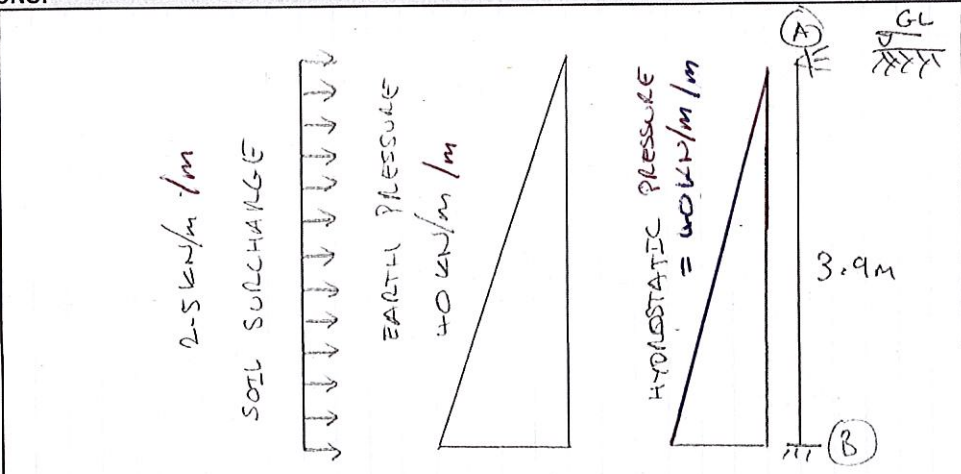


JOB TITLE: ST. PAULS MEWS	JOB NUMBER / FILE: 162176	CALCULATION NUMBER: 1/3	
	CALCULATION: LINER WALL	CALCULATION BY: NS	DATE: 01/04/16
		CHECKED BY:	

Form

**CALCULATIONS:**

REF



OUTPUT

LOADING:

EARTH PRESSURE =  $0.5 P_a h$

$K_p = \frac{1 + \sin 37}{1 - \sin 37} = 4$       $K_a = \frac{1}{4} = 0.25$

$P_a = 20 \times 0.25 \times 4 = 20 \text{ kN/m}^2$

EARTH PRESSURE =  $0.5 \times 20 \times 4 \text{ m} = 40 \text{ kN/m}$

SOIL SURCHARGE =  $P_{sc} = K_v V_{sc}$

$V_{sc} = 10 \text{ kN/m}^2$

VOLUME? HIGHWAY STRUCTURE DESIGN.

$V_{sc} = 10 \text{ kN/m}^2$  - CONSERVATIVE DUE TO SOIL SURCHARGE FROM ST. PAULS MEWS ACCESS

$K_v = 0.25$

$P_{sc} = 10 \text{ kN/m}^2 \times 0.25 = 2.5 \text{ kN/m}^2$

$2.5 \text{ kN/m}^2 \times 1 \text{ m} = 2.5 \text{ kN/m}$

WATER PRESSURE IS ASSUMED TO BE APLIED AT GROUND LEVEL.

JOB TITLE: ST PAULS MEWS	JOB NUMBER / FILE: 142176	CALCULATION NUMBER: 2/3	<b>Form</b>
CALCULATION: LINER WALL	CALCULATION BY: NS	DATE: 14/04/16	

**CALCULATIONS:**

REF	CALCULATIONS:	OUTPUT
	<p>2.5 kN/m SOIL SURCHARGE</p> <p>EARTH PRESSURE = 40 kN/m</p> <p>HYDROSTATIC PRESSURE = 40 kN/m</p> <p>4m</p> <p>FF FL</p>	
	<p>MAX MOMENT = 117.5 kNm</p> <p>b = 1000</p> <p>d = 200 - 10 - 40 = 150 mm</p> $K = \frac{117.5 \times 10^6}{40 \times 1000 \times 150^2} = 0.1305 < 0.156$ $z = 150 \left[ 0.5 + \sqrt{0.125 - \frac{0.1305}{0.4}} \right] = 123.6 \text{ mm} \leq 0.95d = 142.5 \text{ mm}$ $A_s = \frac{117.5 \times 10^6}{0.87 \times 500 \times 123.6} = 2185.4 \text{ mm}^2/\text{m}$ <p><u>USE H20 @ 100 c/c A<sub>s</sub> PROVIDED = 3142 mm<sup>2</sup>/m</u></p> <p><u>ALONG OUTER FACE BOTTOM 1/3</u></p>	

JOB TITLE: ST. PAULS MEWS	JOB NUMBER / FILE: 142176	CALCULATION NUMBER: 3 / 3	Form	
CALCULATION: LINER WALL	CALCULATION BY: NS	DATE: 14/04/16		CHECKED BY:

## CALCULATIONS:

REF		OUTPUT
	MOMENT MID SPAN = 52 kNm	
	$b = 1000$	
	$d = 200 - 8 - 40 = 152 \text{ mm}$	
	$k = \frac{52 \times 10^6}{40 \times 1000 \times 152^2} = 0.056$	
	$z = 152 \left[ 0.5 + \sqrt{0.25 - 0.056/0.9} \right] = 141.86_{\text{mm}} < 0.95d$ $= 144.4 \text{ mm}$	
	$A_{\text{REQUIRED}} = \frac{52 \times 10^6}{0.87 \times 500 \times 141.86} = 842.6 \text{ mm}^2/\text{m}$	
	USE H16 @ 100c/c $A_{\text{PROVIDED}} = 2011 \text{ mm}^2/\text{m}$	
	OUTER FACE 2/3 AND INNER FACE	

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**ANALYSIS**

Tedds calculation version 1.0.13

**Results**

**Node deflections**

**Load case: Self Weight**

Node	Deflection		Rotation (°)	Co-ordinate system
	X (mm)	Z (mm)		
1	0	0	0.01734	
2	0	0	0	

**Load case: Permanent**

Node	Deflection		Rotation (°)	Co-ordinate system
	X (mm)	Z (mm)		
1	0	0	0.10257	
2	0	0	0	

**Total base reactions**

Load case/combination	Force	
	FX (kN)	FZ (kN)
Self Weight	0	18.4
Permanent	0	146.3

**Element end forces**

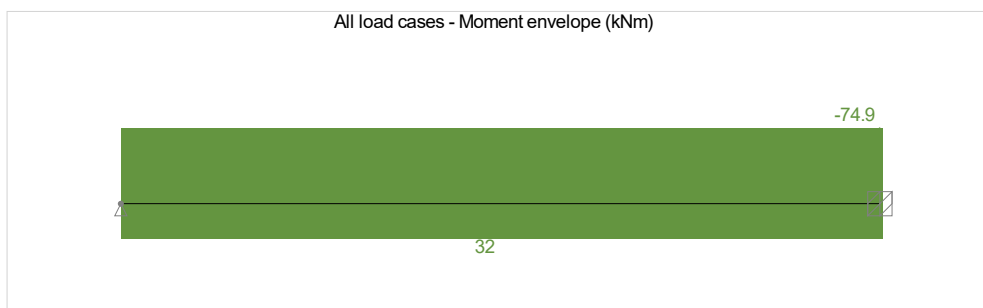
**Load case: Self Weight**

Element	Length (m)	Nodes Start/End	Axial force (kN)	Shear force (kN)	Moment (kNm)
1	3.9	1	0	-6.9	0
		2	0	-11.5	-8.9

**Load case: Permanent**

Element	Length (m)	Nodes Start/End	Axial force (kN)	Shear force (kN)	Moment (kNm)
1	3.9	1	0	-26.3	0
		2	0	-120	-74.9

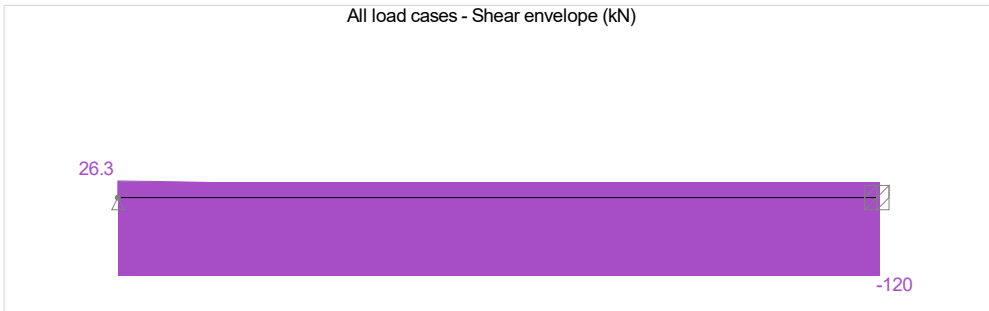
**Forces**





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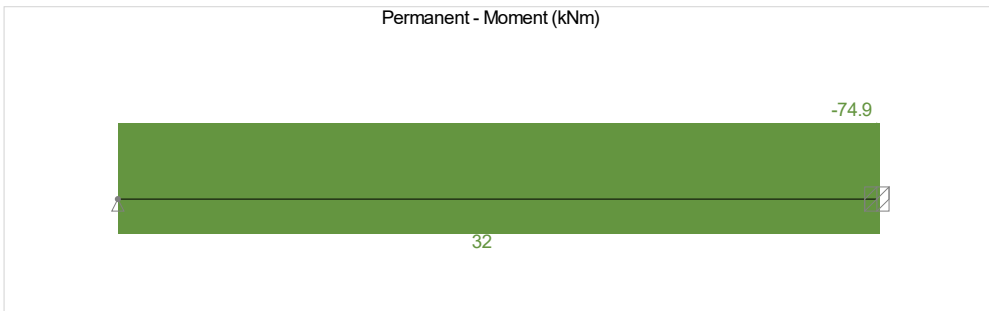
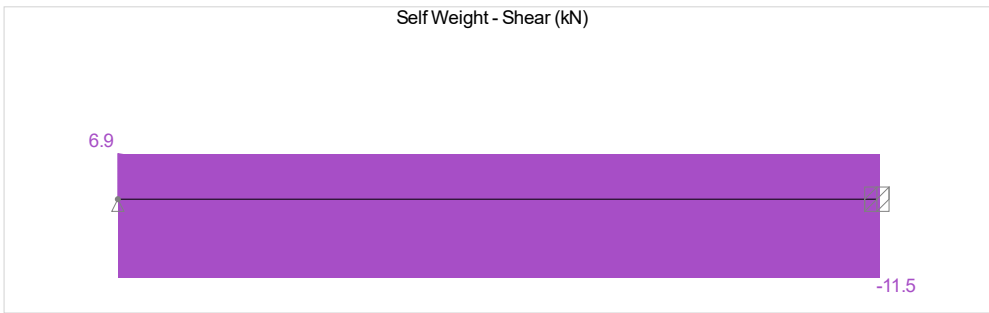
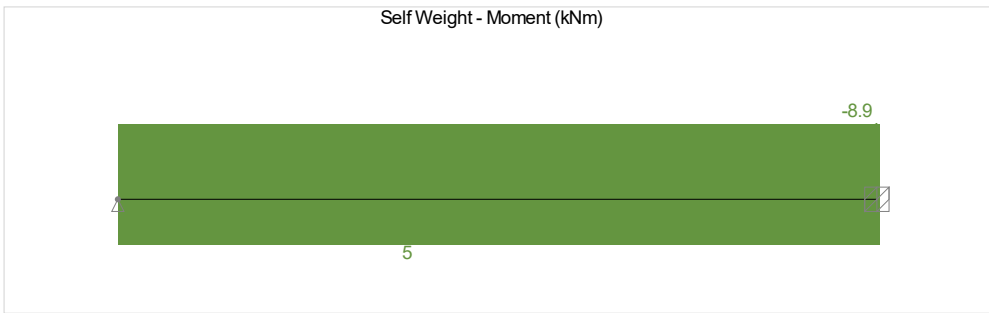
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**Element results**

**Envelope - All load cases**

Element	Shear force		Moment			
	Pos (m)	Max abs (kN)	Pos (m)	Max (kNm)	Pos (m)	Min (kNm)
1	3.9	-120	1.816	32	3.9	-74.9





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Permanent - Shear (kN)

