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OVERHEAD POWER MAINS REPORT



**21 ATKINSON ST LIVERPOOL
DA-84/2016**

Document History

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DISCLAIMER

This Overhead Mains Clearance Report is subject to an ongoing review, the information in this document may be amended at any time by the Author, AA Power Engineering (AAPE). This document has been developed using information available from Binah Design, Synergy Development Group, Mosca Pserras Architects (MPA), Lawrence Group and Sydney Trains and other sources and is intended to be applicable to Overhead Mains from structures and building works

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INTERPRETATION

If in the event that a user of this Overhead Power Mains Report is uncertain about any information or provision, the user should request clarification from AAPE

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SCOPE

This report is to address the Transport Sydney Trains letter in response to Development Application DA84/2016 (21 Atkinson St, Liverpool). The proposed works in the DA fall under the provisions of clause 86 of the Environmental Planning Policy (Infrastructure) 2007 which requires concurrence from Sydney Trains before approval can be granted by council. This report is to address the following components of the letter:

Item 5: Documentation detailing the following items in relation to the Sydney Trains 11kV High Tension Transmission Line adjoining the development site:

- Blow-out design and calculations
- Compliance with AS 7000
- Compliance with ISSC 20, Guideline for the management of activities with Electrical Easements and Close electrical infrastructure.
- Compliance with SMS-06-GD-0268 – Working around electrical equipment
- Compliance with relevant Transport for NSW Asset Standards Authority standards/guidelines
- Construction Management Plan detailing as to the unloading of building material and equipment method of construction in close proximity to power lines (Detailed Construction Management plan to be completed by builder)

The report and findings are subject to MPA architectural plans 15001 AP01 Issue B, LG Surveying Job Number 163408 Drawing DETL-001/A and site investigation. It assesses the requirements of Sydney trains and also takes into consideration the following:

- Work Cover “Work Near Overhead Power Lines” Code of Practice 2006
- Australian Standard “AS/NZS 4576:1995 Guidelines for scaffolding”

The report aims to address the impact of the development on Sydney Trains Overhead Power Mains located on the Western Elevation of the development. The Sydney Trains mains encroach the development property Lot 101, DP777404 on the South West Corner as per site survey. No other impacts or technical assessments were addressed other than those relating to existing overhead mains. Only specific sections in the identified standards were addressed relating to the identified overhead mains.



21 Atkinson St, Liverpool

BLOWOUT DESIGN AND CALCULATIONS

Conductor blowout is the horizontal 'sag' or deviation of powerline conductors from the centre as a result of wind forces.

Blowout calculation is required to determine the distance/clearance of existing Sydney Trains Feeder 735 along the Western elevation of the proposed development to the closest point of the proposed building.

Blowout calculation specifications

Feeder: 33kV Feeder 735 – Conductor 7/0.104” HDBC– (3113N @ 21.11°C)

Span Length: 123m

Tension: 19.75% UTS – 3.113kN

Software used to calculate Blowout: Poles 'n' Wires

Model for Illustration purposes only: APPENDIX A

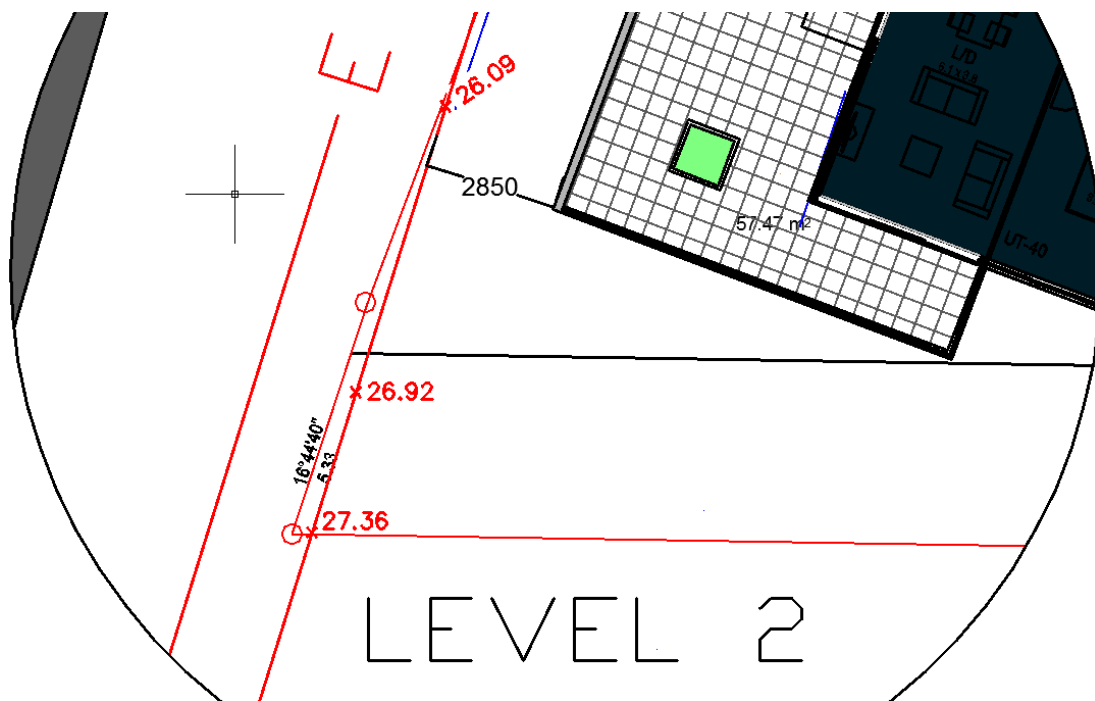
BLOWOUT CALCULATION FINDINGS

Blowout at 40 °C = 1.92m - (SEE SPENDIX B FOR MODEL – BLOWOUT OF 2m USED IN MODEL)

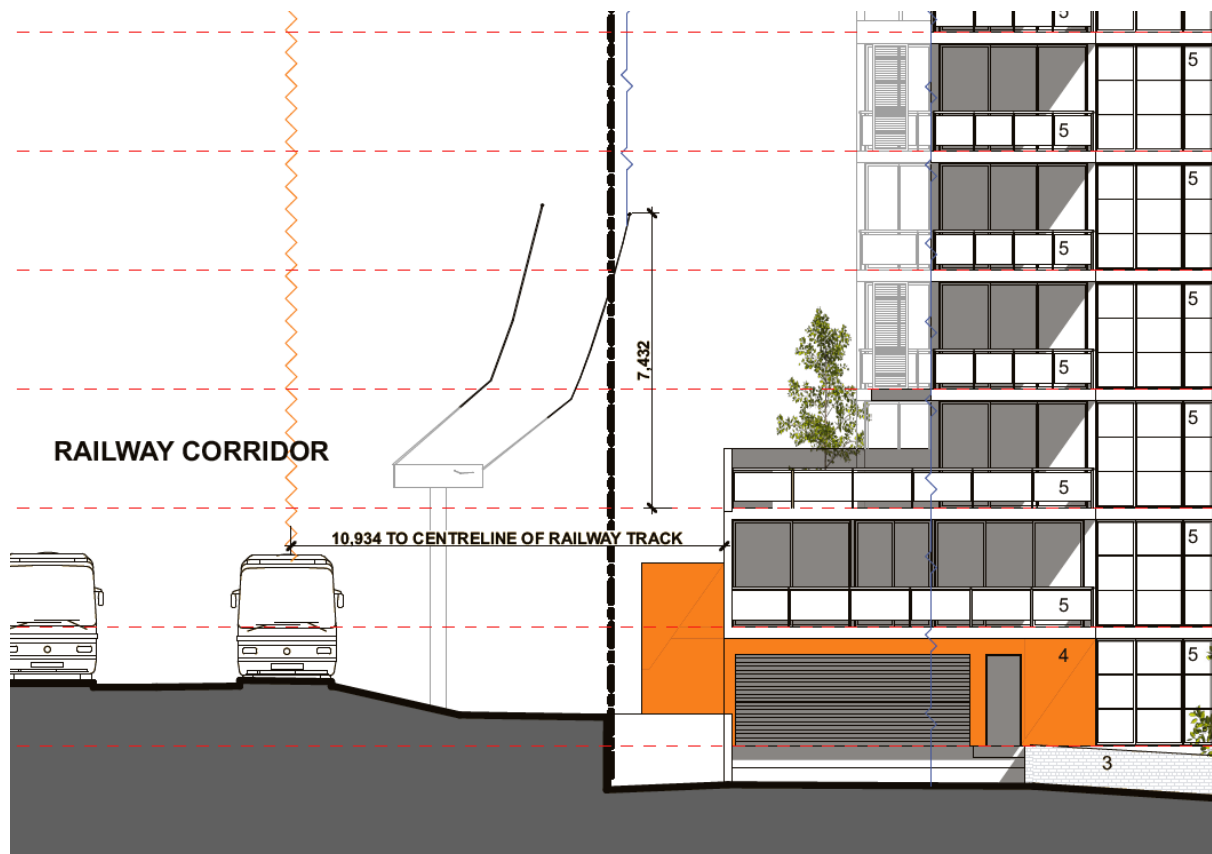
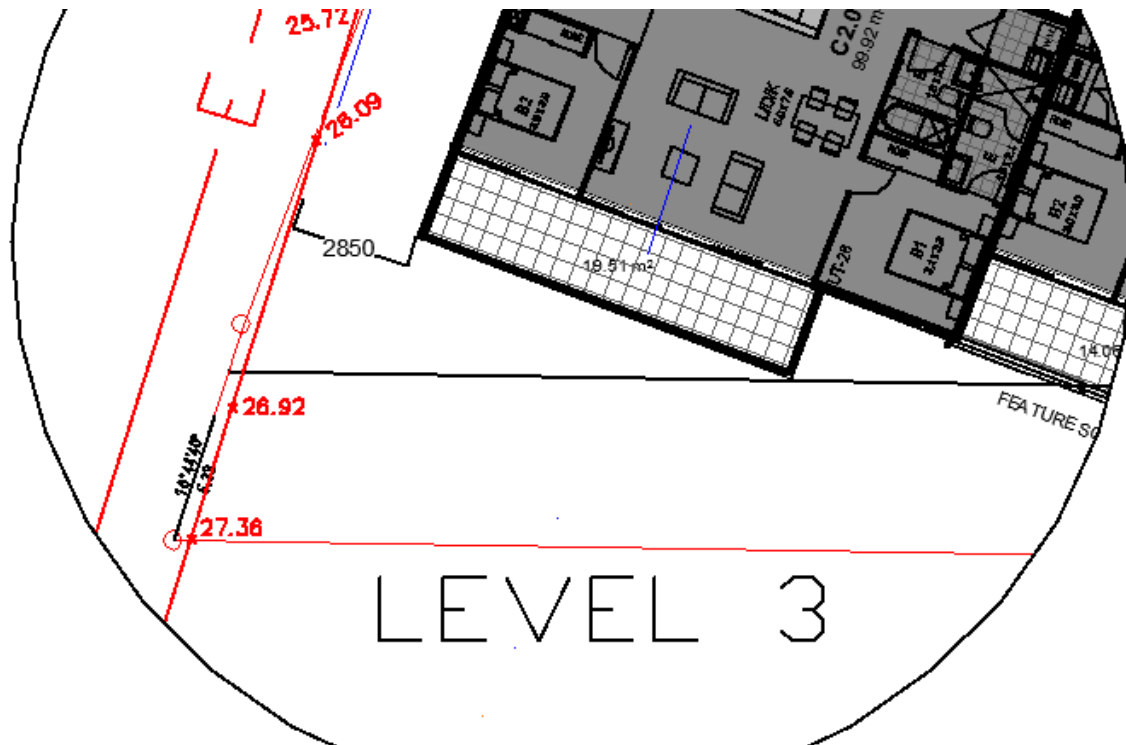
* Blowout calculation was applied to the closest conductor to the building envelope. Other conductors including earth wire were assessed however found to have less impact than that of the closest conductor to the building.

Main issues of investigation included the horizontal clearances of overhead mains to the proposed building structure. Due to the fact that one phase of the feeder encroaches the development property vertical clearances have also been assessed.

The approach taken to determine the findings was a back engineering one. AAPE has used information and specifications provided by Sydney Trains, survey information, site measurement of existing overhead power mains along with further site investigation and completed the blowout assessment report based on the DA Plans and relevant industry and Australian Standards.



Assessment area of Assessment Level 2



The area of concern included the western end of the proposed development site parallel to the reserve between 21 Atkinson St property and the Sydney Trains corridor. In this location the overhead conductor encroaches the private property by up to 385mm (worst case) however is above an easement for underground mains (3m wide) as per site survey. In this location at lower levels there is a horizontal clearance of only 2.85m from the conductor and a vertical clearance of approximately 6m from Level 3 slab. Level 4 and above are set back 8m from the conductor.

As mentioned above Level 4 and above has a minimum 8m setback from conductor and taking blowout into consideration at the point closest to the building we can still have a safe clearance of above 4m with a 1m wide scaffolding system. The area of this assessment is more focused on Level 3 and below

The assessment Diagram is attached in Appendix A

AS7000

AS/NZS 7000:2010 – Overhead line design – Detailed procedures: This standard has been prepared by the AN/NZS committee to provide an industry standard for overhead line design. The standard goes through extensive and detailed overhead line design in which a majority of details is not required for the findings of this report. In this situation we are assessing existing Power Lines in relation to a new building development. In particular we are applying the guidelines in Section 3 “Electrical Requirements” part 3.11.2 “Clearances to buildings, other lines and recreational areas”, and in particular 3.11.2.1 “Structures and Buildings”

The approach taken to determine the findings was a reverse engineering approach. AAPE has used the survey information of existing overhead power mains along with a site investigation and assessed the site based on the DA Plans and other relevant information against the AS7000 standard

Findings as per Table 3.8 “Clearances From Structures” under section 3.11.2 “Clearances to buildings, other lines and recreational areas” are listed below

Clearance	Minimum clearance to Conductor - Up to 33kV	Findings
Vertically above those parts of any structure normally accessible to persons	4.5m	Complies
Vertically above those parts of any structure not normally accessible to persons but on which a person can stand	3.7m	Complies
In any direction (other than vertically above) from those parts of any structure normally accessible to persons but on which a person can stand	2.1m	Complies
In any direction from those parts of any structure not normally accessible to persons	1.5m	Complies
In any direction from ground	5.5m	Complies

COMPLIANCE WITH AS7000

Taking a reverse engineering approach, findings show clearances of overhead 33kV Sydney Trains mains to proposed new building structure do not comply with AS7000. It should be noted that these minimum clearances are being assessed on final building structure and not on clearances during construction.

ISSC 20

ISSC 20 - Guideline for the Management of Activities within Electricity Easements and Close to Electricity Infrastructure. As the name implies the ISSC 20 document is a guideline document to manage works close to electricity infrastructure and in particular as defined in the scope of the document:

- Ensure public safety
- Minimise the likely impact of structures or other impediments on electricity easements and infrastructure
- Maintain unimpeded access to electricity easements and infrastructure for the purposes of the electricity network operators
- Define responsibilities of developers, property owners and occupiers, consent authorities and proponents with respect to activities close to electricity easements and infrastructure.

As per section 5 of ISSC 20, approval from the Sydney Trains must be sought for any works deemed within close vicinity to its electricity infrastructure. This report is a request at seeking approval from

Sydney Trains for works within close vicinity to the 33kV overhead mains within the railway corridor along the Western boundary of 21 Atkinson St, Liverpool.

Site Survey also indicates easement for underground mains and electricity purposes. These have not been assessed as part of this report and only clearances to Overhead Mains have been assessed.

As mentioned above, the Electrical Infrastructure of relevance here is the Overhead 33kV mains within the reserve just outside Sydney Trains Corridor (Conductor also encroaches development property). Section 7 of the ISSC 20 document states that clearance distances of 5m (minimum) from conductors taking blow-out into consideration for a typical span which is not met in this instance.

Permitted activities relevant to this development:

Written approval would not normally be required for permitted activities.

NOTE: Consultation in some cases will be necessary to ensure all conditions are met such as minimum safety clearances from conductors at maximum sag being observed as per AS/NZS 7000:2010, and blow out and earthing requirements are assessed. (ISSC 20 – September 2012)

- **Mobile plant and equipment operation:** *The operation of mobile plant and equipment having a height not exceeding 4.6m when fully extended including any load carried. The Workcover Code of Practice Work near Overhead Powerlines provides requirements for clearances to be maintained to overhead power lines during operation of plant and equipment.*

Controlled Activities relevant to this development:

The activities listed below are not permitted close to electricity infrastructure except where appropriate controls are designed and implemented to mitigate any safety risks. Permission by Sydney Trains to implement these activities will be sought by the builder prior to any works proceeding.

- **Operation of mobile plant/equipment:** Such equipment with a fully extended height greater than 4.6m including any load and/or person carried. Sydney Trains must be consulted to provide safe work requirements and locations.
- **Earthworks, retaining walls, substantial excavations, , stockpiling or change of ground contours:** Approval shall only be given subject to:
 - the maintenance of standard ground clearances, or conductor heights can be adjusted at the proponent's expense;
 - access maintained to all line structures;

- the subsoil stability and surface drainage in the vicinity of structures is not adversely affected and ; and
- Excessive quantities of dust are not generated.

In addition, any approved substantial structure must be set out by a Registered Surveyor, and on completion of the work, an Identification Survey must be carried out and a copy of the survey plan forwarded to the Network Operator. This requirement must be specifically referenced in the approval.

Prohibited Activities

All activities detailed in ISSC 20 section 7.3 will fall under category titled prohibited activities as part of this proposed development.

COMPLIANCE WITH ISSC 20

Based on the information available and referenced in the scope of this document, the known typical building activities at this stage of the Development Application will comply with the clearance guidelines set by the Industry Safety Steering Committee subject to a detailed construction management plan and the coordination between the builder and Sydney Trains. A construction management plan must be sent to Sydney Trains for assessment by the appointed builder

SMS-06-GD-0268

SMS-06-GD-0268 is a NSW Transport System Guide to working around Electrical equipment. The guide is quite thorough and details the hazards associated with working around electrical apparatus and the procedures to eliminate the risk or minimise those risks as far as is reasonably practicable.

In particular for the purposes of this report and the proposed building a structure within close vicinity to the rail conductor's 33kV overhead mains, we have assessed the proposal in taking into consideration:

- Section 3 (Summary of Safe Approach Distances)
- Section 11 (Safe Approach Distances)
- Appendix B Temporary Structures around Electrical Equipment

This assessment has been considered for Aerial spans of 125m or less

COMPLIANCE WITH SMS-06-GD-0268

The clearance between the proposed new building sitting on the property boundary between 21 Atkinson St, Sydney and the Sydney Trains overhead conductors, with no blowout is greater than 5m in any direction. Adding Blowout and Scaffolding this building will be getting close to the Minimum

Safe Approach distances for personnel and tools of 3.0m and in regards to the scaffolding clearances to Temporary Structure of 4.0m minimum is required to be constructible. A detailed scaffolding plan including erection and dismantling of scaffolding must be submitted to AAPE and further assessed by Sydney Trains upon engagement of a builder.

SUMMARY AND COMPLIANCE WITH RELEANT TRANSPORT FOR NSW ASSET STANDARDS AND AUTHORITY STANDARDS/GUIDELINES

Based on the references standards and guidelines being:

- AS 7000
- ISSC 20
- SMS-06-GD-0268
- Work Cover “Work Near Overhead Power Lines” Code of Practice 2006
- Australian Standard “AS/NZS 4576:1995 Guidelines for scaffolding”;

and industry norms and practices, the clearances between 33kV Overhead power lines and the proposed building structure at 21 Atkinson St, Liverpool are in a majority of the development deemed safe. The clearances to the final building structure are also compliant with the above standards and guidelines.

Considerations required by Sydney Trains include (Atkinson St, Elevation):

Ground floor (Mechanical Room) of the proposed building structure sits on the boundary of the Underground Electrical Easement

The driveway/ramp into the carpark (Level 1) is also located on the easement boundary however is classified as permissible under ISSC-20

Proposed Levels 2 and 3 have horizontal clearance of under 3m in one section of the proposed building to the closest 33kV conductor, however the Horizontal clearances is greater than 5m. The final building envelope of these levels comply with relevant standards however AAPE is recommending detailed construction management plan showing construction methodology that construction will comply with Industry standards and guidelines

Sydney Trains overhead mains in the reserve encroach the development property (however they are above an Easement for Underground Mains). There Sydney trains mains run through the reserve sitting in between the development property and the Sydney Trains.

Based on the current DA plans nominated above, site survey identifying location and height of conductors, and site investigation, the proposed building structure complies with industry standards and guidelines, however a detailed construction management plan is required prior to construction. This plan is to be assessed by Sydney Trains to confirm construction compliance. The construction management plan to be completed by the nominated builder will determine in industry standards and guidelines are complied with in particular to construction methodology including use of plans and temporary

CONSTRUCTION MANAGEMENT PLAN

Detailed Construction management plan will be completed by the builder once a builder has been appointed. However the following is recommended to be included in the construction management plan.

Cranes, Hoists and other plant and equipment are not to encroach the Sydney Trains Rail Corridor or implied easement over overhead mains on the western side of the development without Sydney Trains Permission (Trained Spotter might be required). Please note, the minimum clearances between 33kV mains and scaffolding needs to be minimum 4m to comply with WorkCover requirements and this is subject to final blowout.

RECOMMENDATIONS - DURING CONSTRUCTION – WORKING WITHIN CLOSE VICINITY TO LIVE POWERLINES

As mentioned above this assessment was based on working on the part of the structure of the building which is at worst case clearance distance to the outer-most bare overhead conductor as per Appendix A.

During construction the activities of concern include:

1. Erection and dismantling of scaffolding in close proximity to Live Powerlines
2. Scaffolding location in close proximity to Live Powerlines
3. Personnel working within close proximity to Live Powerlines (Personnel working on scaffolding)
4. Operating Cranes and Mobile Plant near Overhead Power Lines
5. Hazard and Risk Assessment

Erection and dismantling of scaffolding in close proximity to Live Powerlines

Because of the close proximity of powerlines to the scaffolding and little margin for error, the following recommendations are to be implemented:

- During erection and dismantling of Scaffolding and because there is a high risk equipment falling a minimum 4m buffer zone is required where no machinery and equipment can come within 4m of Power Mains.
- A thorough risk assessment be completed onsite prior to any erection or dismantling of scaffolding and the following factors taken into consideration:
 1. The type of work activities being undertaken, tools, equipment, scaffolding and materials being used
 2. Proximity of the work activity or scaffolding to the overhead power lines
 3. Environmental conditions, such as rain, wind or uneven terrain, which may be bring a risk of unexpected movement of tools, equipment, scaffolding or material held by workers.

Once these factors are taken into consideration, and risks assessed and mitigated, works are to proceed.

Scaffolding location in close proximity to Live Powerlines

Recommendations in Work Cover “Work Near Overhead Power Lines” Code of Practice 2006 document must be adhered to at all times. This document identifies work methods in relation to working within close vicinity to Overhead Power Lines.

Due to the requirement of scaffolding during construction, additional precaution and clearances are to be accommodated to those identified above in clearances to the building structure. Additional to the Work Cover “Work Near Overhead Power Lines” Code of Practice 2006 the following Australian Standard “AS/NZS 4576:1995 Guidelines for scaffolding” must be implemented. This standard sets a minimum clearance of 4m to Scaffolding to mains and apparatus. This 4m clearance takes into account blowout, however depending on the Sag of existing wires this 4m can be increased.

During construction, scaffolding is to be erected to allow contractors to work on the building façade. To comply with the 4m clearance set out in the Australian Standard “AS/NZS 4576:1995 Guidelines for scaffolding” and Work Cover “Work Near Overhead Power Lines” Code of Practice 2006 the maximum width of scaffolding it to be 2m.

Personnel working within close proximity to Live Powerlines (Personnel working on scaffolding)

During construction safe approach distances must be adhered to regarding Overhead Power Mains. Work Cover “Work Near Overhead Power Lines” Code of Practice 2006, and Network Operator Electrical Safety Rules Document No: ESR 11/11/2013 must be available to personnel working near mains at all times.

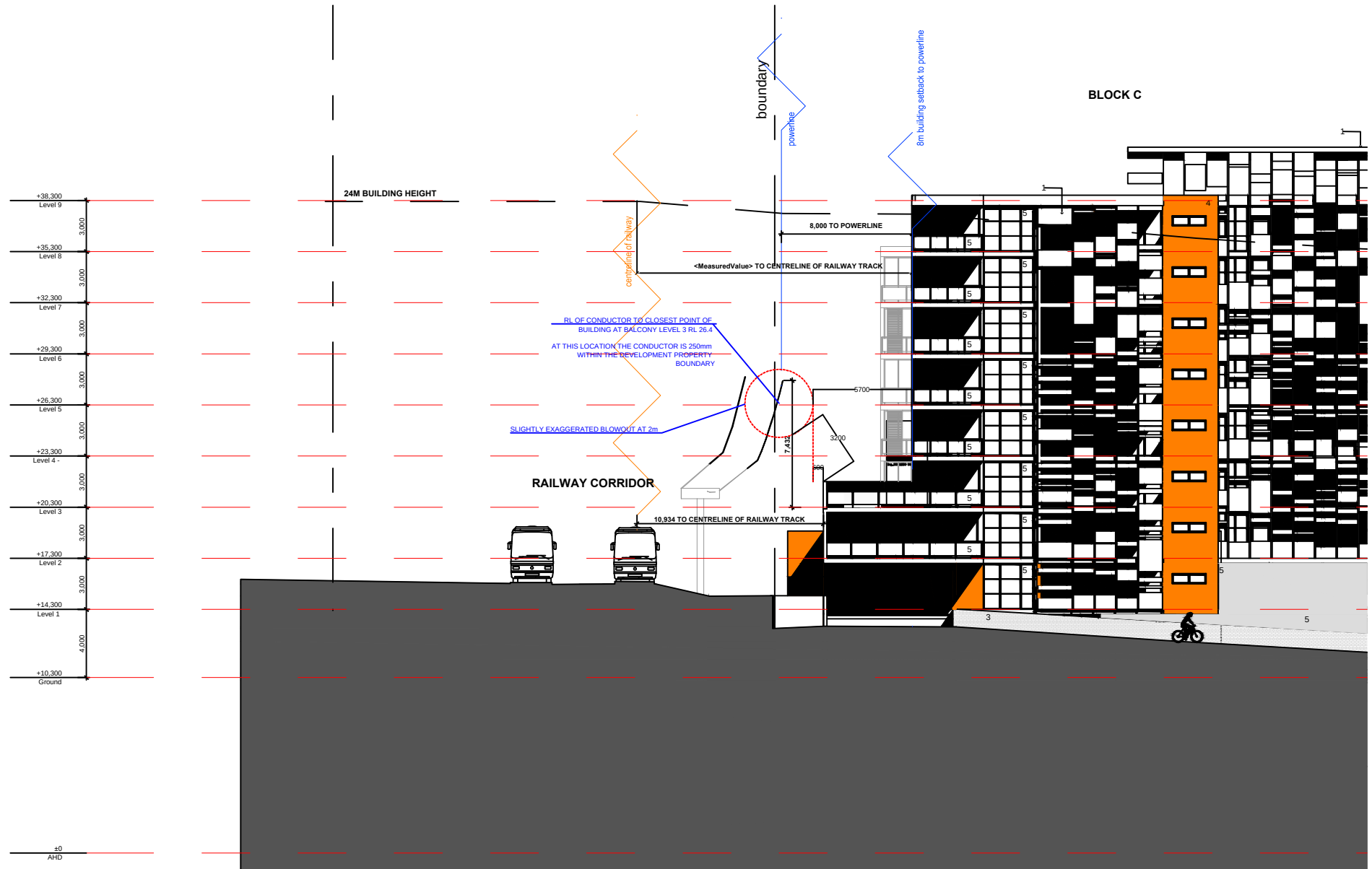
Operating Cranes and Mobile Plant near Overhead Power Lines

During construction no craning of any sort is allowed above the High Voltage Mains. Recommendations in Chapter 4 of Work Cover “Work Near Overhead Power Lines” Code of Practice 2006 must be adhered to at all times when Operating Cranes and Mobile Plant near Overhead Power Lines.

Hazard and Risk Assessment

Prior to works commencing on-site it is recommended that Sydney Trains be informed and met onsite for advice. Advice should also be sought from Crane Operators, Scaffolding suppliers, and machine operators. A Hazard Identification and Risk Assessment to be completed by the builder once building methodology is determined in conjunction with Sydney Trains and the nominated builder.

APPENDIX A



APPENDIX B - BLOWOUT RESULTS

Sag Tension Temperature Calculation Results

Project Name: 21 Atkinson St Liverpool

Conductor Details

- Code:7/12C
- Name:7/12 CU
- Alt Name:7/.104 CU
- Diameter:7.93 mm
- CSA:38.36 mm²
- CBL:15.76 kN
- Mass:0.347604485 kg/m
- Mod. Elast.:124 GPa
- Exp Coeff:0.000017 /°C

Lengths

- Horizontal:123 m
- Vertical:0 m
- MES/RS:123.00 m

Temperatures

- Standard:5 °C
- Actual:21.11 °C

Wind Pressure

- 900 Pa (wind 1)
- 1180 Pa (wind 2)
- 500Pa (blowout)

Tension

- %CBL:19.75
- Std Tens:3.113 kN
- Table:137

Sag

@ Standard Temp

- Sag:2.07 m
- % Span:1.68

@ Actual Temp

- Sag:2.33 m
- % Span:1.90

Wind Effects

Wind 1 @ 15°C

- Transverse Force: 0.36 kN
- Total Force on Pole: 4.77 kN

Wind 2 @ 15°C

- Transverse Force: 0.47 kN
- Total Force on Pole: 5.57 kN

Blowout @ 40°C

- 1.92 m

Actual Tension

	kN	%CBL
No Wind Hor. (@ 21.11°C)	2.77	17.55
Wind 1 Hor. (@ 15°C)	4.76	30.20
Wind 2 Hor. (@ 15°C)	5.55	35.20

Download

	Left Structure	Right Structure
No Wind (@ 21.11°C)	0.21	0.21
Wind 1 (@ 15°C)	0.21	0.21
Wind 2 (@ 15°C)	0.21	0.21

Date of report:16/08/2016

Results produced by **Poles 'n' Wires**
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