

The hydraulic experiment for examining the tsunami force

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1. Introduction

In recent years, we were shocked by some terrible disaster that causing many people were killed, but there was unforgettable disaster is the 2004 Sumatra earthquake had generate the gigantic tsunami that brought more than 220,000 people were killed and lost, millions became unsheltered, and many cities became ruins in just a matter of minute.

Although a tsunami cannot be prevented, the impact of a tsunami can be mitigated through community preparedness, timely warnings, and effective responses. Therefore it is necessary to do lot of research to understanding the tsunami its self and the effect. And the author also will do the related experiment with tsunami especially to research the strength of the tsunami force when hitting the structures.

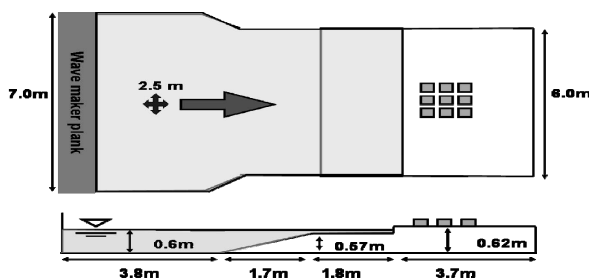


Fig.1 Experimental devices setting

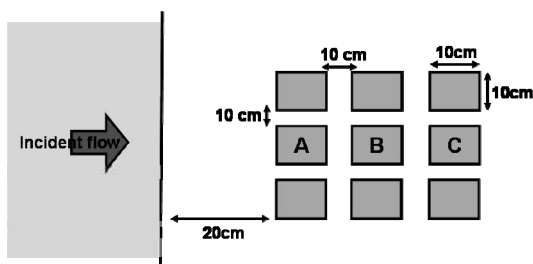


Fig. 2. The conception of position of building

2. Experimental Condition

This hydraulic experiment was held for examining the tsunami force against the structure along the coastal line. By using the experimental devises as is shown in figure 1 and figure 3, the tsunami is generated by computerized wave maker devise with up-down cross calculation found wave profile is H/height of wave 1.85 cm and T/period of wave 6.8 sec.(fig.3). Experiment was done and divided into three kinds of case of experiment with same condition but different placement and number of models.

1) **Case 1.** In this case used nine models of building which located in three columns and three rows with space among the model 10 cm respectively. Experiment is carried out in three positions by set the force gauge in the center of each row such as A, B, C with distance 20 cm, 40 cm and 60 cm from the shoreline (fig. 2).

2) **Case 2.** Using three models of building which located in three columns and one row in every position.

3) **Case3.** Only use one model of building.

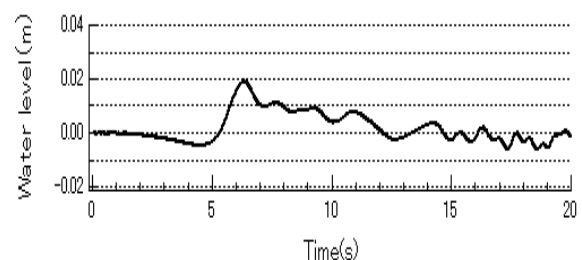


Fig.3. Wave profile with time (2.5 m from wave maker plank)

The condition of $H=1.85$ cm and $T=6.8$ sec was selected because after doing some kind of condition that number can generated the wave as breaking wave and can be assumed it as tsunami wave for experiment.

3. Experimental Result and Discussion :

The main focus in this experiment is case 1 which show the substantive change of force value in second and third row of model (40 and 60 cm from shore line),and to understand that change is convinced by doing case 2 and case 3.And it can see in the following explanation:

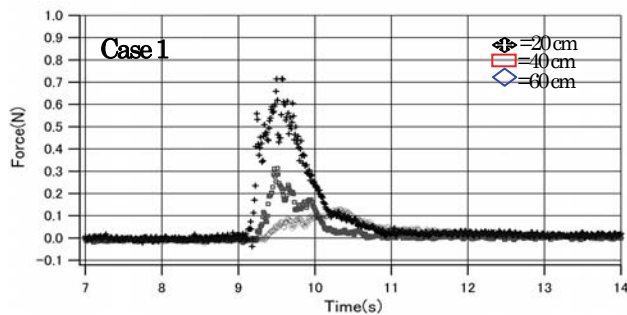


Fig. 4. The effect of the tsunami force to the building

From figure 4 above, the action force of tsunami that work to the model of building decrease abruptly in second and third row of models because of existence of the first row of model to reduce the force of wave.

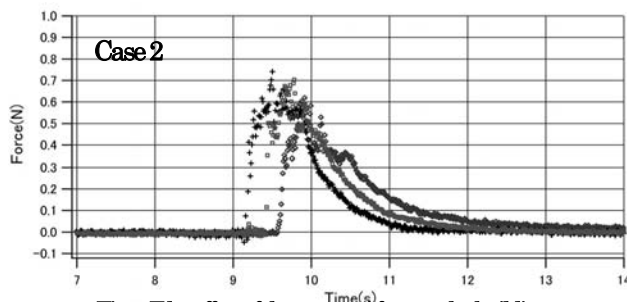


Fig 5. The effect of the tsunami force to the building

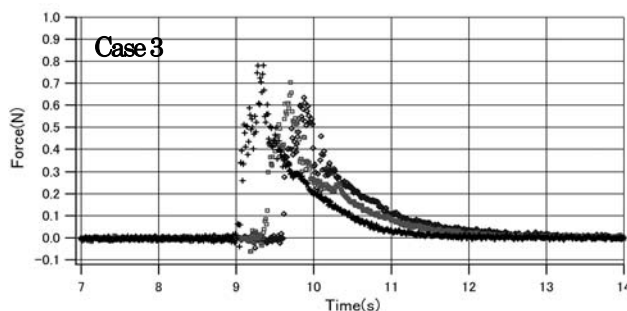


Fig. 6. The effect of the tsunami force to the building

However the decreasing the action force of tsunami in figure 5 and figure 6 is not too essential as figure 4 although in different distance of placement. Because of the wave hit the models directly. And the difference of

maximum action force to the models for each case is shown in fig.7 below.

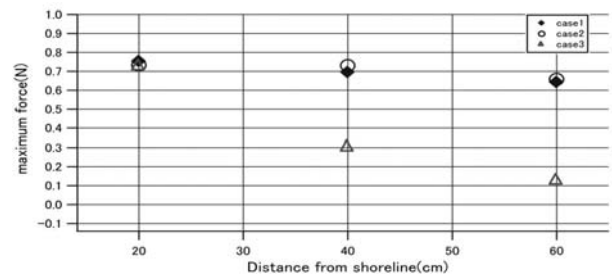


Fig. 7. The average of maximum working force in each case

By direct observation and learning the experimental result, the author got some considerable point as follows:

- 1) For case 1, the action force of the tsunami to model of buildings in each row have big difference. And the action force in A row of model of buildings with is shown by cross mark got bigger impact than B row and in B row is bigger than in C row of models.
- 2) A row which was located in front will be hit by direct wave force and act as if the wall face direct wave, so that, the strength of wave force in the next row will weaken and with the same tendency will happen to the following rows.
- 3) For case 2 and case 3, the action force to the model have same tendency and result is insufficient big change as case 1.

4. Conclusion

Be able to see the general tendency of 'Tsunami' s behavior against the model of building along the coast. The models where located in front facing the wave can give a substantial influence to reduce the force of tsunami. Therefore it become important to build the structure along the coast by the well planned of placement of building for anticipation if the tsunami occurs. (Case I).

Reference

<http://www.bcj.or.jp/c05/02/src/tsunami2006.pdf>. Tsuneo Okada et al.