

Chapter 4

ANALYSIS OF STRUCTURES

4.1 Analysis of 3 tanks for tank full, 75% fill, 50% fill and tank empty Conditions

4.1.1 Analysis for Earthquakes.

- All the tanks were analyzed according to the Normalized Response Spectra given in AS 1170.1-1989 as figure 7.2. (reproduced as Figure 4.1)

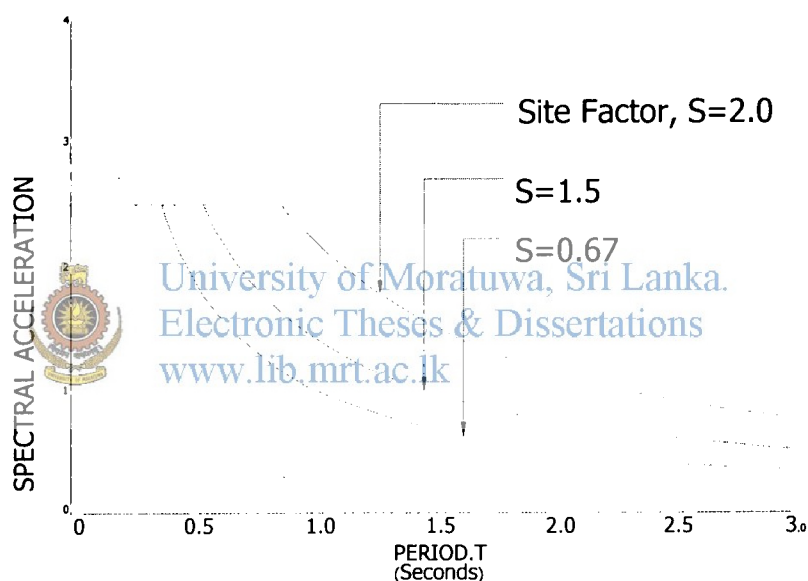


FIGURE 4.1 - NORMALIZED RESPONSE SPECTRA SHAPES (from as 1170.1 - 1989)

- 0.06 was used as Seismic Zone Factor (z), which was recommended for minor earthquake regions in Table 2.3 in AS 1170.1-1989.
- All tanks were analyzed for two different Soil types which were defined in Table 2.4 and AS 1170.1-1989 which are more applicable for Sri Lankan soil conditions.
- Two mass models (Impulsive mode and Convective mode) which were applicable for each and every filled condition were analyzed using SAP 2000 V.14. as Two equivalent uncoupled single degree of freedom systems which was proposed by Prestly et al. (1986)

- Base shear values in the shaft were obtained from SAP model analysis and Bending moments at the bottom of the shafts were derived using those base shear values.
- Obtained Base shear values and Bending moment values from two different modes were combined using Square Root of Sum of Squares (SRSS) rule originally proposed by Malhotra (2004) and recommended in all international codes except Euro code 8 (1998).

4.1.2 Analysis for Wind loads.

- All tanks were analyzed as post-disaster structures for basic wind speeds of 53.5m/s, 47.0m/s, 38.0m/s which were applicable for different wind zones as described on wind design manual published by Ministry of Local Government, Housing and Construction (1980) Refer figure 4.2
- Analysis was carried out according to the CP3: Chapter V: Part 2.

4.2 Analysis for Different Heights

200m³, 300m³ and 750 m³ tanks were modeled for 16, 19 and 18 meters heights, respectively, by following the same procedure described in Clause 3.2.1. However, analysis was done only for soil type 1 with the models developed as explained in 3.2.2, because that is the most common case in Sri Lanka.

4.3 Analysis for Different Shaft Thicknesses

200 m³ & 300 m³ tanks were modeled for 150mm thickness and 300 mm thickness for 750 m³ tank by following the same procedure described in Clause 3.2.1.. But analysis was done only for soil type 1 with the models developed as explained in 3.2.3, because that is the most common case in Sri Lanka.