

- GENERAL NOTES**
- STRUCTURAL DESIGN BASED ON THE MANITOBA BUILDING CODE 2011 EDITION.
  - SEISMIC SITE CLASSIFICATION: NOT APPLICABLE.
  - DO NOT SCALE DRAWINGS.
  - ALL DIMENSIONS ARE TO BE VERIFIED WITH THE PROJECT DRAWINGS AND EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION.
  - THESE STRUCTURAL DRAWINGS SHOW THE COMPLETED STRUCTURE AND DO NOT INDICATE ALL COMPONENTS NECESSARY FOR SAFETY DURING CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SAFETY ON AND AROUND THE JOBSITE DURING CONSTRUCTION.
  - A COPY OF THE GEOTECHNICAL REPORT COMMISSIONED BY THE OWNER IS AVAILABLE FOR REVIEW AT THE OFFICES OF THE OWNER.

- SHORING**
- LOCATE ALL UNDERGROUND SERVICES BEFORE INSTALLING SHORING.
  - SURVEY TOP OF SOLDIER PILE ELEVATIONS AND LATERAL POSITION OF SHORING IMMEDIATELY AFTER INSTALLATION. RE-SURVEY WEEKLY DURING EXCAVATION AND BUILDING PILING WORK. PROVIDE DATA TO SHORING DESIGNER, SHOWING WEEK-TO-WEEK DISPLACEMENTS AS WELL AS CUMULATIVE DISPLACEMENTS.

- CAST-IN-PLACE CONCRETE**
- CONCRETE
  - ALL CONCRETE IS TO BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF CAN/CSA-A23.1-09 "CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION" AND CAN/CSA-A23.2-09 "METHOD OF TEST FOR CONCRETE".
  - PROVIDE CERTIFICATION THAT MIX PROPORTIONS SELECTED WILL PRODUCE CONCRETE OF QUALITY, YIELD AND STRENGTH AS SPECIFIED IN CONCRETE MIXES, AND WILL COMPLY WITH CAN/CSA-A23.1. CERTIFICATION LETTER TO BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA.
  - PROVIDE CERTIFICATION THAT PLANT, EQUIPMENT, AND MATERIALS TO BE USED IN CONCRETE COMPLY WITH REQUIREMENTS OF CAN/CSA-A23.1. CERTIFICATION LETTER TO BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA.
  - CONCRETE STRENGTHS AT 28 DAYS SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE ON THE DRAWINGS.
- SOLDIER PILE BASES:** 25 MPA MIN. AT 56 DAYS  
CLASS OF EXPOSURE: F-2  
ENTRAINED AIR/CATEGORY: NONE  
CEMENT TYPE: GU  
AGGREGATE: MAX. 20 MM  
CURING TYPE: TYPE 1 - BASIC
- SHORING DEADMEN:** 20 MPA MIN. AT 56 DAYS  
CLASS OF EXPOSURE: S-2  
ENTRAINED AIR/CATEGORY: NONE  
AGGREGATE: MAX. 20 MM  
CURING TYPE: TYPE 1 - BASIC

- UNLESS INDICATED OTHERWISE THE CONTRACTOR SHALL SPECIFY CONCRETE SLUMP APPROPRIATE WITH PLACEMENT METHODS AND SITE CONDITIONS. THE CONTRACTOR SPECIFIED SLUMP MUST BE SHOWN ON THE CERTIFICATION LETTER AND CONCRETE DELIVERY TICKET.
- UNLESS NOTED OTHERWISE CONCRETE CURING TO CONFORM TO THE LATEST EDITION OF CAN/CSA-A23.1-09 AS FOLLOWS:
    - TYPE 1 - BASIC: 3 DAYS  $\geq 10^{\circ}\text{C}$  AND FOR A TIME NECESSARY TO ATTAIN 40% OF THE SPECIFIED STRENGTH.
    - TYPE 2 - ADDITIONAL: 7 DAYS  $\geq 10^{\circ}\text{C}$  AND FOR A TIME NECESSARY TO ATTAIN 70% OF THE SPECIFIED STRENGTH.
    - TYPE 3 - EXTENDED: 7 DAYS WET CURING  $\geq 10^{\circ}\text{C}$ .
  - AIR ENTRAINING ADMIXTURES SHALL CONFORM TO THE REQUIREMENTS OF ASTM C260/C260M-10A "STANDARD SPECIFICATION FOR AIR ENTRAINING ADMIXTURES FOR CONCRETE". SUPERPLASTICIZING ADMIXTURES SHALL CONFORM TO ASTM C494/C494M "STANDARD SPECIFICATION FOR CHEMICAL ADMIXTURES FOR CONCRETE" OR ASTM C1017/C1017M "STANDARD SPECIFICATION FOR CHEMICAL ADMIXTURES FOR USE IN PRODUCING FLOWING CONCRETE" WHEN FLOWING CONCRETE IS APPLICABLE. AIR ENTRAINING ADMIXTURES TO HAVE A DURABILITY FACTOR GREATER THAN 75, WHEN TESTED TO ASTM STANDARDS C666/C666M PROCEDURE A. SPACING FACTOR FOR ANY AIR ENTRAINING ADMIXTURE MUST BE 0.17MM OR LESS WHEN TESTED IN ACCORDANCE WITH ASTM C457 "STANDARD TEST METHOD FOR MICROSCOPICAL DETERMINATION OF PARAMETERS OF THE AIR-VOID SYSTEM IN HARDENED CONCRETE".

- STRUCTURAL STEEL**
- STRUCTURAL STEEL TO CONFORM TO CSA-G40.21, "STRUCTURAL QUALITY STEELS" AND CSA-G40.20 "GENERAL REQUIREMENTS FOR ROLLED OR WELDED STRUCTURAL QUALITY STEEL".
  - ALL ROLLED OR STEEL STRUCTURAL SECTIONS SHALL BE G40.21-50W. ALL HOLLOW STRUCTURAL SECTIONS TO BE G40.21-50W CLASS C OR ASTM A500-C. ALL ANGLES, CHANNELS AND PLATES SHALL BE G40.21-44W.
  - FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL BE PERFORMED IN ACCORDANCE WITH CAN/CSA S16-09, "STEEL STRUCTURES FOR BUILDINGS".
  - ALL WELDING SHALL CONFORM TO THE LATEST EDITION OF CSA W59, "WELDED STEEL CONSTRUCTION". FABRICATORS SHALL BE PROPERLY CERTIFIED IN ACCORDANCE WITH CSA W47.1, "CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES".
  - NO HOLES PERMITTED IN STRUCTURAL STEEL WITH OUT THE EXPRESS WRITTEN PERMISSION OF THE SHORING DESIGNER.
  - FABRICATOR TO NOTIFY ENGINEER OF ANY PROPOSED MEMBER SUBSTITUTIONS AND CHANGED CONNECTION DETAILS.

- PROCEDURE**
- INSTALL STEEL SOLDIERS IN CONCRETE SOLDIER PILES AND BACKFILL PILE HOLES WITH STABILIZED FILL OR CLEAN DRY SAND.
  - EXCAVATE, LEAVING A BERM TO 300mm BELOW WALKER, INSTALLING LAGGING AS EXCAVATION PROCEEDS. REFER TO DRAWING S2.1 FOR TYPICAL DETAIL. WORK TO PROCEED CONTINUOUSLY AND PROGRESSIVELY ALONG THE SHORING LINE AND RAKERS TO BE INSTALLED IMMEDIATELY UPON COMPLETION OF EXCAVATION AT ANY PILE LOCATION.
  - INSTALL AND WELD IN PLACE WALERS AND RAKERS. END OF RAKERS TO EXTEND 90mm INTO CONCRETE DEADMEN AND CAST IN IMMEDIATELY AFTER EXCAVATION DESCRIBED ABOVE.
  - COMPLETE EXCAVATION AND INSTALL LAGGING.
  - FILL BACK OF LAGGING WITH DRY SAND.

**SHORING LOCATION PLAN**  
1 : 750

NOTE: THE CONTOURS AND SHORING LINES INDICATED ON THIS PLAN ARE INTENDED AS REFERENCE ONLY. REFER TO DRAWINGS S2.1 THROUGH S2.4 FOR EXCAVATION CONTOURS AND SHORING DETAILS.

**AS BUILT DRAWINGS**

**MAINTENANCE & MONITORING**

TO FOLLOW



No.	Date	Issue/Revision	By
5	21 AUG 2015	AS-BUILT	BF
4	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
3	28 JAN 2014	ISSUED FOR EXCAVATION PERMIT	BF
2	16 DEC 2014	ISSUED FOR CONSTRUCTION	BF
1	19 NOV 2014	ISSUED FOR REVIEW	BF

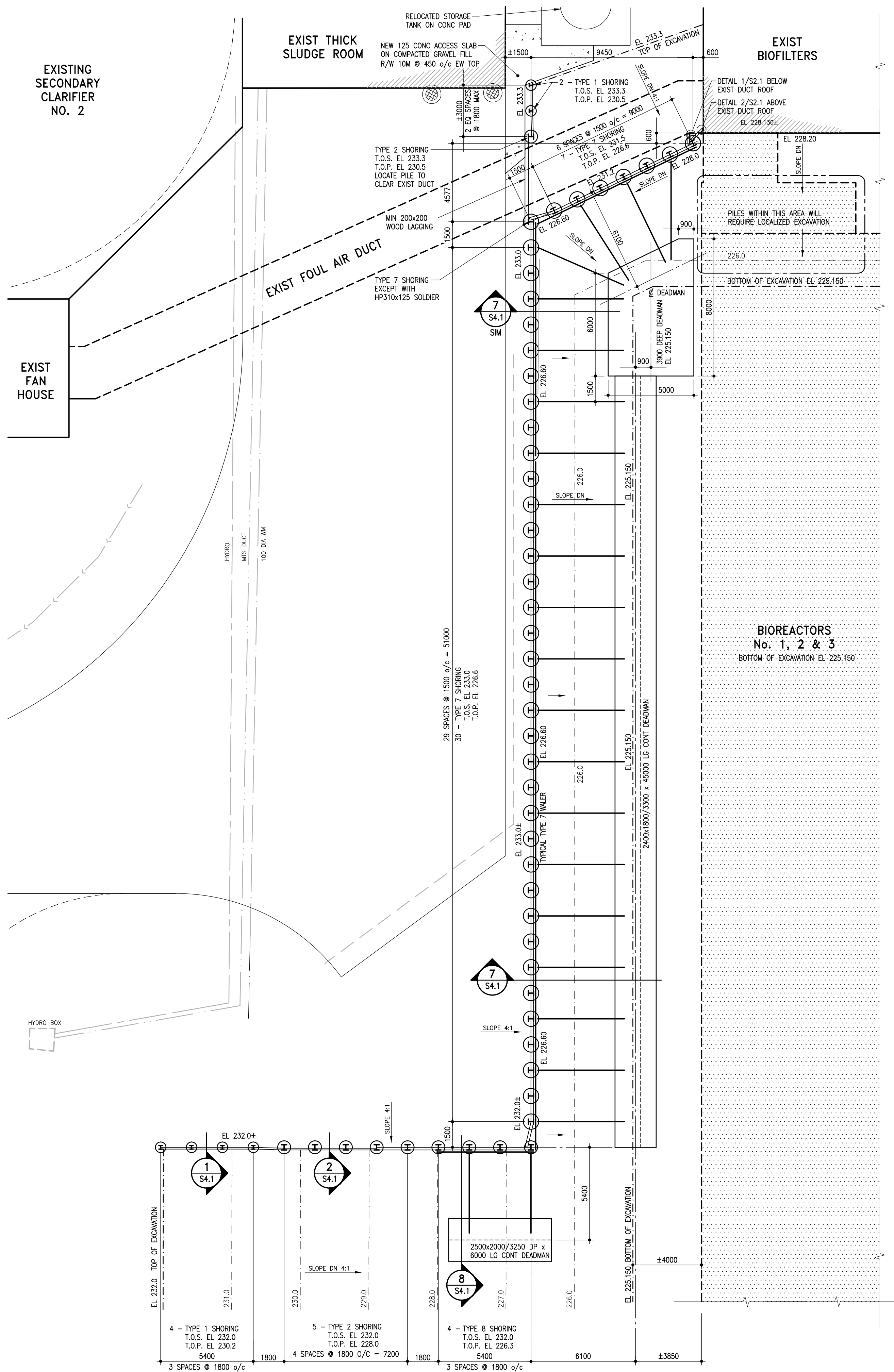
ORIGINAL DRAWING SEALED BY B. FLISAK AND DATED June 25, 2015

300-275 Carlton Street  
Winnipeg, Manitoba R3C 5R6  
T 204. 943. 7501  
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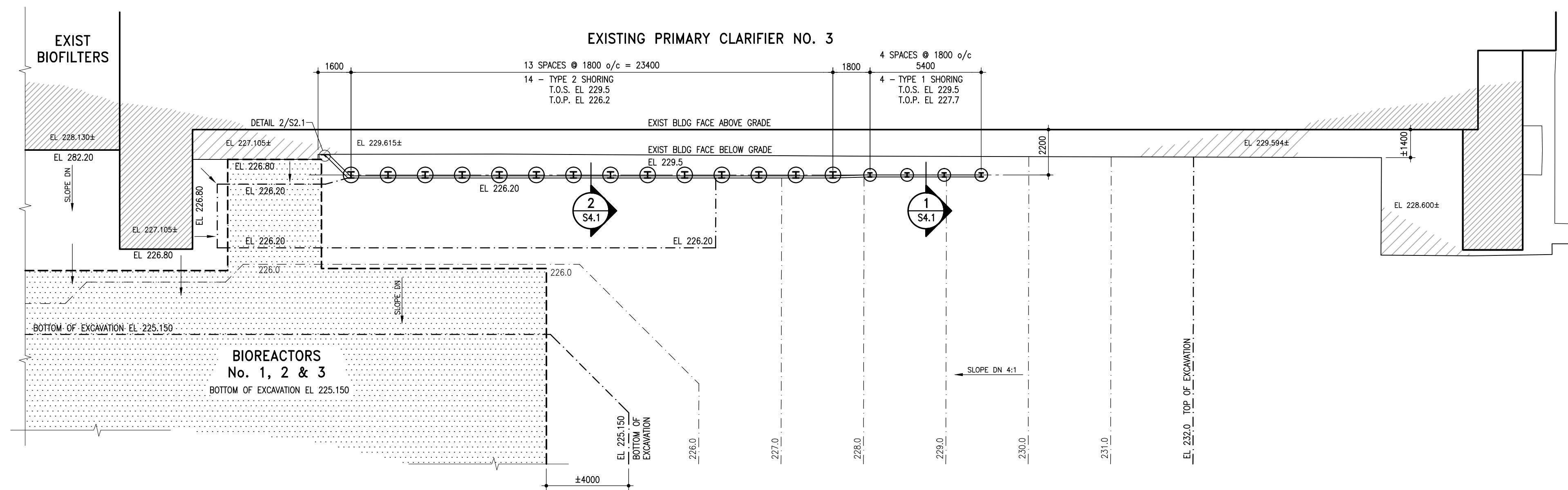
**Crosier Kilgour & Partners Ltd.**  
CONSULTING STRUCTURAL ENGINEERS

Project: THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION						Sheet No.
Sheet Title: SHORING LOCATION PLAN & GENERAL NOTES						S1.1
Design	Drawn	Checked	Scale	Date	File	
JAL	KJL	BF	AS NOTED	21 AUG 2015	2014-1223	

The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.



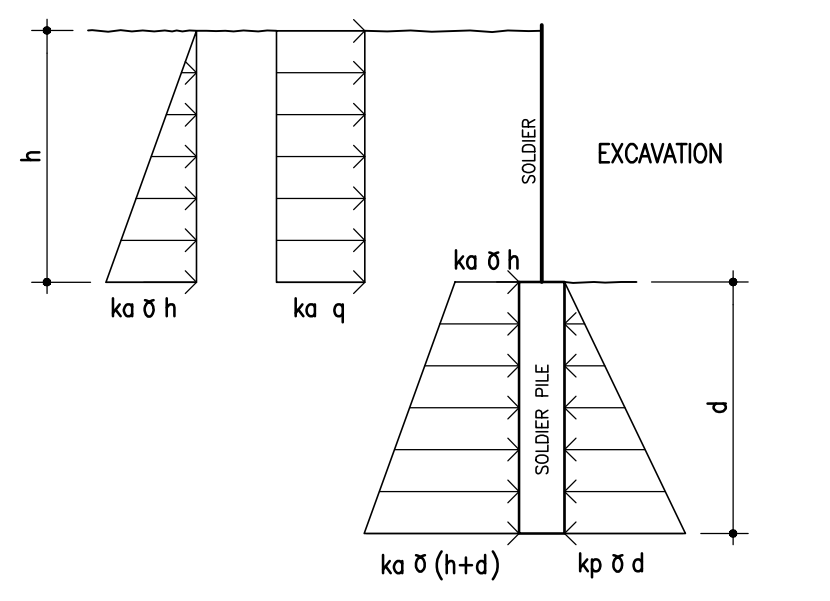
**A SHORING LAYOUT**  
S2.1 1 : 150



**B SHORING LAYOUT**  
S2.1 1 : 150

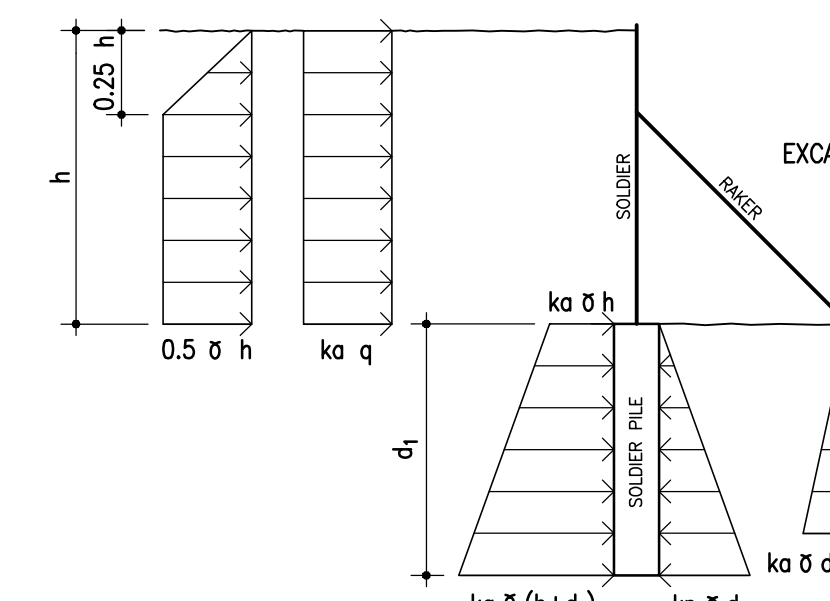
**PLAN NOTES**  
REFER TO SECTIONS FOR SHORING TYPES  
T.O.S. EL - TOP OF STEEL SOLDIER ELEVATION  
T.O.P. EL - TOP OF CONCRETE SOLDIER PILE & DEADMAN ELEVATION

**TYPICAL CANTILEVER SOLDIER PILE DESIGN LOADS**



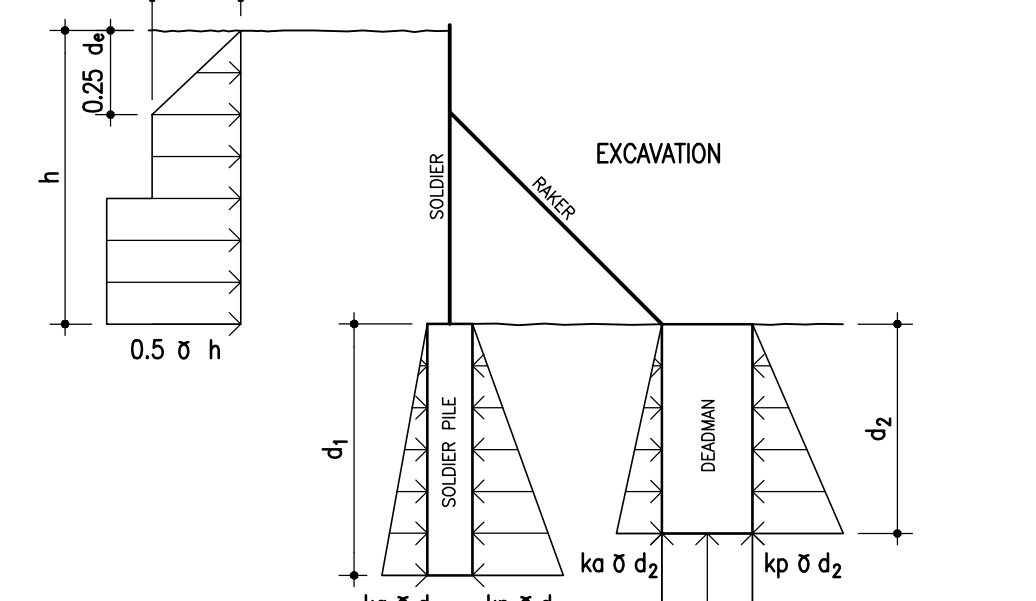
**DESIGN PARAMETERS**  
 $k_a = 0.60$  (ACTIVE PRESSURE COEFFICIENT)  
 $k_p = 2.50$  (PASSIVE PRESSURE COEFFICIENT)  
 $q = 19.7 \text{ kN/m}^3$  (SOIL UNIT WEIGHT)  
 $q = 12.0 \text{ kPa}$  (SURCHARGE)  
 $h =$  DEPTH OF EXCAVATION  
 $d =$  DEPTH OF EMBEDMENT OF SHORING BELOW UNDISTURBED SOIL

**TYPICAL BRACED EXCAVATION DESIGN LOADS**

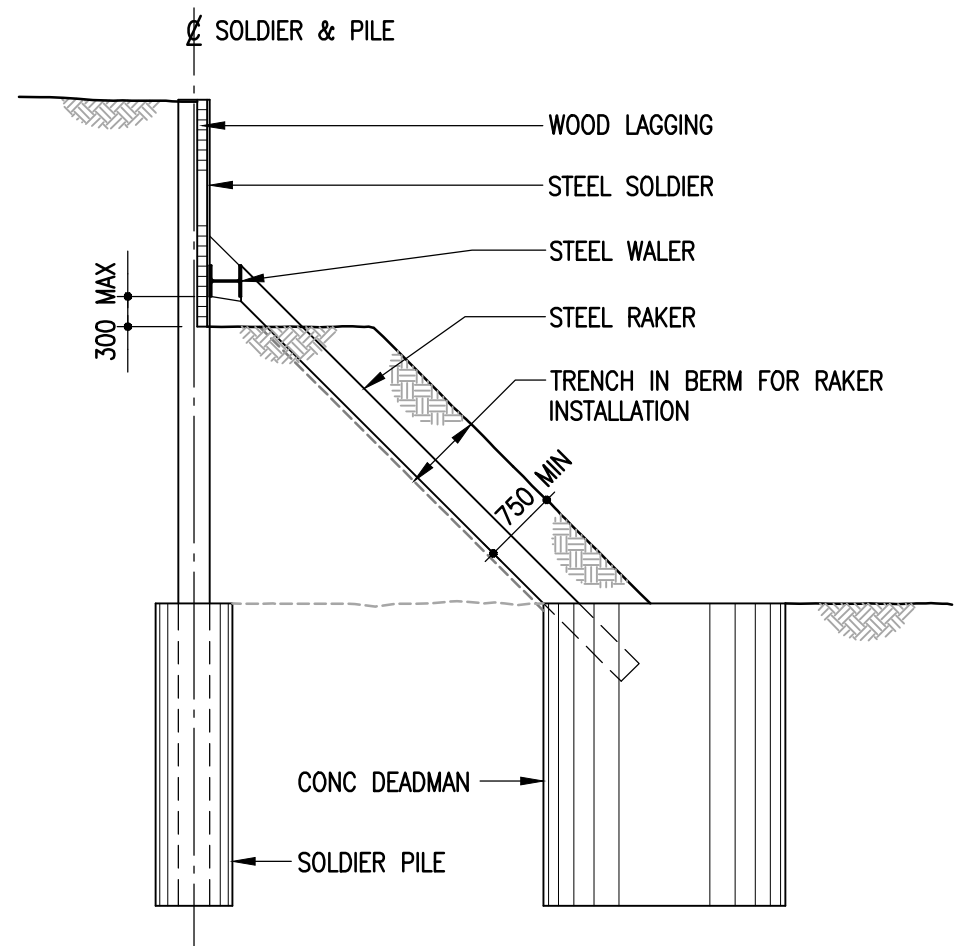


**DESIGN PARAMETERS**  
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 $k_p = 2.50$  (PASSIVE PRESSURE COEFFICIENT)  
 $q = 19.7 \text{ kN/m}^3$  (SOIL UNIT WEIGHT)  
 $q = 12.0 \text{ kPa}$  (SURCHARGE)  
 $\sigma_v = 80 \text{ kPa}$  (BEARING CAPACITY)  
 $h =$  DEPTH OF EXCAVATION  
 $d_1 =$  DEPTH OF SOLDIER PILE BELOW UNDISTURBED SOIL  
 $d_2 =$  DEPTH OF DEADMAN BELOW UNDISTURBED SOIL

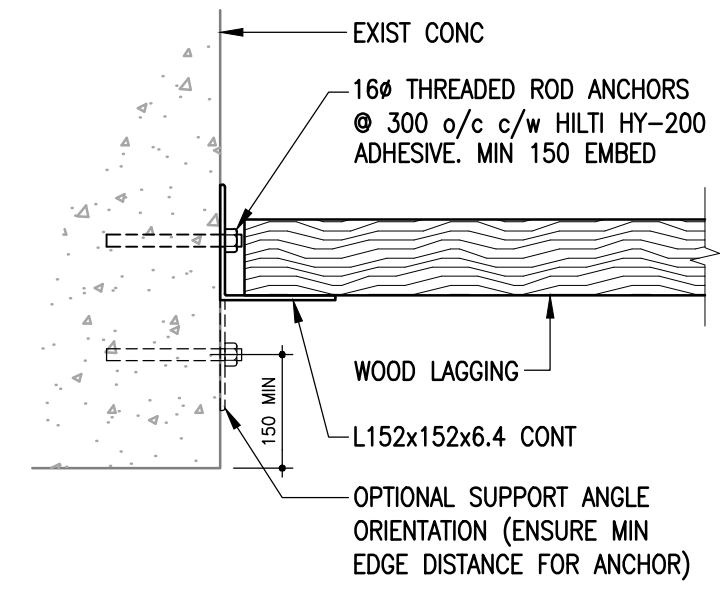
**TYPICAL BRACED EXCAVATION AT EXIST BUILDING DESIGN LOADS**



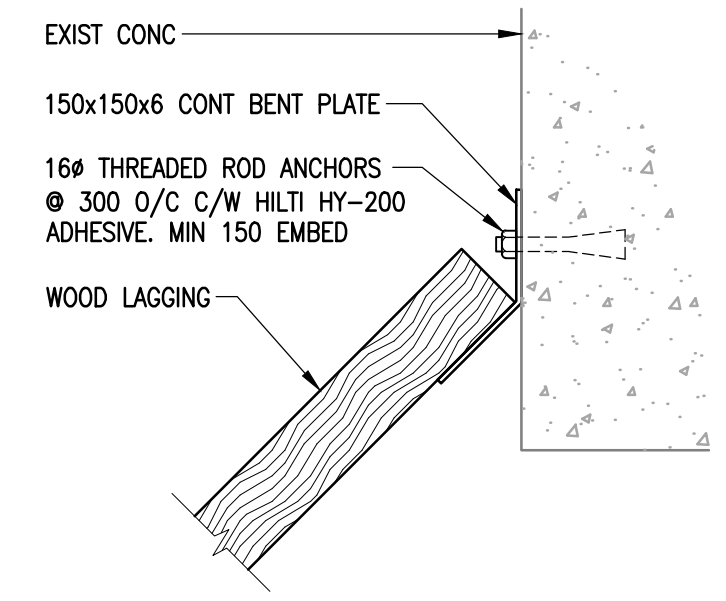
**DESIGN PARAMETERS**  
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 $k_p = 2.50$  (PASSIVE PRESSURE COEFFICIENT)  
 $q = 19.7 \text{ kN/m}^3$  (SOIL UNIT WEIGHT)  
 $q = 12.0 \text{ kPa}$  (SURCHARGE)  
 $\sigma_v = 80 \text{ kPa}$  (BEARING CAPACITY)  
 $h =$  DEPTH OF EXCAVATION  
 $d_1 =$  DEPTH OF SOLDIER PILE BELOW UNDISTURBED SOIL  
 $d_2 =$  DEPTH OF DEADMAN BELOW UNDISTURBED SOIL  
 $d_e =$  DEPTH TO UNDERSIDE EXISTING FOUNDATION  
 $x =$  DISTANCE BETWEEN EXISTING FOUNDATION WALL & NEW SHORING



**TYPICAL SLOPING BERM EXCAVATION DETAIL**  
1 : 75



**1 DETAIL**  
S2.1 1 : 10



**2 DETAIL**  
S2.1 1 : 10

**AS BUILT DRAWINGS**

**APEGM**  
Certificate of Authorization  
Crosier Kilgour & Partners Ltd.  
No. 235 Date: June 25, 2015

No.	Date	Issue/Revision	By
5	21 AUG 2015	AS-BUILT	
4	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
3	28 JAN 2014	ISSUED FOR EXCAVATION PERMIT	BF
2	01 DEC 2014	ISSUED FOR CONSTRUCTION	BF
1	19 NOV 2014	ISSUED FOR REVIEW	BF

ORIGINAL DRAWING  
SEALED BY  
B. FLISAK  
AND DATED  
June 25, 2015

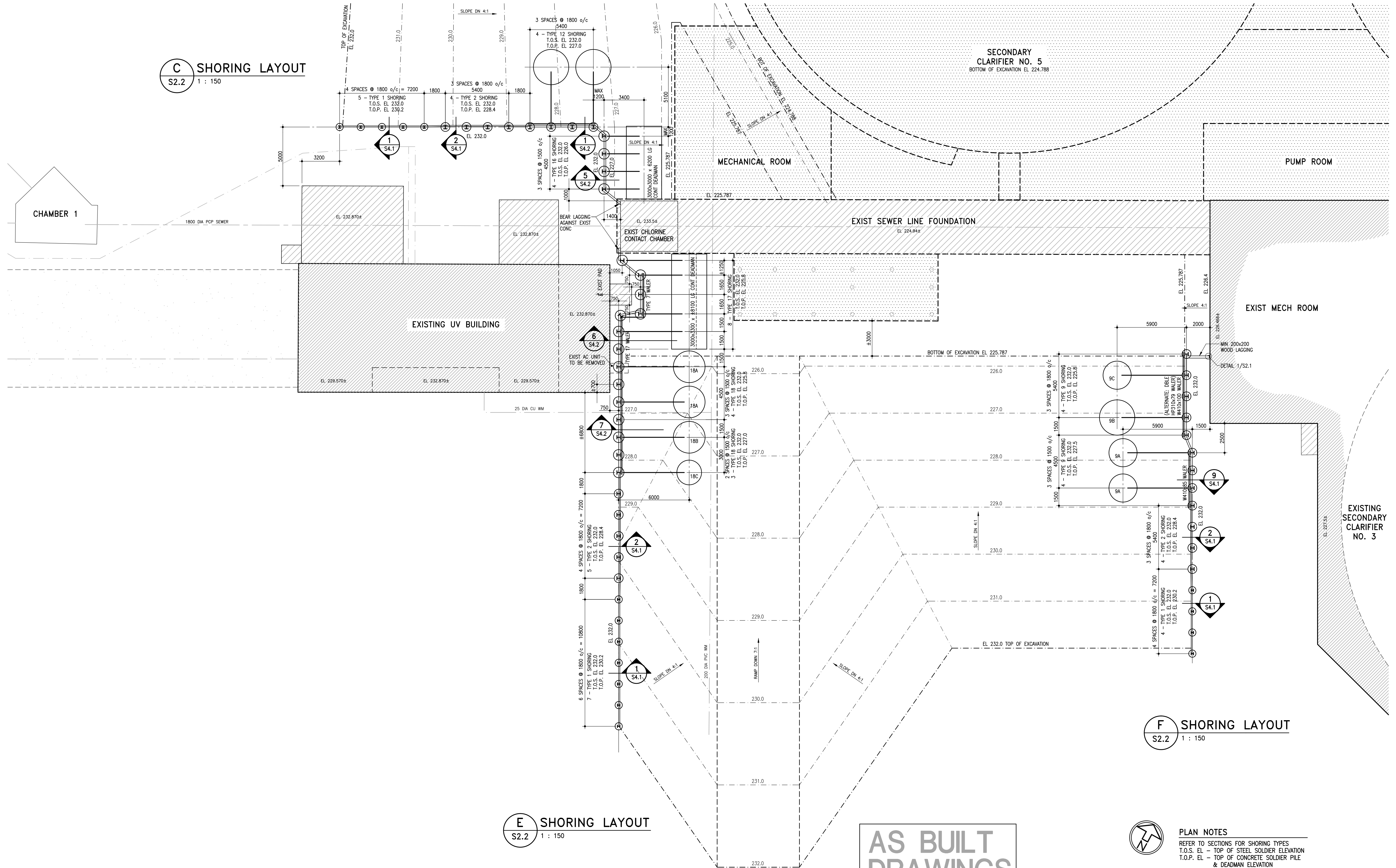
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CONSULTING STRUCTURAL ENGINEERS

The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.

Project		THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION			
Sheet Title		BIOREACTOR BUILDING SHORING LAYOUTS			
Design		JAL	Drawn	KJL	Checked
Scale		AS NOTED	Date	21 AUG 2015	File
Sheet No.		S2.1			

**C SHORING LAYOUT**  
S2.2 1 : 150



**E SHORING LAYOUT**  
S2.2 1 : 150

**F SHORING LAYOUT**  
S2.2 1 : 150

**AS BUILT DRAWINGS**

**PLAN NOTES**  
REFER TO SECTIONS FOR SHORING TYPES  
T.O.S. EL - TOP OF STEEL SOLDIER ELEVATION  
T.O.P. EL - TOP OF CONCRETE SOLDIER PILE & DEADMAN ELEVATION  
REFER TO DWG S2.1 FOR SHORING DESIGN LOADS & TYPICAL SLOPING BERM EXCAVATION DETAIL.



No.	Date	Issue/Revision	By
3	21 AUG 2015	AS-BUILT	
2	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
1	28 JAN 2014	ISSUED FOR EXCAVATION PERMIT	BF

ORIGINAL DRAWING SEALED BY B. FLISAK AND DATED June 25, 2015

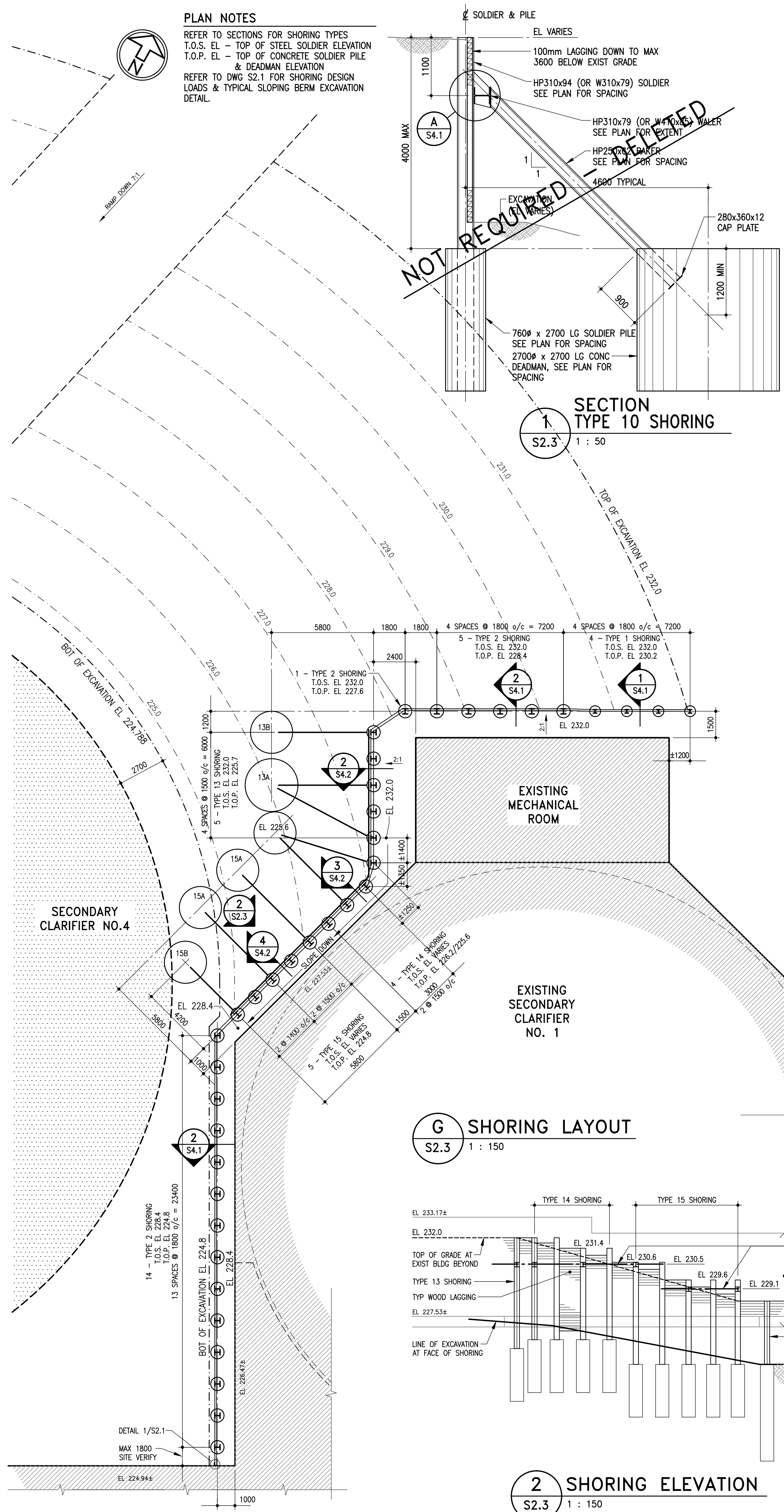
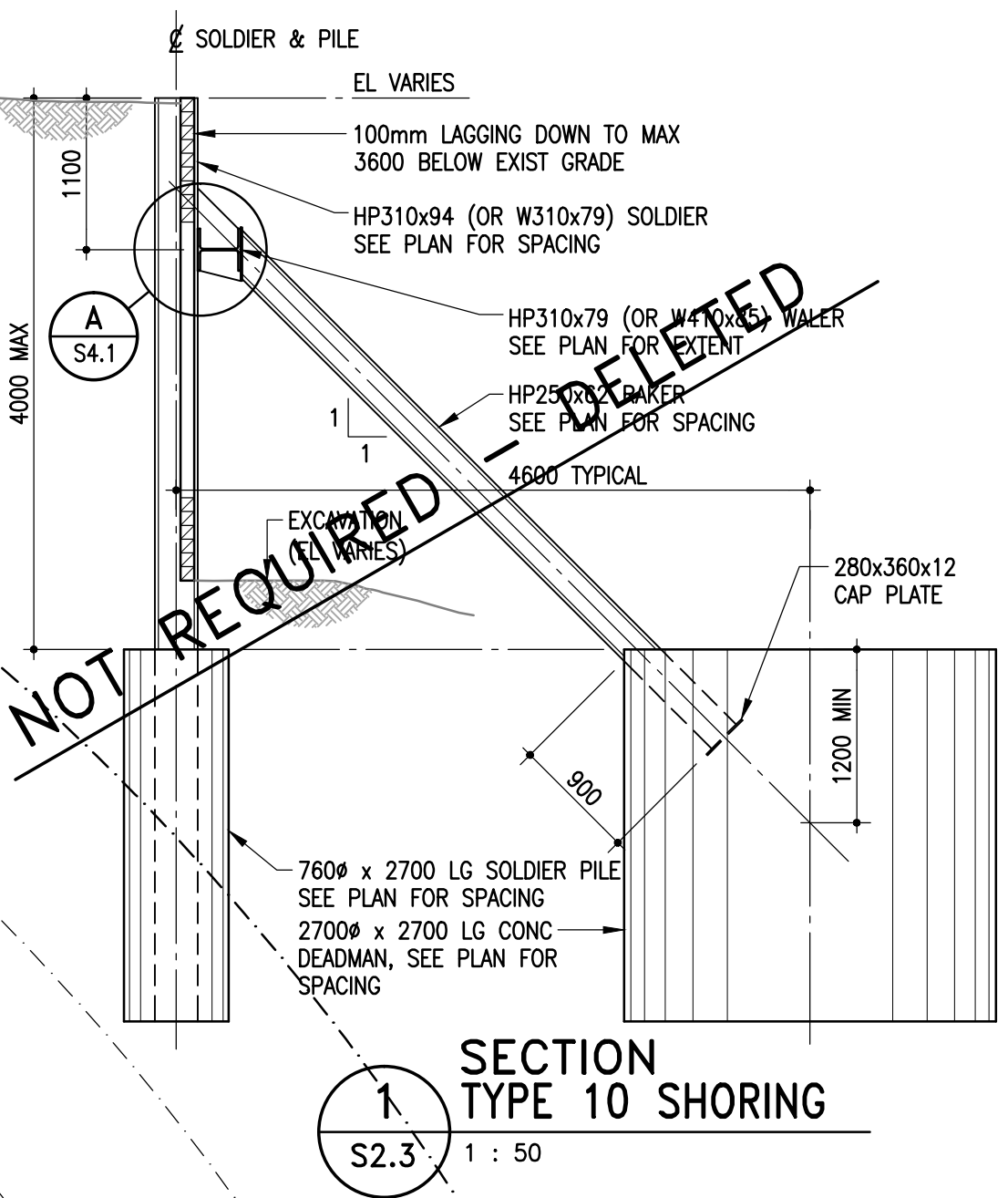


Project THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION						
Sheet Title UV EXPANSION & SECONDARY CLARIFIER NO. 5 SHORING LAYOUTS						Sheet No.
S2.2						
Design	Drawn	Checked	Scale	Date	File	
JAL	KJL	BF	AS NOTED	21 AUG 2015	2014-1223	

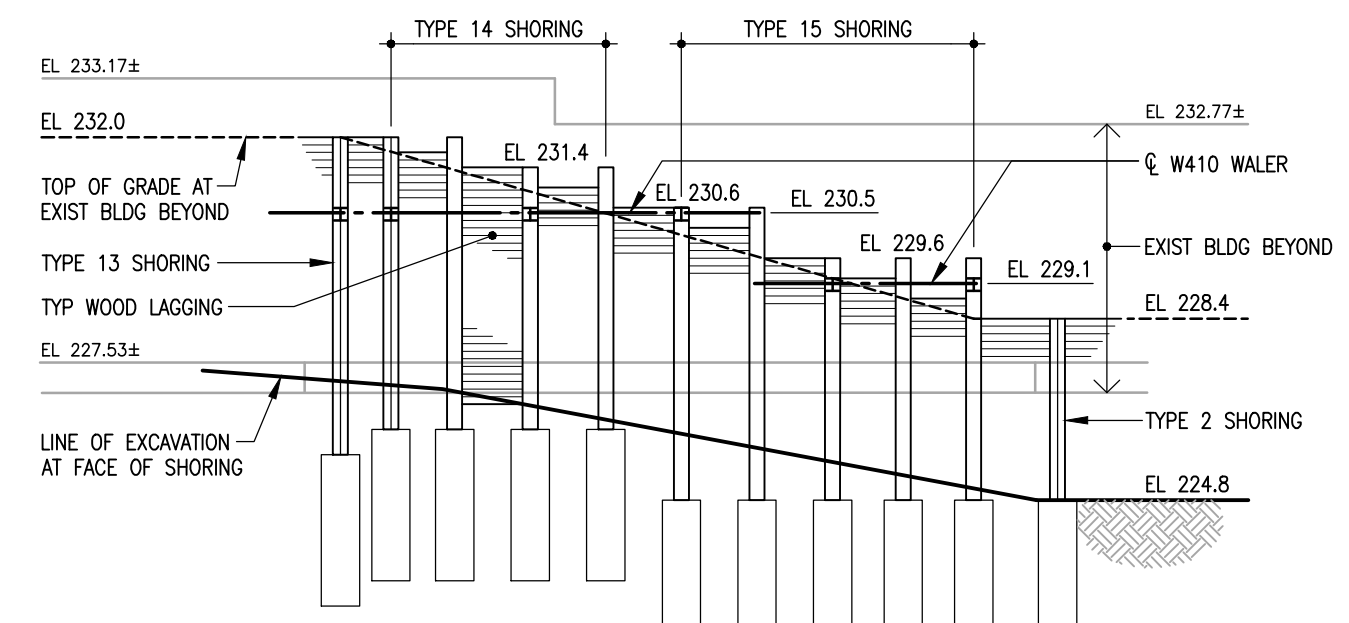
The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.

**PLAN NOTES**

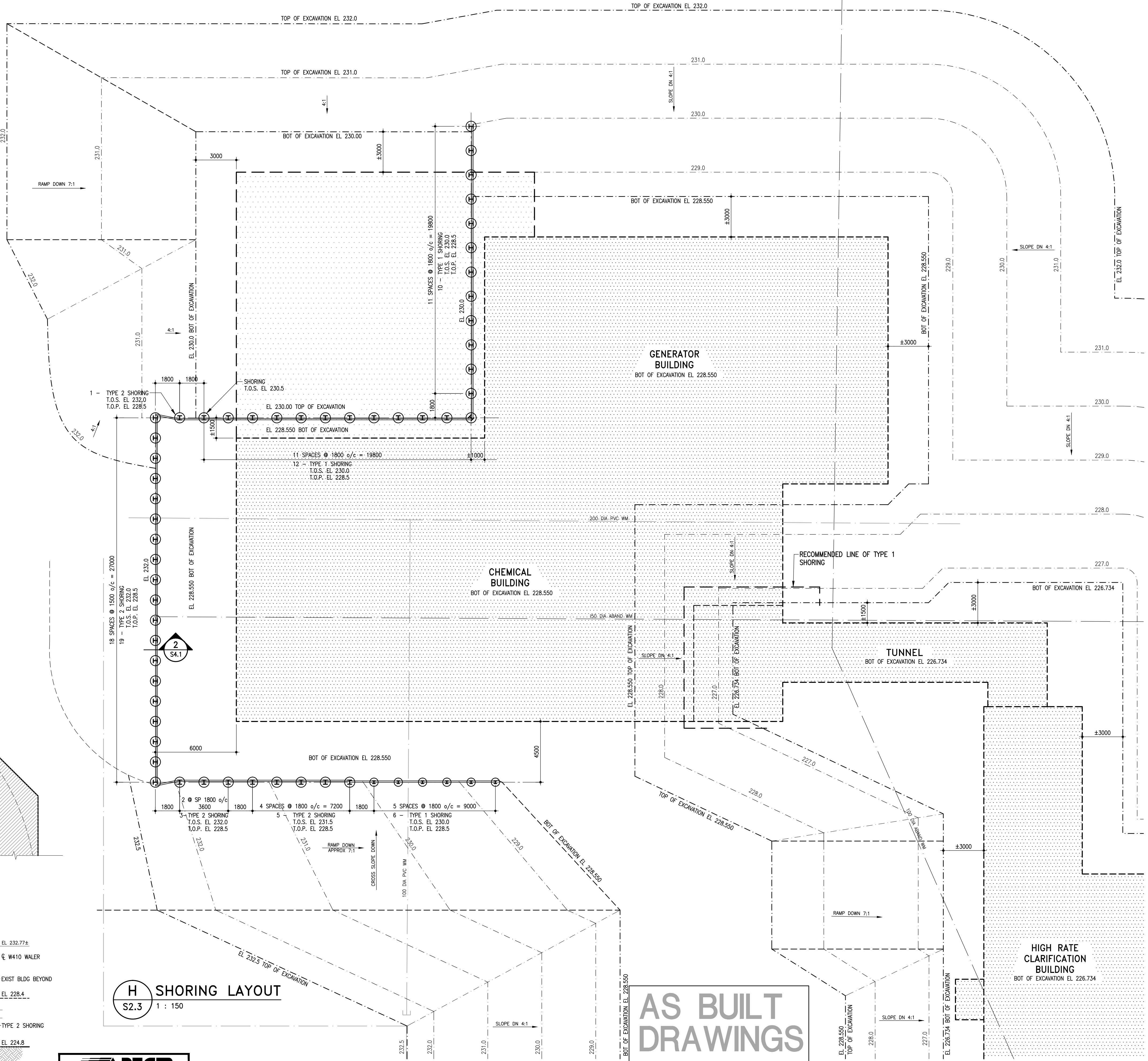
REFER TO SECTIONS FOR SHORING TYPES  
 T.O.S. EL - TOP OF STEEL SOLDIER ELEVATION  
 T.O.P. EL - TOP OF CONCRETE SOLDIER PILE  
 & DEADMAN ELEVATION  
 REFER TO DWG S2.1 FOR SHORING DESIGN  
 LOADS & TYPICAL SLOPING BERM EXCAVATION  
 DETAIL.



**G SHORING LAYOUT**  
 S2.3 1 : 150



**2 SHORING ELEVATION**  
 S2.3 1 : 150



**H SHORING LAYOUT**  
 S2.3 1 : 150

**AS BUILT DRAWINGS**

**APECM**  
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 No. 235 Date: June 25, 2015

No.	Date	Issue/Revision	By
5	21 AUG 2015	AS-BUILT	
4	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
3	7 MAY 2015	ISSUED FOR 'H', 'J' & 'K' SHORING CONSTRUCTION	BF
2	28 JAN 2015	ISSUED FOR EXCAVATION PERMIT	BF
1	16 DEC 2014	ISSUED FOR CONSTRUCTION	BF

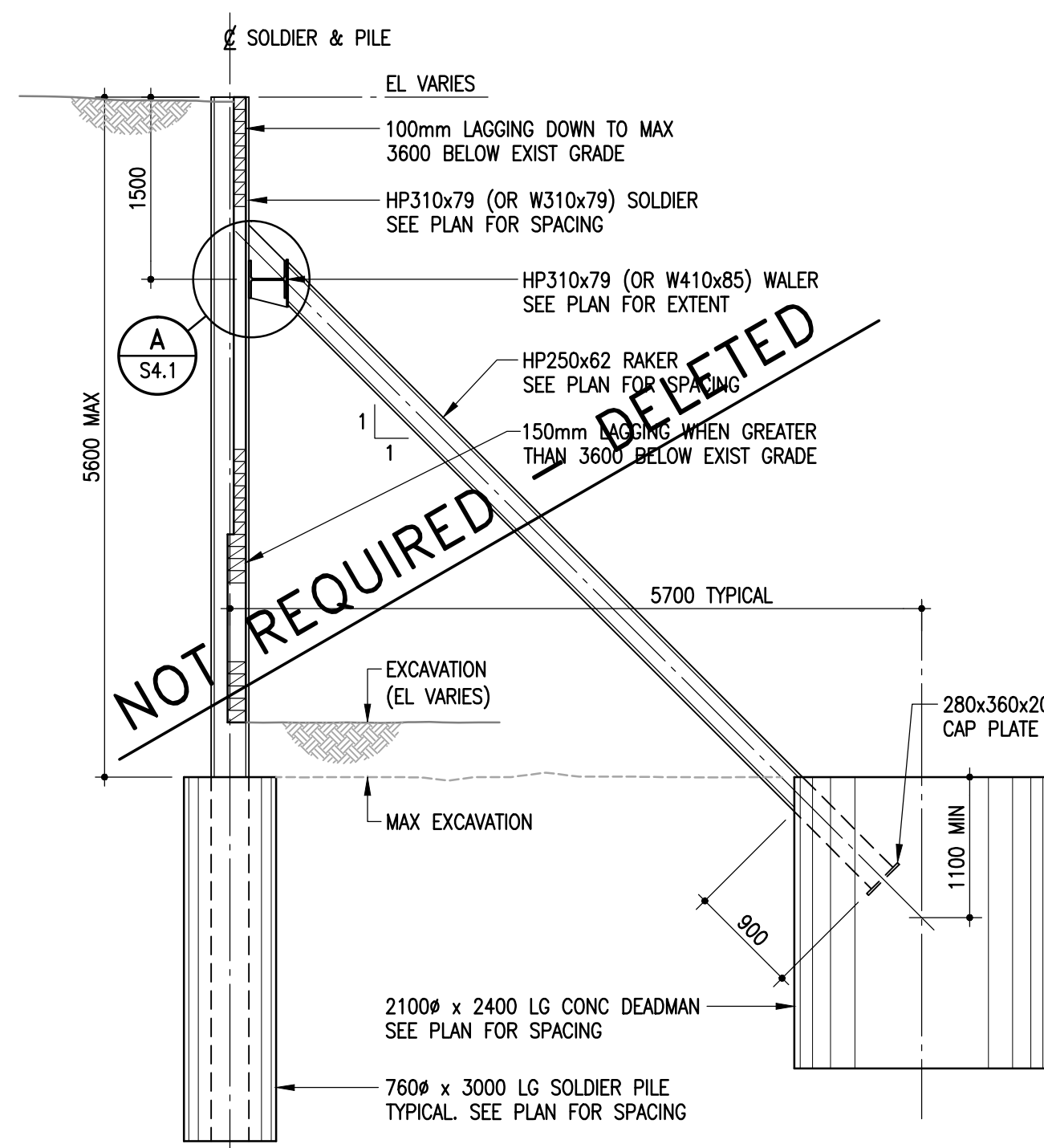
ORIGINAL DRAWING  
 SEALED BY  
 B. FLISAK  
 AND DATED  
 June 25, 2015

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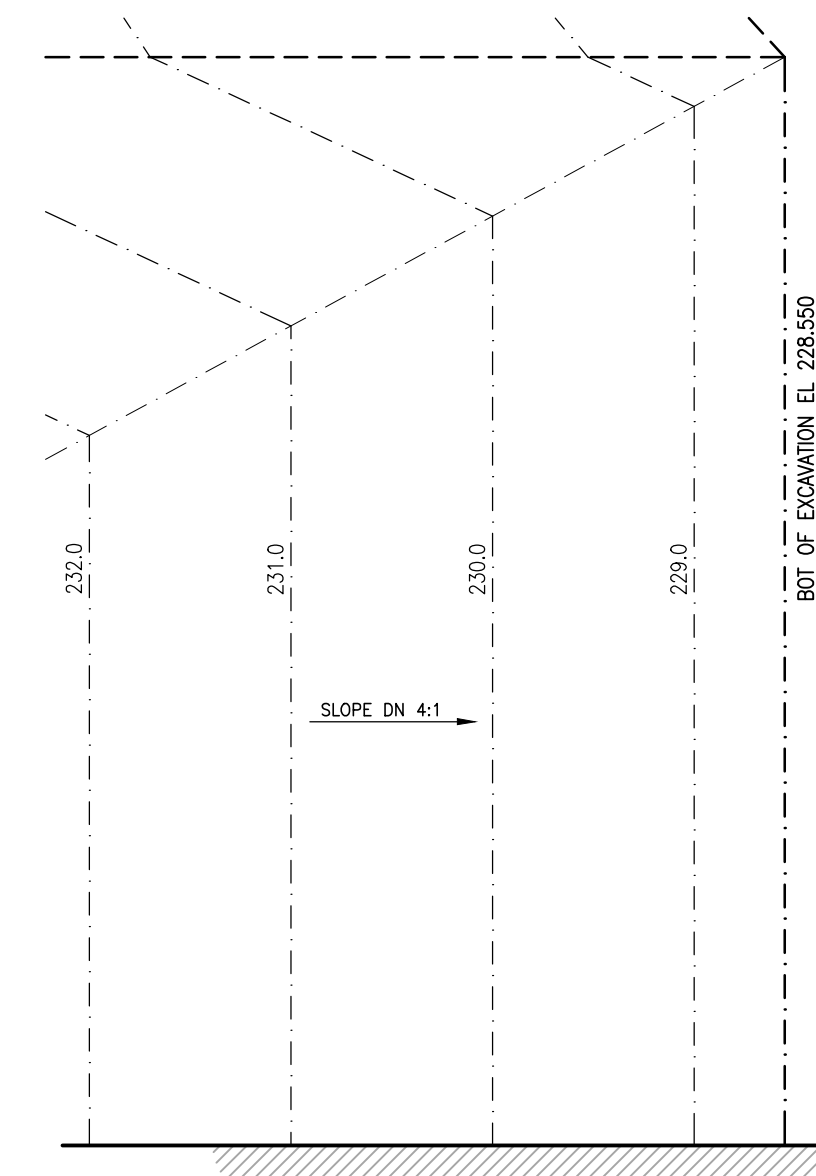
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The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.

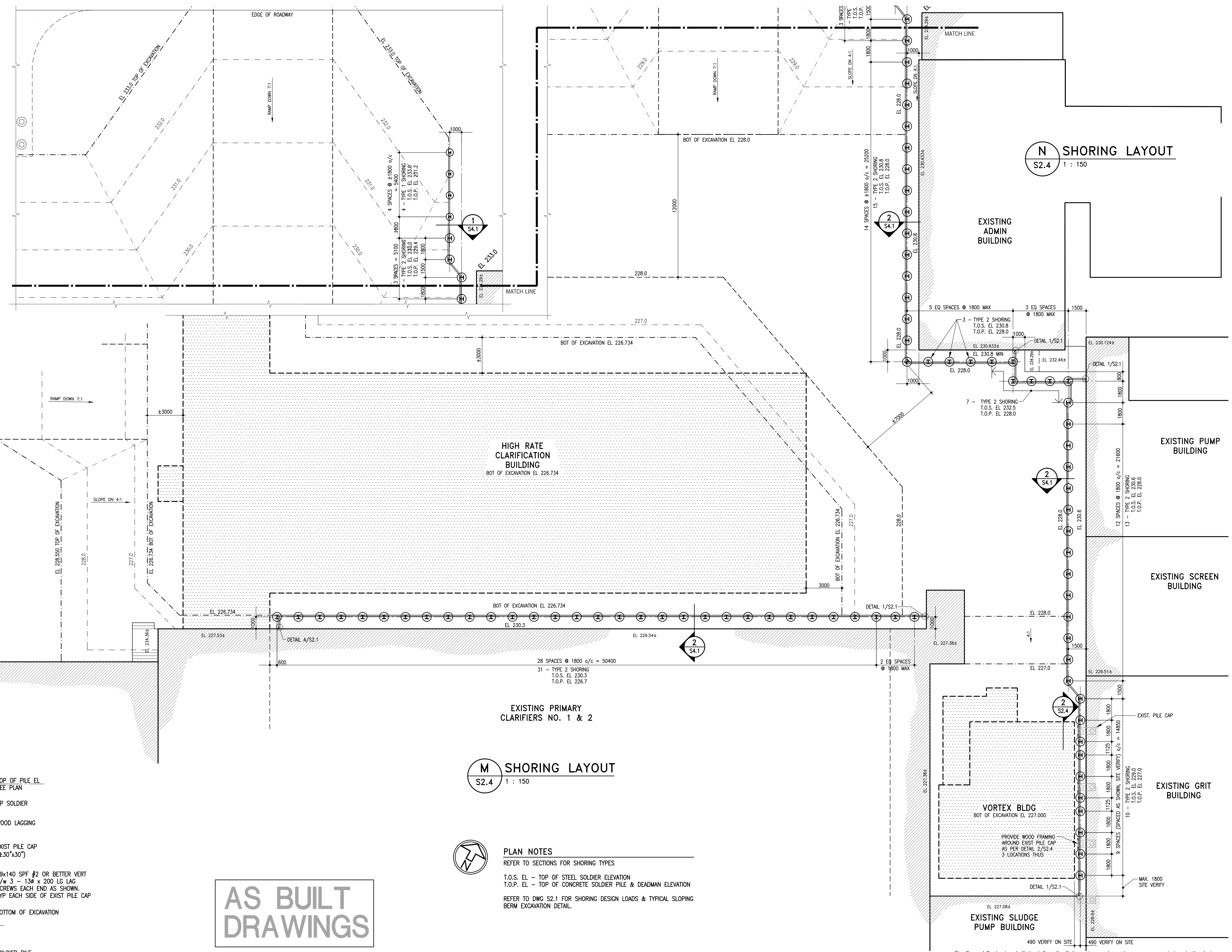
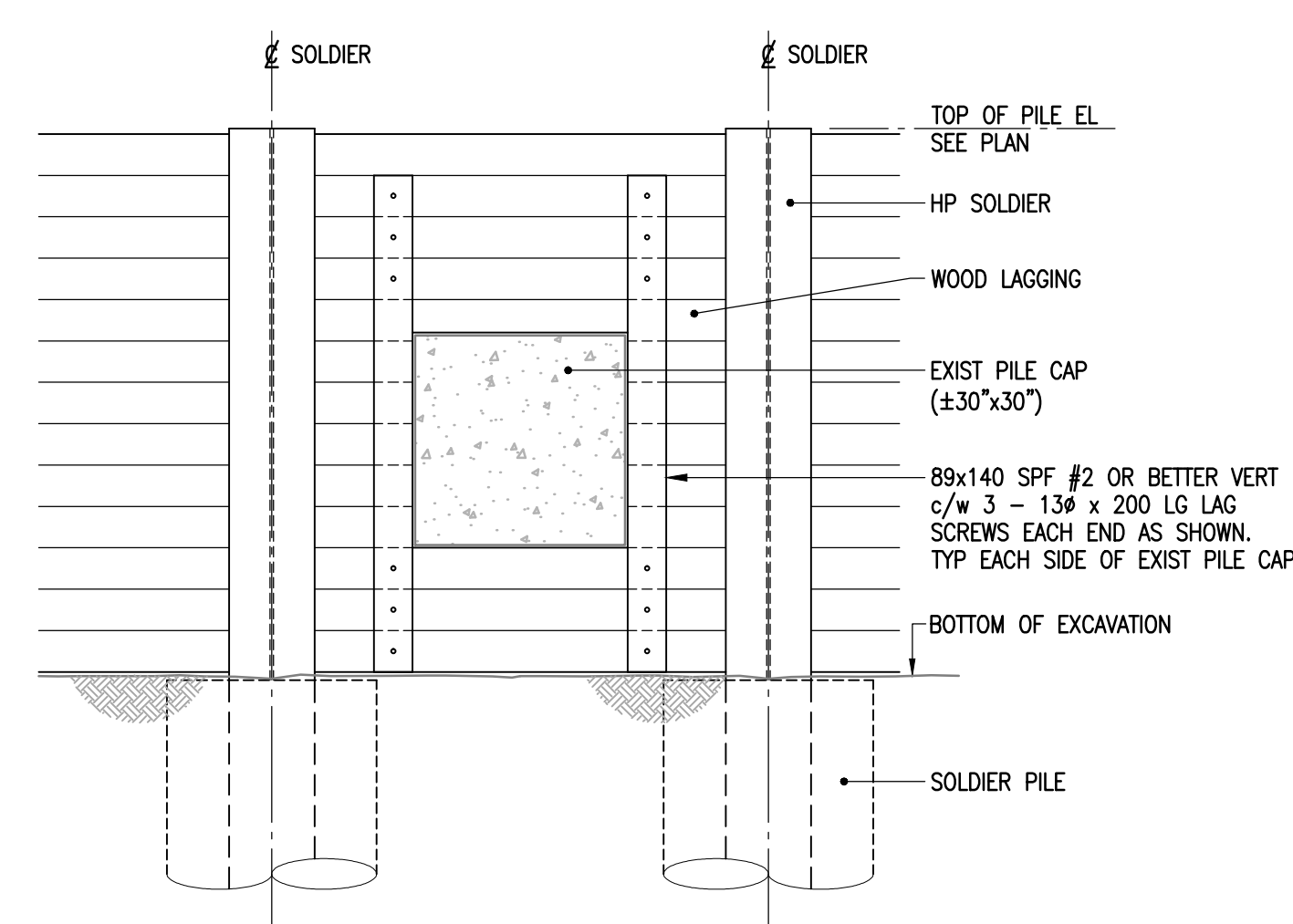
Project		THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION			
Sheet Title		SECONDARY CLARIFIER NO. 4 & CHEMICAL/GENERATOR BLDG SHORING LAYOUTS			
Design		Drawn		Checked	
JAL	KJL	BF		AS NOTED	
Date		File		Scale	
21 AUG 2015		2014-1223		AS NOTED	
Sheet No.					S2.3



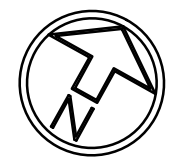
**1 SECTION - TYPE 11 SHORING**  
S2.4 1 : 50



**2 DETAIL - SHORING AT EXISTING PILE CAP**  
S2.4 1 : 25



**M SHORING LAYOUT**  
S2.4 1 : 150



**PLAN NOTES**  
REFER TO SECTIONS FOR SHORING TYPES  
T.O.S. EL - TOP OF STEEL SOLDIER ELEVATION  
T.O.P. EL - TOP OF CONCRETE SOLDIER PILE & DEADMAN ELEVATION  
REFER TO DWG S2.1 FOR SHORING DESIGN LOADS & TYPICAL SLOPING BERM EXCAVATION DETAIL.

**AS BUILT DRAWINGS**

**APEGM**  
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No. 235 Date: June 25, 2015

No.	Date	Issue/Revision	By
7	21 AUG 2015	AS-BUILT	
6	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
5	28 APR 2015	ISSUED FOR 'L' SHORING CONSTRUCTION	BF
4	14 APR 2015	ISSUED FOR 'N' SHORING CONSTRUCTION	BF
3	30 MAR 2015	ISSUED FOR 'M' SHORING CONSTRUCTION	BF
2	28 JAN 2015	ISSUED FOR EXCAVATION PERMIT	BF
1	16 DEC 2014	ISSUED FOR CONSTRUCTION	BF

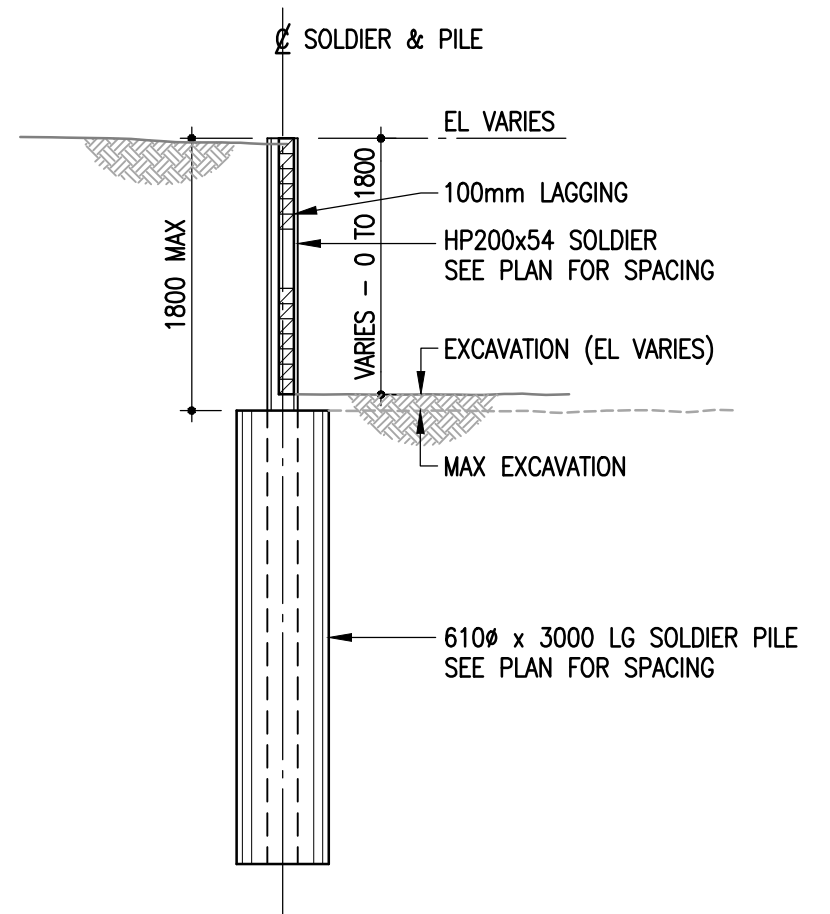
ORIGINAL DRAWING SEALED BY B. FLISAK AND DATED June 25, 2015

300-275 Carlton Street  
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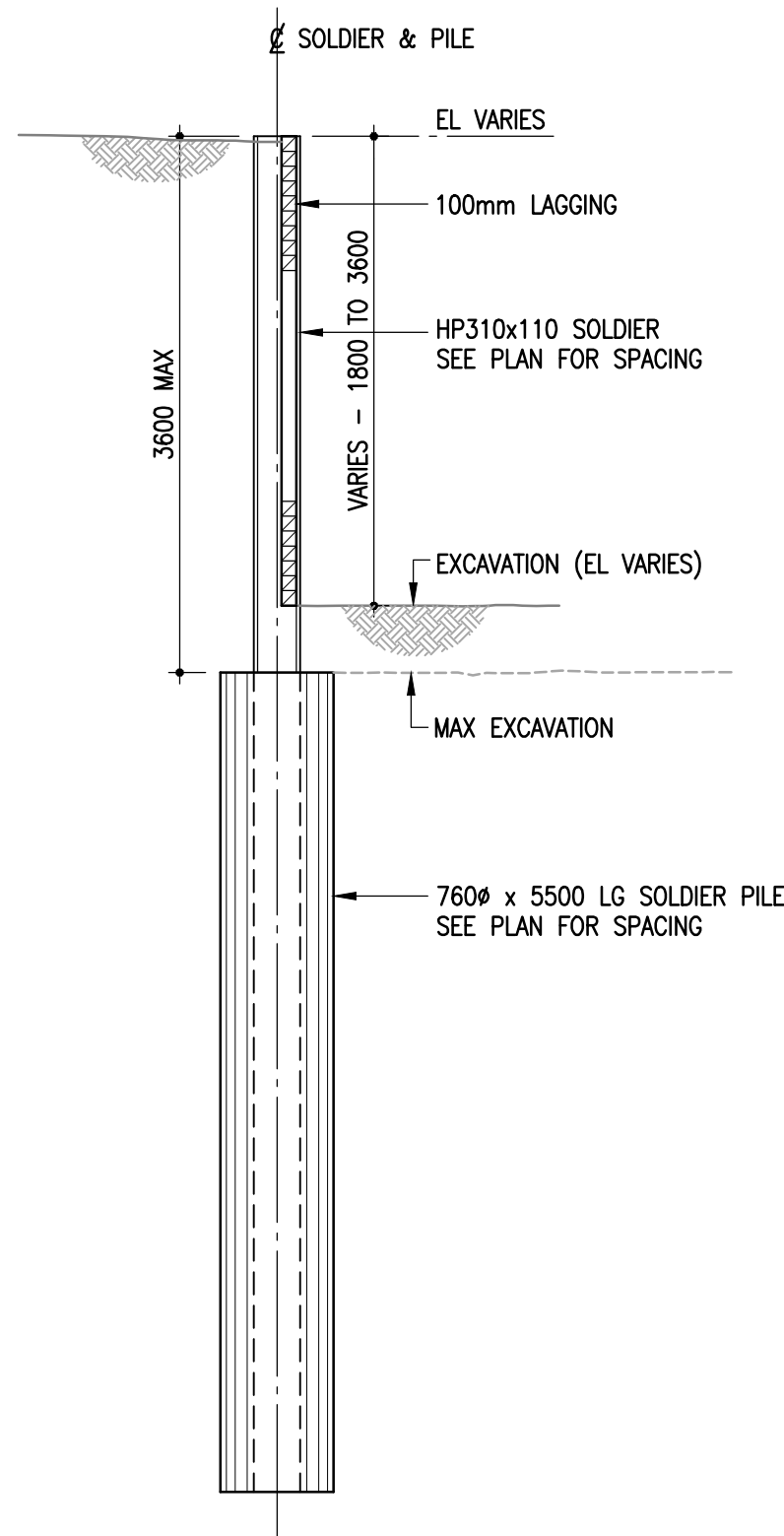
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CONSULTING STRUCTURAL ENGINEERS

Project		THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION			
Sheet Title		HIGH RATE CLARIFICATION BLDG & VORTEX BLDG SHORING LAYOUTS			
Design		JAL			
Drawn		KJL			
Checked		BF			
Scale		AS NOTED			
Date		21 AUG 2015			
File		2014-1223			
Sheet No.					<b>S2.4</b>

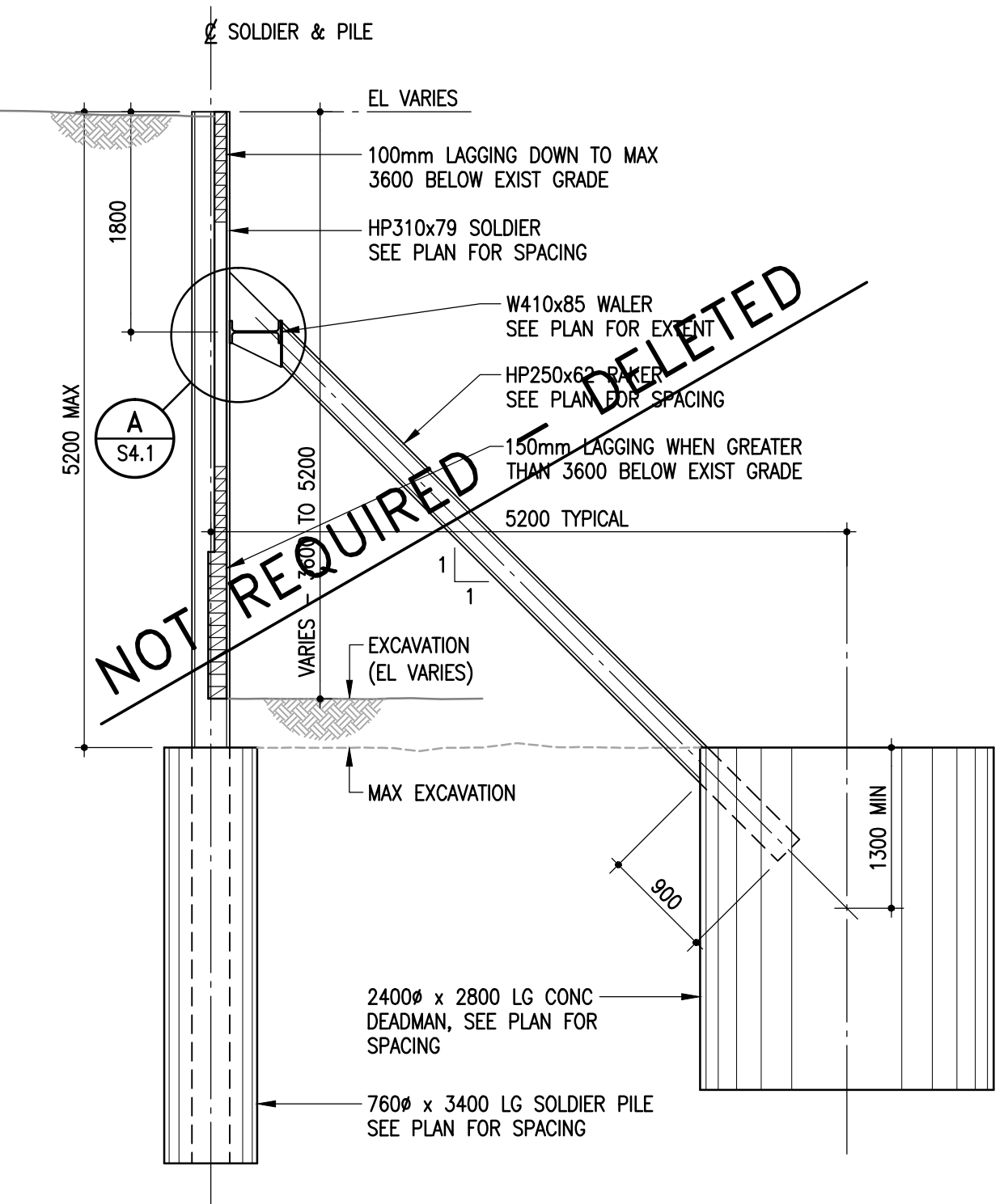
The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.



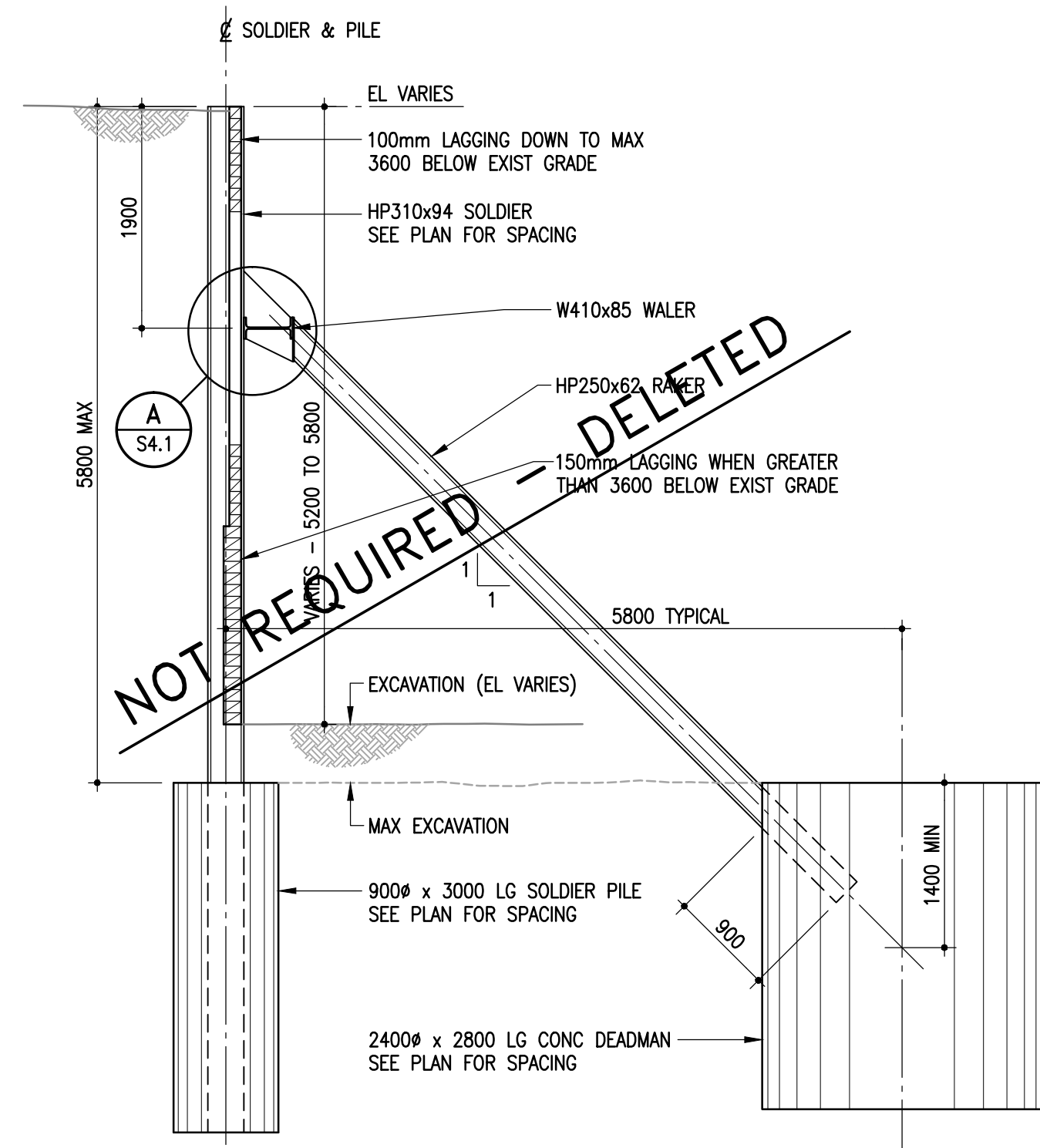
**1 SECTION - TYPE 1 SHORING**  
S4.1 1 : 50



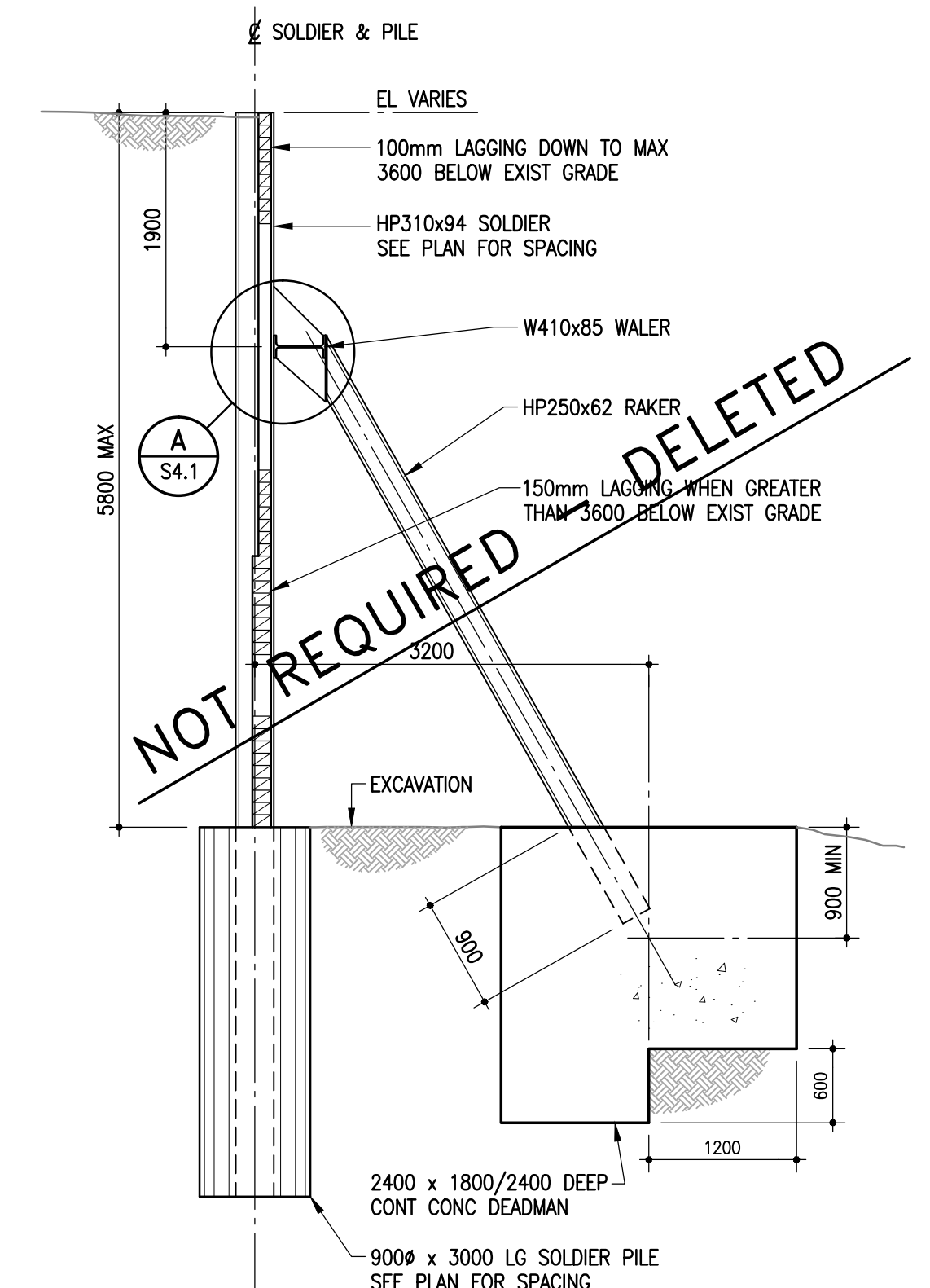
**2 SECTION - TYPE 2 SHORING**  
S4.1 1 : 50



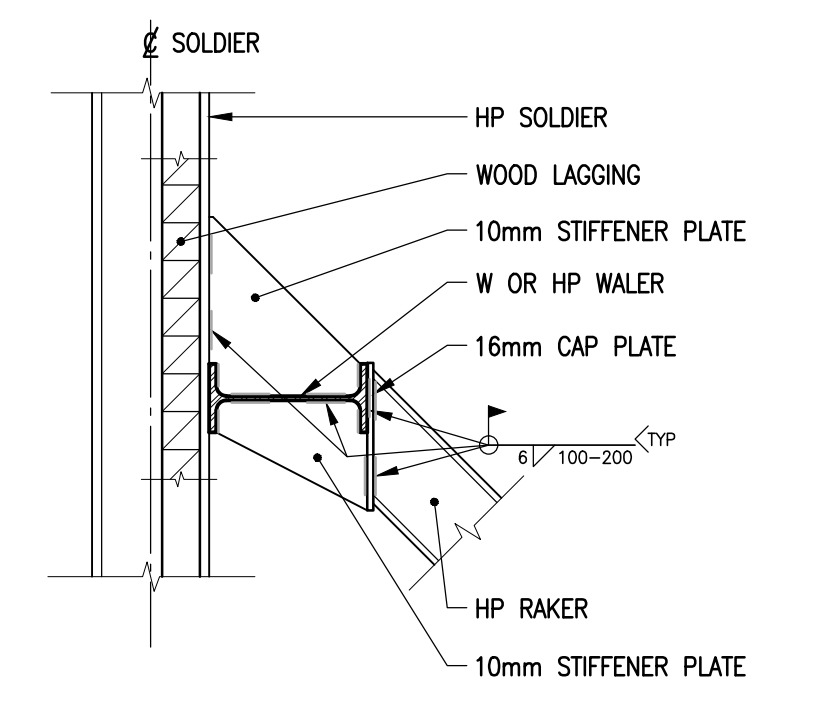
**3 SECTION - TYPE 3 SHORING**  
S4.1 1 : 50



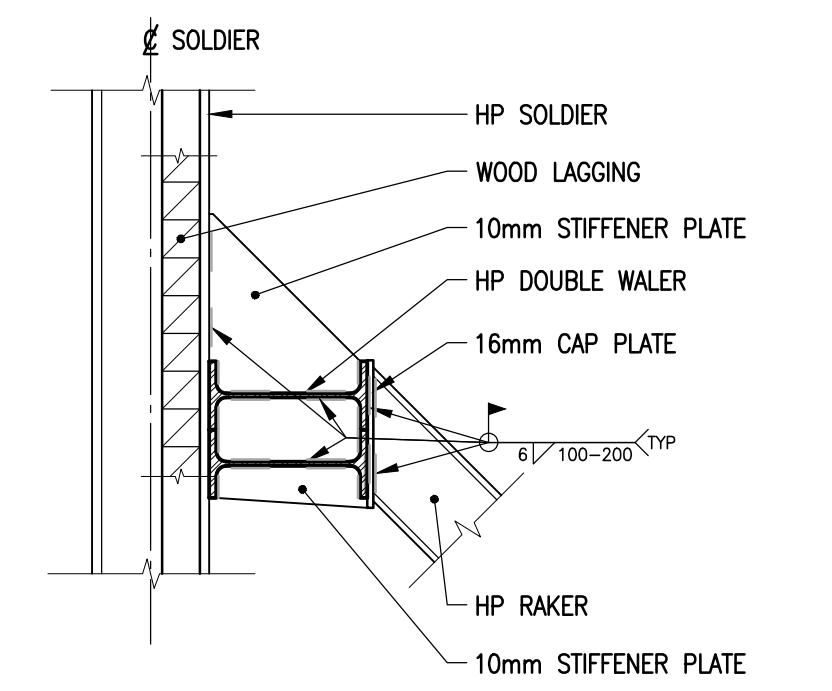
**4 SECTION - TYPE 4 SHORING**  
S4.1 1 : 50



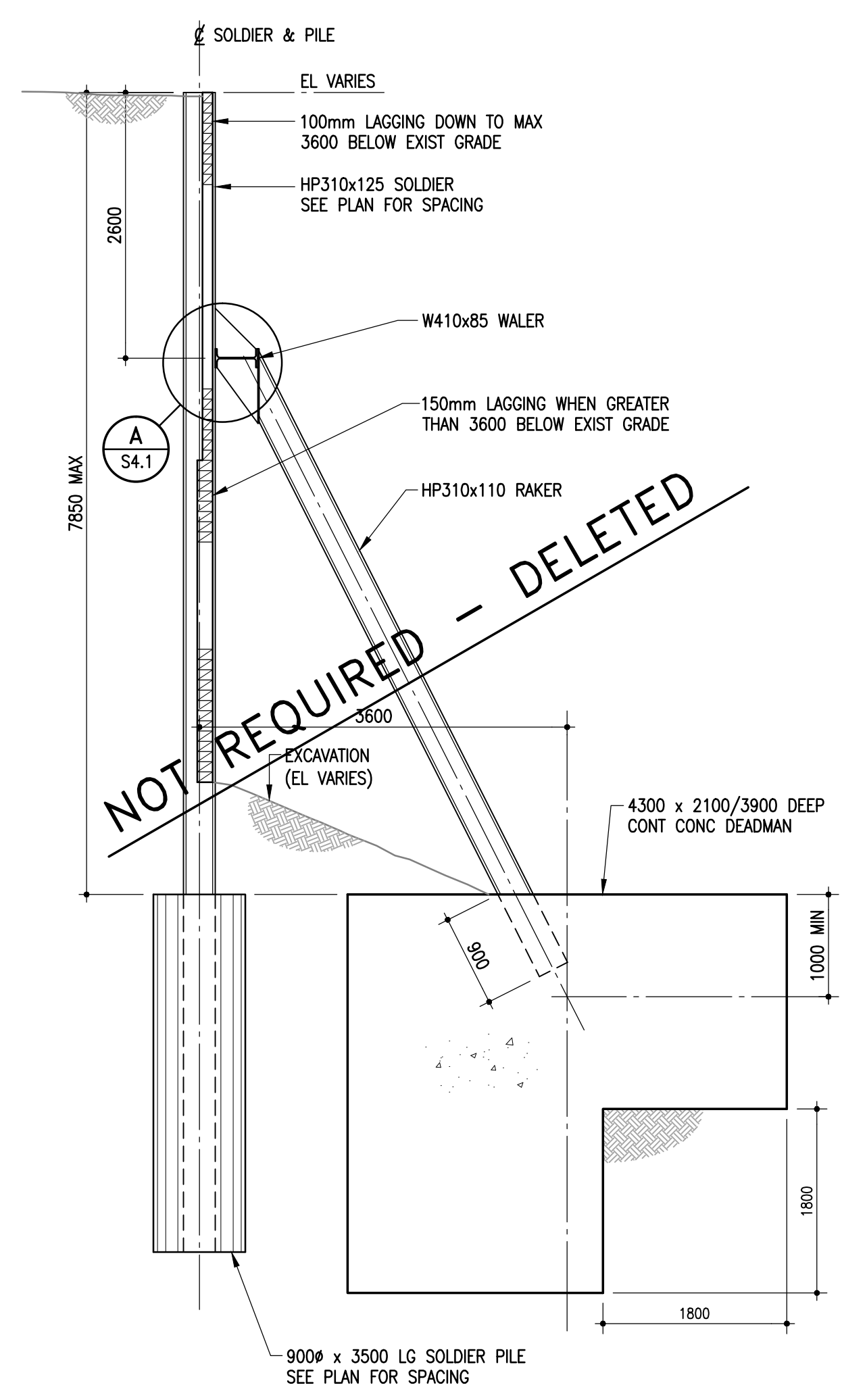
**5 SECTION - TYPE 5 SHORING**  
S4.1 1 : 50



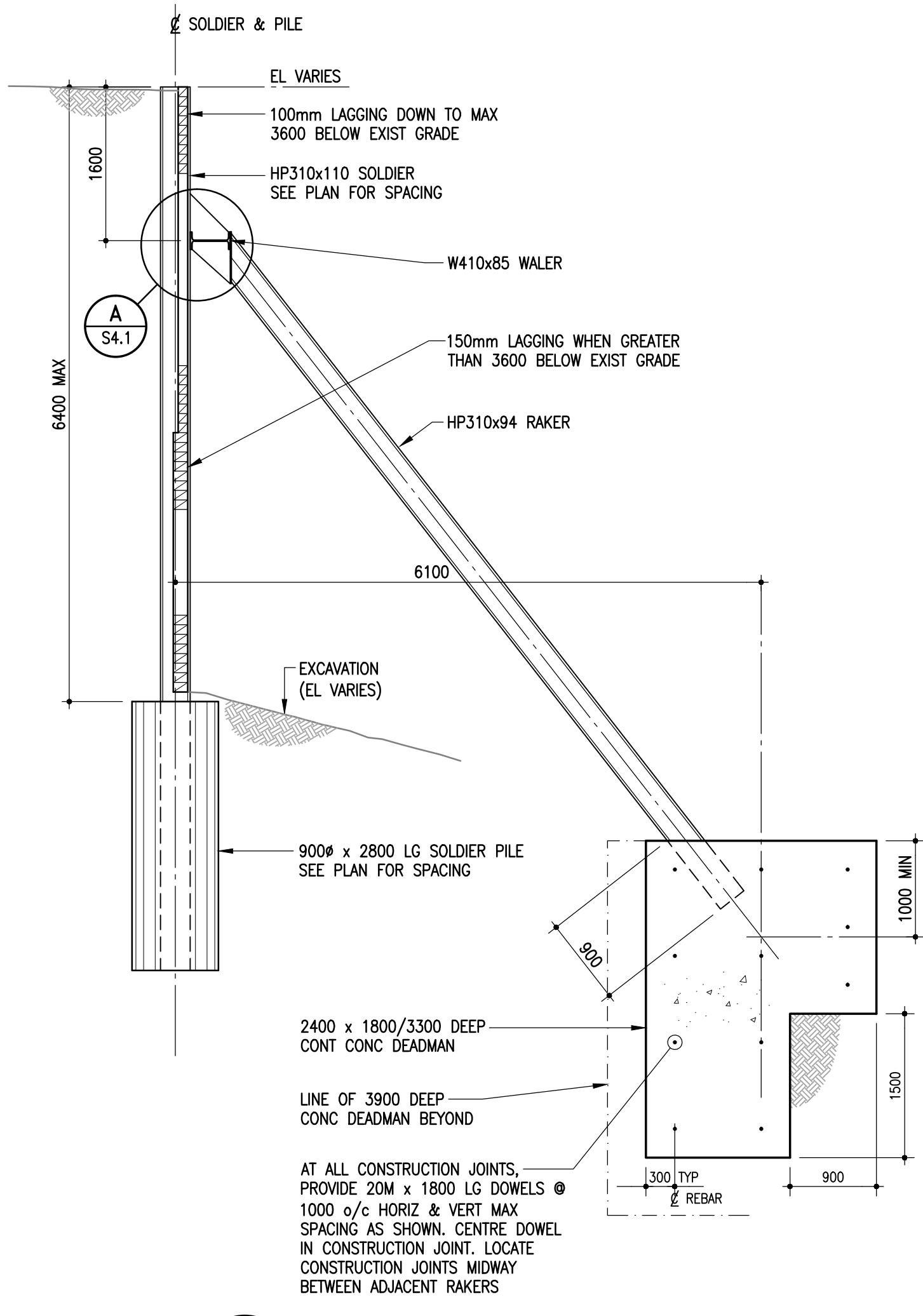
**A DETAIL - SINGLE WALER**  
S4.1 1 : 20



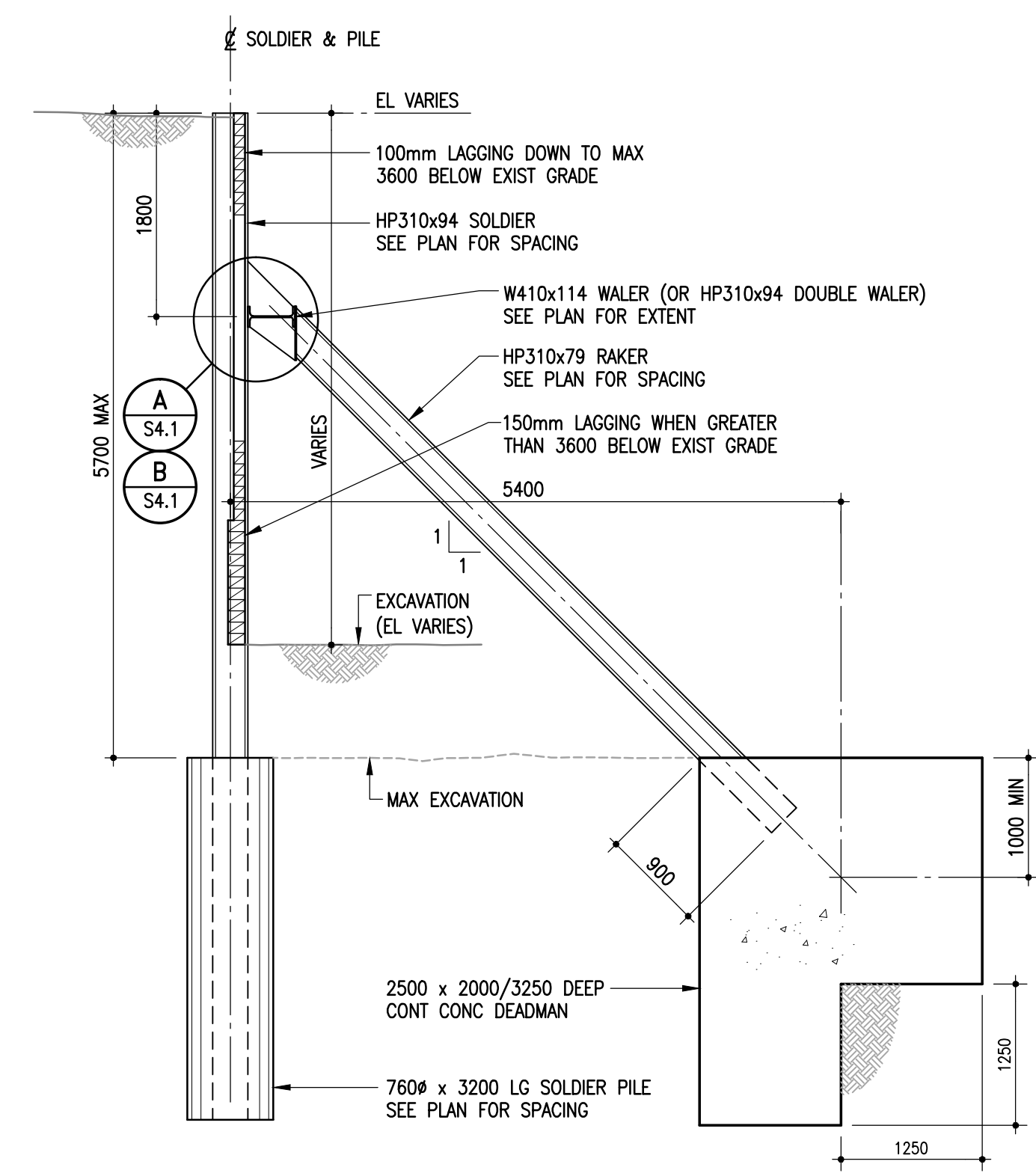
**B DETAIL - DOUBLE WALER**  
S4.1 1 : 20



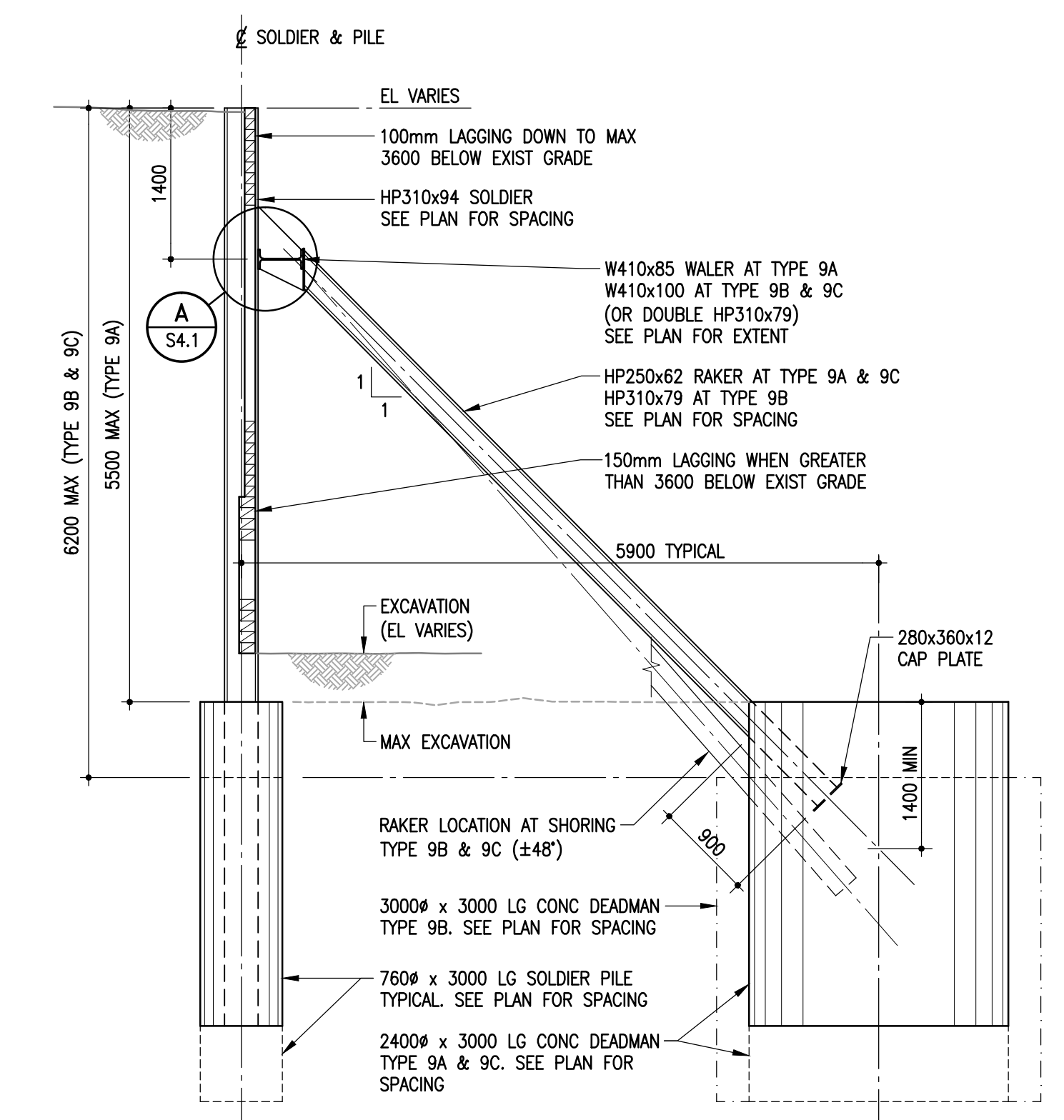
**6 SECTION - TYPE 6 SHORING**  
S4.1 1 : 50



**7 SECTION - TYPE 7 SHORING**  
S4.1 1 : 50



**8 SECTION - TYPE 8 SHORING**  
S4.1 1 : 50



**9 SECTION - TYPE 9 SHORING**  
S4.1 1 : 50

REFER TO SECTION 1/S2.3 FOR TYPE 10 SHORING

REFER TO SECTION 1/S2.4 FOR TYPE 11 SHORING

**AS BUILT DRAWINGS**



No.	Date	Issue/Revision	By
5	21 AUG 2015	AS-BUILT	
4	25 JUN 2015	RE-ISSUED FOR CONSTRUCTION	BF
3	28 JAN 2014	ISSUED FOR EXCAVATION PERMIT	BF
2	01 DEC 2014	ISSUED FOR CONSTRUCTION	BF
1	19 NOV 2014	ISSUED FOR REVIEW	BF

ORIGINAL DRAWING SEALED BY B. FLISAK AND DATED June 25, 2015

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**Crosier Kilgour & Partners Ltd.**  
CONSULTING STRUCTURAL ENGINEERS

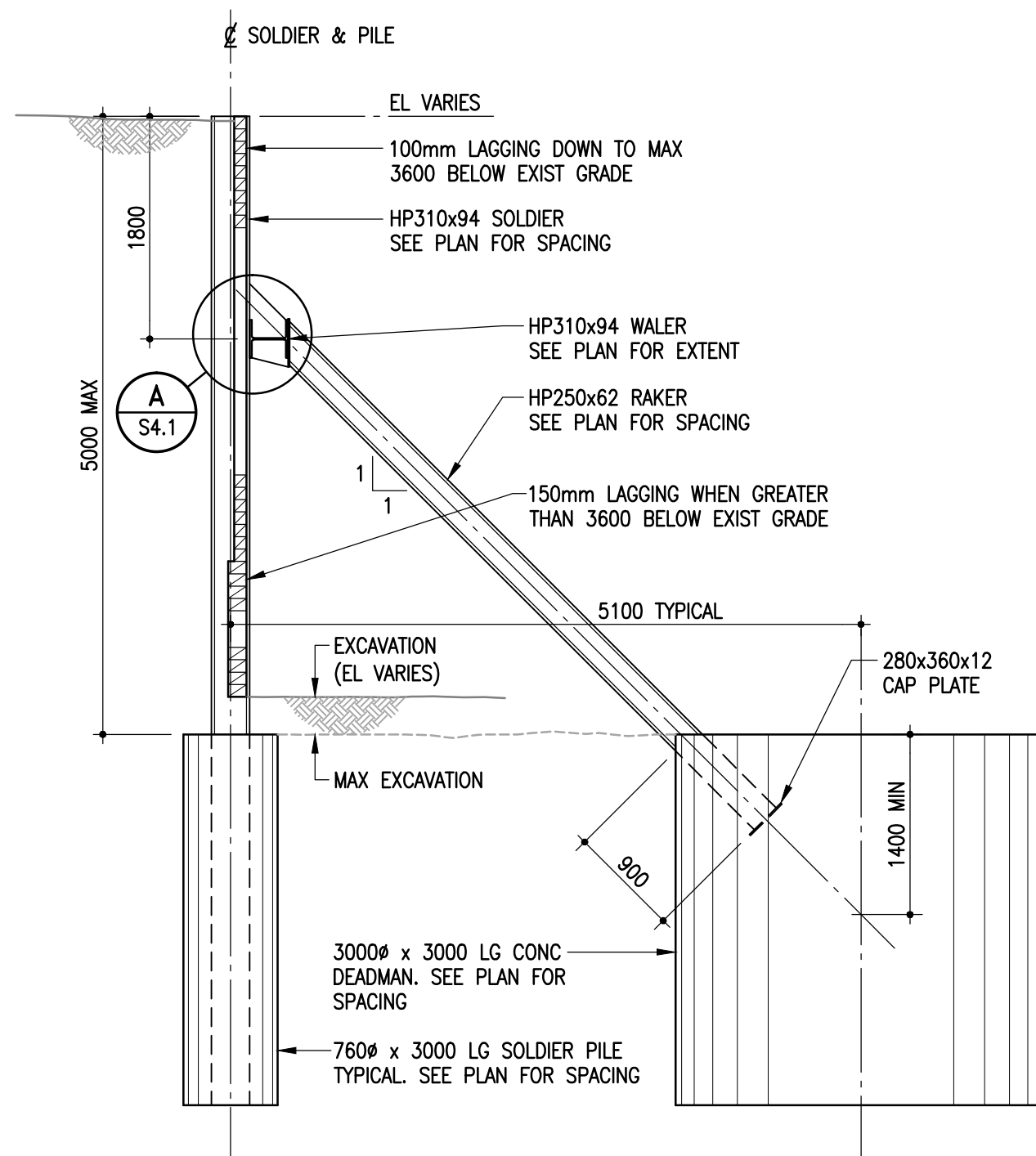
The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.

Project: THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT  
SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION  
SHORING AND EXCAVATION

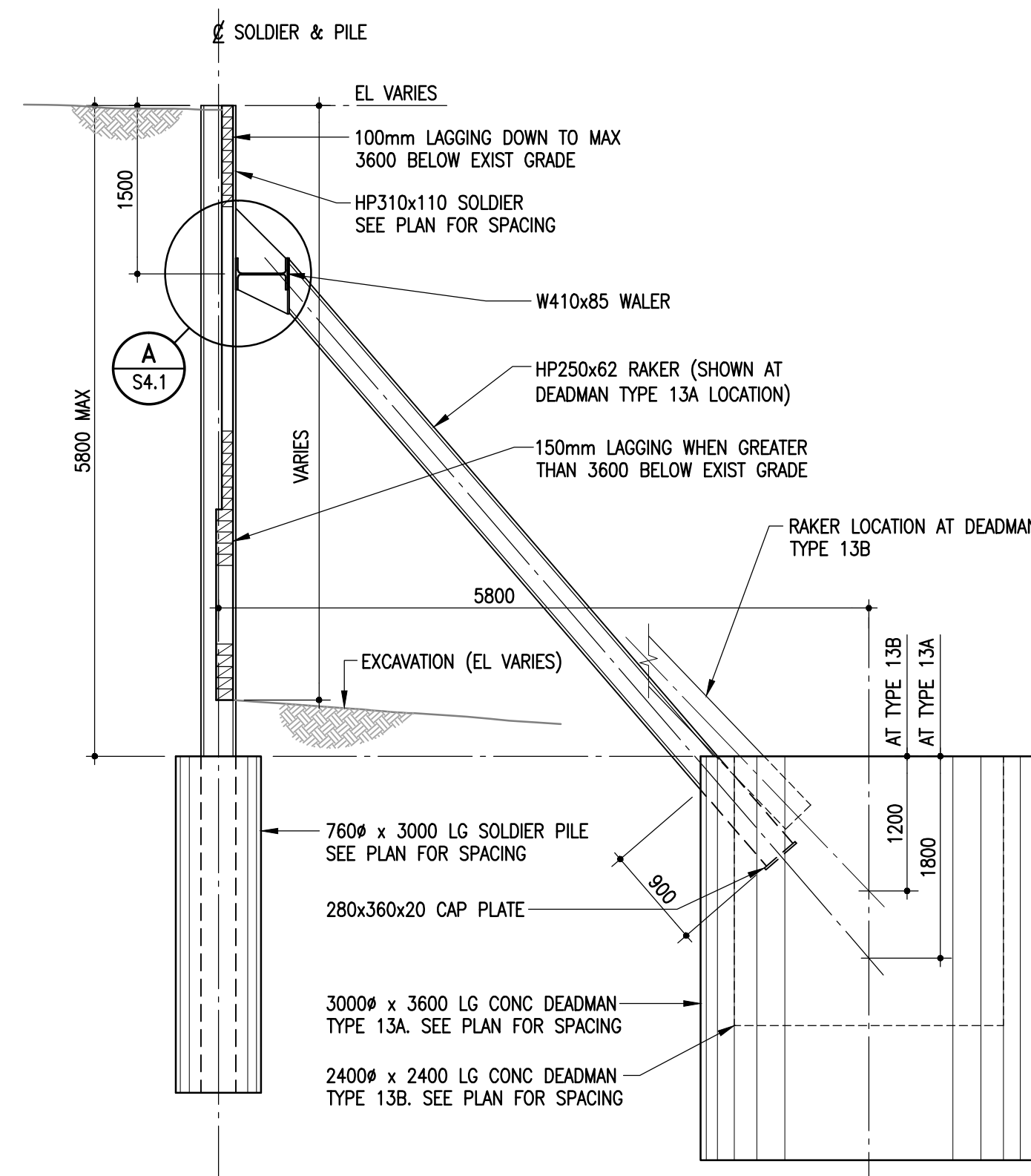
Sheet Title: SHORING SECTIONS

Design: JAL, Drawn: KJL, Checked: BF, Scale: AS NOTED, Date: 21 AUG 2015, File: 2014-1223

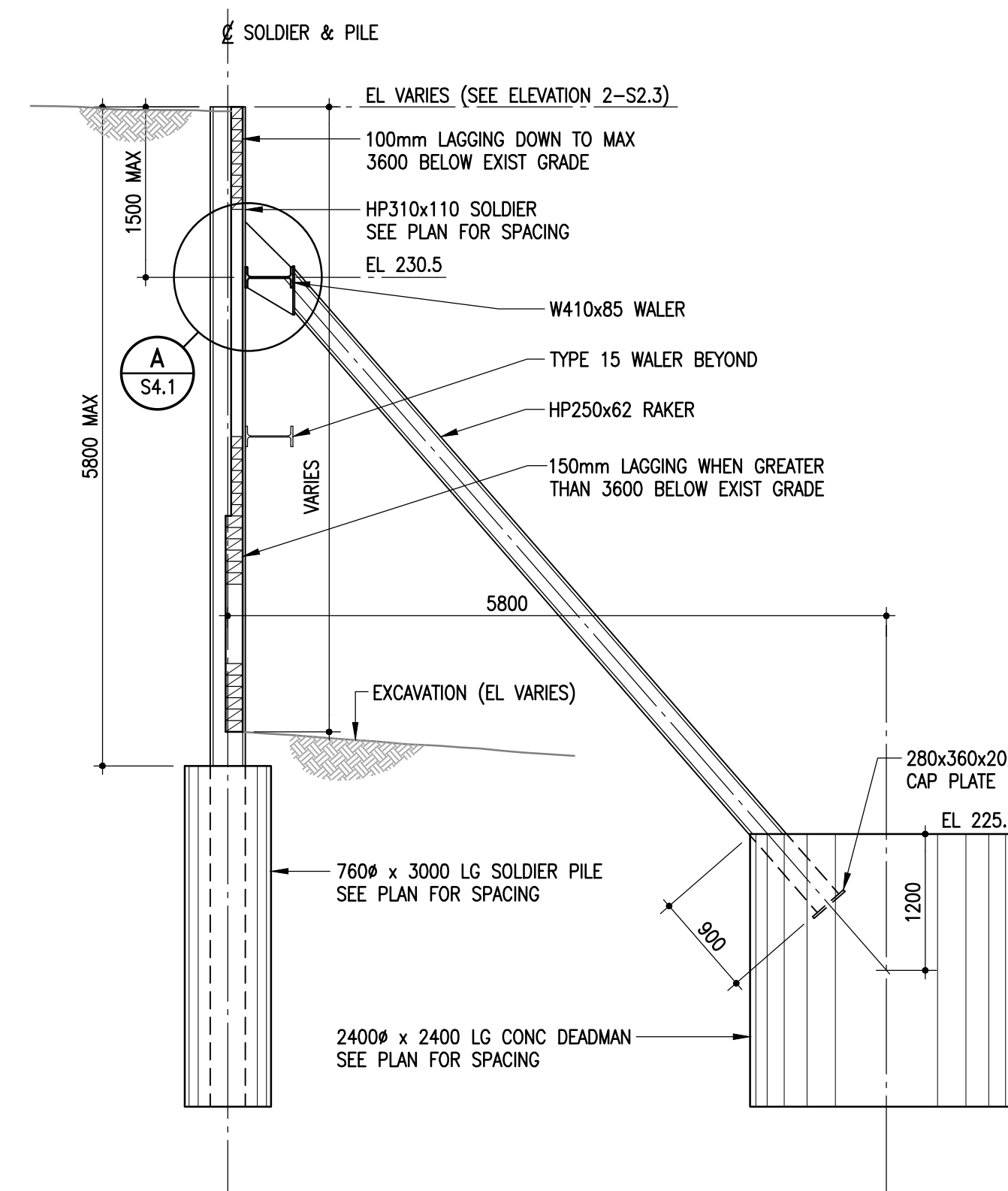
Sheet No.: S4.1



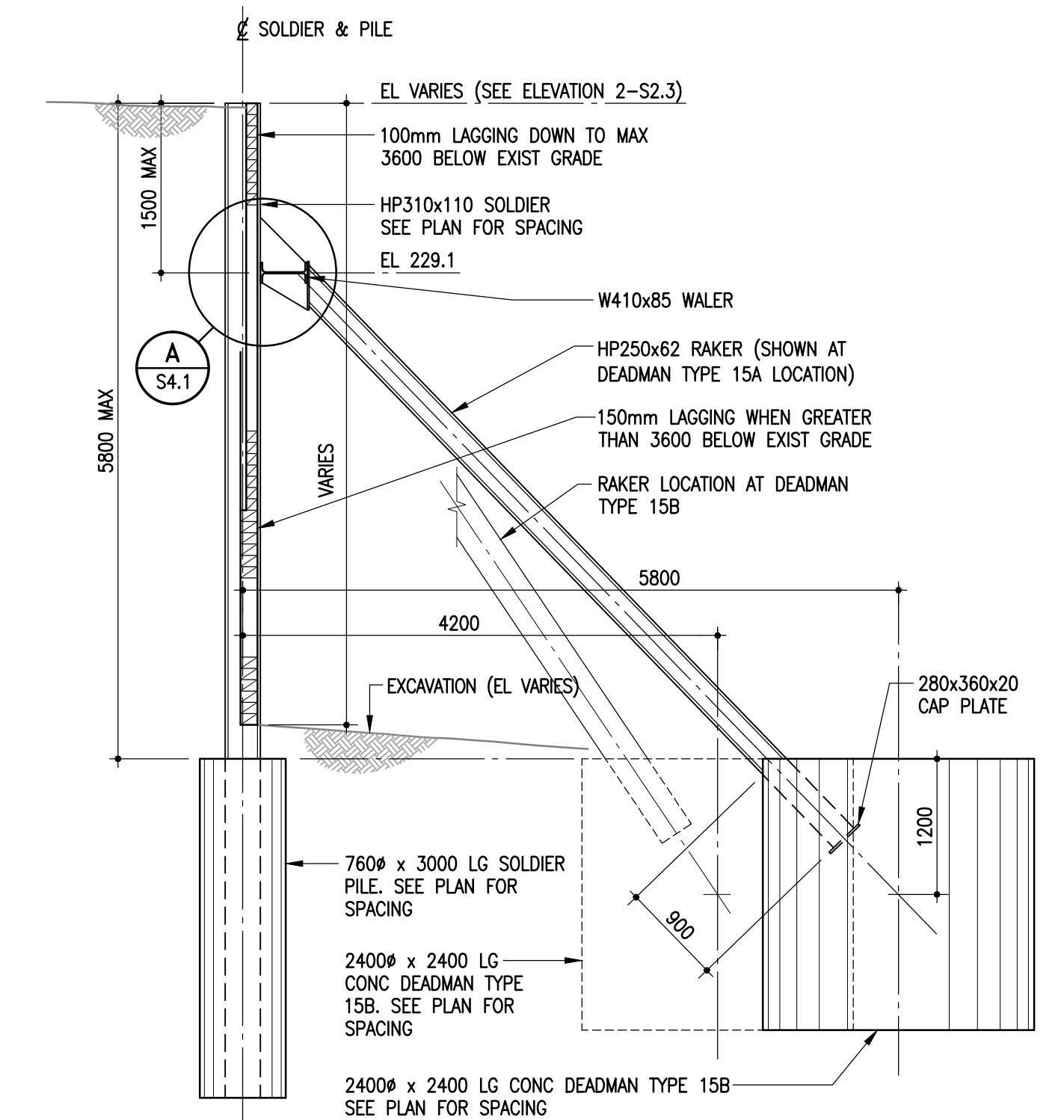
**1 SECTION - TYPE 12 SHORING**  
S4.2 1 : 50



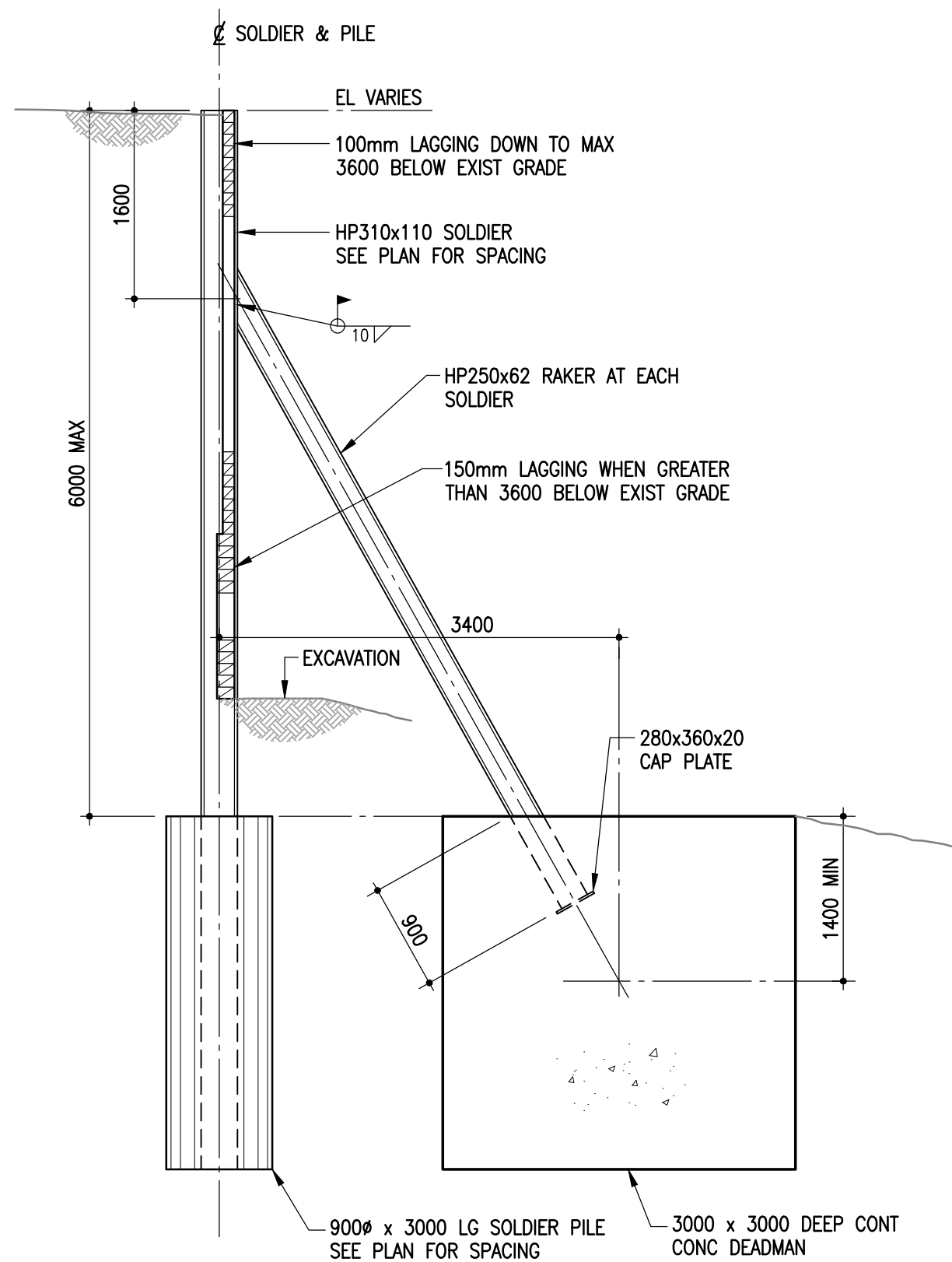
**2 SECTION - TYPE 13 SHORING**  
S4.2 1 : 50



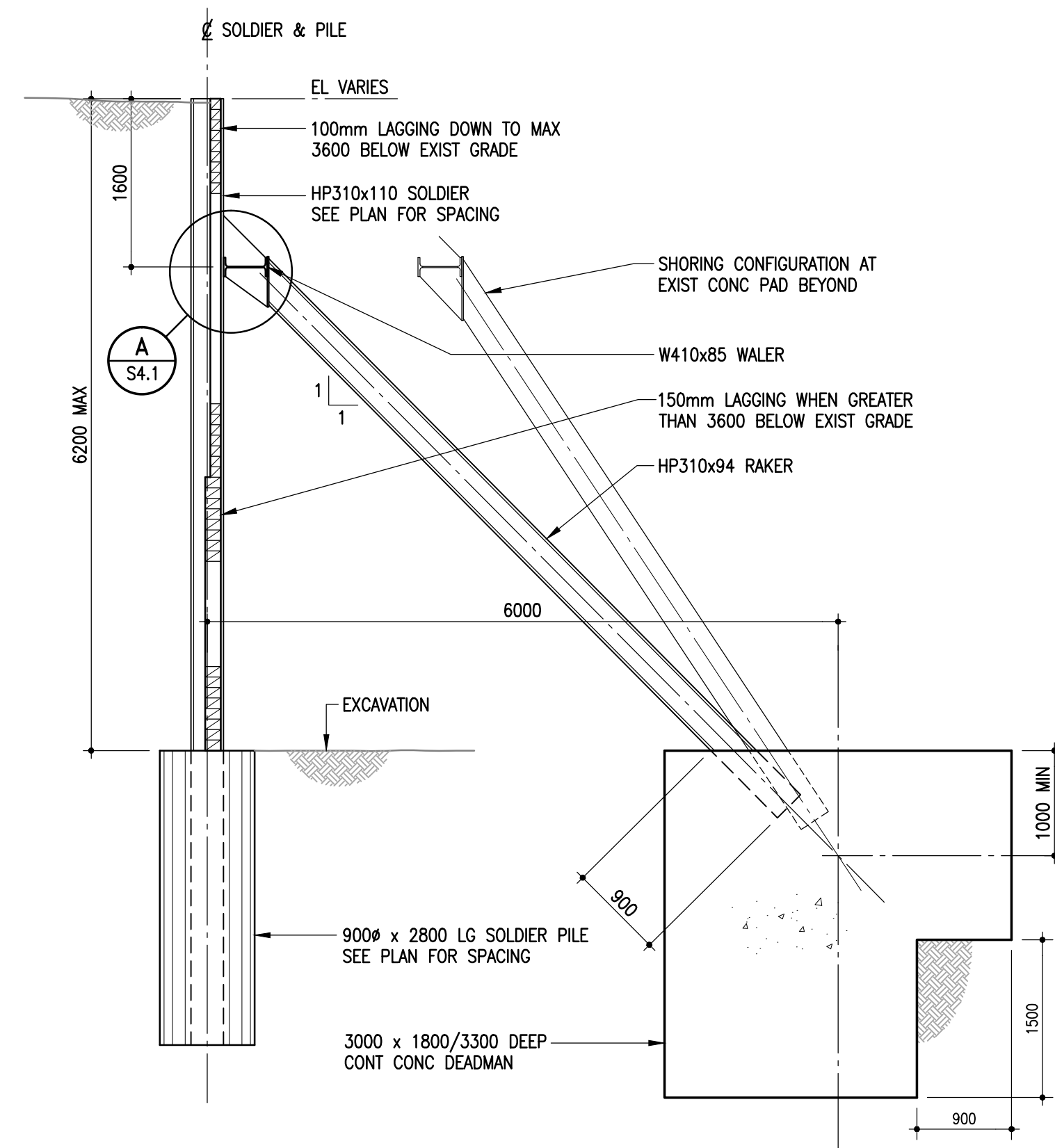
**3 SECTION - TYPE 14 SHORING**  
S4.2 1 : 50



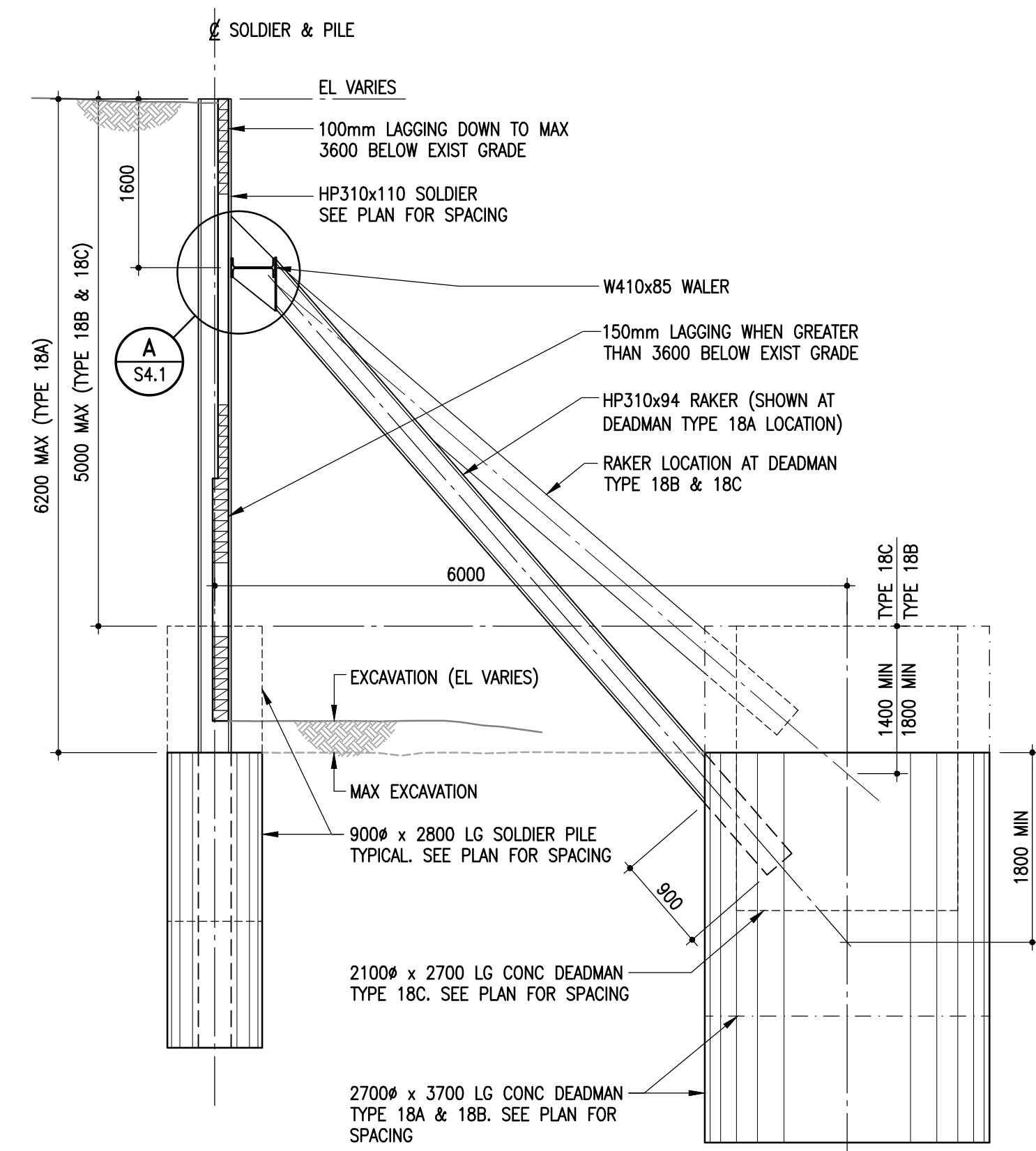
**4 SECTION - TYPE 15 SHORING**  
S4.2 1 : 50



**5 SECTION - TYPE 16 SHORING**  
S4.2 1 : 50



**6 SECTION - TYPE 17 SHORING**  
S4.2 1 : 50



**7 SECTION - TYPE 18 SHORING**  
S4.2 1 : 50

**AS BUILT DRAWINGS**



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ORIGINAL DRAWING SEALED BY B. FLISAK AND DATED June 25, 2015



Project THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT SOUTH END WATER POLLUTION CONTROL CENTRE EXPANSION SHORING AND EXCAVATION						Sheet No.
Sheet Title SHORING SECTIONS						S4.2
Design	Drawn	Checked	Scale	Date	File	
JAL	KJL	BF	AS NOTED	21 AUG 2015	2014-1223	

The General Contractor shall check & verify all dimensions and report any errors or omissions to the designers.