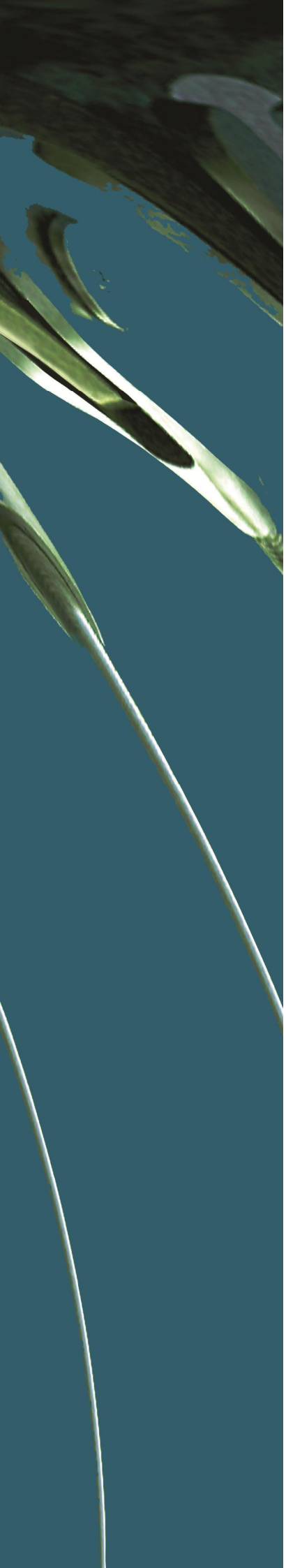

enstruct

North Eveleigh Precinct
Building D4 Affordable Housing

Structural Engineering
Report for Submission to Railcorp

Prepared for: Citywest Housing
By: Enstruct Group
March 2013

ISSUE AUTHORISATION

PROJECT: North Eveleigh Precinct – Building D4 Affordable Housing
Project No: 4389

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A	15/03/13	Issued for Information	BH	BH	RCC

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1 Executive Summary

Enstruct Group Pty Ltd has been commissioned by Citywest Housing Pty Ltd as structural engineers for the North Eveleigh Building D4 Affordable Housing project. The project proposes the construction of 88 residential units over 7 storeys with a single storey basement on the former Eveleigh Rail Yard Site off Wilson Street, Eveleigh, NSW.

The building is located approximately 70 to 75m from the existing main western rail corridor and approximately 57m from the proposed North Eveleigh dive and tunnel corridor.

This report has been compiled to outline the proposed basement excavation methodology and the proposed below ground and above ground structural systems for submission to Railcorp due to the proximity of the proposed development to the existing rail corridor and the proposed future rail tunnel.

A separate geotechnical report for the site has been produced by Jeffery and Katauskas dated 13 March 13 and this report should be read in conjunction with this structural report. Section 4 of the Jeffery and Katauskas report addresses effects of the proposed development on Railcorp assets.

2 Building Structural Systems

2.1 Overview

The proposed building will be a 7 storey concrete framed building over single storey basement. The building is approximately 80m long by 25m wide and will house 88 residential units in a mix of studio, 1 bedroom, 2 bedroom and 3 bedroom apartments. Appendix A shows the location of the site.

The building is located approximately 70 to 75m from the existing main western rail corridor and approximately 57m from the proposed North Eveleigh dive and tunnel corridor. The proposed basement will be excavated to a depth of between 2.3m and 2.8m below existing ground level.

Section 1 in Appendix B shows the position of the proposed building (nominated D4) in relation to the existing rail corridor and the future rail tunnel.

The building lateral load resisting system will be provided by the reinforced concrete lift and staircores. These cores will be tied down using permanent ground anchors to prevent overturning.

2.2 Substructure

The Jeffery and Katauskas geotechnical report shows the site to be underlain by clay over shale transitioning from extremely weathered to moderately weathered. The building primary structure will be supported off reinforced concrete strip and pad foundations founded in the moderately weathered shale.

The building basement will typically be formed by excavating temporary batters at 1:1 to allow the construction of reinforced masonry retaining walls. This form of construction will be adopted on the northern, southern and western retaining walls. The exaction will be backfilled in a controlled fashion following the construction of the ground floor suspended slab.

The eastern wall of the exaction will be constructed using a soldier piled wall with shotcrete infill as the wall is located hard against the site boundary. This wall will be supported in the temporary case by temporary ground anchors. In the permanent case the ground floor slab will strut the soldier piled wall and the temporary anchors will be de-stressed.

Drawings showing the proposed basement structural systems are contained in Appendix C of this report. enstruct sketch SK-003 in this appendix outlines the proposed construction sequence for each of the proposed retention systems.

2.3 Superstructure

The building superstructure will be of conventional concrete frame construction. Typical floors will be constructed as 200mm thick post tensioned concrete flat slabs to minimise building height. Floor elements will be supported by reinforced concrete columns and walls.

The change in building grid at ground floor from residential to basement will necessitate a transfer structure at this level. This transfer structure will consist post tensioned concrete beams of approximately 650mm depth.

2.4 Lateral Structure

The building lateral load resisting system will be provided by the reinforced concrete lift and staircores which are located at either end of the building. As these cores are located near the edge of the building, they have insufficient weight on them to resist overturning under lateral load events and must be tied down using permanent ground anchors.

Each ground anchor consists of a high-tensile steel tendon inserted into a drilled hole. The lower end the anchor is bonded to the bedrock with cement grout. Once the grout has achieved sufficient strength, the anchor tendon is stressed to the required force through the stressing anchorage. Corrosion

protection is provided by full encapsulation of the entire anchor in a thick walled polyethylene sheath and by grout filling the entire borehole.

2.5 Structural Engineering Design Parameters and Materials

The new structure will be designed in accordance with the Building Code of Australia and relevant Australian Standards.

2.5.1 Design Standards

The structural design shall be in accordance with the latest issue of all relevant structural Australian Standards, relevant structural sections of the BCA and other statutory requirements.

In particular the structural design will be in accordance with the following relevant Australian Standards:

- AS/NZS 1170.0 (2002) – Structural Design Actions Part 0 General Principles
- AS/NZS 1170.1 (2002) – Structural Design Actions Part 1 Permanent, Imposed and Other Actions
- AS/NZS 1170.2 (2011) – Structural Design Actions Part 2 Wind Loads
- AS 1170.4 (2007) – Structural Design Actions Part 4 Earthquake Actions in Australia
- AS 2159 (2009) – Piling – Design and Installation
- AS 3600 (2009) – Concrete Structures
- AS 3700 (2011) – Masonry Code
- AS 4100(1998) – Steel Structures
- AS 4678 (2002) – Earth Retaining Structures

2.5.2 Design Life

The building structure will be designed to provide adequate performance for a minimum period of 50 years with a typical structural maintenance system.

2.5.3 Materials

The following structural materials are proposed to be used in the works. Typical values for the properties of these materials are listed.

Concrete

Properties

Co-efficient of thermal expansion	$12x10^{-6}$ per ^{0}C
Poisson's ratio	0.2
Density	24 kN/m^3

Proposed Concrete Grades

Footings	40MPa

Suspended Slabs and Beam	40MPa
Slabs on Grade	40MPa
Piles	40MPa
Columns	40 to 65MPa
Walls	40 to 65MPa
Other areas (UNO)	40MPa

Reinforcement Properties

Plain bars (R)	fsy = 250 MPa
Deformed bars (N)	fsy = 500 MPa
Welded wire fabric (L)	fsy = 500 Mpa
Young's modulus	200 x 10^3 MPa

Structural steel

Properties

Grade (UNO)	300MPa
Steelwork density:	7850 kg/m^3
Young's modulus:	2.05 x 10^5 MPa
Poisson's ratio:	0.3
Coefficient of thermal expansion:	12 x 10^{-6}

Blockwork

Properties

Characteristic Strength	15 MPa.
Core fill grout	40 MPa

2.5.4 Loading

Vertical

- Typical Floor Areas:
  - SDL = 2.0kPa;
  - LL = 1.5kPa;
- Plantrooms:
  - SDL = 2.5kPa;
  - LL = 7.5kPa;
- Stairs
  - SDL = 0kPa;
  - LL = 4.0kPa;
- Toilets/Bathrooms/Kitchens:
  - SDL = 2.0kPa;
  - LL = 2.0kPa;
- Non-Trafficable Metal Deck Roof Areas:

- SDL = 0.5kPa;
- LL = 0.25kPa;
-

Wind Loading

Wind loading is in accordance with AS/NZS 1170.2 – Structural Design Actions – Wind Actions with the following parameters;

- Annual probability of exceedance – 1:500;
- Region A2;
- V_{500} – 45m/s;
- Terrain Category 3.0;

Robustness

Robustness loading in accordance with AS/NZS 1170.0 – Structural Design Actions General Principles with the following parameters:

- 1.0% of (G + ψcQ) load case;

Earthquake

Earthquake loading in accordance with AS 1170.4 – Structural Design Actions – Earthquake Actions for Australia with the following parameters:

- Annual probability of exceedance – 1:500;
- kp = 1.0;
- Z = 0.08;
- Class Ce – Shallow Soil Site;
- Earthquake Design Category II;

2.5.5 Serviceability

Vertical Deflection Limits

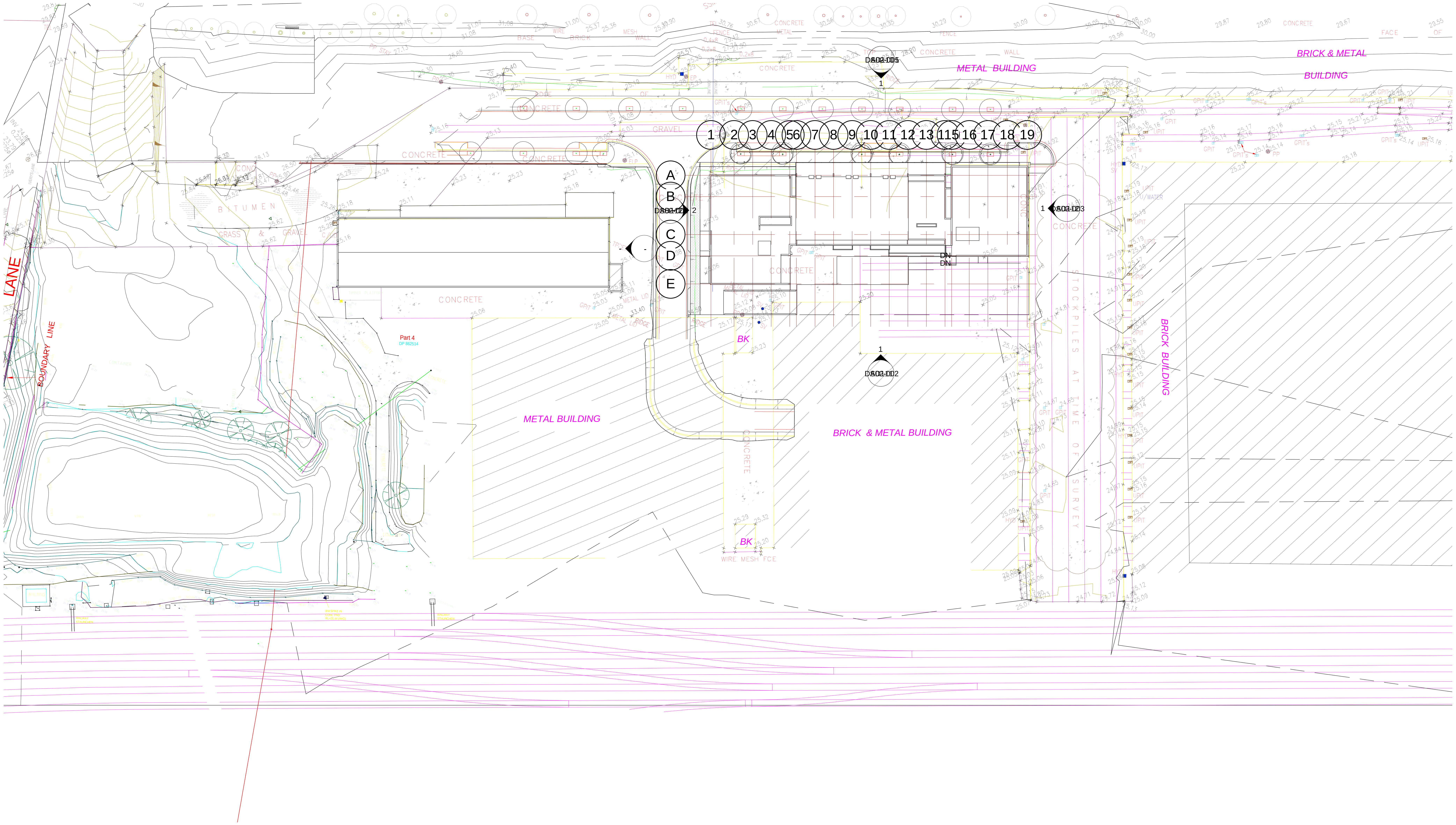
Maximum vertical deflections shall be in accordance with Table 2.3.2 of AS 3600 – 2009.

Lateral Deflection Limits

The lateral drift of the building will be limited to the following:

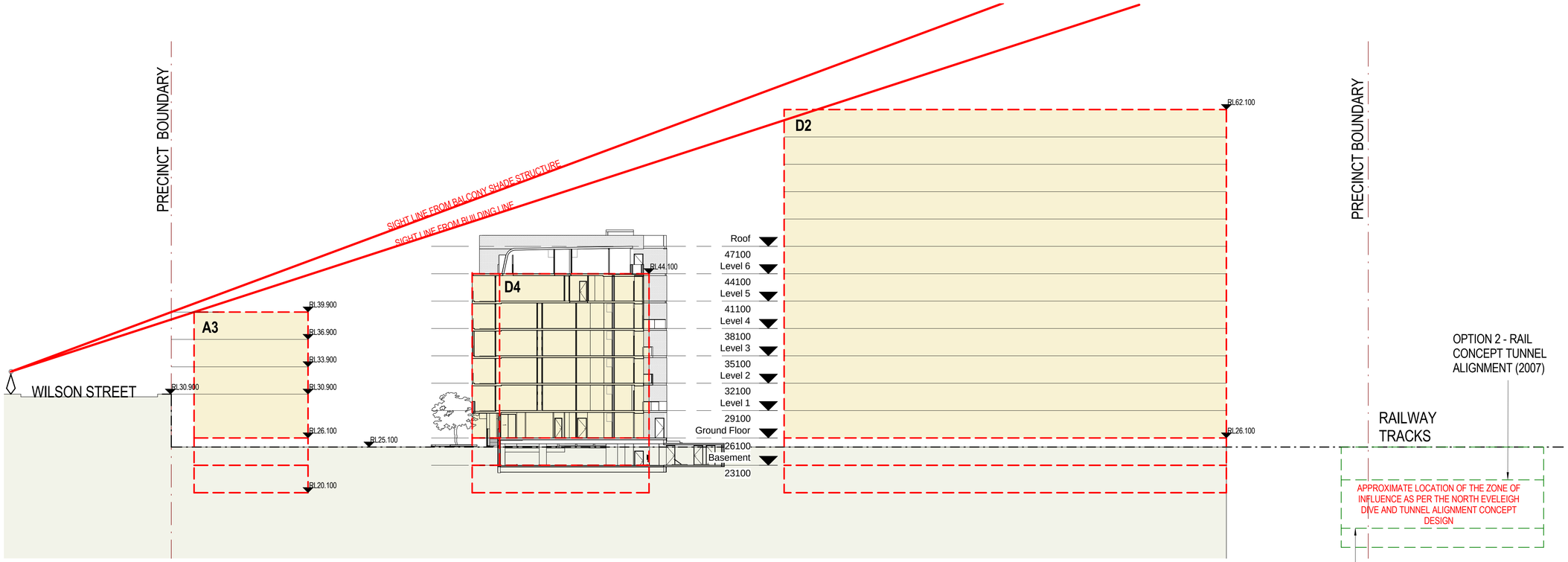
- Under Serviceability Wind Actions – Height/500
- Under Earthquake Actions (AS 1170.4 clause 7.5) – Height/67

Appendix A – Site Plan

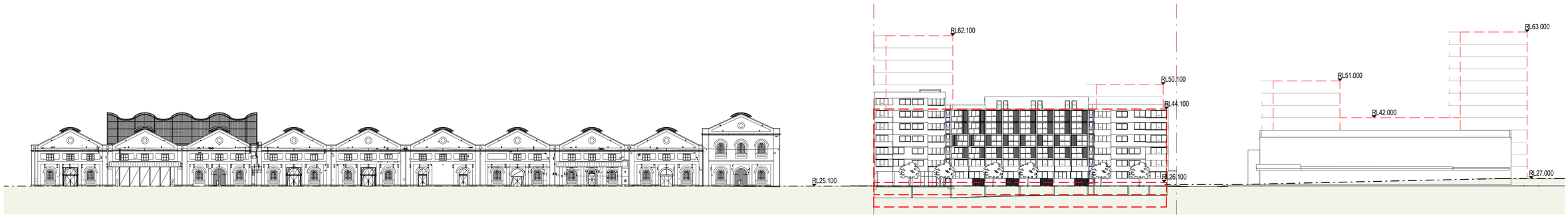


LANE
BOUNDARY LINE
METAL BUILDING
METAL BUILDING
BRICK & METAL BUILDING
BRICK & METAL
BUILDING
BRICK BUILDING
CONCRETE
GRAVEL
BITUMEN
BK
WIRE MESH FCE
Part 4

Appendix B – Site Section



1 Site Section
1 : 250



2 North Elevation (Context)
1 : 500

0 0 0 0 0 0 mm

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
	Issue for Information	04/02/13

issue	amendment	date

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checked PD scale As indicated@A1

drawn BK project no 120325

project
North Eveleigh Affordable Housing

drawing
Context Elevation & Section

drawing no. **A-DA02-005** issue -

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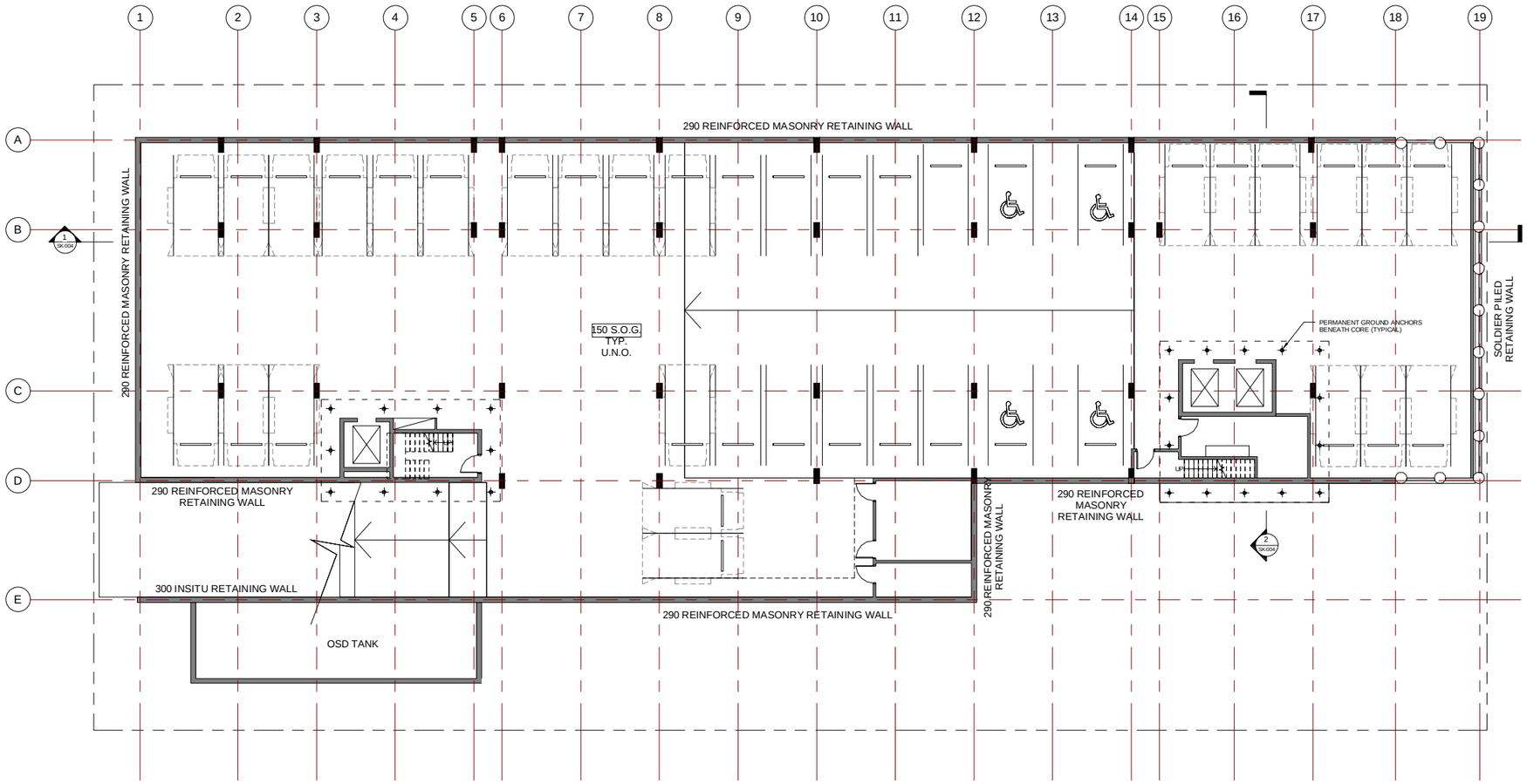
Appendix C – Structural Drawings



BASEMENT PLAN

SCALE 1:100

NOTE:

- FOUNDATIONS - PAD AND STRIP FOOTINGS TYPICAL (40MPa)

✦ - PERMANENT GROUND ANCHORS GROUT FILLED WITH 40MPa GROUT.

Rev.	Date	Description	By
01.	15.03.13	ISSUED FOR INFORMATION	CLP

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project
North Eveleigh Affordable Housing

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BASEMENT PLAN

status
FOR INFORMATION

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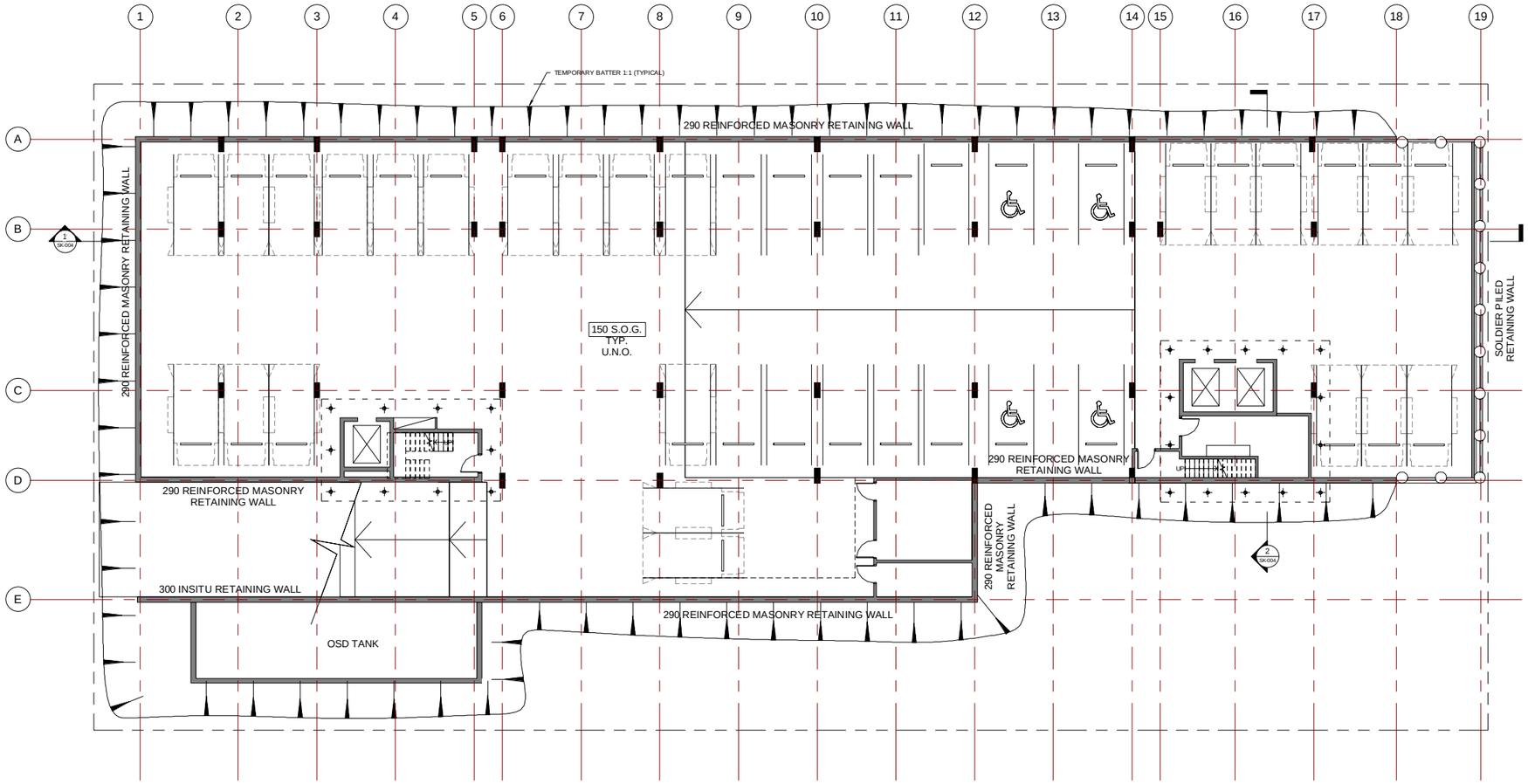

BASEMENT CONSTRUCTION SEQUENCING PLAN

SCALE 1:100

CONSTRUCTION SEQUENCE (NORTH, SOUTH AND WEST ELEVATION)

1. BATTER OUT EXCAVATION AT 1:1 TYPICAL
2. CONSTRUCT FOOTING AND BLOCKWORK RETAINING WALL
3. CONSTRUCT GROUND FLOOR SLAB TO RESTRAIN RETAINING WALL
4. BACKFILL AGAINST NEW RETAINING WALL

CONSTRUCTION SEQUENCE (EAST ELEVATION)

1. INSTALL CONCRETE PILES
2. PROGRESSIVELY EXCAVATE IN MAX. 1m DEEP SECTIONS AND INSTALL SHOTCRETE INFILL
3. INSTALL TEMPORARY ANCHORS AS REQUIRED AS EXCAVATION PROCEEDS TO THE BOTTOM OF THE EXCAVATION
4. CONSTRUCT GROUND FLOOR SLAB TO RESTRAIN RETAINING WALL
5. REMOVE TEMPORARY GROUND ANCHORS

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BASEMENT CONSTRUCTION SEQUENCING PLAN

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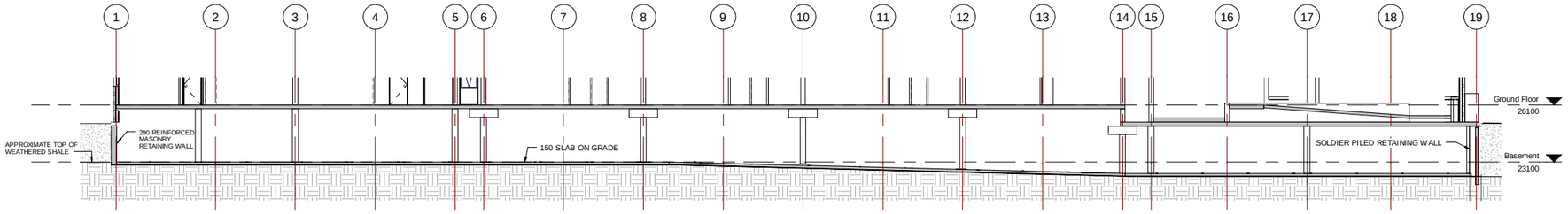
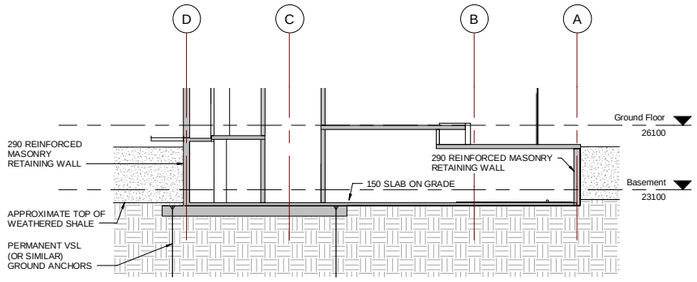


SECTION 1
SCALE 1:100



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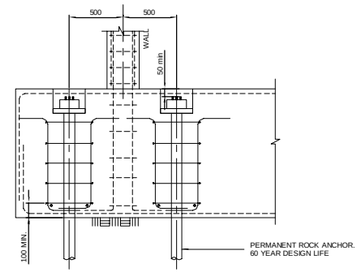
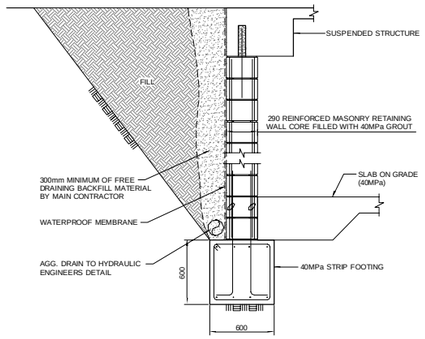
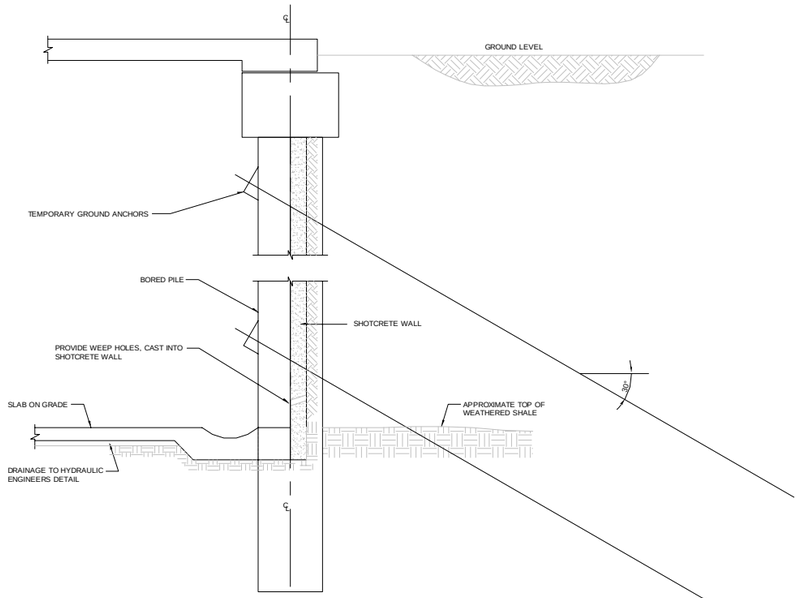


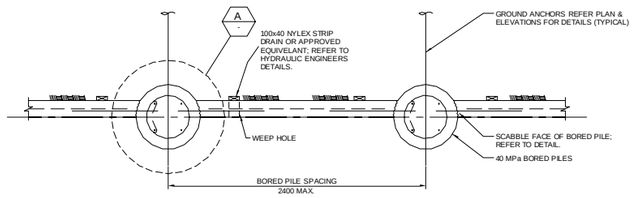
TYPICAL GROUND ANCHOR REINFORCEMENT DETAIL
SCALE = 1:20



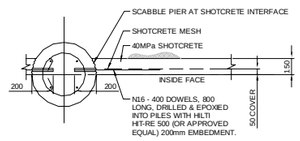
TYPICAL 290mm REINFORCED BLOCKWORK RETAINING WALL SECTION
SCALE = 1:20



TYPICAL SECTION THROUGH PILE/SHOTCRETE WALL
SCALE 1:20



TYPICAL SITE RETENTION MODULE
SCALE 1:20



DETAIL A
SCALE = 1: 20

TYPICAL SHOTCRETE TO PILE CONNECTION

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drawing title
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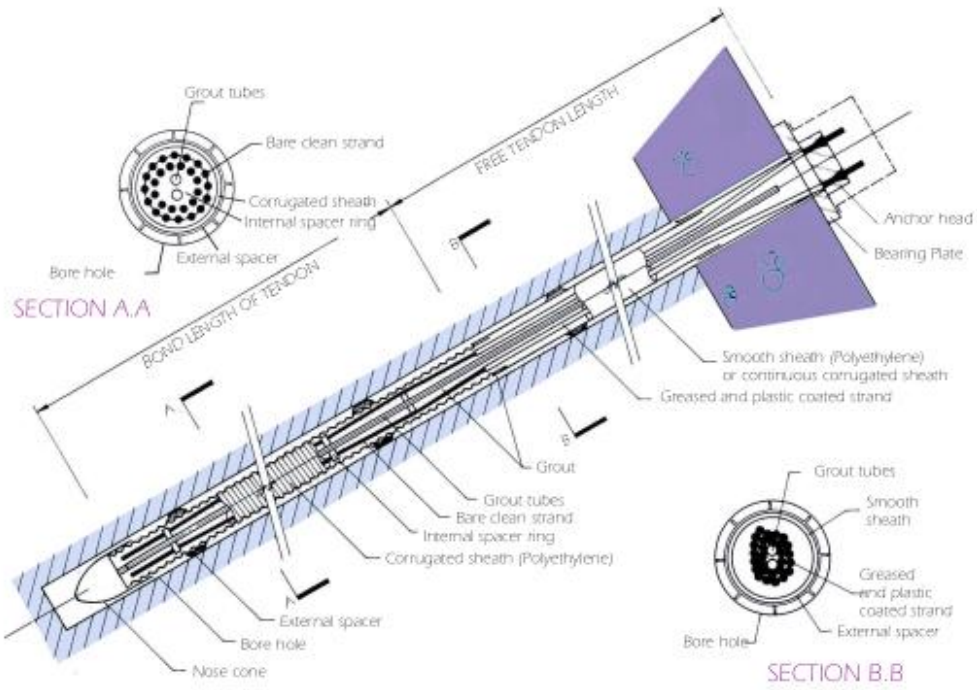
Appendix D – VSL Permanent Ground Anchor Detail



VSL PERMANENT ANCHOR FULLY ENCAPSULATED