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"Comparison of design results of a Structure designed using STAAD.ProV8i and SAP 2000 Software"

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ABSTRACT

STAADProV8i and SAP 2000 are the leading design software in the market. Many design companies use these software for their project design purposes. So, this project mainly deals with the comparative analysis of the results obtained from the design of plan of multi storey building structure when designed using STAADProV8i and SAP 2000 software separately.

The present work is to study and analysis of Comparison of design results of a Structure designed using STAAD.ProV8i and SAP 2000 Software. An investigation is done on building structure we get the structural design.

In this project study of G+1 residential building in Zone II is presented with some preliminary investigation which is analyzed by designed data. This analysis is done by using Software STADD-pro and SAP 2000 Software . The buildings are modeled with floor area of 185.44 sqm (15.2m x12.2m) and built-up area 162.24 sqm (14.32mx11.33m) and story height is 3m. The design is carried out using STAAD.ProV8i and SAP2000 Software.

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CHAPTER-1

INTRODUCTION

1. STAADProV8i and SAP 2000 are the present day leading design and analysis software respectively in the market. Many design company's use these software's for their project design purposes. So, this project mainly deals with the comparative analysis of the results obtained from the design of a G+1 building structure when designed using STAADProV8i and SAP 2000 software's separately. Built up a 11.5mx14.5m G+1 storey structure is modeled using both STAAD.ProV8i and SAP 2000 software's. The height of each storey is taken as 3mts making the total height of the structure 6mts. Analysis and design of the structure is done and then the results generated by these software's are compared and a conclusion is drawn from them.

1.1 STAAD Pro.V8i :-

Our project involves analysis and design of building [G + 1] using a very popular designing software STAAD Pro. We have chosen STAAD Pro because of its following advantages: easy to use interface, conformation with the Indian Standard Codes, versatile nature of solving any type of problem, Accuracy of the solution.

STAAD.ProV8i features a state-of-the-art user interface, visualization tools, powerful analysis and design engines with advanced finite element and dynamic analysis capabilities. From model generation, analysis and design to visualization and result verification, STAAD.ProV8i is the professional's choice for steel, concrete, timber, aluminum and cold-formed steel design of low and high-rise buildings, culverts, petrochemical plants, tunnels, bridges, piles and much more.

STAAD.ProV8i consists of the following:

The STAAD.ProV8i Graphical User Interface: It is used to generate the model, which can then be analyzed using the STAAD engine. After analysis and design is completed, the GUI can also be used to view the results graphically.

The STAAD analysis and design engine: It is a general-purpose calculation engine for structural analysis and integrated Steel, Concrete, Timber and Aluminum design.

To start with we have solved some sample problems using STAAD Pro and checked the accuracy of the results with manual calculations. The results were to satisfaction and were accurate. In the initial phase of our project we have done calculations regarding loadings on buildings and also considered seismic and wind loads.

Structural analysis comprises the set of physical laws and mathematics required to study and predicts the behavior of structures. Structural analysis can be viewed more abstractly as a method to drive the engineering design process or prove the soundness of a design without a dependence on directly testing it. To perform an accurate analysis a structural engineer must determine such information as structural loads, geometry, support conditions, and materials properties. The results of such an analysis typically include support reactions, stresses and displacements. This information is then compared to criteria that indicate the conditions of failure. Advanced structural analysis may examine dynamic response, stability and non-linear behavior.

The aim of design is the achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an appropriate degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and adequate resistance to the effects of seismic and wind. Structure and structural elements shall normally be designed by Limit State Method. Account should be taken of accepted theories, experiment and experience and the need to design for durability. Design, including design for durability, construction and use in service should be considered as a whole. The realization of design objectives requires compliance with clearly defined standards for materials, production, workmanship and also maintenance and use of structure in service.

The design of the building is dependent upon the minimum requirements as prescribed in the Indian Standard Codes. The minimum requirements pertaining to the structural safety of buildings are being covered by way of laying down minimum design loads which have to be assumed for dead loads, imposed loads, and other external loads, the structure would be required to bear. Strict conformity to loading standards recommended in this code, it is hoped, will not only ensure the structural safety of the buildings which are being designed.

1.2 SAP 2000 Software –

From its 3D object based graphical modeling environment to the wide variety of analysis and design options completely integrated across one powerful user interface, SAP 2000 has proven to be the most integrated, productive and practical general purpose structural program on the market today. This intuitive interface allows you to create structural models rapidly and intuitively without long learning curve delays. Now you can harness the power of SAP 2000 for all of your analysis and design tasks, including small day-to-day problems. Complex Models can be generated and meshed with powerful built in templates. Integrated design code features can automatically generate wind, wave, bridge, and seismic loads with comprehensive automatic steel and concrete design code checks per US, Canadian and international design standards.

Advanced analytical techniques allow for step-by-step large deformation analysis, Eigen and Ritz analyses based on stiffness of nonlinear cases, centenary cable analysis, material nonlinear analysis with fiber hinges, multi-layered nonlinear shell element, buckling analysis, progressive collapse analysis, energy methods for drift control, velocity-dependent dampers, base isolators, support plasticity and nonlinear segmental construction analysis. Nonlinear analyses can be static and/or time history, with options for FNA nonlinear time history dynamic analysis and direct integration. From a simple small 2D static frame analysis to a large complex3D nonlinear dynamic analysis, SAP 2000 is the easiest, most productive solution for your Structural analysis and design needs.

CHAPTER-2

OBJECTIVE OF STUDY AND METHODOLOGY

2.1 Objective:

The objective of the present work is to study and analysis of Comparison of design results of a Structure designed using STAAD.ProV8i and SAP 2000 Software. An investigation is done on building structure we get the structural design.

1. In this project study of G+1 residential building in Zone II

2. This analysis is done by using Software STADD-pro and SAP 2000 Software .

The buildings are modeled with floor area of 185.44 sqm (15.2m x12.2m) and built-up area 162.24 sqm (14.32mx11.33m) and story height is 3m. The design is carried out using STAAD.ProV8i and SAP2000 Software

The objective can be brief under following heads :

1. Study and analysis of Comparison of design results of a Structure designed using STAAD.ProV8i software.
2. Study and analysis of Comparison of design results of a Structure designed using SAP 2000 Software.

2.2 Methodology:

For this purpose of study and analysis, two cases of buildings Structure designed are considered.

Case I – using STAAD.ProV8i software for building structure design.

Case II – using SAP2000 software for building structure design.

- The structural analysis of each case is done considering the building vertical and horizontal member are same size use.
- These building structures are subjected to the dead load, live load and seismic load.
- In Building Structure the accuracy and the efficiency of the proposed models are tested by performing software.
- The structural analysis is the find out the requirement of steel in all members using software STAAD.ProV8i and SAP2000.
- Then maximum value finds out the structure data in each software.
- Then the structure data for different case are compared and results are drawn out.

CHAPTER-3

ANALYSIS AND DESIGN

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3.1. General dimensions

Building Type	Residential
Plot area	15.2m x12.2m
Built up area	14.32m x11.33m
No. of storey's	G+1
Storey height	3m
Footing height	1m
Plinth Beam	230x230mm
Floor Beam	230x350mm
Roof Beam	230x300mm
Column	230x400mm
Slab thickness	110mm
Support conditions	Fixed
Grade of concrete	M20
Grade of steel	Fe-415
Zone	II

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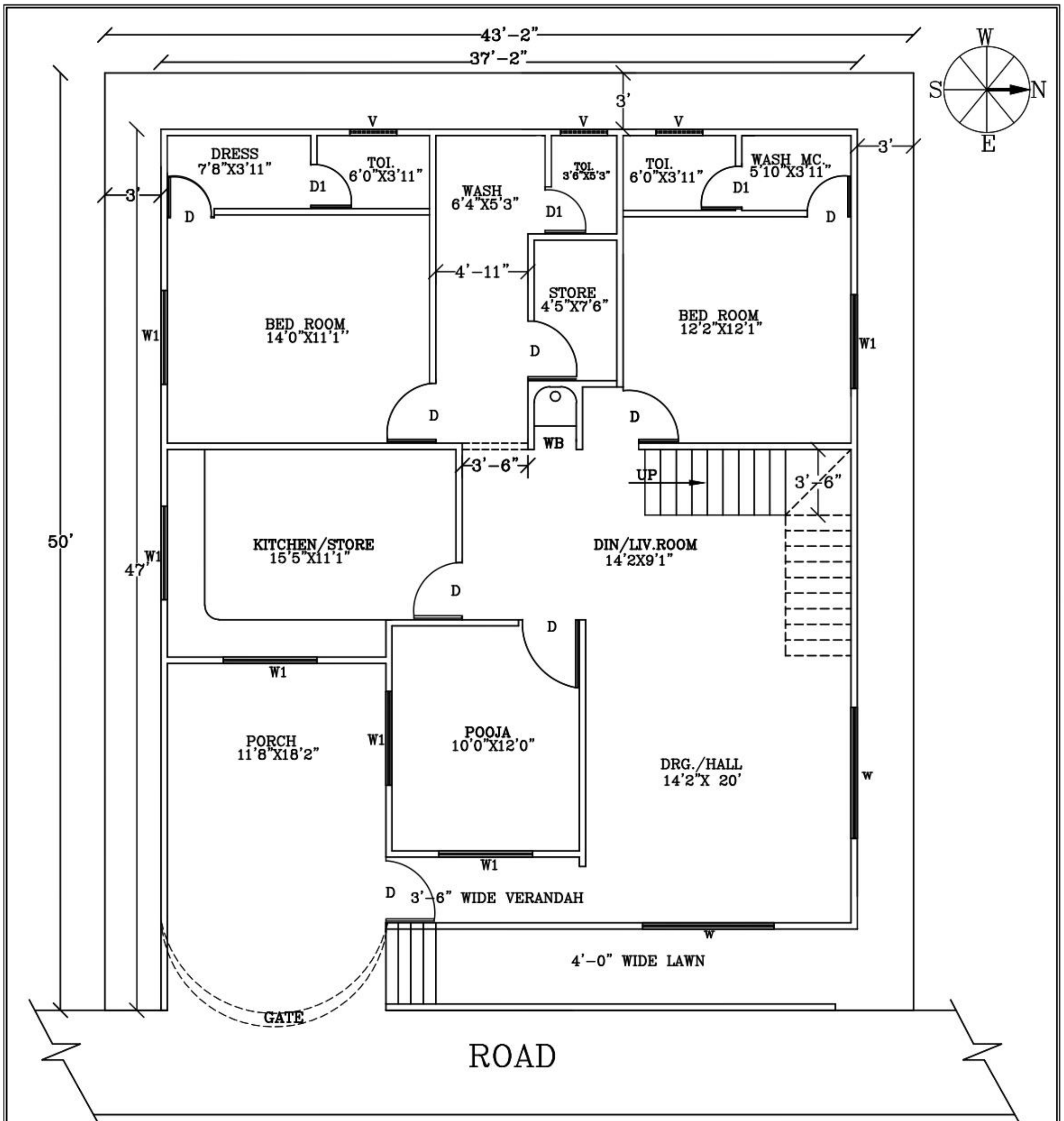
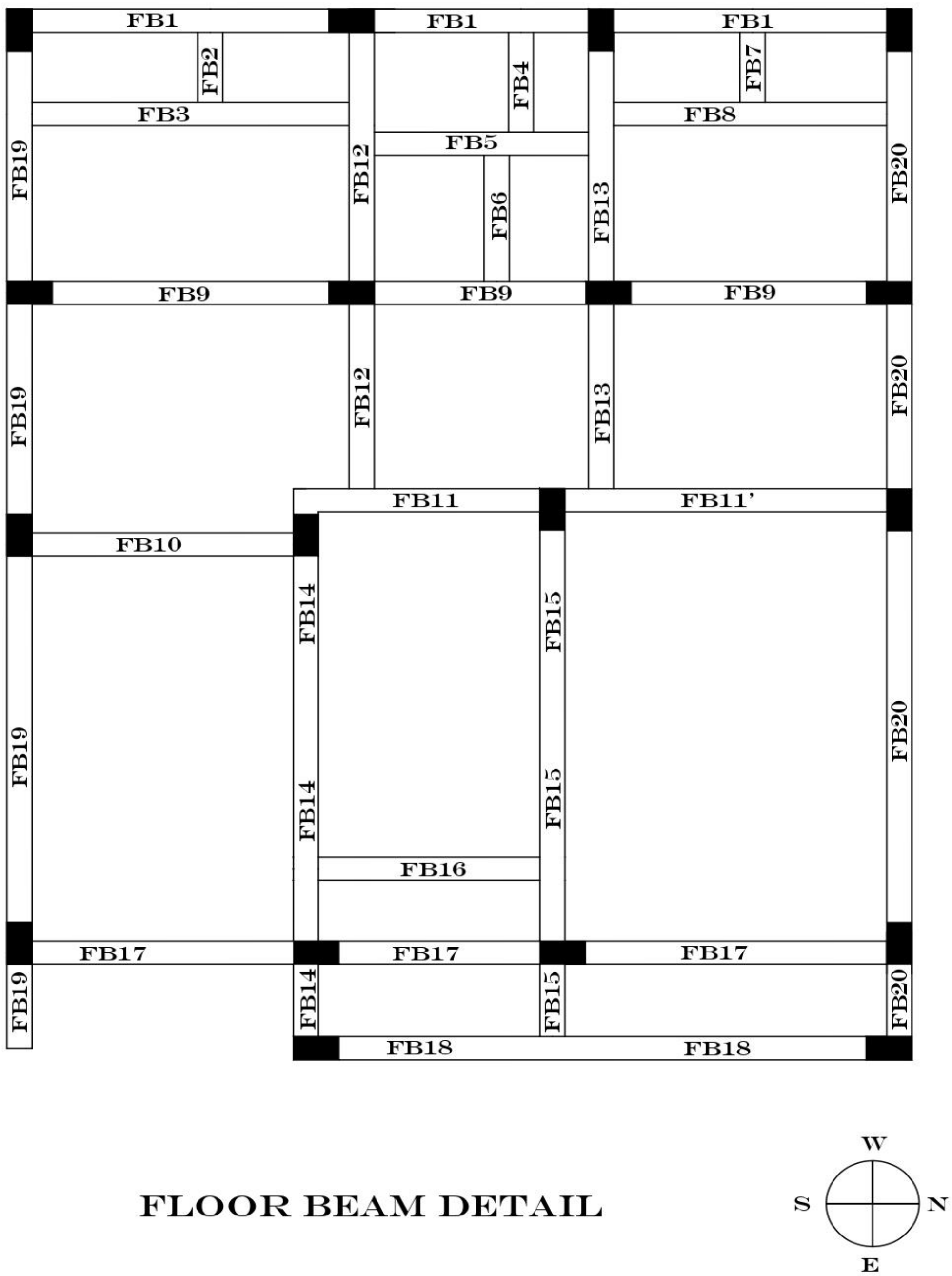


GROUND FLOOR PLAN


FB1
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FB19
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FB15
FB20
FB18
FB18
FLOOR BEAM DETAIL
W
S
N
E

3.2 Loads Considered: The loads considered are as follows :-

3.2.1 Dead Load: All permanent constructions of the structure form the dead loads. The dead load comprises of the weights of walls, partitions floor finishes, false ceilings, false floors and the other permanent constructions in the buildings. The dead load loads may be calculated from the dimensions of various members and their unit weights. the unit weights of plain concrete and reinforced concrete made with sand and gravel or crushed natural stone aggregate may be taken as 24 kN/m ” and 25 kN/m” respectively.

3.2.2 Live Load :
Live load adopted for floor slab and roof according to IS 875 part-II: **3** kN/m^2.

3.2.3 Imposed load:
Imposed load is produced by the intended use or occupancy of a building including the weight of movable partitions, distributed and concentrated loads, load due to impact and vibration and dust loads. Imposed loads do not include loads due to wind, seismic activity, snow, and loads imposed due to temperature changes to which the structure will be subjected to, creep and shrinkage of the structure, the differential settlements to which the structure may undergo.

3.2.4 Seismic load:

Design Lateral Force
The design lateral force shall first be computed for the building as a whole. This design lateral force shall then be distributed to the various floor levels. The overall design seismic force thus obtained at each floor level shall then be distributed to individual lateral load resisting elements depending on the floor diaphragm action.

Design Seismic Base Shear

The total design lateral force or design seismic base shear (V_b) along any principal direction shall be determined by the following expression:

$$V_b = Ah\ W$$

Where,

Ah = horizontal acceleration spectrum

W = seismic weight of all the floors

3.2.5 Load Combinations as considered for static analysis:

The load combinations were adopted according to IS 1893 Part-1: 2002 & IS 456:2000 :

1. 1.5(DL + LL)
2. 1.2(DL + LL + EQX)
3. 1.2(DL + LL - EQZ)
4. 1.2(DL + LL + EQZ)
5. 1.2(DL + LL – EQZ)
6. 1.5(DL + EQX)
7. 1.5(DL – EQX)
8. 1.5(DL + EQZ)
9. 1.5(DL – EQZ)
10. 0.9DL + 1.5EQX
11. 0.9DL - 1.5EQX

Here X & Z are the directions of earthquake loads considered in the analysis.

3.3. Preliminary Sections and materials considered:

The plan area for the proposed work is floor area of 185.44 sqm (15.2m x12.2m) and built-up area 162.24 sqm (14.32mx11.33m) and story height is 3m. The properties of material adopted are:-

3.3.1 M20 concrete adopted .

3.3.2 The Yield strength of steel Fe-415 MPa.

3.4 WORKING WITH STAAD.ProV8i :-

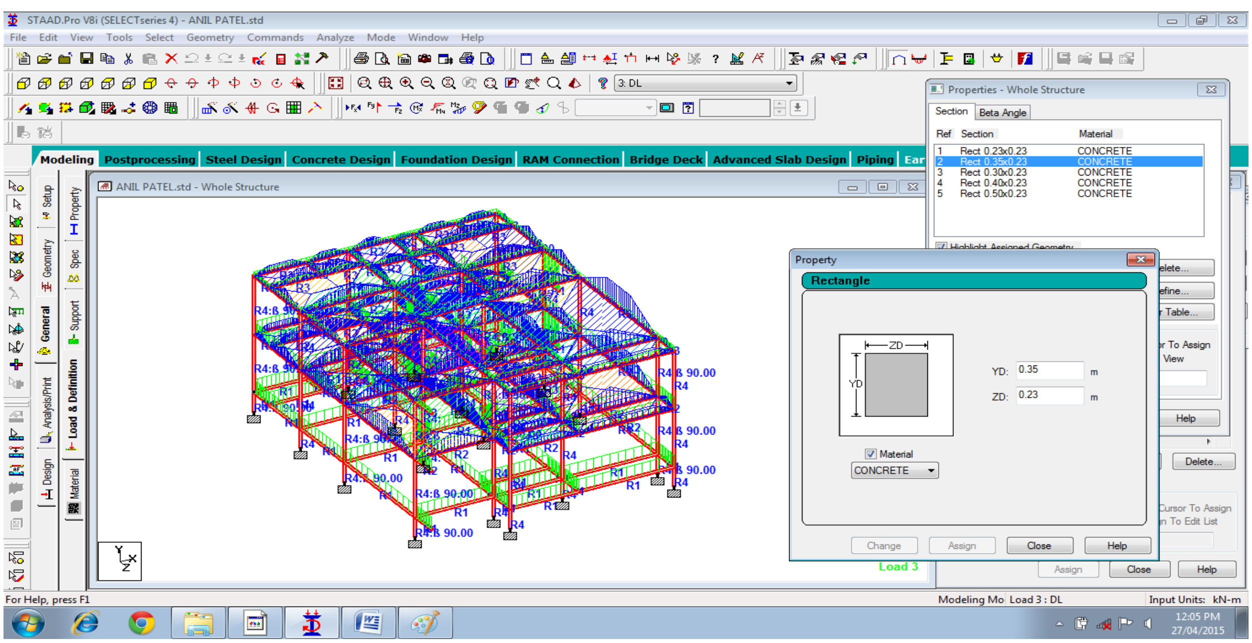
Steps of design flat slab and shear wall in STADD.ProV8i:

1. Create new file in STADD.ProV8i software.

2. Using geometry command create structure using node coordinates and input members with beam and column dimensions and create flat slab through plate command and shear wall through surface command in STADD.ProV8i software.
3. Provide input properties of beam and column dimensions.
4. Specify support types in structure as fixed ,hinged support etc.
5. Provide load as dead, live, earthquake and wind load etc, and different load combinations as (static and dynamic) on the structure.
6. Specify type of analysis and perform analysis of structure.
7. Design structural elements as beam, column, flat slab and shear wall of structure, Calculate and provide main and distribution reinforcement in structural element.
8. Perform analysis and run analysis; If error comes, remove errors and run the file.
9. View output file and observe the design of all the structural elements of beam, column, flat slab and shear wall in STADD.ProV8i software.

Generation of model using STAAD. Pro :

Generation of member property:



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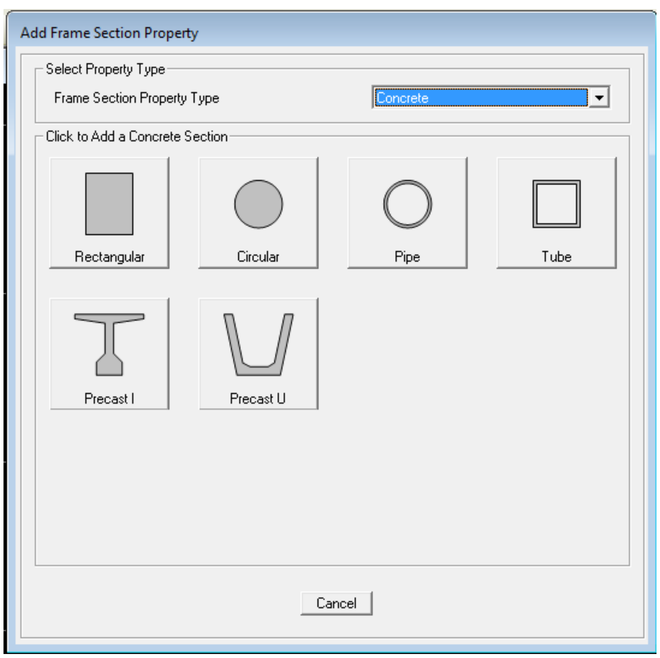
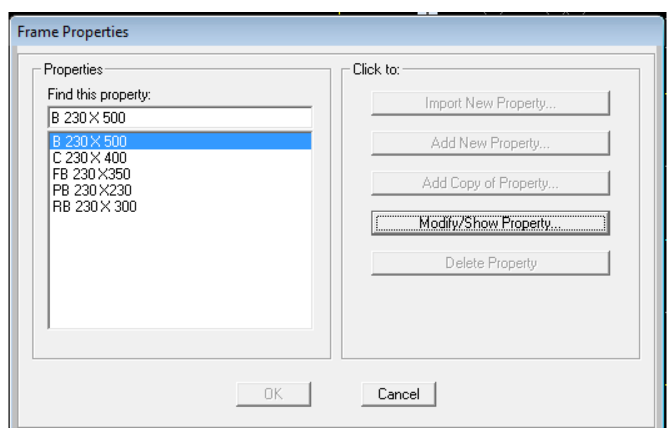
Generation of member property

3.5 WORKING WITH SAP2000 :-

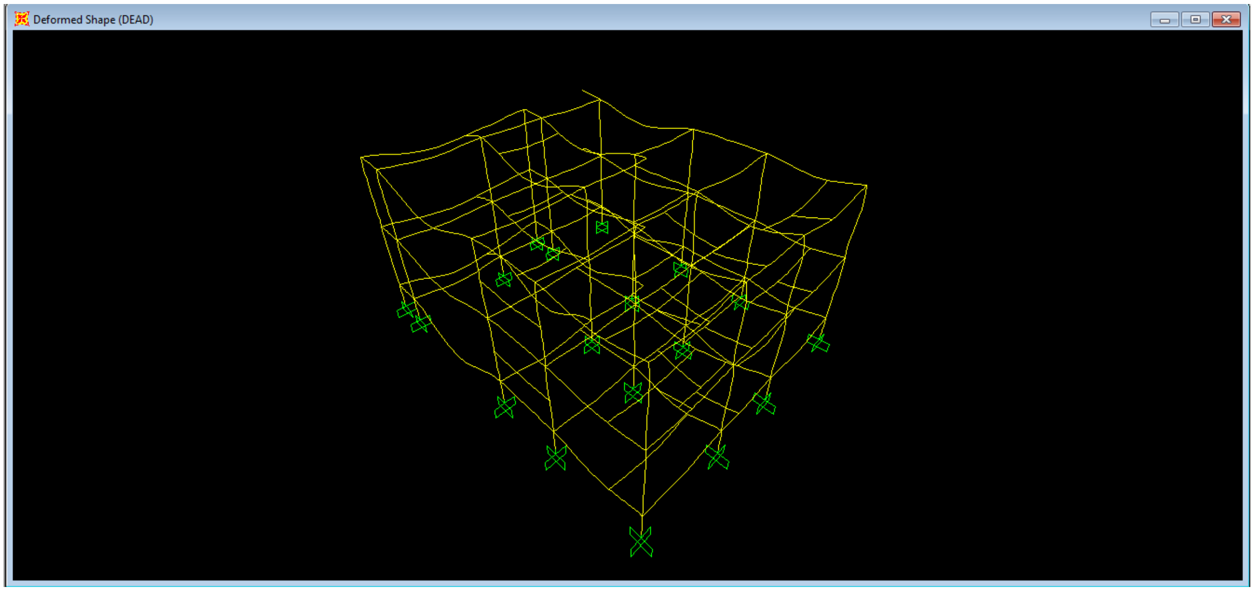
Analysis and design of G+1 storied building using SAP 2000

The special software SAP 2000 option for automatic measuring of construction's members has been used very often. This software gives the opportunity to determine easily and quickly necessary sections of the elements according to the requirements of the AASHTO, AISC, ACI, EUROCODE 2 and 3, UNI. The requirements of different investors can be satisfied without problem in accordance with leading normative documents in the world. The measuring of building structures which uses the SAP 2000 settings by default is very convenient but not always correct. Considering this point the creators of the programs gave the option for individual changes in the coefficients.

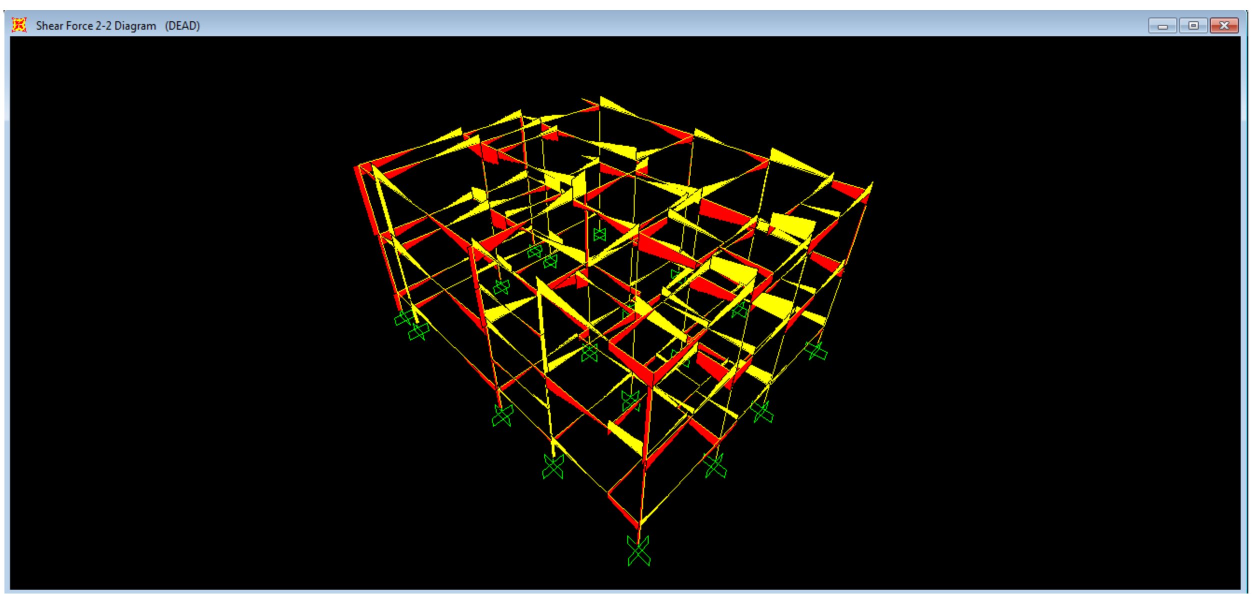




Section Properties Input File



Deflected shape



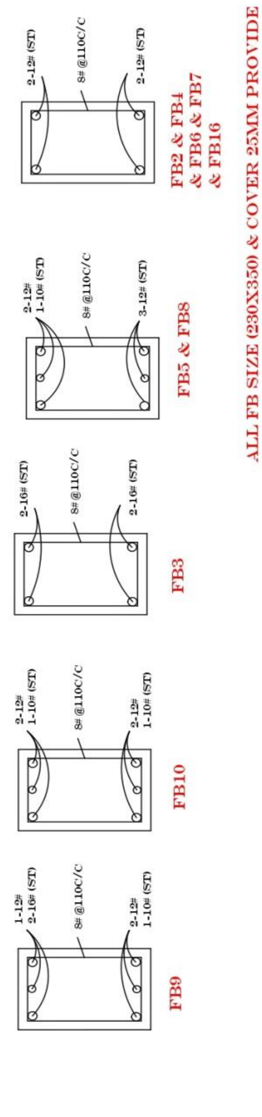
Share Forces

CHAPTER-4

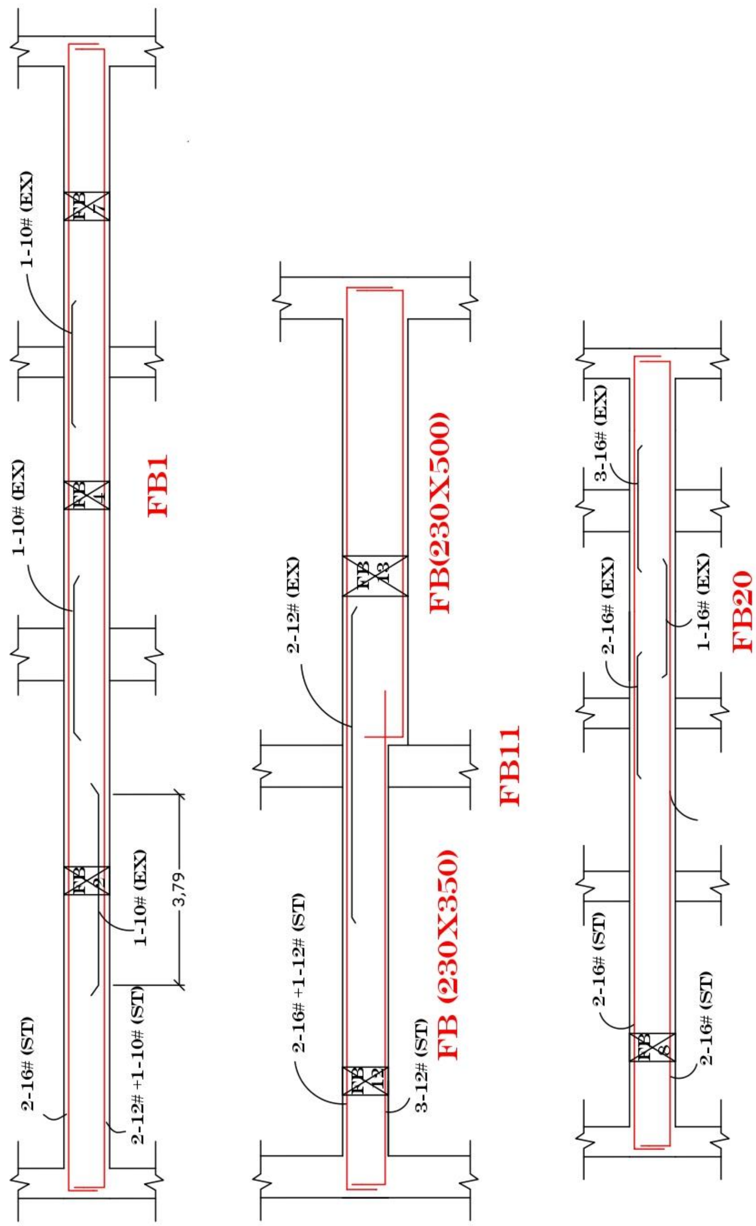
RESULTS

Study and analysis of Comparison of design results of a Structure designed using STAAD.ProV8i and SAP 2000 Software has been done and following results are shown :-

STAAD PRO...



STAAD PRO…


FB1
1-10# (EX)
1-10# (EX)
1-10# (EX)
3,79
2-16# (ST)
2-12# +1-10# (ST)
FB(230X500)
FB11
FB (230X350)
2-12# (EX)
2-16# +1-12# (ST)
3-12# (ST)
FB20
3-16# (EX)
2-16# (EX)
1-16# (EX)
2-16# (ST)
2-16# (ST)

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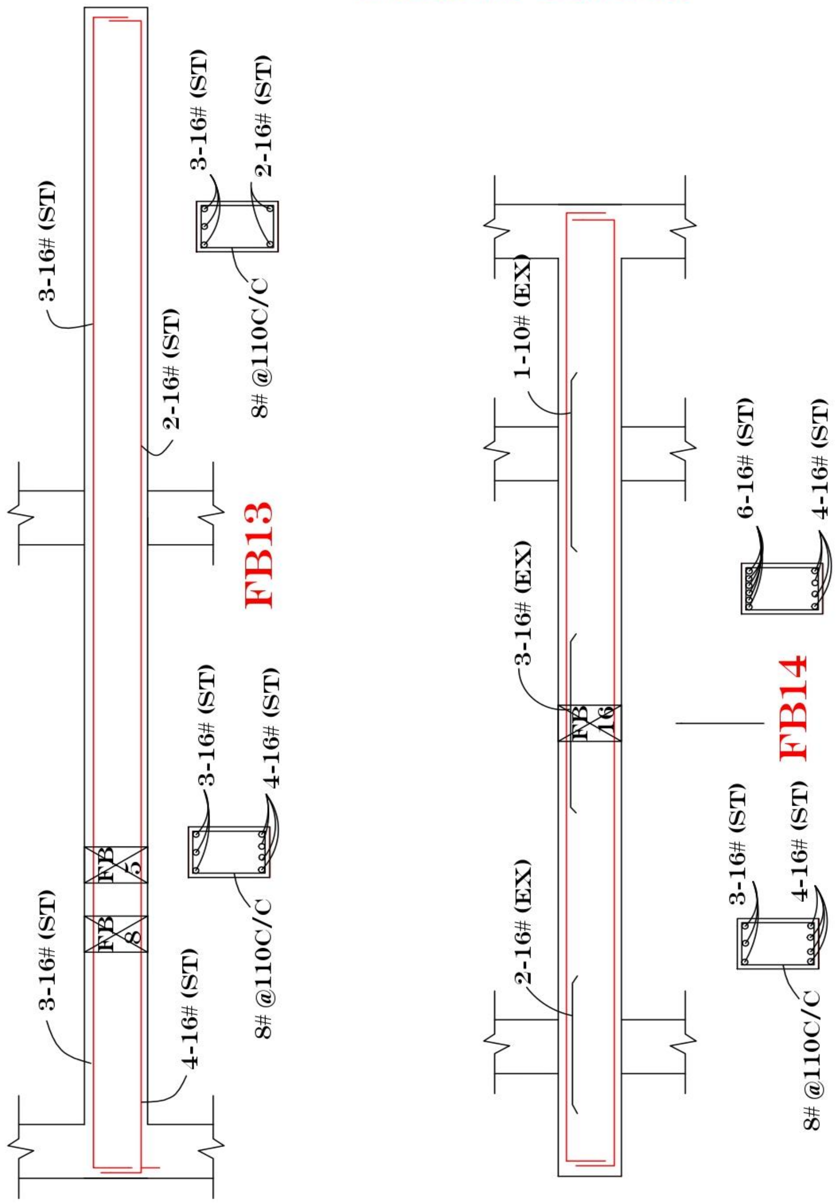
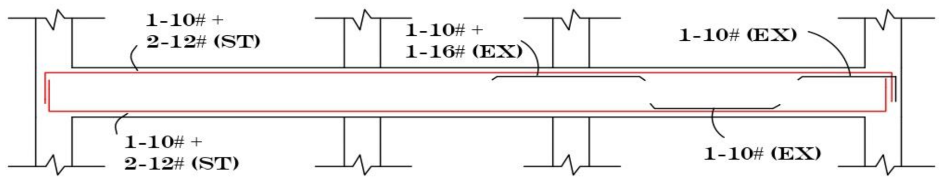
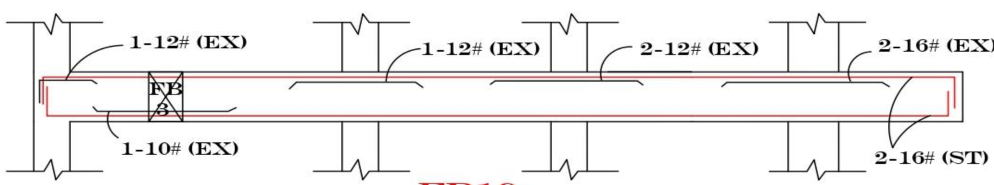
STAAD PRO...

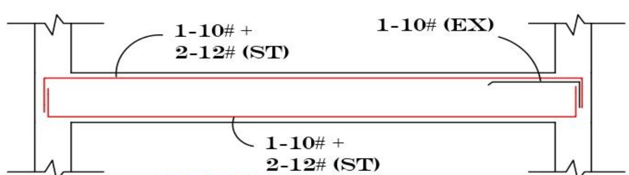




FB17



FB19



FB18

STAAD PRO...

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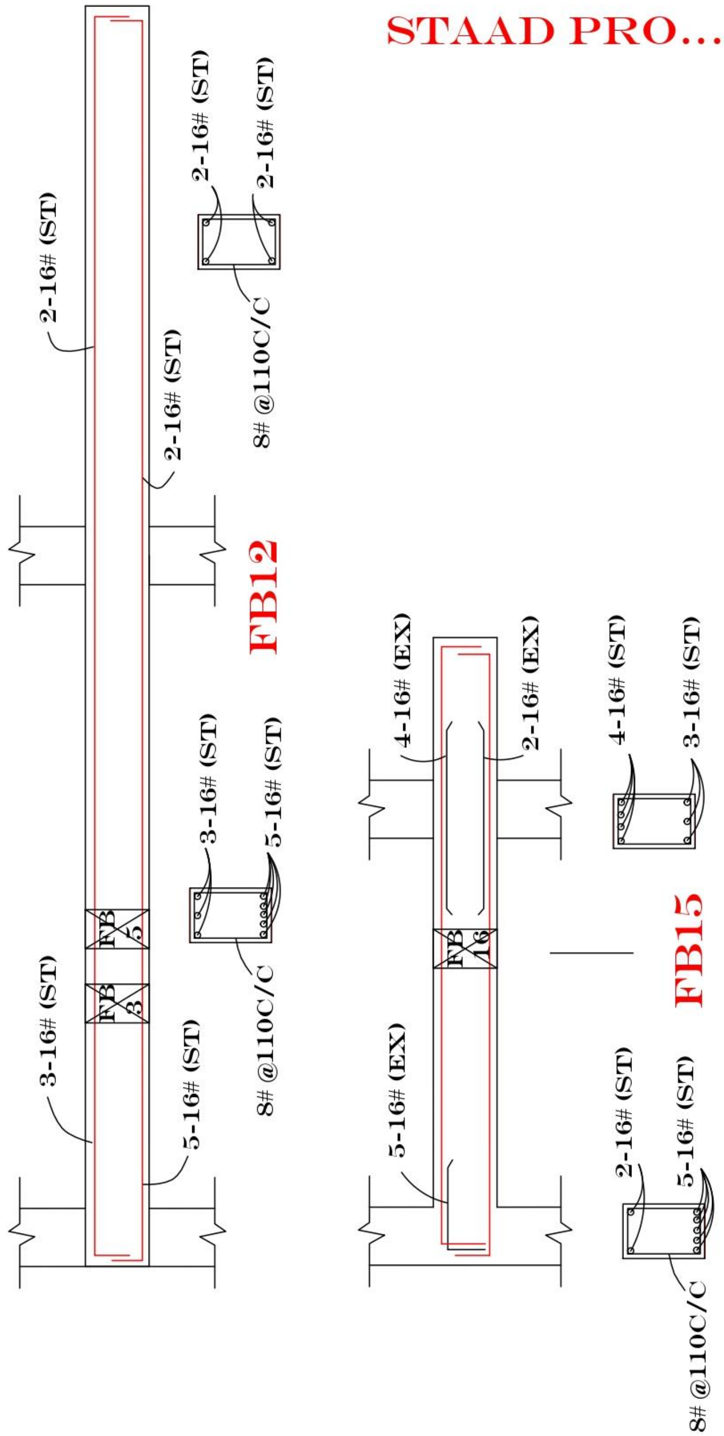
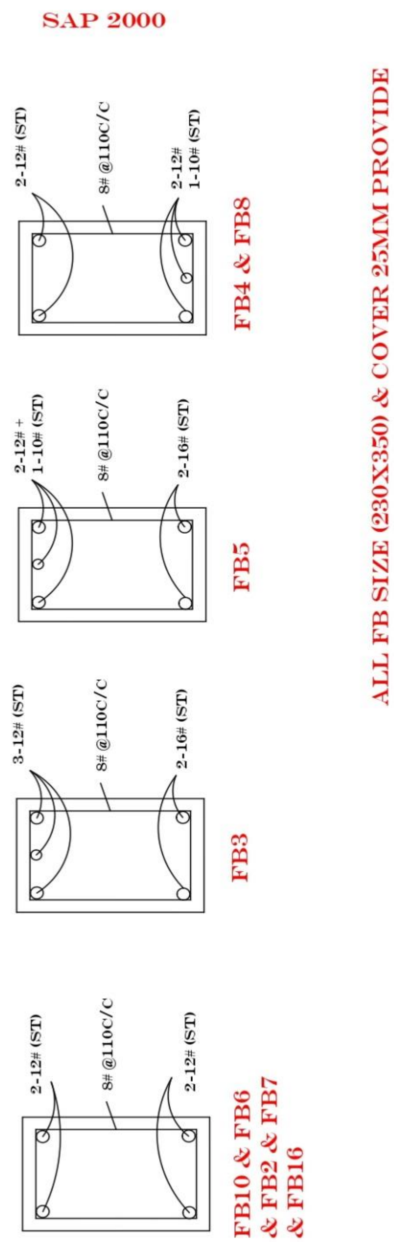
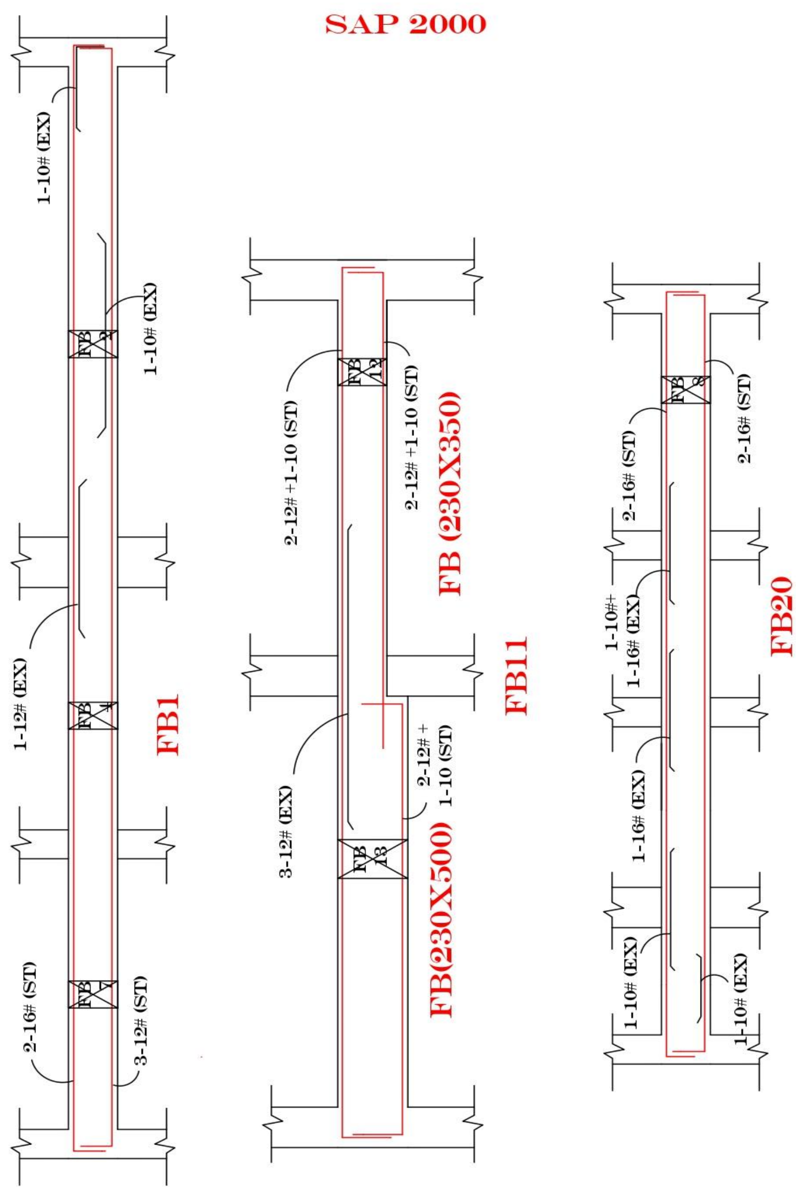


SAP2000 Result :-




SAP 2000
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1-12# (EX)
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3-12# (ST)
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2-12# +1-10 (ST)
FB (230X350)
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2-12# +
1-10 (ST)
FB(230X500)
FB11
2-16# (ST)
2-16# (ST)
1-10#+
1-16# (EX)
1-16# (EX)
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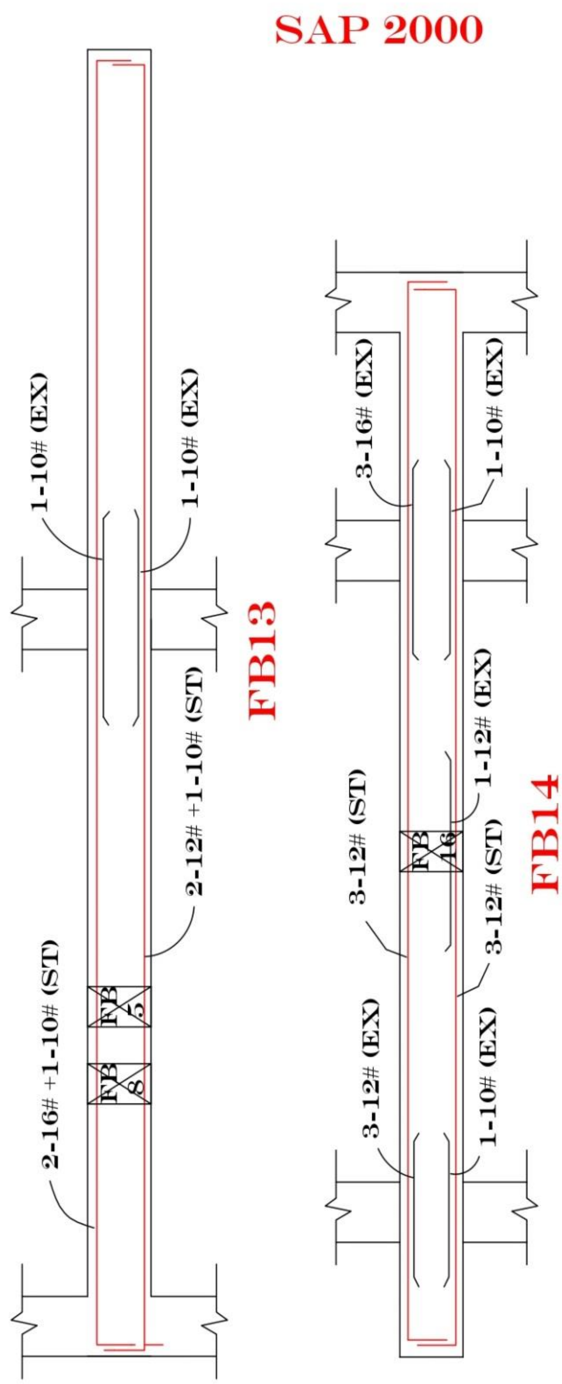
1-10# (EX)
FB20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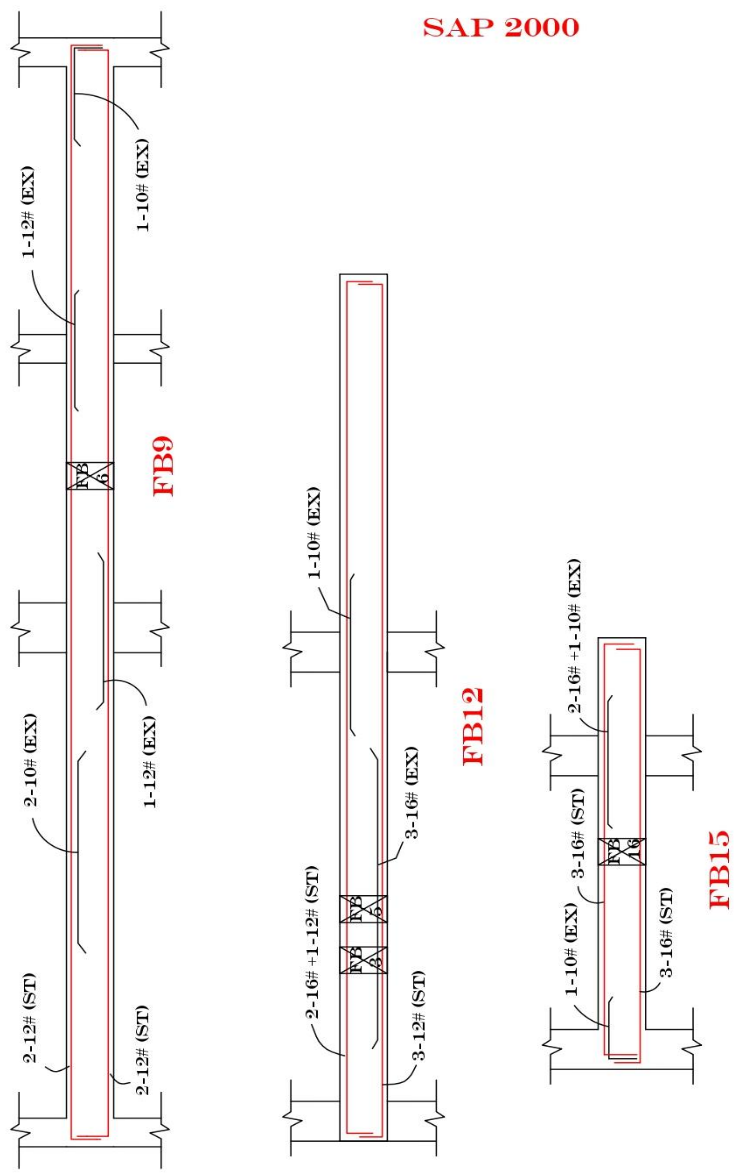
2-12# +1-10# (ST)
2-16# +1-10# (ST)
FB 5
FB 8
FB14
3-16# (EX)
1-10# (EX)
1-12# (EX)
3-12# (ST)
FB 16
3-12# (ST)
3-12# (EX)
1-10# (EX)


SAP 2000
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FB12
FB15
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2-16# +1-12# (ST)
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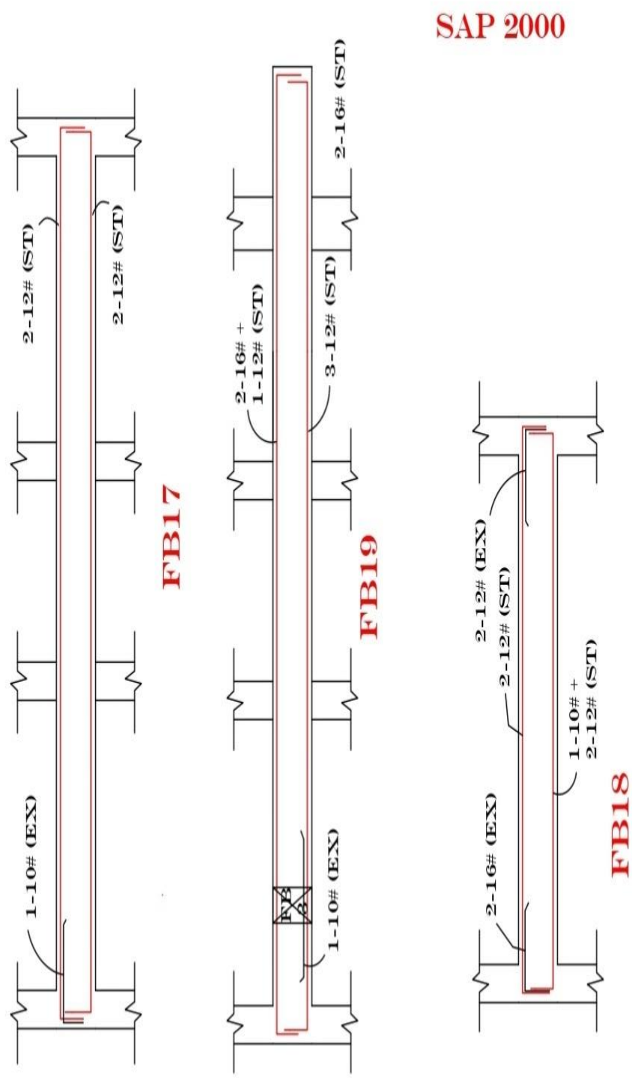
3-16# (ST)


SAP 2000
FB17
2-12# (ST)
2-12# (ST)
1-10# (EX)
FB19
2-16# (ST)
2-16# + 1-12# (ST)
3-12# (ST)
1-10# (EX)
FB18
2-12# (EX)
2-12# (ST)
1-10# + 2-12# (ST)
2-16# (EX)

Quantification of Steel

STAD Pro.

S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
1	1					
	Top	11.94	2	16	1.58	37.73
	Bottom	11.94	2	12	0.89	21.25
		11.94	1	10	0.61	7.28
	Ex. Top	1.19	1	10	0.61	0.72
		0.89	1	10	0.61	0.54
	Ex. Bot	1.31	1	10	0.61	0.80
	Rings	1.11	100	8	0.39	43.29
2	2					
	Top	2.02	2	12	0.89	3.60
	Bottom	2.02	2	12	0.89	3.60
	Rings	1.11	10	8	0.39	4.33
3	3					
	Top	5.09	2	16	1.58	16.08
	Bottom	5.09	2	16	1.58	16.08
	Rings	4.04	38	8	0.39	59.87
4	4					
	Top	2.45	2	12	0.89	4.36
	Bottom	2.45	2	12	0.89	4.36
	Rings	1.11	14	8	0.39	6.06
5	5					
	Top	3.71	2	12	0.89	6.60
		3.71	1	10	0.61	2.26
	Bottom	3.71	3	12	0.89	9.91
	Rings	1.11	26	8	0.39	11.26
6	6					
	Top	3.24	2	12	0.89	5.77
	Bottom	3.24	2	12	0.89	5.77
	Rings	1.11	17	8	0.39	7.36

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S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
7	7					
	Top	2.02	2	12	0.89	3.60
	Bottom	2.02	2	12	0.89	3.60
	Rings	1.11	10	8	0.39	4.33
8	8					
	Top	4.53	2	12	0.89	8.06
		4.53	1	10	0.61	2.76
	Bottom	4.53	3	12	0.89	12.10
	Rings	1.11	33	8	0.39	14.29
9	9					
	Top	11.94	2	16	1.58	37.73
		11.94	1	12	0.89	10.63
	Bottom	11.94	2	12	0.89	21.25
		11.94	1	10	0.61	7.28
	Rings	1.11	95	8	0.39	41.13
10	10					
	Top	4.38	2	12	0.89	7.80
		4.38	1	10	0.61	2.67
	Bottom	4.38	2	12	0.89	7.80
		4.38	1	10	0.61	2.67
	Rings	1.11	32	8	0.39	13.85
11	11					
	Top	8.29	2	16	1.58	26.20
		8.29	1	12	0.89	7.38
	Bottom	8.29	3	12	0.89	22.13
	Ex Top	0.92	2	12	0.89	1.64
	Rings	1.11	69	8	0.39	29.87
12	12					
	Top	7.36	2	16	1.58	23.26
		4.05	1	16	1.58	6.40
	Bottom	7.36	2	16	1.58	23.26
		4.05	5	16	1.58	32.00
	Rings	1.11	57	8	0.39	24.68
13	13					
	Top	7.36	3	16	1.58	34.89
	Bottom	7.36	2	16	1.58	23.26
		4.05	2	16	1.58	12.80

S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
	Rings	1.11	56	8	0.39	24.24
14	14					
	Top	8.30	3	16	1.58	39.34
		3.05	3	16	1.58	14.46
	Bottom	8.30	4	16	1.58	52.46
	Ex Top	0.74	1	10	0.61	0.45
	Ex Top	1.69	3	16	1.58	8.02
	Rings	1.11	62	8	0.39	26.84
15	15					
	Top	8.30	2	16	1.58	26.23
		3.05	2	16	1.58	9.64
	Bottom	8.30	3	16	1.58	39.34
		4.78	2	16	1.58	15.10
	Ex Top	0.74	4	16	1.58	4.70
	Ex Top	1.53	5	16	1.58	12.06
	Ex. Bot	0.74	2	16	1.58	2.35
	Rings	1.11	67	8	0.39	29.00
16	16					
	Top	3.87	2	12	0.89	6.89
	Bottom	3.87	2	12	0.89	6.89
		3.87				
	Rings	1.11	27	8	0.39	11.69
17	17					
	Top	11.94	2	12	0.89	21.25
		11.94	1	10	0.61	7.28
	Bottom	11.94	2	12	0.89	21.25
		11.94	1	10	0.61	7.28
	Ex Top	2.27	1	16	1.58	3.59
	Ex Top	2.27	1	10	0.61	1.38
	Ex Top	1.33	1	10	0.61	0.81
	Ex. Bot	3.09	1	10	0.61	1.89
	Rings	1.11	94	8	0.39	40.69
18	18					
	Top	8.29	2	12	0.89	14.76
		8.29	1	10	0.61	5.06
	Bottom	8.29	2	12	0.89	14.76
		8.29	1	10	0.61	5.06
	Ex Top	1.33	1	10	0.61	0.81
	Rings	1.11	66	8	0.39	28.57

S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
19	19					
	Top	14.93	2	16	1.58	47.18
	Bottom	14.93	2	16	1.58	47.18
	Ex Top	0.39	1	12	0.89	0.34
	Ex Top	1.79	1	12	0.89	1.59
	Ex Top	2.74	2	12	0.89	4.87
	Ex Top	2.08	2	16	1.58	6.57
	Ex. Bot	2.63	1	10	0.61	1.60
	Rings	1.11	120	8	0.39	51.95
20	20					
	Top	14.93	2	16	1.58	47.18
	Bottom	14.93	2	16	1.58	47.18
	Ex Top	2.27	3	16	1.58	10.76
	Ex Top	2.74	2	12	0.89	4.87
	Ex. Bot	4.38	1	16	1.58	6.91
	Rings	1.11	117	8	0.39	50.65
						1581.16
	Steel 16mr	=	729.93	Kg		
	Steel 12mr	=	268.65	Kg		
	Steel 10mr	=	58.63	Kg		
	Steel 8mm	=	523.94	Kg		
			1581.16	Kg		

Quantification of Steel

SAP 2000

S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
1	1					
	Top	11.94	2	16	1.58	37.73
	Bottom	11.94	3	12	0.89	31.88
	Ex. Top	2.22	1	12	0.89	1.98
	Ex. Bot	3.05	1	10	0.61	1.86
	Rings	1.11	100	8	0.39	43.29
2	2					
	Top	2.02	2	12	0.89	3.60
	Bottom	2.02	2	12	0.89	3.60
	Rings	1.11	10	8	0.39	4.33
3	3					
	Top	5.09	3	12	0.89	13.59
	Bottom	5.09	2	16	1.58	16.08
	Rings	4.04	38	8	0.39	59.87
4	4					
	Top	2.45	2	12	0.89	4.36
	Bottom	2.45	2	12	0.89	4.36
		2.45	1	10	0.61	1.49
	Rings	1.11	14	8	0.39	6.06
5	5					
	Top	3.71	2	12	0.89	6.60
		3.71	1	10	0.61	2.26
	Bottom	3.71	2	16	1.58	11.72
	Rings	1.11	26	8	0.39	11.26
6	6					
	Top	3.24	2	12	0.89	5.77
	Bottom	3.24	2	12	0.89	5.77
	Rings	1.11	17	8	0.39	7.36

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S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
7	7					
	Top	2.02	2	12	0.89	3.60
	Bottom	2.02	2	12	0.89	3.60
	Rings	1.11	10	8	0.39	4.33
8	8					
	Top	4.53	2	12	0.89	8.06
	Bottom	4.53	2	12	0.89	8.06
		4.53	1	10	0.61	2.76
	Rings	1.11	33	8	0.39	14.29
9	9					
	Top	11.94	2	12	0.89	21.25
	Bottom	11.94	2	12	0.89	21.25
	Ex Top	2.06	2	10	0.61	2.51
	Ex Top	2.22	1	12	0.89	1.98
	Ex Top	1.31	1	10	0.61	0.80
	Ex. Bot	2.14	1	12	0.89	1.90
	Rings	1.11	95	8	0.39	41.13
10	10					
	Top	4.38	2	12	0.89	7.80
	Bottom	4.38	2	12	0.89	7.80
	Rings	1.11	32	8	0.39	13.85
11	11					
	Top	8.29	2	12	0.89	14.76
		8.29	1	10	0.39	3.23
	Bottom	8.29	2	12	0.89	14.76
		8.29	1	10	0.39	3.23
	Ex Top	2.27	3	12	0.89	6.06
	Rings	1.11	69	8	0.39	29.87
12	12					
	Top	7.36	2	16	1.58	23.26
		7.36	1	12	0.89	6.55
	Bottom	7.36	3	12	0.89	19.65
	Ex Top	1.99	1	10	0.39	0.78
	Ex. Bot	2.63	3	16	1.58	12.47
	Rings	1.11	57	8	0.39	24.68
13	13					
	Top	7.36	2	16	1.58	23.26

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S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
		7.36	1	10	0.39	2.87
	Bottom	7.36	2	12	0.89	13.10
		7.36	1	10	0.39	2.87
	Ex Top	1.99	1	10	0.39	0.78
	Ex. Bot	1.99	1	10	0.39	0.78
	Rings	1.11	56	8	0.39	24.24
14	14					
	Top	8.30	3	12	0.89	22.16
	Bottom	8.30	3	12	0.89	22.16
	Ex Top	1.88	3	12	0.89	5.01
	Ex Top	2.09	3	16	1.58	9.90
	Ex. Bot	1.88	1	10	0.39	0.73
	Ex. Bot	2.09	1	10	0.39	0.81
	Ex. Bot	3.95	1	12	0.89	3.51
	Rings	1.11	62	8	0.39	26.84
15	15					
	Top	8.30	3	16	1.58	39.34
	Bottom	8.30	3	16	1.58	39.34
	Ex Top	1.88	1	10	0.39	0.73
	Ex Top	2.27	2	16	1.58	7.18
		2.27	1	10	0.39	0.89
	Rings	1.11	67	8	0.39	29.00
16	16					
	Top	3.87	2	12	0.89	6.89
	Bottom	3.87	2	12	0.89	6.89
	Rings	1.11	27	8	0.39	11.69
17	17					
	Top	11.94	2	12	0.89	21.25
	Bottom	11.94	2	12	0.89	21.25
	Ex Top	1.32	1	10	0.39	0.51
	Rings	1.11	94	8	0.39	40.69
18	18					
	Top	8.29	2	12	0.89	14.76
	Bottom	8.29	2	12	0.89	14.76
		8.29	1	10	0.39	3.23
	Ex Top	1.32	2	16	1.58	4.17
	Ex. Bot	0.94	2	12	0.89	1.68
	Rings	1.11	66	8	0.39	28.57
19	19					

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S.NO.	Beam No.	Length	No's	Diameter	Unit wt.	Quantity
	Top	14.93	2	16	1.58	47.18
		14.93	1	12	0.89	13.29
	Bottom	14.93	3	12	0.89	39.86
	Ex. Bot	2.63	1	16	1.58	4.16
	Rings	1.11	120	8	0.39	51.95
20	20					
	Top	14.93	2	16	1.58	47.18
	Bottom	14.93	2	16	1.58	47.18
	Ex Top	1.99	1	10	0.39	0.78
	Ex Top	2.74	1	16	1.58	4.32
	Ex Top	2.27	1	16	1.58	3.59
		2.27	1	10	0.39	0.89
	Ex. Bot	2.63	1	10	0.61	1.61
	Ex. Bot	4.38	1	10	0.61	2.67
	Rings	1.11	117	8	0.39	50.65
						1376.19
	Steel 16mr	=	378.05	Kg		
	Steel 12mr	=	435.13	Kg		
	Steel 10mr	=	39.07	Kg		
	Steel 8mm	=	523.94	Kg		
			1376.19	Kg		
	DIFFERENCE	**=**	**204.96**	**kg**		

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CHAPTER-5
CONCLUSION

Considering the results of the study and analysis of Comparison of design results of a Structure designed using STAAD.ProV8i and SAP 2000 Software we reached the following conclusions.

1. Quantification of the reinforcement of floor beams on the basis of result obtained from STAAD PRO-V8i & SAP-2000 is carried out. We conclude that for this particular problem SAP provides the economic design.
2. We obtain total Reinforcement difference of around 13% in floor beam StaadProV8i and SAP2000 software calculation.
3. Concrete requirement in all building members are same quantity in both software.
4. StaadProV8i and SAP2000 processing are around same but SAP2000 are little fast compare to StaadProV8i.