

) () (large strain)

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FLAC

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Investigation of Deformation Characteristics of a 17-m Reinforced Earth Wall Under Seismic Conditions

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ABSTRACT

This paper presents the effect of various parameters on deformation characteristics of a 17-m reinforced wall under seismic conditions with consideration of large strains. The foundation soil strength parameters (angle of internal friction and cohesion) and reinforcing elements (length and stiffness) are varied to investigate their effects on horizontal facing deformation and vertical displacement of the wall toe. The main objective of this research is to investigate the optimized performance of such (high) walls under seismic conditions. Numerical 2-D plane-strain analysis with a finite difference scheme using FLAC-2D is performed to achieve the objectives. A variable amplitude harmonic wave with a 3-Hz frequency is applied to the wall foundation. The results show that an improved foundation soil properties of suitable shear strength and steel reinforcement belts with proper length (with respect to the wall height), the wall deformations are significantly reduced and the wall performance under seismic conditions is improved.

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KEYWORDS

Reinforced earth wall, tall wall, seismic analysis, numerical model, finite difference, deformation characteristics, foundation soil cohesion and friction, reinforcement length and stiffness.

Logansport INDOT

Vienna, Virginia

INDOT

Bathurst and Hatami (1998)

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Bathurst and Hatami (1999) Bathurst and Alfaro, (1996)

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Fakharian and Hosseinzadeh (2007) ()

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0.7H

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(Reinforced Soil)

SP

A-1-a

AASHTO

20.8 kN/m³

(Retained Soil)

4.8

AASHTO

/

A-1-b

SW-SM

kN/m³

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INDOT

Runser et al. (2001)

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Steel 65

$f_u = 552 \text{ MPa}$ $f_y = 448 \text{ MPa}$

$T_u = 143 \text{ kN/m}$ $T_y = 107 \text{ kN/m}$

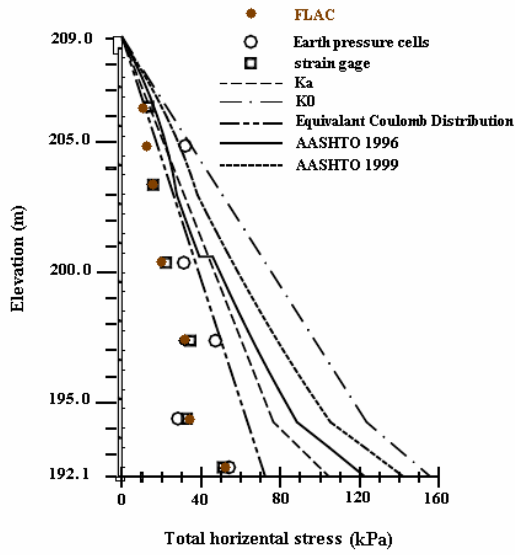
(Runser et al., 2001)

$E = 200 \cdot 10^6 \text{ kPa}$

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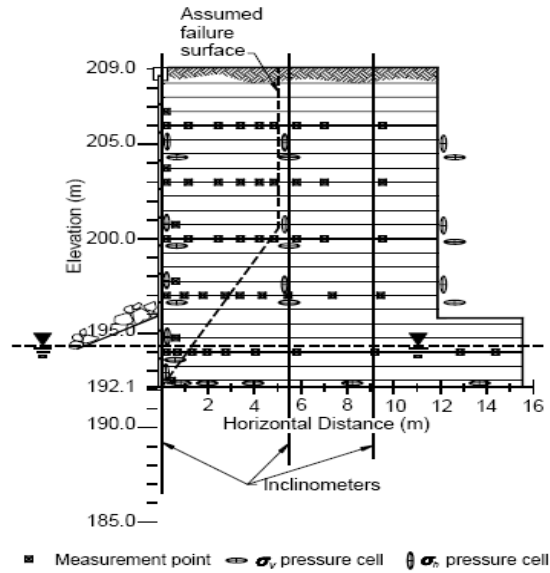


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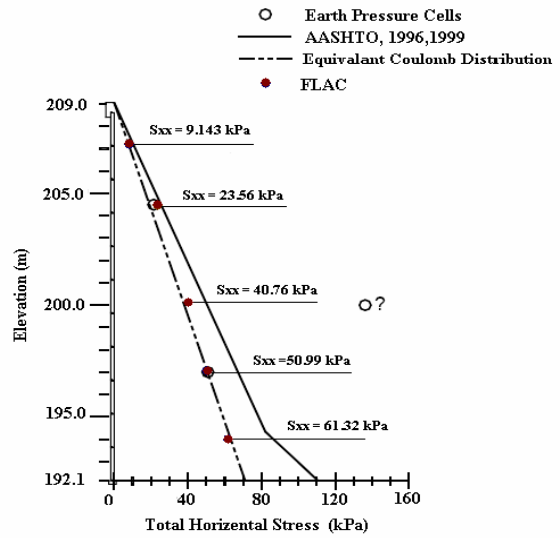


Minnow creek

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Minnow Creek



Minnow creek

Archive

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G_{max}

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(G_{max})

$$G_{max} = 21.7 \times K_{2max} \times P_a \times [\sigma_a / P_a]$$

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(

) K_{2max}

3 Hz

0.2g

()

$$\ddot{u} = \sqrt{\beta e^{-\alpha t}} \sin(2\pi f t)$$

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$$f \quad \alpha = 5.5 \quad \beta = 55 \quad \zeta = 12$$

Interface

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FISH

FLAC

107 kN/m

Minnow Creek

RMC

Bathurst et al. (2001)

(Royal Military College)

28.5

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Grout Material

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$K_b = 6.24e3 \sim 1.37e5$ kPa

$S_b = 0.5$ kPa

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RMC

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2.4 t/m³

$b = 0.384e6$ kPa

$G = 3e5$ kPa

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Bathurst et al. (2001)

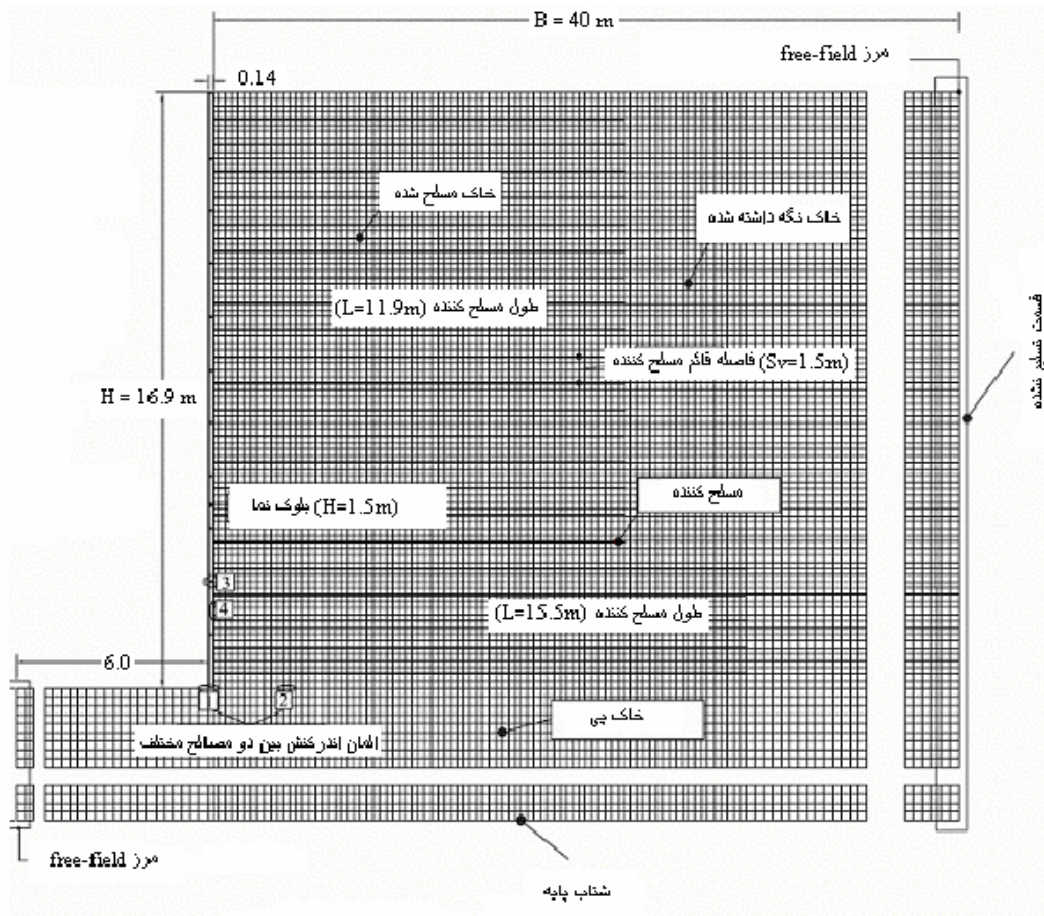
Interface

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RMC



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Interface

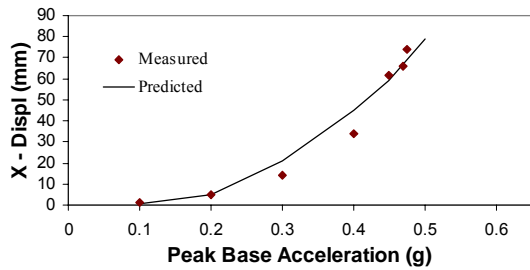
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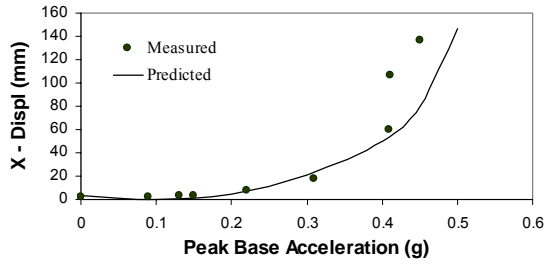
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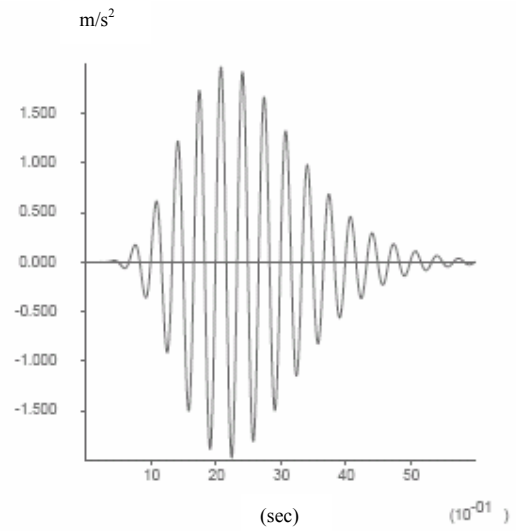
Φ	C (kPa)	ν	E (MPa)	γ (kN/m ³)	
		/		/	
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Ψ	Φ	C (kPa)	ν	E (MPa)	γ (kN/m ³)
			/		



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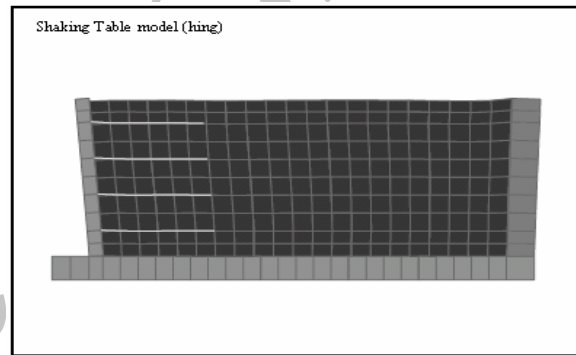


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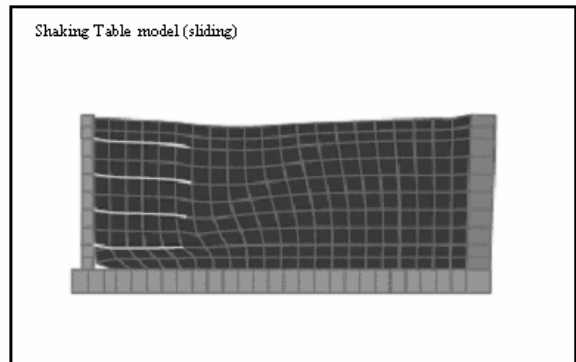
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(FLAC)

0.5g

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0.2g



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(FLAC)

0.5g

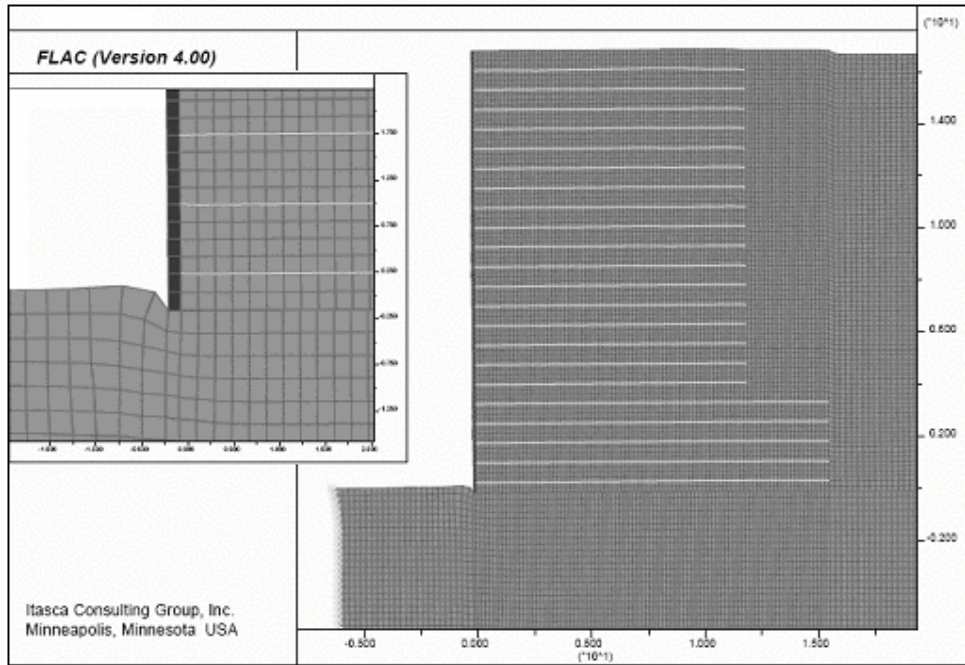
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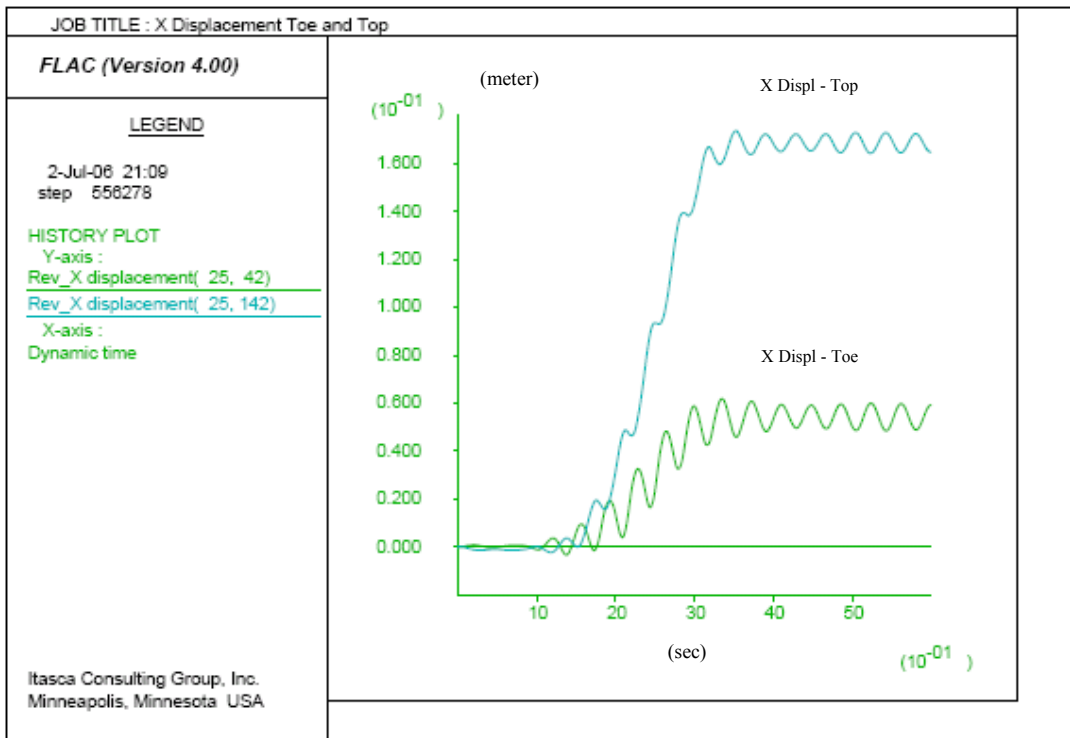
kPa

kPa



Minnow Creek

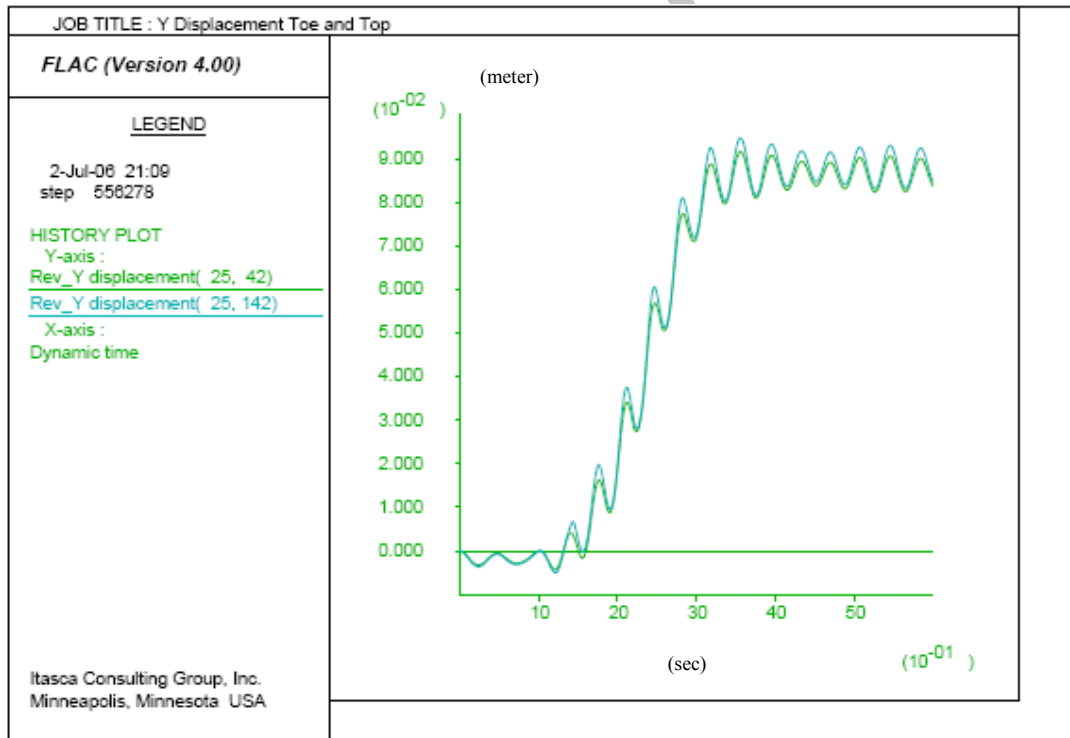
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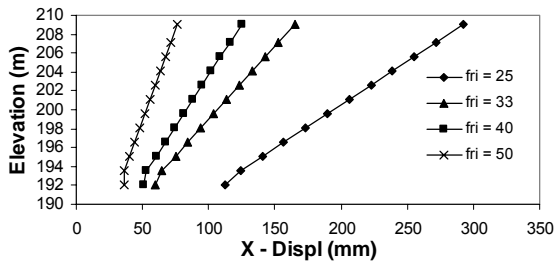


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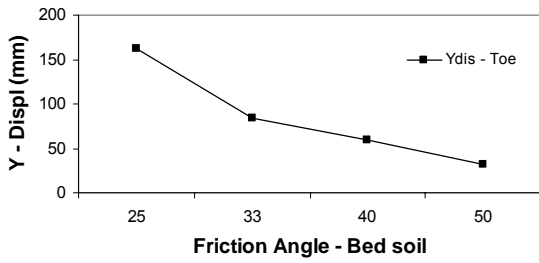
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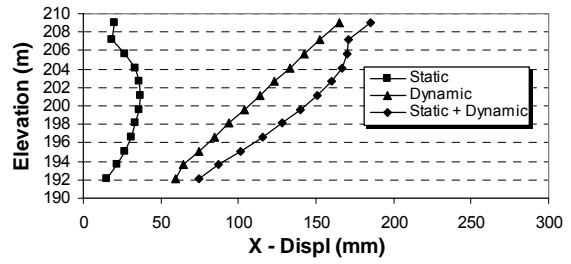
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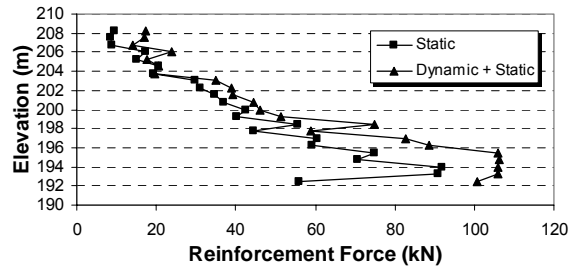
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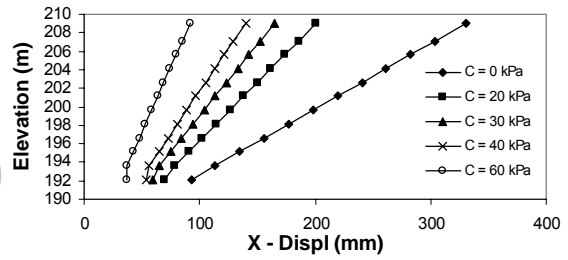
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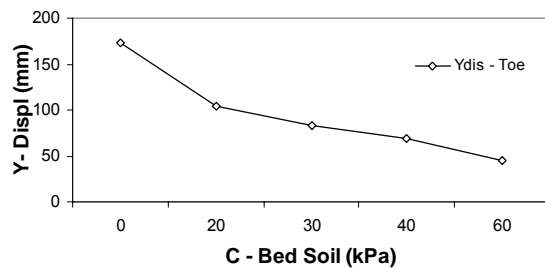
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(j = 2000 kN/m)

kN/m

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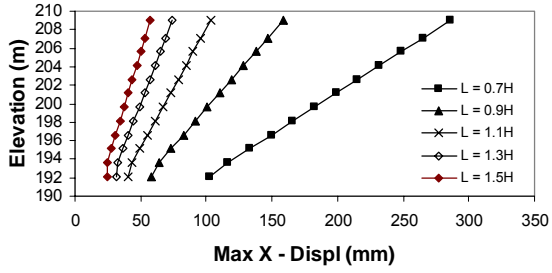
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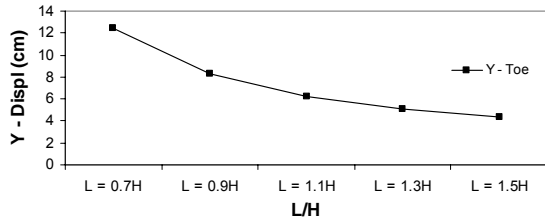
L/H

kN/m

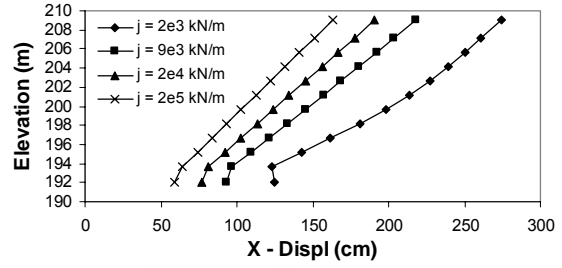
kN/m



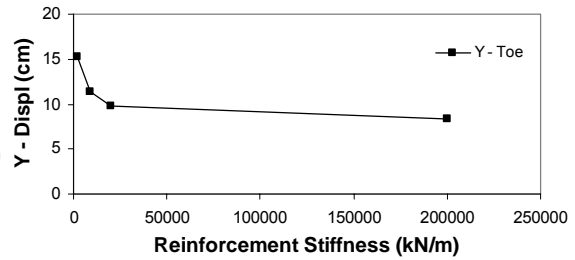
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Minnow Creek

L/H

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