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Structural Modification for High Rise Building for Energy Efficiency

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ABSTRACT

Minimizing energy consumption in buildings has become an important goal in architecture and urban planning in recent years. Rules were created for each climatic zone targeting expanding sun based introduction for structures in chilly atmospheres and at diminishing sunlight based presentation for structures in sweltering atmospheres. This methodology generally anticipates the season with the harshest climate; regularly overlooking that temperatures in urban areas at scope 25° can dip under warm solace restricts in winter and that temperatures in urban areas at scope 48° frequently ascend above warm solace confines in summer. This examination contends that an all encompassing way to deal with vitality effective structure structures is required. It exhibits a nonexclusive vitality effective structure determined by glass dividers at outside and composite divider at the inside. In this investigation we are additionally using low carbon impression material supplanting a specific level of concrete in concrete for R.C.C. individuals. In this research work for modelling and dynamic analysis ETABS tool is considered.

Keywords : ETABS, Structural Analysis, Energy Efficiency, Low Carbon, Building.

I. INTRODUCTION

Vitality protection in the fabricated condition has gotten one of the most significant themes on both political and logical motivation. The rising worldwide populace, diminishing fossil-based vitality assets, rising outflows of destructive gases have risen as the primary inspirations for vitality effectiveness in structures. What's more, cost proficiency, wellbeing and the need to diminish carbon discharges are major explanations behind vitality protection. In the only remaining century, the amazing increment in the measure of vitality utilization and the expanding reliance on vitality assets have constrained individuals to devour vitality in the most proficient manner in each region. The world is ruled by structures with about 40% vitality utilization. Consequently, the development segment is influenced by worldwide vitality issues, and the hints of these impacts are showed in the plan, development and utilization procedures of the structures. In this specific circumstance, vitality proficient structure frameworks identified with the generation of the structures that draw such an extensive amount the world's vitality utilization have been advanced. This Study investigates ways to deal with vitality proficiency in the structures of the only remaining century.

Low vitality structures have pulled in loads of consideration lately. A large portion of the exploration is centered around the structure development or elective vitality sources. In opposite, this Study displays a relative report on an uncovered casing and low vitality discharge outline. general procedure of limiting vitality utilization utilizing current vitality sources and insignificant retrofitting, yet rather utilizing propelled control systems. We center around the examination of vitality investment funds that can be accomplished in a structure warming framework by applying model prescient control (MPC) and utilizing climate expectations.

Flyash is characterized in Cement and Concrete Terminology as "the finely partitioned buildup coming about because of the burning of ground or powdered coal, which is moved from the firebox through the kettle by pipe gases." Flyash is a side-effect of coal-terminated electric producing plants.

Figure 1: green building

II. LITERATURE SURVEY

Jonescu et. al. (2018) In the second quarter of the twentieth century, because of the overall modern unrest, expanding large scale manufacturing nearly in each region likewise influenced the structure part. In design instances of innovation could be seen. Creating warming, ventilating and cooling (HVAC) frameworks and their incorporation with the structures give instances of atmosphere autonomous plan. The principal tries in the utilization of sun oriented vitality and geothermal warmth siphons were begun right now. Developing innovation, expanding populace, urbanization, restrictions of land in urban communities, and planning tall structures, are normal for this period. Straightforward and penetrable surfaces utilized on the structures mirror the compositional language of the period while expanding the measure of vitality utilized in the structures. The principle get-togethers can be recorded as: the foundation of the European Economic Community, the premise of the European Union, the point came to in space innovation during the 60s and its exchange into day by day life, the start of the utilization of atomic vitality, the expanding populace and vitality reliance.

Tavares et. al. (2017) A contextual analysis of an open structure is displayed for instance of the ampleness of auspicious examinations of building execution, in view of a primer engineering plan. The last plan of the contextual investigation building profited of the careful examination performed at this beginning period, the principle inspiration being the eagerness of a town administration of a shrewd structure, prompting a maintainable town-corridor working, in a town in the middle district of Portugal. An upright mix of a responsive structure proprietor and a multidisciplinary configuration group, enabled a precise approach to be utilized, giving the chance to the thought of a few alternatives for each class of productive component and the probability of picking among the choices for each case, in light of quantitative outcomes on the normal execution of the structure. The choices were made and investigated with the assistance of the VisualDOE™ building reenactment apparatus, focusing on an agreeable and vitality productive structure. A few parameters were utilized for empowering the affectability investigations, in particular identifying with divider structure and materials, window outlines, HVAC framework, and so forth

Siroki et. al. (2015) Low vitality structures have pulled in heaps of consideration as of late. A large portion of the examination is centered around the structure development or elective vitality sources. In opposite, this paper introduces a general procedure of limiting vitality utilization utilizing current vitality sources and insignificant retrofitting, however rather utilizing propelled control systems. We center around the investigation of vitality reserve funds that can be accomplished in a structure warming framework by applying model prescient control (MPC) and utilizing climate expectations. The fundamental definition of MPC is depicted with accentuation on the structure control application and tried in a two months analyze performed on a genuine structure in Prague, Czech Republic

The main objective of this study is to determine the following:

- To differentiate a simple building and a energy efficient building.
- To determine the effectiveness of energy efficient building.
- To justify its effect on structure stability.
- To determine that glass as a exterior wall is capable of resisting total building load.
- To determine the cost effectiveness of the structure.

To determine the stability of RC members after replacing cement by fly-ash cement

Table 1 : Material Description

S.NO	Description	Value
1	Fly-ash cement	-
2	Young's modulus of steel, Es	$2.17x10^4$ N/mm^2
3	Poisson ratio	0.17
4	Tensile Strength, Ultimate Steel	505 MPa
5	Tensile Strength, Yield Steel	215 MPa
6	Elongation at Break Steel	70 %
7	GLASS	12 mm

Table 2 : Building Geometry

S.NO	Description	Value
1	Area	16 X 24 m
2	Number of bays in X direction	4
3	Number of bays in Z direction	5
4	Height of Floors	3.0 m
5	Overall height	36 m

Table 3 : Load Assignment

S.No.	Load Type	As per I.S.
1	Dead Load	I.S. 875-PART-1
2	Superimposed Load	I.S. 875-PART-2
3	Seismic (dynamic) response reduction	I.S. 1893-PART-1
4	Load Combinations	I.S. 875-PART-5

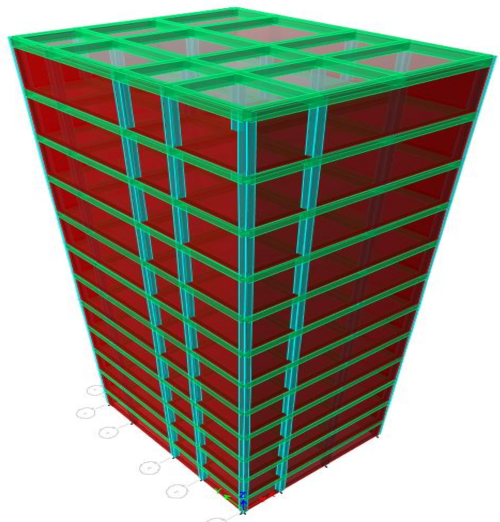

Figure 2 : Building with glass as exterior wall

III. ANALYSIS RESULTS

Table 4 : Max. Bending moment in each storey

Moment in kN-m		
	Bare frame	**Green sustainable frame**
storey12	387.03	363.45
storey11	325.85	318.4
storey10	317.83	310.64
storey9	309.81	302.88
storey8	301.79	295.12
storey7	293.77	287.36
storey6	285.75	279.6
storey5	277.73	271.84
storey4	269.71	264.08
storey3	261.69	256.32
storey2	253.67	248.56
storey1	245.65	240.8

Table 5 : Max. shear force

Shear force in kN-m		
Storeys	**Frame with light weight concrete**	**Bare frame**
storey12	563.32	570.12
storey11	558.65	568.54
storey10	552.85	553.65
storey9	537.05	551.46
storey8	521.25	533.9
storey7	505.45	516.34
storey6	489.65	498.78
storey5	473.85	481.22
storey4	458.05	463.66
storey3	442.25	446.1
storey2	426.45	428.54
storey1	410.65	410.98

Table 6 : STorey displacement

Storey Displacement (mm)		
Stories	**Bare frame**	**Green sustainable frame**
Story12	37.85	30.95
Story11	34.635	28.32
Story10	31.42	25.69
Story9	28.205	23.06
Story8	24.99	20.43
Story7	21.775	17.8
Story6	18.56	15.17
Story5	15.345	12.54
Story4	12.13	9.91
Story3	8.79	7.28
Story2	5.95	4.65
Story1	2.36	2.02
Base	0	0

Cost Analysis :

Table 7 Concrete analysis

S.No.	**Frame type**	**Reinforcement in kg**	**Rate of Rebar kg as per S.O.R.**	**Cost of Rebar in INR (Rupees)**
1	green sustainable frame	9454.23	72.75	6,87,795.23
2	Bare frame	9552.87	72.75	6,94,971.30

Table 8 : Reinforcement Analysis

S.No.	**Frame type**	**Concrete cu.m**	**Rate of concrete (m^3) as per S.O.R.**	**Cost of concrete in INR (Rupees)**
1	green sustainable frame	92.6	5757	5,33,098.00
2	Bare frame	94.5	5757	5,44,036.50

IV. CONCLUSION

For this research work following outcomes are observed:

1. It is observed in above results that bending moment is comparatively more in bare frame, thus green sustainable frame case results in stable structure with less reinforcement requirement.
2. As bending moment is higher in bare frame results thus heavy section is required which will result in less unbalance (shear) force.
3. In the above chapter results shows that green sustainable structure is comparatively economical than bare frame by 8.4%.

V. SUMMARY

Here it can be concluded that green sustainable building results in stable building with more stiffness than bare frame case. Whereas it terms of cost analysis it will be costlier by 8.4 % than bare frame case.

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