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Analysis of Self Compacting Concrete Structure using ETABS

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Abstract - *This paper summarizes the research work on the analysis of self-compacting concrete structure using ETABS2015. Self compacting concrete is a highly flowable, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation. It is also a concrete that can flow around reinforcement and consolidates under its own weight without additional effort and without exceeding specified limits of segregation. New application of self-compacting concrete (SCC) is focused on high performance-better and more reliable quality, dense and uniform surface texture, improved durability, high strength and faster construction.*

In this paper examine the mechanical properties of SCC such as compressive strength, split tensile strength, flexural strength, water absorption, workability and resistance to shrinkage etc. Also implement the SCC with in a structure. The structure is designed and analyzed using ETABS. And check the stability of the structure.

Key Words: Self compacting concrete, ETABS

1. INTRODUCTION

In construction industries self-compacting is introducing in addition to most commonly used material such as concrete. It is a great achievement in construction field. SCC is more helpful to reduce noise pollution.

Self-compacting concrete is highly engineered concrete with much higher fluidity without segregation and is capable of filling every corner of formwork under its self-weight. Thus SCC eliminates the vibration for the compaction of concrete without affecting its engineered properties.

SCC building structure having 10 stories (20×20m) were modelled and analyzed in ETABS 2015. IS 875(Part I, II, III) and IS 1893 are used to calculate the dead load, live load, wind load and seismic load respectively. Analysis of structure is carried out to get desired results.

In the design of a self-compacting concrete structure, the aim is to provide a safe, serviceable, durable, economical and aesthetically pleasing structure. For the structure to be safe, it must be able to resist the worst loading conditions. The beam and column layouts were first fixed and the modeling was done using software ETABS.

1.1 Objective

1. Examine the behavior of self-compacting concrete structure.
2. Examine the story drift.
3. Examine the story shear.
4. Examine the maximum story displacement.

2. SOFTWARE

ETABS is a special-purpose computer program, sophisticated yet easy to use, special purpose analysis and design program developed specifically for building systems. ETABS Version 9 features an intuitive and powerful graphical interface coupled with unmatched modelling, analytical, and design procedures, all integrated using a common database. Although its work quick and easy for simple structures.

3. MODELLING OF STRUCTURE

For the structure to be safe, it must be able to resist the worst loading conditions. Under normal working conditions, the deformation and cracking must not be excessive for the structure to remain serviceable, durable and aesthetically pleasing during the extended design life. Self-compacting concrete structure was modelled in ETABS software for the analysis and design.

Table -1: Structure details

Plan dimension	20×20m
No. of stories	10
Structure type	Self-compacting concrete
Story height	3m each
Base consideration	Fixed

Table -2: Material properties

Compressive strength of SCC	40.3 N/mm^2
Grade of steel	Fe415
Modulus of elasticity of SCC	36184 MPa

Table -3: Sectional properties

Beam size	230×400mm
Column size	600×600mm
Thickness of slab	150mm
Thickness of shear wall	230mm

Table -4: Loading details

Dead load	Top floor : 1.2 kN/m Roof :2 kN/m
Live load	Top floor : 3 kN/m Roof : 1.5 kN/m
Wind Loading	
Wind speed	39 m/s
Category	2
Class	B
Risk factor	1

Table -5: Seismic loading

Zone	II (moderate)
Zone factor	0.16
Importance factor	1.5
Response reduction factor	5

Table -6: Load combination

1.5DL	(DL -EQY)1.5
(DL + LL)1.5	(DL +WLX)1.5

(Dl + LL+ EQX)1.2	(DL +WLY)1.5
(DL + LL + EQY)1.2	(DL -WLX)1.5
(DL + LL – EQX)1.2	(DL -WLY)1.5
(DL + LL - EQY)1.2	0.9 DL + 1.5 EQX
(DL + LL + WLX)1.2	0.9 DL + 1.5 EQY
(DL + LL + WLY)1.2	0.9 DL - 1.5 EQX
(DL + LL – WLX)1.2	0.9 DL - 1.5 EQY
(DL + LL – WLY)1.2	0.9 DL + 1.5 WLX
(DL + EQX)1.5	0.9 DL + 1.5 WLY

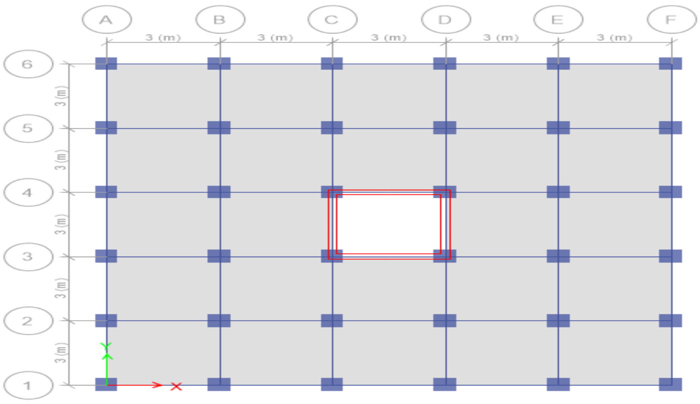

Fig -1: Plan of the structure

4. ANALYSIS

The structure was analysed as special moment resisting space frames in the versatile software ETABS.

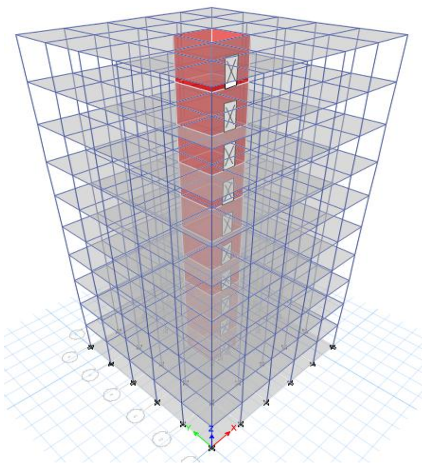

Fig -2: 3D view of the structure

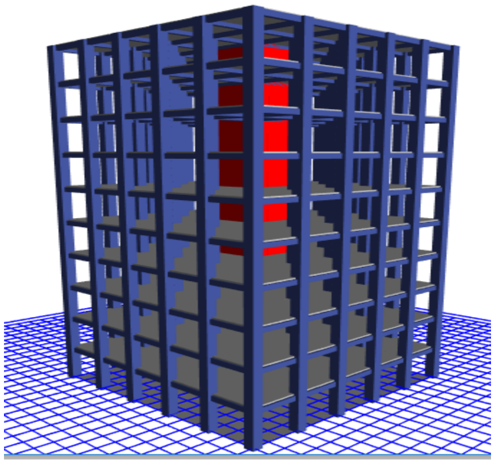

Fig -3: 3D rendered view of the structure

5. RESULT

Fig-4, Fig-5, Fig-6 represents the result value of story shear, story drift and maximum story displacement.

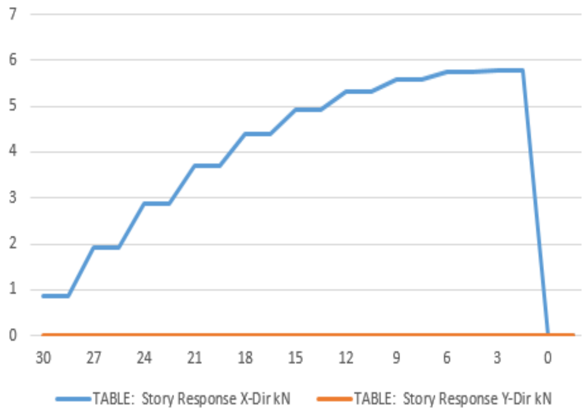

Fig -4: Story shear of the structure

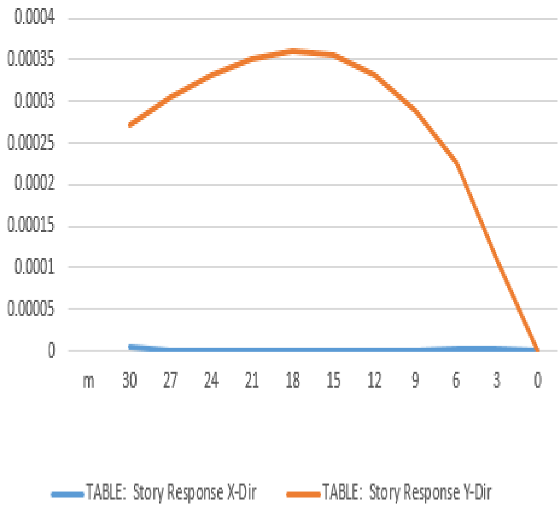

Fig -5: Story drift of the structure

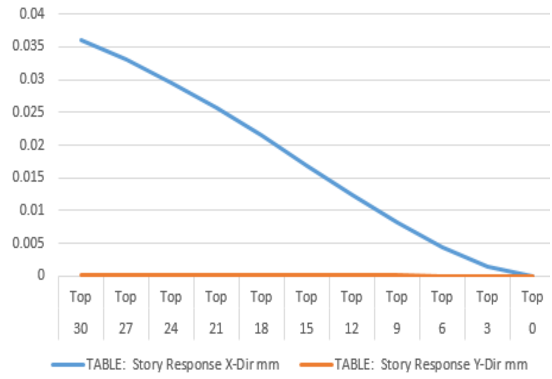

Fig -6: Maximum story displacement of the structure

6. CONCLUSIONS

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