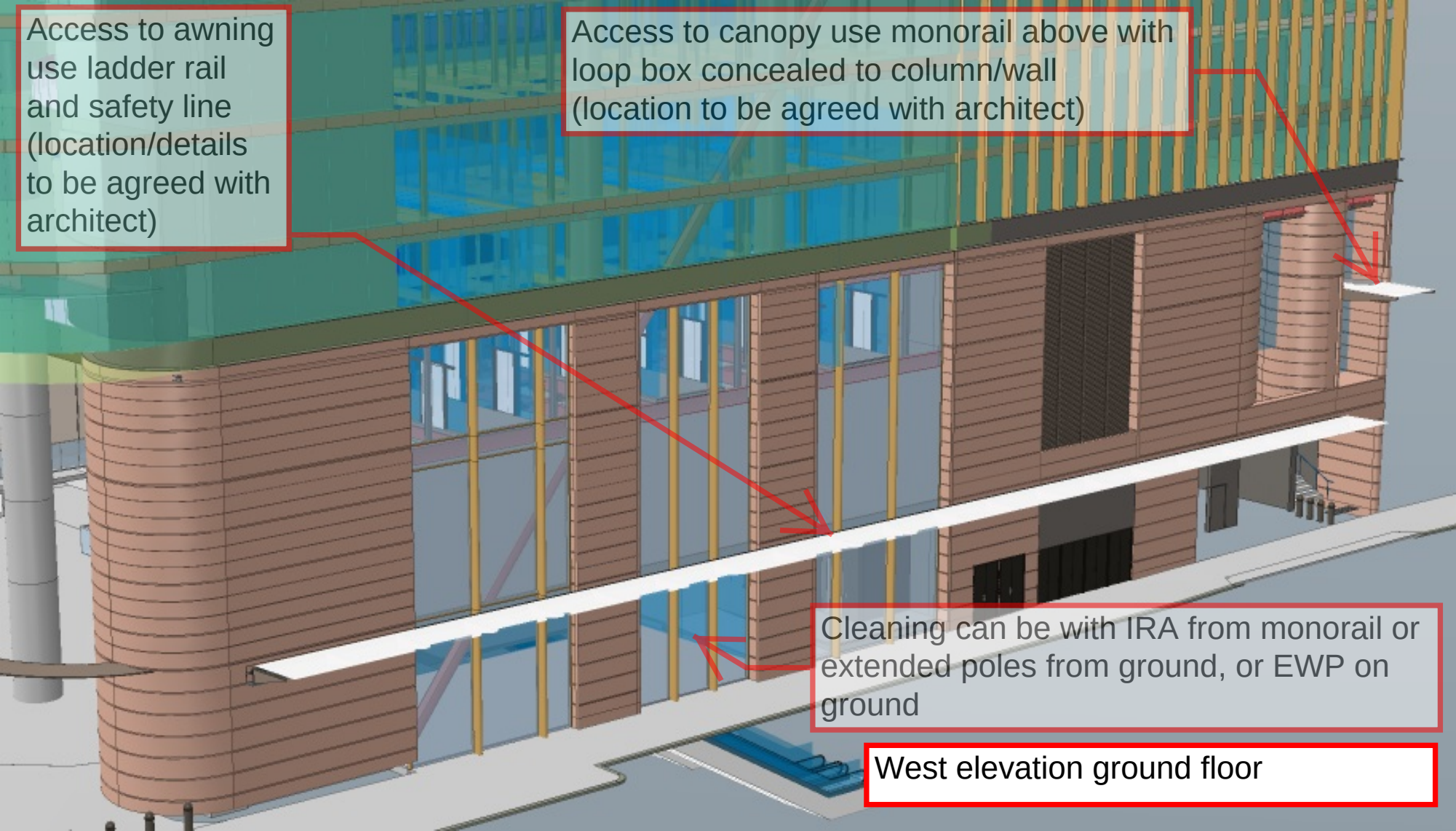
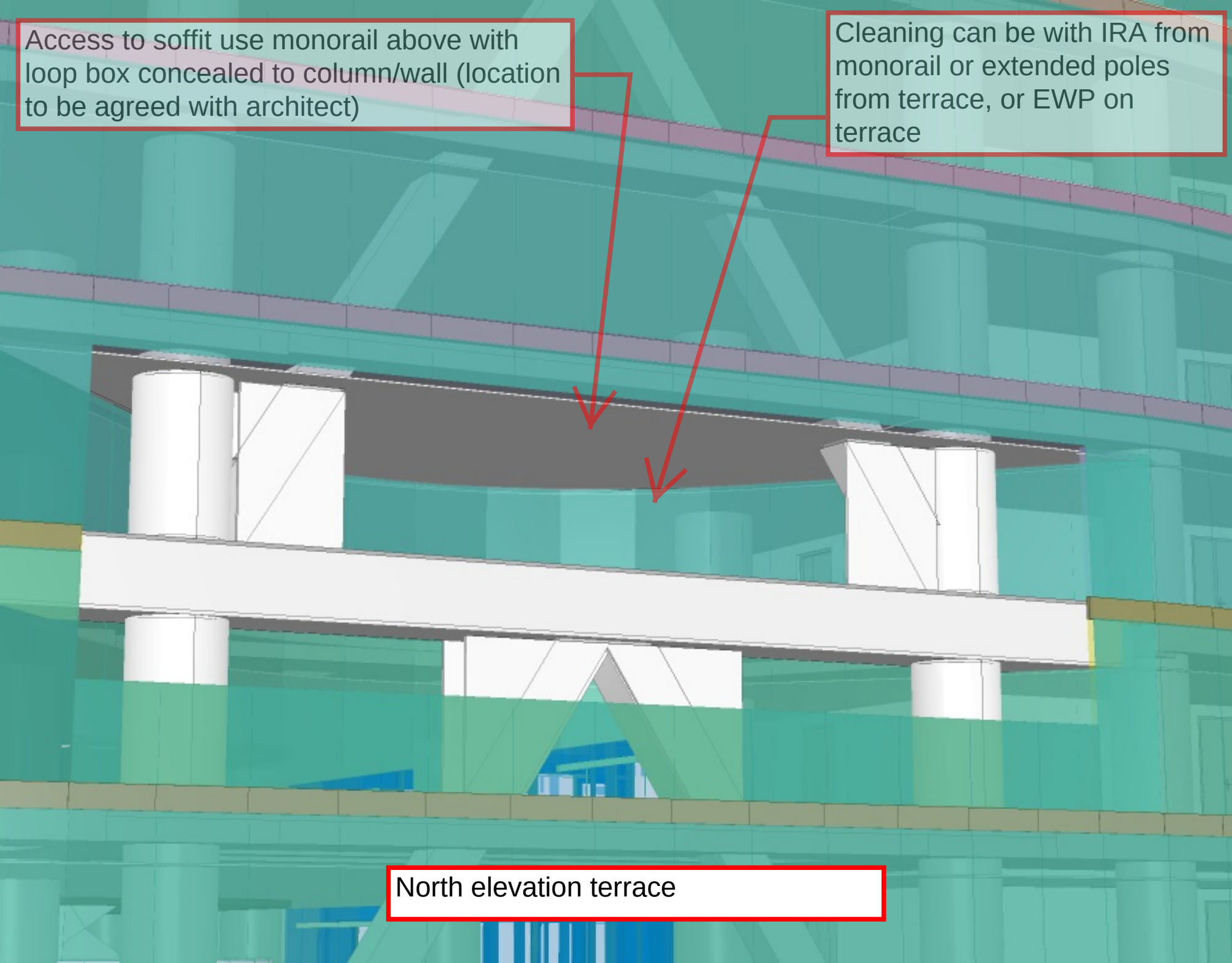
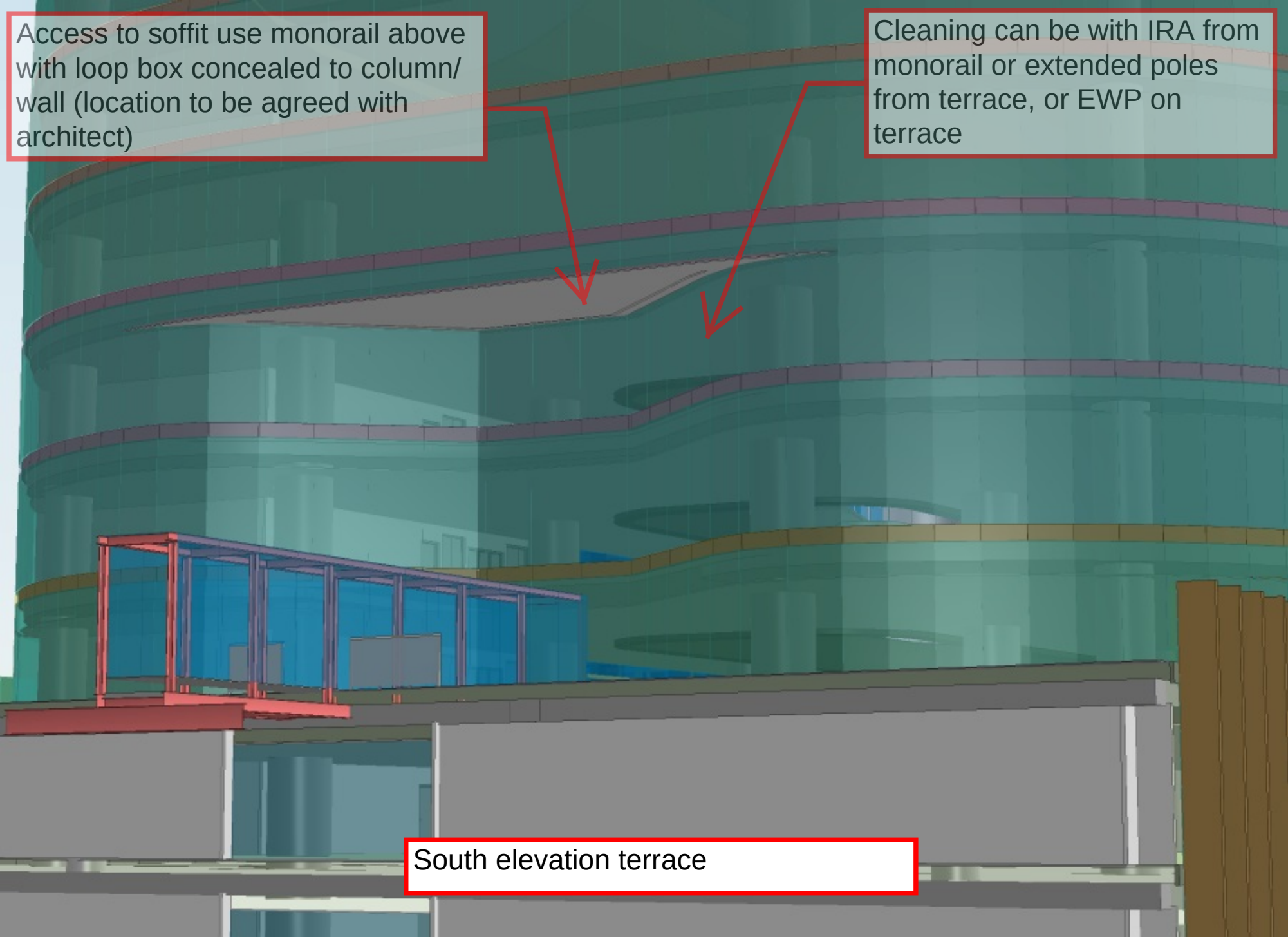

Access to awning use ladder rail and safety line (location/details to be agreed with architect)
Access to canopy use monorail above with loop box concealed to column/wall (location to be agreed with architect)
Cleaning can be with IRA from monorail or extended poles from ground, or EWP on ground
East elevation ground floor

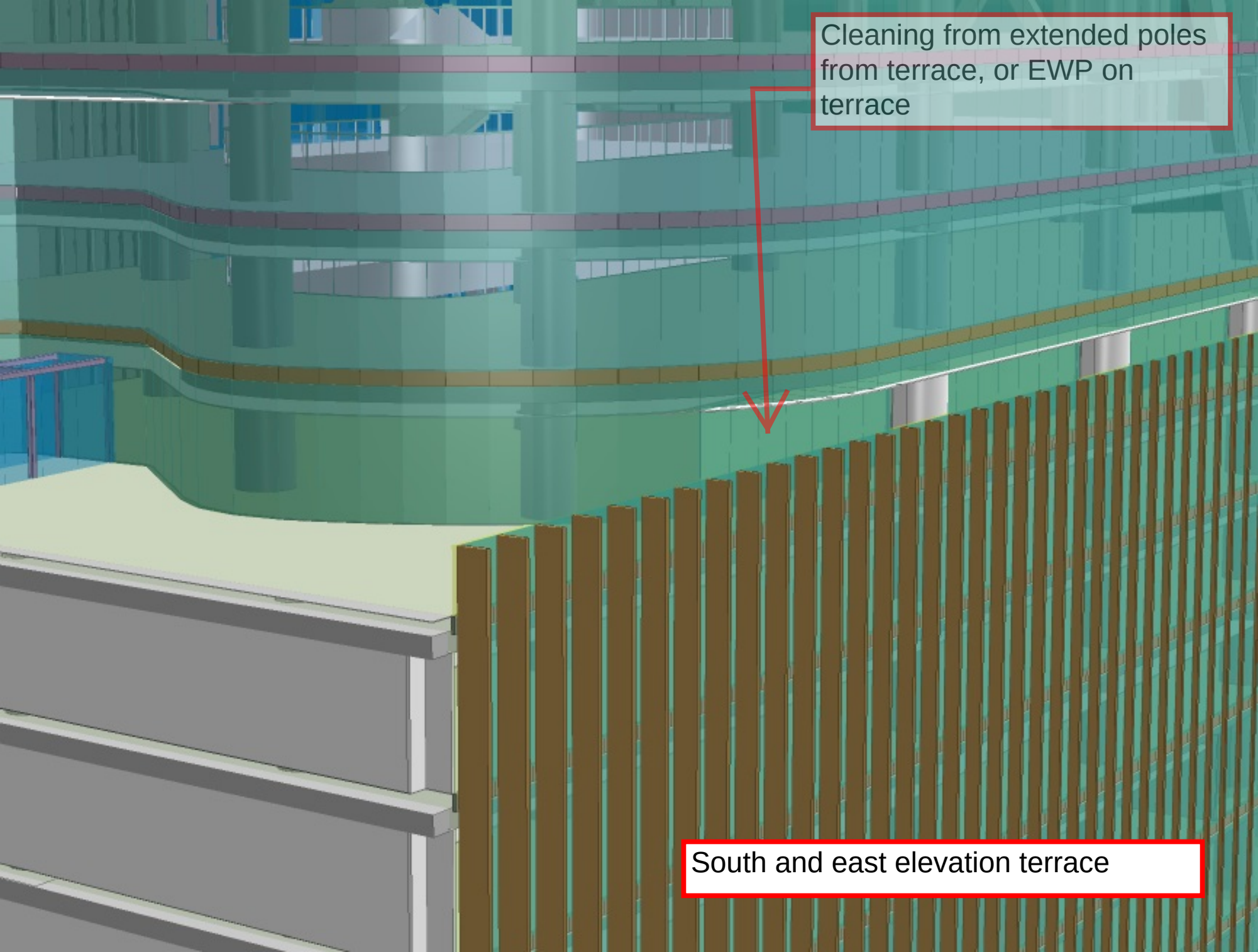


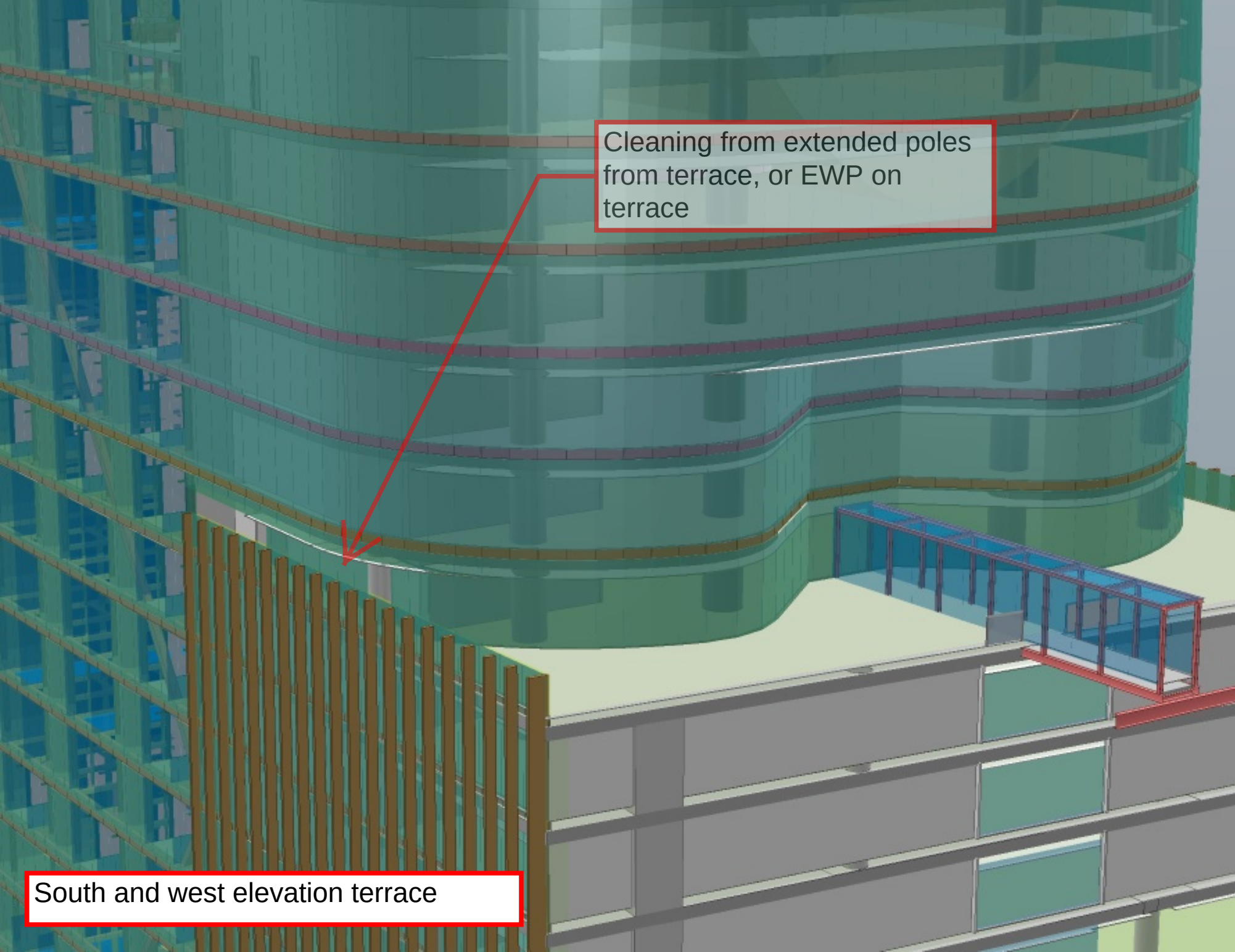
North elevation ground floor


Access to awning use ladder rail and safety line (location/details to be agreed with architect)
Access to canopy use monorail above with loop box concealed to column/wall (location to be agreed with architect)
Cleaning can be with IRA from monorail or extended poles from ground, or EWP on ground
West elevation ground floor


Access to soffit use monorail above with loop box concealed to column/wall (location to be agreed with architect)
Cleaning can be with IRA from monorail or extended poles from terrace, or EWP on terrace
North elevation terrace


Access to soffit use monorail above with loop box concealed to column/ wall (location to be agreed with architect)
Cleaning can be with IRA from monorail or extended poles from terrace, or EWP on terrace
South elevation terrace


Cleaning from extended poles from terrace, or EWP on terrace
South and east elevation terrace


Cleaning from extended poles from terrace, or EWP on terrace
South and west elevation terrace

BLUE – FROM BMU.

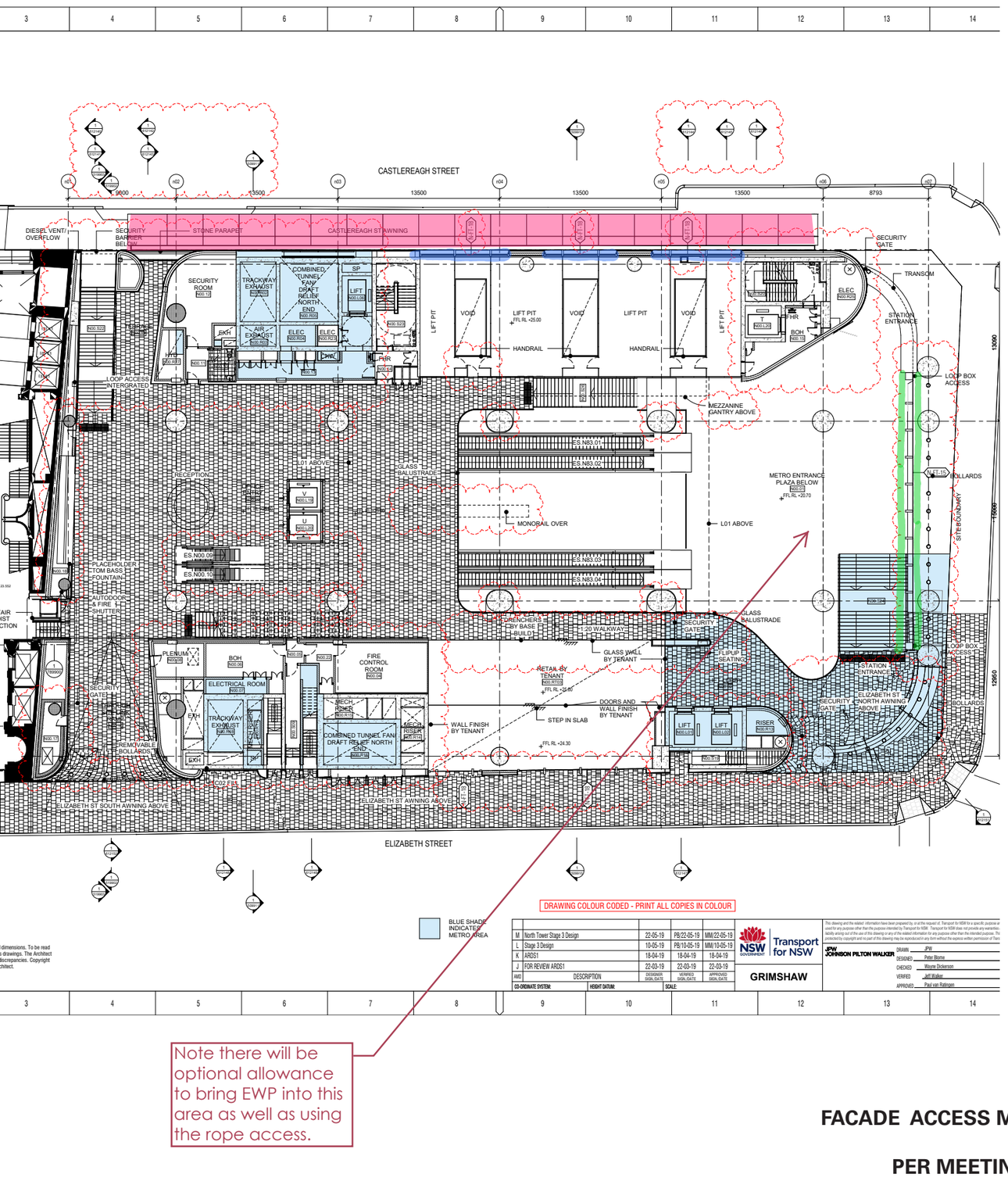
GREEN – FROM ROPE ACCESS RAIL.

PINK – FROM RESTRAINT SYSTEM

ORANGE – FROM E.W.P.

RED – FROM LONG POLE

YELLOW – FROM LIFT CAR.



BLUE SHADE INDICATES METRO AREA

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
M	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
L	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
K	ARDS1	18-04-19	18-04-19	18-04-19
J	FOR REVIEW ARDS1	22-03-19	22-03-19	22-03-19

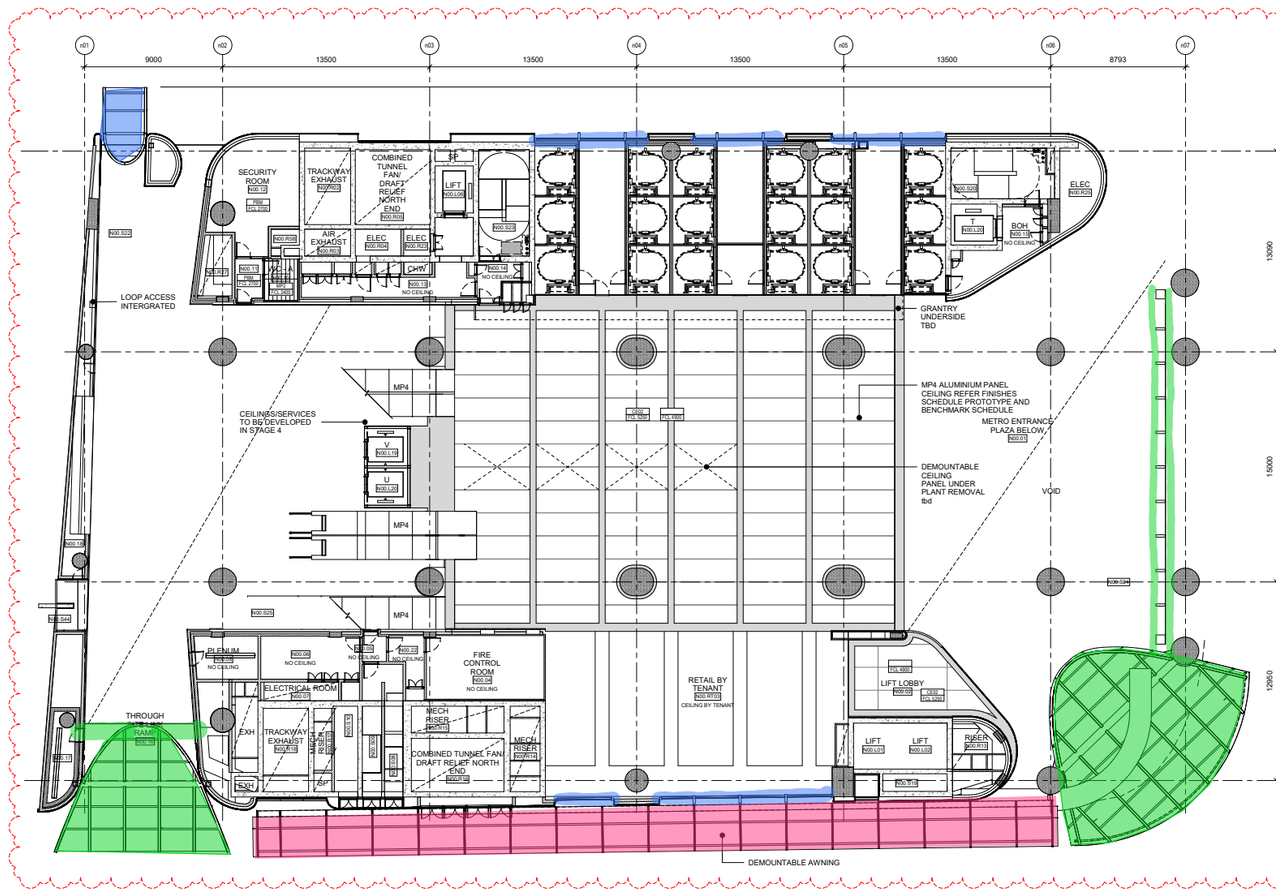
CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

Transport for NSW — GRIMSHAW — JOHNSON PILTON WALKER

DRAWN: JPW
DESIGNED: Peter Blome
CHECKED: Wayne Dickerson
VERIFIED: Jeff Walker
APPROVED: Paul van Rijnsoever

dimensions. To be read
s drawings. The Architect
discrepancies. Copyright
chitect.

Note there will be optional allowance to bring EWP into this area as well as using the rope access.



DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
E	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
D	INTERIM ISSUE	22-02-19	22-02-19	22-02-19
C	GMP VE Baseline Set Update 3	15-06-18	15-06-18	15-06-18

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

Transport for NSW — GRIMSHAW — JOHNSON PILTON WALKER

DRAWN: Author
DESIGNED: Peter Blome
CHECKED: Wayne Dickerson
VERIFIED: Jeff Walker
APPROVED: Paul van Rijnsoever

PRELIMINARY - NOT APPROVED - NOT METRO

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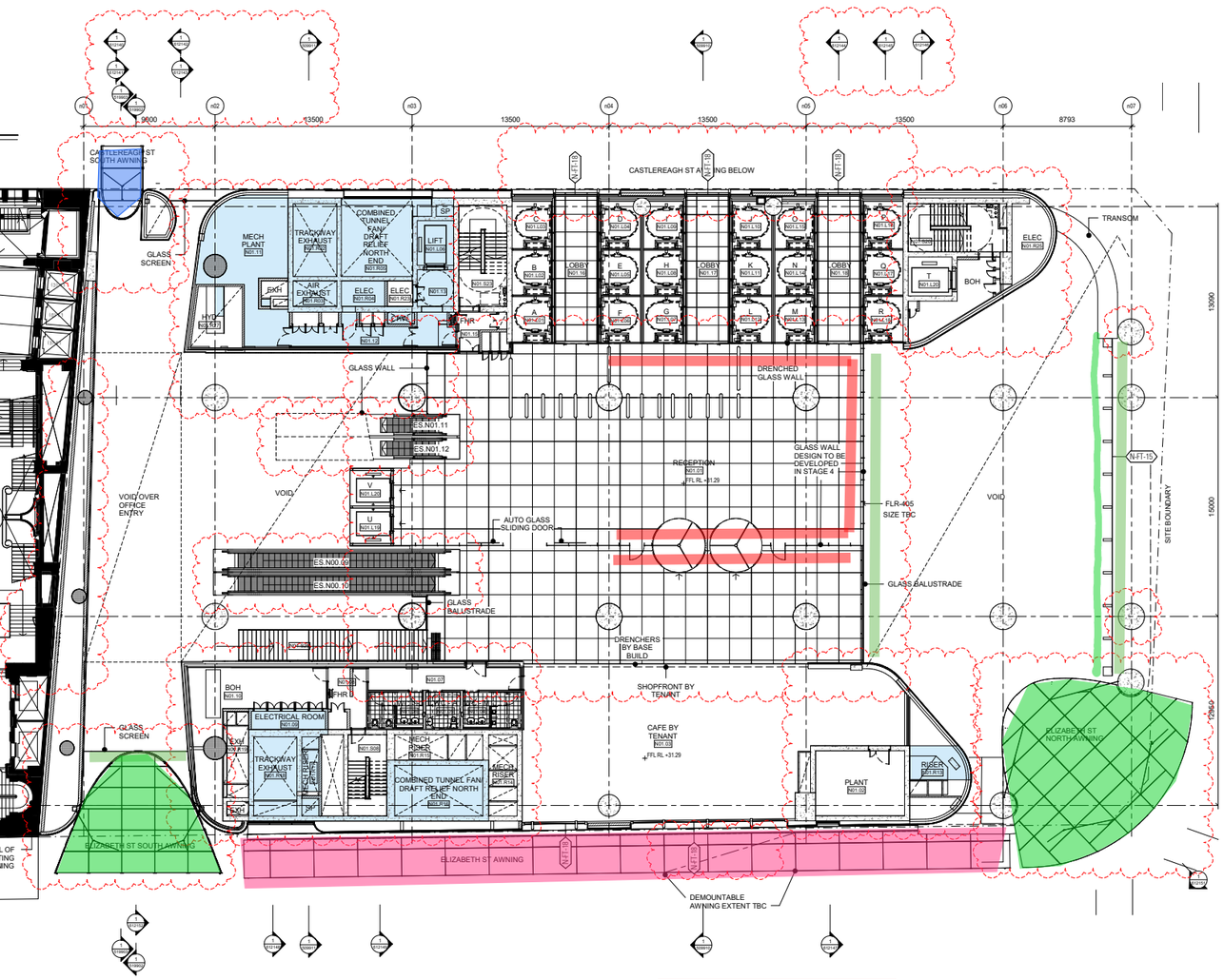
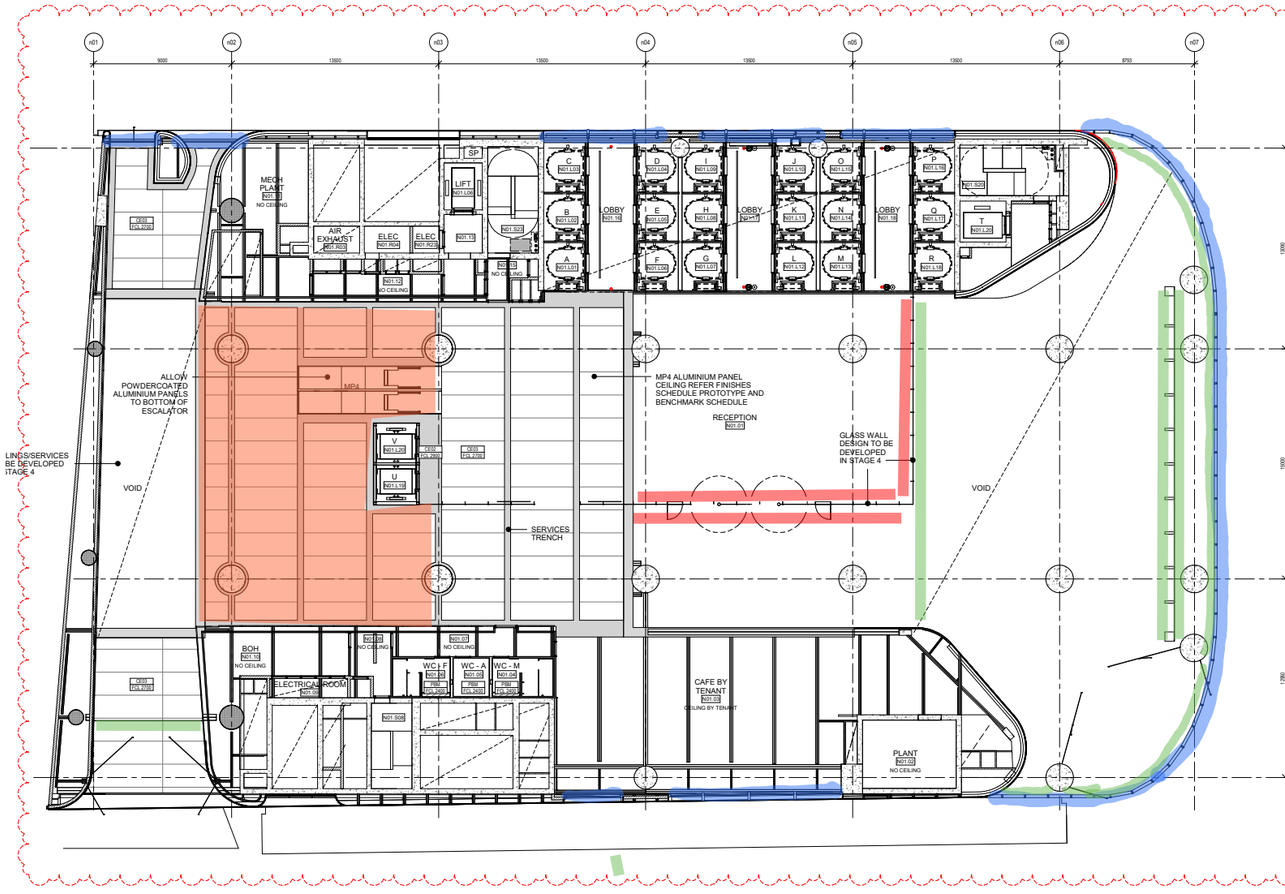
chitect.

FACADE ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19





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BLUE SHADE INDICATES METRO AREA

K	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
J	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
I	ARDS1	18-04-19	18-04-19	18-04-19
H	FOR REVIEW ARDS1	22-03-19	22-03-19	22-03-19
AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

NSW GOVERNMENT Transport for NSW

GRIMSHAW

JOHNSON PILTON WALKER

DRAWN Author
DESIGNED Peter Blome
CHECKED Wayne Dickerson
VERIFIED Jeff Walker
APPROVED Paul van Ratingen

dimensions. To be read
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F	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
E	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
D	INTERIM ISSUE	22-02-19	22-02-19	22-02-19
C	GMP VE Baseline Set Update 3	15-06-18	15-06-18	15-06-18
AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

NSW GOVERNMENT Transport for NSW

GRIMSHAW

JOHNSON PILTON WALKER

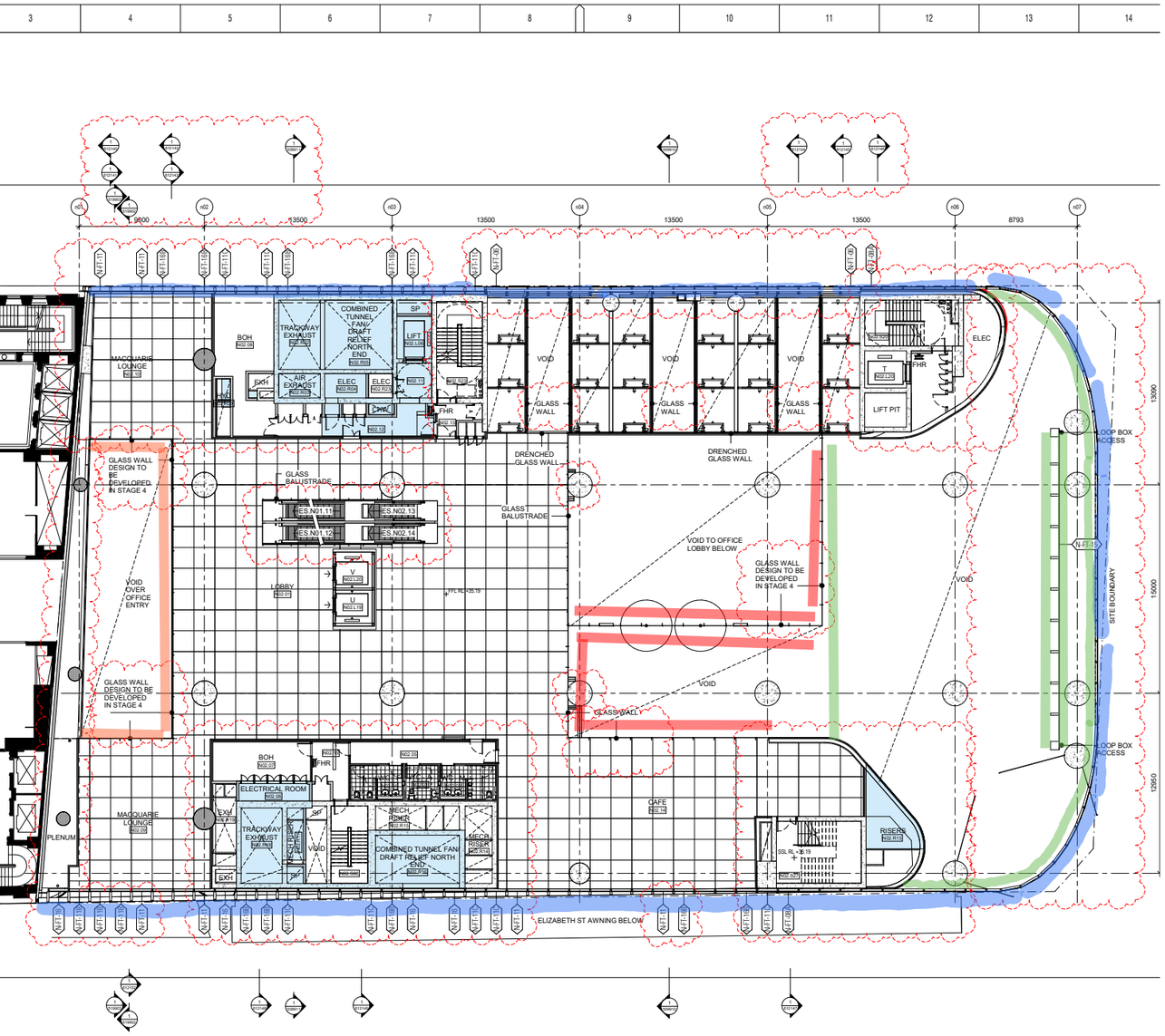
DRAWN Author
DESIGNED Peter Blome
CHECKED Wayne Dickerson
VERIFIED Jeff Walker
APPROVED Paul van Ratingen

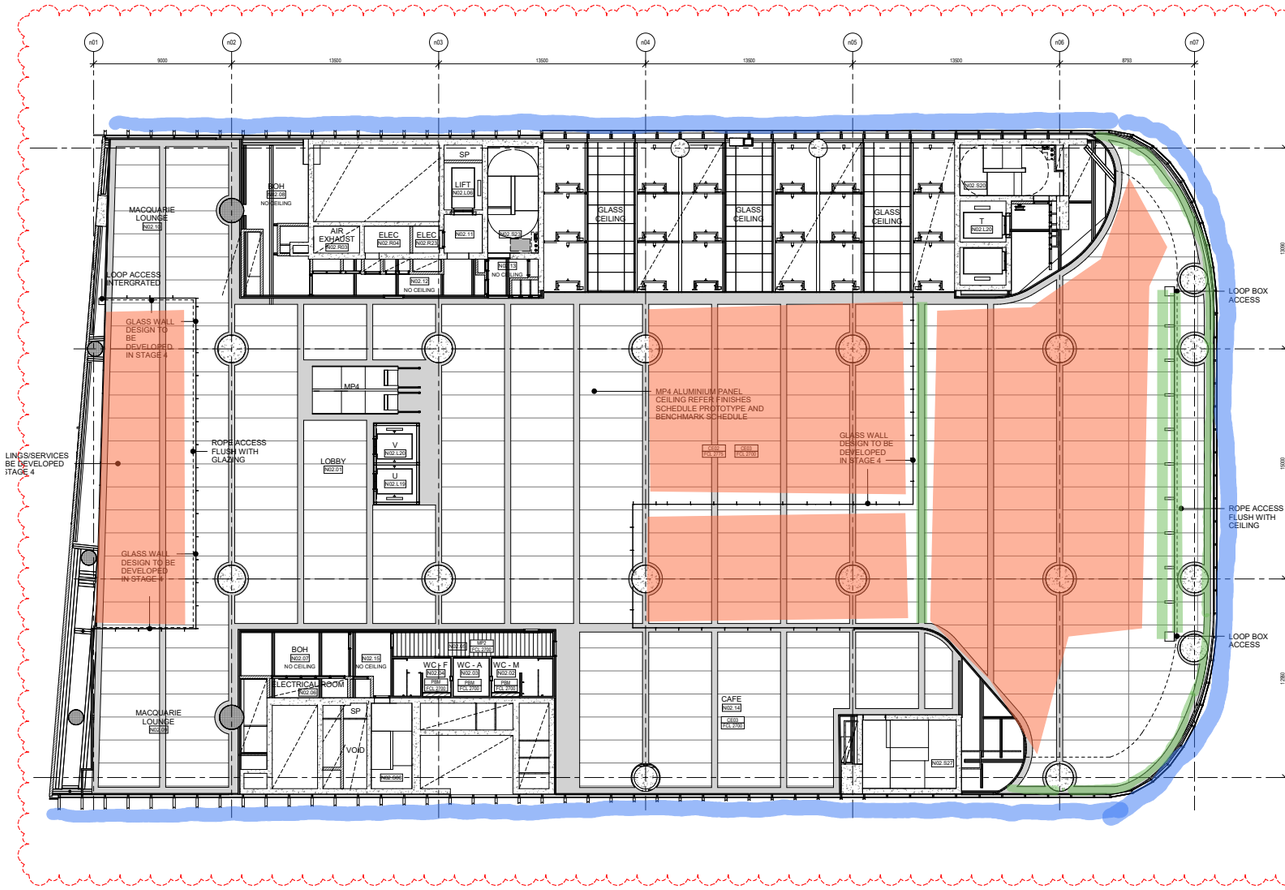
NOT APPROVED - NOT METRO

dimensions. To be read
s drawings. The Architect
iscrepancies. Copyright
chitect.

FACADE ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19





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BLUE SHADE INDICATES METRO AREA

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
L	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
K	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
J	ARDS1	18-04-19	18-04-19	18-04-19
I	FOR REVIEW ARDS1	22-03-19	22-03-19	22-03-19

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

Transport for NSW — GRIMSHAW — JOHNSON PILTON WALKER

DRAWN: Author
DESIGNED: Peter Blome
CHECKED: Wayne Dickerson
VERIFIED: Jeff Walker
APPROVED: Paul van Rijnsoever

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
F	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
E	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
D	ARDS1	18-04-19	18-04-19	18-04-19
C	GMP VE Baseline Set Update 3	15-06-18	15-06-18	15-06-18

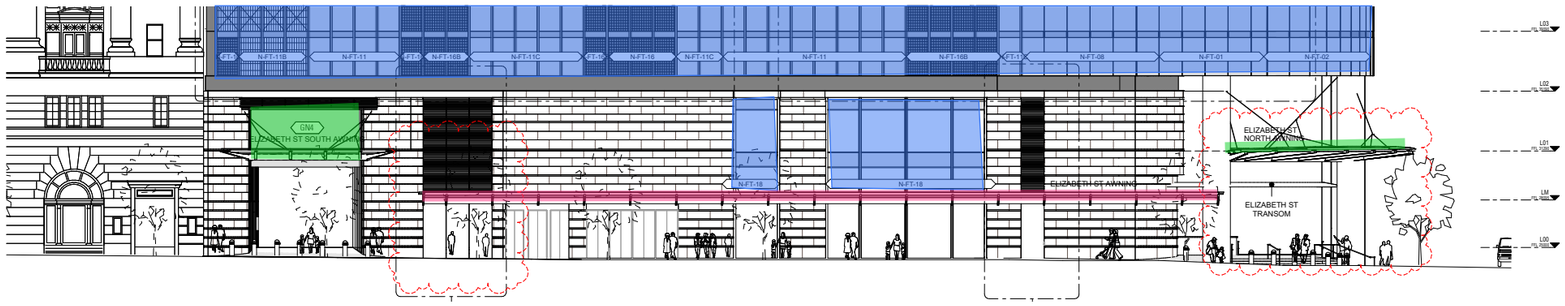
CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

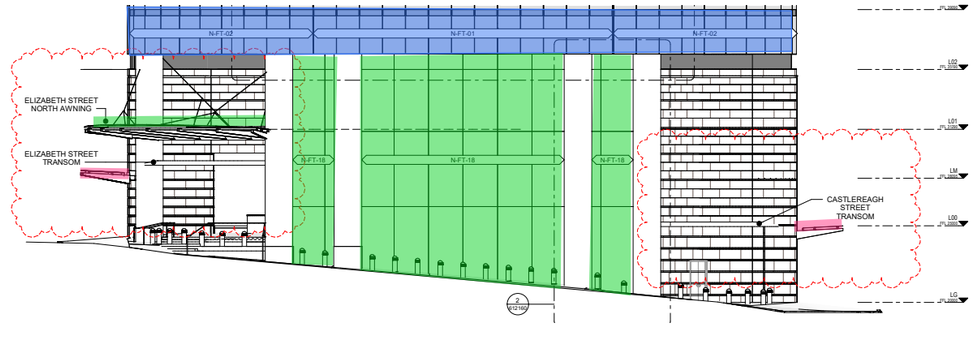
Transport for NSW — GRIMSHAW — JOHNSON PILTON WALKER

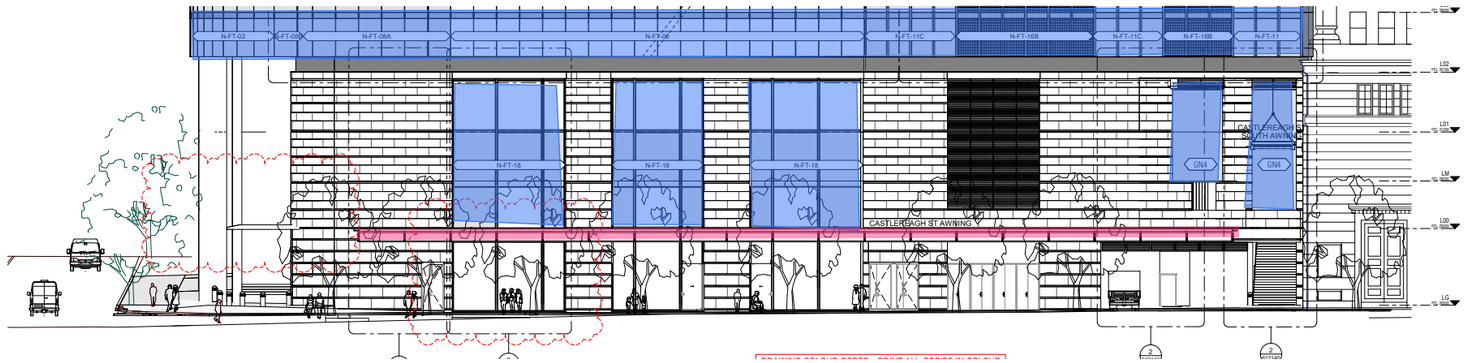
DRAWN: Author
DESIGNED: Peter Blome
CHECKED: Wayne Dickerson
VERIFIED: Jeff Walker
APPROVED: Paul van Rijnsoever

FACADE ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19

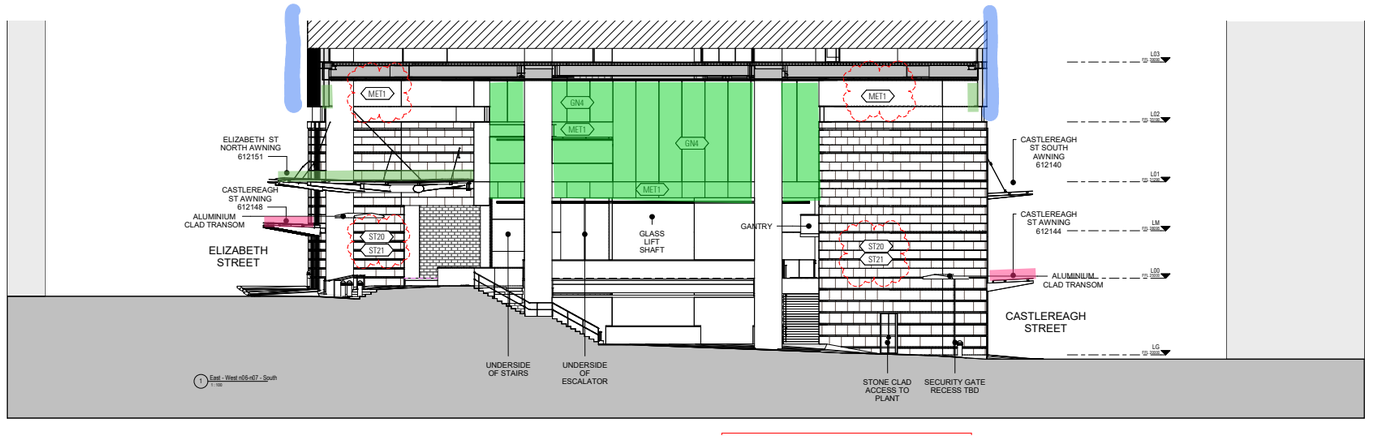


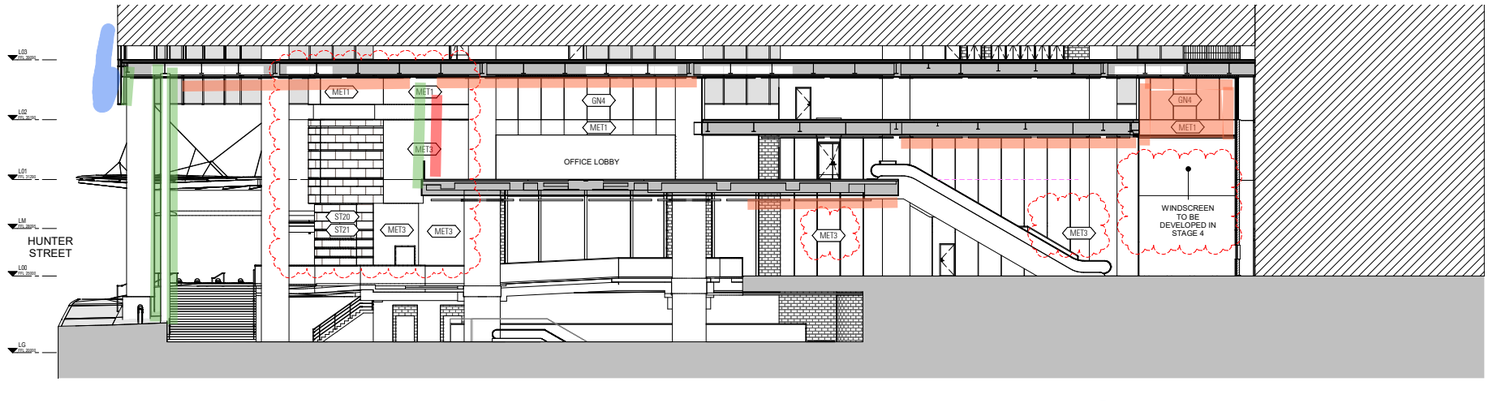


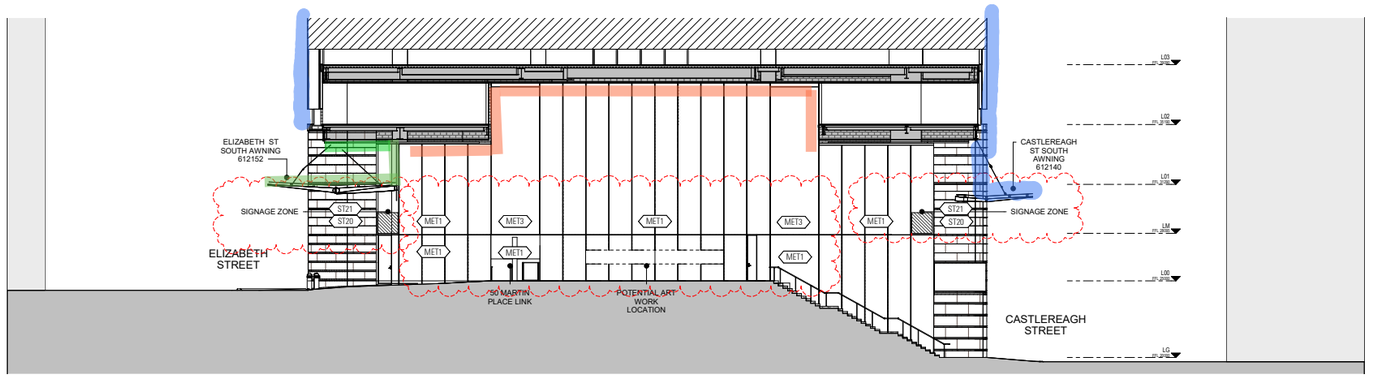


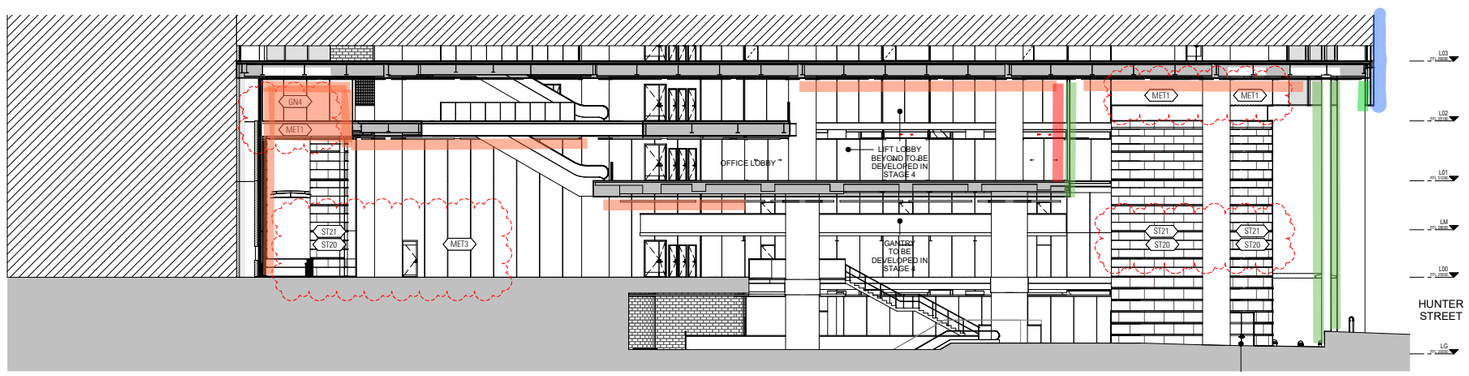
FACADE ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19



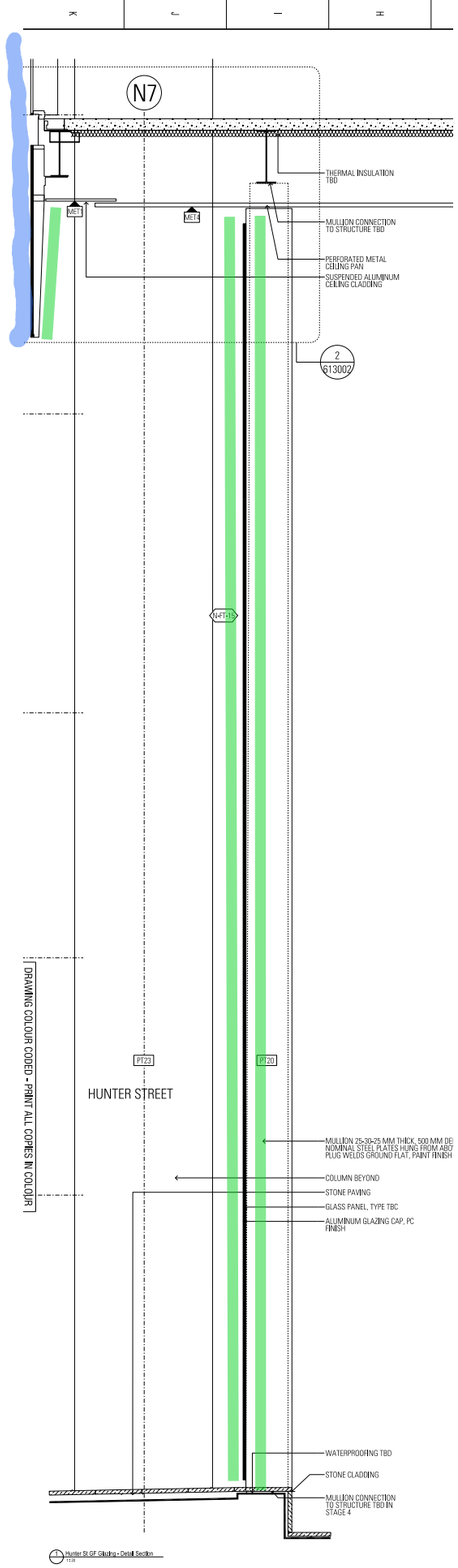






FACADE ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19



Hunter St GF Glazing - Detail Section
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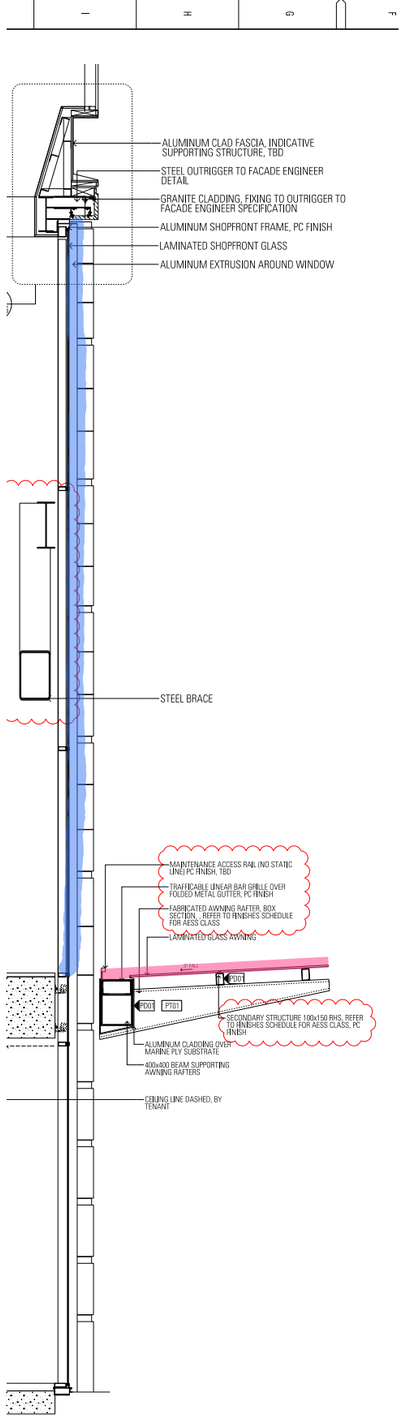
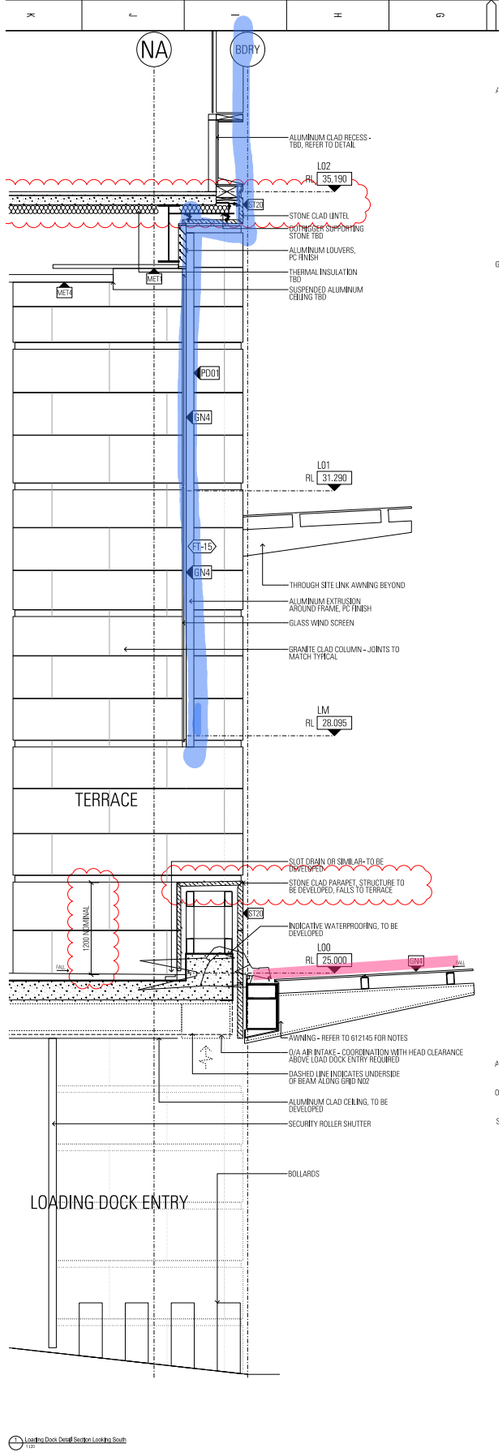
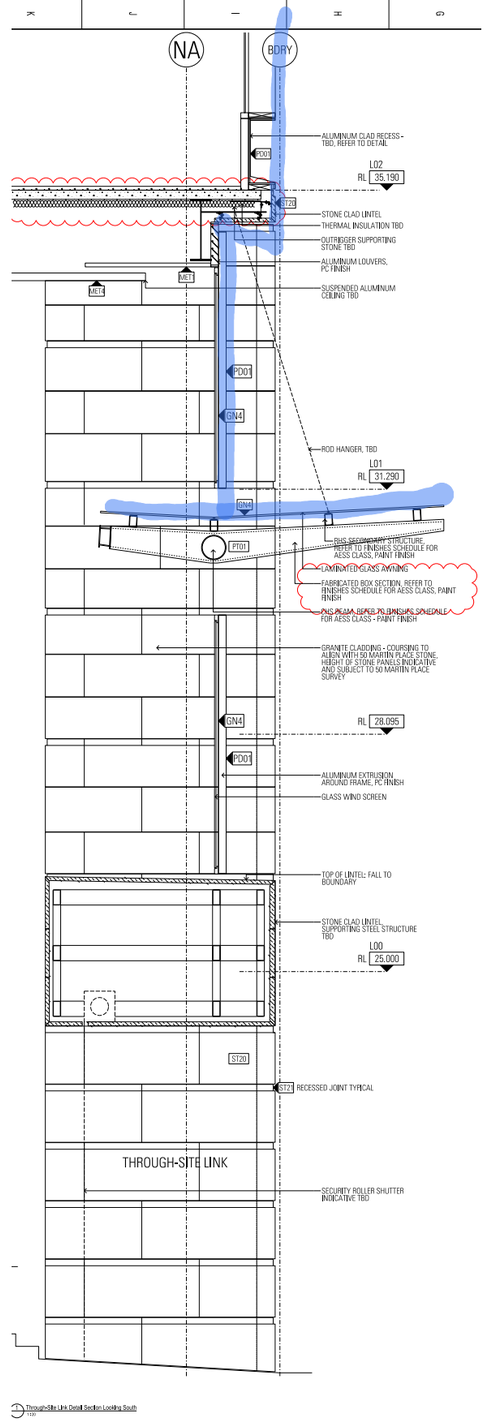




Loading Dock Detail Section Looking South
1:20



Through-Site Link Detail Section Looking South
1:20

NOT FOR CONSTRUCTION

INTERNAL ACCESS MARKUP - PODIUM;

PER MEETING 28/08/19

Appendix E

Additional details for Internal Atrium (Zone N6)

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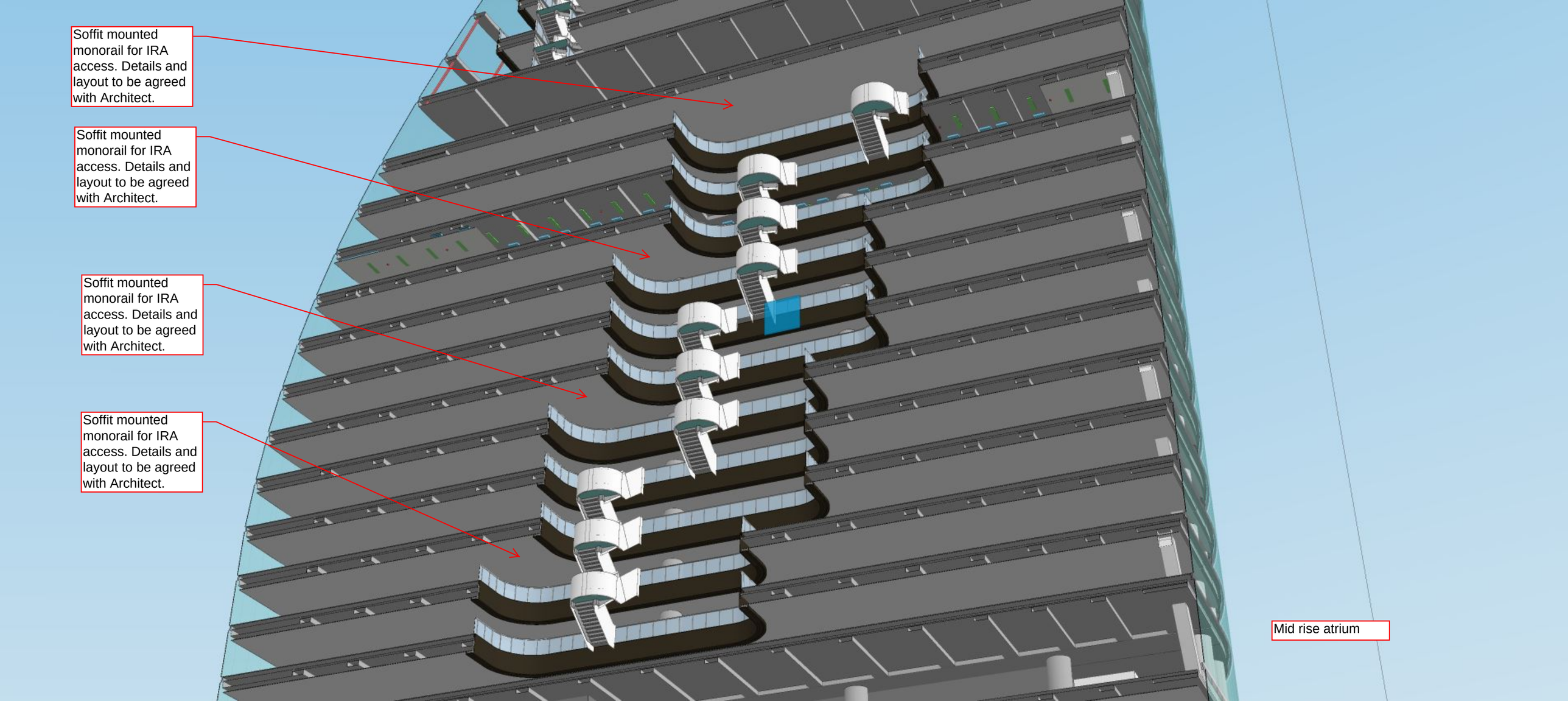
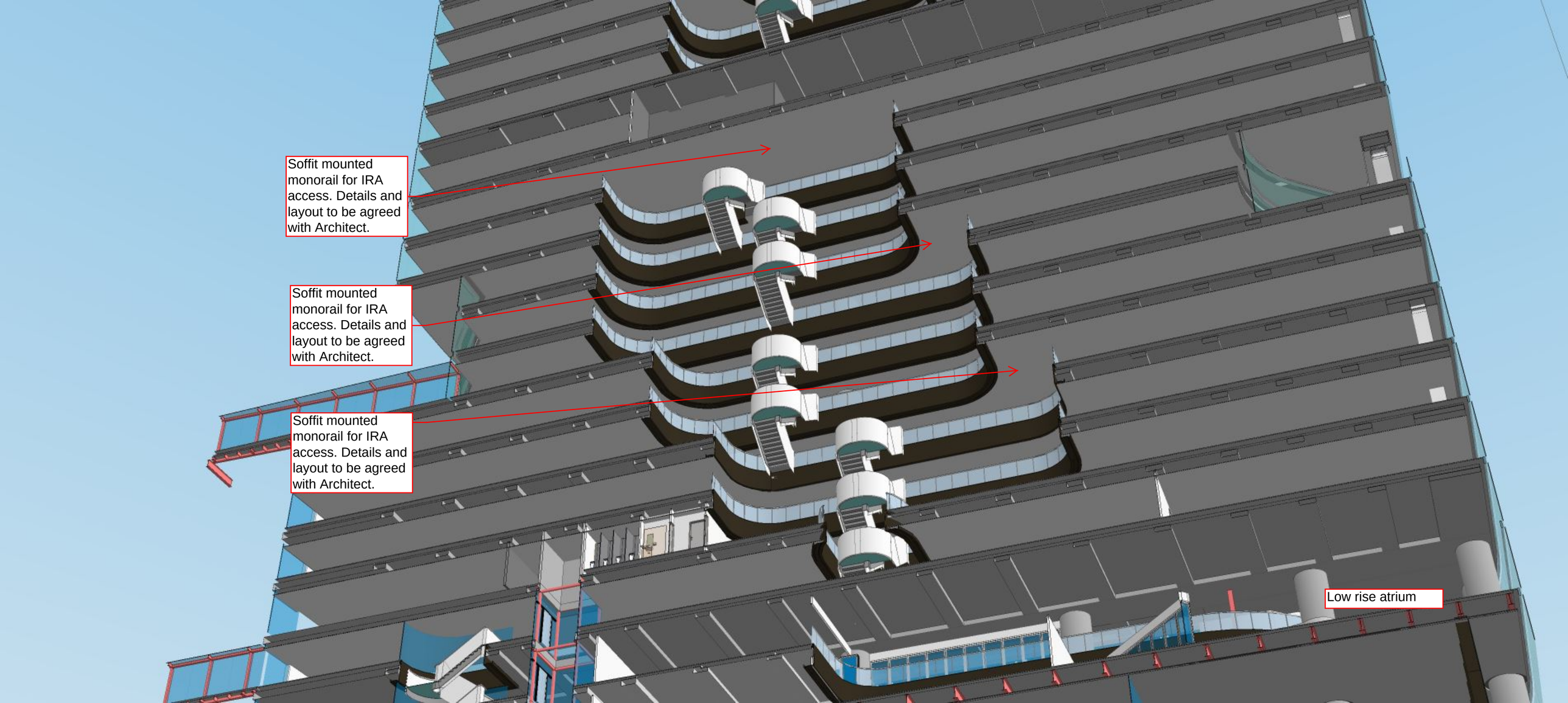
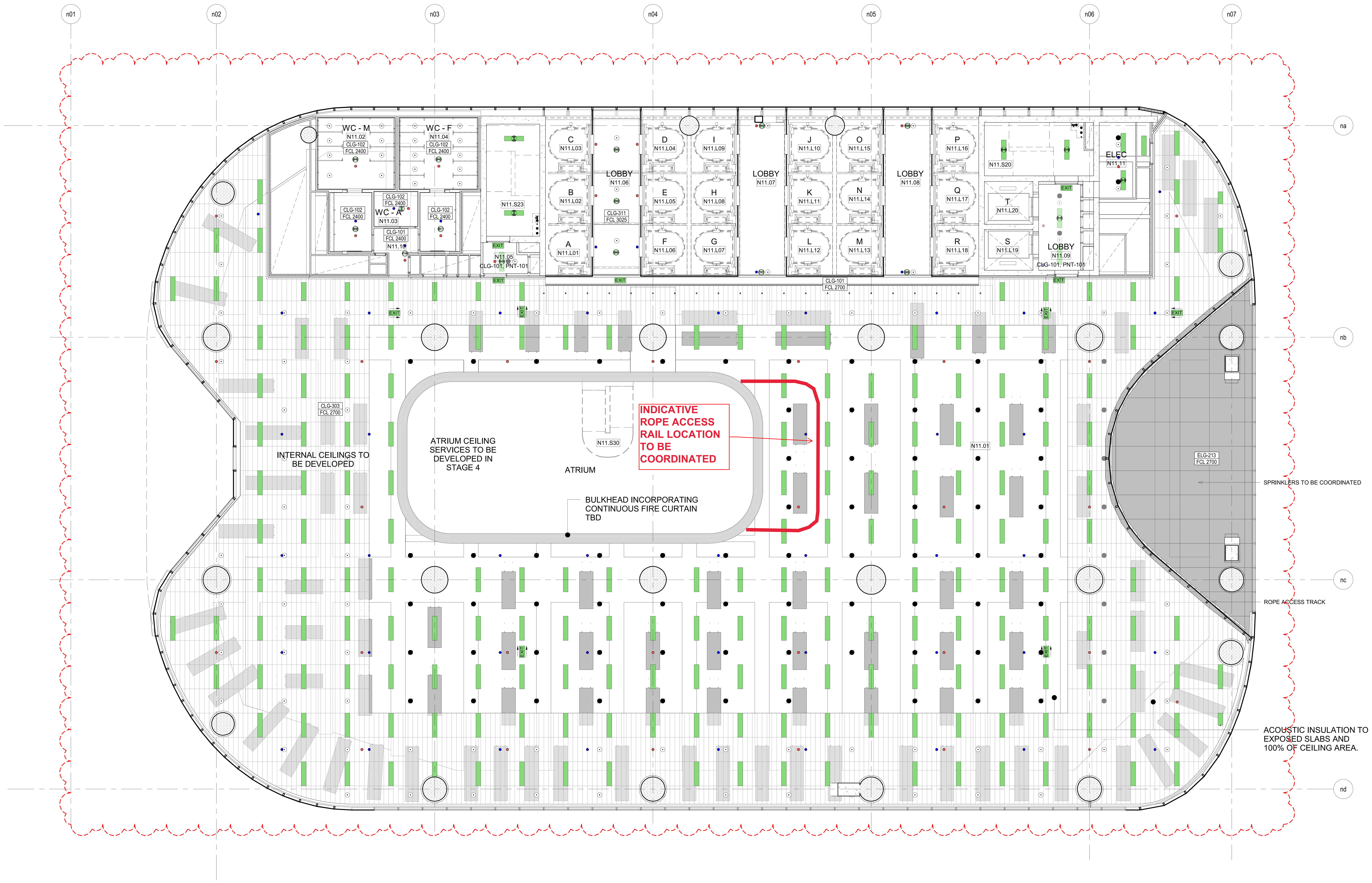

Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Mid rise atrium


Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Soffit mounted monorail for IRA access. Details and layout to be agreed with Architect.
Low rise atrium



● (red)	SMOKE DETECTOR
● (blue)	RECESSED SPEAKER
●	CONCEALED SPRINKLER
⊙	RECESSED SPRINKLER
EXIT	EMERGENCY EXIT SIGN
⊛	EMERGENCY LIGHT
○	DOWN LIGHT
▬ (green)	LIGHT FIXTURE
▭	PASSIVE CHILLED BEAM
◯	ACCESS PANEL

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
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D	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
C	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
B	ARDS1	18-04-19	18-04-19	18-04-19

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

NSW GOVERNMENT Transport for NSW

GRIMSHAW

JPW JOHNSON PILTON WALKER

DRAWN	Author	11.04.19
DESIGNED	Peter Blome	11.04.19
CHECKED	Wayne Dickerson	11.04.19
VERIFIED	Jeff Walker	11.04.19
APPROVED	Paul van Ratingen	11.04.19

NOT APPLICABLE - NOT METRO ISSUE

SYDNEY METRO - MARTIN PLACE

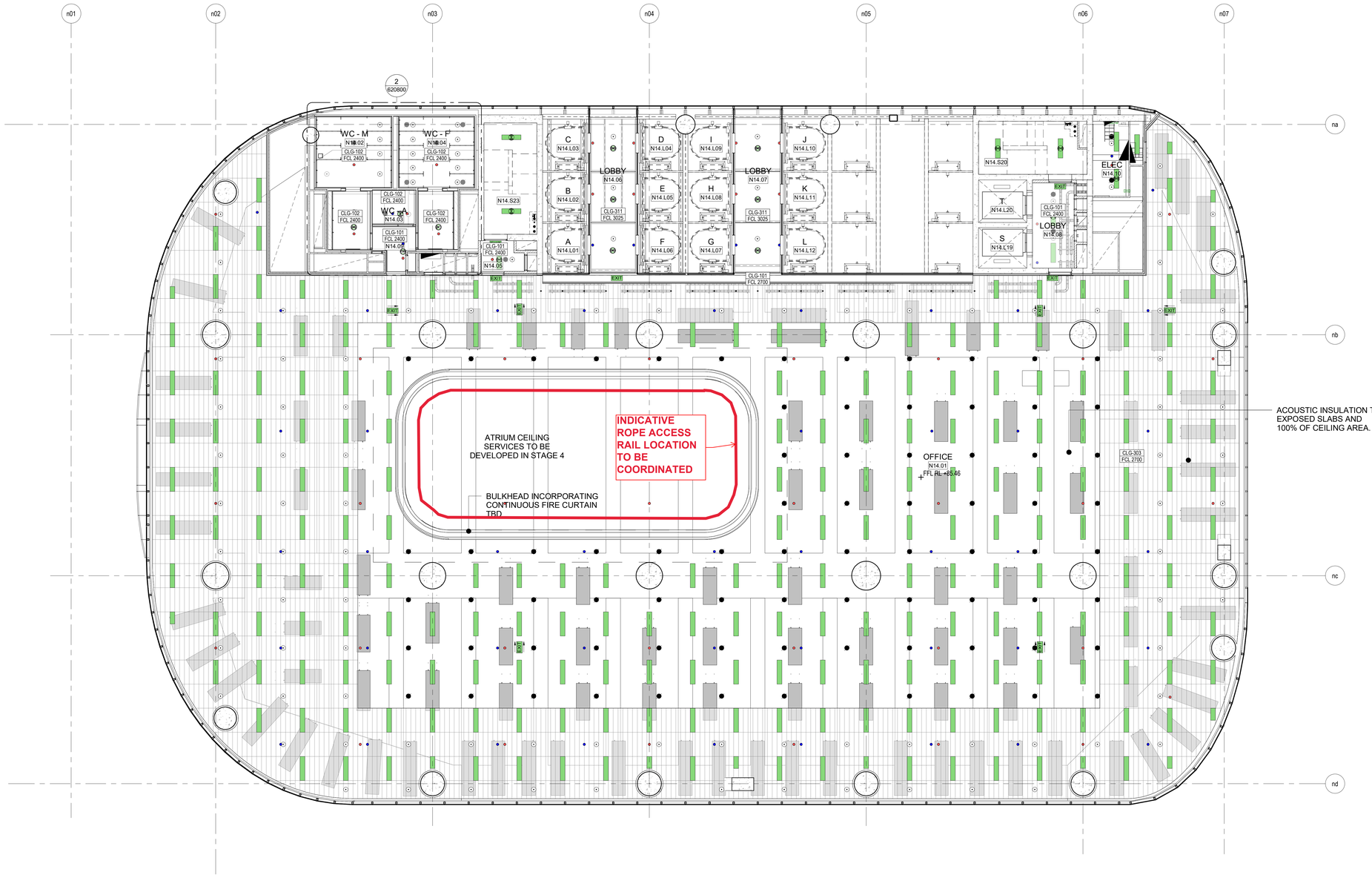
LEVEL 11 REFLECTED CEILING PLAN 31 RCP

FILE No. n/a SHEET: OF A0

STATUS: NORTH TOWER STAGE 4 DESIGN

DRG No. CSWSMP-MAC-SMN-AT-DRG-311100 E EDMS No.

DF 801*554



	SMOKE DETECTOR
	RECESSED SPEAKER
	CONCEALED SPRINKLER
	RECESSED SPRINKLER
EXIT	EMERGENCY EXIT SIGN
	EMERGENCY LIGHT
	DOWN LIGHT
	LIGHT FIXTURE
	PASSIVE CHILLED BEAM
	ACCESS PANEL

1000 0 2500 5000mm
1:100(A0)

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
D	North Tower Stage 4 WIP 1	30-08-19	PB/30-08-19	MM/30-08-19
C	North Tower Stage 3 Design	22-05-19	PB/22-05-19	MM/22-05-19
B	Stage 3 Design	10-05-19	PB/10-05-19	MM/10-05-19
A	ARDS1	18-04-19	18-04-19	18-04-19

CO-ORDINATE SYSTEM: | HEIGHT DATUM: | SCALE:

NSW GOVERNMENT Transport for NSW

GRIMSHAW

JPW
JOHNSON PILTON WALKER

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DRAWN	Author	11.04.19
DESIGNED	Peter Blome	11.04.19
CHECKED	Wayne Dickerson	11.04.19
VERIFIED	Paul Wilkie	11.04.19
APPROVED	Paul van Ratingen	11.04.19

NOT FOR CONSTRUCTION

NOT APPLICABLE - NOT METRO ISSUE

SYDNEY METRO - MARTIN PLACE

LEVEL 14 REFLECTED CEILING PLAN
31 RCP

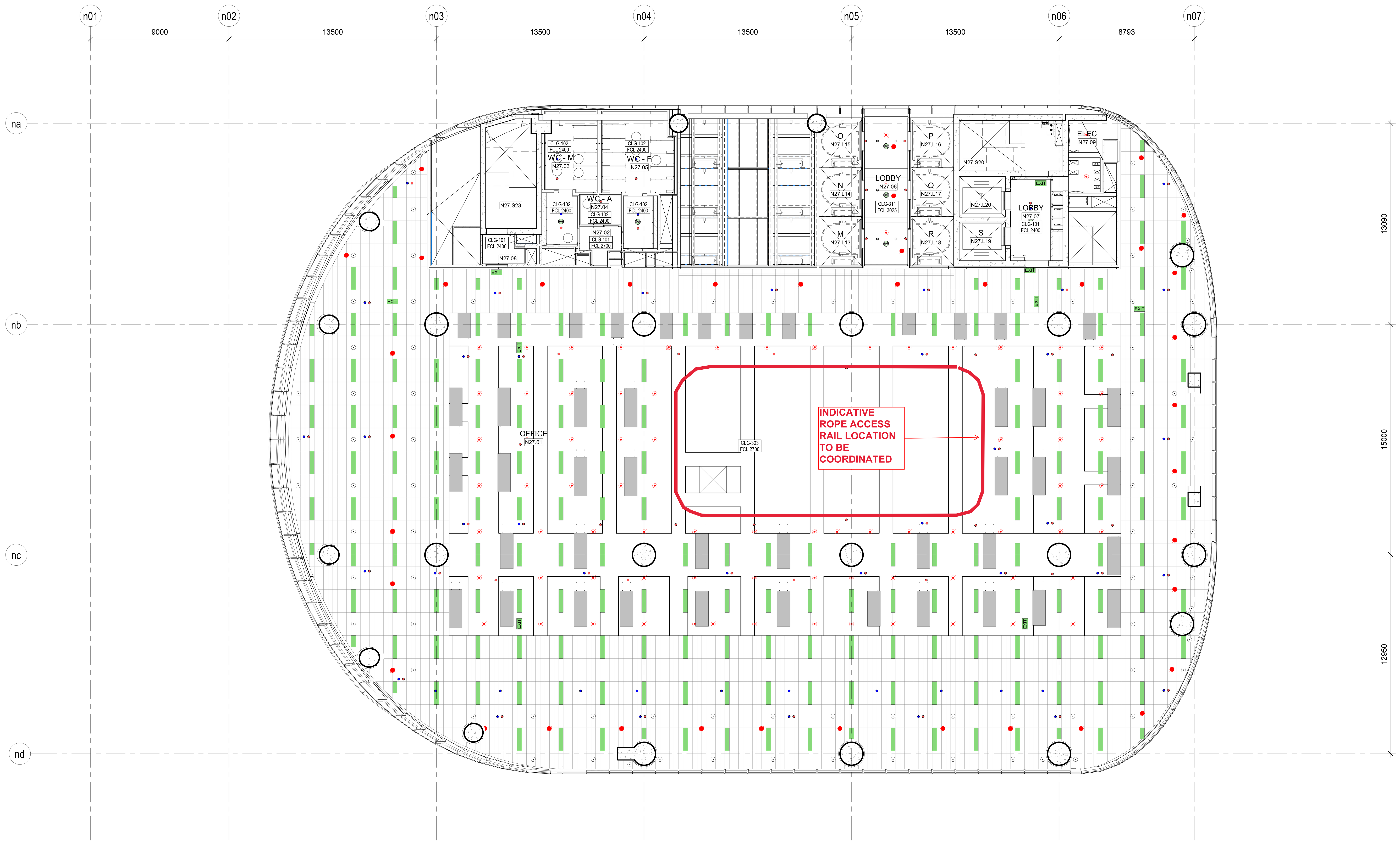
FILE No. n/a | SHEET: OF | A0
STATUS: NORTH TOWER STAGE 4 DESIGN | ©
ORIG No. CSWSMP-MAC-SMN-AT-DRG-311400 | D | EDMS No.

DF 801*15A

Plot Date & Time: 30/08/2019 1:39:46 PM

REFLECTED CEILING PLAN LEGEND

	MOUNT SENSOR
	EMERGENCY LIGHT
	SMOKE DETECTOR
	RECESSED SPEAKER
	EXPOSED SPRINKLER
	CONCEALED SPRINKLER
	RECESSED SPRINKLER
EXIT	EMERGENCY EXIT SIGN
	EMERGENCY LIGHT
	DOWN LIGHT
	LIGHT FIXTURE
	PASSIVE CHILLED BEAM
	ACCESS PANEL
	DRENCHER



General Notes:

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NOTE:
TO BE READ IN CONJUNCTION WITH FINISHES SCHEDULE
CSWSMP-MAC-SMN-NA-SCH-939900

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
A	North Tower Stage 4 WIP 2	18-10-19	PB/18-10-19	MM/18-10-19

CO-ORDINATE SYSTEM: | HEIGHT DATUM: | SCALE:

NSW GOVERNMENT | Transport for NSW

GRIMSHAW

JPW
JOHNSON PILTON WALKER

DRAWN	Author	18.10.19
DESIGNED	Peter Blome	18.10.19
CHECKED	Jeff Walker	16.10.19
VERIFIED	Wayne Dickerson	17.10.19
APPROVED	Paul van Ratingen	18.10.19

NOT APPLICABLE - NOT METRO ISSUE

SYDNEY METRO - MARTIN PLACE

LEVEL 27 REFLECTED CEILING PLAN
31 RCP

FILE No. n/a | SHEET: OF | A0

STATUS: NORTH TOWER STAGE 4 WIP 2

DRG No. CSWSMP-MAC-SMN-AT-DRG-312700 | A | EDMS No.

DF 801*554

Appendix F

Additional details for Lightwell and bridge (Zone N7 and N8)

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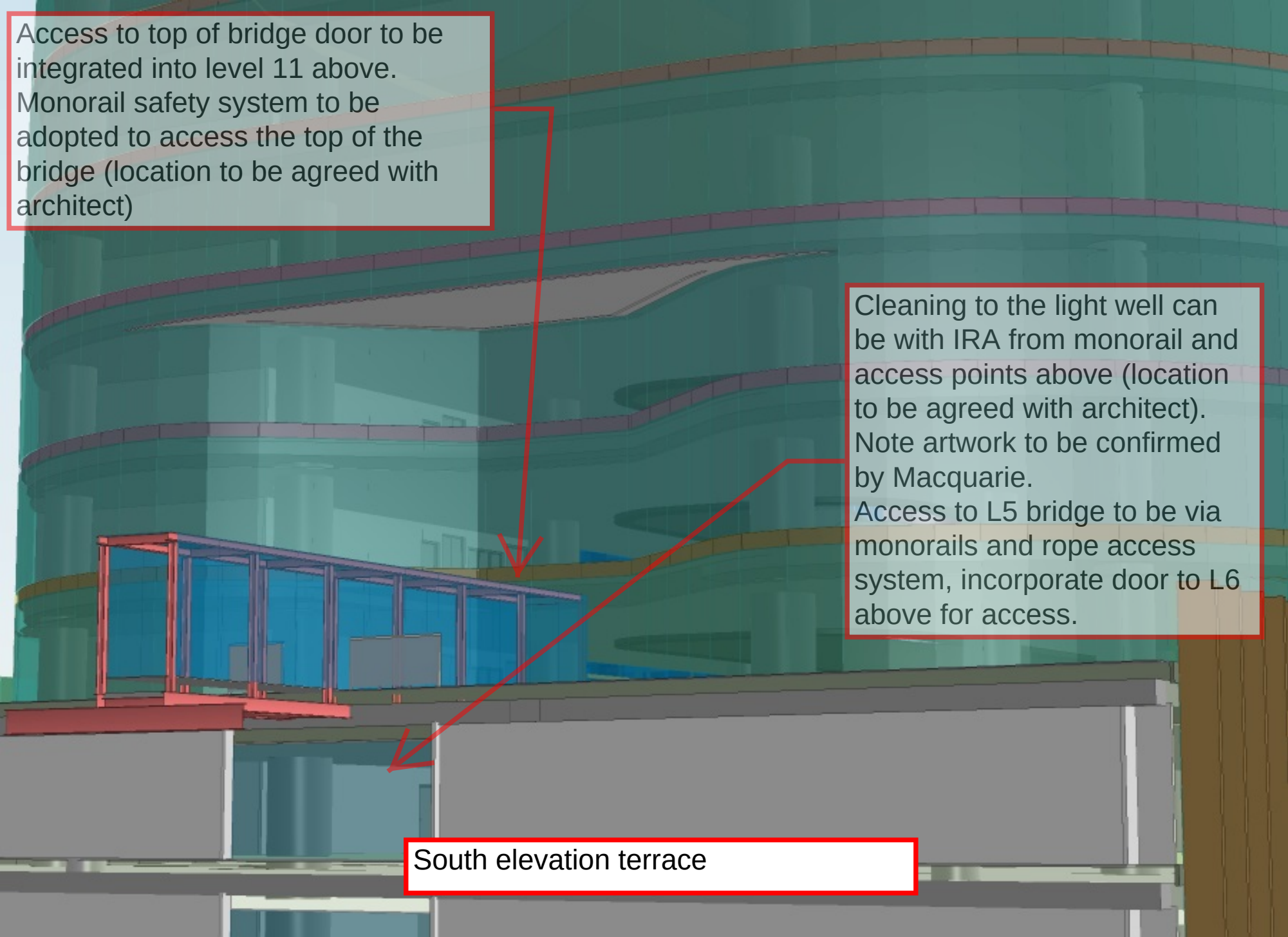
Access to top of bridge door to be integrated into level 11 above. Monorail safety system to be adopted to access the top of the bridge (location to be agreed with architect)
Cleaning to the light well can be with IRA from monorail and access points above (location to be agreed with architect). Note artwork to be confirmed by Macquarie.
Access to L5 bridge to be via monorails and rope access system, incorporate door to L6 above for access.
South elevation terrace

Appendix G

Additional details for Access within the lift core (Zone N9)

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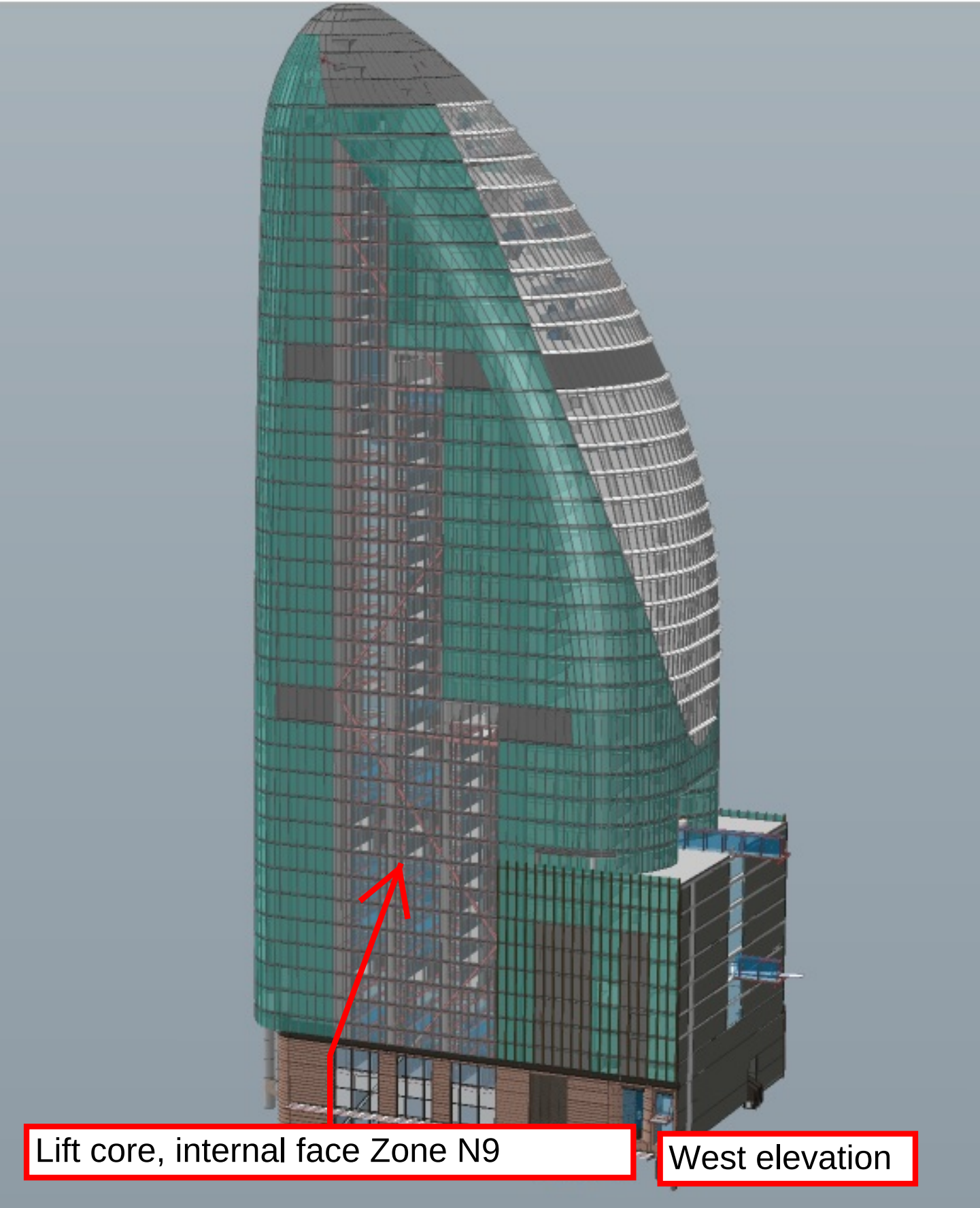
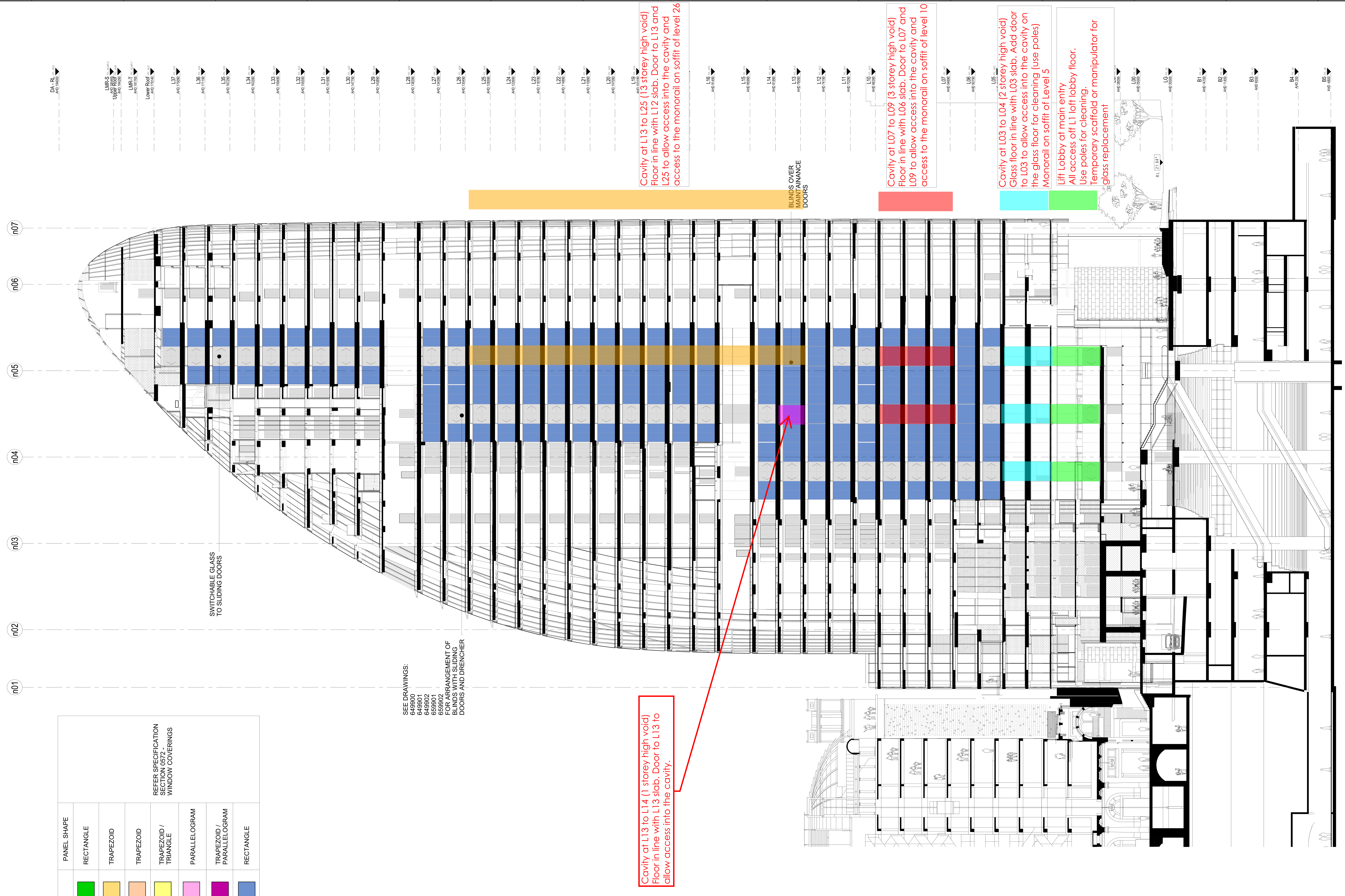

Lift core, internal face Zone N9
West elevation



REFER SPECIFICATION SECTION 0572 - WINDOW COVERINGS

CODE		PANEL SHAPE
FIX-201	(green)	RECTANGLE
FIX-203	(yellow-orange)	TRAPEZOID
FIX-204	(peach)	TRAPEZOID
FIX-205	(yellow)	TRAPEZOID / TRIANGLE
FIX-206	(pink)	PARALLELOGRAM
FIX-207	(magenta)	TRAPEZOID / PARALLELOGRAM
FIX-208	(blue)	RECTANGLE

2000 0 5000 10000m
1:200(A0)

General Notes:

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
A	Window Coverings Tender Package	17-09-19	PB/17-09-19	MM/17-09-19

CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

NSW GOVERNMENT | Transport for NSW

GRIMSHAW

JPW
JOHNSON PILTON WALKER

DRAWN	Author	11.04.19
DESIGNED	Peter Blome	11.04.19
CHECKED	Wayne Dickerson	11.04.19
VERIFIED	Jeff Walker	11.04.19
APPROVED	Paul van Ratingen	11.04.19

NOT APPLICABLE - NOT METRO ISSUE

SYDNEY METRO - MARTIN PLACE

INTERNAL ELEVATION - BLIND TYPE
61 Facade Blind Type Elevations

FILE No. n/a | SHEET: OF | A0
STATUS: NORTH TOWER STAGE 4 DESIGN
DRG No. CSWSMP-MAC-SMN-AT-DRG-610034 | A | EDMS No.

Plot Date & Time: 9/17/2019 5:46:08 PM

DF 801*554

Appendix H

Example images of BMU's and Access Equipment (for reference only)

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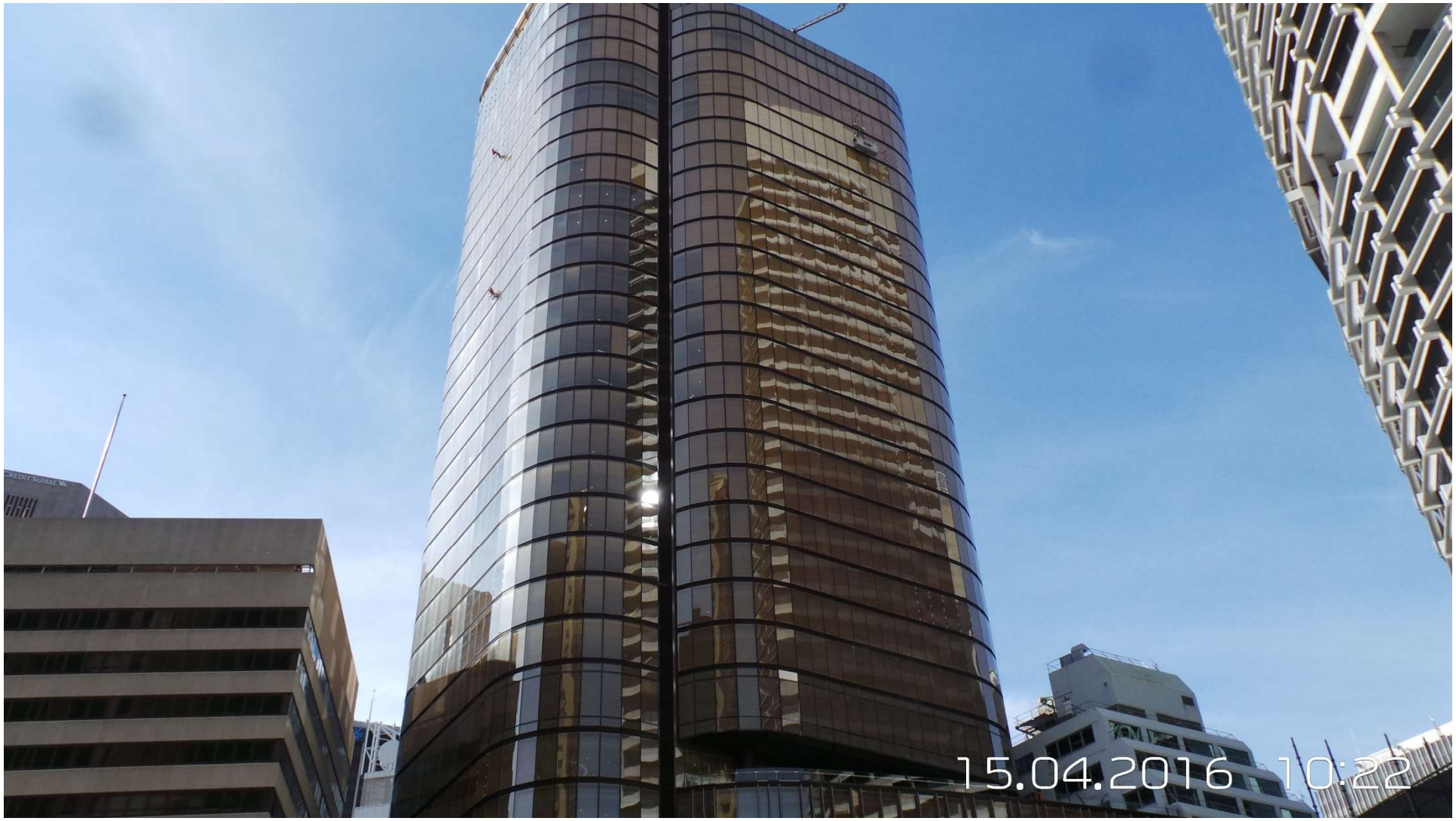
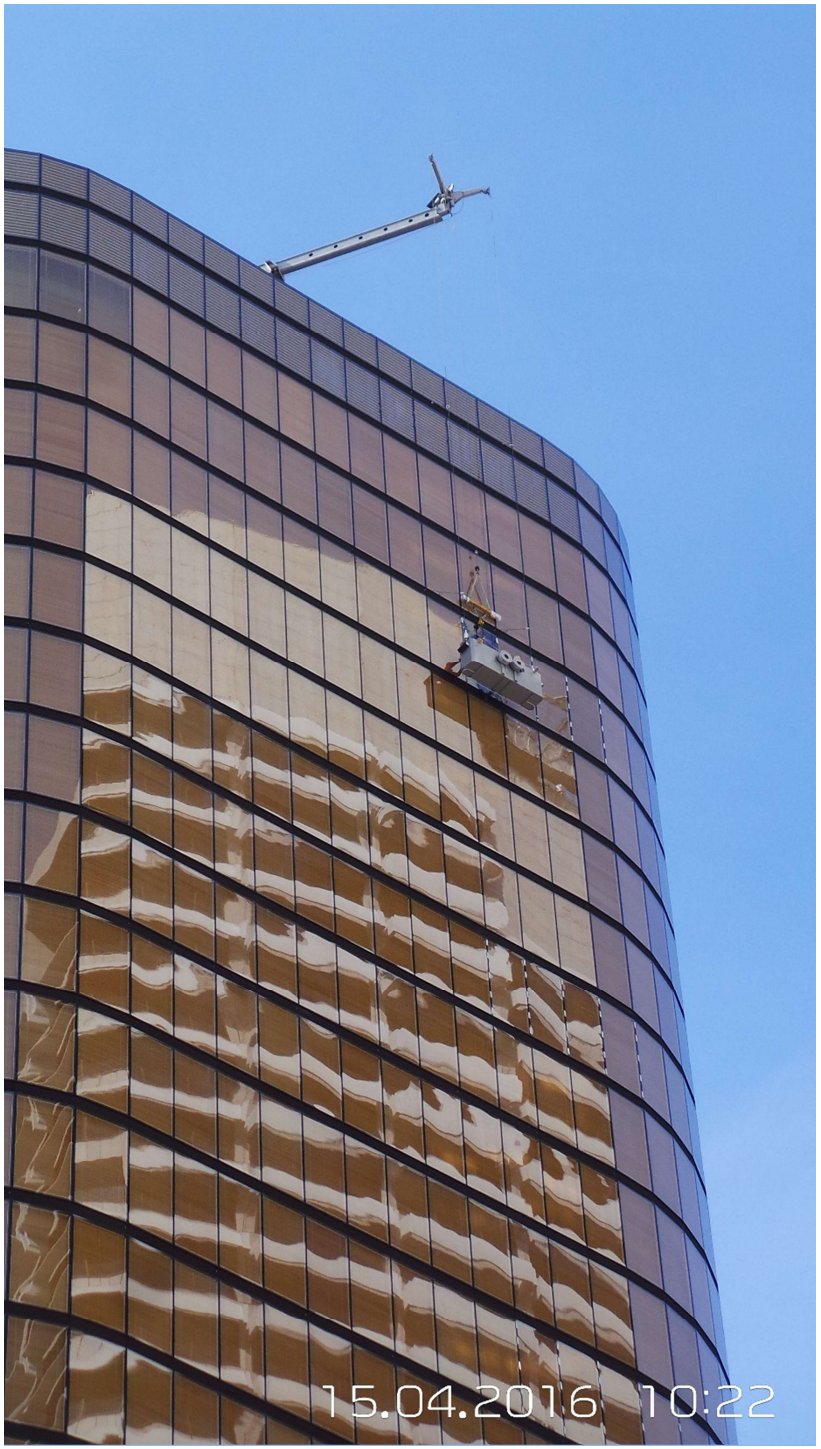
Examples – 200 George Street



Surface Design

Examples – 200 George Street



Project: 200 George Street
Supplier:
Jib: Max extended 25m
Obstruction: Parapet maximum height 7m

Surface Design

Examples – 200 George Street

Surface Design

Examples – 200 George Street

Surface Design

Examples – 200 George Street

Surface Design

Examples – 200 George Street

Surface Design

Examples – 200 George Street terrace BMU

Surface Design

Examples – 1 Bligh Street

Examples – 1 Bligh Street

Examples – One Central Park

Examples – Aurora Place

BMU

The centralised maintenance system relies on one large crane type Building Maintenance Unit (BMU) located at the main roof level. This is capable of reaching all areas on the facade including both sides of the main sail as well as both sides of all projecting fins.

Weighing in the vicinity of 30 tonnes and operating from a fixed position, the unit sits on a heavy duty track which is located on structural steel supports just below the line of the sloping roof.

The BMU has a telescopic jib which can be extended to 55 metres with a luffing capacity enabling it to luff upward to reach over the main sail. It can also luff below horizontal so as to maintain the minimum 15m unrestrained cable length from the tip of the jib to the first restraint point on the east facade.

The method of restraint for the BMU is via lanyards, so that on the outer face, sheaves on each lanyard allow a cable to pass through cleanly. On the inner face, a system comprising a nylon rope on separate spool, allows the cradle to be kept against the facade whilst the main support cables are free to move.

By using a 3D computer model of the building's design, the BMU can access all points on the facade below the main roof levels except for the two steps in the north elevation at approximately levels 12 and three. These are served by monorail mounted swing stages.

This is one of the largest units ever made and has to cope with extraordinary challenges such as a sloping roof and an inclined facade.

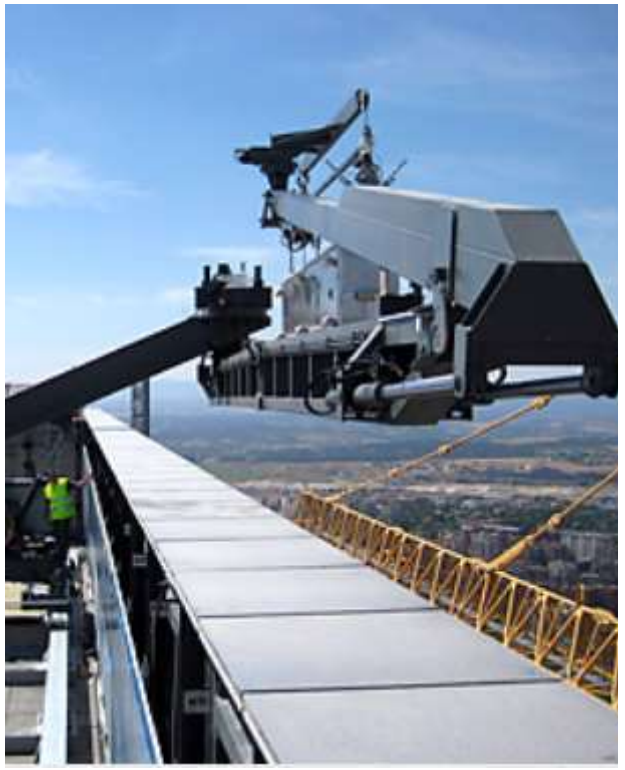
Surface Design

Project: Aurora Place
Supplier: Cox Gomyl
BMU garage: recessed raised platform
Jib: Max extended 55m
Obstruction: Sail maximum height 30m

Surface Design

Surface Design

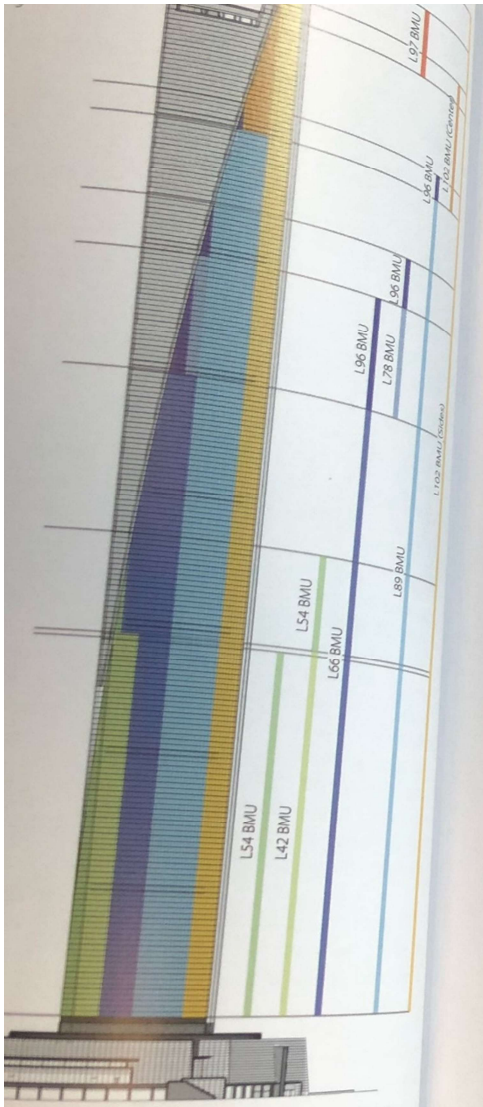
Project: Q1 Gold Coast
Supplier: Cox Gomyl
BMU garage: Fixed rail platform
Jib: Max extended ??m
Obstruction: Sail maximum height 30m



Surface Design

Project: Torre Caja Madrid
Supplier: Cox Gomyl
BMU garage:
Jib: Articulated Max extended 55m
Obstruction: Under croft surfaces

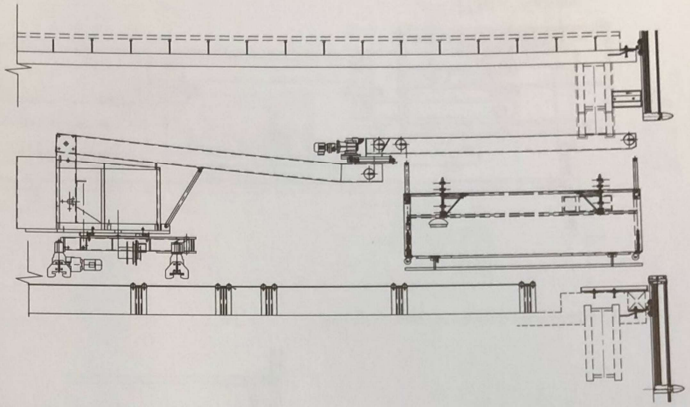
Examples – Shanghai World Financial Centre



access zones, which are serviced by 20 separate BMUs

openings, and reach around corners to position the cradle in challenging spaces on the façade.

▲ Figure 2.3.4: This image shows Shanghai World Financial Center's BMUs, which are able to retract into the building to park. © Mori Building

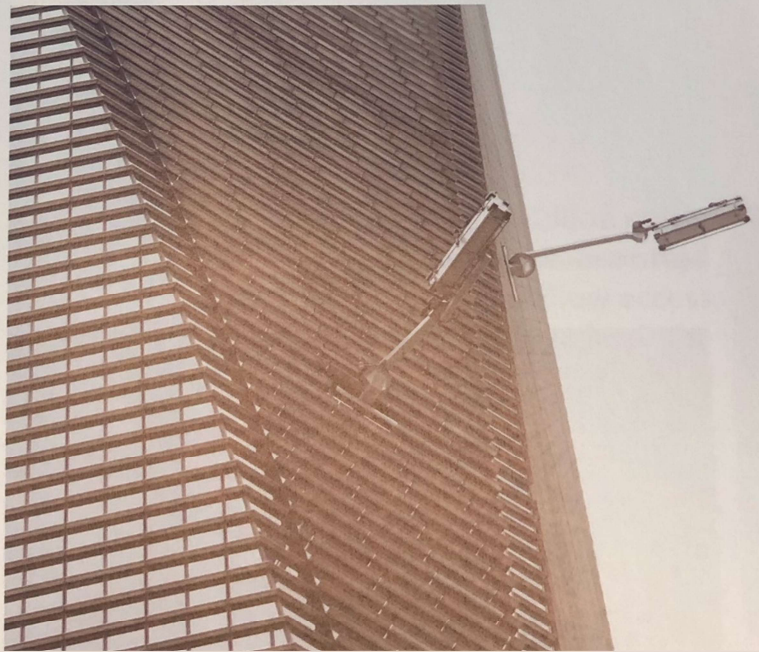


▲ Figure 2.3.5: Side elevation of the level 42 BMU. © CoxGomyl

however, despite minor differences, they are similar in functionality.

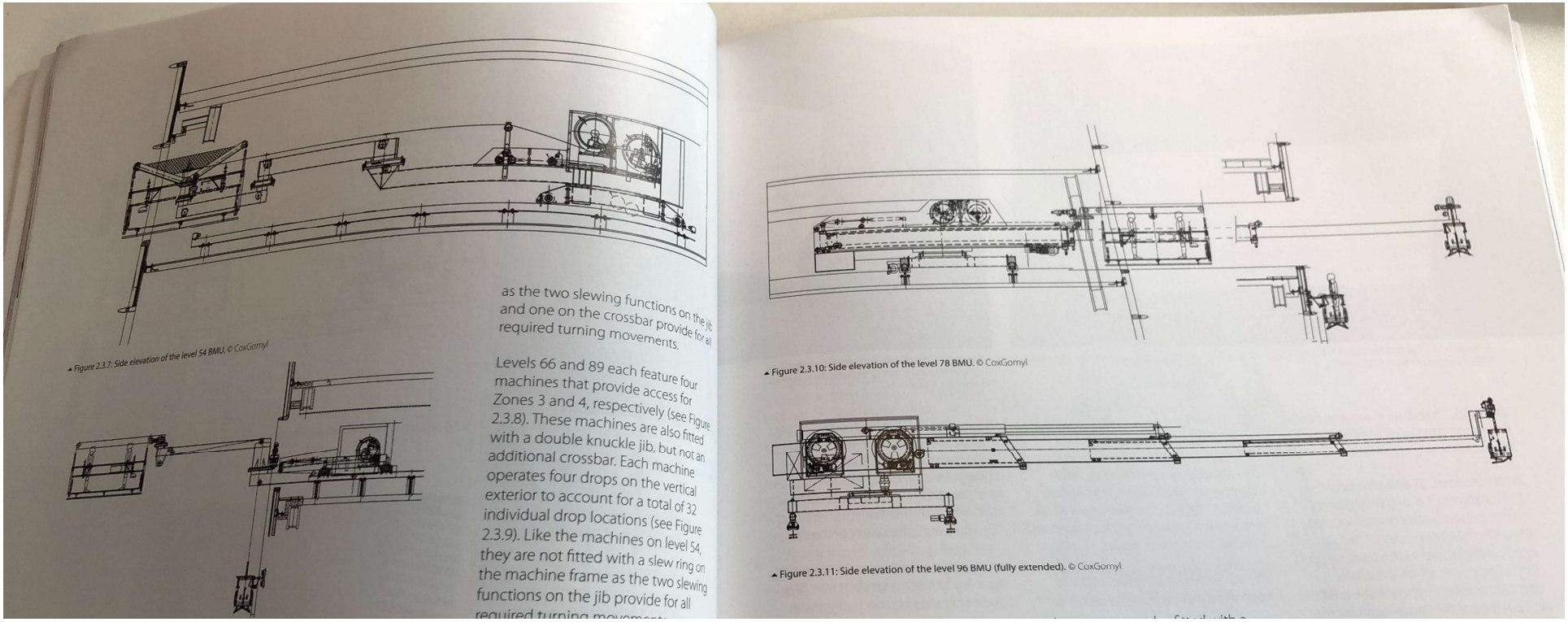
There are two BMUs for Zone 1 at level 42, the lowest platform launch location (see Figure 2.3.5). These BMUs feature track-mounted bottom slew machines with knuckle crossbars that allow the cradle to be slewed to either the left or right of the jib. They provide access to four drops each, through operable panels provided in the façade.

Two additional track-mounted machines are provided for Zone 2 at level 54 (see Figure 2.3.6). These machines are fitted with a double knuckle jib, which allows the cradle to be slewed to either the left or right of the main jib, and another slewing crossbar (see Figure 2.3.7). The double knuckle jibs and slewing crossbar provide additional flexibility so that these units can access two cradle drops on the vertical face of the building



Surface

Examples – Shanghai World Financial Centre



▲ Figure 2.3.7: Side elevation of the level 54 BMU. © CoxGomyl

as the two slewing functions on the jib and one on the crossbar provide for all required turning movements.

Levels 66 and 89 each feature four machines that provide access for Zones 3 and 4, respectively (see Figure 2.3.8). These machines are also fitted with a double knuckle jib, but not an additional crossbar. Each machine operates four drops on the vertical exterior to account for a total of 32 individual drop locations (see Figure 2.3.9). Like the machines on level 54, they are not fitted with a slew ring on the machine frame as the two slewing functions on the jib provide for all

▲ Figure 2.3.10: Side elevation of the level 78 BMU. © CoxGomyl

▲ Figure 2.3.11: Side elevation of the level 96 BMU (fully extended). © CoxGomyl

Surface Design

Examples – Evolution Tower, Moscow

Surface Design

Examples – Evolution Tower, Moscow

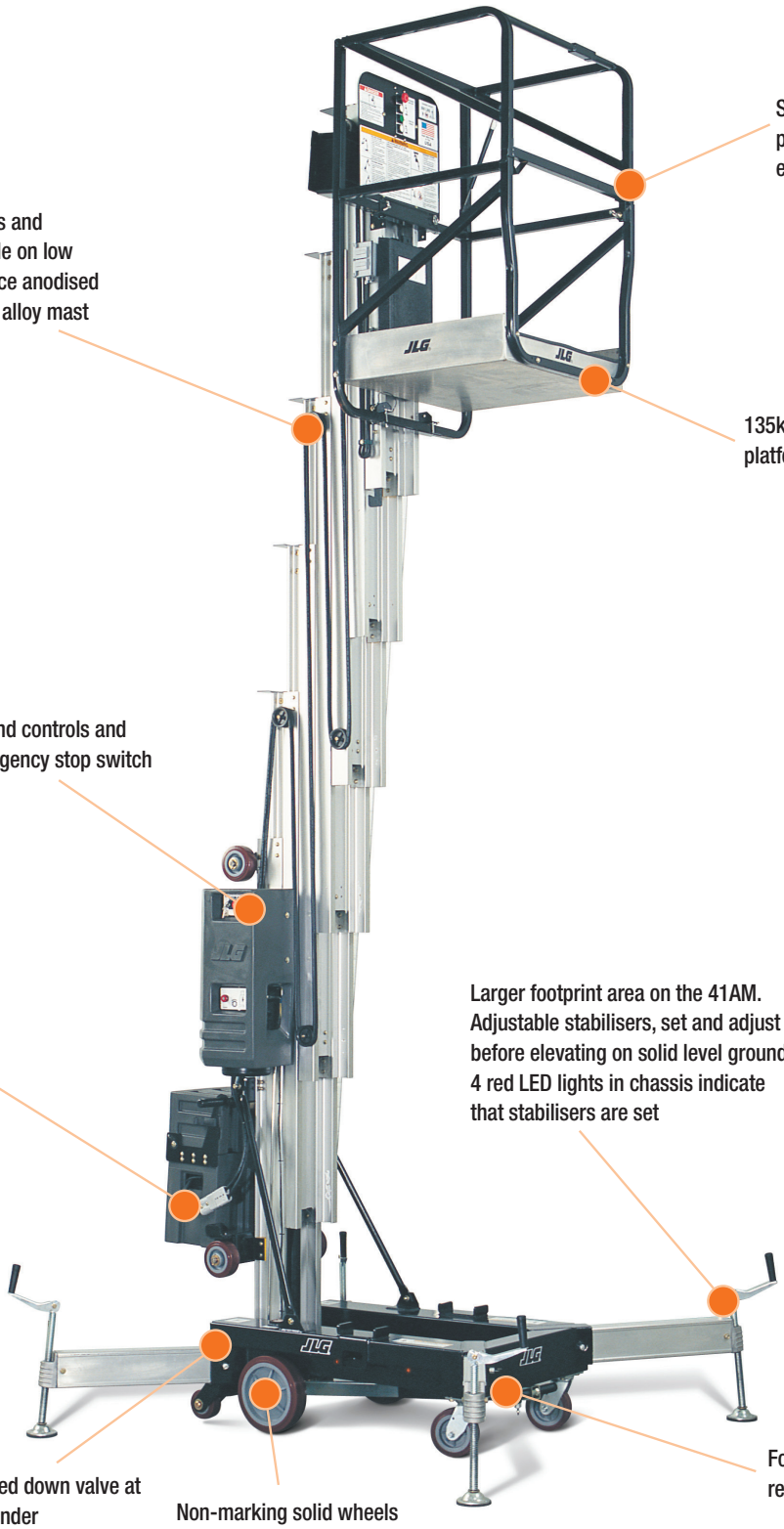
▲Figure 2.8.9: The customized soft rope guiding system is used to provide stabilization for this system's dynamic set of movements. © Global BMU

Surface Design

Examples – Glass replacement

Surface Design

41AM Push Around Vertical Lift



Steel rails and aluminium alloy platform floor, with drop bar entry gate for ease of use

Dual chains and timing cable on low maintenance anodised aluminium alloy mast

135kg platform capacity to 12.34m platform height. Working height 14.34m

Ground controls and emergency stop switch

12V deep cycle battery and automatic charger, removable for transport

Larger footprint area on the 41AM. Adjustable stabilisers, set and adjust before elevating on solid level ground. 4 red LED lights in chassis indicate that stabilisers are set

Manual bleed down valve at base of cylinder

Non-marking solid wheels for sensitive floor areas

Forklift boots at front and rear, for ease of transport

Example EWP

41AM Push Around Vertical Lift

QUESTIONS TO ASK

- What are the ground conditions in the work area?
- What are the floor load requirements and access to the site?
- What is the working height needed for the job?
- Is there 240V AC power available for charging?
- Is indoor and flat hard support surface needed?

KEY SELLING POINTS

- Work in tight and confined vertical areas
- 4 easy fit outriggers with interlock switch and telltale light indicating each outrigger is locked and set
- Base can be levelled on outriggers
- Dual chain vertical mast lift
- Non-marking solid tyres
- 1 x 12V DC deep cycle battery
- Removable SCR automatic battery charger for quick recharging

APPLICATIONS

- Facilities maintenance
- Electricians for lighting tube/globe replacements
- All maintenance work
- Factory fit outs in tight areas
- Ideal warehouse use between racking and narrow aisle areas
- Hospitals, schools and offices for suspended ceiling maintenance

SPECIFICATIONS

Performance:	
Platform Height (max.)	12.34m
Working Height	14.34m
Lift Time	130 sec
Lower Time	55 sec
Platform Capacity Standard	135kg
Dimensions:	
Stowed Length	1.46m
Stowed Height	2.64m
Height Tilted Back	2.00m
Stabiliser Footprint Length	2.14m
Stabiliser Footprint Width	2.17m
Platforms:	
Standard Platform Type	Steel Rail/Alloy Floor
Overall Width	0.74m
Standard Platform Size - (WxL)	0.66 x 0.66m
Chassis Length	1.35m
Platform Entry Height	0.48m
Power:	
Power Source	Battery
DC Voltage	12V
DC Power	93 Amp hr
Weights and Capabilities:	
GVW AC	499kg
GVW DC	558kg

RAPTOR®

ROPE ACCESS RAIL SYSTEM

SAYFA PROTECT
1300 301 755
SAYFA.COM.AU

SYSTEM CONTENTS

ROPE ACCESS RAIL SYSTEM FOR EFFORTLESS MOBILITY

⚠ MUST BE READ AND UNDERSTOOD PRIOR TO USE

SYSTEM OPERATION MANUAL

RAPTOR® ROPE ACCESS RAIL

Sayfa Group leads the industry in the design, installation and management of access, fall protection and ground safety systems.

The In-Action model demonstrates access, fall and ground protection requirements for a commercial building design.

Sayfa Group recommendations fulfill current workplace requirements for the safety of building maintenance subcontractors, employees and the general public.

#	DESCRIPTION	
1	3 SIXTY	Fall arrest anchors
2	TRAVEL 8	Roof or wall mount static lines
3	SENTRY	Roof mount guardrails
4	ON-TRAK	Roof walkways (yellow or grey)
5	PROTEX	Skylight protectors
6	RAPTOR	Abseil / Fall Arrest

#	DESCRIPTION	
7	KATT	Modular fixed ladders
8	VISTA	Modular fold down ladders
9	ALTO	Step ladders & step bridges
10	ALTO	Stairs & platforms
11	MODDEX	Handrails & balustrades
12	SKYDORE	Roof access hatches

For more information, please contact Sayfa Group directly.

IT'S THE SAYFA WAY

MULTI OPERATOR RAIL SYSTEM PROVIDING EFFORTLESS LATERAL MOBILITY & EASE OF OPERATION

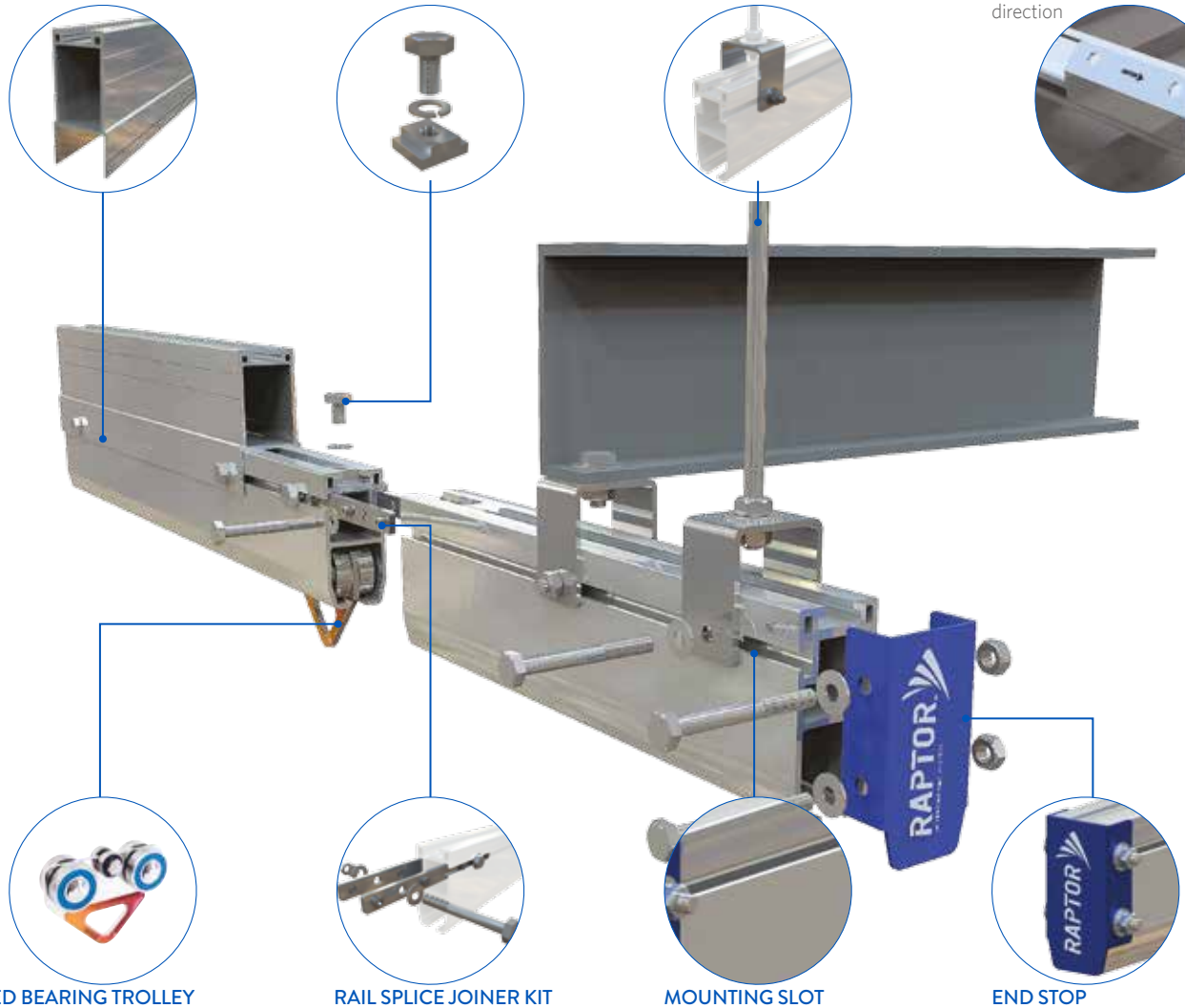
FEATURES & BENEFITS

LONG SPAN SECTION
Spanning up to 6000mm using long span attachment

T-NUT MOUNT
Connects fixing brackets to rail system

SUSPENSION BRACKET
Provides connection of rail to support structure suspension system

MULTI DIRECTION TROLLEY
Alternative to the the standard trolley which can be loaded multi direction



SEALED BEARING TROLLEY
Provides connection point for ropelines

RAIL SPLICE JOINER KIT
Used to join multiple rail sections together

MOUNTING SLOT
Provides adjustable positioning of mounting brackets

END STOP
Provides the trolley termination point

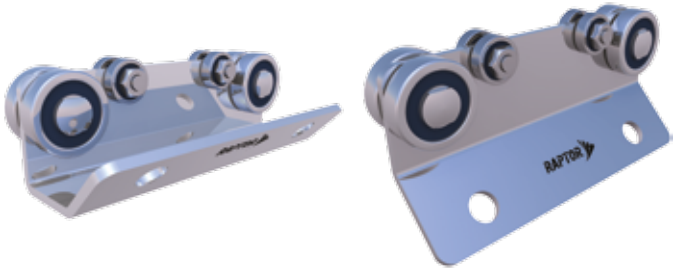
UNIQUE PRODUCT FEATURE

ROPE ACCESS TROLLEY

FOR EFFORTLESS MOBILITY

The robust sealed bearing trolley ensures effortless operator mobility when used as a rope access or fall arrest system. Lateral stabilising bearings allow the trolley to function normally when angled or side loading is required providing unlimited flexibility for positioning the rail to best suit the application and safety of the operator.

PATENTS AND DESIGN REGISTRATIONS APPLY



OPERATION

MUST BE READ PRIOR TO USE

1. Prior to use, ensure all operating procedures have been read and understood.
2. This rope access system is only to be used by competent persons who have experience and training in the safe use of the system and associated equipment.
3. Ensure all workplace OH&S requirements are identified and understood. A risk assessment with a safe work method procedure must be completed and approved by management prior to work commencing.
4. This system requires periodic inspection and maintenance by a qualified rope access inspector. The system MUST NOT be used if the service date is overdue.
5. A rescue plan must be devised and be ready to be implemented prior to usage of a rope access system.
6. Authorisation to enter any risk area must be obtained from the work place manager prior to accessing.
7. Only approved rope access harness, gear and equipment certified to Australian Standard AS/NZS 4488, to be used with this system.
8. Visually inspect the system for damage prior to use. System must not be used if there is any deterioration or deformation of any components or structure to which the system is attached.
9. If the rope access system is damaged or has arrested a fall, discontinue use until it has been fully inspected and recertified by a competent height safety equipment inspector.
10. Ensure all fixings, fittings and components are securely attached. Any tightening, adjustment or replacement of components must be carried out by a competent height safety inspector.
11. Rope protectors required wherever rope lines pass over an edge.
12. Where rope lines will potentially damage an edge, then an edge protection device will be required to spread rope access loads during operation.
13. Persons must not be allowed to work alone during rope access operations in case emergency rescue assistance or first aid is required.
14. All applicable Australian Standards, OHS Acts & Regulations, and Codes of Practice & Guidelines must be read and obeyed when using this safety system.
15. This user manual does not in any way, replace the need for completion of a recognised rope access training course by a Registered Training Organisation (RTO).

⚠ **Failure to follow all warnings, usage and maintenance instructions may result in serious injury or death.**

LIMITATIONS

MUST BE READ PRIOR TO USE

1. Only to be used by competent persons with proof of training by a Registered Training Organisation (RTO) in the use of height safety and rope access systems.

2. Harness gear is susceptible to deterioration when exposed to chemicals or hazardous environments and must be approved by the manufacturer for use in these applications.

3. The Raptor rope access rail system is suitable for up to 4 persons per span. See table below:
   RAPTOR RAIL SPAN TABLE - ROPE ACCESS

RAPTOR RAIL ONLY			RAPTOR RAIL WITH LONGSPAN SECTION		
No of Users Per Span	Max Span Length	Support Structure Design Load	No of Users Per Span	Max Span Length	Support Structure Design Load
1	4000mm	12kN	1	6000mm	12kN
2	3200mm	18kN	2	5500mm	18kN
3	2500mm	24kN	3	5200mm	24kN
4	2000mm	30kN	4	4200mm	30kN

4. Two attachment points are required per person. Multiple pairs of trolleys are required for additional users. For OH261 or OH273 trolleys, one is required per operator and for OH260 trolley, two are required per operator.

5. Operators of this system must be connected via a certified karabiners and abseil rope lines.

6. The system must be set up so that the operator will not load by more than 20 degrees from the surface to where rail is attached.
   ⚠ **Loading beyond 20 degrees may cause the system to malfuction which could result in injury or death.**

7. When the Raptor Rail is set up to be used as a fall arrest system, the retractactable lanyard needs to be positioned at least 600mm above the operator's head to ensure correct fall arrest action of the system.

8. Do not tamper with system components.

9. This system is not to be used for tethering or lifting machinery or equipment.

10. The safety system must be recertified by a competent height safety inspector as recommended:
    - Non corrosive/mild environment – 12 monthly
    - Corrosive/harsh environment – 6 monthly (more frequent inspection may be required).

⚠ **Sayfa recommends that persons using rope access systems do not work alone in case of an emergency and help is required.**
Should any part of the system/equipment have been subjected to abnormal loading, use must be discontinued until replaced/recertified by a competent rope access inspector.

SAFE USE PROCEDURE

STEP 1

Ensure a proper rope access harness is used and once fitted that straps are properly adjusted to ensure firm but comfortable fit.

⚠ **Harness Gear must be certified to Australian Standards AS/NZS 4488**

⚠ **Ensure system (harness and rail) serviceability dates are current.**

STEP 2

Barricade area work zone, to ensure access by unauthorised persons is prohibited.

STEP 3

Ensure that the correct number of trolleys are in rail for number of operators using the system.

STEP 4

Attach working line and safety line to Raptor trolleys via certified karabiners.

⚠ **Ensure working line and safety line are attached seperatly.**

SAFE USE PROCEDURE

STEP 5

Check all attachment hardware and ropes.

⚠ **Rope access must always be done by two operators.**

⚠ **Any damage to the system must be reported to the workplace manager and removed or tagged out of service until recertified by a competent height safety inspector.**

STEP 6

Connect rope grab device (backup) to safety line.

STEP 7

Connect descender device to working line.

⚠ **Ensure all attachment hardware is correctly and securely attached, prior to moving into a 'Fall Zone' .**

STEP 8

Use a rope protection device whever rope lines pass over edge.

SAFE USE PROCEDURE

STEP 9

Attach edge protection device (If neccessary). See example below.

⚠**Required where ropes will likely damage superficial cladding.**

STEP 10

Attach foot strap with rope grab device to safety line.

STEP 11

Step into foot strap and climb over edge.
⚠**Operator must ensure the descender and backup device have been positioned correctly with no slack rope line between attachment point and operator.**

STEP 12

Remove foot strap rope grab device from safety line and attach to tool loop on harness.

SAFE USE PROCEDURE

STEP 13

Descend on rope lines to carry out work to be done on facade.

⚠ **Suitable protection maybe required to protect facade being worked on.**

ACCESS OVER EDGE

HIGH PARAPET - Using a portable ladder with parapet hooks

STEP 1

Retrieve portable ladder.

STEP 2

Locate ladder beside rope lines.

⚠ **Ensure hooks locate securely over parapet and base is secure.**

SAFE USE PROCEDURE

HIGH PARAPET (CONT.)

STEP 3

Connect rope grab device (backup) to safety line.

STEP 4

Climb ladder.

STEP 5

Straddle parapet.

STEP 6

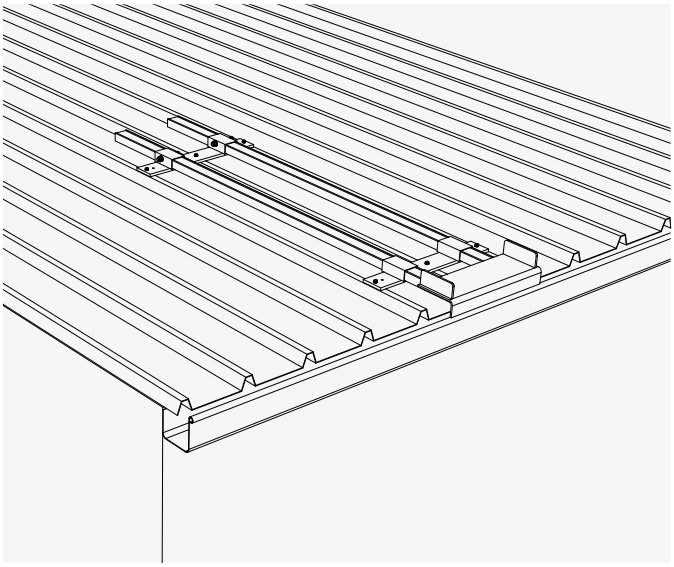
Connect descender device to working line.

⚠ **Ensure all attachment hardware is correctly and securely attached prior to moving into a 'Fall Zone' .**

SAFE USE PROCEDURE

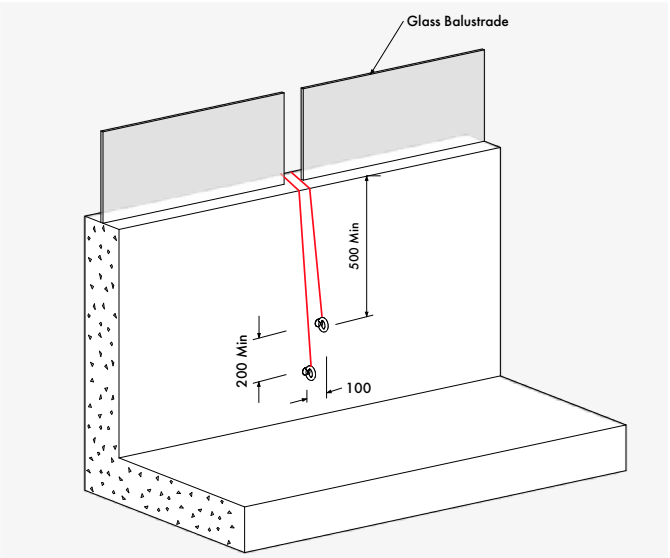
EAVES GUTTER

When accessing over an eaves gutter use gutter edge protection device, see example below.



GLAZED BALUSTRADE

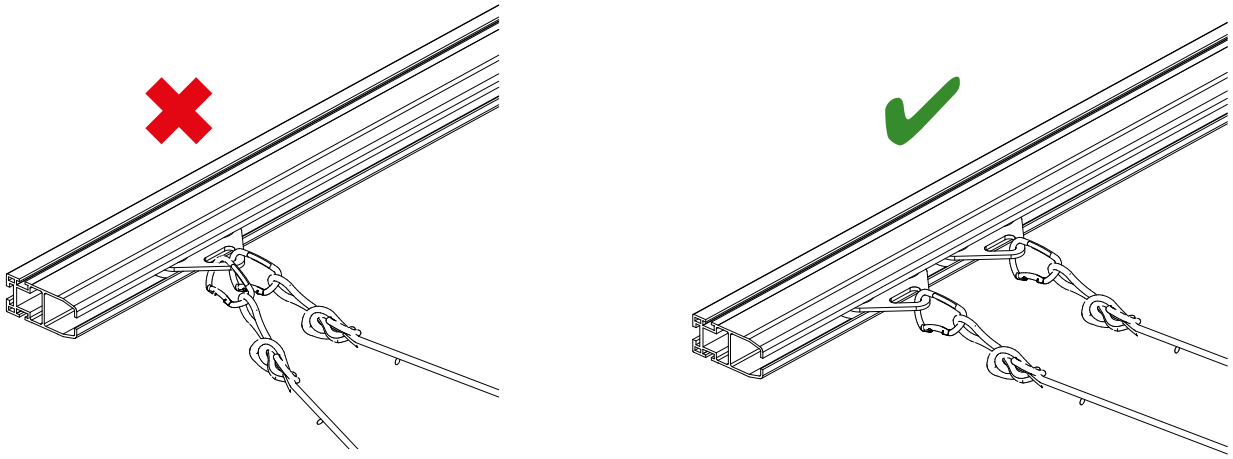
When accessing over glazed balustrade rope lines must be passed through vertical gap between balustrade panels of not less than 50mm wide, see sample below.



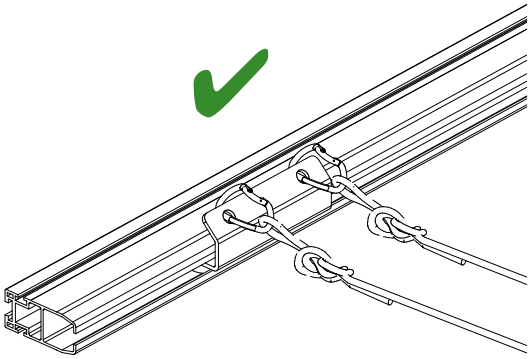
SAFE USE PROCEDURE

ATTACHMENT

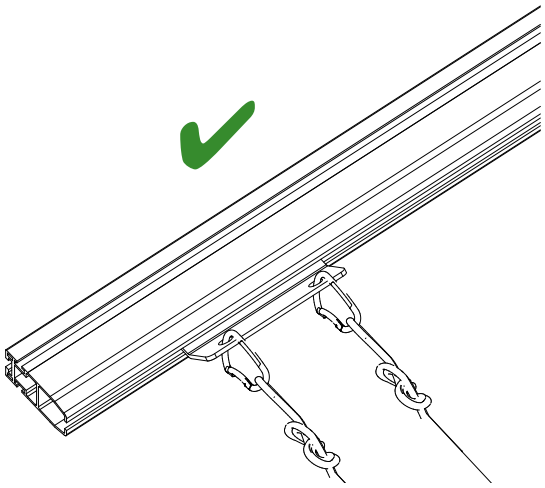
OH 260 TROLLEY



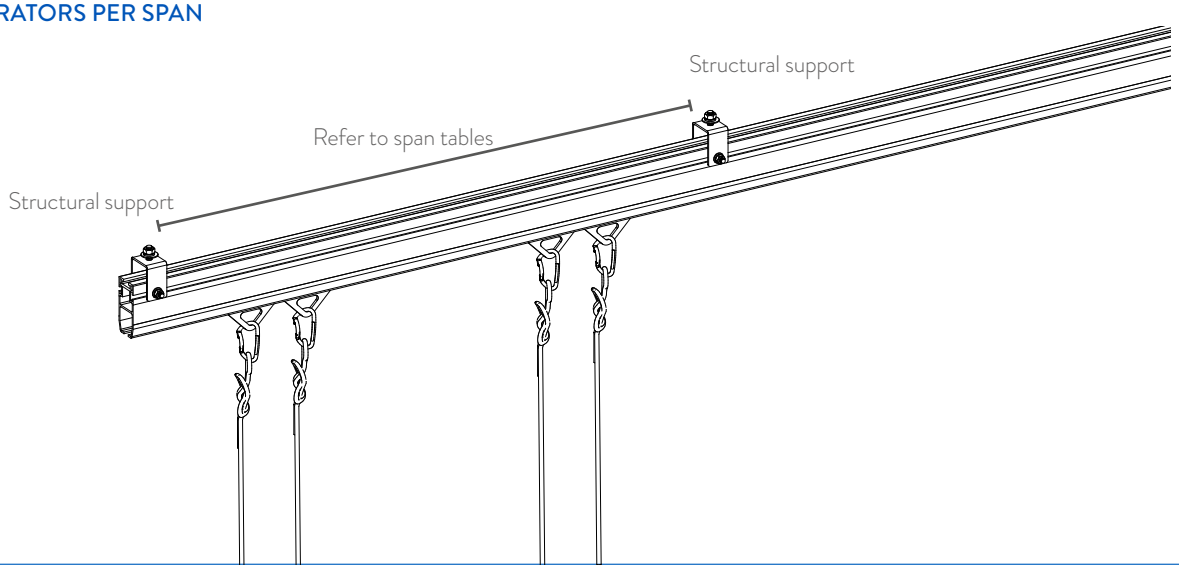
OH 261 TROLLEY



OH 273 TROLLEY

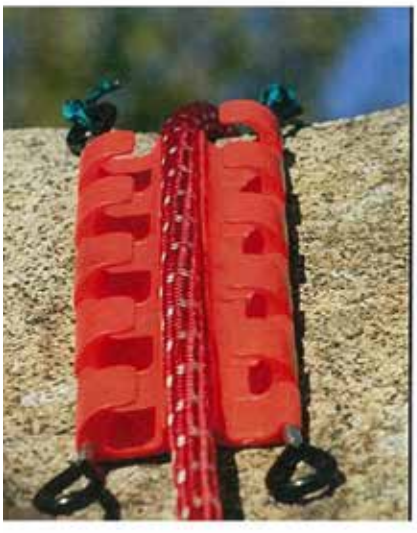


NO. OF OPERATORS PER SPAN



SAFE USE PROCEDURE

EXAMPLES OF ABSEIL EDGE PROTECTION DEVICES



CONFIGURATIONS

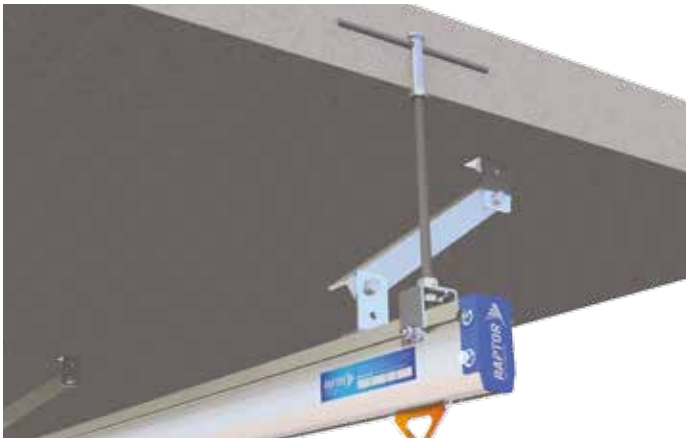
OH1 RAPTOR RAIL, PURLIN MOUNT - INLINE

OH2 RAPTOR RAIL, PURLIN MOUNT - ACROSS

OH3 RAPTOR RAIL, FLUSH MOUNT

OH4 RAPTOR RAIL, SIDE MOUNT

OH5 RAPTOR RAIL, SUSPENDED



OH6 RAPTOR RAIL SYSTEM, METAL DECK MOUNT

MAINTENANCE

1. This system needs to be checked and recertified by a competent height safety inspector every 12 months for non corrosive environments or 6 monthly for corrosive or harsh environments. (To be determined by specialist depending on severity of surrounding conditions.)

2. Never clean using acids or other chemicals that could damage the system components.

3. The identification label must be completed confirming installation, certification and recertification of the system.

4. Harness gear and equipment must be maintained and stored in a dry, protected area, away from acids and ultra violet rays which cause material fibres to break down and reduce their safety and life expectancy.

5. Any deterioration or damage to the system or equipment must be reported to the person in control of the workplace and relevant corrective action untertaken.

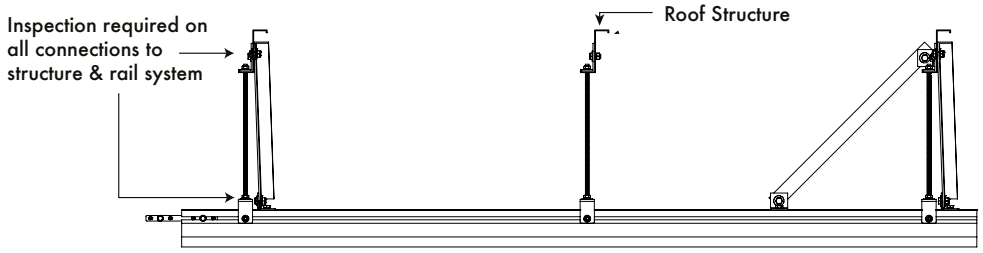
6. Maintenance inspections must be clearly documented. Any non-conformance must be clearly identified and tagged 'Do Not Use' until corrective action by a competent person has been completed.

7. Where the rail system is mounted into concrete using friction fit anchorages and will be loaded in tension during operation, a load test will need to be carried out, to half the design load of the system.

The Raptor Rail System may be configured in 2 different ways:

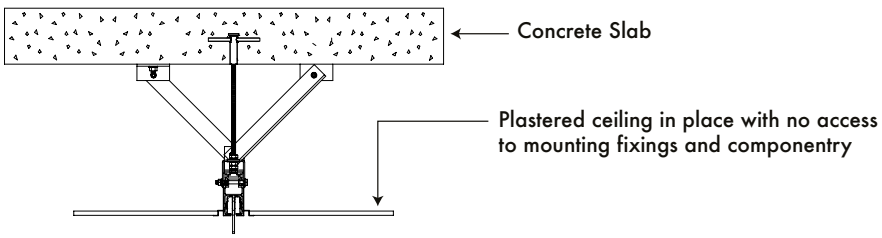
1. ACCESSABLE STRUCTURE AND RAPTOR ATTACHMENT HARDWARE - VISUAL ASSESSMENT

In this application, all the components and fixings must be checked according to the procedure as set out on the pages 6 to 10. The structure must be capable of the required loads and be certified by an engineer unless it is clear to a competent person that the structure is suitably adequate.



2. NO ACCESS TO STRUCTURE AND RAPTOR ATTACHMENT HARDWARE - LOAD TESTING

(Sayfa always recommends that ceiling hatches are installed for inspection purposes, where possible)



In this application the only way to check the system in accordance with Australian Standards is via a load test. The load test will involve loading the rail to half the design load, (see span table on page 5) onto the trolley, ideally directly under the rail support structure. The rail/ trolley can be loaded using a block and tackle system or can be loaded using weights. The load must be held for a minimum of 3 minutes with no failure or evidence of support structure movement of the system.

Frequency of the load testing is dependent on the environment in which the system is installed and should be determined by a competent person.

Recommended minimum testing
- Non corrosive / mild environment - 3 years
- Corrosive / harsh environment - 12 monthly

⚠ **Recertification should be based on structural engineer report confirming project installation compliance and suitability.**

MAINTENANCE

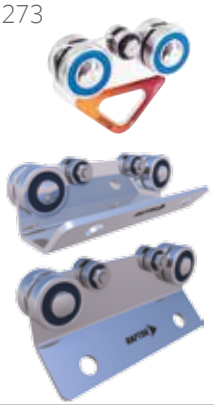
The checklist below outlines key checking criteria required to ensure the safe use of this system. Any item of concern not shown on the checklist must be noted on the maintenance report and brought to the attention of the workplace manager.

Items ticked PASS - **YES** means they conform with the required checking criteria and are suitable for normal use until the next recertification date. System data plates must be updated showing current check date and next check date.

Item ticked PASS - **NO** means they do not conform to the required checking criteria. These items must be clearly tagged ' Do Not Use' and the required corrective actions put in place. The maintenance report must clearly document all non-conforming criteria.

⚠ **This system must be maintained by a competent height safety inspector trained in the safe use and maintenance of this system.**

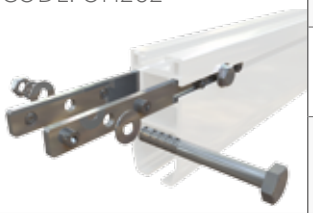
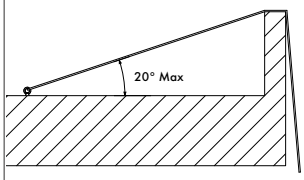
SYSTEM MAINTENANCE CHECKLIST

COMPONENT	INSPECTION CRITERIA	PASS Y / N	CORRECTIVE ACTION	COMPLETION DATE
TROLLEY CODE: OH260/OH261/ OH273 	Check all bearing axles and middle bearing bolts are secure			
	There must be no deformation in the connection plate			
	Make sure bearings do not show signs of wear			
	Trolley must run freely in the track ⚠ **Raptor trolley is designed with a 'fail safe' axle arrangement. Should the trolley not run freely and possibly 'jam' inside the rail it is likely that the bearing axle is working loose.**			
END STOP CODE: OH265 	Check all bolts/nuts are secure (18Nm)			
	Ensure there is no sign of damage to the end stop			
SUSPENSION COMPONENTS 	Check all bolts/nuts are secure (18Nm) ⚠ **Friction fit anchors into concrete will need to be load tested to half the design load and applied for 2 minutes with no sign of movement or failure.**			
	Check for any signs of structure break down or damage ⚠ **Should the system attachment structure not be accessable, a load test will be required to check correct performance. (See page 9 for structure checking and testing.)**			

⚠ **A record of system maintenance recertification and necessary repairs must be kept by the workplace manager**

MAINTENANCE

SYSTEM MAINTENANCE CHECKLIST

COMPONENT	INSPECTION CRITERIA	PASS Y / N	CORRECTIVE ACTION	COMPLETION DATE
U-BRACKET CODE: OH260.10/20 	Check all bolts/nuts are secure (18Nm)			
	Check for any signs of deformation in the U-bracket			
SPLICE JOIN CODE: OH262 	Check all bolts/nuts/ grub screws are secure (18Nm)			
	Check for any signs of deformation in the spice join			
	Max permissible gap between rail joins - 4mm			
T-NUT CODE: OH264 	Check all bolts/ T-Nuts are secure (18Nm for M10 bolts 25Nm for M12)			
RAIL CODE: OH250 	Check bearing travel flanges on the rail are not bent/ damaged and free from grime			
	Max opening between travel flanges - 19mm			
	Check for signs of excessive load or damage to the rail			
DECK MOUNT BRACKET & PLATE CODE: OH253 	Check min of 3 x 14kg tek screws into roof structure			
	Check min of 9 x 8mm Bulb Tite rivets into roof deck			
	Check min 2 x M14 bolt sets connecting bracket to plate			
	Check angle of rope does not exceed 20°. See diagram			

TECHNICAL

SYSTEM REQUIREMENTS

The worker must wear a certified rope access harness when connected to the Raptor Rail compliant with AS/NZS 4488.

Harness connectors must be rated to at least 12kN. Non-compatible connectors may unintentionally disengage (roll-out). Karabiners supplied with proprietary systems must not be removed or substituted with any other component.

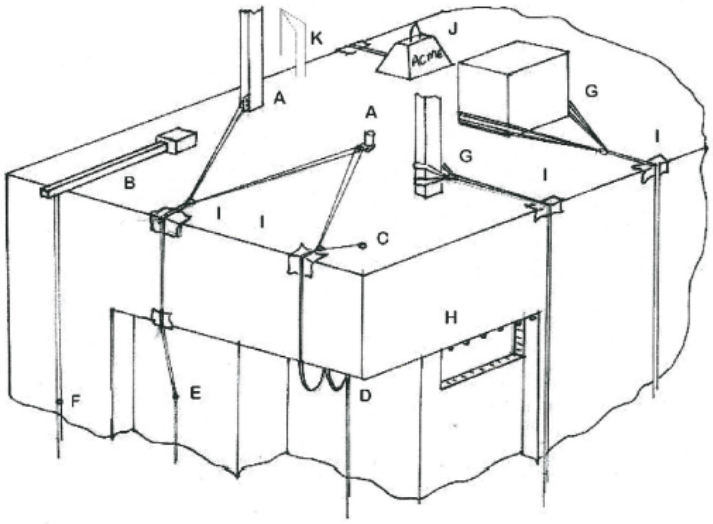
INSPECTION AND MAINTENANCE

Inspection and recertification of abseil systems and equipment is required at least every 12 months by competent person in accordance with manufacturer's specifications and requirements of Australian Standard AS/NZS 4488.

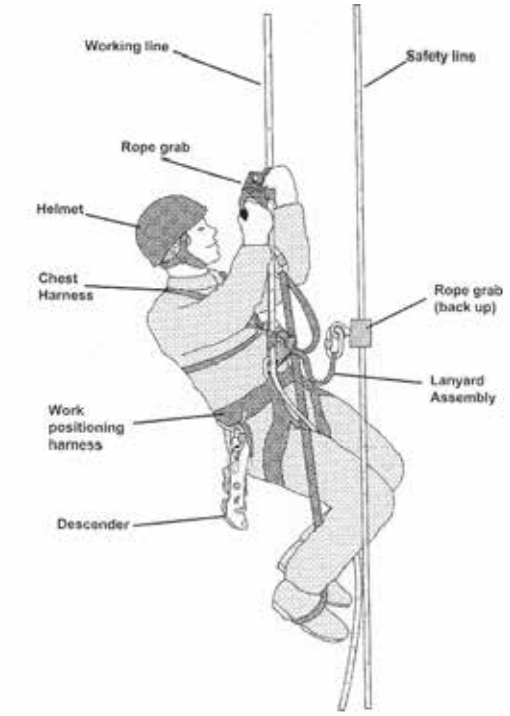
IMPORTANT NOTE

Failure to supply and/or install Sayfa proprietary products in accordance with Australian Standards compliance codes, Sayfa specifications and instructions voids complete system certification and/or warranty.

TYPICAL ABSEIL SET-UP DIAGRAM



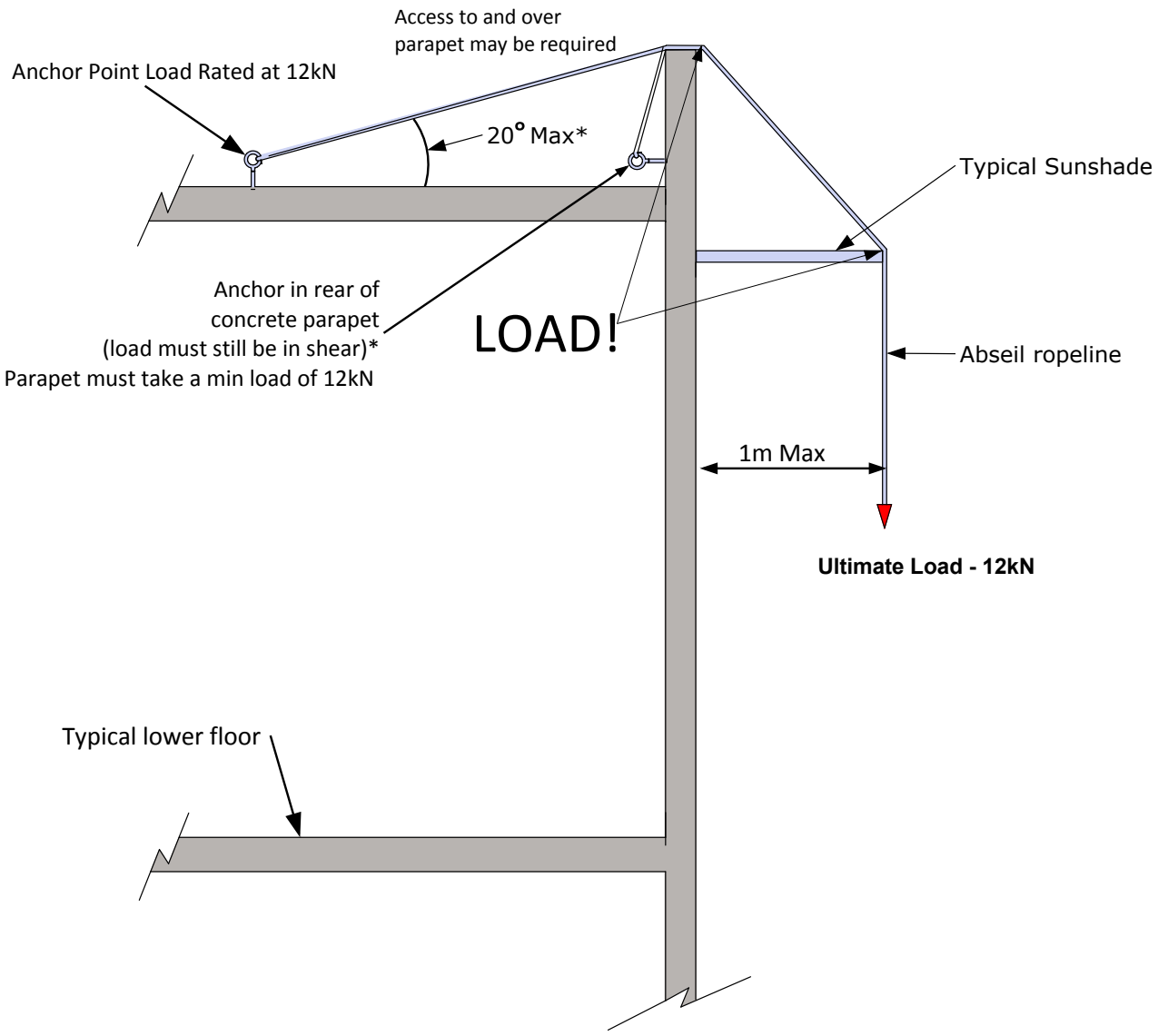
TYPICAL ABSEIL OPERATOR DIAGRAM



Code	Description	Minimum ut Strength
A	Primary anchor	12kN
B	Counterweighted anchor (sometimes called a "needle") - temporary	12kN
C	Diversion	12kN
D	Re-anchor (re-belay)	12kN
E	Deviation	6kN
F	Lateral restraint	2kN
G	Improvised using sling (in the cases above, use of a steel column and a lift motor room has been made but sometimes other devices are used) - temporary	12kN
H	Aid route	12kN
I	Edge protection	-
J	Dead weight anchor - temporary	12kN
K	Davit (primary anchor)	12kN

TECHNICAL

IMPORTANT - TYPICAL LOADINGS FOR ABSEIL ROPE LINES



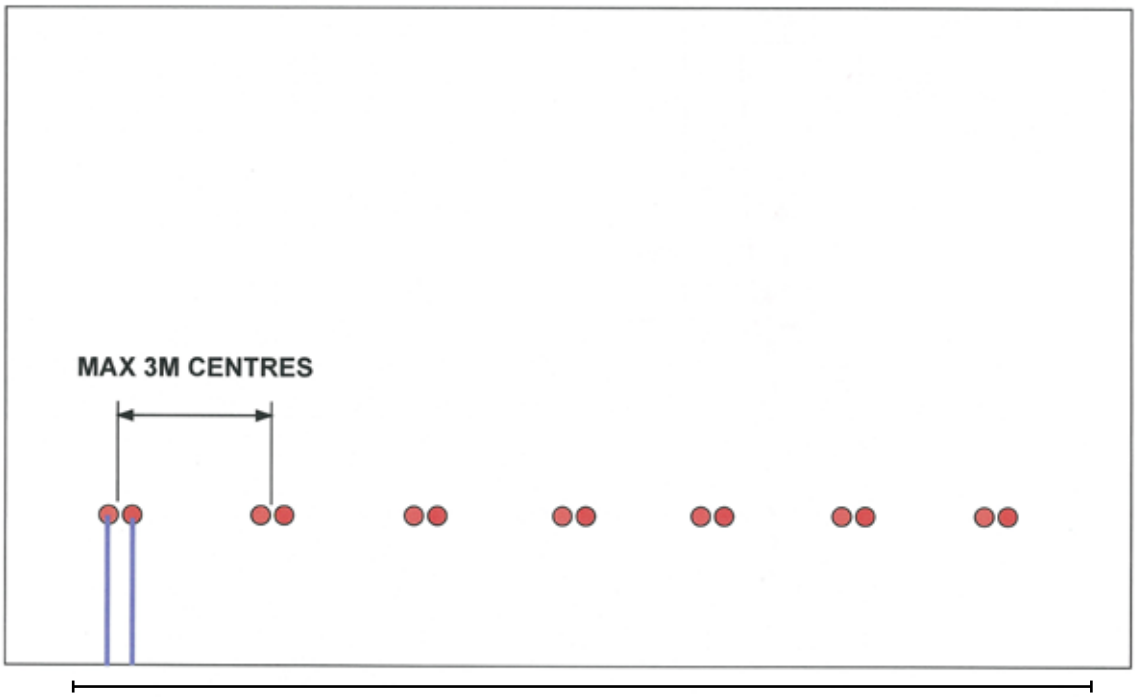
Note: Diagram for illustration purposes only

- All structural loadings/forces on parapets, awnings, sunshades, or canopies to be calculated and authorised by a qualified engineer.
- Any awning, sunshade or canopy less than 3.0M below top of parapet/roof level must be trafficable.
- Any structural componentry required will need to be allowed for and provided by others.
- For any abseiling anchorages placed within 2.0M of fall edge, adequate fall protection must be provided for operator to access and attach safely.
- Adequate protection for sharp or fragile edges to be provided by the abseiler.
- Layout of fall protection and abseil devices is critical.
- All products/systems to comply with relevant Australian Standards; OH & S Regulations and Codes of Practice.
- Any davit system will require engineer's approval.

DESIGN

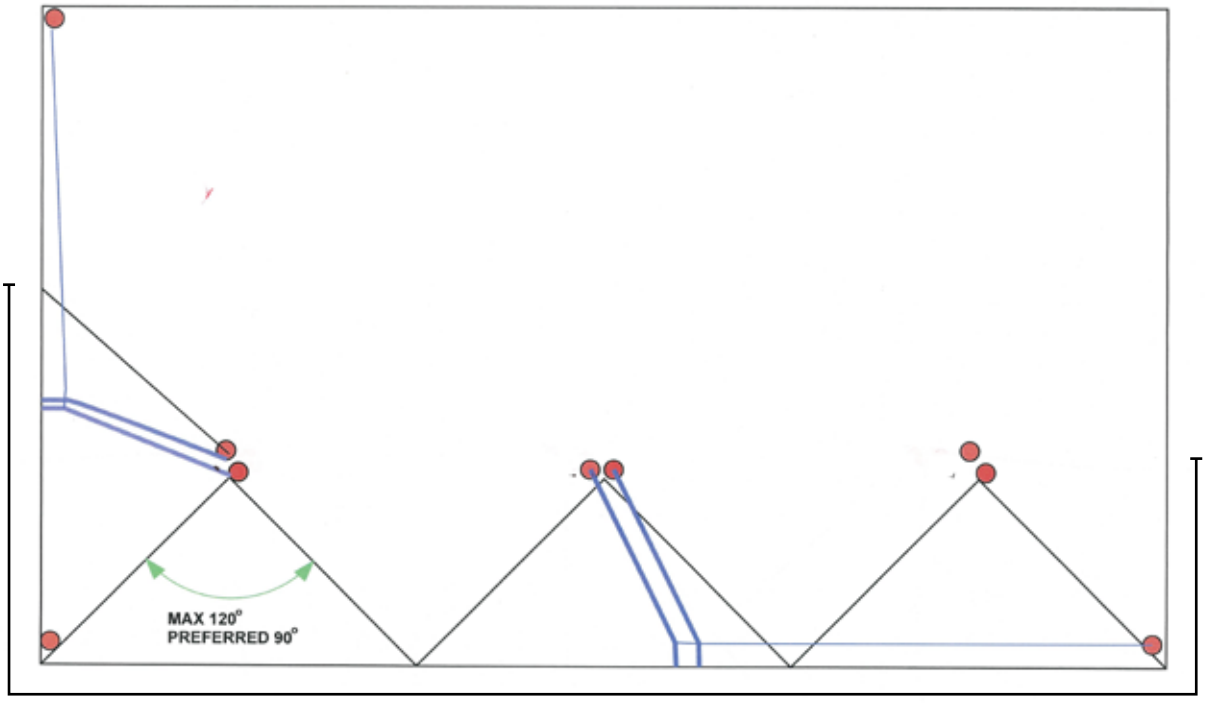
ABSEIL LAYOUT OPTIONS - PLAN VIEW

OPTION 1



EXTENT OF FACADE TO BE ACCESSED

OPTION 2

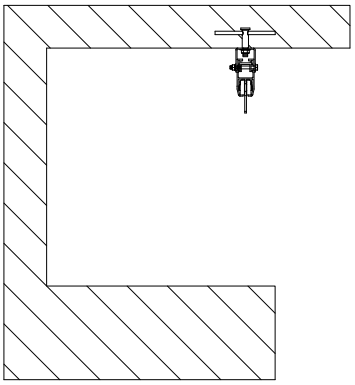


EXTENT OF FACADE TO BE ACCESSED

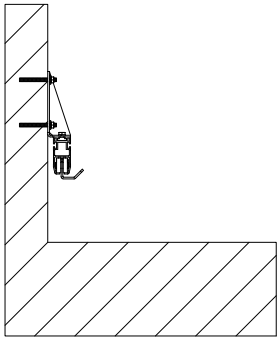
DESIGN

MOUNTING OPTIONS

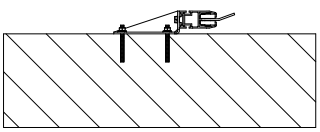
OVERHEAD MOUNT



SIDE MOUNT



ROOF MOUNT



TROLLEY OPTIONS

OH 260

Trolley - Standard

- 15kN rated
- 1.5kg

For overhead applications

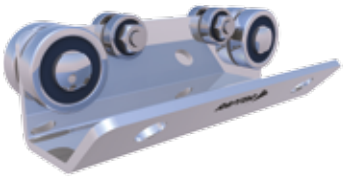
⚠ 2 trolleys required per operator for rope access use.

OH 261

Trolley - Multi Direction

- 15kN rated
- Dual attachment
- 2.6kg

For parapet and roof deck mount applications



OH 273

Trolley - Offset

- 15kN rated
- Dual attachment
- 2.6kg

For wall and floor mount applications

WARRANTY

WARRANTY PERIOD ON THIS SYSTEM - 10 YEARS FROM DATE OF PURCHASE

Should you have a warranty claim as a result of a defect the following procedure must be followed:

Identify the following information:

- The product/system name and code number.
- The date of purchase/installation.
- Installation company details.
- The installation identification number.
- The name of the company using this system.
- A description of the defect/warranty claim.
- The periodic system maintenance report.

Forward the above information to sales@sayfa.com.au or contact technical helpline, 1300 301 755.

TERMS & CONDITIONS

- All warranty claims must be made in writing within 14 days of the appearance of the defect.
- Incorrect installation or work done by a non accredited Sayfa system installer will void all warranty rights.
- Systems that have been installed using non proprietary equipment will void all warranties.
- System roof/cladding penetration seals are not covered in this warranty.
- Systems/components that have not been maintained in accordance with manufacturer's/legislative requirements will void warranty.
- Systems used by incompetent persons or use with non compatible accessories ie. harness gear, lanyards, travellers, fall arrestors etc. will void warranty.
- Systems/components used for purposes other than their intended use will void warranty.
- General wear and tear is expected and will depend on the frequency of use and is not covered by warranty.

NEVER HAS SAFETY IN THE WORKPLACE HAD A HIGHER PRIORITY

TECHNICAL SPECIFICATION

SYSTEM CODE

RAPTOR RAIL SYSTEM - ROPE ACCESS
OH 250

TECHNICAL DATA

MATERIALS
- Rail – profiled hi-tensile aluminum
- Trolley – stainless steel including 6 sealed bearings
- Mounting Brackets – profiled stainless steel and/or aluminium
- Mounting Fixings – M12 stainless steel fixings

FIXINGS (into support structure)
- Steel fixing – M12 bolt or threaded stud
- Concrete fixing – M12 mechanical concrete anchor

Note: May vary depending on application

WEIGHT
- 4.5kg / per linear metre of rail section

WORKING LOAD LIMIT

Single person use – 180kg per trolley (user/equipment)

- Maximum horizontal pitch for safe use – 3°
- Support structure integrity, suitability and fixing method to be assessed and determined by a competent person prior to installation

RAPTOR RAIL SPAN TABLE (FOR ROPE ACCESS USE)

RAPTOR RAIL ONLY			RAPTOR RAIL WITH LONGSPAN SUPPORT		
No of Users Per Span	Max Span Length	Support Structure Design Load	No of Users Per Span	Max Span Length	Support Structure Design Load
1	4000mm	12kN	1	6000mm	12kN
2	3200mm	18kN	2	5500mm	28kN
3	2500mm	24kN	3	5200mm	24kN
4	2000mm	30kN	4	4200mm	30kN

COMPLIANCE

Raptor Rail for abseil use is designed to comply with Australian Standards AS/NZS4488 and relevant statutory OHS Codes of Practice/Guidelines. (Refer instruction manual.)

TESTING

Testing and performance based on requirements of Australian Standard

- AS/NZS 4488

PRODUCT WARRANTY

10 years from date of purchase subject to correct installation, use and maintenance in accordance with manufacturer's specifications and recommendations. (Refer instruction manual.)

INSPECTION AND MAINTENANCE

Inspection and certification every 12 months by a height safety equipment inspector in accordance with manufacturer's specifications and requirements of Australian Standard AS/NZS181.1:2009 (Refer instruction manual.)

IMPORTANT NOTE

Failure to supply and/or install proprietary product in accordance with above standards and codes, specifications and instructions voids complete system certification and/or warranty.

Designed and manufactured by Sayfa Group. For all technical assistance contact Sayfa Group.SAYFAGROUP-28.5.2015

SAYFA GROUP

1029 MOUNTAIN HWY
BORONIA VIC 3155
AUSTRALIA

T 1300 301 755
F 1300 881 092
E INFO@SAYFA.COM.AU

FOR MORE INFORMATION
VISIT SAYFA.COM.AU

THE SAYFA GROUP

WE SAVE LIVES!

This is our Mission, and it drives our Vision to BRING EVERY WORKER HOME SAFELY.

Sayfa Group leads the industry in the design, installation and management of access, fall protection and ground safety systems. As an Australian owned company, we engineer and rigorously test our proprietary systems to exceed national and international standards. Simple installation and easy to use systems are our key drivers for ensuring maximum effectiveness, improved safety and compliance with Occupational Health and Safety standards in the workplace.

OUR VALUES

We are governed by the following principles in everything we do:

A – Accountability / Totally responsible and answerable for our actions.

L – Loyalty / Steadfast and dependable based on our values in our dealings with one another.

I – Integrity / Honest and sincere, we do what we say, on time every time.

V – Value Driven / Increase what's of value in view of a win win plan for all.

E – Enthusiastic / Motivated and inspired to continuously perform better.

COMMITMENT

We are passionate about our work with every product a testament to our commitment of world class safety, quality and performance. Our obligation is to live up to our own high standards as well as those of our customers and stakeholders ensuring total peace of mind.

QAS INTERNATIONAL
ISO 9001:2008
REGISTERED FIRM

PRODUCT IS OWNED BY THE SAYFA GROUP.
THE SAYFA GROUP CONSISTS OF:

SAYFA ACCESS SAYFA PROTECT SAYFA EQUIP

Honeywell
MILLER

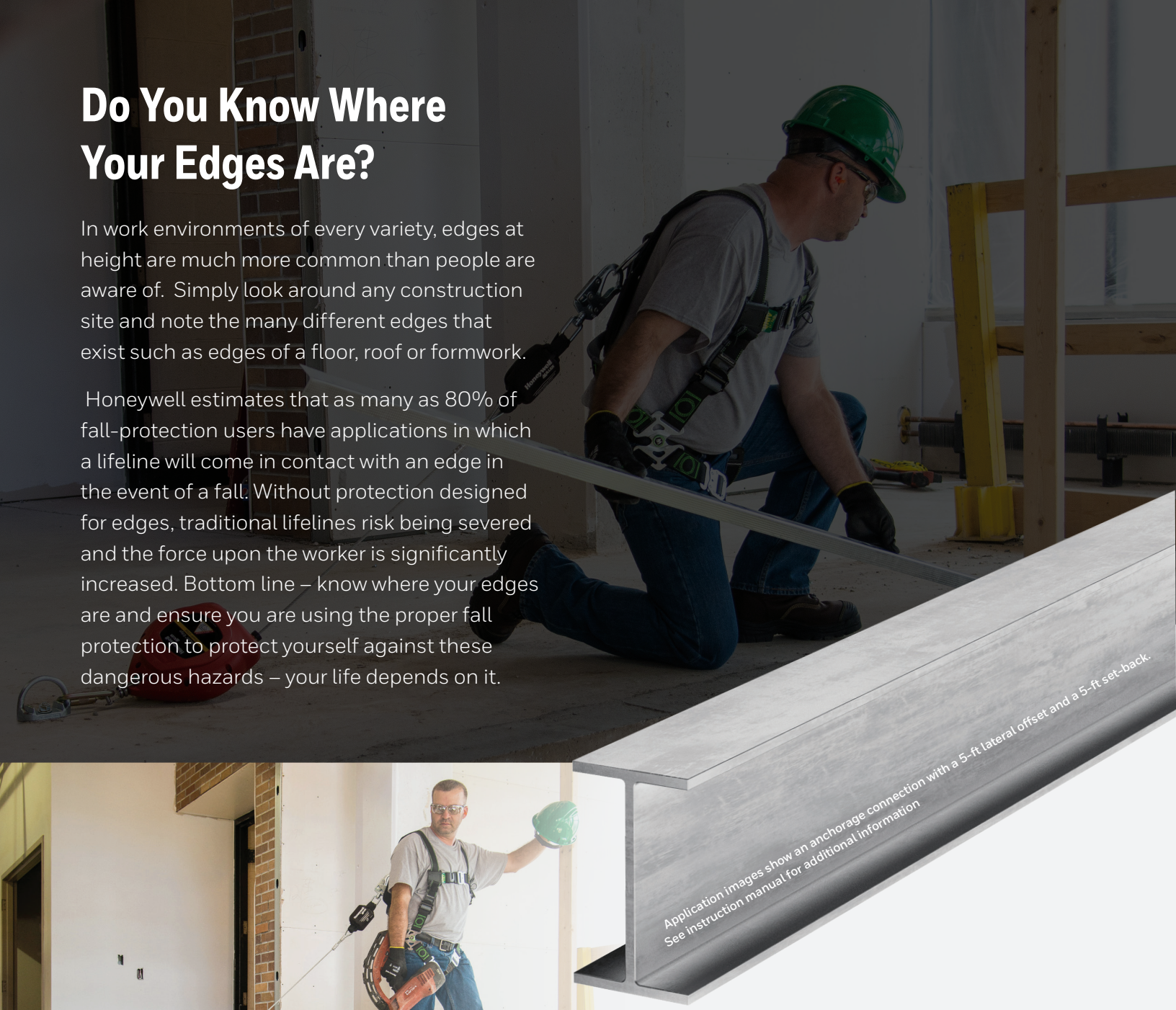
Miller® Falcon™ Edge Self-Retracting Lifeline

When the Job Takes You to the Edge: Depend on Miller

Do You Know Where Your Edges Are?

In work environments of every variety, edges at height are much more common than people are aware of. Simply look around any construction site and note the many different edges that exist such as edges of a floor, roof or formwork.

Honeywell estimates that as many as 80% of fall-protection users have applications in which a lifeline will come in contact with an edge in the event of a fall. Without protection designed for edges, traditional lifelines risk being severed and the force upon the worker is significantly increased. Bottom line – know where your edges are and ensure you are using the proper fall protection to protect yourself against these dangerous hazards – your life depends on it.



New Leading Edge Safety Standards

As awareness of this threat is increasingly on the rise, new safety standards have been defined. ANSI Z359.14-2014 & CSA Z259.2.2-17 require leading edge connecting devices to meet criteria such as:

- Edge radius as sharp as 0.005 in (0.13 mm) (ANSI) & 0.010 in (0.25 mm) (CSA)
- Safe for users connected at foot level
- Used anytime the device is anchored below the harness back D-ring (CSA)
- Requires an integral shock-absorber attached to the end of the lifeline connected to the worker

The Versatility You Need. The Safety You Depend On.

Designed for performance in edge applications, Falcon Edge SRLs offer versatility, reliability, and maximum safety.

Safe

- Designed for sharp edge applications with an edge radius of ≥ 0.005 in (0.13 mm)
- Provides protection in applications that require anchoring at foot level
- Meets many stringent safety standards, including ANSI Z359.14 SRL-LE & CSA Z259.2.2 Class SRL-LE

Versatile

- ***Perfectly suits your personal profile, with the capacity to support user weights up to *420-lbs. in all connections at foot level and above*** *(*up to 375-lbs. Canada only)*
- Provides protection for all working at height situations – horizontal, vertical, mounted overhead, anchored at foot level and work near edges
- Available in 20, 30, and 50-ft. working lengths to cover a wide range of applications
- ***Models available for welding applications include a shock absorber cover that is flame retardant and resistant to weld splatter***

Reliable

- ***Durable design with corrosion resistant internal components extend service life and lowers cost of ownership***
- ***Up to 30% lighter than competitive models for easier installation and transportation to reduce worker fatigue and increase productivity***
- Thicker galvanized cable (7/32") increases durability to lower cost of ownership
- ***Equipped with RFID for efficient asset and inspection tracking***
- Repairable with quick turnaround time, lowers cost of ownership and increases productivity

* Rated for up to a 375-lbs. (170 kg) user in all connections when tested to CSA Z259.2.2-17

① ***Steel Double Locking Carabiner***

*Steel carabiner (and tagline) included for **easier connection and installation.***

② ***Built-in Handle***

*Built-in, ergonomically-designed molded handle on 30-ft. & 50-ft. models **provides easy installation and transportation***

③ ***Dual Swivels***

*Dual swivels at top of unit and on snap hook **increase mobility** and minimize lifeline from twisting during use*

④ ***High Impact Resistant Nylon Housing***

*Withstands the harsh rigors of the toughest applications for **increased durability to extend service life and to lower cost of ownership***

⑤ ***Unique Side Payout Design***

*Reduces wear on the entry guide bushing and cable providing smooth operation with less drag to **increase user mobility**. Internal entry guide bushing and roller prevent cable from cutting into housing for **increased durability***

⑥ ***Integral Shock Absorber***

Integral shock absorber connected to the worker** ensures the lifeline is kept intact if a fall were to occur over an edge to **increase safety

⑦ ***RFID Technology***

*RFID for **easy and efficient asset tracking***

⑧ ***Durable Shock Absorber Cover***

*Ballistic nylon shock absorber cover for **increased durability** (flame retardant shock absorber cover for welding applications also available).*

Miller® Falcon™ Edge Self-Retracting Lifelines

Galvanized Steel Cable Lifeline with Integrated Shock Absorber, Carabiner, and Tagline.

SKU	Length	Lifeline Connector	Unit Weight (Lbs.)
MP20G-LE	20-ft. (6 m)	Steel Locking Swivel Snap Hook	11.0 lbs. (5 kg)
MP30G-LE	30-ft. (9 m)		14.3 lbs. (7 kg)
MP50G-LE	50-ft. (15 m)		17.4 lbs. (8 kg)

Galvanized Steel Cable Lifeline with Integrated Shock Absorber with flame retardant cover for welding applications, Carabiner, and Tagline.

SKU	Length	Lifeline Connector	Unit Weight (Lbs.)
MP20G-LEK	20-ft. (6 m)	Steel Locking Swivel Snap Hook	11.0 lbs. (5 kg)
MP30G-LEK	30-ft. (9 m)		14.3 lbs. (7 kg)
MP50G-LEK	50-ft. (15 m)		17.4 lbs. (8 kg)

Honeywell has your back with a full range of leading edge self-retracting lifelines and personal fall limiters , including the Miller® TurboLite™ Edge Series.

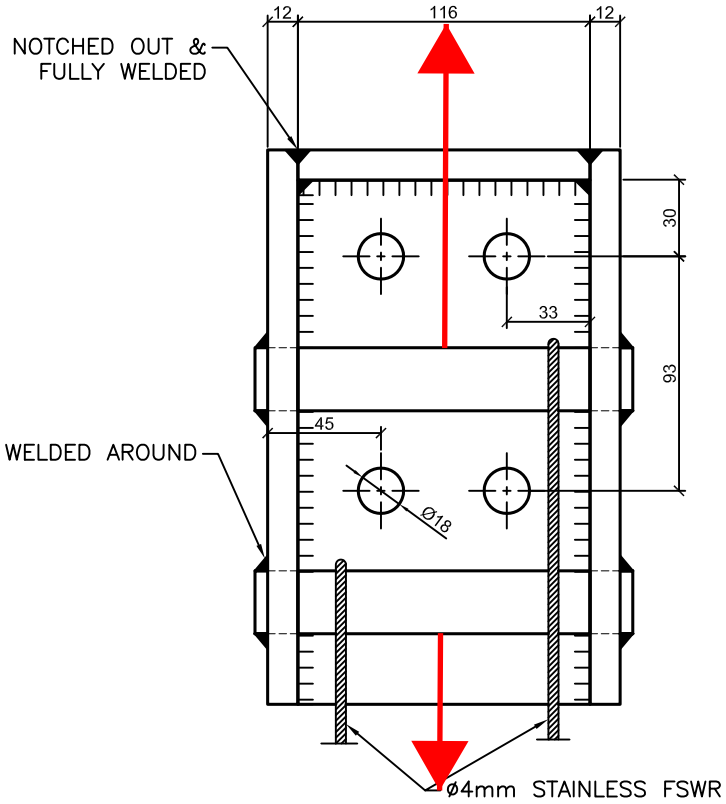
Limitless Possibilities. Ask the Expert.
Technical Service: 800.873.5242
www.millerfallprotection.com

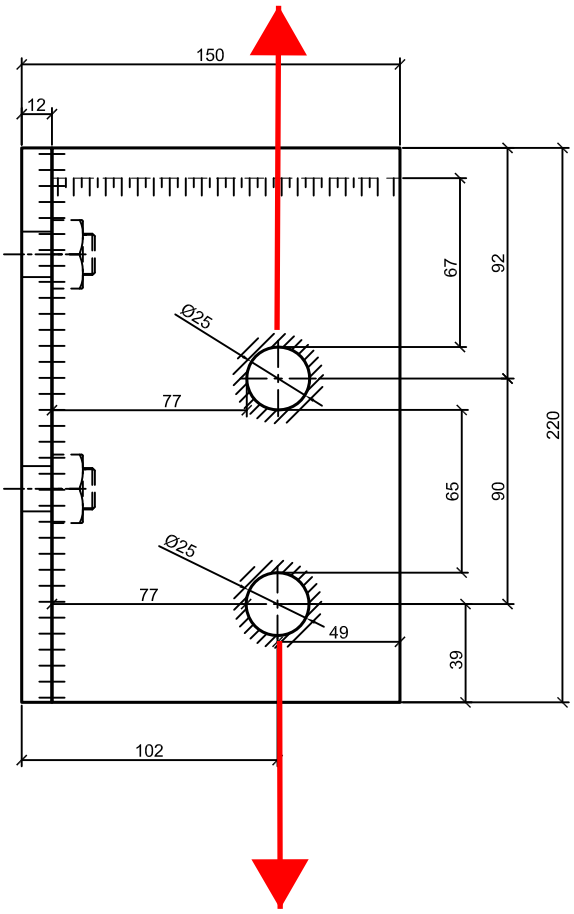
Honeywell Industrial Safety
900 Douglas Pike
Smithfield, RI 02917

USA:
Phone:. 800.430.5490
Fax. 800.322.1330
www.honeywellsafety.com

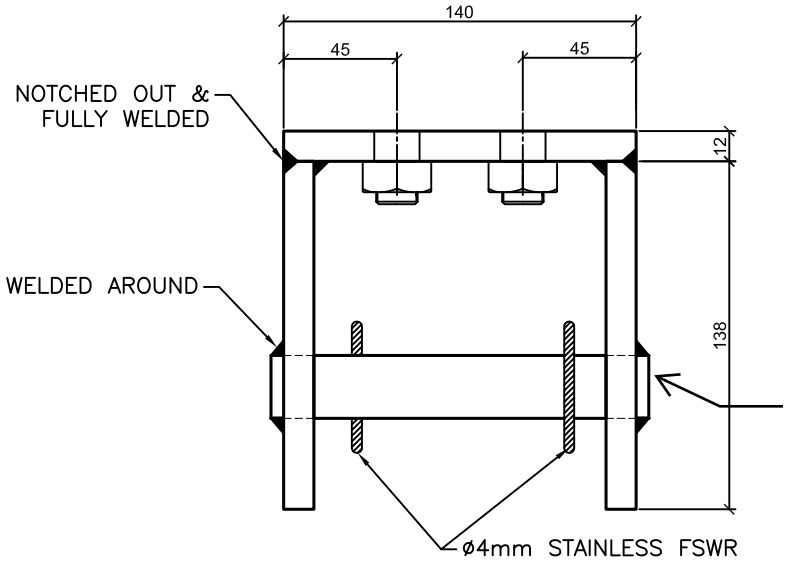
Canada:
Phone: 888.212.7233
Fax. 888.667.8477

Honeywell





Ultimate Design Load 15kN



25 mm diameter Round bar

NOT FOR CONSTRUCTION

All Hot Dip Galvanized or 316 Stainless Steel

Example loop box

Vertical Rope Access Anchor Point "Loop-Box"

DRAWN	ABDUL	SCALE: VARIES	DRAWING No.	PLOT DATE	REV.
CHECKED	AF	Job No A1215	01	000	04
DATE	04.12.2009				

KARABINER

Karabiner
P. 1300 222 300
e. info@karabiner.com.au
w. www.karabiner.com.au

TECHNICAL FILE

KARABINER

Example

Horizontal anchor device ALTIRAIL

- Sales brochure
- Technical data sheets
- Conformity
- Operating instructions
- Identification and check sheets

Horizontal fall arrest rail system

ALTIRAIL

Photo Credit VERTIC NL

PRODUCT ADVANTAGES

- Ideally suited for use in raised installation, on the under-surface of the roof, or when the fall clearance is incompatible with a cable system
- Ideal for working at a distance, or in association with a high weight block
- Various routes may be used, thanks to the switch which enables continuous movement
- Reduced height of fall owing to the rigidity of the system
- Can be installed on the majority of the roofs, thanks to the ALTIFIX supports suitable for the rail system

Can be specially bent upon request

Tel : +33(0)4 76 13 12 15 **Fax :** +33(0)4 76 13 12 16 support@vertic.fr

ALTIRAIL

Several possible uses

Lateral circulation

Circulation on the top of the rail

Overhead position

Recommendations for use

Maxi 2 users per interval

D = 4 meters for using the rail only as a fall arrest system

D = 2 meters recommended for suspension use

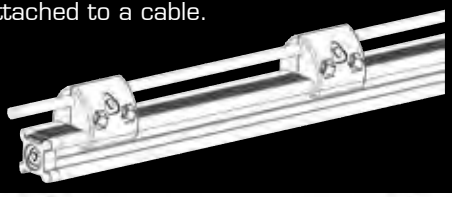
Ball bearing carriage

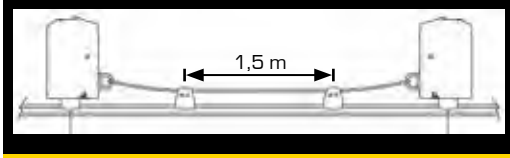
The mobile VERTIC carriage is made to roll under load.
It allows mobility when working in suspension, or associated with a self-retractable lanyard.

R.CF3

ALTIRAIL/CABLE combined configuration

For special applications where there is no support available, the rail may be attached to a cable.





MOTORIZED SWITCH

Ensures the safety of warehouses with a significant height. The switch can be used and activated at a distance thanks to a remote control.

COMPOSANTS ALTIRAIL®

Aluminium rail

Supplied in 3m length, drilled and milled.

Switches

Allow a continuity of movement, and the change of circulation of the carriage. Available in 3 or 4 directions.

Entry/Exit piece for carriage

Can be installed at any location on the rail, to allow the installation of the different carriages.

Rail carriage with rollers

The mobile VERTIC carriage is fitted with multiple rollers to provide perfect movement, whatever position is used.

Retractable end stop

This end stop enables the carriage to be fitted at the end of the rail.
Automatic locking.

90° corner for lateral movement

Interior or exterior angle to allow the carriage to circulate sideways.

Fixed end stop

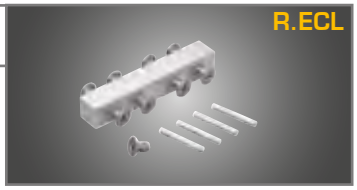
Blocks the carriage at the end, securing the system.
Finishes the extremity of the rail nicely.

90° corners for movement on under surface

Interior or exterior angle to allow the carriage to circulate under-surface.

Rail coupling block

Allows assembling two lengths of rails. The 4 pins ensure a perfect lining up of the rail.



Mounting angle

Allows mounting the rail on a facade, when circulation is done under-surface.

Opening support

Made of copper-aluminium, it facilitates the fitting and removal of the rail.
Also permits free expansion of the rail.

Safety sign

Must be installed at the access of the system.
Allows the identification and the control of the system.

TECHNICAL DATA SHEETS

TECHNICAL DATA SHEET : ALTIRAIL

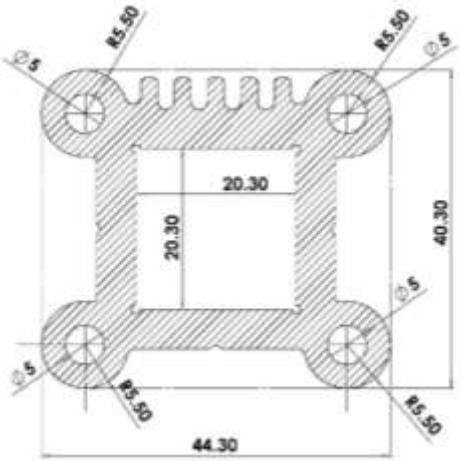
(16/02/16)

ALUMINIUM RAIL

R.RAIL (3/1/1.5)

Product picture

Product technical drawing



Technical features

- Material properties : Aluminium 6060 T5
- Standard finish : natural
  (optional anodized finish upon request
  Ref R.PVA)
- Standard length : 3m
  (other possible lengths : 1m, 1,5 m)
- Weight : 2.07 kg/ml (therefore 6.2kg for L=3m)

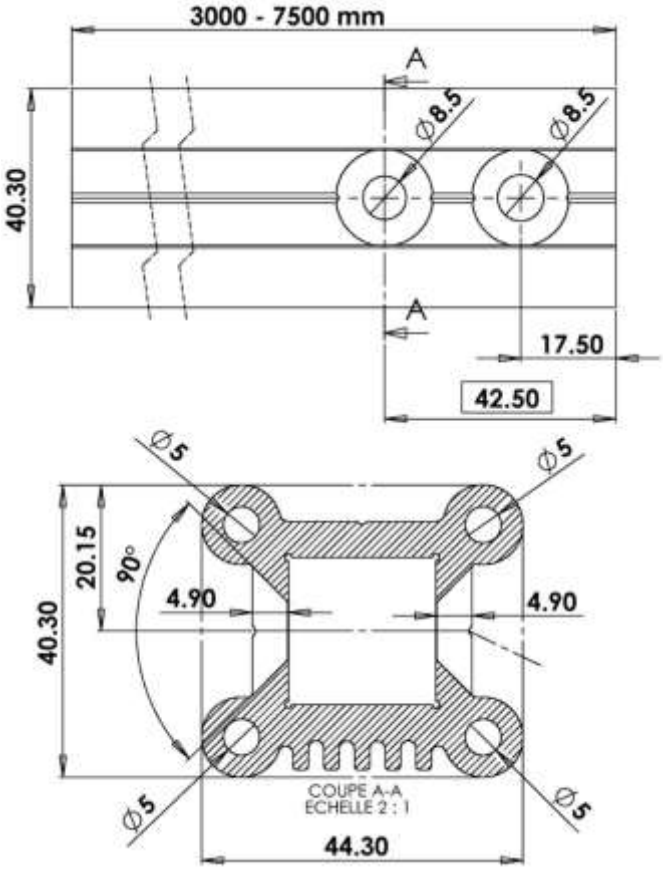
Advantages

- Custom bending possible.
- Specific lengths cuts can be done in our workshop (upon order).
- Cutting and drilling on site is possible using the specific tool, ref.: R.OUTIL

Assembling features

- Span between supports recommended = 4 meters.
- This distance will be reduced to 2 meters for an installation dedicated to work in suspension.
- The 4 grooved pins in the peripheral holes ensure a perfect alignment of the rails at junctions.

Installation application



Drilling with 8.5 mm drill bit
Milling with 16.5 mm to 90°mm drill

TECHNICAL DATA SHEET : ALTIRAIL

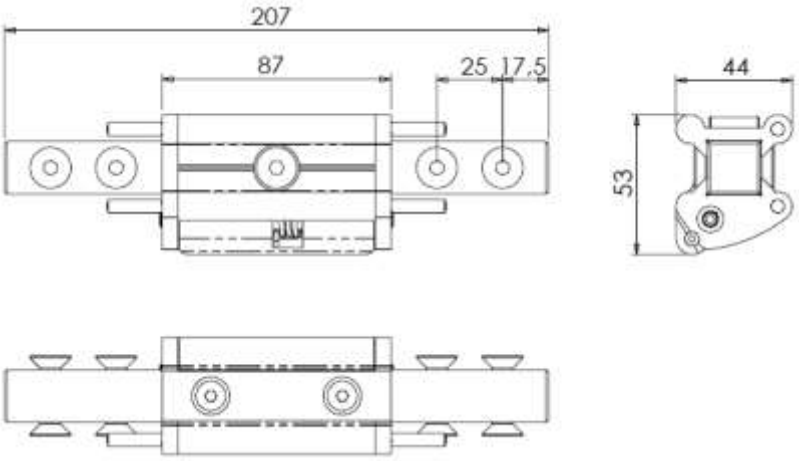
(16/02/16)

ENTRY/EXIT PIECE FOR RUNNER

R.RO

Product picture

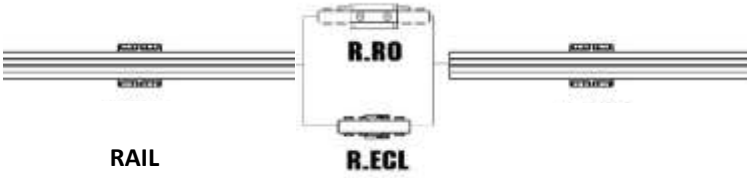
Product technical drawing



Technical features

- Material properties of opening part : stainless steel
- Material pincs : Steel with Geomet treatment
- Weight : 1kg

Installation application



Advantages

- Allows the connection of the carriage on the location selected.
- Also used as rail connector plate.

Assembling features

- Attached between 2 rail parts instead of the connector plate (ref R.ECL).

TECHNICAL DATA SHEET : ALTIRAIL

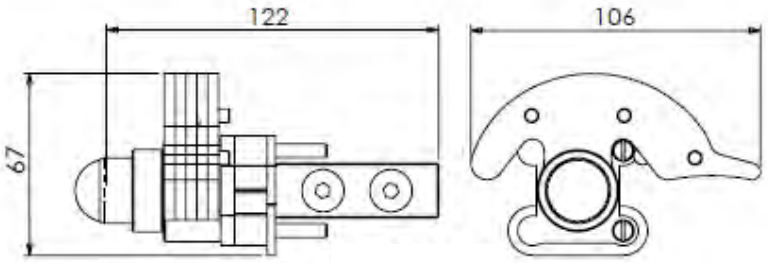
(16/02/16)

RETRACTABLE END STOP

R.BE

Product picture

Product technical drawing



Technical features

- Material properties :
  Flanges : aluminium
  Jointbars : acier traité Geomet
  Bolts : Geomet treated steel
- Weight : 700 g
- Breaking resistance > 2200daN

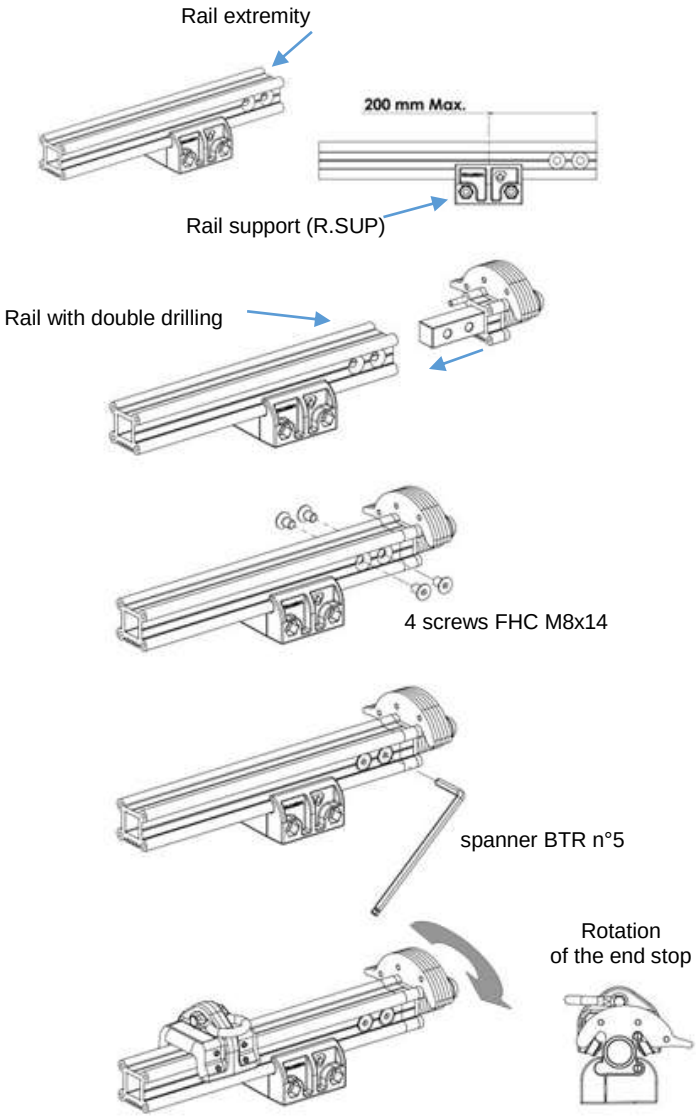
Advantages

- Automatic closure of the end stop.
- Its ergonomic design allows ease of use in all configurations of rail installation.
- Easy of installation.

Assembling features

- The R.BE is sold with the jointbar system.
- Attached directly to the rail extremity with double drilling, using the 4 M8x14 FHC bolts provided.

Installation application



TECHNICAL DATA SHEET : ALTIRAIL

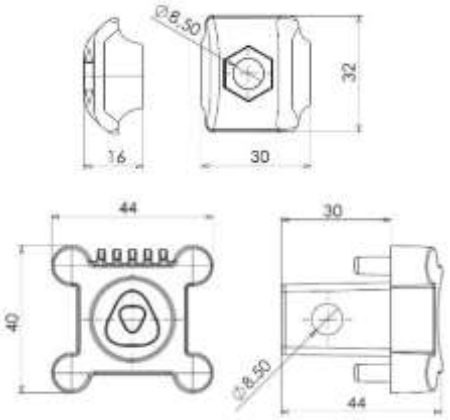
(16/02/16)

FIXED RAIL END STOP

R.EXTF

Product picture

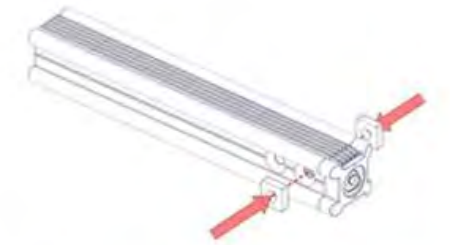
Product technical drawing

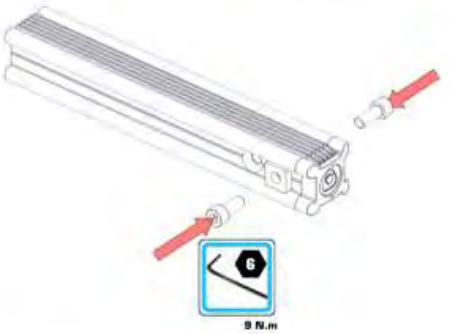


Technical features

- Material properties :
  End stop : PU (plastic)
  End piece : Composite
  Bolts : Stainless steel
  Weight : 80 g

Installation application

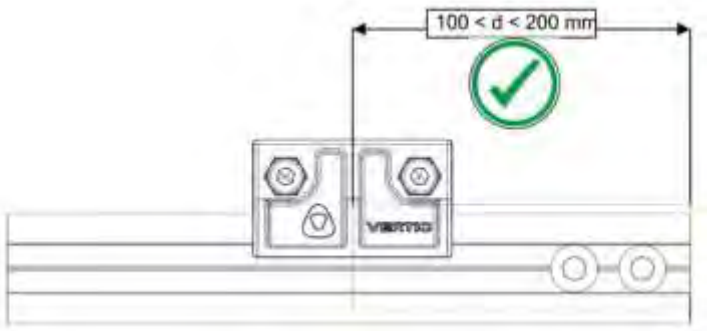


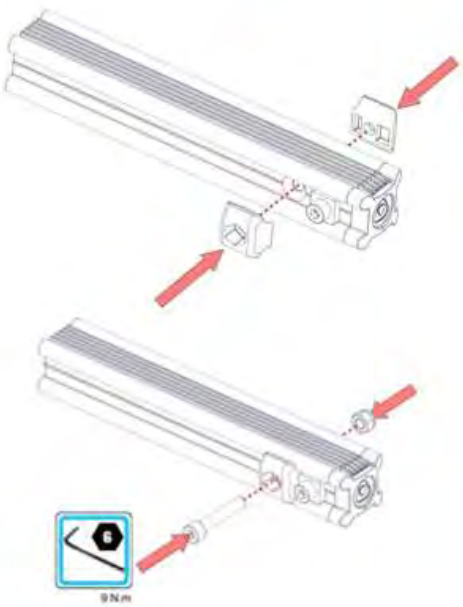


Advantages

- The endpiece allows perfect finishing of the rail end.
- 2 PU stops and 2 stainless steel spacers are blocking the runner at the extremity, to secure the system.

Assembling features





TECHNICAL DATA SHEET : ALTIRAIL

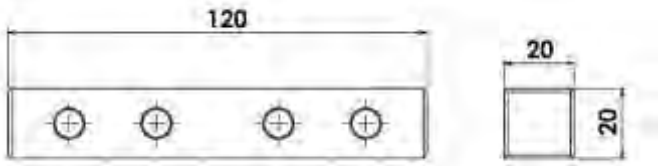
(16/02/16)

RAIL JOINT BAR

R.ECL

Product picture

Product technical drawing



Technical features

- Material properties : steel with Geomet treatment
- Pre-coated bolts with thread lock substance
- Weight : 450 g

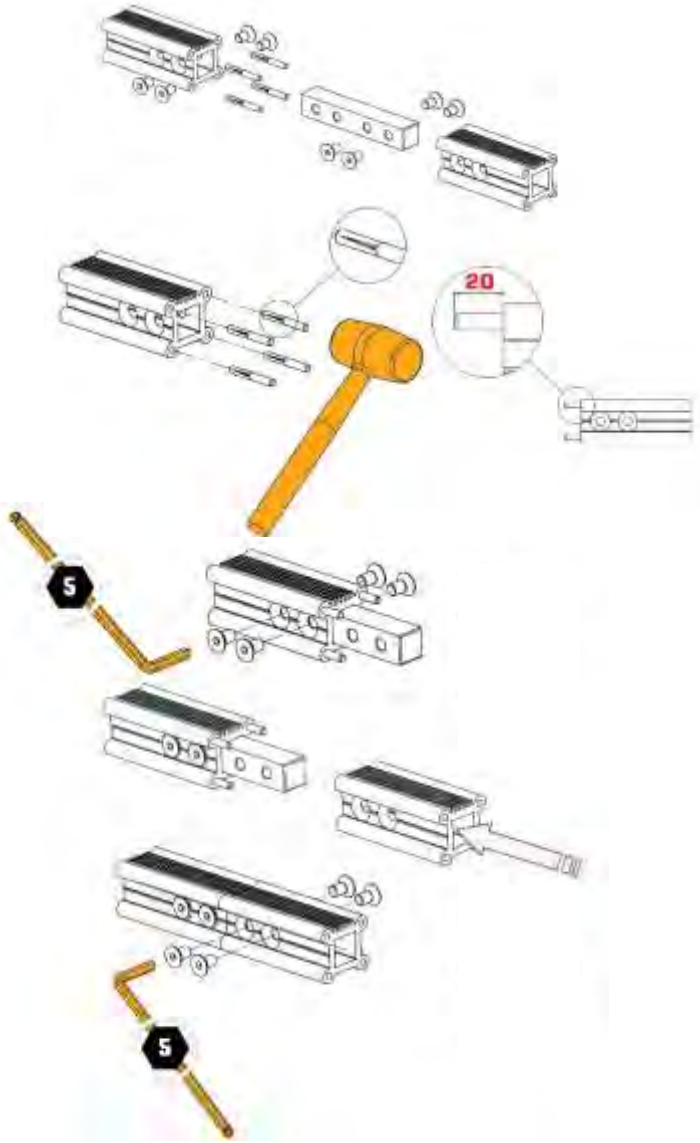
Advantages

- The position of the splice plate relative to the supports does not matter because of its stiffness and strength.
- The 4 grooved pins ensure perfect alignment of the rails.
- The bolts are pre-coated with thread lock, providing a reliable security against loosening.

Assembling features

- The rails have two sets of 4 milling holes at each end for a quick and simple mounting.
- Attached with 8 M8x14 FHC bolts that lodge in the milling holes.

Installation application



TECHNICAL DATA SHEET : ALTIRAIL

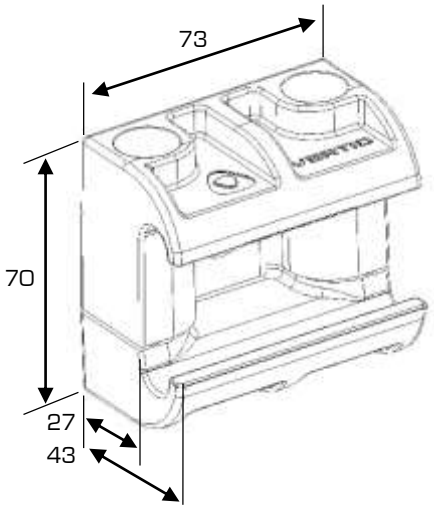
(16/02/16)

RAIL SUPPORT

R.SUP

Product picture

Product technical drawing



Technical features

- Material properties : cupro-aluminum
- Finish : grey painting
- Weight : 750 g

Advantages

- Corrosion resistant.
- The rail is free to expand.
- Possible installation in any positions.

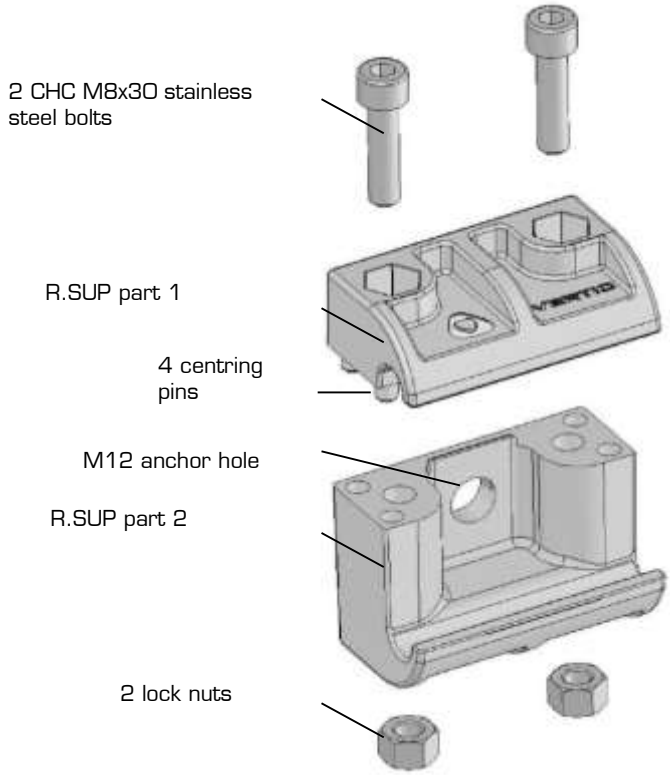
Installation application

- The R.SUP is made of 2 pre-assembled parts with 2 CHC M8x30 bolts and 2 lock nuts.
- Attached with M12 bolt (not supplied).

Maximum span between 2 supports recommended:

- **4 m for safety**
- **2 m for suspension work**

Installation application



TECHNICAL DATA SHEET: ALTIRAIL

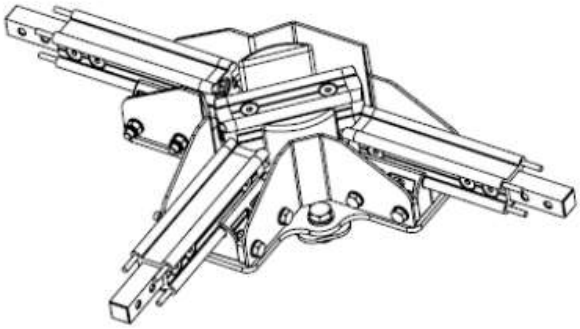
(16/02/16)

3 DIRECTION SWITCH

R.AIG3D

Product picture

Product technical drawing



Technical features

- Material properties :
  - Central block : Aluminium
  - Support : Stainless steel
- Weight : 8 Kg

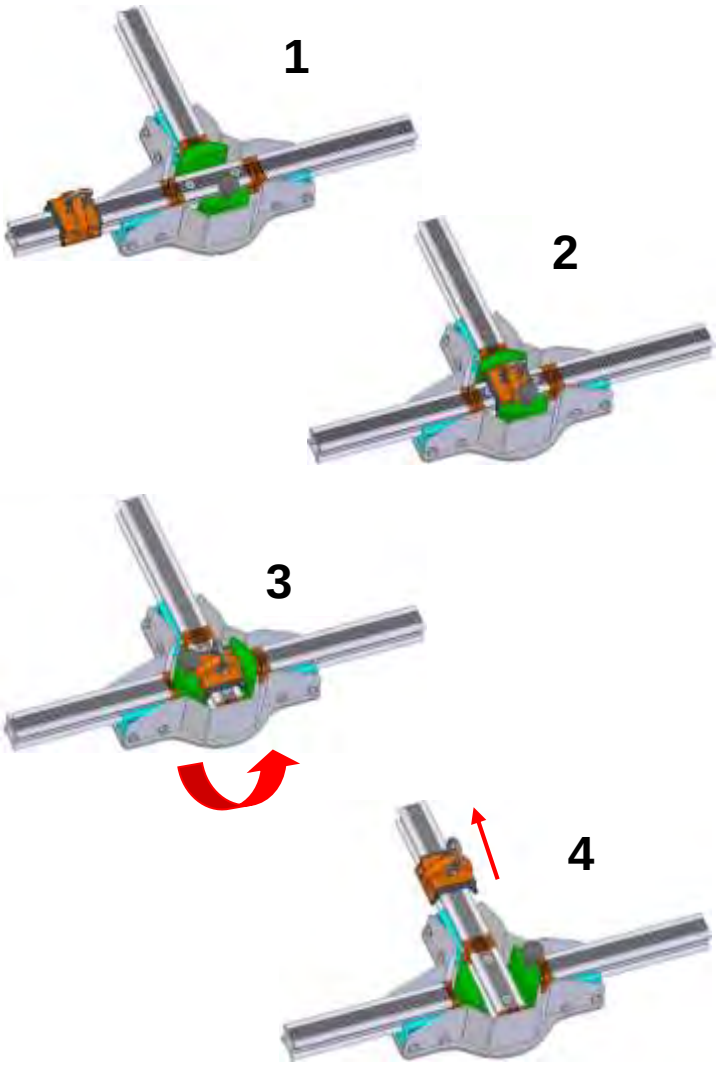
Advantages

- The 3D switch allows a circulation of the operator in all directions without ever disconnecting from the fall arrest system.
- The manual rotation of the central block is easy.
- The indexing system positions correctly the switch for a good circulation of the runner.

Assembling features

- Can be installed directly on a concrete support or on steel by 2 M12 fixings.
- Can also be installed on posts PST1 or ALTIFIX.

Operating principle



TECHNICAL DATA SHEET : ALTIRAIL

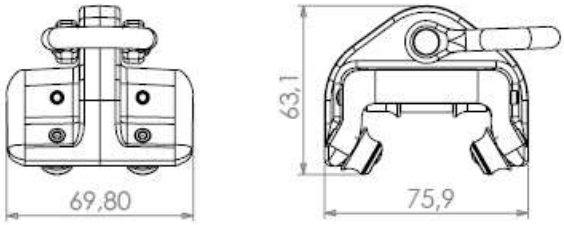
(16/02/16)

MOBILE RUNNER

R.CF2

Product picture

Product technical drawing



Technical features

- Material properties :
  - Body : aluminium
  - Axis and shackle : stainless steel
  - Rollers : cupro-aluminum
- Finish : black anodization
- Weight : 420 g
- Exceed EN 795D : 2012 standard

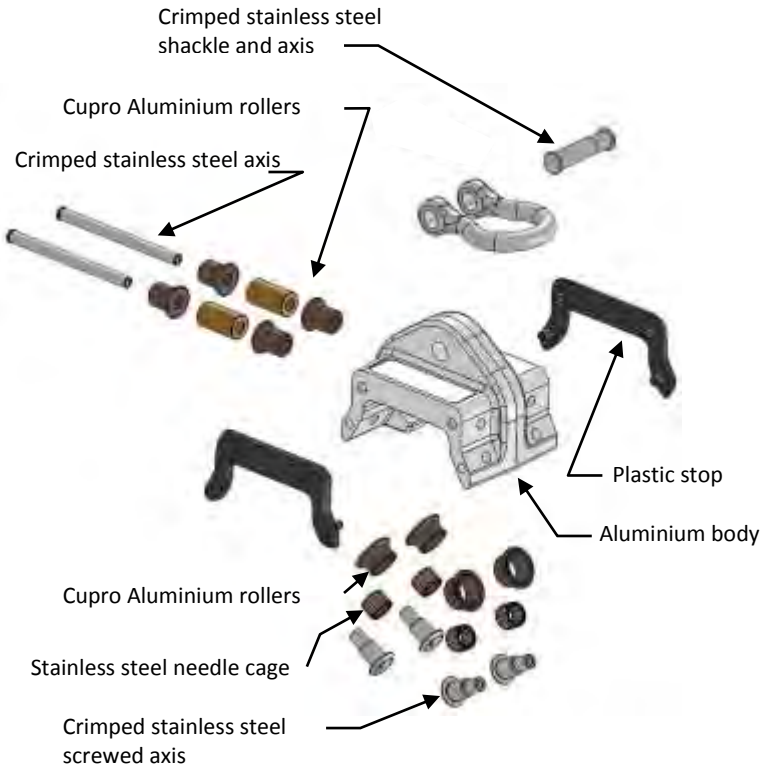
Advantages

- The one-piece body with two safety hooks ensures a high level of security.
- The combination of two types of rollers allows good circulation of the runner in all installation configurations.

Using features

- The runner can be left permanently on the rail or connected on the end part of this one, thanks to a retractable end stop.

Exploded view



TECHNICAL DATA SHEET : ALTIRAIL

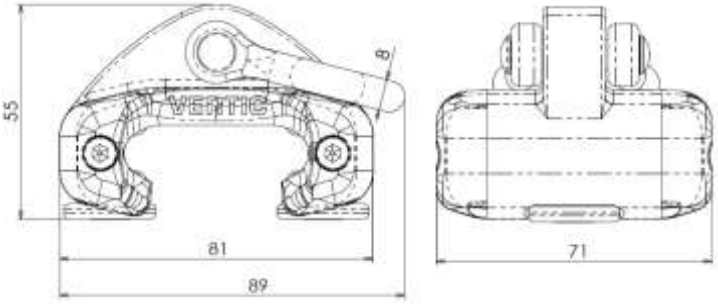
(16/02/16)

BALL BEARING RUNNER

R.CF3

Product picture

Product technical drawing



Technical features

- Material properties :
  - Body : serie 7 aluminium
  - Axis and shackle : Stainless steel 316L
  - Ball bearings : stainless steel 316L
- Finish : orange anodizing
- Weight : 370 g
- Exceed standard : EN 795D : 2012

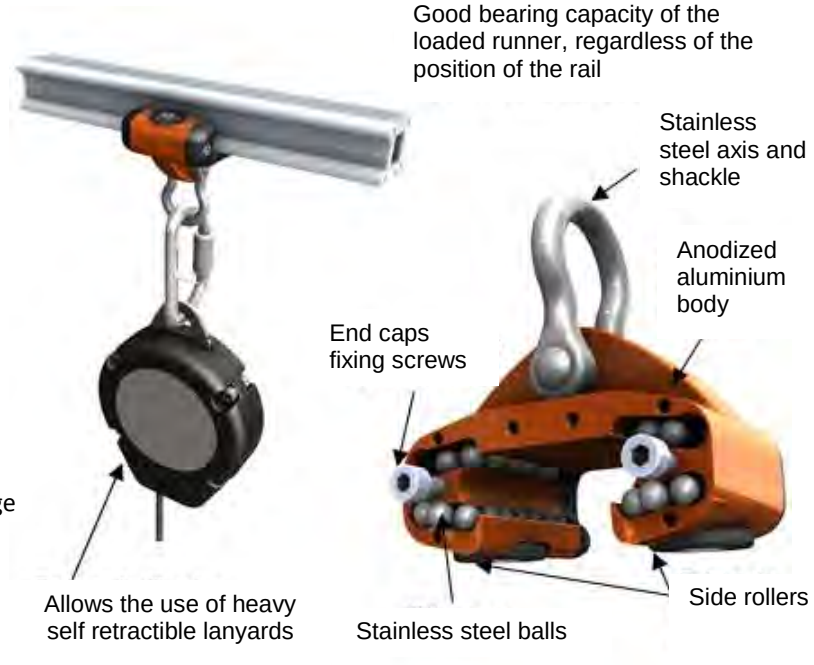
Advantages

- **<u>Runner intended to run under loads.</u>**
- Provides a great mobility when working in suspension, or associated with self retractible lanyards.
- Totally compatible with all products from the range ALTIRAIL.

Using features

- The runner can be left permanently on the rail or connected thanks to an optional opening system. It can also be connected with a retractable end stop attached at the end of the rail.

Using application



TECHNICAL DATA SHEET : INTERFACES

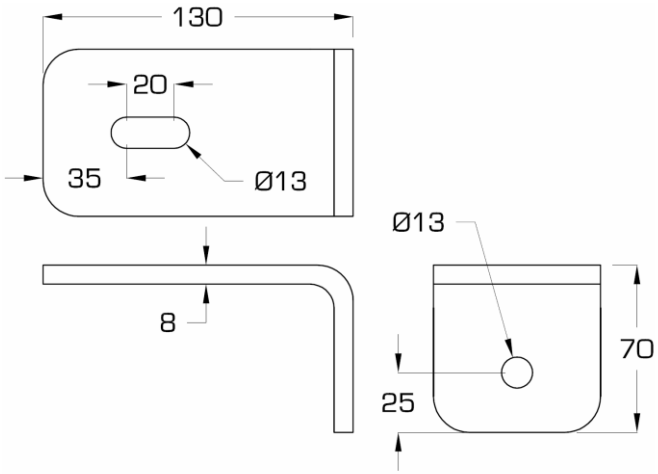
(16/02/16)

STEEL ANGLE BRACKET

R.EQG

Product picture

Product technical drawing



Technical features

- Material properties : hot-dipped galvanised steel
- Weight : 0.765 kg

Advantages

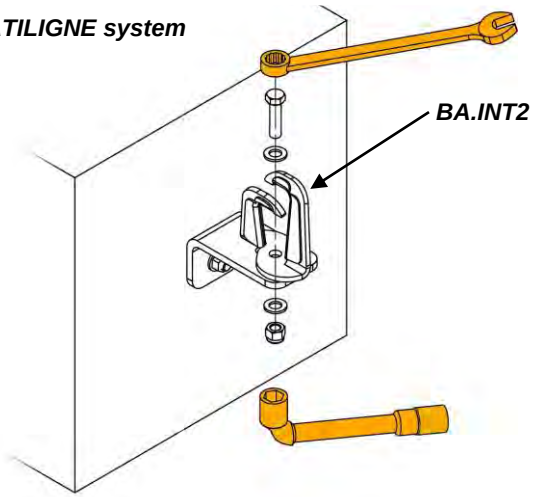
- The R.EQG allows façade installations.
- Long slot of 20 mm enables installation adjustment in the attachment hole.

Product compatibility

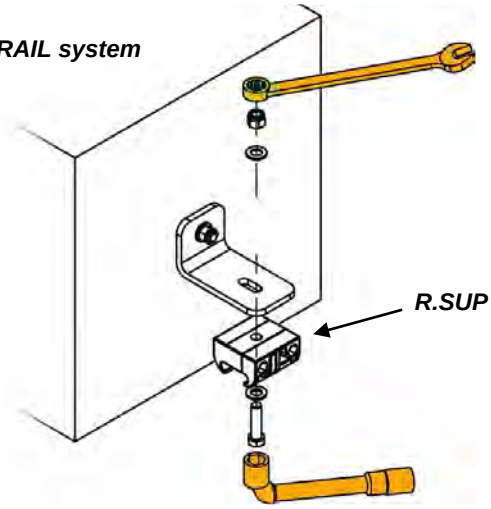
- Can be used with VERTIC systems : BATILIGNE and ALTIRAIL.
- Installed with M12 bolt on metal structures or adhesive bolts in concrete.

Installation applications

*With **BATILIGNE system***



*With **ALTIRAIL system***



TECHNICAL DATA SHEET : ALTIRAIL

(16/02/16)

SAFETY SIGN AND LABEL

R.PS

Product picture

Panel 1 : « Compulsory PPE »

Product Labels

Panel 2 : « Rail labels »

Technical features

- Materiel properties of panel 1 : expanded PVC 3 mm
- Materiel properties of panel 2 : aluminium
- Weight : 76 g

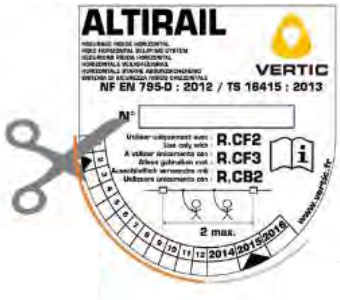
Advantages

- 13 mm diameter hole for fixing with M12 bolts.
- Several languages included in the kit.

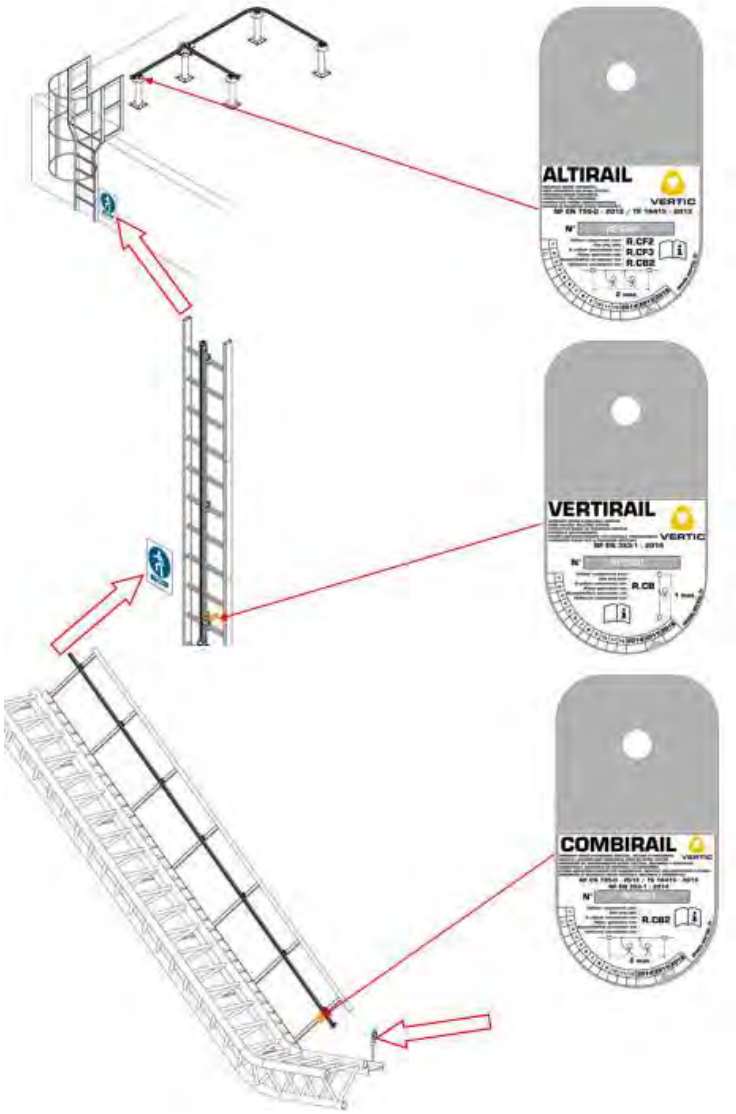
A full kit includes:

- 1 panel « Compulsory PPE » to be installed at the access point near the system.
- Several sticking labels « languages » to be chosen among several languages.

- 1 pannel « Rail labels » including 3 « systems » labels to chose from, to install directly at the access point near the system.



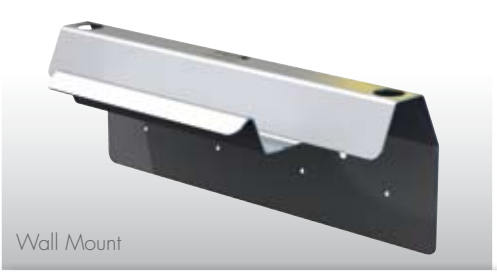
Installation application



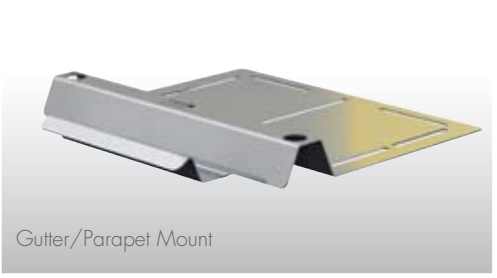
Example ladder hook

SAYFA systems

KATT® LADDER SUPPORTS



Wall Mount



Gutter/Parapet Mount

KATT® LADDER SUPPORT BRACKETS

Katt Ladder Support Brackets are designed to provide a secure attachment point for portable ladders when accessing a roof. The support bracket prevents movement of portable ladder in any direction.

> Simple installation using standard fixings
> Prevents sideway movement and ladder foot slip
> High strength stainless steel construction
> Low aesthetic profile, minimal visual impact

SPECIFICATION CODE

Katt Ladder Support Bracket (LD401) – Wall Mount type
Katt Ladder Support Bracket (LD402) – Gutter & Parapet Mount type

SAYFA systems

KATT® LADDER SUPPORTS

Specification Summary

Supply and install the Katt Ladder Support Bracket as per manufacturer, Sayfa Systems, recommendations. Support bracket to incorporate ladder tie off points and variable fixing location penetrations. The support bracket must be adaptable to varied locations with allowance for specific profiling of the bracket attachment plate to suit the application. (Refer instruction manual.)

System Applications

> Portable ladder anti slip device for personnel accessing roofs and other areas for maintenance

Technical Data

Material

Profiled stainless steel (with option for powder coating)

Dimensions

Length – 470mm (profiled section)
Width – 150mm (profiled section)

Weight

Wall mount – 2.30kg
Gutter/Parapet mount – 3.70kg

Fixings

Timber fixing – 14g type 17 Tek screw
Metal fixing – M8 stainless steel bolt set
Concrete fixing – M8/ 75mm mechanical concrete anchor
Metal roof deck fixing – 8mm construction grade Bulbtite rivet
Composite panel fixing – 8mm construction grade Bulbtite rivet (Refer instruction manual.)

Working Load Limit

Recommended for single person use with approved portable ladder – max user weight 120kg.

> Support structure integrity, suitability and fixing method to be assessed and determined by a competent person prior to installation.

Compliance

Katt Ladder Support Brackets are designed and manufactured generally in accordance with requirements of Australian Standards AS1657:1992 and AS/NZS1891.4:2009 and relevant statutory OHS Codes of Practice/Guidelines.

Testing

Testing and performance based on single person use (max 120kg) using an Australian Standards approved portable ladder.

Product Warranty

3 years from date of purchase subject to correct installation, use and maintenance in accordance with manufacturer's specifications and recommendations. (Refer instruction manual.)

Inspection and Maintenance

Visual inspection for any damage or loose fixings must be done periodically and prior to use. No certified maintenance required. Basic wear/ tear preventative maintenance is recommended, as per manufacturer's specifications and recommendations (Refer instruction manual.)

Important Note

Failure to supply and/or install proprietary product in accordance with above specification and installation/usage guidelines voids complete system certification and/or warranty.

Technical Support

Sayfa Systems
T \ 1300 301 755
F \ 1300 881 092
E \ technical@sayfa.com.au
W \ www.sayfa.com.au

Designed and manufactured by Sayfa Systems

KARARAIL

Operating Instructions

KARABINER

Horizontal Anchor Device System

Compliance: The KARARAIL system complies with:

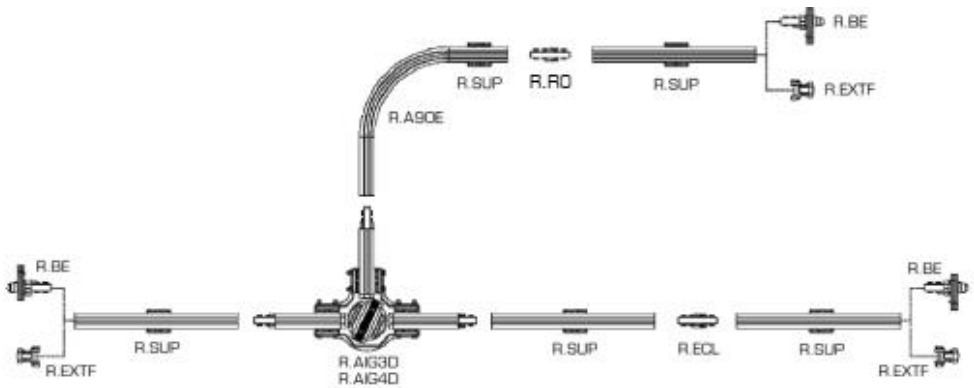
EN 795-D : 2012
+ CEN TS 16415 :2013

Certificate issued by:

DEKRA

DEKRA EXAM GmbH
Prüflaboratorium für
Bauteilsicherheie
Dinnendahlstraße 9
D-44809 Bochum
Allemagne

Parts Lists



R.RAIL1,5 R.RAIL3		R.A90S		R.RO	
R.EXTF		R.A90E		R.CF3	
R.BE		R.A90S2		R.CF2	
R.ECL		R.A90E2		R.CB2	
R.aig3D		R.ASPECIF		R.PS	
R.aig4D		R.SUP			

KARARAIL

Markings

(1)

(2)

(3)

(4a)

(4b)

(4c)

1. A sign specifying that personal protective equipment against fall from a height must be worn at all times is placed at the rail's access.
2. A sign is fixed on the fall arrest rail with the following information:
    - System name
    - Product description
    - Standard
    - The system's identification number
    - Pictgram: read manual!
    - Maximum number of people that can connect simultaneously.
    - Manufacturer's name.
3. Badge indication the periodic inspection's date and the location of the badge on the safety sign.

(4A, B and C) Trolley Marking.

Operating Principle

Maximum 2 users between supports.

Maximum 4 m pole distance reduced to 2m for work in suspension.

The KARARAIL system has been designed and certified to be used with the trolley ref. R.CF2, R.CF3 and R.CB2.

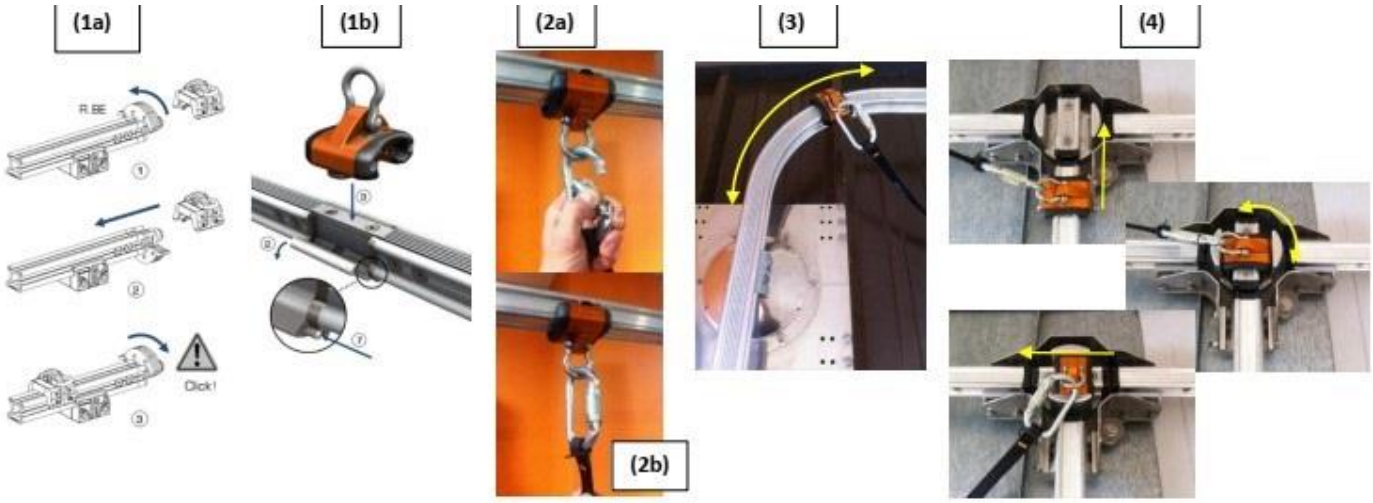
Insertion of the trolley on the rail with a retractable end stop R.BE (1a) or with an entry / exit piece R.RO (1b).

(2a & 2b) Connection of the fall arrest link (Complaint to EN 353-2, EN 355 or EN 360) with a connector complaint to EN 362.

(3) Once connected to the rail, the trolley moves freely along the support, in both directions. Unhooking won't be necessary to get over the intermediate and angle parts.

(4) Switch use.

WARNING: Before disconnecting of the KARARAIL system, the operator must ensure to be safe: area of collective protection or connected to another fall arrest system.



Information

These instructions are designed for the KARARAIL system's users. Before use, they must be read and understood. Should a doubt, a problem in understanding or a problem that is not dealt with in this document arise, please refer to a VERTIC representative or to VERTIC's technical services. These instructions must be always at the user's hand. If the product is sold outside of the first country of destination (France) it is crucial for the user's safety that the seller provides the operating instructions, the instructions regarding maintenance, periodic checks and repairs that must be drafted in the language of country where the product is to be used. Any activity at height is dangerous and can cause accidents, severe or fatal injuries. You are liable for the use and for the training to the use of the appropriate equipment. Before using the product, the information contained in these operating instructions must therefore be read and understood. The failure to comply with any of the warnings contained herein may cause severe or fatal injuries. For security reasons, the user must be in good health, and must not be under the influence of medicines, alcohol or drugs. Workers using a piece of personal protective equipment must have been appropriately trained, in compliance with the European directive 89/656, Section II, Article 4, §8.

Operating Instructions

Technical Description

The KARARAIL system is a horizontal (max. inclination 15°) rigid anchor support compliant to the EN 795:2012 standard and CEN/TS 16415:2013.
This system is designed to arrest the fall of one or several workers and should not be used for carrying heavy duty.
It is designed for a maximum of 2 users between 2 supports (maximum 4 m pole distance reduced to 2 m for work in suspension).
The KARARAIL system must be used with appropriate equipment and limiting the dynamic force exerted on the user to a maximum of 6 kN.
The user should wear an integral safety harness compliant to the EN361 standard.
The user connects to the KARARAIL's system with a trolley type R.CF2, R.CF3 or R.CB2 (one runner per user).

Important – Prevention:

Before any use

At height, your life depends on the equipment you use. Any doubt regarding the device safety must be reported to the manufacturer and to the installation manager.
The durability of the support should be verified according to the use.

A rescue plan must be implemented to face any emergency that may occur during work.
The KARARAIL system must preferably be located above the user.
The stopping distance of the used fall arrest link must be compatible with the clearance available on site.
When an adjustable link is used, the worker must optimize its length so as to limit the possible fall height and to reduce the risk of pendulum movement.
Calculation of the Necessary Fall Clearance (NFC):
Rail deflection (aprox.. 1 m)
+ Lanyard length LL
+ Lanyard energy absorber deployment DLAbs
+ User height t (usually 1.80m)
– Rail height H
+ Safety distance 1m
= Necessary Fall Clearance
Use the KARARAIL system with the following PPE against fall from a heigth:
- EN 355 compliant lanyards with shock absorber
- EN 353-2 mobile rope fall arresters
- EN 360 compliant retractable type fall arresters
- EN 358 and EN 361 compliant full body harnesses and work positioning belts

Control – Checks

Check that the safety rail's operating instructions are put up on the provided sign.
Check that the fall arrest system you have is compliant and compatible with those recommended for the use of the KARARAIL system.
Check that the controls and periodic maintenance of the rail system are up to date (see image (3)).
Visually and functionally check the whole rail system. To do this, use the KARARAIL system's identification and verification card.
After a fall, the rail must not be used before being controlled and being brought back into conformity by a person authorized by the manufacturer.

Service Time - Disposal

For the VERTIC products made of plastics and textile, the maximum service life is 10 years from the date of manufacture. The service life is not limited for metal products.
ATTENTION: an exceptional event can lead to a disposal of the product after only one use (operating type and intensity, operating environment: aggressive environments, marine environment, cutting edges,

extreme temperatures, chemicals, etc.)

A product has to be disposed of when:

- It is more than 10 years old and is made of plastics or textile,
- It has been subjected to an important fall (or effort),
- The outcome of the product checks is not satisfactory,
- You doubt this reliability,
- You don't know its complete operating history,
- Its use has become obsolete (legal, standard, technical changes or incompatibility with other devices, etc.).

These products must be destroyed to avoid future use.

System Receipt and Guarantee

The product guarantee begins at the delivery date of the material or the completion date from Vertic. It lasts 10 years subject to the annual maintenance has been performed by Alpic or any other company approved by VERTIC. VERTIC warrants this product against defects in materials or workmanship. Are excluded from the guarantee: normal wear, oxidation, modifications or repairs, improper storage, poor maintenance, damage due to accidents, negligence, and uses for which this product is not intended.

Maintenance and Overhaul

Any modification or addition to the equipment is forbidden without the manufacturer's prior written consent.

Any repair of the system components must be done in compliance with VERTIC's procedures. In case of doubt regarding the product's state, replace it by a genuine VERTIC part.

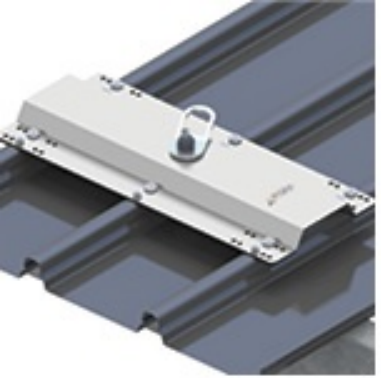
A dirty product must be washed and rinsed with water, and then dried. It must not be put into contact with corrosive or aggressive materials and must not be stored at extreme temperatures. Any chemical product or solvent can affect the system components' resistance. If the equipment may be in contact with such products, please let us know the exact names of the chemical components and we will tell you what to do after an adequate study.

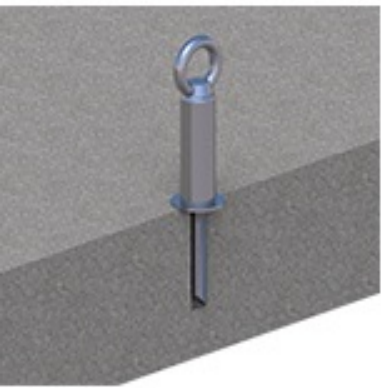
VERTIC guarantees this product against any material or manufacturing defect. The following are excluded from the guarantee:

normal wear, oxidation, changes or repairs, bad storage, bad maintenance, damages due to accidents, negligence or uses for which the product is not designed.

It is advised to have an authorized person check the KARARAIL safety system state at least once a year in the strict respect of VERTIC's procedures. Such periodic and regular checks are necessary because the user's safety is linked to the continuous efficiency and resistance of the equipment. The control and its results must be filed in a maintenance manual through the identification and verification card provided by VERTIC. The ALPIC company can also care about these maintenance and verification operations

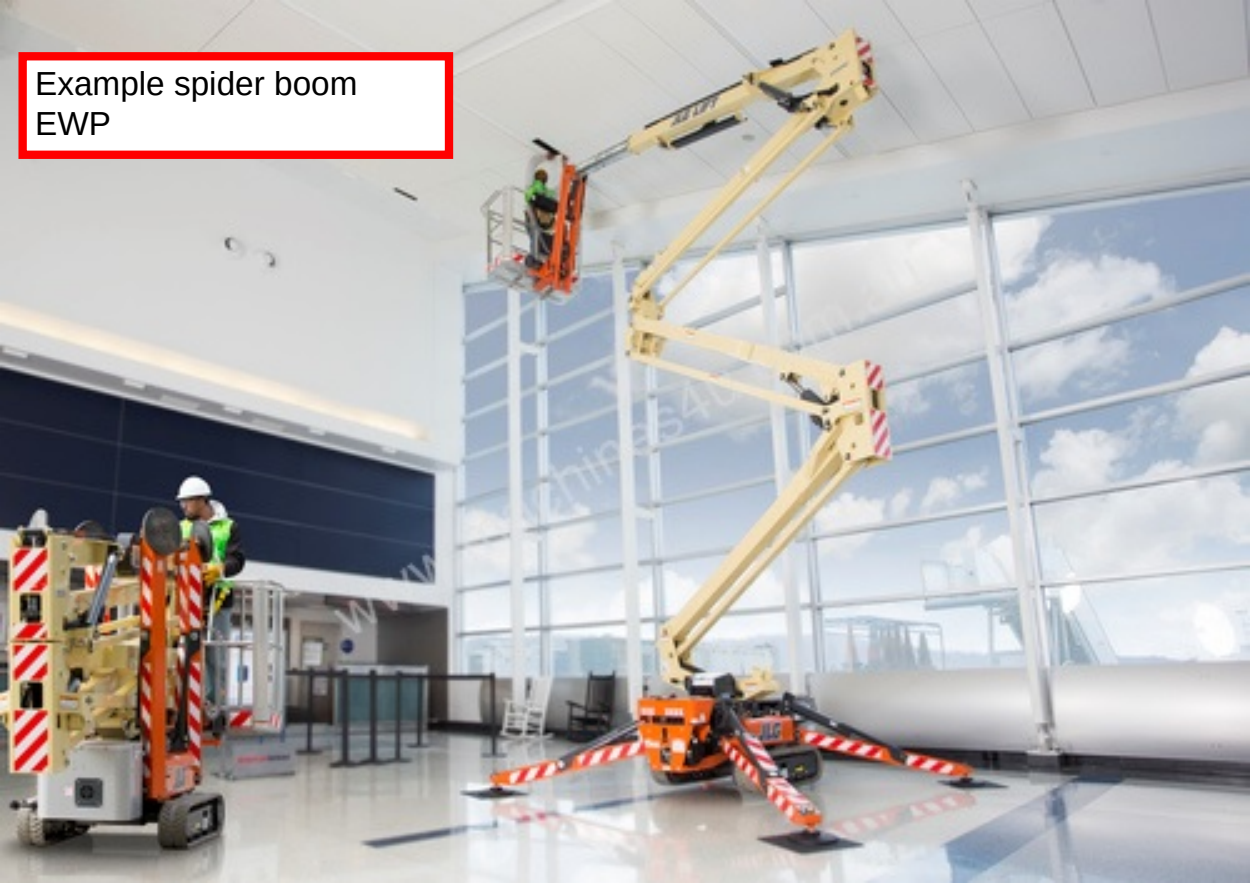
Example glass manipulator

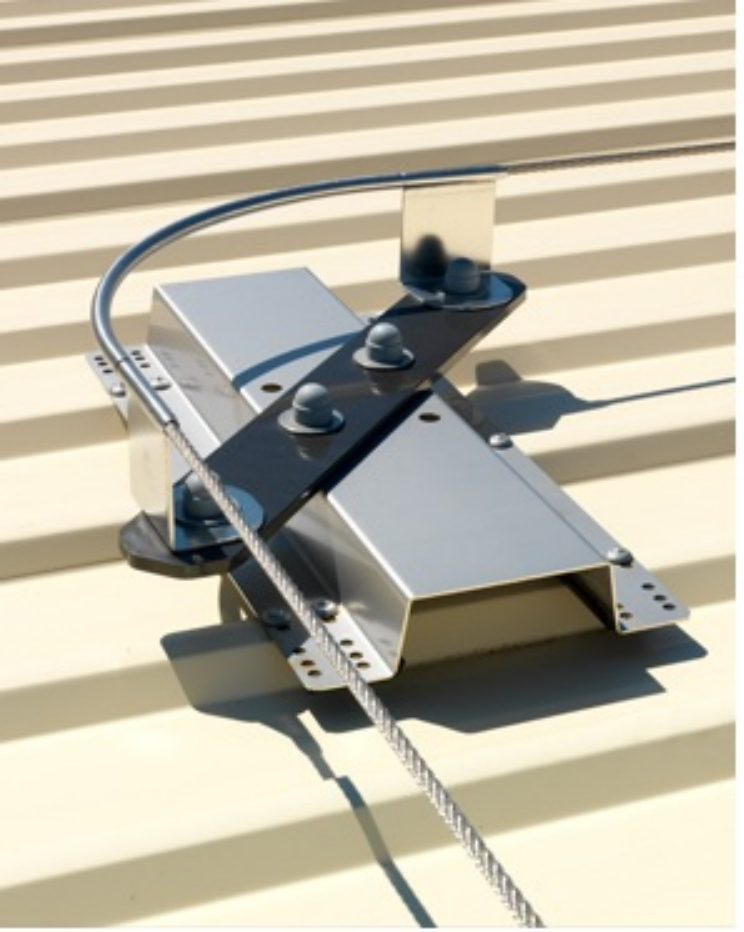




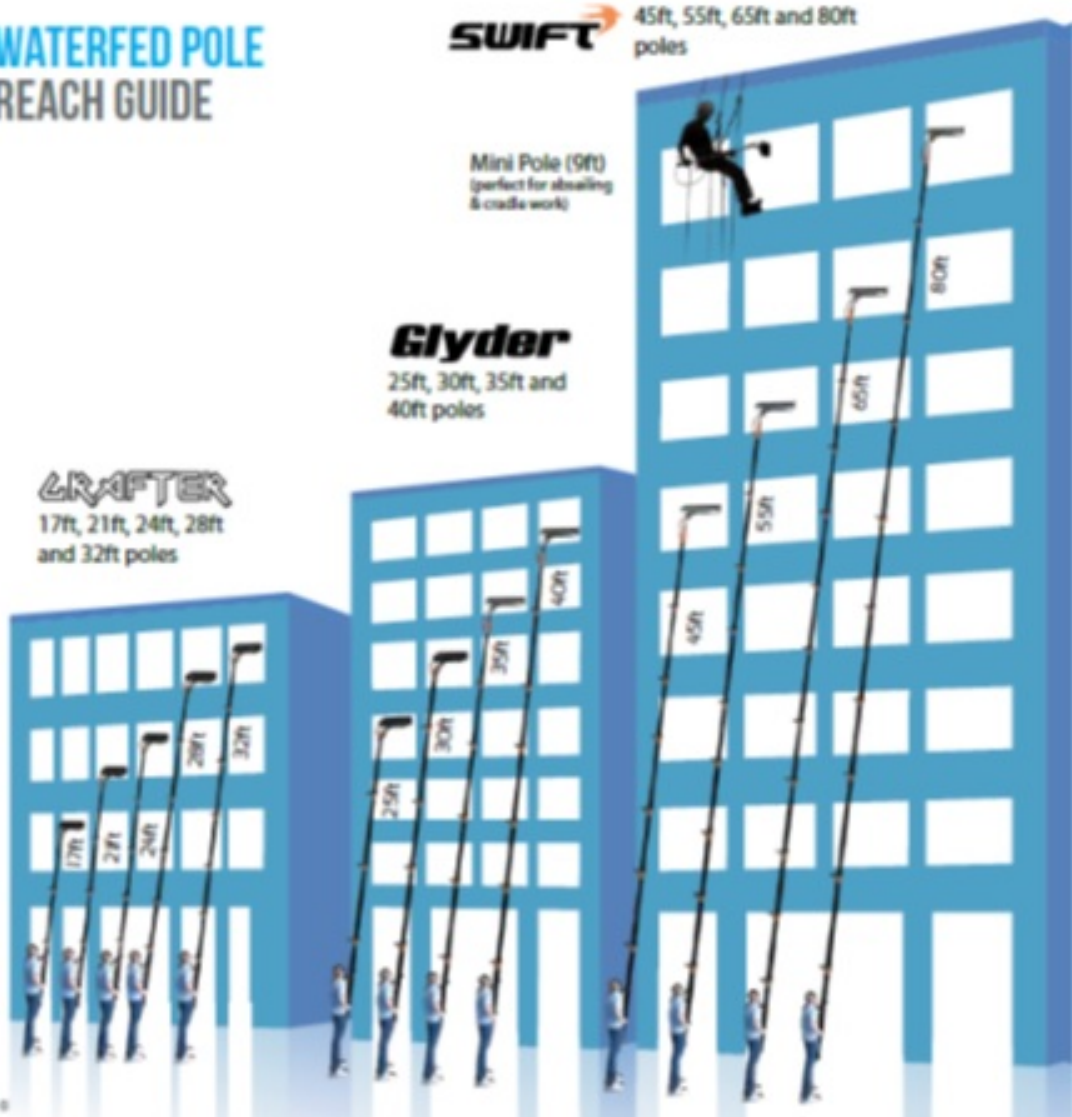
Example rope restraint points for IRA

Example EWP's, scissor lift and knuckle boom


Example spider boom
EWP



WATERFED POLE REACH GUIDE



Appendix I

Codes and standards

The design and installation of a façade access system needs to comply with the following Codes, Standards and Guidelines as a minimum:

Workcover - Guidelines For Building Façade Access Systems (or equivalent)

Access from fixed or portable structures:
AS 1657 Fixed platforms, walkways, stairways and ladders - Design, construction and installation.
AS/NZS 4576 Guidelines for scaffolding.
AS/NZS 1892 Portable ladders.

Personnel Lifting Equipment
AS 2550.10 Cranes-safe use, Part 10: Evaluating work platforms.

Industrial Rope Access
AS/NZS 4488.1 Industrial rope access system, Part 1: Specifications.
AS/NZS 4488.2 Industrial rope access systems, Part 2: Selection, use and maintenance.

Industrial Rope Access Association IRAA - Industry Code on Industrial rope access technique - September 2000.

Fall Arrest System
AS/NZS 1891.1 Industrial fall-arrest systems and devices, Part 1: Safety belts and harnesses.
AS/NZS 1891.2 Industrial fall-arrest systems and devices, Part 2: Horizontal lifeline and rail systems.
AS.NZS 1891.3 Industrial fall-arrest systems and devices, Part 3 Fall-arrest devices.
AS/NZS 1891.4 Industrial fall-arrest systems and devices, Part 4: Selection, use and maintenance.

Safe Work Australia – Code of practice: Managing the risk of falls at workplace

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