

EFFECT OF USING HIGH STRENGTH CONCRETE COLUMNS ON THE STRUCTURAL BEHAVIOUR OF RC BUILDING WITH C30 QUALITY

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ABSTRACT:

High quality cement has been utilized as a part of the lower story sections of tall structures attributable to its qualities over typical quality cement - in numerous nations. However, the full auxiliary characteristics of the HSC were not able to be utilized in light of inadequate data with respect to the basic conduct of the material and its properties were not sufficiently tended to in construction regulations including EBCS. Logical examination was directed at structure level to explore the impact of utilizing HSC segment on the auxiliary conduct of general models of medium to skyscraper outline structures under seismic horizontal load notwithstanding gravity loads. Solid quality varieties of C30 to C90MPa were connected on the segments of the edge models. The proposed properties of the HSC class were fused in the examination and plan of the segments. The edges investigation was finished utilizing ETABS and segments were outlined in light of the EBCS section plan method.

Segments minute bend bends were created and greatest between story floats were acquired for the diverse casing models with variety in sections solid quality. The investigation demonstrates that casings with HSC segments have bring down firmness and performed well in fulfilling pliability request. The most extreme between story floats are somewhat higher for outlines with HSC segments, yet the commitment of the solid quality in opposing the parallel disfigurements was huge. Monetary examinations were likewise made and it was discovered that the most sparing casing relates to outline with the most astounding sections solid quality.

In developing countries, the increasing reliance of employment on economic and social considerations is one of the reasons that lead to increasing rural-to-urban migration which in turn lead to increased demand on land use in large cities like Addis Ababa. Following this, higher rise structures are being constructed now than in the past. On the other hand, for the developed countries, the engineering challenge where by the two targets of boasting the longest bridge and the highest building have become serious considerations in the conceptual design of landmark projects is another stimulus for construction of high rise buildings. Thus, the need for higher buildings naturally leads to the conclusion that high strength construction materials will be increasingly used in the future. The following three performance criteria lend weight to the argument for the use of high strength concrete (HSC) for such high rise buildings. Firstly, column sizes should be kept at manageable dimensions in order to make more effective use of floor areas, especially in the lower stories of high rise structures. Secondly, increased wind, increase in seismic force in seismic prone areas and traffic vibration susceptibility dictates that the modulus of elasticity of the material should be as high as possible in order to limit small amplitude elastic

1. INTRODUCTION

deformations. And the third point is the need for rapid construction requires early age strength gain, a feature that may be offered readily by high strength concrete. The combined effect of the three above mentioned requirements renders high strength concrete economics rather appealing.

1.1 DEFINITION AND DEVELOPMENT OF HSC:

Albeit high-quality cement is frequently viewed as a moderately new material, its improvement has been steady finished numerous years. As the improvement proceeded with, the meaning of high-quality cement has changed with time and topographical area because of absence of a standard model for the quality that is required to qualify as a high quality cement. In the 1950s, concrete with a compressive quality of 34 MPa was viewed as high quality. In the 1960s, concrete with 41 and 52 MPa compressive qualities were utilized financially. In the mid 1970s, 62 MPa concrete was being delivered.

The accompanying regular groupings in view of quality are seen in a few written works.

Ordinary quality..... 20-50MPa

High quality..... 50-100MPa

Ultra-high quality..... 100-150MPa

Uncommon quality ... >150MPa

The ceaseless increment in the compressive quality of cement has been seen in the previous decades, however with confined accessibility. Today, high quality cement in abundance of 100MPa is as of now being

utilized for elevated structures, long-traverse spans and seaward structures in many parts of the world because of its prevalent execution and quality particularly in development of sections of multi-story structures. Yet, in Ethiopia, despite the fact that the development of elevated structures are expanding as of late in a few urban areas of the nation, the act of utilizing high-quality cement (HSC) for such activities is low. In this way, likewise for the execution criteria recorded over, extra data with respect to the basic conduct of HSC sections of multi-story building is required for mindfulness creation in utilizing HSC and for tending to the different favorable circumstances of the HSC over that of the NSC. In this proposal, the impact of HSC segments on basic conduct of edge structures will be explored through diagnostic investigation.

1.2 STATEMENT OF THE PROBLEM:

The utilization of high quality cement has gone before explore and in this way the conduct of the material can't yet be anticipated with sensible precision. As a result, imperative issues identified with outline and development of high quality solid structures are not sufficiently tended to in construction laws including EBCS. Auxiliary creators can't take the full favourable position of the material in view of lacking data. Consequently, investigate on fortified HSC segments subjected to hub stacking and bowing minute is expected to furnish originators and scientists with extra data on the auxiliary conduct of strengthened HSC segment and that of the casing building, and to give information to assess inclination of the HSC over the NSC for sections of medium to elevated structures

under both static and seismic loadings. A few research ventures have been done worried about the exploratory conduct of fortified high quality cement at material level.

1.3 SCOPE OF THE STUDY:

This investigation is constrained to examination of minute opposing solid casing structures with number of story at the very least ten which was accepted to speak to medium elevated structures. Test standard minute opposing edge structures with rectangular even design will be demonstrated utilizing basic investigation program ETABS. The structures casing will be stacked and examined in light of EBCS 2, 1995, ACI construction law and other significant construction law arrangements. Solid class variety will be connected on the segments of the casing. For various solid quality of the sections, a similar building casing will be examined. Keeping all other outline parameters consistent with the exception of the segments cross area measurement, the impact of modification in segments solid quality on basic conduct of the edges will be examined. Since higher number of story manages the utilization of other sidelong load opposing framework which is outside the extent of this postulation, the quantity of story is restricted to not more prominent than twenty five.

HIGH RISE BUILDINGS:

The expanding dependence of work on money related administrations is one reason that prompt expanding rustic to-urban

movement which thusly prompt expanded request ashore use in substantial urban communities. Though in 1950 there were just 7 urban regions on the planet with more than 5 million occupants, this number rose to 34 out of 1980 and is required to rise further to 60 by the year 2000.1 consequently, more skyscraper structures are being developed now than 10 years or two back. An auxiliary jolt for development of elevated structures is that of creation challenge, whereby the two focuses of bragging the longest scaffold and the most astounding building have turned out to be not kidding contemplations in the calculated plan of historic point ventures.

HIGH STRENGTH CONCRETE AND STEEL IN CONSTRUCTION:

A persistent increment in the compressive quality of cement has been seen in the previous decades, however with limited accessibility. Today, high quality cement is now being utilized for elevated structures, long-traverse spans and seaward structures in many parts of the world.

The meaning of high quality cement has changed after some time. In the 1950s, 35MPa cement was viewed as high-quality. By the 1960s, compressive qualities of 50MPa could be achieved. This restrain expanded to 60MPa in the mid 1970s, while late advancements in solid innovation make it feasible for compressive qualities of up to 100MPa to be achieved without breaking a sweat.

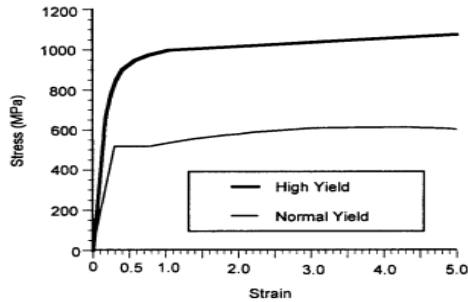


FIGURE 1.1 TYPICAL STRESS-STRAIN RELATIONSHIPS FOR STEEL BARS

2.0 LITERATURE REVIEW:

In the course of the most recent couple of decades, the advancement in material innovation, particularly with the accessibility of mineral and concoction admixtures, prompted the creation of higher solid quality review. From that point forward, a progression of research examines have been led on the conduct of such concrete.

Some past investigations affirmed changes in the conduct of strengthened solid segments and building outlines under seismic loads because of utilizing HSC. Be that as it may, a substantial number of studies have shown the economy of utilizing high-quality cement in sections of tall structures, and in addition low to medium-ascent structures where it has been for the most part pertinent.

MATERIAL COMPOSITION OF HSC:

The basic practices of fortified cement, for example, the anxiety strain reaction of solid, its compressive quality and its definitive strain are elements of a few parameters, including the blend extents, sort of bond and cementations materials, kind of admixtures, and reviewing of totals. The material determination and blend proportioning of

HSC are more basic than those of NSC. Subsequently, it is vital to survey the piece and properties of the fixing materials of HSC. Concrete is composite comprising of totals encased in a grid of bond glue which has two noteworthy parts concrete glue and totals.

2.1 COARSE AGGREGATE:

In HSC the limit of the totals can be the constraining element. This might be either the aftereffect of the total being weaker than the low water-bond lattice, or on the other hand it is not adequately solid and unbending to give the reinforcing impact.

This is for the most part identified with the coarse totals (CA) which comprise of one or a blend of rock or smashed stone with particles overwhelmingly bigger than 5 mm and by and large between 9.5 mm and 37.5 mm. Getting HSC requires lessening of CA measure dissemination. For example, research canter sifter examination improved the situation evaluating of CA for C90 solid demonstrates the sizes are restricted in the vicinity of 5mm and 19mm which are inside the prescribed range. The quality increments were caused by the decrease in normal bond worry because of the expanded surface range of the individual total. Littler total sizes are additionally considered to create higher solid qualities as a result of less extreme groupings of worry around the particles, which are caused by contrasts between the flexible moduli of the glue and the total.

3. METHODOLOGY:

It is a complex, yet simple to utilize, uncommon reason examination and configuration program grew particularly to build frameworks. ETABS highlights a

natural and intense graphical interface combined with unmatched demonstrating, investigative, and plan methods, all coordinated utilizing a typical database. Albeit fast and simple for straightforward structures, ETABS can likewise deal with the biggest and most complex building models, including an extensive variety of geometrical nonlinear practices, settling on it the instrument of decision for auxiliary architects in the building business. The exactness of scientific displaying of complex Wall Systems has dependably been of worry to the Structural Engineer.

WIND PRESSURES AND FORCES ON BUILDINGS/STRUCTURES:

The breeze stack on a building should be ascertained for:

- The working all in all,
- Individual basic components as rooftops and dividers, and
- Individual cladding units including coating and their fixings.

Where,

Ok = even speeding up range

W = seismic weight of the considerable number of floors .

FUNDAMENTAL NATURAL PERIOD

The surmised principal common time of vibration (T_n), in seconds, of a minute opposing casing working without block in the boards might be evaluated by the exact articulation: Ta=0.075 h^{0.75} for RC outline building Ta=0.085 h^{0.75} for steel outline building Where, h = Height of working, in m. This bars the storm cellar stories, where storm cellar dividers are associated with the

ground floor deck or fitted between the building segments.

$$T = 0.09H / \sqrt{D}$$

Where,

h= Height of building

d= Base measurement of the working at the plinth level, in m, along the considered heading of the horizontal power. Dissemination of Design Force Vertical Distribution of Base Shear to Different Floor Level

The outline base shear (V) might be appropriated along the tallness of the working according to the accompanying articulation

4. RESULTS:

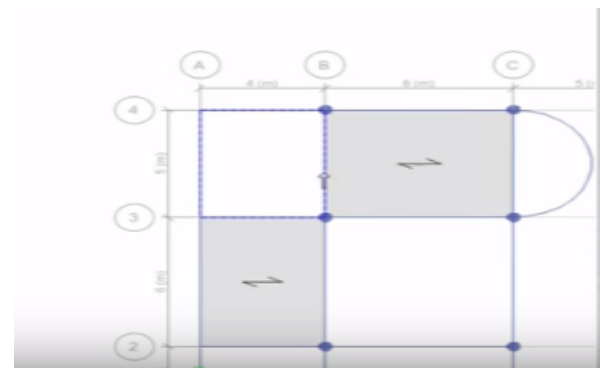


FIG 4.1 PLANE VIEW OF THE RC FRAME BUILDING



THE FIG 4.2 SHOWS THAT TORSIONAL MODE OF Y-DIRECTION IN RC BUILDING

TABLE 4.1 X- COORDINATE SYSTEM GRIDE DATA

Gride Id	X-Coordinate	Variable	Double loc
A	0	yes	end
B	8	yes	end
C	16	yes	end

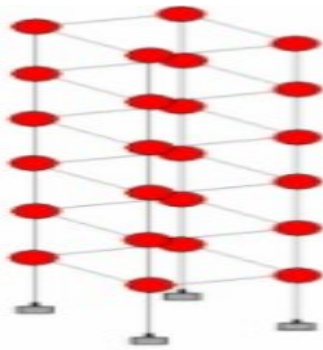
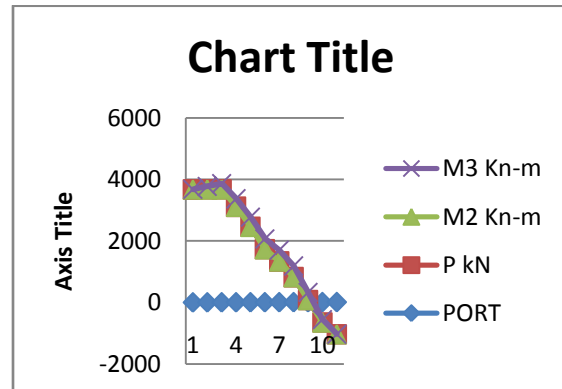


TABLE 4.2 Y- COORDINATE SYSTEM GRIDE DATA

Gride Id	y-Coordinate	Variable	Double loc
A	0	yes	start
B	8	yes	start
C	16	yes	start
D	24	yes	start

TABLE 4.3 3D SURFACE AND SECTION CURVE DATA

PORT	P kN	M2 Kn-m	M3 Kn-m
1	3673.4103	0	0
2	3673.4103	0	96.9555
3	3673.4103	0	184.2892
4	3107.2143	0	260.0866
5	2454.2197	0	312.2169
6	1726.1325	0	336.3083
7	1327.9464	0	364.7702
8	815.8471	0	364.7702
9	73.7255	0	249.5798
10	-656.563	0	97.5814
11	-1038.8826	0	0



GRAPH 4.1 3D SURFACE AND SECTION CURVE

CONCLUSIONS:

This examination was led to research the impact of utilizing HSC section on the basic conduct of customary rectangular models of

medium to skyscraper outline structures subjected to seismic parallel load notwithstanding ordinary utilize gravity loads. The basic practices; level of pliability and between story floats were the fundamental concentration of the examination. To obviously envision the impact, the quantities of factors were restricted to variety in segments solid quality and enhancing the segments cross sectional measurements. Segments longitudinal steel; yield quality, proportions and circulations were kept consistent for all casing models to limit their impact. Moreover, square segment areas were used for all the casing models. The properties of the HSC class were joined in the examination and plan of the sections in light of the proposed conditions by ACI and a few specialists. The edges examination was finished utilizing ETABS and segments were outlined in view of the EBCS-2 section plan methods utilizing exceed expectations spread sheet. Sections minute arch bends were created to investigate the malleability levels of the diverse solid quality segments. It was discovered that casings with HSC segments have bring down firmness and performed well in the level of sections malleability. The most extreme stories dislodging and interstorey floats have been acquired from the investigation yield and graphical correlation were made between the casings with fluctuated segments solid quality.

PERCEPTIONS:

Curvature pliability marginally upgraded with higher solid quality of the sections.

Flexural quality of the segment area diminishes with the expansion in segment solid quality.

The extreme quality is generously higher than the yield quality for NSC segment area, however it ends up noticeably tantamount to the yield quality of the segment as section solid quality

REFERENCES

- [1] a. bourouz, b. bousalem and k. belaloui , " flexural limit of high-quality cement routinely restricted areas", sbeidco –first universal meeting on reasonable assembled condition frameworks in creating nations, enset, october 12-14, 2009, oran, algeria.
- [2]. aci-asce council 441, "high-quality solid sections: cutting edge announced ", aci 441r-96, american solid organization, usa.
- [3] aci board 211.4r, "direct to select extents for high-quality solid utilizing portland bond and different cementitious materials", aci 211.4r-10, american solid foundation, farmington slopes, mi 48331, usa.
- [4]. aci panel 318, "construction regulation prerequisites for auxiliary cement", aci 318m-11 and editorial, american solid establishment, farmington slopes, mi 48331, usa.
- [5]. aci board of trustees 363," write about high quality cement", aci 363r-10, american solid establishment, farmington slopes, mi 48331, usa.