Final BIM Project Documentation

Project Title: RCC Residential Building

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1.Introduction

The primary objective of structural design is to ensure the stability, strength, and serviceability of a building throughout its intended lifespan while maintaining economy and constructability. This report presents the structural planning, modeling, analysis, and design of a reinforced concrete (RCC) residential building, developed as a part of an academic project.

The building has been conceptualized and modeled using Autodesk Revit to create detailed architectural and structural layouts. Further, Autodesk Robot Structural Analysis was used for structural simulation and design validation. The building comprises structural components such as columns, beams, slabs, and foundations designed to safely resist applied dead, live, and seismic loads as per the relevant Indian Standards (IS codes).

This documentation includes a comprehensive presentation of design assumptions, material specifications, analysis methods, load calculations, and results. Additionally, schedules for quantities and a detailed bar bending schedule have been prepared to estimate the material requirements and construction costs.

Through this report, a practical understanding of building design, code compliance, and industry-standard practices has been demonstrated, reinforcing the application of classroom knowledge in a real-world design environment

2. Architectural and design process followed

- Structural System: G+5 RCC Frame
- Design Code: IS 456:2000, IS 875 (Part 1, 2, 3)
- Concrete Grade: M25 (default)
- Steel: Fe500
- Assumed live load reduction as per code

The house that I have designed contains 2 bedrooms with an attached bathroom and a big living room with an attached open kitchen to better utilize the space. Access to each floor includes an exterior curved staircase supported by a column and help to the building with the help of curved beams and an elevator shaft provided inside the main building itself, both with direct access to the hallway.

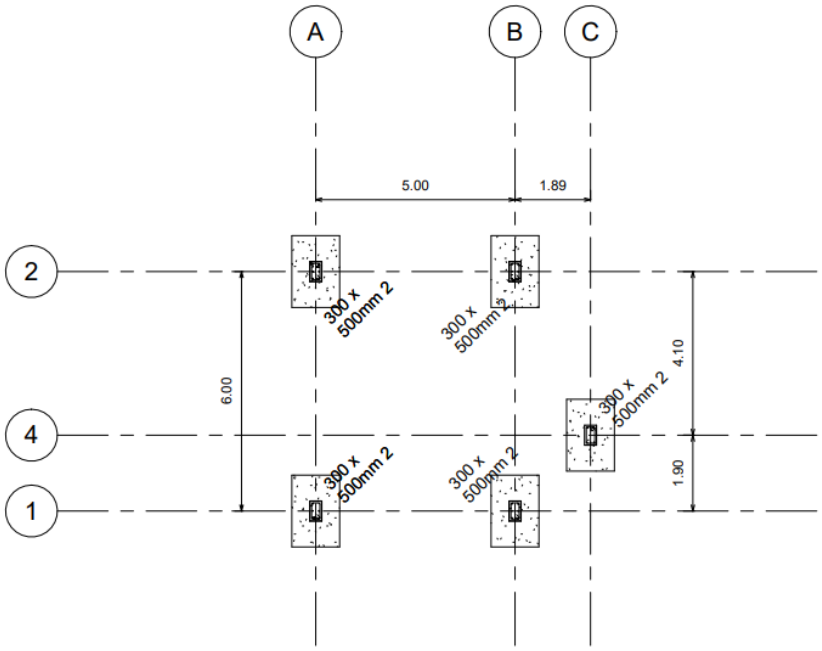
I then re-modelled this building on a structural template on revit and provided each column and beam with reinforcement through their respective cross sections. For the floor slabs, I provided reinforcement through the area method available on revit. I also modelled appropriate footings for this building and provided reinforcements with stirrups extending into them from the columns.

I also generated bar schedules and detail views of all elements and created sheets for the same and exported them for convenience.

Once this was done, I proceeded to generate an analytical model of this building before exporting the same to Autodesk Robot for further structural analysis.

On Robot, I did the necessary calculations and generated the figures and values for displacement, reactions, and moment forces. After this, I provided reinforcement to the various types of columns, beams and footings through preset reinforcement parameters and generated sheets of the same.

2. Column Layout Plan

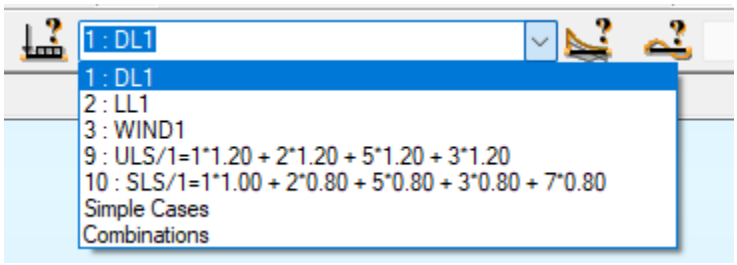


3. Codes used

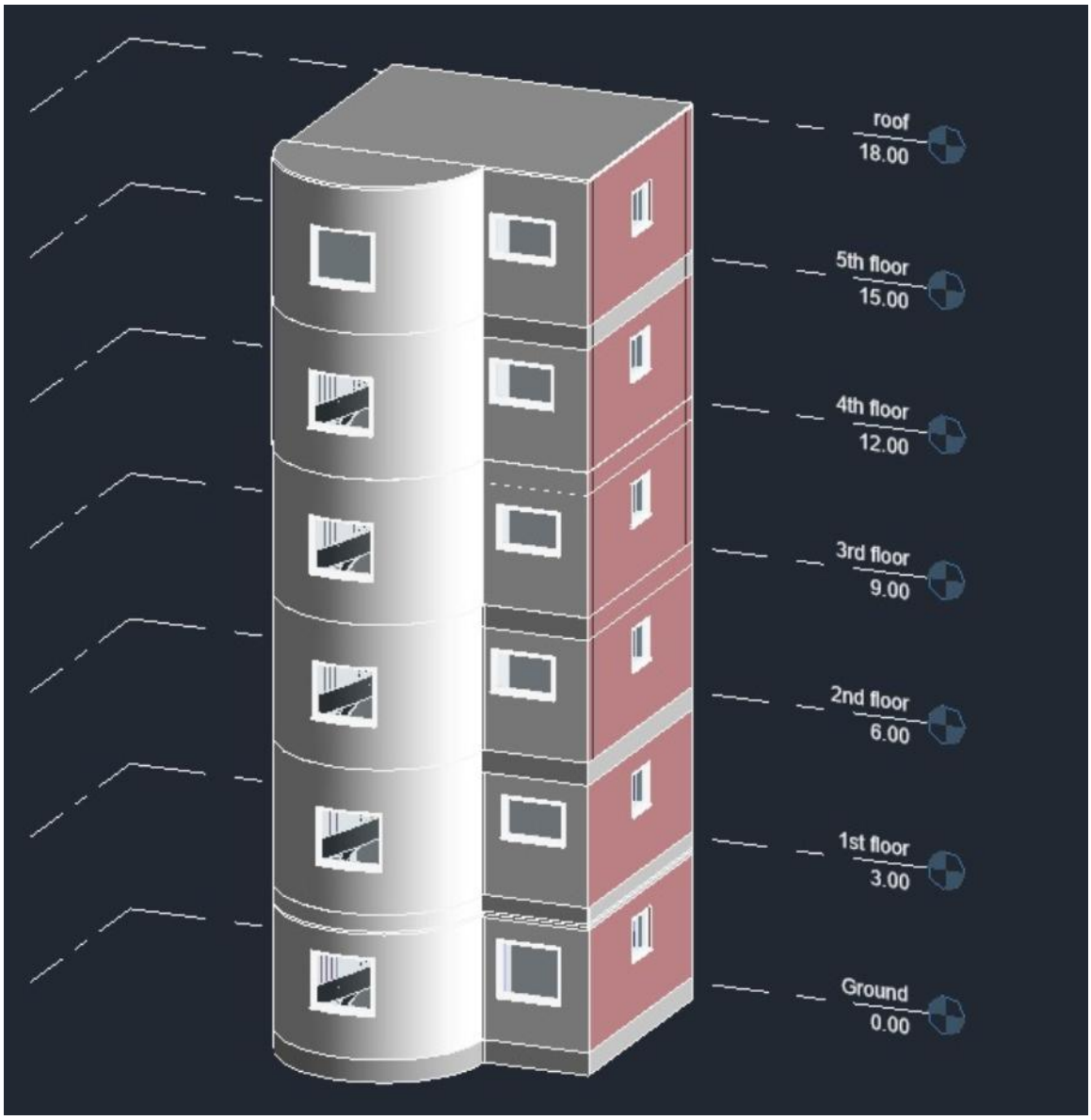
- IS 800:2007 – General Construction in Steel – Code of Practice
- IS 13920:2016 – Ductile Detailing of Reinforced Concrete Structures
- IS 875 (Part 3):1987 – Wind Loads
- IS 875 (Part 2):1987 – Imposed Loads
- IS 875 (Part 1):1987 – Dead Loads
- IS 456:2000 – Plain and Reinforced Concrete – Code of Practice

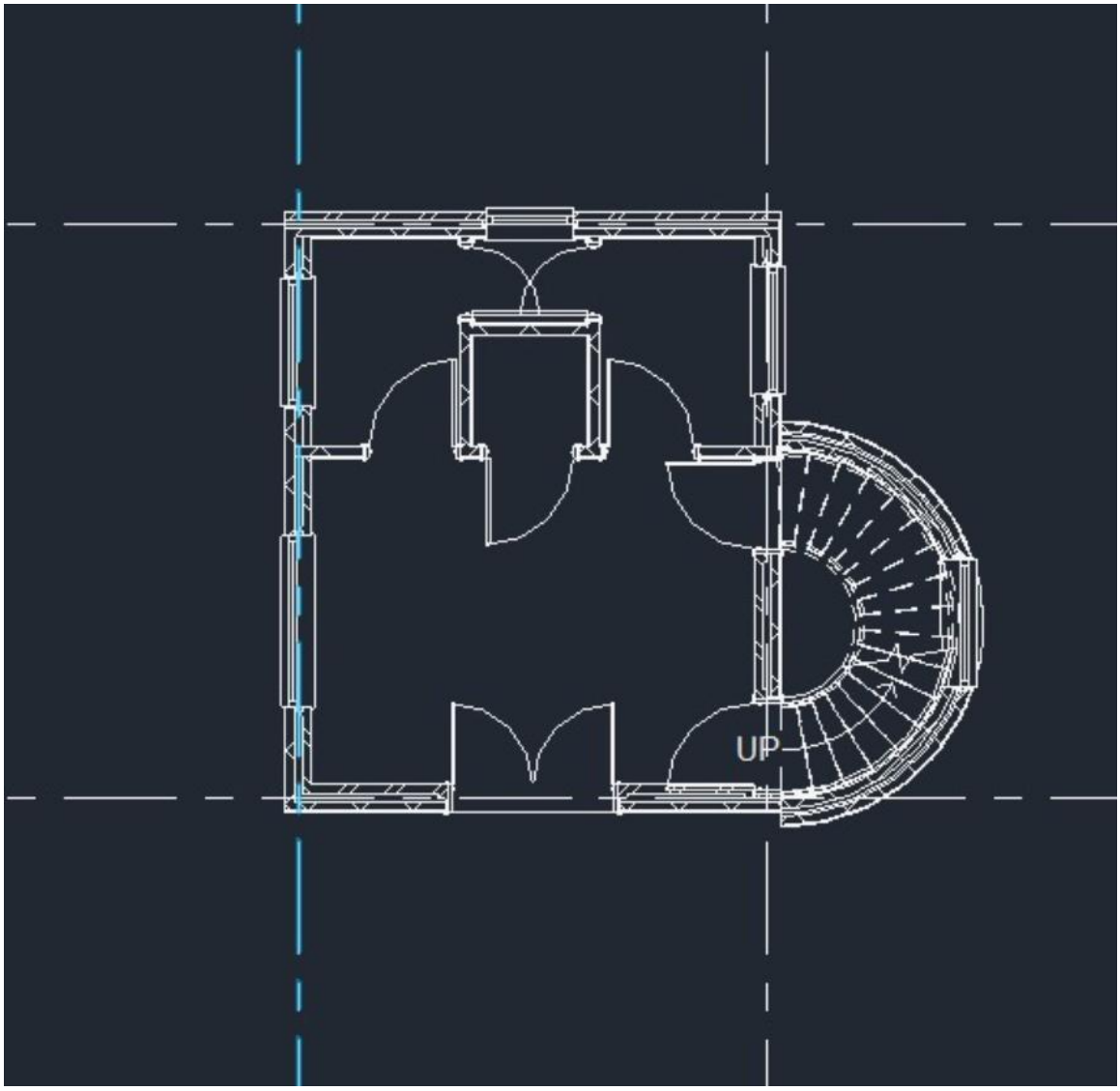
4. Load calculations

- Dead Load:
  - Slab Self-weight = 25 kN/m^3 × 0.15 m = 3.75 kN/m^2
  - Wall Load (230 mm thick, 3 m height) = 0.23 × 3 × 20 = 13.8 kN/m
- Live Load: 2.0 kN/m^2 (as per IS 875)
- Wind Load: Calculated using IS 875 Part 3
- Load Combinations:



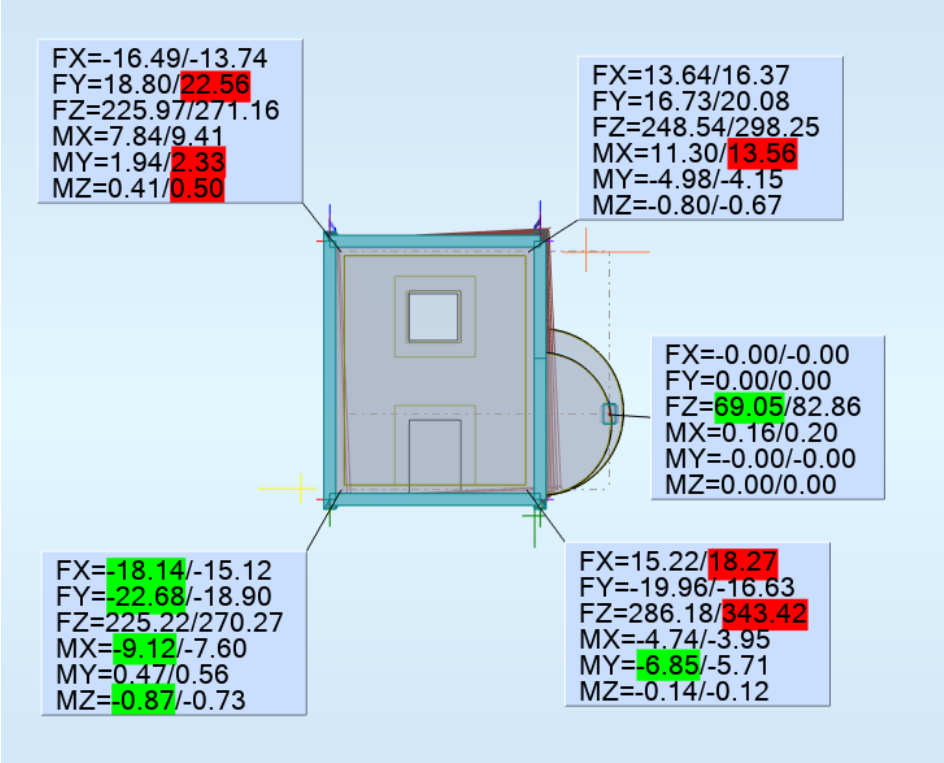
6. Architectural model


roof
18.00
5th floor
15.00
4th floor
12.00
3rd floor
9.00
2nd floor
6.00
1st floor
3.00
Ground
0.00



7. Structural Model & Analysis Results

- Model created in Autodesk Revit
- Loads applied as per above.



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Min= 0.0
KY 0.5kN/m
Max= 0.0
Min= 0.0
RM kNm
RF kN
Dis 0.5mm
Max=1.3
Mz 5kNm
Max=6.03
Min=-6.03
My 5kNm
Max=14.54
Min=-20.48
Mx 5.e-002kNm
Max=0.27
Min=-0.20
Fz 5kN
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Fy 5kN
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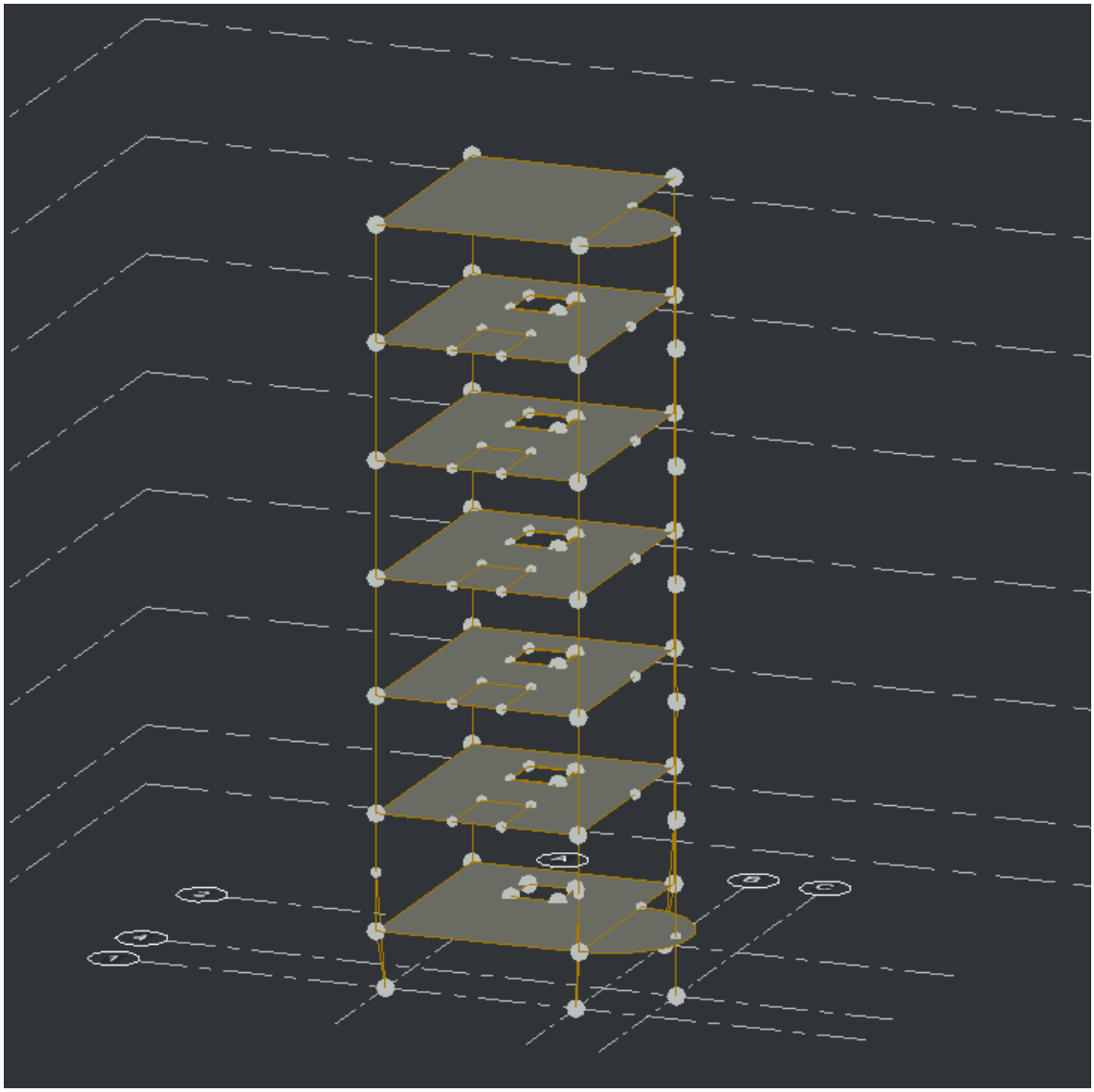
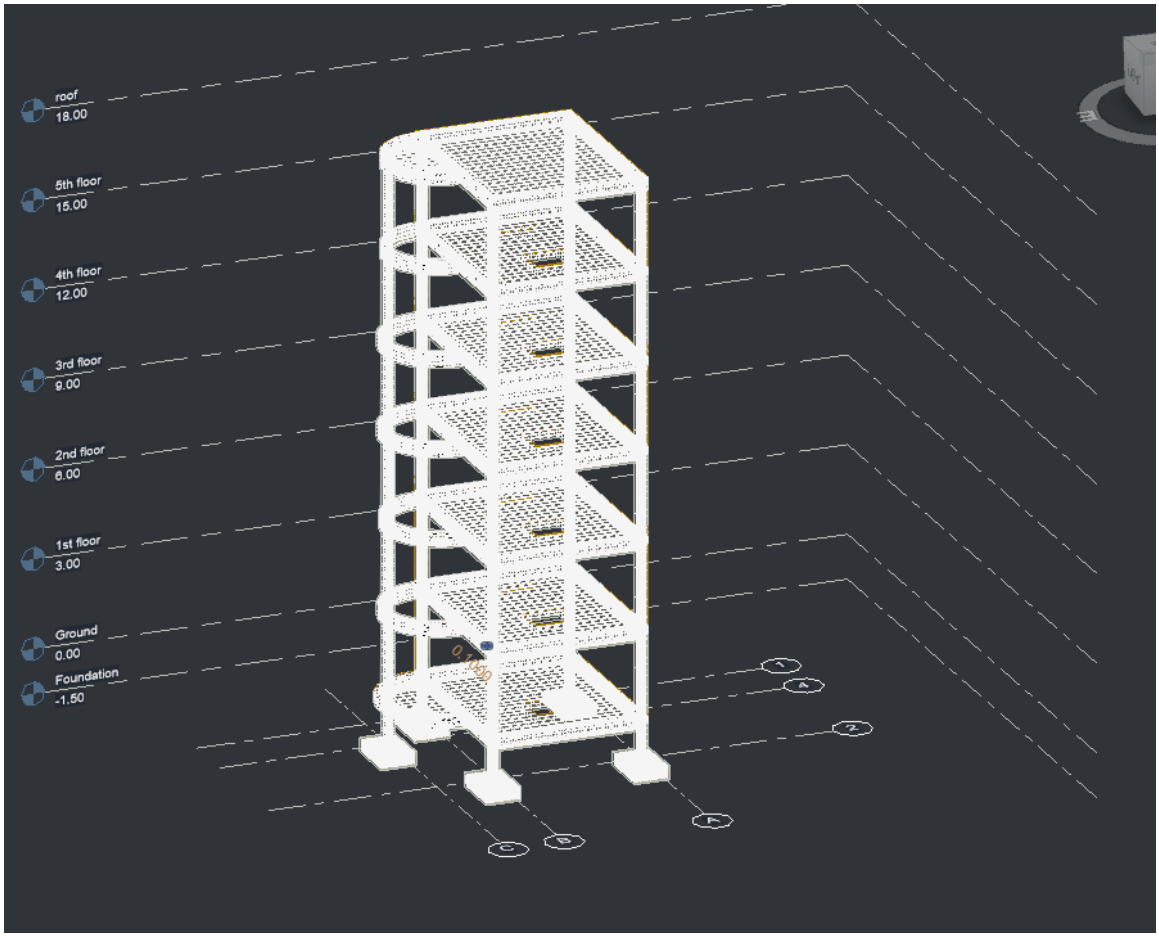
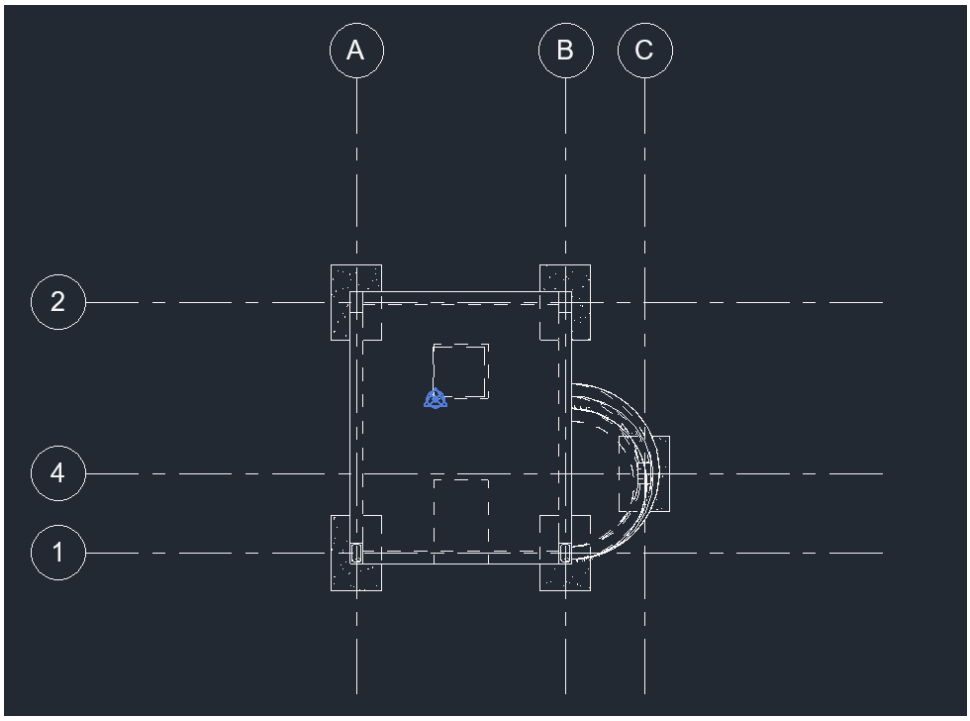
Min=-6.76
Fx+c Fx-t 50kN
Max=279.27
Min=-21.39



Analytical model

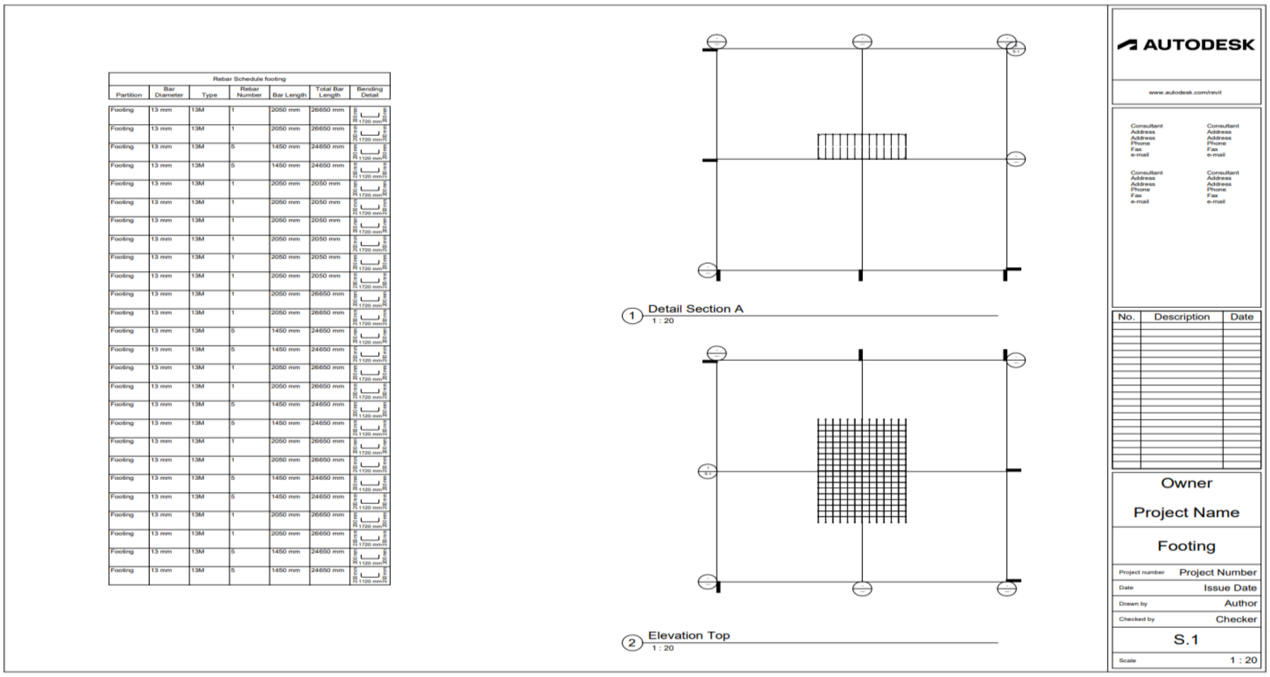
8. Structural design



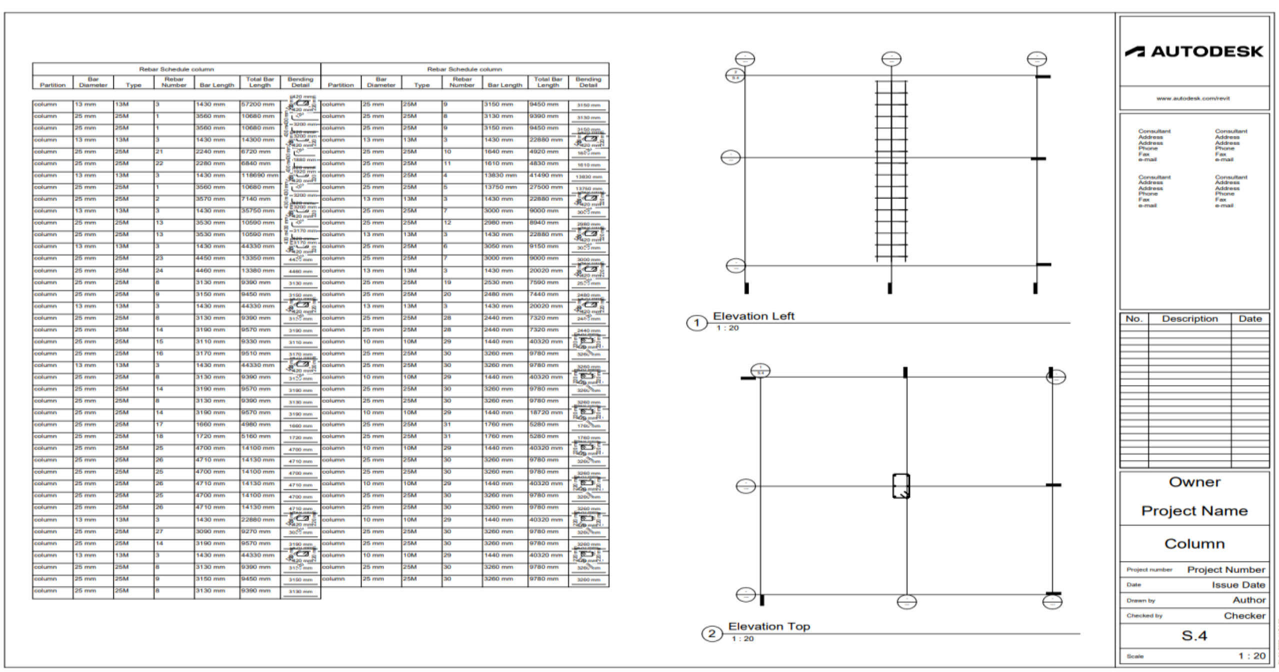


9. Bar Bending Schedule and Estimation

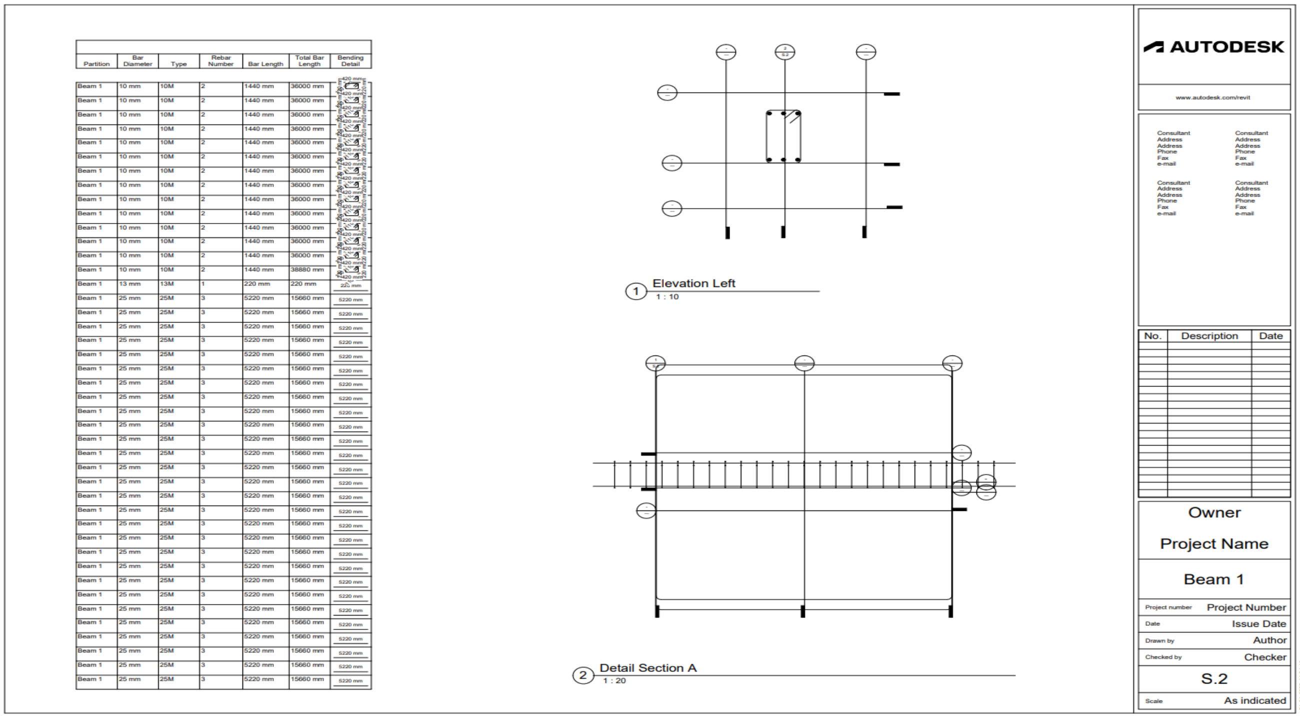
Footing



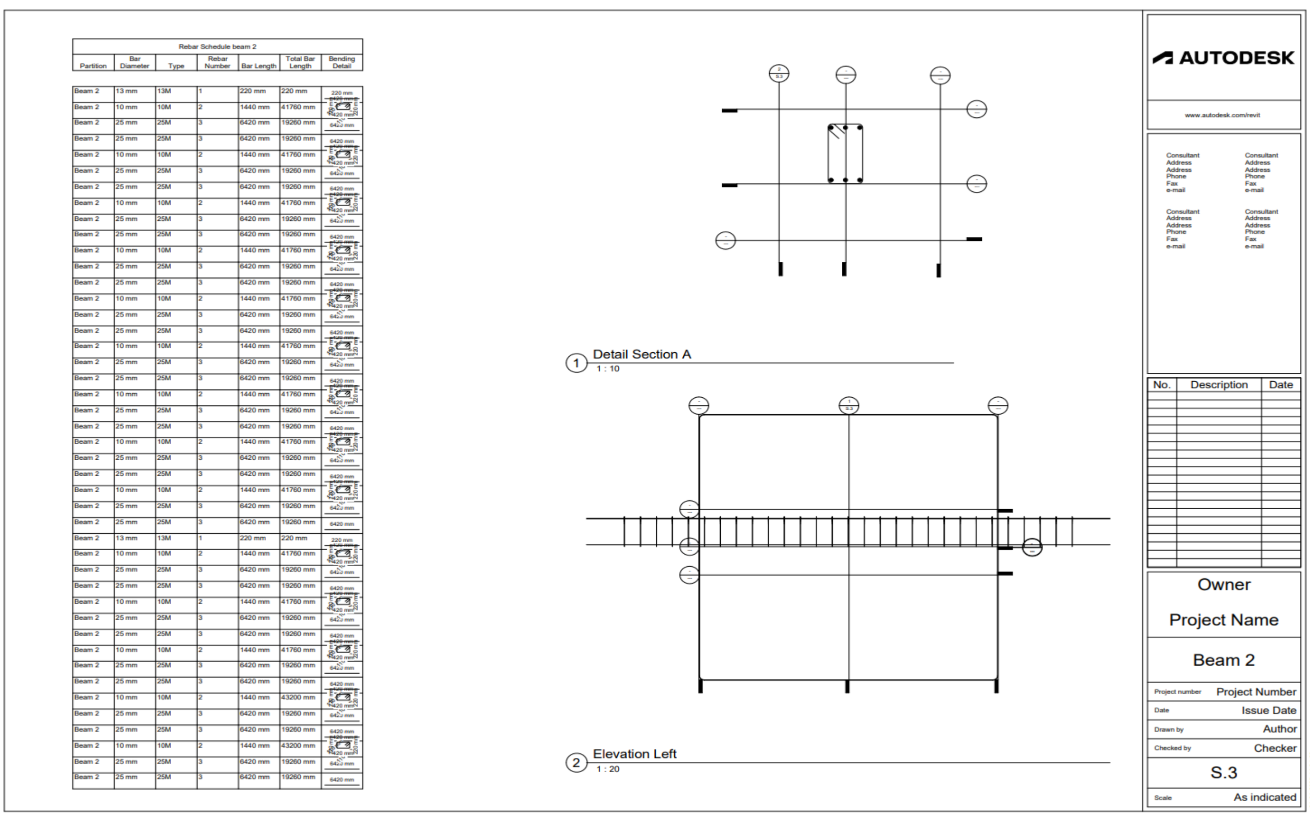
Column



Beam 1

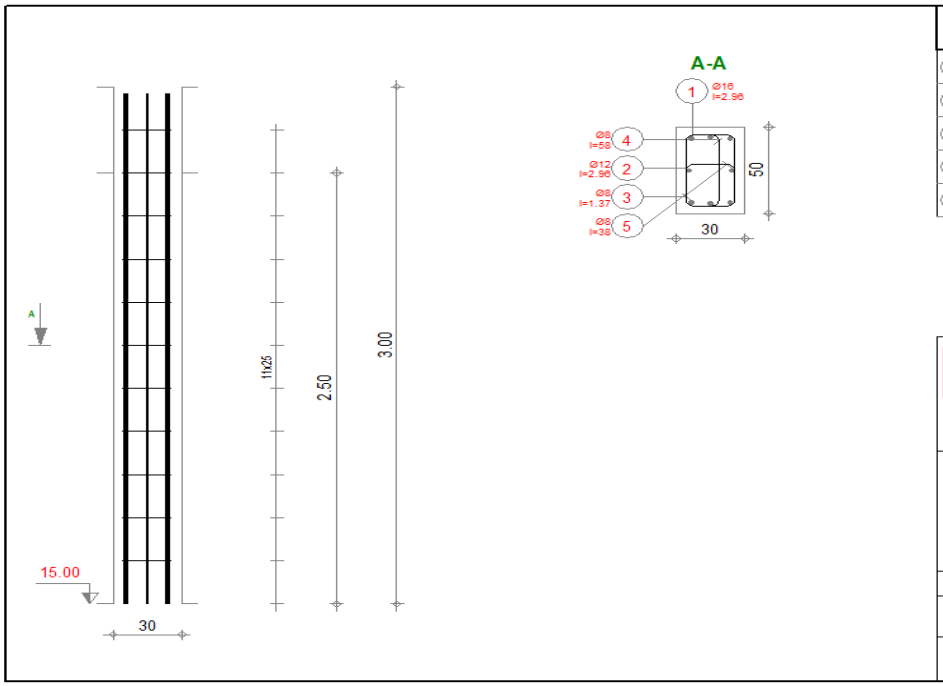

Partition
Bar Diameter
Type
Rebar Number
Bar Length
Total Bar Length
Bending Detail
Elevation Left
1 : 10
Detail Section A
1 : 20
AUTODESK
www.autodesk.com/revit
No.
Description
Date
Owner
Project Name
Beam 1
Project number
Project Number
Date
Issue Date
Drawn by
Author
Checked by
Checker
S.2
Scale
As indicated

Beam 2


Rebar Schedule beam 2
Partition
Bar Diameter
Type
Rebar Number
Bar Length
Total Bar Length
Bending Detail
Detail Section A
1 : 10
Elevation Left
1 : 20
AUTODESK
www.autodesk.com/revit
No.
Description
Date
Owner
Project Name
Beam 2
Project number
Project Number
Date
Issue Date
Drawn by
Author
Checked by
Checker
S.3
Scale
As indicated

10. Robot provided reinforcement

Column



Pos.	Reinforcement		Shape	Steel	Number
1	Ø16	l=2.96	2.96	Fe500	6
2	Ø12	l=2.96	2.96	Fe500	2
3	Ø8	l=1.37	22 / 10 / 5	Fe500	11
4	Ø8	l=58	5 / 42	Fe500	11
5	Ø8	l=38	5 / 22	Fe500	11

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Column66

Max. aggregate diameter : 20mm
Exposure class : mild
Formwork = 4 m2
Number 1

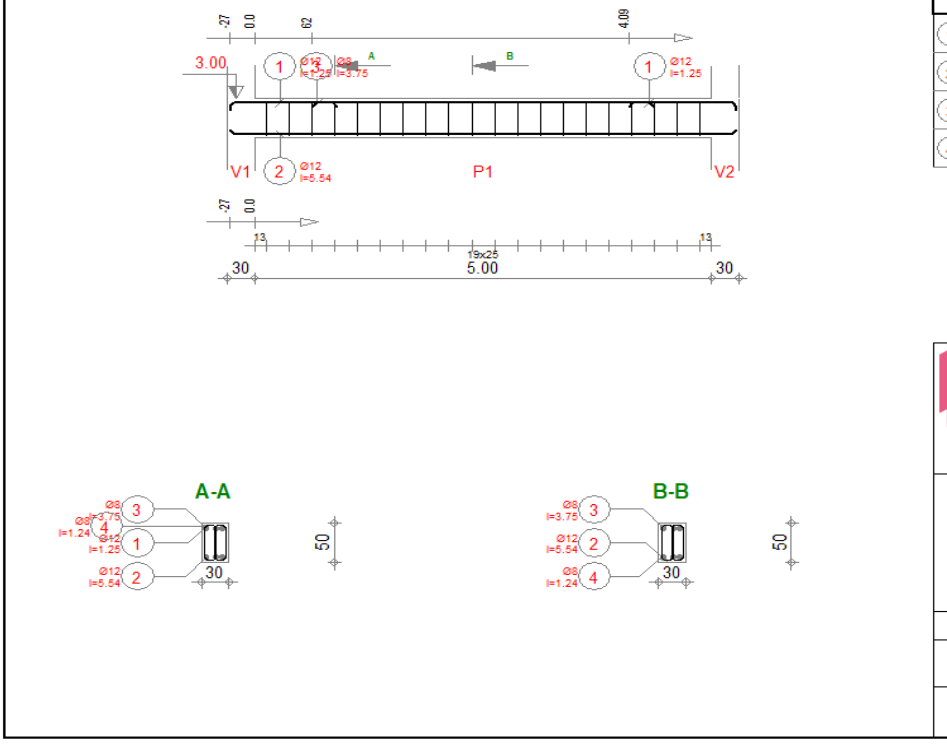
Cover 40 mm
Page 1/1

Section scale 1/20 — View scale 1/20

Concrete : M 40 = 0.375 m3

Steel : Fe500 = 33.3 kg
Steel : Fe500 = 10.1 kg

Beam 1



Pos.	Reinforcement		Shape	Steel	Number
1	Ø12	l=1.25	1.18	Fe500	6
2	Ø12	l=5.54	5.54	Fe500	3
3	Ø8	l=3.75	3.75	Fe500	3
4	Ø8	l=1.24	13 / 10 / 5	Fe500	40

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1st floor

Beam4 : P1

Max. aggregate diameter : 20mm
Exposure class : mild
Consistence : S1
Number 1

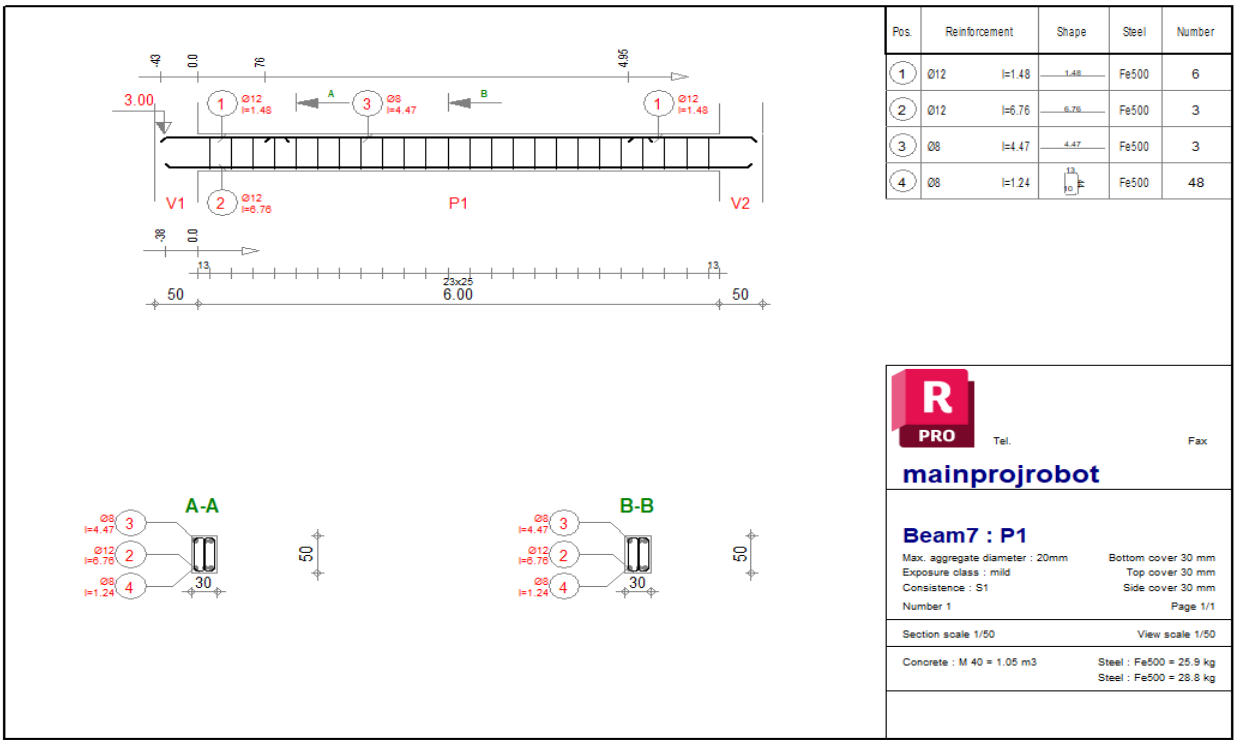
Bottom cover 30 mm
Top cover 30 mm
Side cover 30 mm
Page 1/1

Section scale 1/50 — View scale 1/50

Concrete : M 40 = 0.84 m3

Steel : Fe500 = 21.4 kg
Steel : Fe500 = 24 kg

Beam 2



Pos.	Reinforcement		Shape	Steel	Number
1	Ø12	l=1.48	1.48	Fe500	6
2	Ø12	l=6.76	6.76	Fe500	3
3	Ø8	l=4.47	4.47	Fe500	3
4	Ø8	l=1.24	13 10	Fe500	48

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Beam7 : P1

Max. aggregate diameter : 20mm
Exposure class : mild
Consistence : S1
Number 1

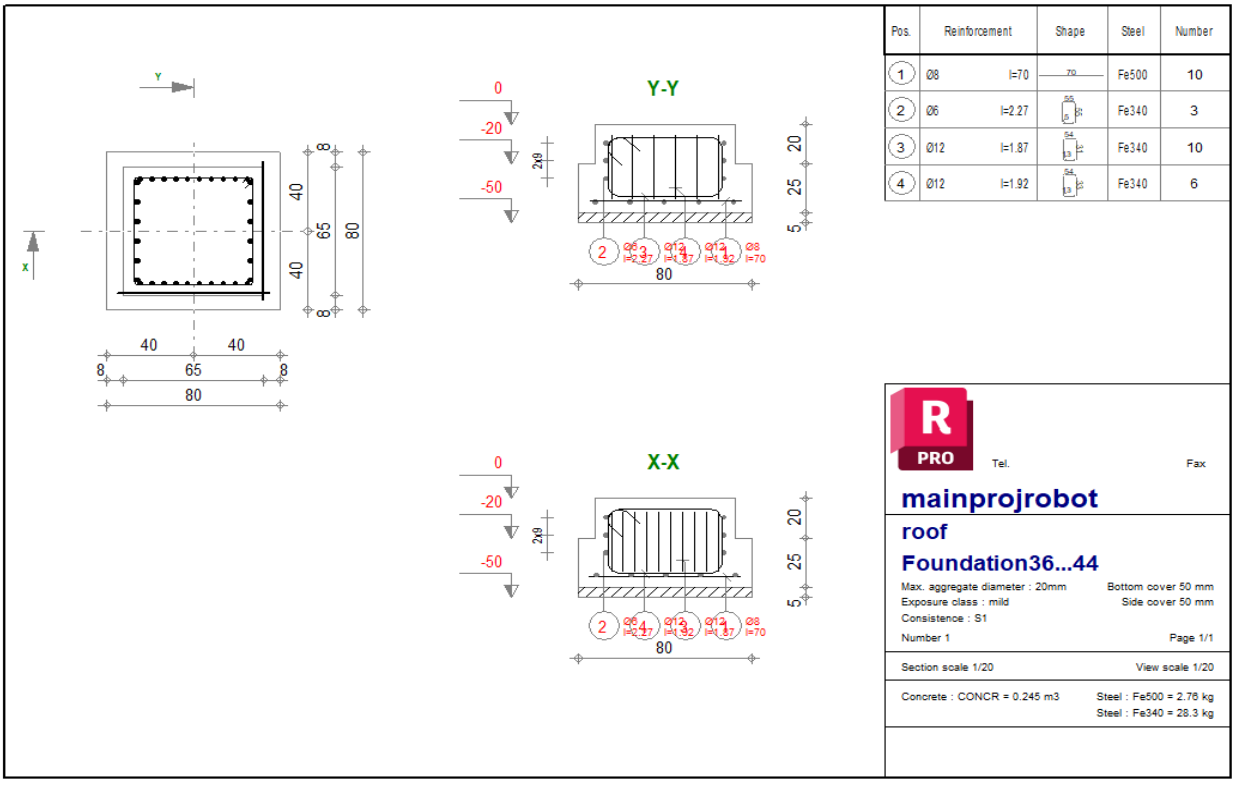
Bottom cover 30 mm
Top cover 30 mm
Side cover 30 mm
Page 1/1

Section scale 1/50 — View scale 1/50

Concrete : M 40 = 1.05 m3

Steel : Fe500 = 25.9 kg
Steel : Fe500 = 28.8 kg

Foundation



Pos.	Reinforcement		Shape	Steel	Number
1	Ø8	l=70	70	Fe500	10
2	Ø6	l=2.27	55	Fe340	3
3	Ø12	l=1.87	54	Fe340	10
4	Ø12	l=1.92	54	Fe340	6

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roof

Foundation36...44

Max. aggregate diameter : 20mm
Exposure class : mild
Consistence : S1
Number 1

Bottom cover 50 mm
Side cover 50 mm
Page 1/1

Section scale 1/20 — View scale 1/20

Concrete : CONCR = 0.245 m3

Steel : Fe500 = 2.76 kg
Steel : Fe340 = 28.3 kg

11. Conclusion

This report documents the complete process of structural planning, analysis, and design of a reinforced concrete residential building using industry-standard software tools such as Autodesk Revit and Robot Structural Analysis. Through this project, a comprehensive understanding of real-world structural design practices was developed, from conceptual modeling to load application and reinforcement detailing.

All structural elements including columns, beams, slabs, and footings were designed to safely withstand applied dead and live loads. The design adhered strictly to relevant IS codes, ensuring safety, serviceability, and durability throughout the building's lifespan.

Bar bending schedules, material quantity estimates, and cost approximations were prepared to reflect practical construction needs. The integration of parametric modeling in Revit allowed efficient coordination of structural elements, while Robot enabled precise analysis and design verification.

This project served as a vital bridge between theoretical concepts and practical application, reinforcing the importance of design codes, accuracy in modeling, and attention to detail. Moving forward, this experience will be foundational in approaching larger and more complex structural design challenges.