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PLAN AND INVESTIGATION OF AUDITORIUM USING STAAD PRO

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Abstract -

It is a large building or hall used for public gatherings, typically speeches or stage performances for organizing seminars, cultural programmers etc .Arrangement for above 800 people for seating with obvious visibility from all area. All structural elements such as beam, column, slab, foundation etc.

Loads are taken from the code IS 875(part2) 1987.By using STAAD PRO. AUTO CAD is used for drawing. Structural design, plan, elevation and drawings are enclosed in this volume.

Key Words: Analysis, IS codes, loads, STAAD Pro, AUTO CAD.

1.INTRODUCTION.

Structural design is a planned investigation to get the economical of a structural element to carry the predicted load safely. Structural design we can obtain size, grade, reinforcement .The entire planning and design requires not only fascination and conceptual thinking,but also knowledge of science of structural engineering besides. design codes and building bye-laws, backed up by ample experience, institution and judgment. The design and planning of a structure, primarily requirements of the client. They may be vague and may also be impracticable because is not aware of the various implications involved in the planning and design and about the limitations and the intricacies of structural science. The requirements and the aspect of safety, serviceability, durability and economy of the structure for its intended use over life span of the structure are attended by the structural designers. Development in India in this decade has increased the shift of population form village, towns to cities. hence s resulted in rapid urbanization, site value has also increased unboundedly, and people are going for multi stored flats to economically utilize the land area available.Builders are going business on these multi stored buildings. Hence most of the people prefer purchase flats rather than the construct independent once. Auditorium space types are for large meetings, performances. facilities may include assembly, exhibit halls, auditoriums. Auditorium spaces are designed to accommodate large audiences for meet. They have wide spans and multiple-stories high to accommodate seating, sightline, and acoustical requirements. Raised stage/dais and lighting equipment are required as well.

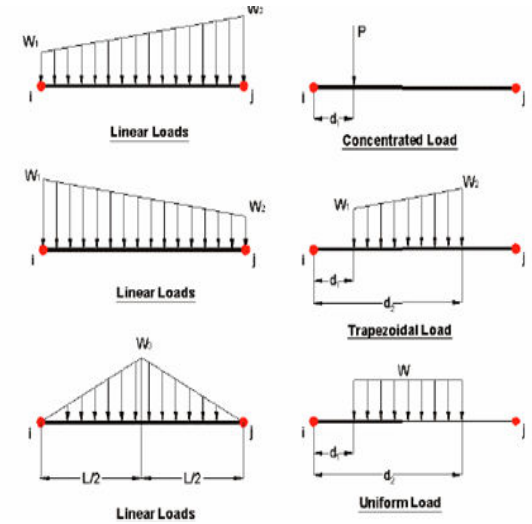
FEATURES OF AUDITORIUM:

Etymology: Its taken from Latin word (from auditorium, from audītōrius (“‘pertaining to hearing’”)); concept is taken from Greek auditorium, a series of semi-circular seating shelves in the theatre, divided by broad 'belts', called diatomite.

STRUCTURAL DESIGN: The following methods are:

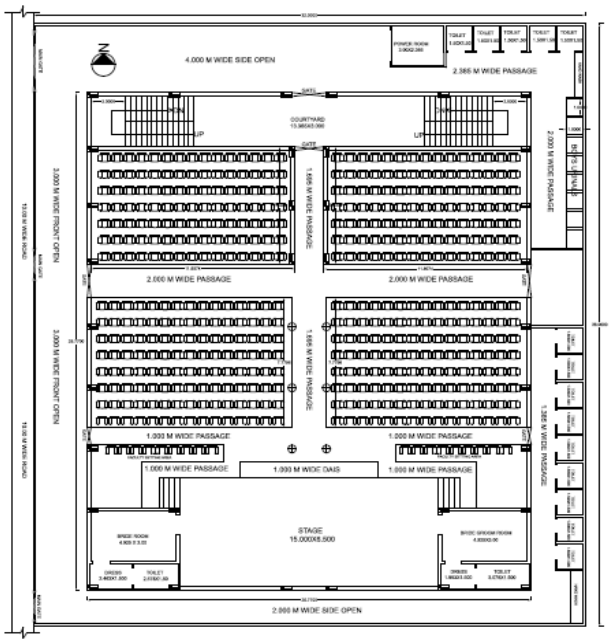
a. Working Stress method
b. Limit State Method
c. Methods based on Experimental investigations

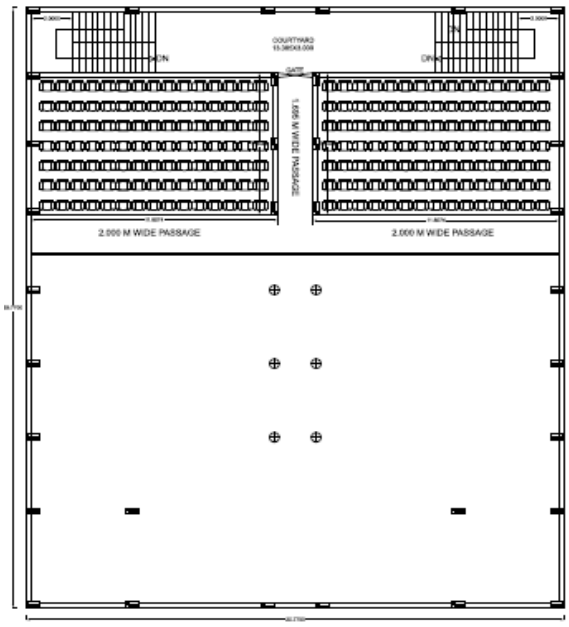
MEMBER LOADS:



STAAD PRO: It is a analysis and design software developed by Research Engineers International in 1997. In 2005, Research Engineers In was bought by Bentley Systems. It is used for structural analysis and design software products. Over 90 international steel, concrete, aluminum design codes.

PLANING OF AUDITORIUM BUILDING:





LOADS (FORMANUAL CALCULATIONS):

Floor loads: 2.5kN/m² (As per IS 875 (part2))

Dead load: 1kN/m

Slab weight: 0.15 X 25 = 3.75 kN/m^2

Floor finishes = 1.0 kN/m^2

Live load: (As per Table-1 of IS-875(part2))

Beams under internal walls: 0.115 X 19 X 2.55 = 5.244 ≈6kN/m

Beams under external walls: .0.230 X 19 X 2.55 = 11.141 ≈ 12kN/m

Nodel load at steel beams: 50 KN/m

DESIGN OF BEAMS:

There are three types of beams:

(i) Singly Reinforced beams
(ii) Doubly Reinforced beams
(iii) Flanged beams

DESIGN OF SLAB:

Slabs are classified mainly into two types:

1. One-way slabs

2. Two-way slabs

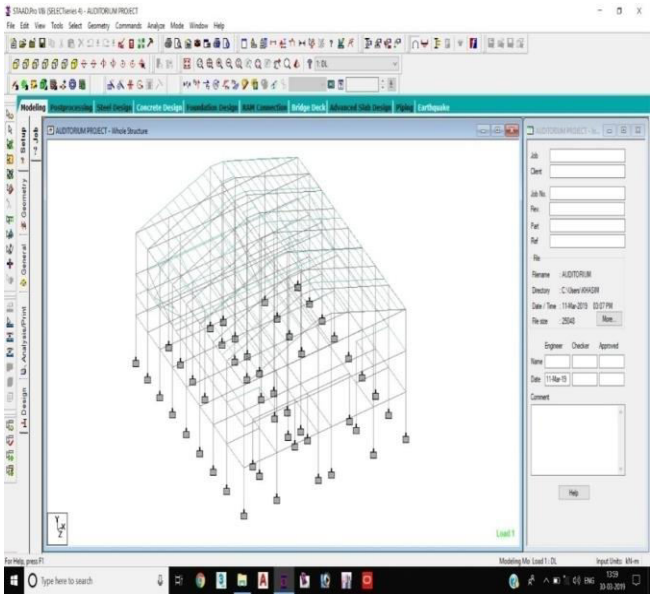
DESIGN OF COLUMNS:

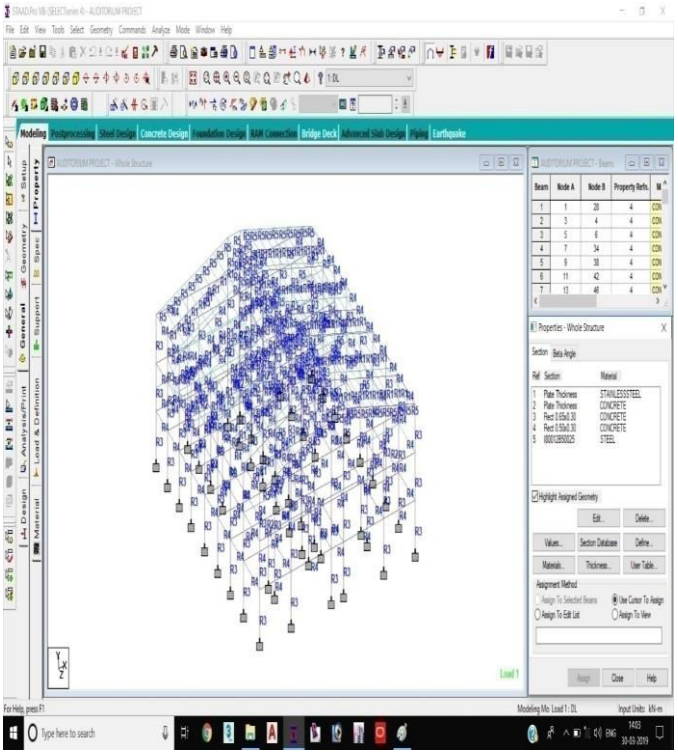
Based on shape:

- Rectangle
- Square
- Circular
- Polygon

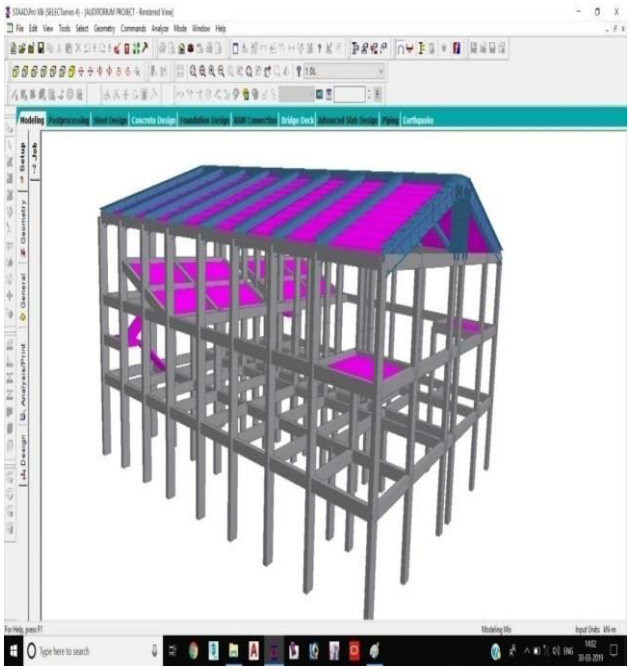
RESULTS:

ANALYSIS REPORTS:

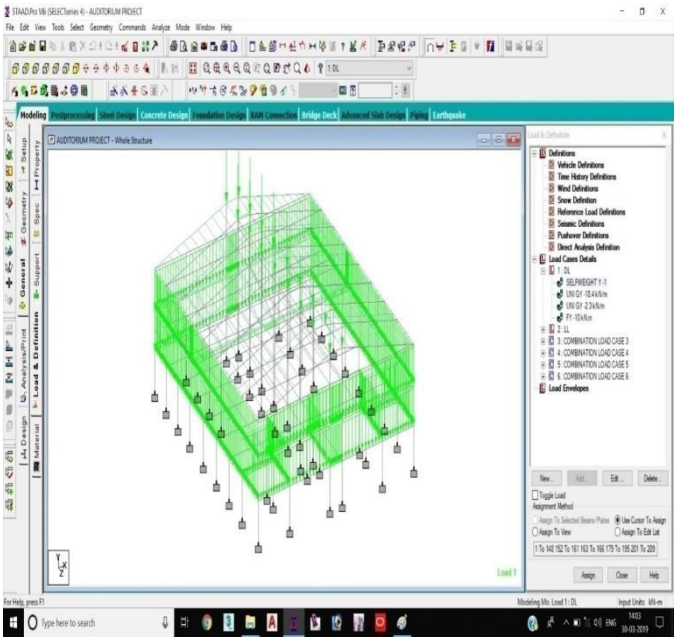




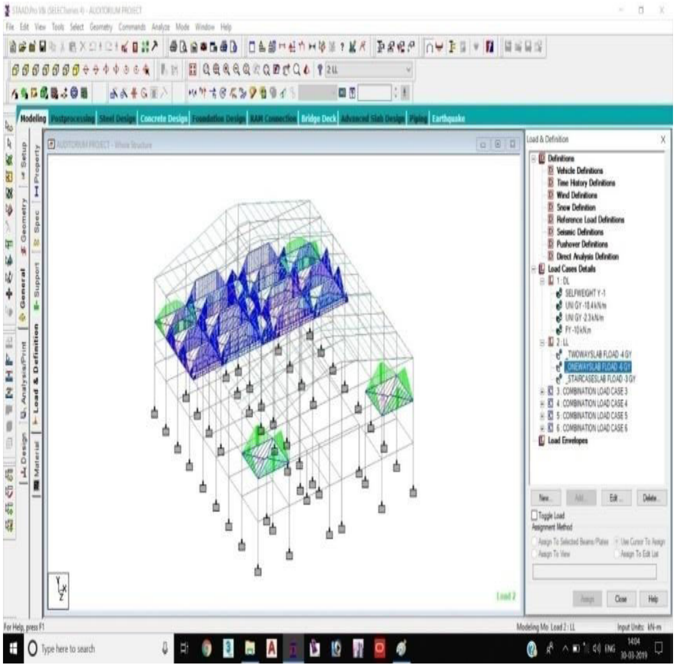
PROPERTY



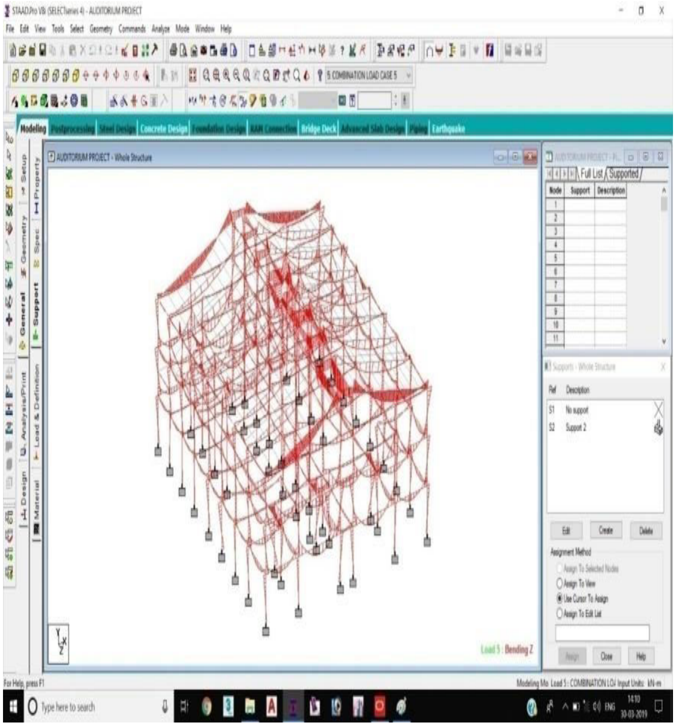
3D STRUCTURE



MEMBER AND NODEL LOADS



FLOOR LOADS



BENDING MOMENT

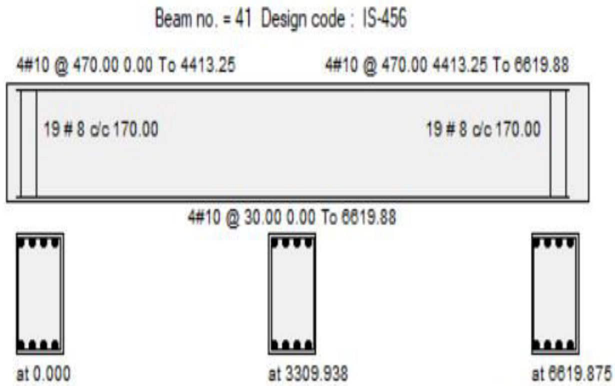
BEAM NO. 41 DESIGN RESULTS

M20 Fe500 (Main) Fe415 (Sec.)

LENGTH: 6619.9 mm SIZE: 304.8 mm X 500.0 mm COVER: 25.0 mm

SUMMARY OF REINF. AREA (Sq.mm)

SECTION	0.0 mm	1655.0 mm	3309.9 mm	4964.9 mm	6619.9 mm
TOP REINF.	243.54 (Sq. mm)	243.54 (Sq. mm)	243.54 (Sq. mm)	243.54 (Sq. mm)	243.54 (Sq. mm)
BOTTOM REINF.	243.54 (Sq. mm)	243.54 (Sq. mm)	243.54 (Sq. mm)	243.54 (Sq. mm)	0.00 (Sq. mm)



Design Load

Mz Kn Met	Dist. Met	Load
9.78	3.3	5
-18.86	0	5
-20.6	6.6	5

Design Parameter

Fy(Mpa)	500
Fc(Mpa)	20
Depth(m)	0.5
Width(m)	0.304800003
Length(m)	6.620117187

COLUMN REPORTS:

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        C O L U M N   N O.   358  D E S I G N   R E S U L T S

      M20                  Fe500 (Main)              Fe415 (Sec.)

 LENGTH:  4000.0 mm   CROSS SECTION:  304.8 mm X  650.0 mm  COVER: 40.0 mm

 ** GUIDING LOAD CASE:    5  SHORT(Z)        /BRACED LONG(Y)


 REQD. STEEL AREA   :      252.13 Sq.mm.
 REQD. CONCRETE AREA:    31515.91 Sq.mm.
 MAIN REINFORCEMENT : Provide   8 - 12 dia. (0.46%,    904.78 Sq.mm.)
                      (Equally distributed)
 TIE REINFORCEMENT  : Provide  8 mm dia. rectangular ties @ 190 mm c/c

 SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
 ----------------------------------------------------------
 Puz :   1875.36   Muz1 :     53.27   Muy1 :     24.34

 INTERACTION RATIO: 0.98 (as per Cl. 39.6, IS456:2000)

 SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
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 WORST LOAD CASE:     5
 Puz :   2114.23   Muz :    130.74   Muy :     55.31   IR: 0.42
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CONCLUSION:

“plan and Investigation of Auditorium”. As this is a prayer hall all the members of the staff assemble here.Project includes designing of structural members like slab, columns beams, footings. It has been done based on IS code 456:2000 for concrete and SP 16 for the steel. CAD was used for drawings (plan, section, &elevation).Load combinations as per IS code, considering seismic load as the major apart. It concludes moments and forces appearing the structure were significantly lower than in case of plane frame under similar load.Shows that for long spans structures are considerably cost effective than plane frame structures.

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"Some interior details were probably drawn by Frank Lloyd Wright, who started in Sullivan's office as a draftsman in 1887." Banister Fletcher. A History of Architecture. p. 1241