

*

(// , // , //)

()

:

»

«

()

[]

[,]
(Convective) -

(Impulsive) -

()

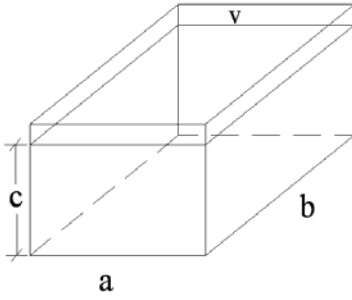
()



[]

()

[,]



[]

| | Tank-1 | Tank-4 |
|-------|--------|--------|
| a(m) | | |
| b(m) | | |
| c(m) | | |
| t(cm) | | |

Beam

Fluid 80

Ansys

3,

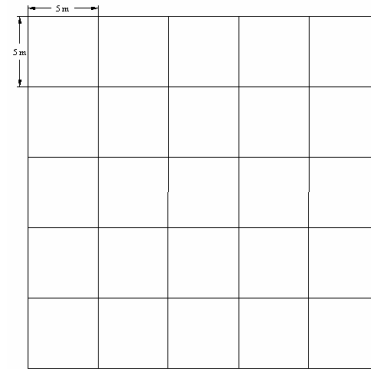
Shell63

[]

* N/m²
/ kg/m³
* N/m² (β)

kg/m³

()



()
()

(Tank-2 Tank-1)

)

()

(Ansys)
)
c

(

(compressive)

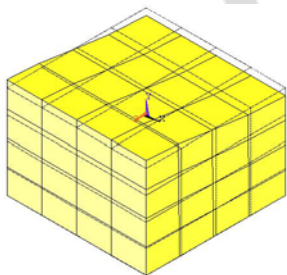
()

(sloshing)

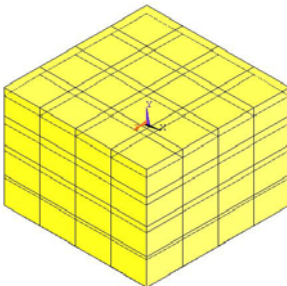
| | Tank-1 | Tank-2 |
|---------------|--------|--------|
| f sloshing | / | / |
| f compressive | / | / |
| f Impulsive | / | / |

(sloshing)

)



(Compressive)



(Sloshing)

()
(c)

$$(T_0 = /)$$

$$(I =) /$$

()
(R)

$$(A = /) /$$

(

$$(R =)$$

()

(cm kgf/m²) composite

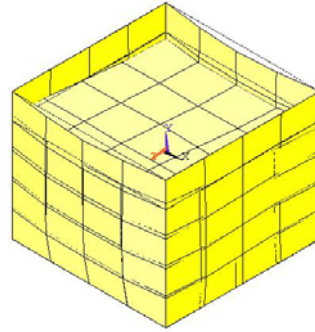
()

()

(Impulsive)

()

| | | (sec) | | |
|---------|---|-------|------|------|
|) | 1 | 0.85 | 0.84 | 0.84 |
| | 2 | 0.25 | 0.1 | 0.94 |
| + Tank1 | 1 | 1.2 | 0.11 | 0.11 |
| | 2 | 0.86 | 0.73 | 0.84 |
| | 3 | 0.26 | 0.11 | 0.95 |
| + Tank4 | 1 | 2.5 | 0.2 | 0.2 |
| | 2 | 0.92 | 0.68 | 0.88 |
| | 3 | 0.27 | 0.09 | 0.97 |



(impulsive)

()

W

$$V = CW$$

B

C

$$C = \frac{ABI}{R}$$

)

()

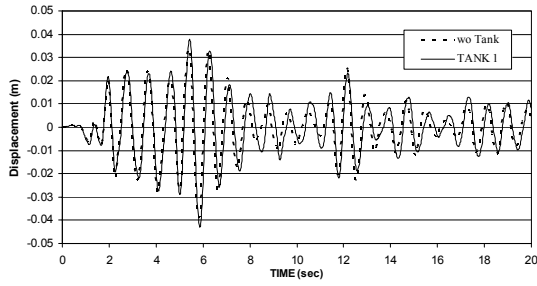
(

()

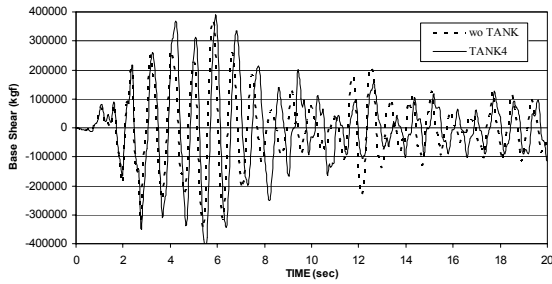
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(

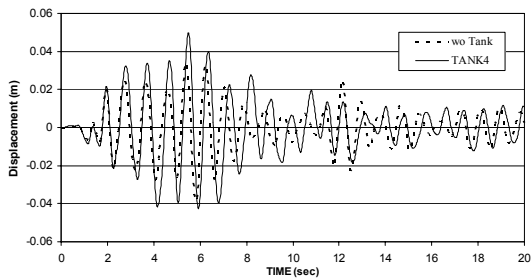
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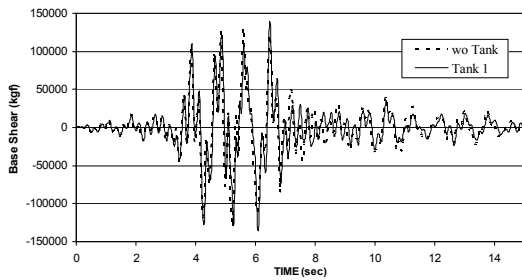
(Tank-1)



(Tank-4)

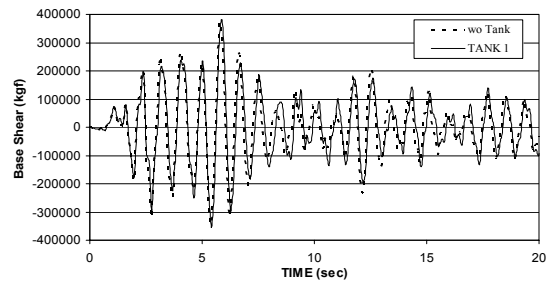


(Tank-4)

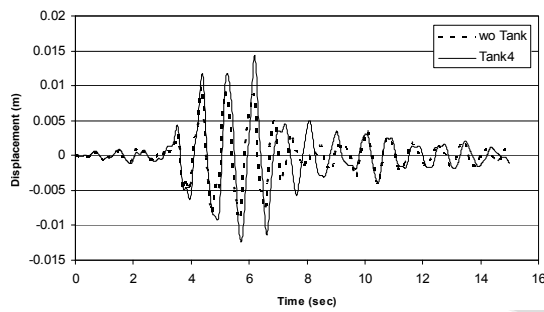


(Tank-1)

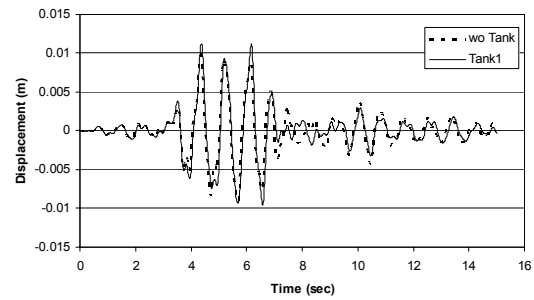
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)
()
()



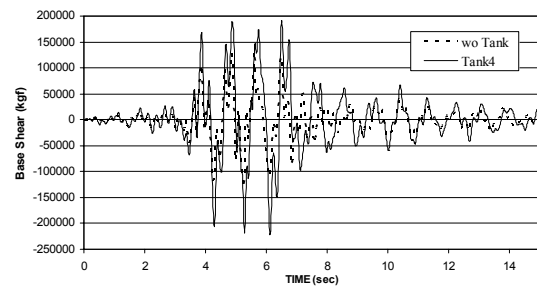
(Tank-1)



(Tank-4)



(Tank-1)



(Tank-4)

- 1 - Hashemi, S. F. (2005). *Studying Impact of Dynamic Water-Structure Interaction in the Tanks on Buildings Roofs*. A thesis presented to the University of Tehran, in partial fulfillment of the requirement for the Degree of M.Sc.
- 2 - Afkham Javid, A. (2004). *Evaluating Reduction Factor Elevated Concrete Tanks with Braced and Unbraced Legs*. Thesis presented to Tarbiat Modares University, in partial fulfillment of the requirement for the Degree of M.Sc.
- 3 - Malhotra, P. K. and Veletsos, A. S. (1995) "*Seismic Response of Unanchored and Partially Anchored Liquid Storage Tanks*". Report TR-105809, Electric Power Research Institute, Palo Alto.
- 4 - Housner, G. W. (1963). "The dynamic behavior of water tanks." *Bulletin of Seismological Society of America*, Vol. 53.
- 5 - Haroun, M. A. and Housner, G. W. (1981). "Seismic design of liquid-storage tanks." *Journal of Technical Councils, ASCE*, New York, Vol. 107, No. 1, PP. 191-207.
- 6 - Haroun, M. A. (1983). "Vibration studies and tests of liquid storage tanks." *Earthquake Engineering and Structural Dynamics*, Vol. 11, PP. 179-206.
- 7 - Hamdan, F. H. (2000). "Seismic behavior of cylindrical steel liquid storage tanks." *Journal of Constructional Steel Research*, Vol. 53, PP. 307-333.
- 8 - ANSYS 5.4, (1997). "User's manual for ansys revision 5.4." *ANSYS Engineering Analysis System*, SAS IP, Inc.