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SEISMIC ANALYSIS OF R.C.C. AND STEEL SILOS

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Abstract
Structures used for storing bulk solids are called bins, bunkers, silos, or tanks. There is no generally accepted definition for these terms, shallow structures containing coal, crushed stone, gravel, and similar materials are called bins or bunkers and tall structures containing materials such as grain, cement and wheat are usually called silos. Elevated silos generally consist of a conical roof, a cylindrical shell and a conical hopper and they could be elevated and supported by frames or reinforced concrete columns. Circular silos (both steel and reinforced concrete) are used to store material in various industries like cement plants (clinkers), power plants(raw coal), oil and gas industry(sulfur pellets) etc.Elevated steel and reinforced concrete circular silo for storage show performance in earthquake reinforced concrete silo stability increases by using shear wall but loss of steel silo in earthquake stability increases using steel panel on opposite side Displacement of structure decreases in case of shear wall panel and stiffness increases.

Keywords: *Elevated* silos, response spectrum analysis, shear wall, steel plate, time history analysis**.**

I. INTRODUCTION

Silos are an inclusive term of all structures for the storage of bulk solids common use, may be ground-supported or elevated. Typical elevated silos generally consist of a conical roof, a cylindrical shell and a conical hopper and they could be elevated and supported by frames or reinforced concrete columns or on discrete supports. Silos are lifeline structures and strategically very important, since they have vital use in industries. Silos are special structures subjected to many different unconventional loading conditions, which result in unusual failure modes. Silos are cantilever structures with the material stacked up very high vertically. The walls of different type of silos are subject to earthquake loads from the stored mass, and these may substantially exceed the pressures from filling and discharge. The elevated silos response is highly influenced by the earthquake characteristics and is depending on the height to diameter ratio. In the earthquake analysis of such structures is to consider the silo and its content as a lumped mass and seismic effect of this mass is considered in design of the supporting frame only. Failure of a silo can be devastating as it can result in loss of the container, contamination of the material it contains, loss of material, replacement costs, environmental damage, and possible injury or loss of life. Silos and bins fail with a frequency which is much higher than almost any other industrial equipment. Sometimes the failure only involves distortion or deformation which, while unsightly, does not pose a safety or operational hazard.

II. MODELING

Four models of the present work were used to analyze elevated silos R.C.C. silos with and without shear wall and steel silos with and without shear wall panel use M20 and Fe 500.

Table 1 Dimension of silos

Height of cylindrical portion	18m
Height of conical portion	2.5m
Height of column	5m
Internal diameter	5.5m
Central opening	0.5m
Diameter of column	500mm
Thickness of shell	300mm
Size of beam	300X600mm

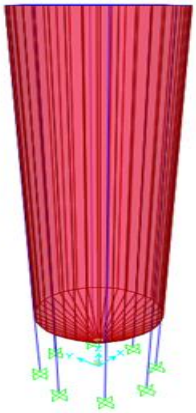


Fig.1 R.C.C. Silo without shear wall

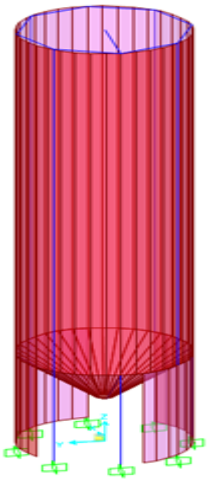


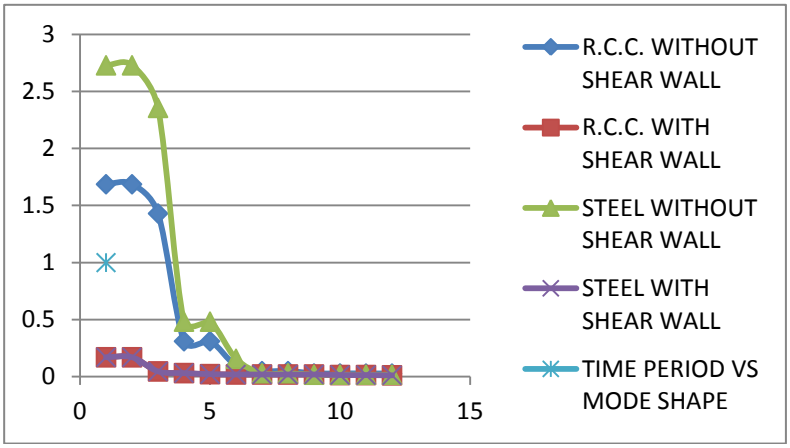
Fig.2 R.C.C. Silo with shear wall

III. RESULTS AND DISSCUTION

In R.C.C. Silo with maximum displacement in case of without shear wall but provide shear wall on the opposite side displacement due to earthquake loading is decrease. Wall thickness of shear wall is same as thickness of cylindrical portion. In case of Steel silos steel plate is provided as function of shear wall displacement of steel silo is decrease by using steel plate and stability of structure is increases. Time period of structure is less of both cases R.C.C. and steel silos by using shear wall.

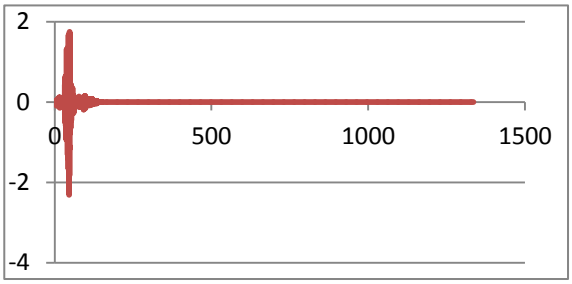
Table 2 Top displacement in (mm)

R.C.C. Silo without shear wall	R.C.C. Silo with shear wall
U1=11.6742	U1=6.9956
U2=0.0015	U2=0.6928
U3=0.0927	U3=0.1468
Steel Silo without shear wall	Steel Silo with shear wall
U1=19.4412	U1=3.5691
U2=0.0006	U2=0.286
U3=0.2946	U3=0.5068

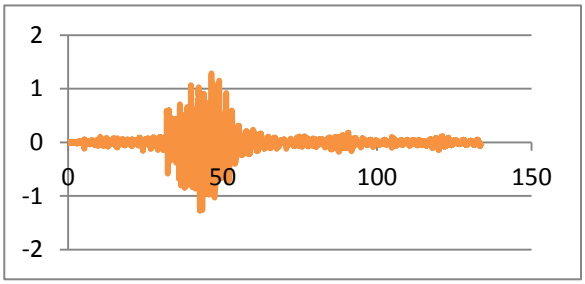


Graph 1 Time period Vs Mode shape

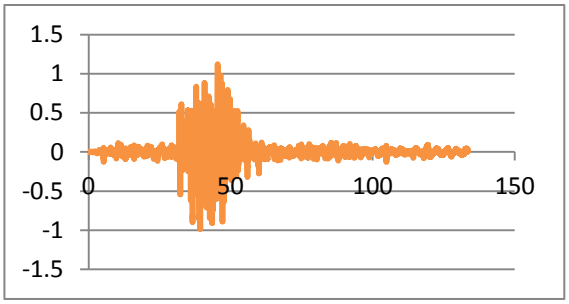
Acceleration results for full loaded condition (Acceleration Vs Time)



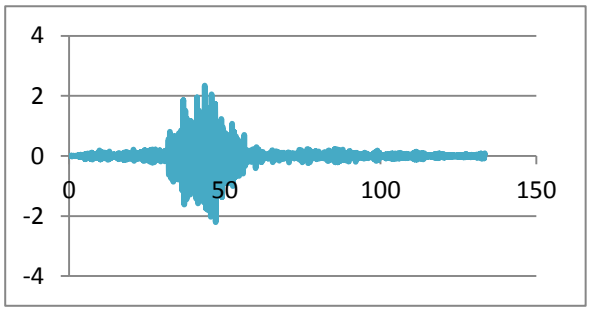
Graph 2 R.C.C. Silo with shear wall



R.C.C. Silo without shear wall

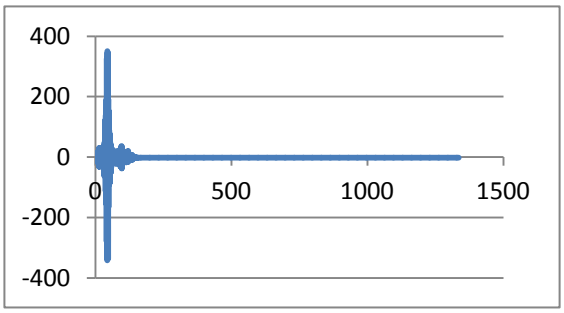


Graph 3 Steel Silo with shear wall

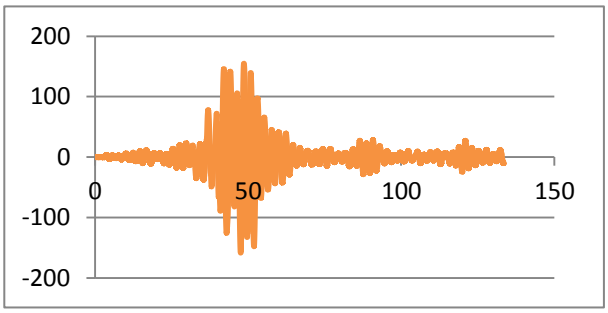


Steel Silo without shear wall

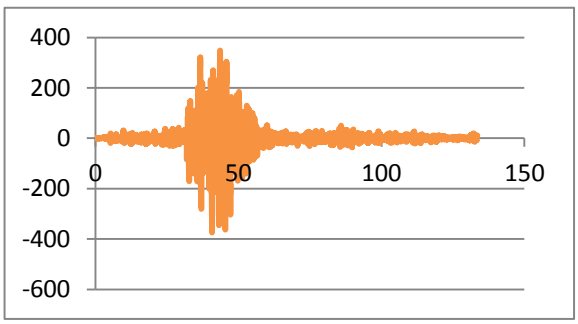
Base Shear results for full loaded condition (Base Shear Vs Time)



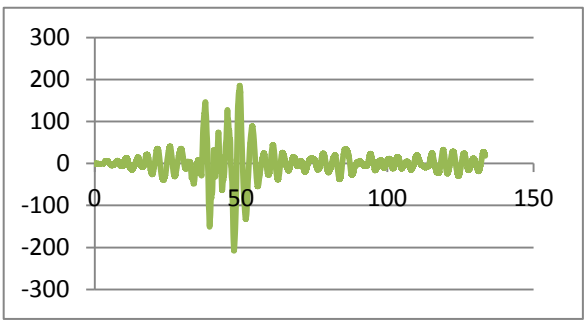
Graph 4 R.C.C. Silo with shear wall



R.C.C. Silo without shear wall



Graph 5 Steel Silo with shear wall



Steel Silo without shear wall

IV. CONCLUSION

R.C.C. Silos and steel silos in RSM method with shear wall displacement of structure is reduce compare to without shear wall. Due to using shear wall time period of structure is reduces. In Time history analysis acceleration of silo structure is decreases and base shear is increases in both cases R.C.C. Silos and steel silos with shear wall.

V. REFERENCES

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