Job No.: 5197 **STRUCTURAL ASSESSMENT** 12 November 2018

Proposed Concrete Walers, Steel Soldiers and Stringers for Retaining Walls

IMPORTANT NOTE: This structural design assessment does not provide engineering certification for builders, landscapers, homeowners, or engineers. Public distribution of this document and the accompanying technical drawings is prohibited. Persons using these products must have a structural engineer provide independent engineering certification for the soldiers, stringers and walers for each and every site.

This letter is a structural assessment of the proposed reinforced concrete walers, galvanized steel soldiers, and galvanized steel stringers for the manufacturing production of wholesale products for Fyshwick Cement, trading as Uprite Retaining Wall System. I have assessed the structural design of the proposed structural members in accordance with the following Australian Standards and engineering principles:

- AS1170.0: General Principles
- AS1170.1: Structural Design Actions: Permanent, Imposed and Other Actions
- AS4678: Earth-Retaining Structures
- AS3600: Concrete Structures
- AS4100: Steel Structures
- The Engineering Principles of Soil Mechanics and Structural Mechanics

Limitations on the use of this design, including the variables used for the structural calculations, are listed below:

- Concrete Specifications: The concrete walers have a 'B1' exposure classification. This excludes walers from being used in within 2km of the coast, harbours, or other saltwater rivers and tributaries. The 'B1' classification is reliant upon the use of 40MPa concrete with exactly 30mm concrete cover to the reinforcing steel.
- Concrete Grade shall be 40MPa, General Purpose concrete, with a 100mm slump, and nominal 10-20mm aggregate.
- Concrete cover must be accurate to within +/-4mm of the stated cover.
- Mechanically vibrate the concrete to completely fill all voids, but do not excessively vibrate to the point of segregation.
- Concrete must be properly cured for at least 7 days and must not be distributed before the concrete has reached its full characteristic strength at 28 days.
- The use of admixtures or additives is strictly prohibited.
- All materials, workmanship, and testing of concrete shall comply with AS1379, AS3600, and AS3610.

Steel Soldier Specifications:

- Steel soldiers must be hot dip galvanized, designed, and independently certified by a structural engineer for each and every site-specific location.
- Soldier spacings must be exactly 1525mm (+/-5mm tolerance) to ensure sufficient bearing between concrete walers and the flanges of the steel soldiers. The bearing length at both ends of the concrete walers must be 30mm.
- Steel Hot-Rolled sections shall be Grade 300 in accordance with AS3679.
- All materials, workmanship, and fabrication of steel shall comply with AS1538, AS1554, and AS4100.

Steel Stringer Specifications:

- Steel stringers must be hot dip galvanized after the welding and fabrication of all joints and are to be independently certified by a structural engineer for each and every site-specific location.
- Use 100x50x3.0mm Rectangular Hollow Sections on edge as stringers.
- Use 100x50x3.0mm Rectangular Hollow Sections as supporting columns embedded 300mm minimum into a concrete pier with minimum dimensions of 450mm diameter and 500mm depth into solid foundation soil.
- Supporting columns shall be at a maximum horizontal spacing of 1800mm in plain view.
- Treads shall be 300mm length, and risers shall be 150mm height.
- Stringers are to be used at both ends of 1500mm long stair treads. Structural design of stair treads is the responsibility of others.

- All joint welds for the stringers and columns shall be comprised of complete penetration 'Vee' butt welds (chamfered as required to a 'Vee' angle of between 90-120 degrees), or 6mm equal leg continuous fillet welds. Joints may be comprised of a combination of 'Vee' butt welds and fillet welds when suitable.
- Each stringer joint must be fully welded on all four edges.
- Stringers must be fully welded to steel column on all four edges for twist restraint.
- Steel Hollow sections shall be minimum Grade C350LO in accordance with AS1163.
- All materials, workmanship, and fabrication of steel shall comply with AS1538, AS1554, and AS4100.

Retaining Walls Variables:

- Live load superimposed on the backfill is 5.0 kPa as per AS4678.
- The maximum gradient of the soil backfill at the top of the wall is 20% (1 Vertical: 5 Horizontal).
- Soil backfill is assumed to have an internal angle of friction equal to 20 degrees.
- The soil backfill must be completely free draining. The use of gravel backfills, agricultural drainage piping, and geofabric must be installed correctly.
- The water table must be below the base of the retaining wall (walers). Hydrostatic pressure has not been used in calculating the lateral forces on the retaining walls.
- Soil backfill is assumed to have a saturated unit weight of 20kN per cubic metre (typical for saturated soils).

Note: The technical drawings accompanying this letter have additional drafted specifications.

I hereby certify that the structural members detailed and scheduled on the accompanying technical drawings, when installed by suitably qualified and experienced tradesmen, are in compliance with the relevant Australian Standards abovementioned and deem that it is suitable for its intended application.

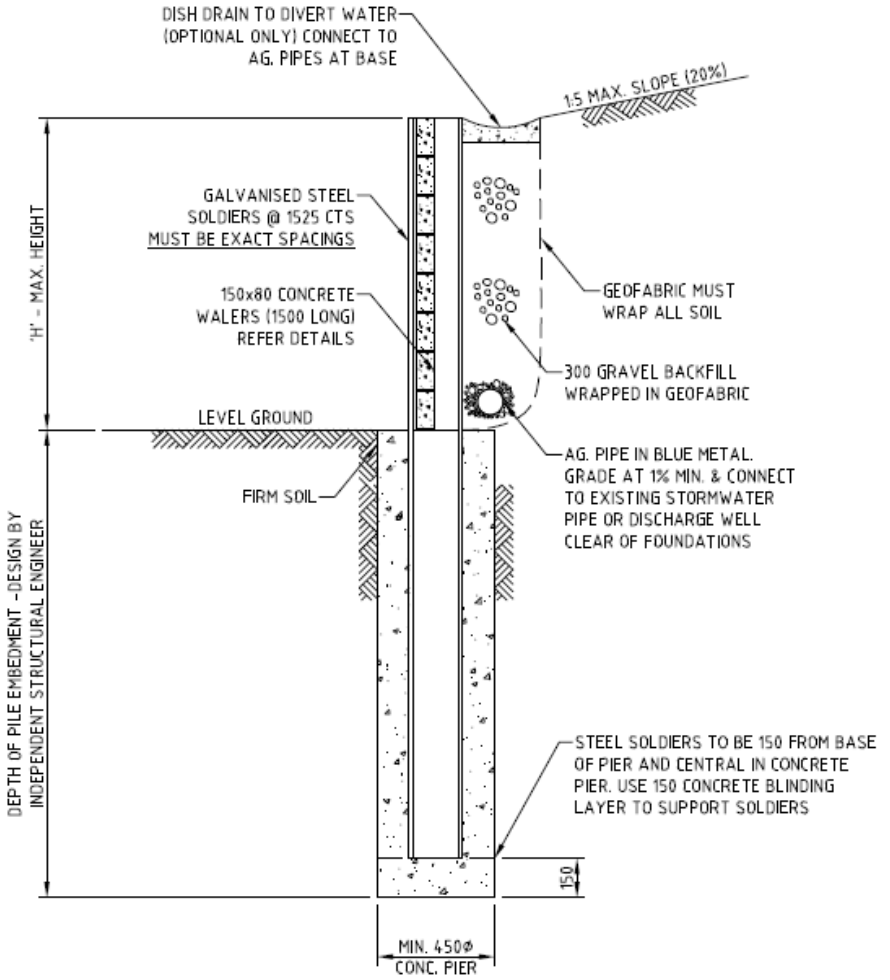
Notes: All fabrication and construction must be carried out and supervised by suitably qualified and experienced trades. Uprite Retaining Wall takes no responsibility or liability if suitable tradesmen are not used to carry out all work during manufacturing in the factory and installation on site. Uprite Retaining Walls takes no responsibility or liability for retaining walls constructed on soft or weak soils; areas proned to landslip or landslides; areas subject to mine subsidence or soil erosion; disturbed soils resulting from previous excavations, demolition of buildings, structures, or the removal of trees; aggressive soils with high levels of salinity, sulphates, or acid-sulphates; or areas affected by tree root systems or the weight of trees.

IMPORTANT NOTES :

THESE DRAWINGS ARE FOR THE EXCLUSIVE USE OF UPRITE RETAINING WALL SYSTEM FOR THE PURPOSES OF MANUFACTURING AND WHOLESALE DISTRIBUTION. THESE DRAWINGS ARE NOT TO BE USED AS ENGINEERING CERTIFICATION FOR BUILDERS, LANDSCAPERS, ENGINEERS, OR HOMEOWNERS. DISTRIBUTION OF THESE DRAWINGS TO THE PUBLIC IS PROHIBITED. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING LETTER OF STRUCTURAL ASSESSMENT. LIMITATIONS AND THE VARIABLES USED IN THE RETAINING WALL DESIGN ARE STIPULATED IN THE LETTER OF ASSESSMENT, ALONG WITH THE SPECIFICATIONS FOR THE CONCRETE AND STEEL SECTIONS.

RETAINING WALL SCHEDULE

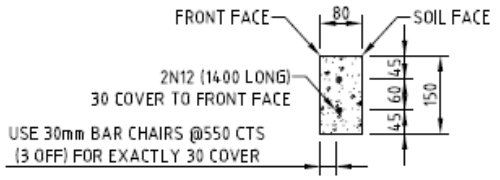
'H' MAX. HEIGHT	'I' SECTION	END 'C' SECTION
UP TO 1050	100UC15 OR 200UB18	100PFC OR 100TFC
1200	100UC15 OR 200UB18	100PFC OR 100TFC
1350	100UC15 OR 200UB18	100PFC OR 100TFC
1650	100UC15 OR 200UB18	125PFC
1800	200UB18	150PFC
1950	200UB22	150PFC
2100	200UB22	180PFC
2400	250UB25	200PFC



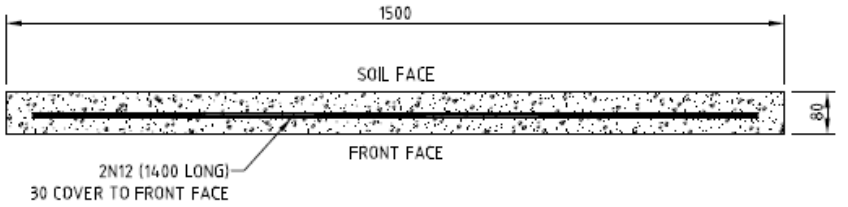
RETAINING WALL SECTION

SCALE: 1:20

DATE	COMPANY	DRAWING TITLE	SHEET TITLE	SHEET SIZE	SHEET #
11 NOVEMBER 2018	UPRITE RETAINING WALL SYSTEM	PROPOSED RETAINING WALL WALERS & SOLDIERS FOR MASS PRODUCTION	RETAINING WALL SECTION, NOTES & SCHEDULE	A3	S1



SIDE VIEW



TOP VIEW

CONCRETE WALER DETAILS

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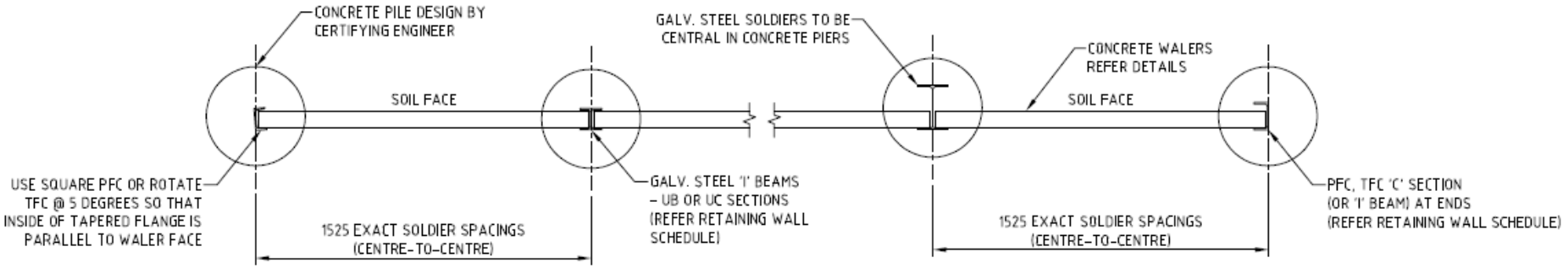
NOTE : REFER LETTER OF STRUCTURAL ASSESSMENT FOR SPECIFICATIONS



SHORTER WALL HEIGHTS

TALLER WALL HEIGHTS

RETAINING WALLS - PLAN VIEW

SCALE: 1:20

NOTE : REFER LETTER OF STRUCTURAL ASSESSMENT FOR SPECIFICATIONS

DATE	COMPANY	DRAWING TITLE	SHEET TITLE	SHEET SIZE	SHEET #
11 NOVEMBER 2018	UPRITE RETAINING WALL SYSTEM	PROPOSED RETAINING WALL WALERS & SOLDIERS FOR MASS PRODUCTION	RETAINING WALL DETAILS	A3	S2