DESIGN OF A STRUCTURE SUPPORTED ON A SINGLE COLUMN

CHANDRALEKA.A[1], KALAIBHARATHI.K[2], SUGANYA.R[3] , SURYA.S.A[4] , PREMA.R[5]
BE-final year and Assistant Professor[5]
Department of CIVIL,
Bharathiyar Institute Of Engineering for women ,
Deviyakurichi(po), Attur(tk),
Salem(dt), Tamilnadu, India.
lekacivil1996@gmail.com[1],kalaibharathi97 @gmail.com[2] ,Suganyacivil1996@gmail.com[3] ,
suriyaporkalai94@gmail.com[4]

ABSTRACT

The design and analysis of RCC structure supported on a single column is done in this project. Since single column is supporting whole structure, all other members will act as cantilevers. This project presents structural modeling, stress, bending moment, shear force and displacement design considerations for a structure a is analyzed using STAAD Pro.

Various steps involved in designing of RCC structure supported on a single column using STAAD Pro are Geometric Modeling, providing material properties and sectional Properties, fixing supports and boundary Conditions, providing loads & load combinations, Special Commands, Analysis Specification and Design Command.

The influence of plan geometry has an important role in static analysis.Maximum values of stresses, bending moments, shear forces and displacements are presented. The acting loads considered in the present analysis were self weight, floor load, wind load and earthquake load. In these cases the floor load wasapplied perpendicular to the RCC structure. To reduce the cantilever span for the structural beams converting two-third of the length as simply supported by providing the two ring beams and inclined beams.

INTRODUCTION

Structure supported on a single column provides better architectural view compared to structure supported on many columns. They save ground space as requires less area for providing foundation and provides more space for parking. They are also unique. Single column structure can be made either by using RCC or Steel. RCC structures are more common now days in India. Reinforced concrete as a structural

material is widely used in many types of structures. It is competitive with steel if economically designed and executed.

It has a relatively high compressive strength and better fire resistance than steel. It has long service life with low maintenance cost. It can be cast into any required shape. Reinforced concrete is a composite material in which concrete's relatively low tensile strength and ductility are counteracted by the inclusion of reinforcement having higher tensile strength and ductility.

- Geometric Modeling
- Material Properties
- Sectional Properties
- Supports
- Boundary Conditions
- Loads & Load combination
- Special Commands
- Analysis Specification
- Design Command

SPECIFICATION

Design is a word that means different things to different people. In dictionaries the word is described as a mental plan, preliminary sketch, pattern, construction, plot or invention. The starting-point for the designer is normally a conceptual brief from the client, who may be a private developer a government body. The conceptual brief may simply consist of some sketches prepared by the client or perhaps a detailed set of architect's drawings. Experience is crucially important, and a client will always demand that the firm he is employing to do the design has previous experience designing similar structures. Although imagination is thought by some to be entirely the domain of the architect, this is not so. For engineers and technicians an imagination of how elements of structure interrelate in three dimensions is essential, as is an appreciation of the loadings to which structures might be subject in certain circumstances.

STRENGTH

A structure or structural element is to be designed mainly to with stand the worst loading (dead load, shrinkage, creep, etc…) to which it may be subjected in the period of its service.

STABILITY

In addition the strength requirements the stability of the structural element and the structure as a whole against overturning, sliding etc., is to be

also ensured in the design in accordance with clause 26.4 of IS 456 – 200

SERVICEABILITY

Excessive deflection or vibration of supporting member affect the function of supported cracks is concrete due excessive stress change temperature, shrinkage of concrete etc.

LOADS

Load acting on a structure are classified as

1. Dead load
2. Imposed load

DEAD LOAD

Dead in a building shall comprise the weight of the wells, partition walls, floor and roof shell include the weight of all other permanent construction in the building these could be calculated for the IS 875 -1987 PART-2

COVER TO REINFORCEMENT

Steel reinforcement provide in RCC shell be completely embedded in to the concrete so that it does not come in to contact with atmospheric air or water which cause its corrosion and to develop the required bound between concrete and steel sufficient concrete over is to be provide around the steel.

EFFECTIVE COVER TO REINFORCEMENT

The distances of the nearest extreme layer of concrete form the cancroids of the reinforcing bars the effective cover. When bars are provided in single row, there effective cover will be to the clear cover +half of the diameter of reinforcement bars.

The clear cover for different elements as follows.

Slab = 20mm

Beam = 40mm

Column = 40mm

Footing = 50mm

EFFECTIVE DEPTH OF CROSS – SECTION OF BEAM /SLABS

The distance of the cancroids of reinforcement in tension zone form the extreme compression layer of the cross section is termed as the effective depth of cross – section.

Effective depth (d) = total depth (D) – effective cover

CONCLUSION

In this project a multi-storey building resting on single column was analysed and designed by using AUTO CAD & STAAD Pro software.

The limit state method of design was adopted.

The design aspects of the structure was analysed manually and using software.

Using this software analysis of bending moment, shear force, deflections, end moments , beams,columns and foundation reactions are calculated.

In our project we also used the code provision of the SP16 and IS 456-2000, IS 875 -1987 (the designaids for concrete and detailing

Detailed drawings of all R.C.C. members such as slabs, beams, columns, and footings are also shown.

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