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Journal Name:	British Journal of Mathematics & Computer Science
Manuscript Number:	2014_BJMCS_11299
Title of the Manuscript:	Evaluating numerical- mathematical model of base-isolated rectangular liquid tanks under Bi-directional seismic excitation
Type of the Article	Original Research Article

General guideline for Peer Review process:

This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty**', provided the manuscript is scientifically robust and technically sound.

To know the complete guideline for Peer Review process, reviewers are requested to visit this link:

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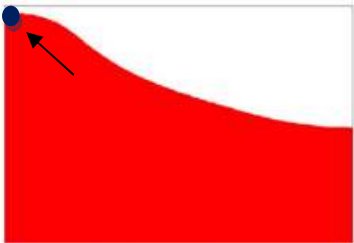
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PART 1: Review Comments

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
<u>Compulsory</u> REVISION comments	Strict major revision required. Cannot tell the acceptance now, it depends how the paper is revised and resubmitted.	
<u>Minor</u> REVISION comments	What I understand from the manuscript is: Sloshing response under different horizontal and vertical seismic excitations in water filled rectangular tanks with and without base isolation is carried out numerically. Authors have used finite element method as the numerical method. Formulation has been validated with experimental results. It is concluded that base isolation has strong effect on base shear. Literature has wide references on sloshing; with base isolation also there are papers. The problem of sloshing is always under research and an interesting problem. However numbers of papers present, still new papers keep published on sloshing. The present articles work is interesting, but it is not written up to the mark. It can be further refined and make look convincing, good. Final conclusion on the manuscript can be taken if authors can look after the following comments: 1. The manuscript is not at all in proper order. Authors discussed governing equation in section 2, finite element formulation without discussing and showing any system, base isolation in section 3, followed by verification of FEM numerical model. Section 4 discusses ground motions used for analysis, then numerical analysis with	1. Modified according to referee comment. 2. Modified according to referee comment. 3. Modified according to referee comment. 4. Modified according to referee comment. 5. Modified according to referee comment. 6. Modified according to referee comment. 7. Modified according to referee comment. 8. Modified according to referee comment. 9. Modified according to referee comment. 10. Modified according to referee comment. 11. Modified according to referee comment. 12. Modified according to referee comment. 13. Modified according to referee comment. 14. As you know verification process must be done by proper experimental data. Unfortunately there isn't any proper data of isolated water tank so the numerical approach has been verified by a proper data of non-isolated experimental data after that the results extended to isolated case. 15. Modified according to refry comment. 16. The highest point in the middle of tank transversal wall.



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	modal analysis and time history analysis. Arrange the sections in appropriate order and make discussion continuous. Abstract 2. Line 13: The continuous liquid mass of the Tank was modeled as lumped masses referred as convective mass, impulsive and rigid mass. What is rigid mass? 3. Line 14: What does verified rectangular tank mean? 4. Line 30: What does accured mean? 5. Line 68: The governing boundary conditions (dynamic and kinematic) for free surface are linearized to get single free surface condition Eq. (3). Consider rewriting the Para. 6. Eqs. (1)-(3) are potential based and Eq. (5) is pressure based. Eq. (3) and Eq. (5) are the same. Why there is a difference in the variable? Section 3-2 – Finite Element Formulation of motion 7. It would be better to show a base isolated liquid storage tank in figure. Nowhere, I could see its figure where the whole paper theme is analysis of base isolated storage tanks. Also discuss about base isolation. 8. As it is mentioned finite element formulation, it is required to show the mesh of the base isolated liquid storage tank. 9. In Eq. (6), α, F_y, Z_x and Z_y has to be explained. Section 3- Verification of FEM Numerical model 10. Line 110: check the spelling of dimension 11. Write the dimensions of tank and shake table in the same order l,b,h (length, breadth and height) 12. Line 119: N shall be n. 13. Eq. (9) nowhere mentioned and importance of this	 17. Natural frequency of tank is equal to 0.887 HZ. <table border="1"> <thead> <tr> <th colspan="3">Number of Elements</th> <th rowspan="2">Number of fluid elements</th> <th rowspan="2">Natural frequency</th> </tr> <tr> <th>In length</th> <th>In breadth</th> <th>In height</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>8</td> <td>12</td> <td>1920</td> <td>0.887</td> </tr> </tbody> </table> 18. Modified according to referee comment. 19. Modified according to referee comment. 20. Modified according to referee comment 21. The total displacement vector in the X, Y and Z directions by RSM method. 22. Modified according to refry comment. Validate the frequencies with analytical solutions: the first frequency of convective mode of rectangular liquid tank According to, ACI, 350.3 code is obtained from follow equations: Also First mode frequency of fluid that obtained from modal analysis is equal to 0.119 HZ, which was shown in table 1 of modal analyses.	Number of Elements			Number of fluid elements	Natural frequency	In length	In breadth	In height	20	8	12	1920	0.887
Number of Elements			Number of fluid elements	Natural frequency											
In length	In breadth	In height													
20	8	12	1920	0.887											



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	equation not explained. 14. Validation is done without base isolation; it is not at all mentioned. How Eq. (7) give dynamic response without base isolation? It has to be discussed. 15. For dynamic analysis, it is needed to give input frequency and amplitude. It is not at all mentioned what are the excitation parameters for the response validated and shown in Figure 1. 16. Figure 1 shows the slosh response at what location of tank? 17. Before the dynamic response analysis, it is needed to find the natural frequencies of the system and then solve for dynamic response. Get the natural frequencies and compare with the reference [15]. This makes validation of the model proper and strong. Section 4 – Records of ground motions 18. Rewrite the whole section. Mention the necessity of reducing the time history into few seconds which are dominant. 19. It would be better to mention from where the time history records has been obtained as a reference. It would help the readers to use such records if they are of same field. Section 5.1. Modal Analysis 20. Rewrite the first paragraph (154 – 161). 21. Line 165: What does summation displacement vector mean? 22. Table I: What are the units of frequencies? These are frequencies of what dimensions of tank? Validate the frequencies with existing results or analytical solutions. Are these frequencies with base isolation? Or without	$\omega_c = \frac{\lambda}{\sqrt{L}}$ $\lambda = \sqrt{3.16g \tanh[3.16(H_L/L)]}$ $T_c = \frac{2\pi}{\omega_c} = \left(\frac{2\pi}{\lambda}\right)\sqrt{L}$ $\omega_c = \frac{3.58}{\sqrt{22.6}} = 0.75$ $\lambda = \sqrt{3.16 \times 9.8 \times \tanh[3.16 \times (3.16/22.6)]} = 3.58$ $T_c = \left(\frac{2 \times \pi}{3.58}\right) \times \sqrt{22.6} = 8.34$ $f_c = \frac{1}{T_c} = \frac{1}{8.34} = 0.119$ 23. Modified according to referee comment. 24. Modified according to referee comment. 25. Modified according to referee comment. 26. COMBIN40 is a combination of a spring-slider and damper in parallel, coupled to a gap in series. A mass can be associated with one or both nodal points. The element has one degree of freedom at each node, either a nodal translation, rotation, pressure, or temperature. The mass, springs, slider, damper, and/or the gap may be removed from the element. 27. The basic theory of fluid-structure interaction that used is this research was done based on: [Amabili et al. (1998), Papaspyrou et al. (2004)]. 28. The base-isolated structural systems contain an isolator layer composed by rubber like materials with obvious non-linear mechanical properties. Therefore the time history analysis can be called “non-linear time history analysis”.
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	base isolation? Does base isolation effect natural frequencies? 23. Figure 4: What does displacement vector sum mean? As the analysis is 3D, 3D mode shapes for sloshing can be shown. What is difference between first and third mode shape? In the second mode there is no deformation at all. Check the mode shapes once again. Section 5.2. Time history analysis 24. I think authors have used ANSYS software for the analysis. Line 181, they have mentioned the elements used, these are elements of ANSYS. Why authors have not mentioned the software used? Rather they mentioned elements of software; it would be confusing to readers. 25. Fluid element has three d.o.f (degrees of freedom), from these how the governing Eq. (1)-(4) are solved? Include explanation. 26. Check the number of d.o.f for combination 40 element. 27. Authors used fluid-structure interaction. No where structure formulation discussed. Please discuss about structure. 28. Line 189: what is nonlinear time history analysis? Explanation needed. 29. Table 2, symbols are not proper. 30. Figure 5, no where mentioned. Explain usage of Figure 5. 31. Figure 6, better to show also finite element mesh with and without base isolation. Section 6. Results and discussions Section 6.1. Sloshing 32. Figure 7, there is no match between legend and curves plotted.	29. Modified according to referee comment. 30. Modified according to referee comment. 31. Modified according to referee comment. 32. Modified according to referee comment. 33. Point A and point B in figure 8. 34. The natural period of isolated tank is equal to 2.5 second and this for non-isolated tank according to table 1 is 0.031 second that conclude the first mode period of base isolation vibration mode in comparison with fixed tank is so longer. 35. The case study that was selected in this research, has symmetric geometry, therefor the base shear plot in X and Y direction look same. In fact the base shear value aren't same. 36. Modified according to refry comment. 37. According the validation parts, sloshing response is validated via proper data. Base shear and sloshing seismic responses aren't indepedended. In my idea with validating sloshing, base shear will be validated. 38. The material of the tank wall like steel or concrete and these properties can be influenced on the rate of rigid or flexible of the tank wall. Which that is one of the factors on the sloshing frequency. 39. Modified according to referee comment. 40. Modified according to referee comment.
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	33. Figure 7 shows the slosh response at what location of the tank? Section 6.2 Base shear 34. Line 244: because of base isolation, the first mode period of base isolation vibration mode in comparison with fixed tank is so longer, where are the frequencies with and without base isolation? It is required to show these frequencies in modal analysis. 35. Figure 8, the base shear plot w.r.t time under X and Y direction excitation looks same. Explain. 36. Line 257: It is needed to explain about LRB at the base isolation explanation. Section 7. Conclusion 37. Line 268: The dynamic analysis to evaluate seismic response sloshing and base shear was proposed and validated by the experimental results. Rewrite this, sloshing response under seismic excitation is validated with existing experiment results. Base shear is not validated and calculation of base shear not discussed. It would be good if the above things are included in article. 38. Line 278: The sloshing frequency is influenced by the material properties of the tank wall, and they are the same for all of the tank models. Justify this statement. References 39. [11] and [12] follows different bibliography compared to rest of references. 40. [13] Should be soil dynamics, mistyped as oil dynamics.	
<u>Optional/General</u> comments		