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Original Article

Reinforcement Detailing And Bar Bending Schedule (Bbs) Of Rcc Structure Including Core Wall Using Rebar Cad

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Abstract *- Reinforced Cement Concrete (RCC) structures require proper reinforcement detailing to ensure safety, strength, and durability. This project focuses on the preparation of reinforcement detailing and Bar Bending Schedule (BBS) for an RCC structure including a core wall using Rebarcad software. Reinforcement detailing is an essential step in structural design as it provides complete information about the placement of steel bars in different structural elements such as beams, columns, slabs, and walls. The Bar Bending Schedule gives a detailed summary of bar diameter, shape, cutting length, and quantity required for construction. The use of Rebarcad software improves accuracy, reduces human error, and enhances productivity. The project also highlights the importance of core walls in providing lateral stability to structures. The study supports sustainable construction practices by reducing material wastage and improving efficiency.*

Keywords *- RCC Structure, Reinforcement Detailing, Bar Bending Schedule, Core Wall, RebarCad, Structural Engineering.*

I. INTRODUCTION

Reinforced Cement Concrete (RCC) is one of the most widely used construction materials in the world. It combines the compressive strength of concrete with the tensile strength of steel reinforcement. Proper detailing of reinforcement is necessary to ensure that the structure performs safely under different loading conditions.

Reinforcement detailing involves the preparation of detailed drawings that show the arrangement of reinforcement bars in structural elements. It ensures proper load transfer, crack control, and durability of the structure.

Bar Bending Schedule (BBS) is a document that provides detailed information about reinforcement bars including their size, length, shape, and quantity. It helps in estimating material requirements and reducing wastage.

Core walls are important structural components used in multi-storey buildings to resist lateral loads such as wind and earthquakes. Proper detailing of core walls is essential for maintaining structural stability.

II. OBJECTIVES

1. To prepare reinforcement detailing of RCC structural elements.
2. To develop proper detailing of core wall reinforcement.
3. To generate Bar Bending Schedule (BBS) using Rebar Plus software.
4. To ensure accurate placement of reinforcement bars.
5. To understand software-based rebar modeling process.

III. SCOPE OF THE STUDY

The scope of this project includes the preparation of reinforcement detailing for RCC structural components such as beams, columns, slabs, and core walls. The study focuses on the use of Rebar Cad software for generating reinforcement drawings and Bar Bending Schedule.

The outputs of this project include detailed reinforcement drawings and BBS sheets which can be directly used for construction purposes. The study helps in improving construction quality and reducing material wastage.

IV. MATERIALS AND METHODS

Materials Used:

- RCC structural design data
- Reinforcement steel bars (Fe 415/Fe 500)
- Rebar cad software

Methodology:
1. Collection of design data
2. Modeling of structural elements
3. Reinforcement detailing
4. Core wall detailing
5. Generation of BBS
6. Verification of results

V. REINFORCEMENT DETAILING

Reinforcement detailing is the process of preparing drawings that show the arrangement of steel bars in structural elements. It includes details such as bar diameter, spacing, length, and anchorage.

Proper detailing ensures structural safety, prevents cracking, and improves load transfer. It also helps in easy execution at the construction site.

MINIMUM DEVELOPMENT AND SPLICE LENGTHS (mm)
CLASS "B"

BAR SIZE (mm)	TENSION					COMPRESSION	
	SPLICE (mm)		DEVELOPMENT LENGTH (mm)		90° HOOK DEVELOPMENT LENGTH (mm)	SPLICE (mm)	DEVELOPMENT LENGTH (mm)
	2db	3db	2db	3db			
Ø10	500	500	450	450	200	300	250
Ø12	600	600	550	550	250	400	300
Ø14	700	700	600	600	300	500	400
Ø16	800	800	700	700	300	500	400
Ø20	1000	1000	900	900	400	600	450
Ø22	1300	1100	1000	950	450	700	550
Ø25	1600	1250	1300	1100	500	800	600
Ø32	2700	1800	2100	1400	600	1000	750

Figure 1: LAP TABLE

C4-W3	FROM GF TO L02	300	T12@200	T12@200
C4-W3	FROM L02 TO L03	300	T12@200	T10@200
C4-W3	FROM L03 TO L04	300	T12@200	T10@200
C4-W3	FROM L04 TO L05	300	T12@200	T10@200

Figure 2: DESIGN DETAILS

VI. INTERNATIONAL CODES AND STANDARDS

- ACI 301M-16, SPECIFICATIONS FOR STRUCTURAL CONCRETE
- ACI 318M-19, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND COMMENTARY, AMERICAN CONCRETE INSTITUTE
- ACI 350M-20, CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES AND COMMENTARY
- ACI 543R-12, GUIDE TO DESIGN, MANUFACTURE, AND INSTALLATION OF CONCRETE PILES
- ACI 336.3R-14, REPORT ON DESIGN AND CONSTRUCTION OF DRILLED PIERS
- ACI 224.2R, CRACKING OF CONCRETE MEMBERS IN DIRECT TENSION .
- ACI 216.1M-14, CODE REQUIREMENTS FOR DETERMINING FIRE RESISTANCE OF CONCRETE AND MASONRY CONSTRUCTION

- ACI PRC-365.1-17: REPORT ON SERVICE LIFE PREDICTION.
- ACI 363R-92, STATE-OF-THE-ART REPORT ON HIGH-STRENGTH CONCRETE.
- ACI 211.1, STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL, HEAVY WEIGHT, AND MASS CONCRETE.
- IBC 2018, INTERNATIONAL BUILDING CODE
- ASCE 37-14, DESIGN LOADS ON STRUCTURES DURING CONSTRUCTION –FOR TEMPORARY LOADS DURING CONSTRUCTION
- PCI MNL 120-17 -PCI DESIGN HANDBOOK, 8TH EDITION
- PCI DESIGN HANDBOOK, PRECAST AND PRESTRESSED CONCRETE"-7TH EDITION •CIRIA C766-19, EARLY AGE THERMAL CRACK CONTROL IN CONCRETE
- AISC STEEL CONSTRUCTION MANUAL
- AISC 303 CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES •AISC 360 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS .
- AISC 341: SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS
- AISC DESIGN GUIDE 11: VIBRATIONS OF STEEL-FRAMED STRUCTURAL SYSTEMS DUE TO HUMAN ACTIVITY (SECOND EDITION)
- AWS D1.1, D1.2, D1.3 STRUCTURAL WELDING CODES
- ASCE 7-16, MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES
- ASCE 19-16 STRUCTURAL APPLICATIONS FOR STEEL CABLES FOR BUILDINGS
- ASTM F1554 -STANDARD SPECIFICATION FOR ANCHOR BOLTS, STEEL, 36, 55, AND 105KSI YIELD STRENGTH
- ASTM F3125 / F3125M -STANDARD SPECIFICATION FOR HIGH STRENGTH STRUCTURAL BOLTS AND ASSEMBLIES
- ISO 12944 CORROSION PROTECTION OF STEEL STRUCTURES BY PROTECTIVE PAINT SYSTEMS, PARTS 1 THROUGH

VII. CORE WALL DETAILING

Core walls are vertical structural elements that provide stability to buildings. They resist lateral loads such as wind and seismic forces.

Core wall reinforcement includes vertical bars, horizontal ties, and boundary elements. Proper detailing is necessary to ensure strength and durability.

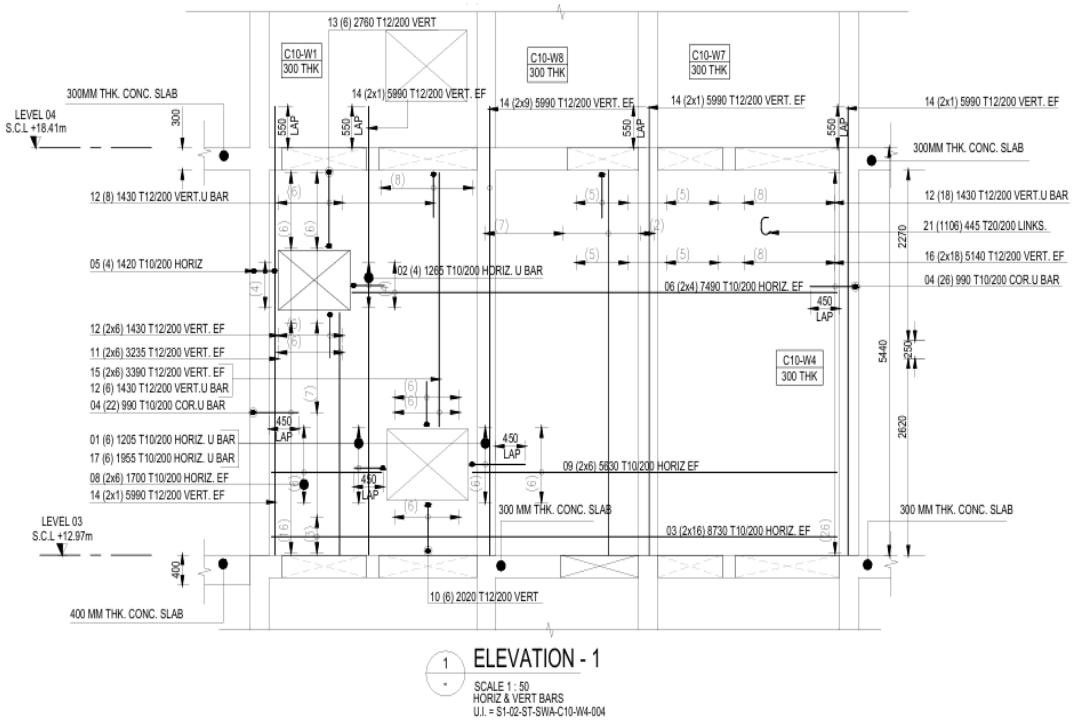


Figure 3: DETAILING

VIII. BAR BENDING SCHEDULE (BBS)

Bar Bending Schedule (BBS) is a table that provides details of reinforcement bars including bar mark, diameter, length, shape, and quantity.

Advantages of BBS:
- Reduces material wastage
- Helps in cost estimation
- Improves construction efficiency
- Ensures accuracy

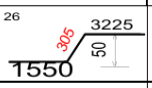
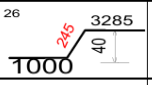
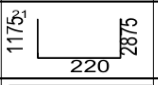
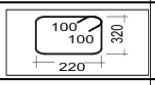
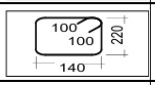
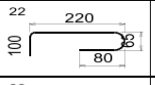
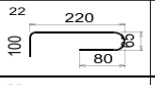
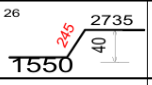
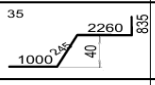
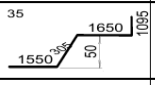
Member	Bar Mark	Type and Size	No. of Mbrs	Qty	Total Qty.	Length of each bar mm †	Shape code	A * mm / F * mm	B * mm / G * mm	C * mm / H * mm	D * mm / I * mm	E/R * mm / J * mm	Shape	Weight (Kg)	Rev.
ELEVATION-1	01	T25	1	14	14	5080	26	1550	305	3225	50			274.09	0
ELEVATION-1	04	T20	1	14	14	4530	26	1000	245	3285	40			156.39	0
ELEVATION-1	07	T12	1	130	130	4220	21	1175	220	2875				487.38	0
ELEVATION-1	09	T10	1	130	130	1180	99165	320	220	100	100			94.5	0
ELEVATION-1	10	T10	1	65	65	820	99165	220	140	100	100			32.83	0
ELEVATION-1	11	T8	1	343	343	415	22	100	220	65	80			56.5	0
ELEVATION-1	11	T8	1	112	112	415	22	100	220	65	80			18.45	0
ELEVATION-1	37	T20	1	17	17	4530	26	1550	245	2735	40			189.9	0
ELEVATION-1	41	T20	1	31	31	4285	35	1000	245	2260	40	835		327.57	0
ELEVATION-1	42	T25	1	14	14	4530	35	1550	305	1650	50	1095		244.5	0

Figure 4: Bar Bending Schedule

IX. RESULTS AND DISCUSSION

The use of Rebar cad software resulted in accurate reinforcement detailing and BBS generation. It reduced manual errors and improved efficiency.

The software allowed easy modification of designs and better visualization of structural elements.

XI. CONCLUSION

The project highlights the importance of reinforcement detailing and BBS in RCC structures. The use of Rebar cad software improves accuracy and efficiency. Proper detailing ensures structural safety and cost-effective construction.

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