A STUDY ON STRUCTURES WITH REFERENCE TO HSC IN COASTAL AREA

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Abstract

The aim of this section is to provide an overview of the structural engineering properties and characteristics of HSC, in light of the recent experimental and theoretical research and published results. There are other non-structural benefits of using HSC, for example the improved durability of the material which is a result of reduced porosity and the use of high-quality materials. However, the topic of durability is not discussed here in detail. HSC with good binder and aggregates with footing taken in to consideration for mix design of the structural properties enhancement for water resisted structures. The work further makes a theoretical and computational response comparison at the end for better recommendations. A recommended difference of 2 to 3 % in all the cases found between numerical and computational.

Keywords: *Structural properties, HSC, Water resisted structures.*

INTRODUCTION

In the past few years, High Strength Concrete (HSC) has attracted more attention from civil and building engineers. This relatively new material is gaining popularity in the industrial sector due to its low cost and excellent engineering properties. It also has a lower life-cycle cost than standard cement (NSC) and is more durable and rigid than NSC. Beton has a 25MPa unique force (f'c). This characteristic force is well-known for being extremely strong in the mid-twenties. High strength concrete with 50 MPa was used in the 1980s. HSC was first identified as an alternative design method for concrete construction around 20 years ago. HSC is now a viable option for concrete construction during the preliminary design phase. HSC technology is now sufficiently advanced to make concrete commercially available with compressive strengths of up to 120MPa. This is in addition to being much more robust than the one made in the laboratory. HSC is well-known for its economic benefits. This can be seen in the many recent construction projects where HSC has been implemented successfully.

HSC is increasingly being used in building construction, particularly multi-storey buildings in developing and industrial countries. HSC is used in nearly every building project in Australia for high-rise and mid-rise buildings. Most buildings in Australia are constructed in concrete.

High strength concrete constituents

There can't be any unusual or single components in renewable, high-performance concrete. A popular mix is Portland cement, super plasticizers, silica and fly ash. There are many cement substitutes that can be used as cement by-products. This section focuses on the relative value of each material in high-performance concrete production.

Water/content binding (w/b), and cement content. The HSC usually contains one or two minerals for partial cement replacement. The W/B relationship can be replaced with the term water/cement (w/c), which is used in the NSC ratio. Here, the binder is the cement's total weight plus any additional additives. The minimum w/b ratio for maximum cement pastes is 0.36. NSC has a working capacity limit that is often exceeded. HSC does not require complete hydration to reach maximum force. Therefore, w/b ratios lower than 0.36 can be achieved. As low as 0.2% HSCs was required to achieve the w/b ratios. Due to the high amount of over-plasticisers, a w/b ratio of 0,23 is ideal for high resistance concrete combinations. This allows for maximum compressive strength and protects working power. HSC concrete is often made with mineral admixtures such as silica smoke and fly ash. These by-products of surface modification allow for the production of concrete with high resistance.

LITERATURE REVIEW

Mayor Baxani et al. (2015) The Masonry wall's dynamic response was 0.5 kg 0.5 m away from the wall. Langrange and Eulerian methods are used to implement the necessary blast load parameters. Autodyne was used as a tool for analysing the Finite Elements. This work was designed to analysed the local effect and global response of the masonry wall. The study found acceleration, load speed in ground and air, the highest air-exclusion speeds were 11,772 mm/s2 and 8,14 mm/s2, respectively.

J. Yogeshwarana, C. Pavithrab (2015) Frame analysis of a high-floor tank was performed. This study also takes into account that previous studies did not consider the fluid reaction to the tank structures. However, this work employs the master model approach for calculating seismically forces within this tank volume of 900 cubic meters. The hydrodynamic pressure of liquid had a greater impact on slab structure and wall in this analysis. The tank's water content will affect the base year value. The study found that the tank wall must not fail in order to maintain earthquake resistance. This study shows that the intensity of the horrible event affects the tension of the pump. It is also crucial to fill the pump with water.

METHODOLOGY

As technology has increased very rapidly in the past two decades, concrete has been constructed with different new constituent forms, fine aggregates, rough aggregates, are the only materials that are used in concrete over the last decades and in the earlier times; now, different materials are available that can substitute these materials. High strength concrete is that, with a pulse force exceeding 55MPa, no specific codes for high strength concrete according to the Indian requirements, various test error methods have to be performed to achieve a high strength. The addition of super plastics known as reduction of water cement and other mixes, including silica fume, fly ash, GGBS etc. can achieve high strength concrete the materials used in high strength concrete are good enough to achieve strength.

Advantages of the high strength concrete compared to normal grade concrete are mentioned below

- Greater stiffness
- High resistance to abrasion

Greater load resistance

Long life expectancy and durability

Low permeability

Chemical protection Safety In order to achieve engineered strength, high strength

Baton must be properly examined when casting and the following points must be taken into account during the work with HSC. Clear and precise should be the mixing proportions. Need for concrete mixer.

- Good property of aggregates.
- High slump value than normal grade concrete.
- High Water reducers-super plasticizers
- Addressing the DRR set objectives out in the Sendai Risk Reduction Framework.

High Strength Concrete:

- Low w/c/w/b ratio
- Fine pozzolanic/silica fumes addition
- Super plasticizers may be added

Beton with a specific cubic strength between 60 and 100 N/mm2 can be defined as high strength concrete (HSC) Concrete High-solid concrete is generated by reducing to 0.35 or lower the water-cement ratio (W/C). Super plasticizers are also combined with high-strength cement mixtures to compensate for the decreased working capacity due to low W / C ratios. In bridges, HSC could reduce the girders' number and depth and belt length.

Properties of Concrete:

Concrete properties include the contact of the cement paste with the aggregates. The purpose of cement pastes and sand as a mortar is to bind coarse compounds. The mortar adhesion to the ground aggregate depends on the form and dimension of the mould. The mixture of the concrete components therefore would have an effect on their characteristic.

RESULTS AND DISCUSSIONS

Materials for the Structure

The structural materials with their various constants were defined as concrete according to the Norm IS code of practice.

Dead load from slab

STAAD can also cause the slab to bear the dead load. Consider the floor thickness and the load per square meter.

Column weight, beam weight, RCC weight, RCC sheet Weight, Terracing weight. Outside walls, inner walls, and a roof parapet.

The load was found to be:

Wall loads 14 kN/m^2

Floor load 5.5kN/m^2.

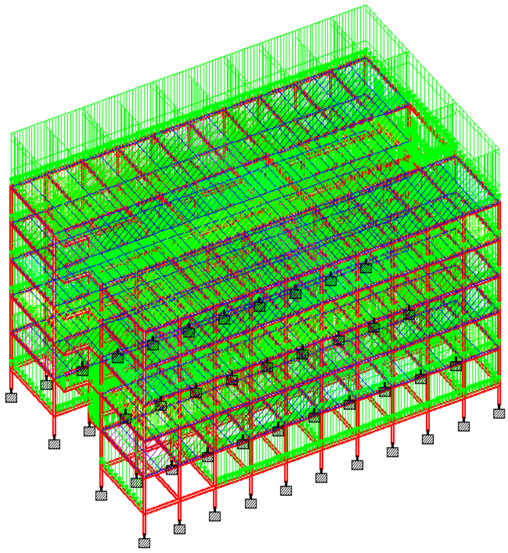


Figure: Structure under DL from slab

Live Load

Live load is taken as 4kN/m^2 (as per is standards for educational buildings from IS 875).

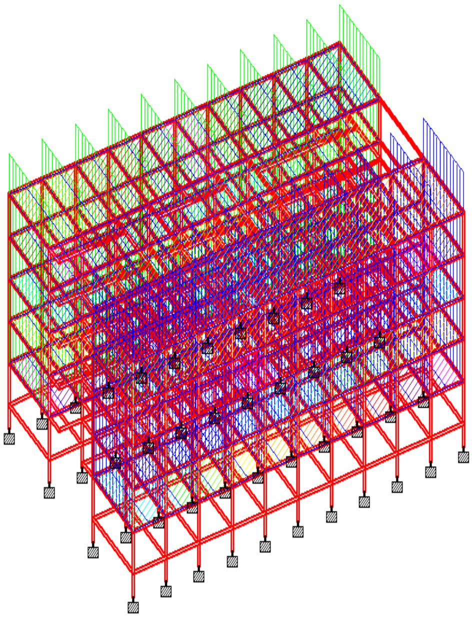


Figure: Structure under live load

Design of stair case:

Staircases have arisen because of the need to secure a convenient and safe passage from one level to another. Thus at its beginnings, such a passage might be regarded as a sloping plane, connecting two horizontal levels with a series of equal rises, or steps shaped to allow for travelling.

Linear dynamic analysis

The linear method of analyzing dynamics is the approach to response spectrum. This method calculates the maximum response of the structure to an earthquake. However, it is not applicable to structural design.

Linear time history analysis eliminates all of the problems of a modal continuum analysis. Nonlinear action is not involved and the model's support points are moved back and forth to match a recoded ground movement of an earthquake. This data was recorded by a seismograph, and can be viewed in tabular form as time vs acceleration.

Load combinations according to IS codes

When earthquake forces are considered, load combinations are combined together with partial safety factors to state-limit designs for reinforced concrete structures. DL, LL and EQX are the response quantities due live load, dead load and earthquake loads in X or Y direction. As outlined in Table 5.2, IS 1893-2002 Part 1 Part 1, load combinations are considered.

Table: Load combination as per Indian standards

Load Combination	Load Factors
Gravity Analysis	1.5(DL + LL)
Equivalent Static Analysis	1.2(DL + LL ± EQX)
	1.2(DL + LL ± EQY)
	1.5(DL ± EQX)
	1.5(DL ± EQY)
	0.9(DL ± EQX)
	0.9(DL ± EQY)
	0.9DL ± 1.5EQX
	0.9DL ± 1.5EQY

It is the complete displacement of the story about the terrain. Table shows the historical displacement of modeled structures in zone III using the response spectrum approach and time history analysis in X – direction.

Table: Story displacements of the structures in zone III in X-direction

Displacements(mm) in Zone III in X-			
Story	**Elevation (m)**	**X** Displacement(mm)	**Y** Displacement(mm
Story7	21	-1.74	-0.5297
Story6	18	-1.063	-0.3476
Story5	15	-0.337	-0.514
Story4	12	-0.886	-0.2058
Story3	9	-0.1442	-0.1479

Story2	6	-0.12711	-0.05726
Story1	3	-0.1195	-0.01442
Base	0	0	0

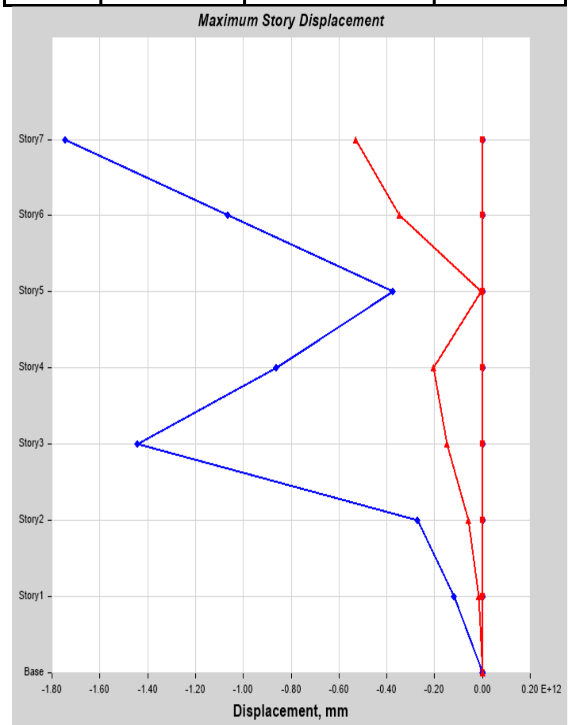


Figure: Story displacement of conventional concrete in zone III in X-direction & Y- direction

Story drifts

Tale Two floors consecutively are called drift because of the floor height displacement. A drift in the frame structure is the result of the shear and flexure mode contributions. The flexural component displacement of high-rise structures is dominated by higher axial forces and column deformations and their impact accumulation at higher heights. The table shows the drifts of modelling system in zone III, along with a continuum of response and a timeline in X.

Table 4.4 Story drifts of the structures in zone III in X-direction

Drift(mm) in ZoneIII in X-direction			
		X	**Y**
Story	**Elevation (m)**	Drift(mm)	Drift(mm)
Story7	21	-1.745	-0.5297
Story6	18	-1.063	-0.3476
Story5	15	-3.732	-0.0515
Story4	12	-0.8604	-0.2058
Story3	9	-1.442	-0.1479
Story2	6	-0.2711	-0.05726
Story1	3	-0.1195	-0.01442
Base	0	0	0

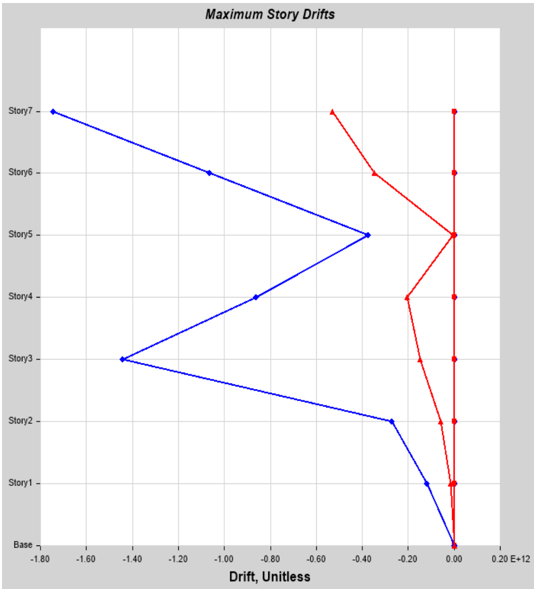
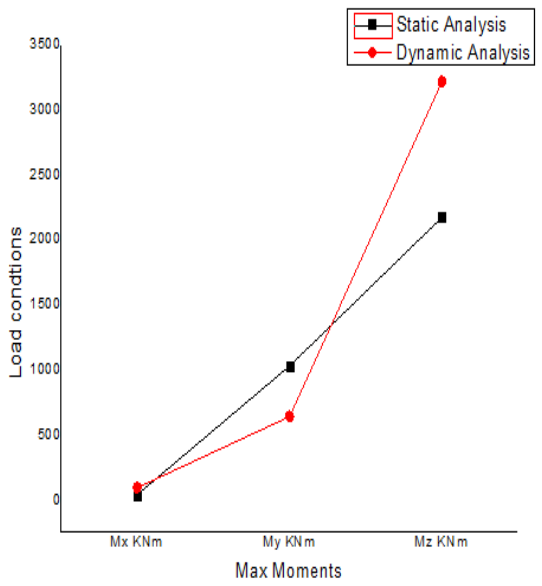


Table 4.6: Result comparison of static and dynamic results

Particulars	Static Analysis	Dynamic Analysis
Max Moments		
Mx KNm	38.635	92.934
My KNm	1029.329	640.199
Mz KNm	2169.87	3213.101
Max Forces		
FyKN	877.562	538.36
FzKN	368.041	99.638
Axial Forces		
FxKN	21311.26	1570.604
Deflection mm	22.343	0.91



Graph: Load conditions vs Max Moments

Discussions

The behaviour of buildings in Zone 5 is analysed for dynamic and static conditions. Analyzing the maximum deflection, maximum times and maximum shear forces, as well as the axial forces parameters, allows for a comparison between the Dynamic and Static states of Zone V.

In contrast to dynamic states, the axial force for static is increasing.

The static state has higher shear strength than the dynamic one.

Dynamic moments bend more on a radius than static. As the beam bends, the floor's height decreases.

It can be seen that static analysis has a higher deflection than dynamic analysis, when comparing the analyzes.

Because earthquake impact is greater at the bending moment of column, footing and column joint displacement, static structures are not subject to earthquake load * (Dynamic). The earthquake load is important for design and analysis.

The earthquake column load significantly increases the bending time. This is due to the increase in the storey's height. If earthquake loads are not considered for study, there would be potential for overturning.

Static analysis results are generally inefficient because the deflection values for dynamic analyses are higher.

CONCLUSION

The current analysis revealed that there are two modes in the field of study, one that is convective, and one that is impulsive. However, the study can be done in either mode to analyze the liquid or the structure, so the results are significantly higher. Software usage can be used to analyse different parameters. However, the software's reliability is affected by certain assumptions. This means that it is necessary to research ways to reduce software use for better results. Some reports stated that seismic wave recording was used for the study. This will yield a better result because it can easily be calculated by an earthquake that provides both the actual production and the damage caused by an earthquake. However, there are many limitations because it is difficult to establish a true problem with sandquakes. There are also factors to consider such as the liquefaction and boiling of sand during earthquakes. This review article focuses on earthquake resistance analysis and liquid retention structures design. Moreover, other studies and guidance provided by organizations can make it difficult to determine the correct seismic conduct of water retention structures.

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