

Wave Analysis of Rubble Mound Steel-Concrete-Steel Sandwich Seawall in Coastal Area

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Abstract - This paper aims to analyse the effect of wave on sandwich rubble mound seawall model. Rubble mound steel-concrete-steel (SCS) sandwich seawall model is analysed and the total deformation and stress on the structure is studied. The modelling and analysis of structure are done using ANSYS.

Key Words: Rubble mound seawall, steel-concrete-steel, sandwich model, wave analysis, ANSYS

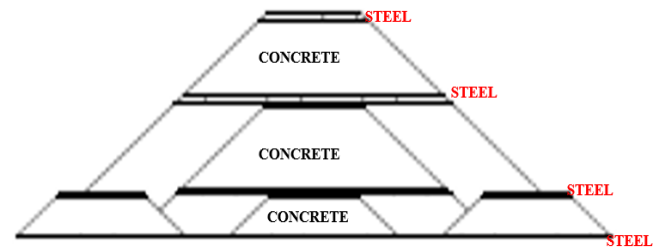


Fig -1: Model

1. INTRODUCTION

Waves are created by wind transferring the energy to water, causing it to move in a circular motion. Waves caused by gravitational pull of sun and moon on earth cause tides. The size of wave depends on wind speed, wind duration and area over which the wind is blowing. A seawall is a form of coastal defense constructed where the sea and associated coastal processes impact directly upon the landforms of coast. The purpose of a seawall is to protect areas of human habitation, conservation and leisure activities from action of tides, waves, or tsunamis. There are many types of seawalls such as curved seawalls, gravity seawalls, steel sheet pile seawalls, concrete block and rock walls. Seawalls are normally very massive structures because they are designed to resist the full force of waves and storm surge. Mound type seawalls are porous, which allow water to filter through after the wave energy has been dissipated.

2. METHODOLOGY

Conventional seawalls are constructed with rock, RCC etc... In this study a composite sandwich seawall model is analysed and studied to make an effective seawall structure which can effectively manage the waste material and make an economical structure. The rubble mound steel-concrete-steel sandwich seawall is modelled and analysed using ANSYS. Rubble mound seawall consists of 3 layers and in each layer a composite sandwich layer of steel-concrete-steel is provided. The steel is provided as thin sheets. The seawall is designed as per IS456-2000, IS1730-1989, CWPRS.

3. MODELING

3.1 Model Type

Model1- Rubble mound steel-concrete-steel sandwich model.

3.2 Model Data

Model details as shown in Table 1.

Table -1: Details of model

Total height	6.36m
Thickness of armour layer	2.18m (1.78m concrete & 0.2m steel each)
Thickness of under layer	2.18m(1.98m concrete & 0.1m steel each)
Thickness of core layer	1m
Thickness of toe berm layer	1m(0.9m concrete & 0.05m steel)
Thickness of filter layer	1m
Grade of concrete	M 30
Grade of steel	Fe 415
Wave energy	3 rd order

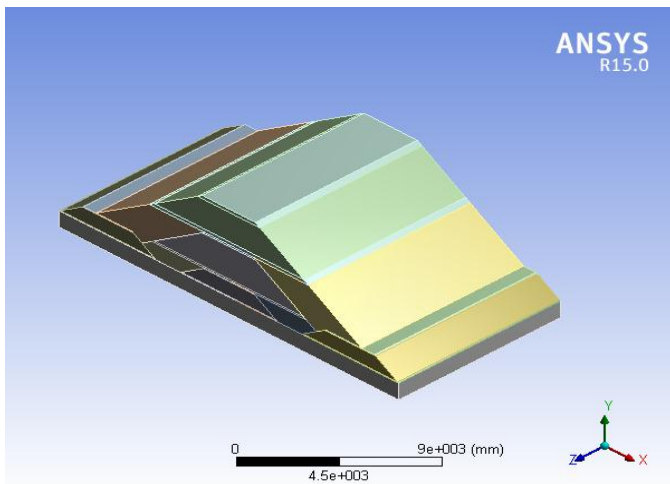


Fig -2: Model

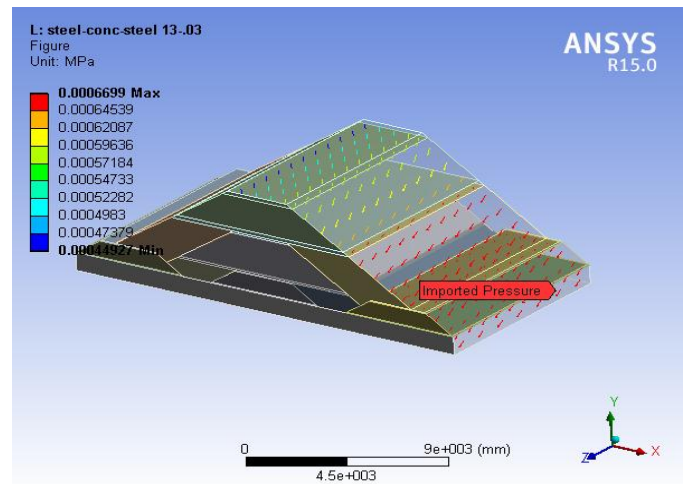


Fig -3: Maximum pressure distribution

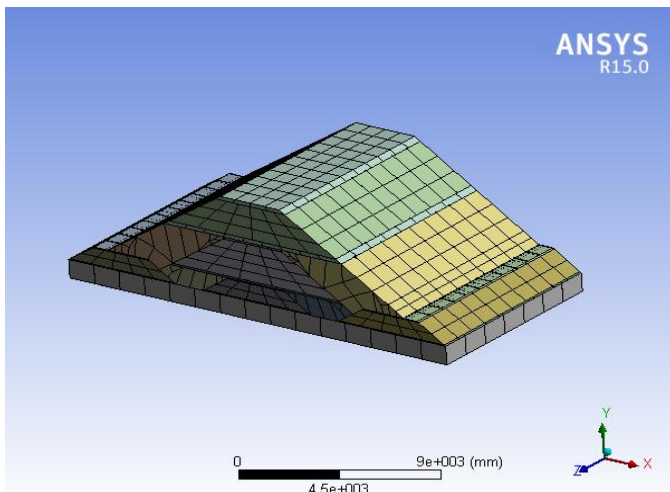


Fig -3: Mesh model

4.2 Total Deformation

The total deformation of the seawall is the displacement caused by the stress. The total deformation of seawall is 0.0003MPa as shown in fig:5

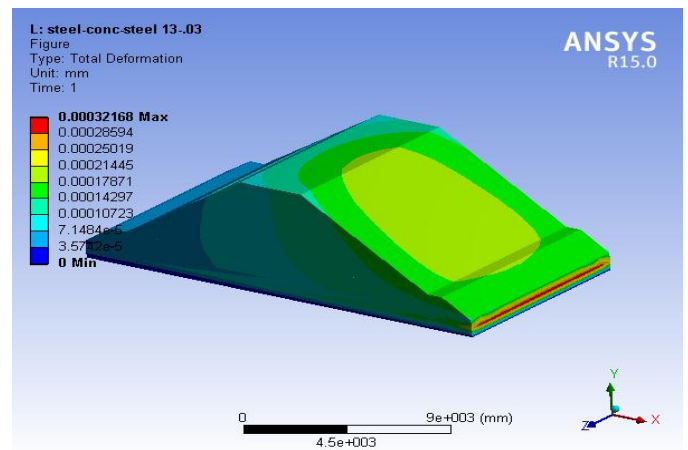


Fig -5: Total deformation

4. RESULT AND DISSCUSION

Analysis of all model is done by wave analysis using ANSYS fluent. The total deformation and maximum principal stress is found.

4.1 Pressure Distribution

The load for analysis is given as wave energy and wave load is converted into pressure distribution. This pressure distribution is simply the pressure at all points in seawall. The maximum pressure distribution on seawall is 0.0007MPa as shown in fig: 4.

4.3 Maximum Principal Stress

The maximum principal stress is the maximum value of normal stress on the seawall. The maximum principal stress of seawall is 0.0003MPa as shown in fig:6

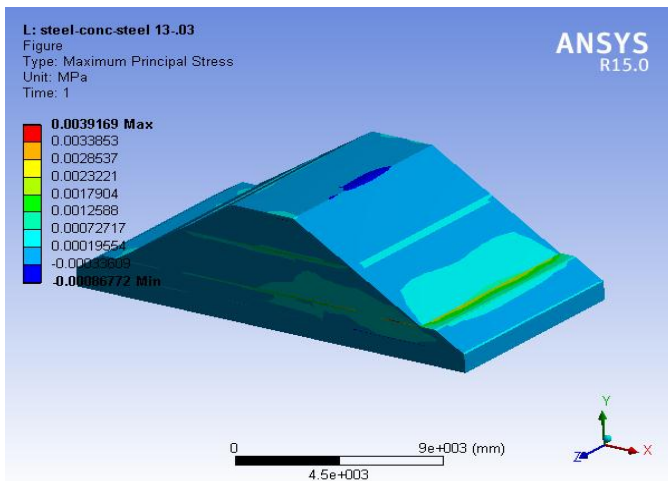


Fig -6: Maximum principal stress

5. CONCLUSIONS

From the wave analysis of rubble mound steel-concrete-steel sandwich seawall, the following conclusions are drawn:

- The value of total deformation is in the safe limit
- The value of maximum principal stress is in the safe limit.
- The effective use of steel and concrete is possible in the structure.
- From the above analysis, it is found that it is safe to use rubble mound SCS sandwich seawall.
- This structure is more effective than CSC sandwich seawall.

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REFERENCES

- [1] L.Calveri et al, "Wave Modelling in Coastal And Inner Seas" Science Direct, 2018
- [2] Balaji R , "Understanding the Effect of Seawall Construction Using a Combination of Analytical Modelling" International Journal Of Ocean and Climate Systems, 2018
- [3] Vijayaraghavan R et al, "Design Of Seawall", IJSDR, April 2018
- [4] IS 456 :2000 Indian Standard- " Plain and Reinforced Concrete -Code of Practice ", Bureau of Indian Standards, New Delhi, 2007.
- [5] IS 800:2007, Code of practice for general construction in steel, Bureau of Indian Standards.
- [6] CWPRS: Guidelines for design & construction of seawall.