

# GENERAL STRUCTURAL NOTES

## GENERAL

- The following notes are **minimum requirements** unless noted otherwise on the structural drawings prepared by DAVID NAIER & ASSOCIATES LTD [ DNA ].
- Read structural drawings in conjunction with all other consultants' drawings, contract documents and specifications.
- Check and verify all dimensions, quantities and site conditions with architectural drawings before commencing with any work. Notify architect of any discrepancies.
- The latest edition of the standards and codes referenced in these notes and on the Structural Drawings shall apply.
- Do not construct from these drawings unless marked "Issued for Construction".
- In the event of discrepancies in the specifications, drawings or contract documents, the more stringent requirement shall apply. Contact DNA for clarifications.
- Notes and details specified on the plans and details take precedence over those in General Structural Notes, except for minimum requirements.
- For conditions not explicitly shown, Contractor shall immediately request clarifications from the Structural Engineer.
- Contractor to submit to DNA in writing all proposed alternate products, materials and structural systems for review at least 4 weeks prior to start of construction.

## FIELD REVIEW

- Contractor is responsible for pre-inspecting the work and confirming completeness and conformity with the Structural Contract Documents prior to field review by DNA.
- Notify DNA **at least 72 hours** in advance for field review of the following:
  - Concrete reinforcement: Prior to each concrete pour
  - Structural steel: Prior to concealment
  - Wood framing: Prior to concealment
- Work found to be incomplete or deficient may require additional field reviews at additional cost to the Contractor.
- Our field review consists of a periodic review of the structural work only. It is not carried out for the Contractor's benefit, and it does not make DNA guarantors of the Contractor's work. The Contractor is responsible for his own quality control and shall perform the work with good workmanship and in conformance with the Contract Documents.

## SUBMITTALS AND SHOP DRAWINGS

- Contractor is responsible for overall co-ordination of sub-trades.
- Submittals are items required by the Contract Documents to be submitted by the General Contractor, such as (but not limited to) request for payment, progress reports, shop drawings, manufacturer's literature on equipment, concrete mix designs, concrete test results, aggregate gradation reports, schedules, etc.
- Supplier shall prepare for DNA and submit to the General Contractor four ( 4 ) complete sets of Shop Drawings for general compliance review prior to fabrication. Each sheet shall be sealed and signed by a Professional Engineer registered in the Province of British Columbia, who will be the **Specialty Structural Engineer** responsible for the integrity of his design.
- DNA will **NOT** review or assume responsibility for such matters as dimensions or quantities or the Contractor's safety measures or methods of construction.
- Incomplete sets of Shop Drawings, or Shop Drawings prepared using reproductions of DNA Structural Drawings will **NOT** be accepted.
- Shop drawings and other submittals of pre-engineered or proprietary structural elements shall clearly indicate type, position, and connection to elements of the Primary Structural System as well as the criteria and loads used for the design.
- Submittals must be reviewed by the General Contractor prior to DNA's review.
- Where required by the following sections of these General Structural Notes, proprietary products, connections and other structural elements which have been designed by Specialty Structural Engineers shall be inspected by those engineers at the appropriate stage of construction, at which time observations and deficiencies in the work shall be reported in writing to the SER (DNA).
- Where required by the following sections of these General Structural Notes, each Specialty Structural Engineer shall submit to DNA Letters of Assurance Schedules B and C-B, or S-B and S-C, sealed and signed, clearly outlining areas of responsibility.
- Refer to the following sections for specific Shop Drawing requirements.

## CONSTRUCTION

- Drawings show completed structures only. Contractor is responsible for temporary bracing for all building elements against construction loading conditions and for construction erection procedures. Temporary support to be designed by a Professional Engineer registered in the Province of British Columbia in accordance with WorkSafeBC regulations and as required by local building authorities.
- It is the sole responsibility of the Contractor to ensure that no part of the work is subjected to a load which will endanger the safety of the building or workers.
- Protect structural work in adverse weather conditions to approval of DNA.
- Contractor to compare all design drawings, dimensions and site conditions and notify DNA of any discrepancies prior to proceeding with the work.
- Contractor to submit to DNA in writing all proposed alternate products and structural systems, including technical specifications where required, for review and approval.
- Contractor shall review the concrete pour plan with DNA prior to construction.

## STRUCTURAL DESIGN

- The new construction for this base building has been designed by DNA in accordance with:
 

**Part 4 of the 2006 British Columbia Building Code [ BCBC ]**
- Climatic Design Criteria:
  - Ground Snow Load (1 in 50 year)  $S_s (1/50) = 2.8 \text{ kPa (58.5 psf)}$   
Rain Load (1 in 50 year)  $S_r (1/50) = 0.3 \text{ kPa (6.3 psf)}$   
Importance Factor for Snow Load,  $I_s = 1.0$
  - 24-Hour Rain  $150 \text{ mm (6 inch)}$
  - Hourly Wind Pressure (1/10 year)  $q (1/10) = 0.36 \text{ kPa (7.5 psf)}$   
Hourly Wind Pressure (1/50 year)  $q (1/50) = 0.48 \text{ kPa (10 psf)}$   
Importance Factor for Wind Load,  $I_w = 1.0$
- Minimum Design Live Loads:
 

Area	Occupancy/Notes	Specified Load
Pedestrian Bridge		4.8 kPa ( 100 psf)
Stairs		4.8 kPa ( 100 psf)
Handrails and Guards		Per Part 4 of the Building Code
- Seismic Data:
  - Ground Motions:  $S_s(0.2) = 0.88$   $S_s(0.5) = 0.61$   
 $S_s(1.0) = 0.33$   $S_s(2.0) = 0.17$
  - Peak Ground Acceleration  $PGA = 0.44$
  - Site Class C  $F_a = 1.0$   $F_v = 1.0$
  - Importance Factor  $I_e = 1.0$
- See drawings for specific loads and loading conditions. Specialty Engineers to be responsible for identifying specific loading conditions within their scopes of work.

## SITE PREPARATION AND FOUNDATIONS

- Building foundations have been designed in accordance with a Geotechnical Report prepared by:
 

PJAJR Engineering Inc. File No: 07-2-256 dated: Sept 4, 2011 and subsequent correspondence dated October 8, 2011, December 2, 2011, January 9, 2012.
- Site Preparation: Contractor to prepare site in accordance with Geotechnical Report and notify Geotechnical Engineer for field review of site preparation prior to foundation construction.
- Protect native soils from softening and frost. Remove all softened or frost damaged soils prior to placement of reinforcement and concrete.
- Excavations to be free of water prior to and during concrete placement. Provide adequate means of removing water from excavations and trenches.
 

Foundation design:

  - Bearing soil: Till like sand
  - Serviceability Limit State bearing capacity: 200 kPa (4186 psf)
  - Factored Ultimate Limit State bearing capacity: 350 kPa (7315 psf)
  - Minimum footing width: 600mm (2'-0")
    - Strip footing: 450mm (1'-6")
  - Variable soil conditions that result in lower allowable soil bearing conditions may require revision to foundation design.
- Min. frost cover to be 450mm, per geotechnical report.
- Building design based on the following long-term settlements estimated by the Geotechnical Engineer:
  - Total settlements: = 25mm (1 inch)
  - Differential settlement: Maximum = 19mm (0.75 inch)
  - Angular distortion = 19mm/9m
- Provide full specified depth of footings with formwork and level sub-base to allow uniform clear cover to reinforcement.
- Loose or wet sub-base under footings may require removal, sub excavation and replacement with structural fill. Refer to Geotechnical Report for details.
- Compact fills in maximum lifts and to densities as noted in the Geotechnical Report or as directed by the Geotechnical Engineer, and test for compaction at sufficient intervals to verify performance.
- Securely tie down all anchor bolts and embedded items to formwork prior to concrete pour.
- Centre footings under columns/walls unless noted otherwise.
- Retaining wall design: See drawings for retaining wall design criteria, draining granular backfill.

## CONCRETE

- Specifications:
  - Standards: CAN/CSA A23.1, CAN/CSA A23.2, CSA CAN3 A23.3
  - Cement: Portland Cement Type N in accordance with CSA CAN3-A5. (air entrainment) and ASTM C494 (chemical).
  - Coarse Aggregate: 19mm ( 3/4" ) maximum.
  - Mix Design to Alternative 1 per Table below:

Locations	28 - Day Compressive Strength, MPa	W/C Ratio	Air Entrainment %	Slump (mm)	Exposure Class	Cement Type	See Notes
Footings, Walls	25	0.55	4 to 7	80 ± 30	F-2	G.U.	N/A

  - Admixtures: Admixtures to approval of DNA. Calcium Chloride not allowed. Admixtures to conform to requirements of ASTM C260 (air entrainment) and ASTM C494 (chemical).
  - Testing: Test concrete as per CSA A23.2. Submit concrete test results to DNA for review.
  - GROUT: Non-shrink cementitious grout, minimum 30 MPa at 3 days and minimum 55MPa at 28 days.
- Concrete to be well consolidated with mechanical vibrator.
- Protect concrete from all harmful substances during construction.
- No embedded items are permitted in concrete formwork unless specifically authorized by DNA.
- All concrete work, including footings, walls, slabs, curbs and topping, shall be reinforced except skidcoats U.N.O.

## REINFORCING STEEL

- All work shall meet the requirements of the Canadian Standards Association [CSA] and the American Society for Testing and Materials [ASTM].
- Deformed bars shall conform to CSA G30.18 Grade 400 MPa (  $F_y=60,000 \text{ psi}$  ) with:
  - Lapped tension splices in accordance with CAN3-A23.3 as follows:
 

BAR SIZE	10M	15M	20M	25M	30M	WWM
BASIC TENSION	450	630	780	1290	1700	300
LAP SPLICE	(18)	(24)	(30)	(30)	(37)	(12)
TOP BAR TENSION	620	890	1090	1810	2400	-
LAP SPLICE	(n)	(24)	(36)	(43)	(72)	(94)
  - Detail reinforcement to stagger splices and minimize usage of splices U.N.O. on plans.
  - Splicing of reinforcing steel shall meet the requirements of CAN3-A23.3.
  - Horizontal reinforcement shall be continuous around corners with bends or corner bars.
  - All concrete shall be reinforced. Concrete not explicitly detailed shall have the following minimum reinforcement:
    - Columns: 1% of gross area of section. 15M ties spaced at least 1/2 least dimension of column.
    - Beams: 0.35% of gross area of section. 15M ties spaced at 1/2 depth of beam.
    - Slabs and Walls: 0.2% of gross area of section every way and perimeter bars as detailed.
- Maintain concrete cover to reinforcing as follows when not explicitly detailed:
 

STRUCTURAL MEMBER	EXPOSURE TO WEATHER	
	EXPOSED	NOT EXPOSED
For beams, girders, columns and piles:	mm (in)	40 (1 1/2)
For ties, stirrups and spirals:	mm (in)	30 (1 1/8)
For slabs, walls and joists, No. 20 and smaller:	mm (in)	20 (3/4)
For bars with diameter d larger than listed above, cover shall be min. 50mm (and need not be > 50mm)	1.5 d	1.0 d
The ratio of the cover to the nominal maximum aggregate size shall be minimum:	1.5 d	1.0 d
When cast against, and permanently exposed to, earth:	mm (in)	75 (3)

- The cover for a bundle of bars shall be the same as that for a single bar with an equivalent area.
- Placement:
    - Openings in walls and slabs:
      - Do not cut typical reinforcement at openings, but shift to each side of opening.
      - Openings  $\leq 600 ( 24" )$  square: Provide 2 - 15M each side, extending 600 ( 24" ).
      - Openings  $\geq 600 ( 24" )$  square: Provide extra reinforcing as directed on site by DNA.
    - Provide dowels to match size and spacing of vertical and horizontal reinforcement.
  - All reinforcement required to be welded to connection plates shall be Grade 400W (Weldable).
  - All reinforcement to be bent in the field shall be Grade 400W (Weldable).
  - Ensure all bars are securely tied and chaired to maintain specified cover and prevent displacement during concrete placement. For surfaces exposed to weather, provide non-corrosive chairs.
  - All reinforcing steel shall be clean of substances that will affect its bond to concrete.
  - Bars damaged in the field may require replacement as directed by DNA.
  - For tension splices, no more than 50% of the bars shall be spliced at any one location.
  - Provide minimum of 500 lbs of extra reinforcement (10M + 15M) to be used as directed by DNA.

## STRUCTURAL STEEL, MISCELLANEOUS STEEL & CONNECTIONS

- Fabricate and erect structural steel to CSA S16 Division 2 certification or better.
- Structural steel shall conform to CSA G40.20 and G40.21 with the following grades:
  - W Shapes: Grade 550W
  - Angles & channels: Grade 500W
  - HSS: Grade 550W Class C
  - Plates & miscellaneous steel: Grade 500W
  - Connection bolts:
    - Steel to steel connections: ASTM A325
    - Steel to foundation anchor bolts: ASTM A307 or A325 per drawings
    - Wood connections: (interior - not exposed to moisture) ASTM A307 hot dipped galvanized to CAN/CSA-G164
    - One coat shop primer except embedded items. See specifications.
- All welding shall conform to CSA W59, W55.3 and W186 - Reinforcing Bars and shall be performed by fabricators fully certified by the Canadian Welding Bureau to the requirements of CSA W47.1.
- Supplier to confirm all dimensions and site conditions of structure prior to fabrication.
- All edges and corners of connections shall be ground smooth.
- All steel shall be hot dip galvanized.
- All hot dip galvanizing to be in accordance with CAN/CSA G164 U.N.O.
- All HSS sections shall be provided with 6mm (1/4") thick end caps.
- Submittals: Supplier shall provide the following submittals (refer to the Submittals section):
  - Shop Drawings
  - Certificates showing that the fabricator is fully certified by the Canadian Welding Bureau.

## ADHESIVE ANCHORAGES

- Provide adhesive at all drilled anchor and reinforcing steel locations indicated on structural drawings to depths of embedment in typical anchor installation detail and table U.N.O.
- Products
  - Adhesive used to install reinforcing steel and threaded rods in existing concrete shall be:
    - HI HI HIT HY150MAX Adhesive System for threaded rods or,
    - Simpson Strong-Tie Epoxy-Tie SET Adhesive System for threaded rods &, or
    - HI HI RE 500 Adhesive System for rebar
  - A written request for the use of alternate products, with applicable technical specifications, must be submitted to, and approved by DNA prior to construction.
- Reinforcing steel and threaded rod anchors shall be as specified in the reinforcing steel notes.
- Execution
  - Drilling of holes through existing reinforced steel in beams and columns is prohibited. If encountered, abandon hole location and start a new hole away from reinforcing steel locations. Patch all unused holes.
  - Installation shall be in strict accordance with the manufacturer's recommendations. Special attention is drawn to the minimum temperature requirements.
  - On site load testing may be required if determined by DNA.
  - Anchors shall be installed by personnel trained by manufacturer's representatives. Written confirmation of installers' qualifications may be requested by the Engineer.
  - Anchor holes shall not be drilled through existing reinforcing steel in beams, columns or slabs without prior approval by the Engineer.

## HEAVY TIMBER FRAMING

- All wood framing to be as follows:
 

MEMBER	GRADE U.N.O.	FINISH
Decking	D.Fir No.2	Rough with cup-side facing down
Beams, Purlins	D.Fir No.2	Rough
Railings	Western Red Cedar No.2	S4S Eased Edge
- Supplier shall supply and install (In shop where required) all steel connections between:
  - heavy timber to heavy timber,
  - heavy timber to supporting structure, and
  - as indicated on the Structural Drawings.
- Install heavy timber in accordance with the Shop Drawings and Supplier's specifications.
- All bolted connections to be 25mm (1") thru bolts c/w washers and C/S 25mm (1") max. U.N.O.
- All connection hardware shall be hot dipped galvanized in accordance with CAN/CSA G164.
- Double check and retighten all bolted connections prior to enclosing wood framing.
- Protect shop finish of heavy timber and pole framing from markings during shipping, storage and installation until building has been closed in. Sand any markings, scuff marks, water stains, etc. to smooth finish.
- Delay applying finish as long as possible to allow maximum drying time for wood members.
- Submittals: Supplier shall provide the following submittals (refer to the Submittals section):
  - Shop drawings sealed and signed by Supplier's Specialty Structural Engineer indicating a) Layout showing location of heavy timber, bearing conditions and relevant dimensions. b) Detailed fabrication of each member. c) Connection details showing design load capacity and installation details. d) Installation/erection instructions and details.
  - Quantity of all member types, connections and accessories on a shipping sheet.
- Bonded connections between wood members and steel members shall use "Powerfill Epoxy Filler and Bonding Agent" by Industrial Formulators', tel 1-888-277-8050.

## PRESSURE TREATED LUMBER

- All pressure treated lumber will be subjected to wet service conditions.
- Preservatively treated wood members by pressure process in accordance with:
  - CSA O80 Series-08 "Wood Preservation" and all applicable commodity and preservation standards.
  - "Best Management Practices for Use of Treated Wood in Aquatic Environments" (BMP) developed by the CIWJ and WRI.
  - All treating shall occur in a BMP certified Treatment Facility.
  - AWPA standards.
- All members shall be preservatively treated for Use Category UC3.2 with minimum retention levels of 4.0 kg/m3:
 

MATERIAL	SPECIES	PRESERVATIVE
Lumber and timber	D.Fir No. 1 or better	ACZA
- Shop cut and drill all lumber to fit and finish prior to pressure treatment wherever possible. Only minor cutting and drilling of pressure treated lumber is allowed on site. Field treat all site cut and drilled lumber with at least three coats of copper naphthenate. Field treatment shall be performed upland wherever possible. Contractor shall take measures to ensure all excess field preservative is adequately contained and disposed of when upland field treatment is not possible.
- Pressure treaters shall retain an independent certified inspection company to:
  - inspect all timber prior to and after pressure treatment.
  - Submit a grading certificate for conformance with specified lumber grades.
  - Certify that all timber was treated in accordance with the BMP's and stamped with the BMP mark.
  - Certify that all lumber is in conformance with CSA O80 by assay and penetration testing.
 Submit all above documentation to DNA for review and acceptance prior to shipping pressure treated lumber to site.
- All steel connections and fasteners to be hot dip galvanized in accordance with CAN/CSA-G164.

## NON-STRUCTURAL ELEMENTS

- DNA is not responsible for the structural design of non-structural and secondary structural elements and their connection to the primary structural elements. These elements include but are not limited to:
  - Attached and free-standing signage structures.
  - Guards and guard railing.
  - Drainage systems behind retaining walls.
  - Geotechnical aspects of foundation design.
  - Anchorage of granite facing.
- Structural design of non-structural elements to be carried out by Specialty Structural Engineers retained by the Contractor and/or Supplier of the non-structural elements in accordance with Part 4 of the Building Code for gravity and lateral loads.
- Shop Drawings
  - Submit to DNA four complete sets of shop drawings at least three weeks prior to fabrication.
  - Shop drawings to indicate all design assumptions, design loads, loads imposed on building structure and connection details.
  - Shop drawings must be signed and sealed by a BC registered Professional Engineer for structural design.
- Specialty Engineers to submit Schedules S-B and S-C and perform the necessary field reviews. See Submittal Section.

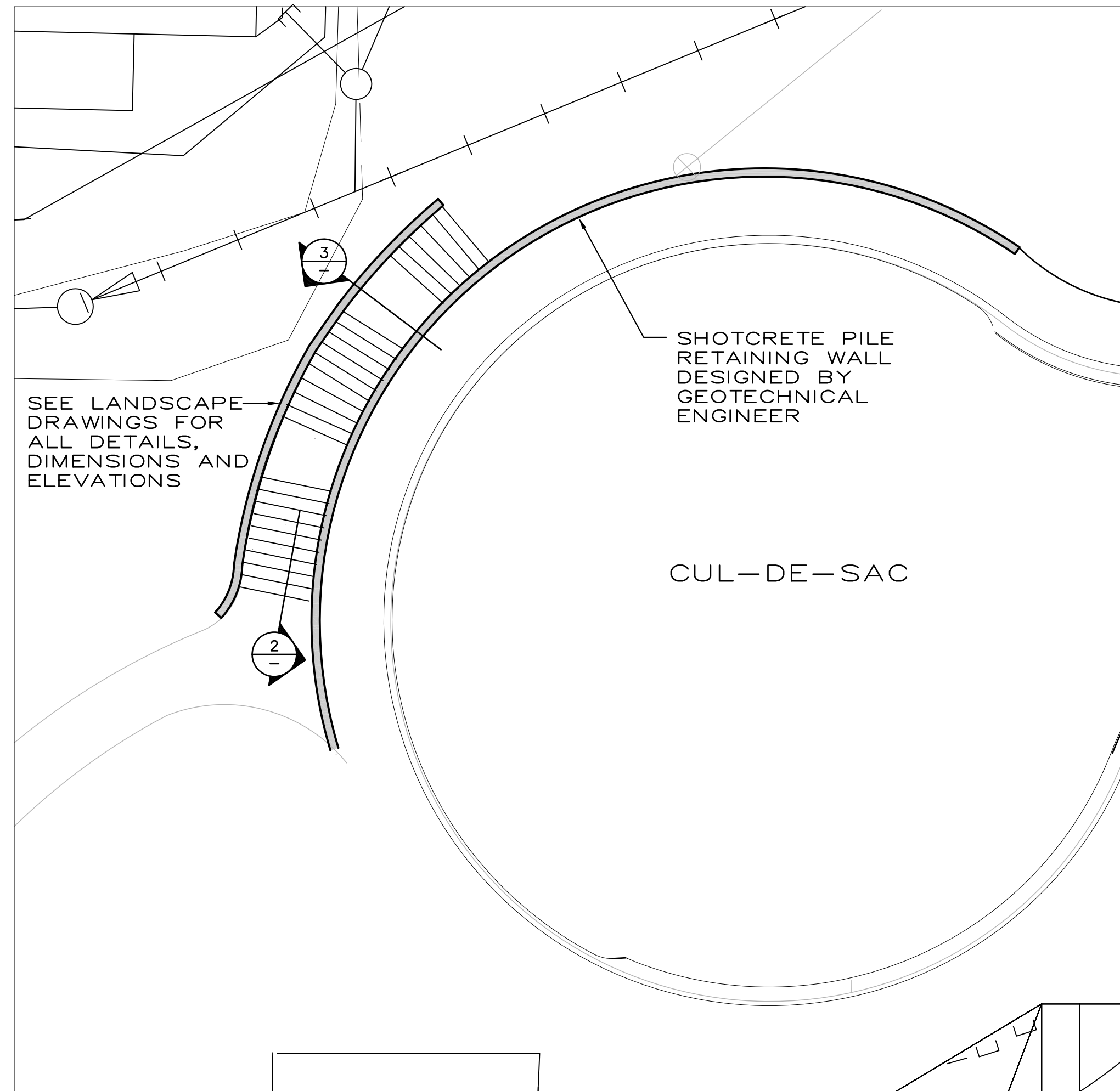
## ABBREVIATIONS

ABBREV.	DENOTES	ABBREV.	DENOTES	ABBREV.	DENOTES
Ø	DIAMETER	FTG	'FOOTING(S)'	REQ'D	'REQUIRED'
±	PLUS OR MINUS	GA	'GAUGE'	REV	'REVISION'
>	'GREATER THAN'	GALV	'GALVANIZED(D)'	RS	'RIGHT SIDE'
<	'LESS THAN'	GC	'GENERAL CONTRACTOR'	r/w	'REINFORCED WITH'
#	'ANCHOR BOLTS'	GL	'GLUE' or 'GLUE LAMINATED'	RWL	'RAIN WATER LEADER'
AB	'ALTERNATE'	GRID	'GRIDLINE'	SM	'SIMILAR'
ALT	'ALTERNATE'	S.O.G.	'SLAB-ON-GRADE'	S.O.G.	'SLAB-ON-GRADE'
ARCH	'ARCHITECT(URAL)'	H	'HIGH'	SO	'SQUARE'
BCE	'BOTTOM CHORD EXTENSION'	H1E	'REINFORCING BAR WITH 90° BEND ONE END'	STAG	'STAGGERED'
BL or B	'BAY LINE'	H2E	'REINFORCING BAR WITH 90° BEND BOTH ENDS'	STD	'STANDARD'
BLDG	'BUILDING'	HD	'HOLLOW(S)'	STIFF	'STIFFENER'
BLK	'BLOCK(ING)'	HORIZ	'HORIZONTAL'	STIRR	'STIRRUP(S)'
BLL	'BOTTOM LOWER LAYER'	HSS	'HOLLOW STEEL SECTION'	SW	'SHORT WAY'
BOT	'BOTTOM'	HST	'HEIGHT'	SYM	'SYMMETRY' or 'SYMMETRICAL'
BP or B	'BASE PLATE'	IF	'INSIDE FACE'	T&B	'TOP AND BOTTOM'
BRG	'BEARING'	ID	'INSIDE DIAMETER'	T&G	'TONGUE AND GROOVE'
B/S	'BOTH SIDES'	INT	'INTERIOR'	TEMP	'TEMPORARY'
B/TWN	'BETWEEN'	LAT	'LATERAL'	THK	'THICK'
B/U	'BUILT UP'	LG	'LONG'	TL	'TOTAL LOAD'
BUL	'BOTTOM UPPER LAYER'	LL	'LIVE LOAD'	TLL	'TOP LOWER LAYER'
B/W	'BOTH WAYS'	LLH	'STEEL ANGLE 'LONG LEG HORIZONTAL'	TRANS	'TRANSVERSE'
CANT	'CANTILEVER(ED)'	LLV	'STEEL ANGLE 'LONG LEG VERTICAL'	THRU	'THROUGH'
c/c	'SLAB 'CONTROL'/'CONSTRUCTION JOINT'	LONGIT	'LONGITUDINAL'	TUL	'TOP UPPER LAYER'
CL	'CLEAR(ANCE)'	LS	'LEFT SIDE'	UNO	'UNLESS NOTED OTHERWISE'
€	'CENTRELINE'	LSL	'LAMINATED STRAND LUMBER'	U/S	'UNDERSIDE OF'
COL	'COLUMN'	LVL	'LAMINATED VENEER LUMBER'	VERT	'VERTICAL'
CONC	'CONCRETE'	CONC	'CONTINUOUS'	W	'WIDE'
CONT	'CONTINUOUS'	CONC	'CONTINUOUS'	w/	'WITH'
C/S	'COUNTERSINK'	M	'METRE(S)'	w/o	'WITHOUT'
c/w	'COMPLETE WITH'	MECH	'MECHANICAL'	WMM	'WELDED WIRE MESH'
DBL	'DOUBLE'	MEZZ	'MEZZANINE'		
DET	'DETAIL'	mm	'MILLIMETRE(S)'		
DIAG	'DIAGONAL'	N/F	'NEAR FACE'		
DM	'DIMENSION'	N/S	'NEAR SIDE'		
DL	'DEAD LOAD'	NTS	'NOT TO SCALE'		
D/S	'DEEP'	e/c	'ON CENTER'		
DP	'DRAG STRUT'	OD	'OUTSIDE DIAMETER'		
DWG	'DRAWING(S)'	OF	'OUTSIDE FACE'		
E/A	'EACH'	O.H.	'OPPOSITE HAND'		
E/E	'EACH END'	OSB	'ORIENTED STRAND BOARD'		
E/F	'EACH FACE'	OPP	'OPPOSITE'		
EL	'ELEVATION'	OWSJ	'OPEN WEB STEEL JOIST'		
EQ	'EQUAL(LY)'	PERP	'PERPENDICULAR'		
E/S	'EACH SIDE'	PL or P	'PLATE'		
E/W	'EACH WAY'	PLL	'PARALLEL'		
EXIST	'EXISTING'	PLY	'PLYWOOD'		
EXT	'EXTERIOR'	FSL	'PARALLEL STRAND LUMBER'		
FD	'FLOOR DRAIN'	P.T.	'PRESSURE TREATED'		
FDN	'FOUNDATION'	RD	'ROOF DRAIN'		
F/F	'FAR FACE'	REINF	'REINFORCE(MENT)' or 'REINFORCING'		
F/H	'FULL HEIGHT'				
F/S	'FAR SIDE'				
FT	'FEET'				

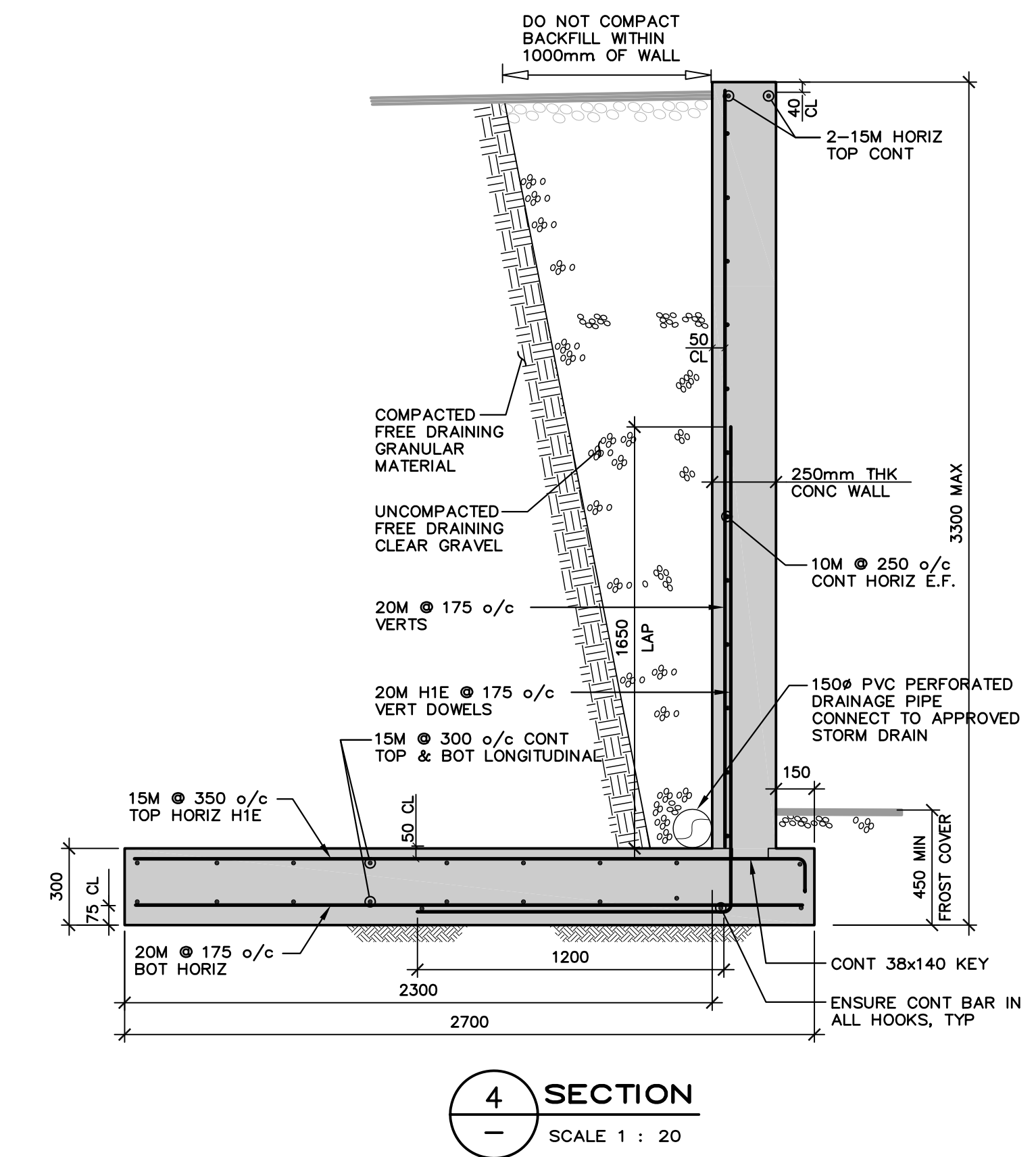
## STRUCTURAL DRAWING INDEX

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S2.1	BRIDGE PLAN, ELEVATION & ABUTMENT DETAIL
S2.2	STAIR DETAILS & SECTIONS
S3.1	BRIDGE DETAILS & SECTIONS





**1 KEY PLAN OF STAIRS**  
SCALE 1 : 100



**4 SECTION**  
SCALE 1 : 20

### RETAINING WALL DESIGN NOTES

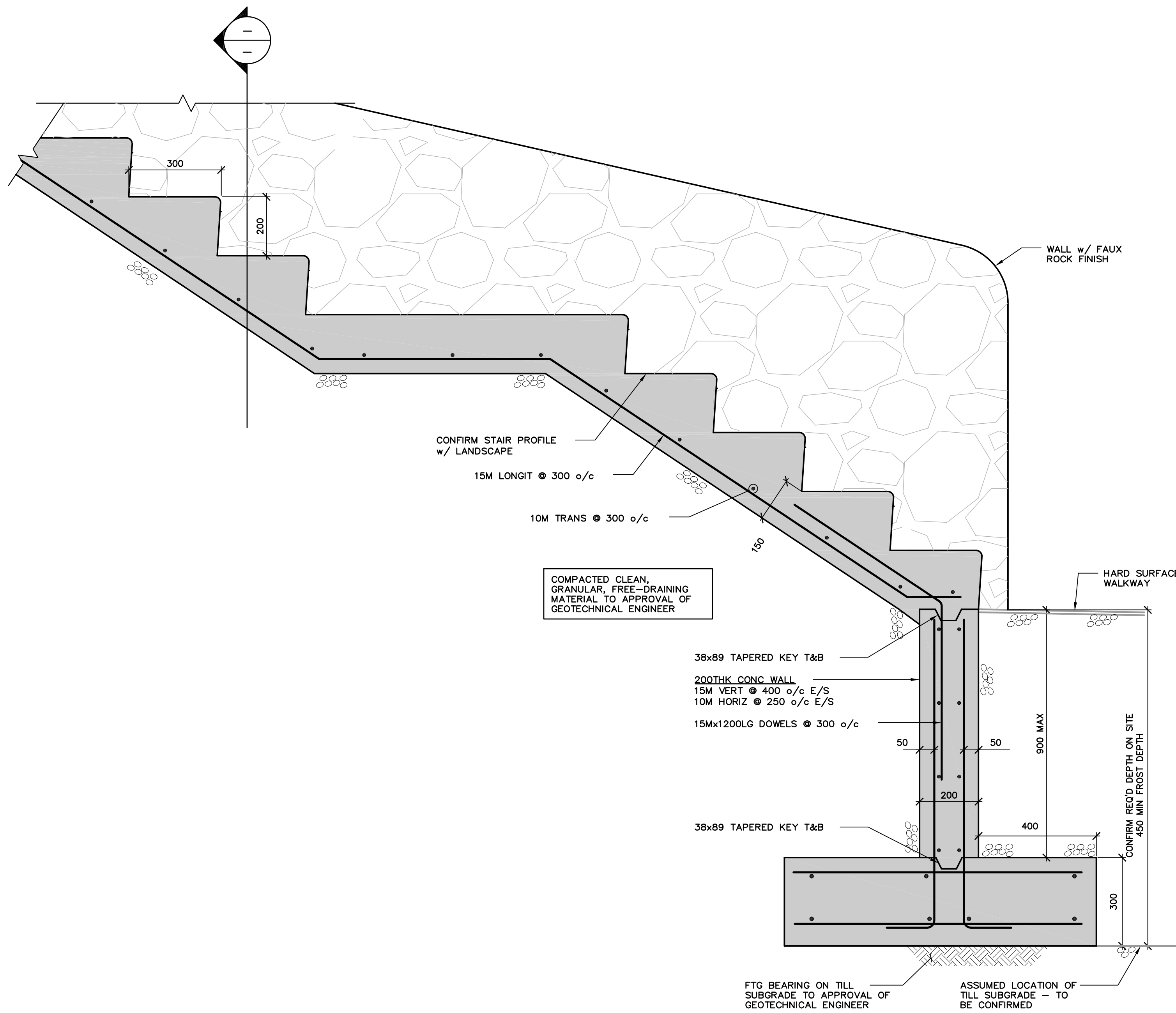
**DESIGN CRITERIA**

- RETAINING WALLS ARE DESIGNED AS FREE-STANDING, UNRESTRAINED CANTILEVER WALLS.
- WALLS ARE DESIGNED TO RESIST LATERAL EARTH PRESSURES DUE TO THE FOLLOWING CONDITIONS: (ACTIVE) OR (ACTIVE + SEISMIC). SEE DIAGRAMS TO THE RIGHT.
- FOOTING DESIGN IS BASED ON BEARING ON THE NATIVE TILL SUBGRADE w/ THE FOLLOWING BEARING CAPACITIES:
  - SLS BEARING CAPACITY = 200 kPa
  - FACTORED ULS BEARING CAPACITY = 350 kPa
- A FRICTION FACTOR OF 0.45 IS USED FOR SLIDING RESISTANCE BETWEEN THE U/S OF THE FOOTING AND THE NATIVE SUBGRADE.
- A 19 kN/m<sup>3</sup> UNIT WEIGHT OF SOIL HAS BEEN ASSUMED.
- RETAINING WALLS ARE NOT DESIGNED FOR HYDROSTATIC PRESSURES, SURCHARGE PRESSURES, SLOPING BACKFILL PRESSURES, & COMPACTION-INDUCED LATERAL EARTH PRESSURES.
- WALKWAY RETAINING WALLS ARE NOT DESIGNED FOR ADDITIONAL LATERAL PRESSURES DUE TO SURCHARGE FROM UPPER RETAINING WALLS.
- ALTERNATE RETAINING WALL DESIGNS WILL BE REQUIRED SHOULD SITE CONDITIONS DIFFER FROM THESE DESIGN ASSUMPTIONS.

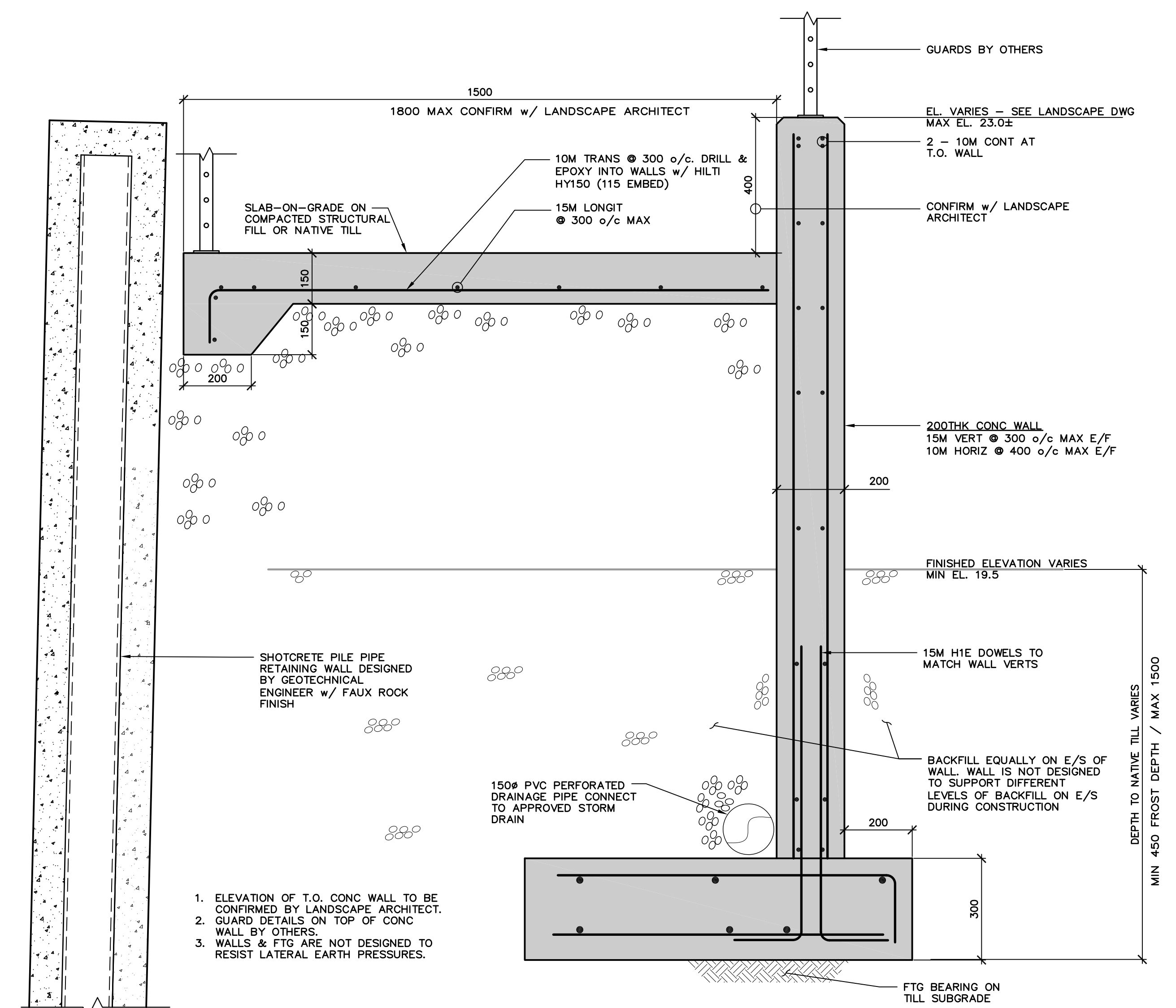
**BACKFILLING**

- DO NOT BACKFILL BEHIND WALL UNTIL CONCRETE HAS ACHIEVED SPECIFIED 28-DAY COMPRESSIVE STRENGTH. BACKFILL MATERIAL SHALL BE CLEAN, GRANULAR, & FREE-DRAINING TO APPROVAL OF GEOTECHNICAL ENGINEER.
- COMPACTION PROCEDURES TO BE REVIEWED AND APPROVED BY GEOTECHNICAL ENGINEER TO ENSURE THAT NO COMPACTION-INDUCED LATERAL EARTH PRESSURES ARE DEVELOPED WITHIN 1000mm OF THE WALL.

**RETAINING WALL DESIGN LOADS (SPECIFIED)**



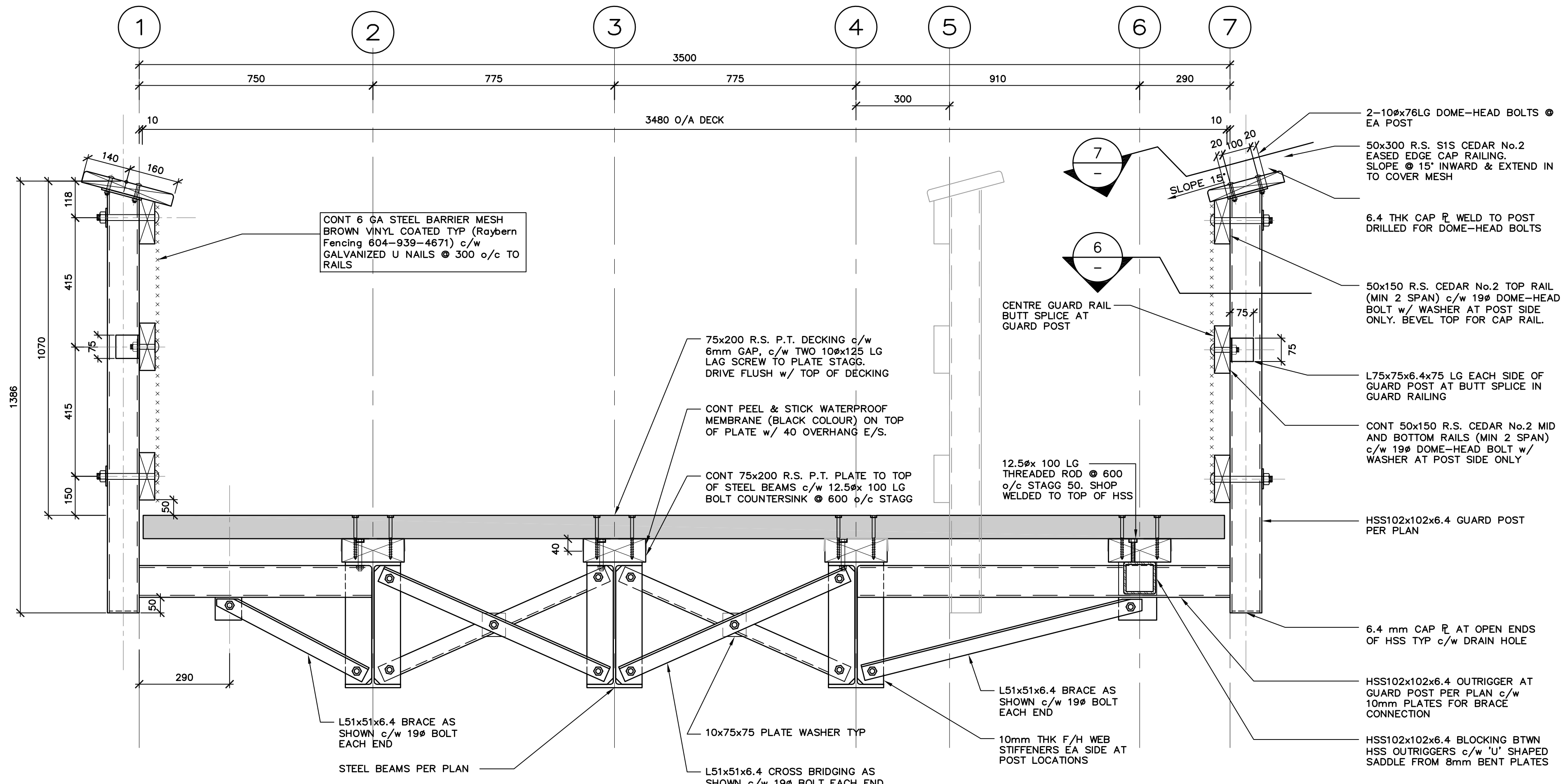
**2 CONC STAIR-ON-GRADE AT WALKWAY**  
SCALE 1 : 10



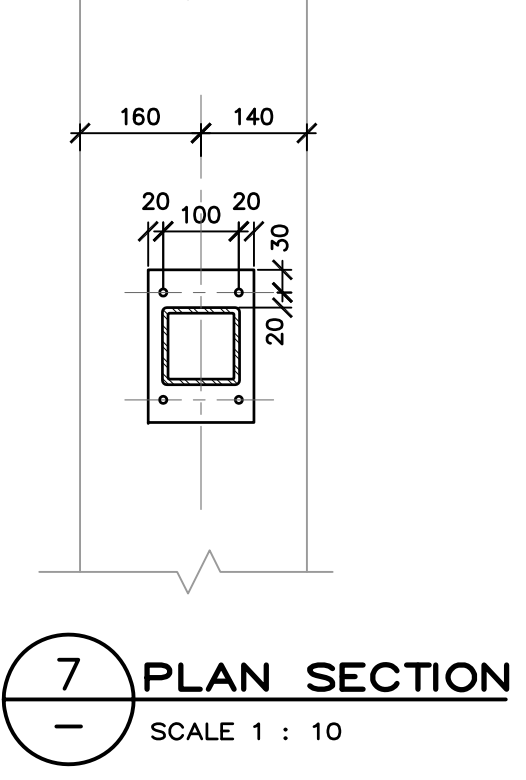
**3 STAIR AT CUL-DE-SAC**  
SCALE 1 : 10

7
6
5
4
3
2
1
ISSUED FOR B.P. FEB 2012
REVISIONS
DESIGNED BY: SFLUM
CHECKED BY:
DRAWN BY: SAL
DRAWING DATE: 2011-1-17
SCALE: AS SHOWN
CONSULTANT
PROJECT NAME: DOLLARTON HIGHWAY SUBDIVISION DEVELOPMENT
CLIENT: NICK EBRAHIM
PROJECT ADDRESS: 3707-3739 DOLLARTON HWY NORTH VANCOUVER, BC
DRAWING TITLE: STAIR DETAILS & SECTIONS
REVISION NO: 1

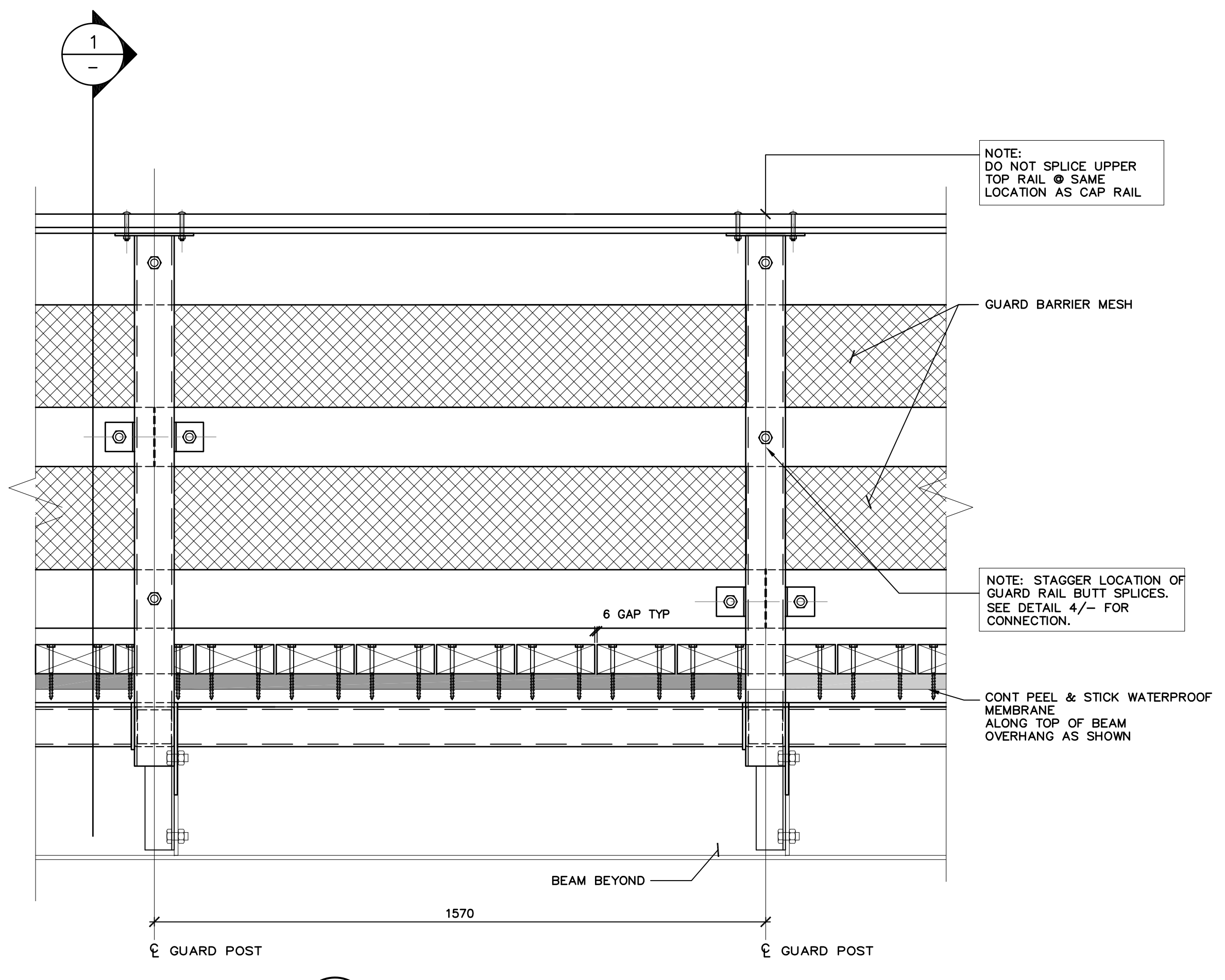




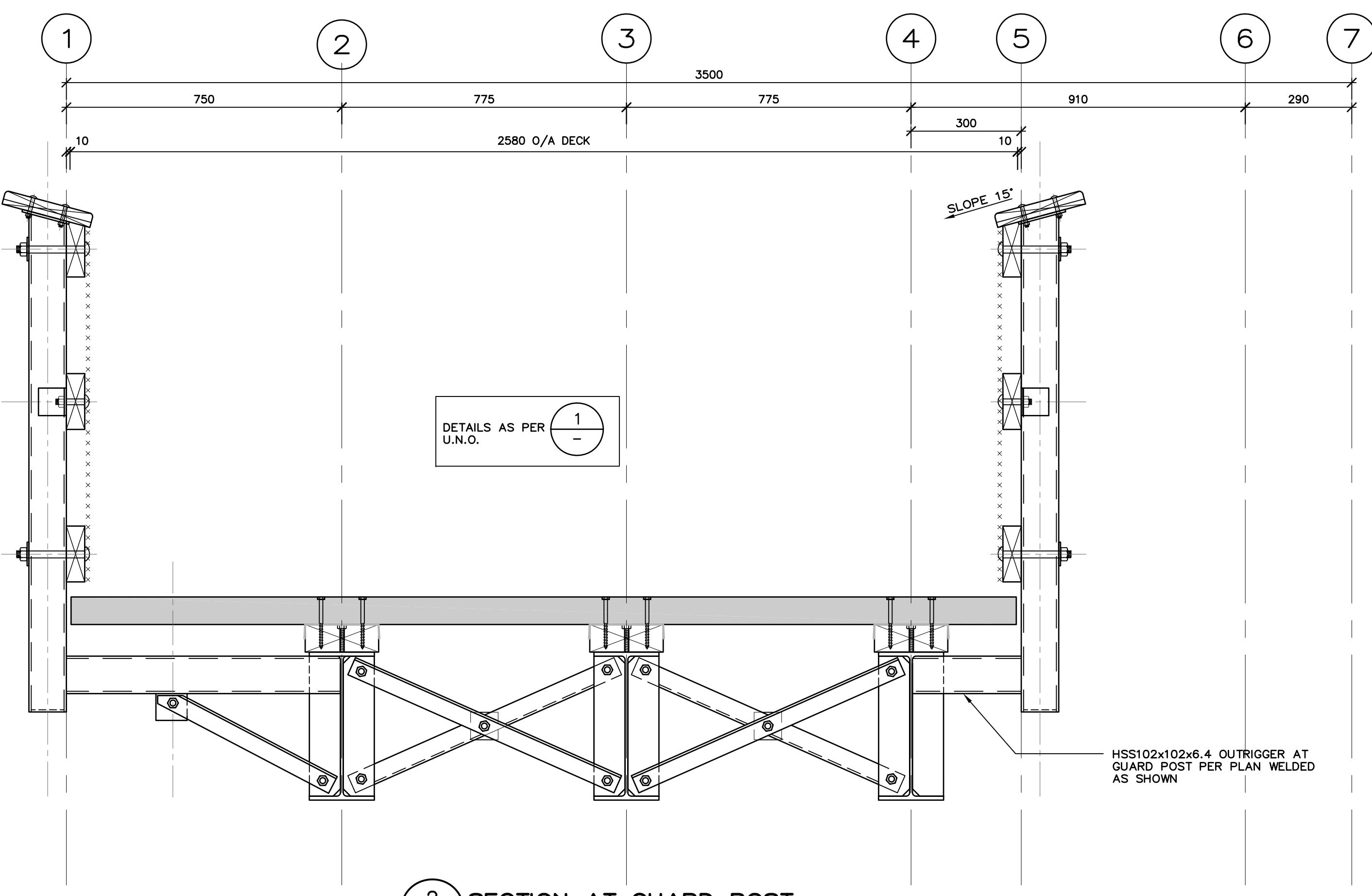
**1 SECTION AT GUARD POST VIEWING AREA**  
 S2.1 SCALE 1 : 10



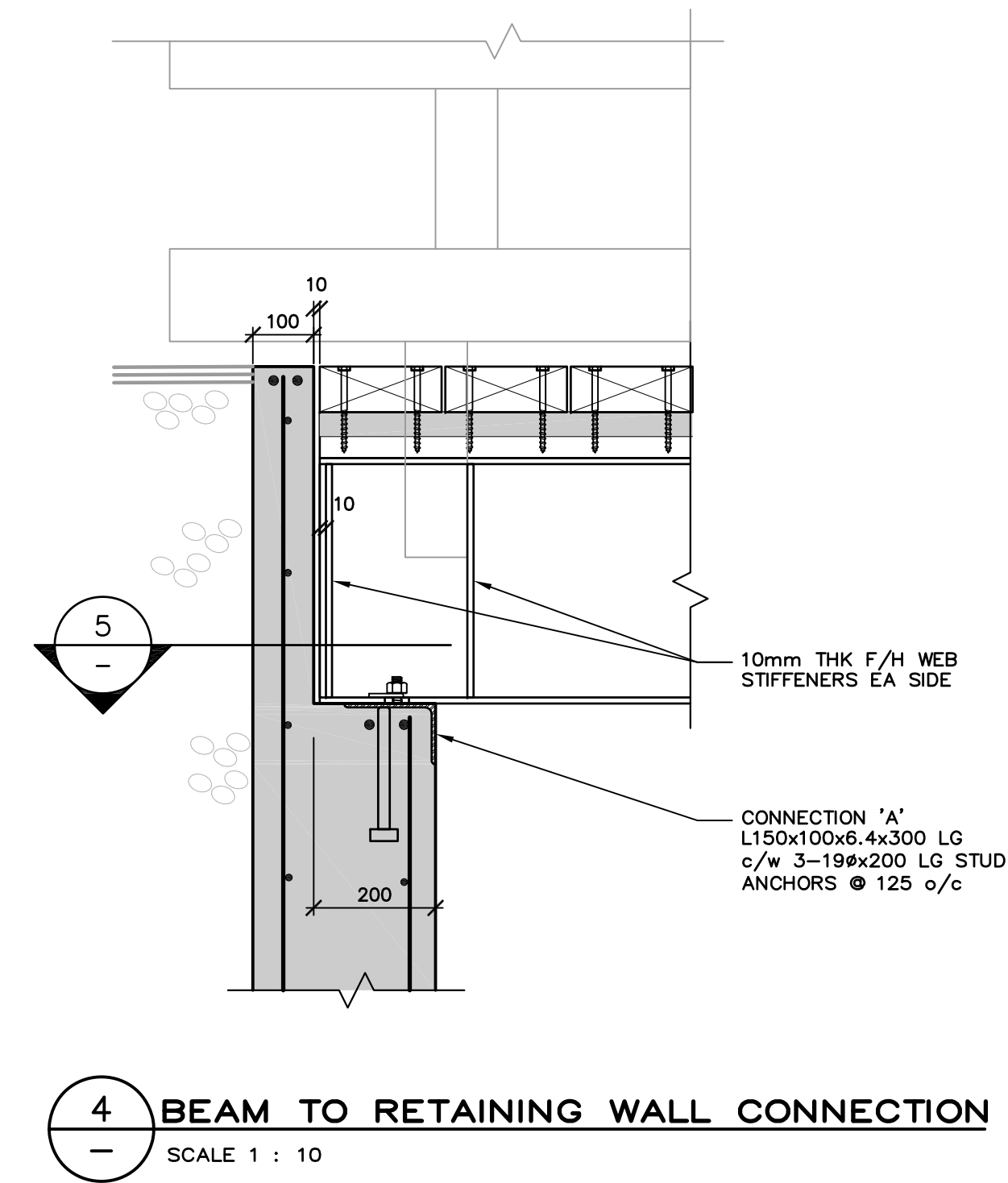
**7 PLAN SECTION**  
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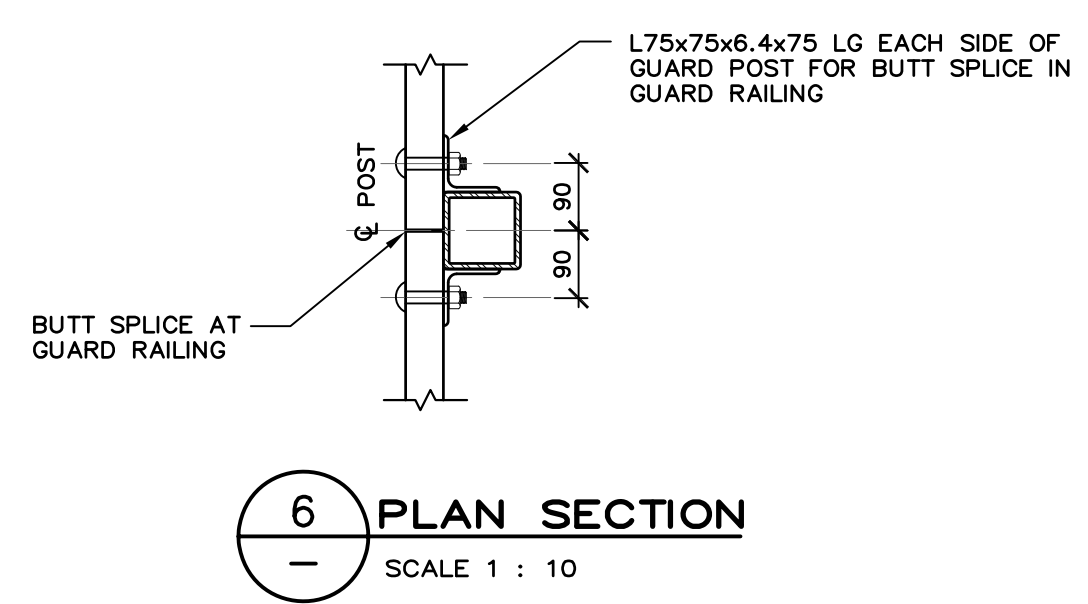
**3 ELEVATION OF GUARD RAILS & POSTS**  
 SCALE 1 : 10



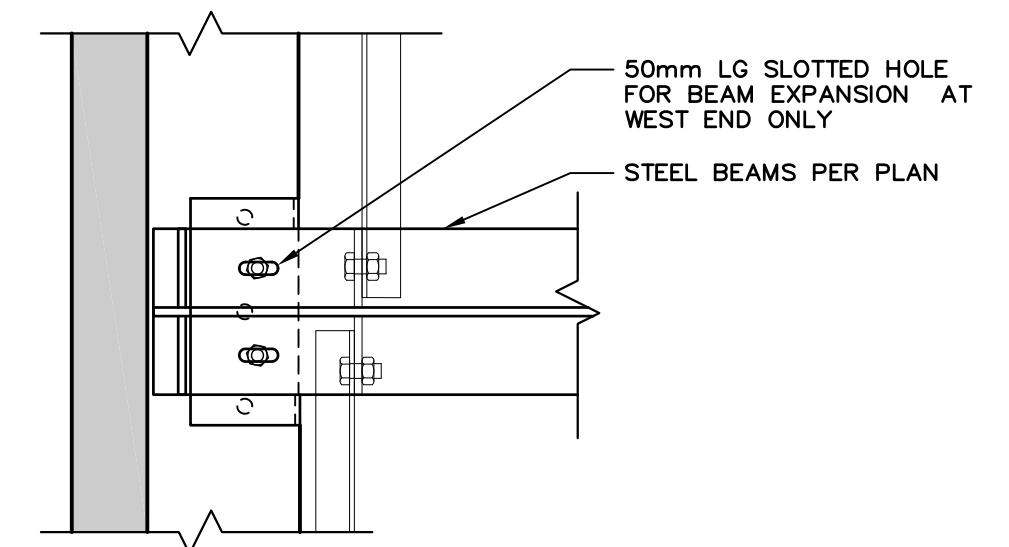
**2 SECTION AT GUARD POST**  
 S2.1 SCALE 1 : 10



**4 BEAM TO RETAINING WALL CONNECTION**  
 SCALE 1 : 10



**6 PLAN SECTION**  
 SCALE 1 : 10



**5 PLAN SECTION**  
 SCALE 1 : 10

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ISSUED FOR I.P.  
 FEB 2012  
 REVISIONS

DESIGNED BY:  
 BFLUM

CHECKED BY:

DRAWN BY:  
 SAL

DRAWING DATE  
 2011-11-17

SCALE:  
 AS SHOWN

CONSULTANT

PROJECT NAME  
 DOLLARTON HIGHWAY  
 SUBDIVISION  
 DEVELOPMENT

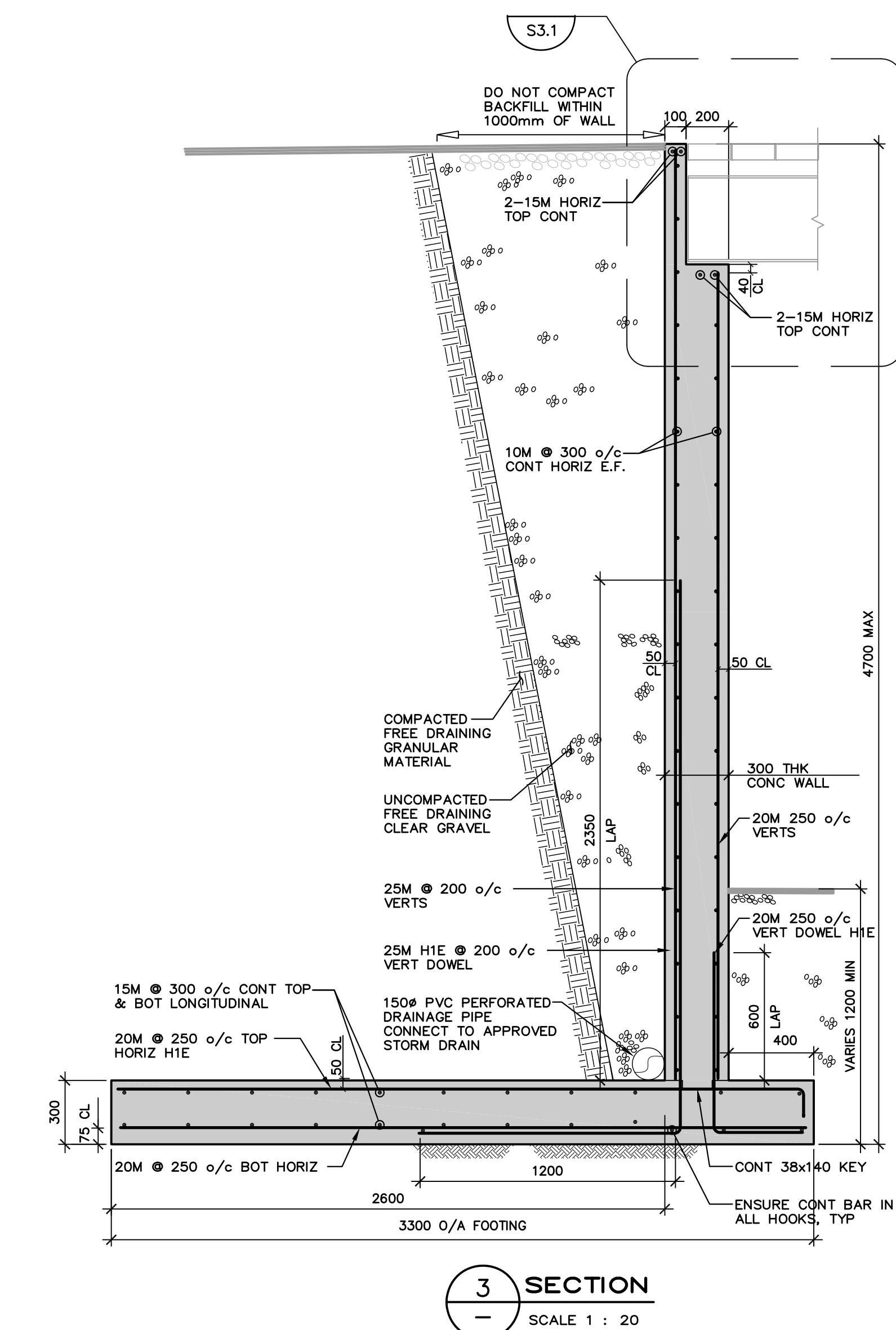
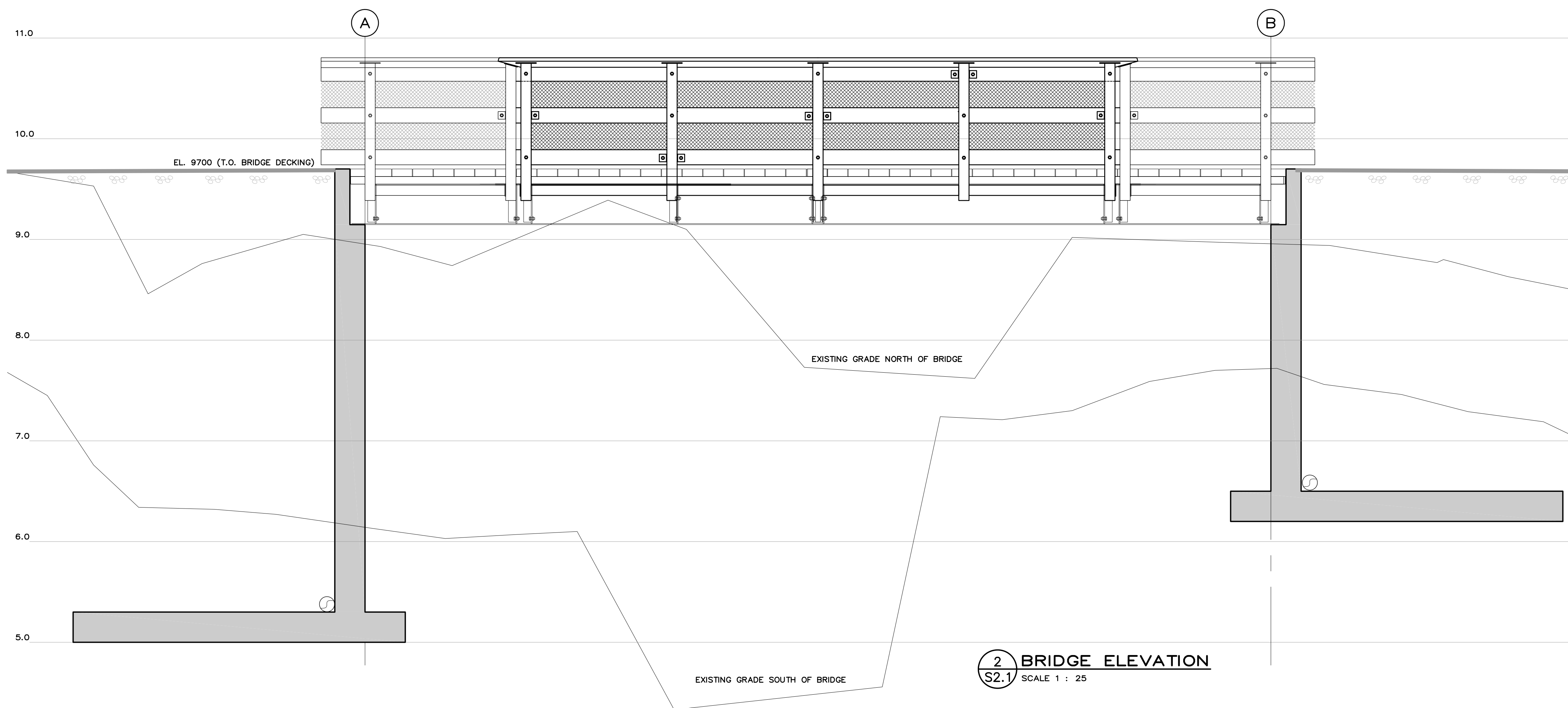
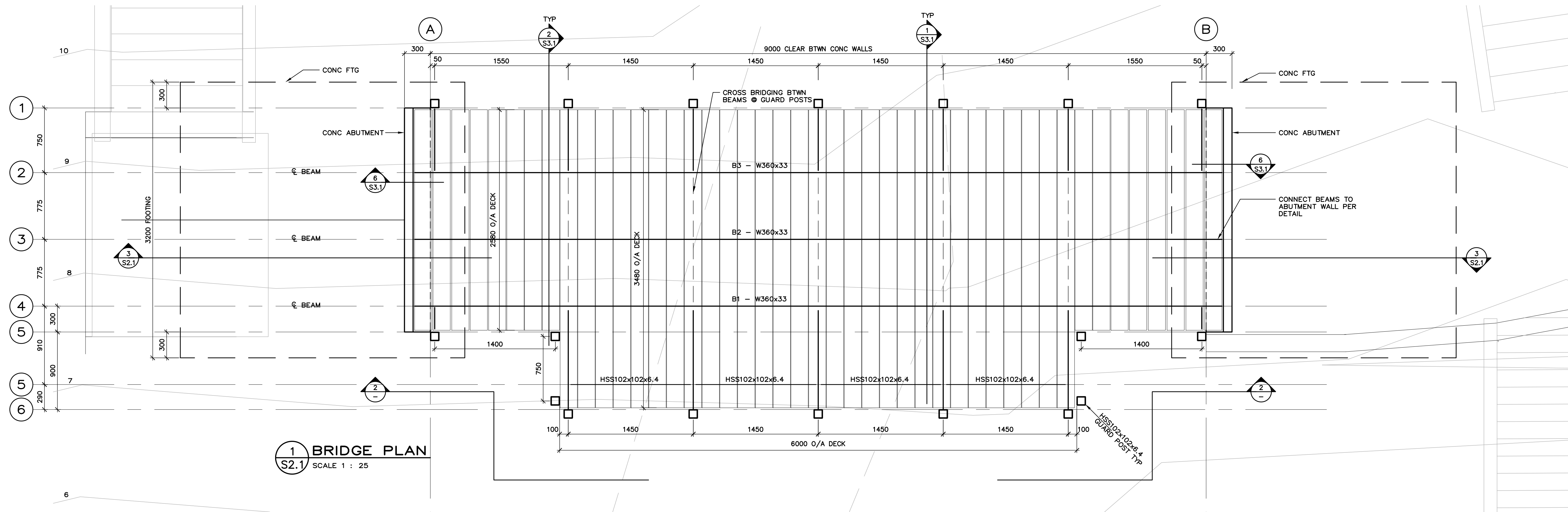
CLIENT  
 NICK EBRAHIM

PROJECT ADDRESS  
 3707-3739  
 DOLLARTON HWY  
 NORTH VANCOUVER, BC

DRAWING TITLE  
 BRIDGE DETAILS  
 & SECTIONS

REVISION No. 1





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ISSUED FOR I.P.  
FEB 2012

REVISIONS

DESIGNED BY:  
LUM

CHECKED BY:

DRAWN BY:  
SAL

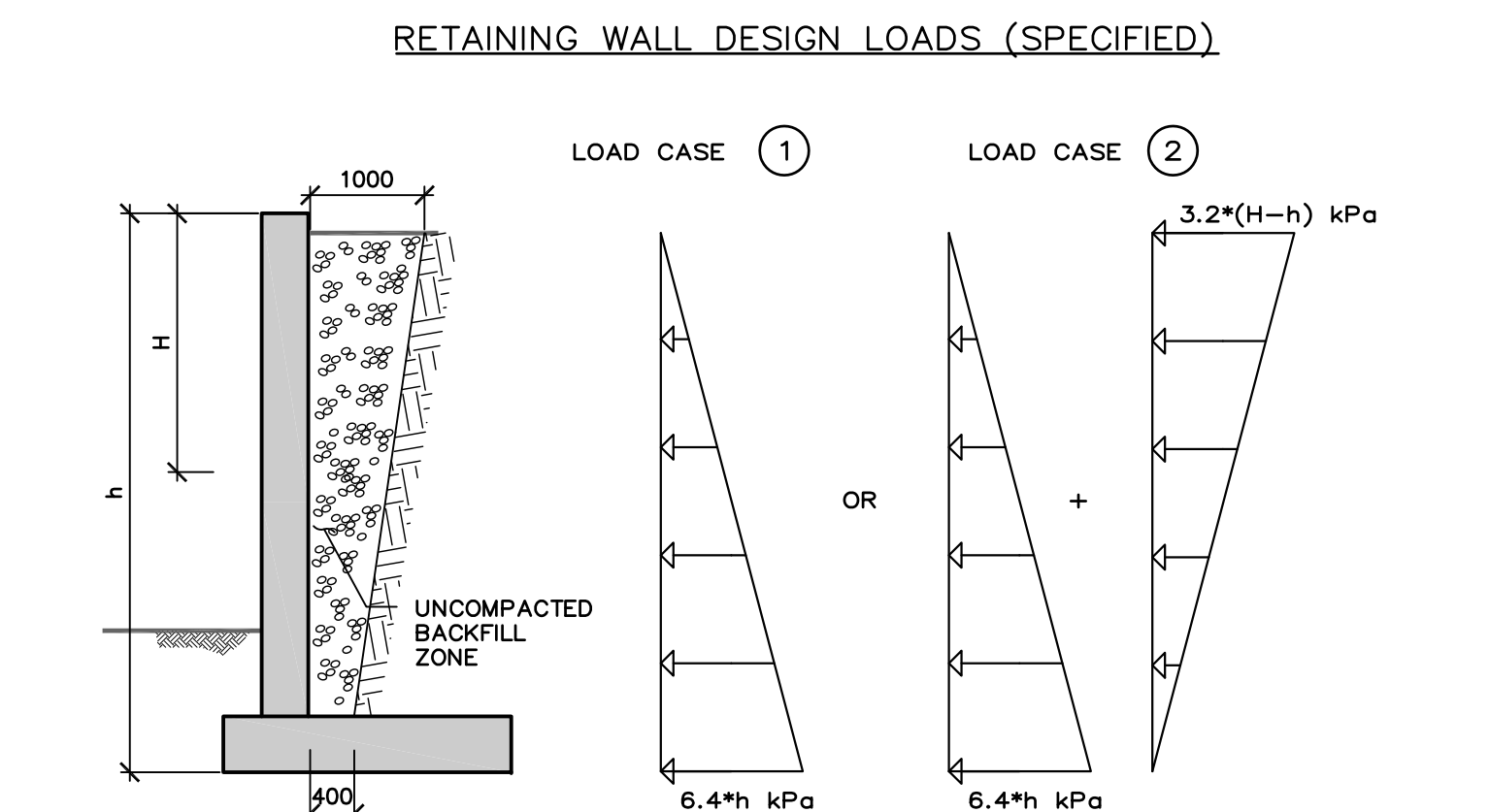
DRAWING DATE  
2011-11-17

SCALE:  
AS SHOWN

CONSULTANT

**RETAINING WALL DESIGN NOTES**

- DESIGN CRITERIA**
- RETAINING WALLS ARE DESIGNED AS FREE-STANDING, UNRESTRAINED CANTILEVER WALLS.
  - WALLS ARE DESIGNED TO RESIST LATERAL EARTH PRESSURES DUE TO THE FOLLOWING CONDITIONS: (ACTIVE) OR (ACTIVE + SEISMIC). SEE DIAGRAMS TO THE RIGHT.
  - FOOTING DESIGN IS BASED ON BEARING ON THE NATIVE TILL SUBGRADE w/ THE FOLLOWING BEARING CAPACITIES:  
 3.1. SLS BEARING CAPACITY = 200 kPa  
 3.2. FACTORED ULS BEARING CAPACITY = 350 kPa
  - A FRICTION FACTOR OF 0.45 IS USED FOR SLIDING RESISTANCE BETWEEN THE U/S OF THE FOOTING AND THE TILL NATIVE SUBGRADE.
  - A 19 kN/m<sup>3</sup> UNIT WEIGHT OF SOIL HAS BEEN ASSUMED.
  - RETAINING WALLS ARE NOT DESIGNED FOR HYDROSTATIC PRESSURES, SURCHARGE PRESSURES, SLOPING BACKFILL PRESSURES, & COMPACTION-INDUCED LATERAL EARTH PRESSURES.
  - WALKWAY RETAINING WALLS ARE NOT DESIGNED FOR ADDITIONAL LATERAL PRESSURES DUE TO SURCHARGE FROM UPPER RETAINING WALLS.
  - ALTERNATE RETAINING WALL DESIGNS WILL BE REQUIRED SHOULD SITE CONDITIONS DIFFER FROM THESE DESIGN ASSUMPTIONS.
- BACKFILLING**
- DO NOT BACKFILL BEHIND WALL UNTIL CONCRETE HAS ACHIEVED SPECIFIED 28-DAY COMPRESSIVE STRENGTH. BACKFILL MATERIAL SHALL BE CLEAN, GRANULAR, & FREE-DRAINING TO APPROVAL OF GEOTECHNICAL ENGINEER.
  - COMPACTION PROCEDURES TO BE REVIEWED AND APPROVED BY GEOTECHNICAL ENGINEER TO ENSURE THAT NO COMPACTION-INDUCED LATERAL EARTH PRESSURES ARE DEVELOPED WITHIN 1000mm OF THE WALL.



PROJECT NAME  
**DOLLARTON HIGHWAY  
 SUBDIVISION  
 DEVELOPMENT**

CLIENT  
**NICK EBRAHIM**

PROJECT ADDRESS  
**3707-3739  
 DOLLARTON HIGHWAY  
 NORTH VANCOUVER, BC**

DRAWING TITLE  
**BRIDGE PLAN, ELEVATION  
 & ABUTMENT DETAIL**

REVISION NO. **1**