

1710GE 7 Reybridge

Structural Calculations

King Post Retaining Wall

Prestressed Concrete Panels

Retained height up to 1.5m

Steel posts at 2.4m centres

Applied Load:

Earth pressure:

Take effective angle of shear resistance = 25°

$$K_a = \frac{1 - \sin \phi}{1 + \sin \phi}$$

$$K_a = 0.4$$

$$\text{Total pressure, } P = 0.5 \times \gamma \times H^2 \times K_a = 0.5 \times 19 \times 1.5^2 \times 0.4 = 8.55 \text{ kN/m}$$

Water pressure, assume water level is at ground level

$$\text{Total pressure, } P_w = 0.5 \times \gamma \times H^2 = 0.5 \times 10 \times 1.5^2 = 11.25 \text{ kN/m}$$

Surcharge, $q = 10 \text{ kN/m}^2$

$$\text{Total pressure from surcharge, } P_q = q \times K_a \times H = 10 \times 0.4 \times 1.5 = 6 \text{ kN/m}$$

$$\text{Design force per unit length} = 1.35 (8.55 + 11.25) + 1.5 \times 6 = 35.7 \text{ kN/m}$$

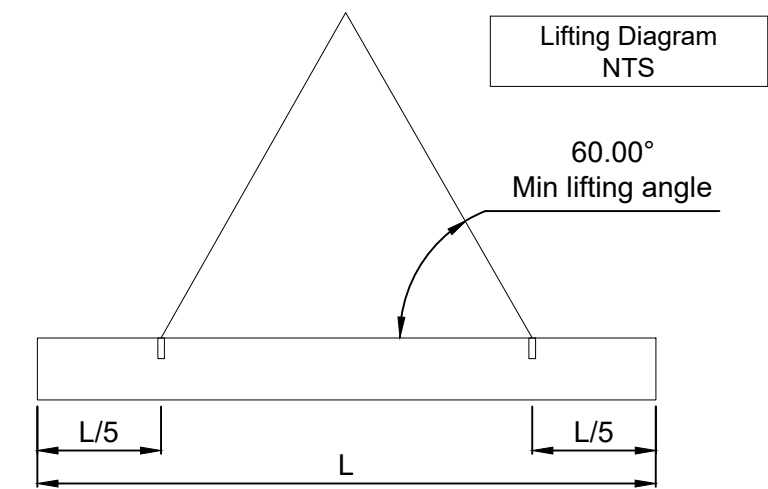
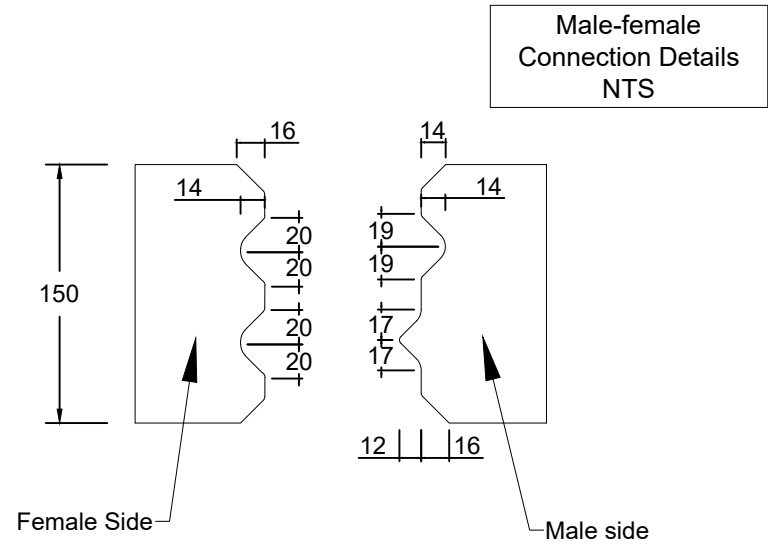
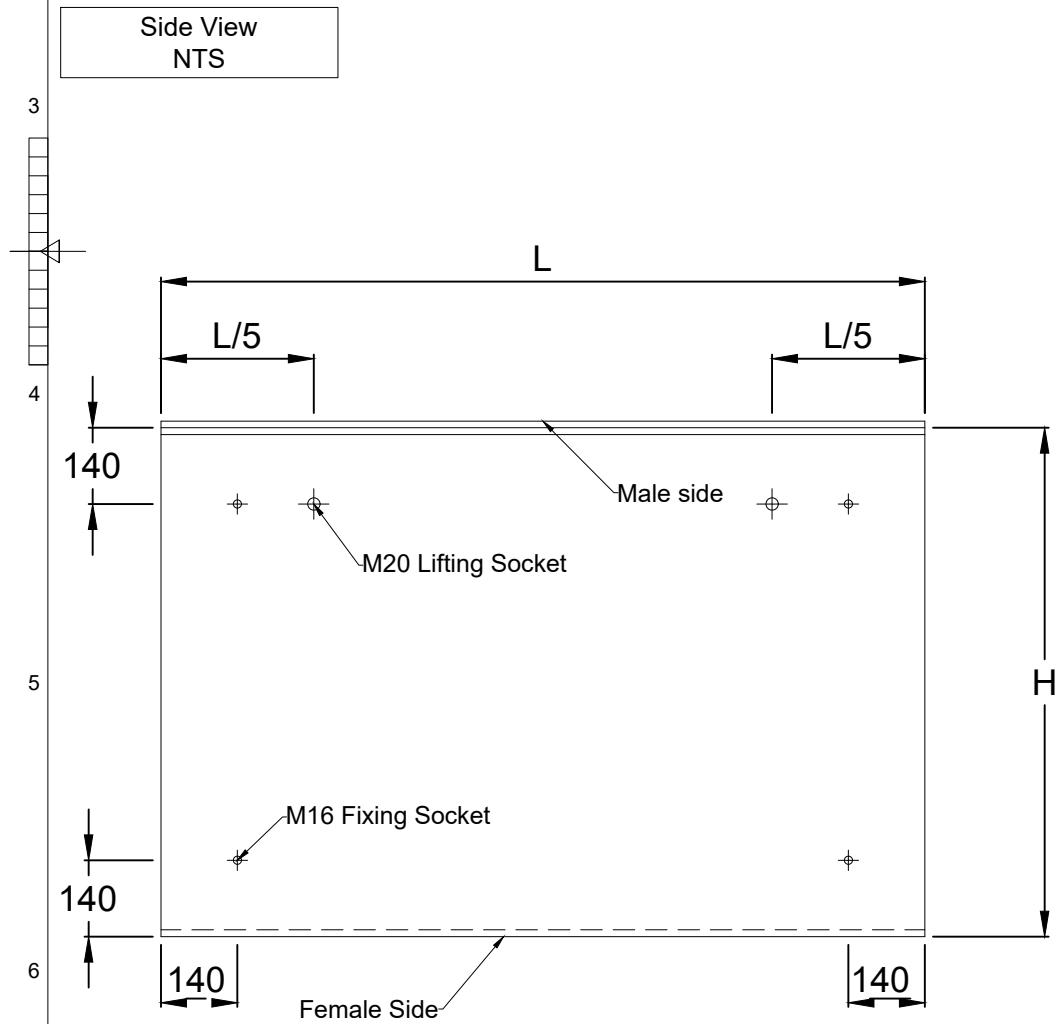
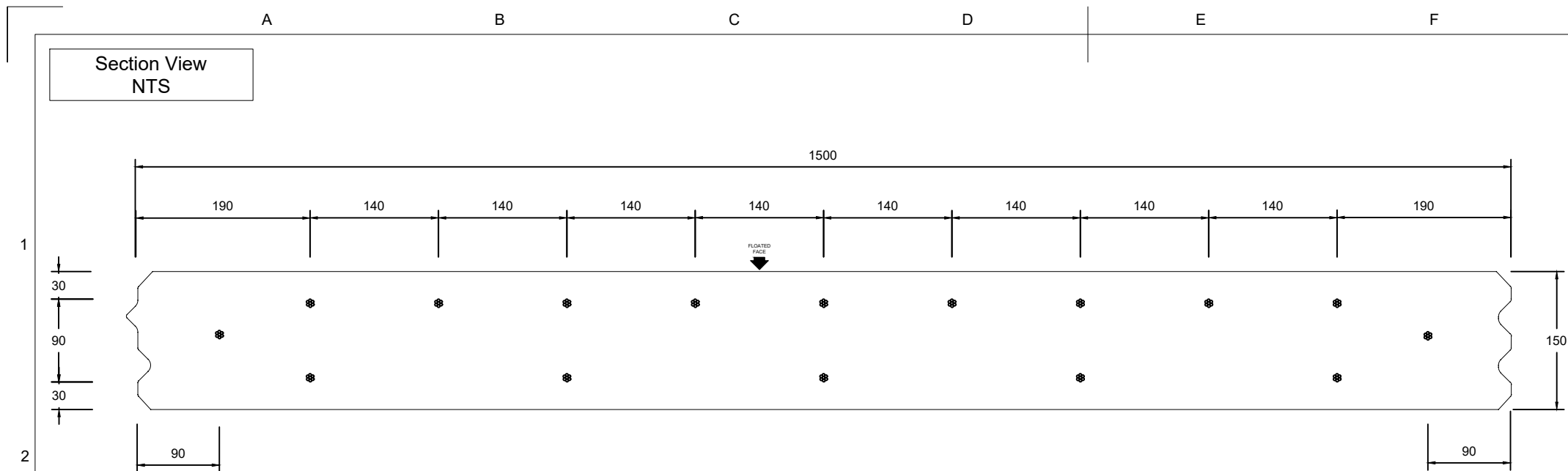
$$\text{Design moment} = w L^2 / 8 = 35.7 \times 2.4^2 / 8 = 25.7 \text{ kNm}$$

$$\text{Design shear} = w L / 4 = 35.7 \times 2.4 \times 0.25 = 21.4 \text{ kN}$$

Use JP Concrete 150mm thick grade C50/60 prestressed concrete panels with 7No. 9.3mm diameter prestressed tendons.

$$\text{ULS moment of resistance} = 59.7 \text{ kNm}$$

$$\text{ULS shear resistance} = 128.3 \text{ kN}$$



- 1. Design**
- a) Concrete Beam design to BS EN 1992-1-1:2004;
 - b) Permissible SLS characteristic bending moment = 35.6 kNm per 1500mm panel;
 - c) ULS moment of resistance = 59.7 kNm per 1500mm panel;
 - d) ULS shear resistance = 128.3 kN per 1500mm panel ;
- Note: JP Concrete have designed the concrete unit only, the stability of the support conditions should be checked by overall scheme designer.**

- 2. Concrete**
- a) Concrete strength at transfer = C32/40 ;
 - b) Concrete strength at 28 days = C50/60 ;
 - c) Other: CEM I, minimum Cement content: 360kg/m³ Max W/C = 0.50 ;
- 3. Prestressing Strand**
- a) Strand Diameter = 9.3mm ;
 - b) Strand designation = BS5896-Y1860S7-9.3-I (Strand Jacking force: 64.4kN);

- 4. Durability**
- a) Design Life: 50 years to BS8500;
 - b) Fire Resistance: 60min (REI 60) BS EN 1992-1-2 Table 5.8 (One way Spanning);
 - c) Cover to Strand & Exposure:

Min Cover	All	Exposure			
All Faces	30mm	All Faces	XC4	XA1	XF1

- 5. Handling**
- a) Unit Volume / Weight
- | Unit Ref | Volume (m³/m) | Weight (T/m) | Weight + 5% (T/m) |
|---------------|---------------|--------------|-------------------|
| 150x1500 16no | 0.225 | 0.57 | 0.60 |

Weight is based on 2.5 T/m³. +5% is recommended for sizing lifting equipment.

- 6. Manufacture**
- a) Manufactured to BS 8110.

- 7. Tolerances**
- a) Length -5mm to +10mm;
 - b) Width -0mm to +6mm;
 - c) Thickness -2mm to +6mm;
 - d) Squareness 12mm difference between diagonals;
 - e) Socket position ± 10mm;
 - f) Lifter Position ± 100mm.
 - g) Flatness ± 3mm in any 1.5m direction.

- 7. Finish**
- Please refer to the attached document regarding JP concrete's panel finishes and spec.

- 8. Disclaimer**
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All dimensions noted are in millimeters unless stated otherwise;

This drawing is to be read in conjunction with all other relevant documents relating to the project;

Do not scale from this drawing, if dimensions are not clear, please ask.

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