IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Use of RCF Software in Construction Industry

[1]Chetan Sonkar, [2]Prof. N.K Dhapekar
[1]Research Scholar, [2]Associate Professor
[1]Department of Civil Engineering.
[1]Kalinga University, Raipur, India

Abstract: For generations the process of designing of members of structure and their quantity & cost estimation has been manual, error-prone and time consuming process. RCF software has been used in this research paper to design the beam, slab, column, and footing of the structure. Designing is the preliminary process followed by the quantity and cost estimation, which is as important as designing in large construction project. Before calculating the quantity and costing, the beam, column, slab and footings are designed and all the loads are allocated and analyzed. Data narrating the technical and marginal parameters such as beam reinforcement schedule, column reinforcement schedule, schedule of foundation, Bending Moment Diagram (BMD), Shear Force Diagram (SFD) are also described in this research paper using RCF software. The method used to create bar bending schedule and slab reinforcement is also discussed in detail which justifies the acceptability of RCF software in construction industry.

Index Terms **- RCF, Beam, Column, Slab, Footing, Cost Estimation.**

I. INTRODUCTION

This software is designed to perform designing of the structure, analysis, estimation and costing of a RCC floor designed at uniform level (2D) This software also design beams, slabs, columns and isolated footings, when column project file is created by the user. To get the complete building cost all the cost related to beam, slabs, column and footings quantities are added to floor costs automatically

In this RCF software, the user is only require to enter the floor data for joints, columns, slabs, beams, point load & continuity. Other things of the operation will be taken care by the software itself. User can also add, remove or rename the beam, column, slab and footings even after entering these data at the beginning. This software is designed such that the graphics option is also available for display and editing or deleting data is also available in tabular format. Printing any data is the most basic feature which is available at the bottom of every tabular or graphical data. Printing will be done with same set of default values such that Aerial font, 8mm thick, portrait and bold letter. There is an exception that the beam schedule can be only printed in landscape mode.

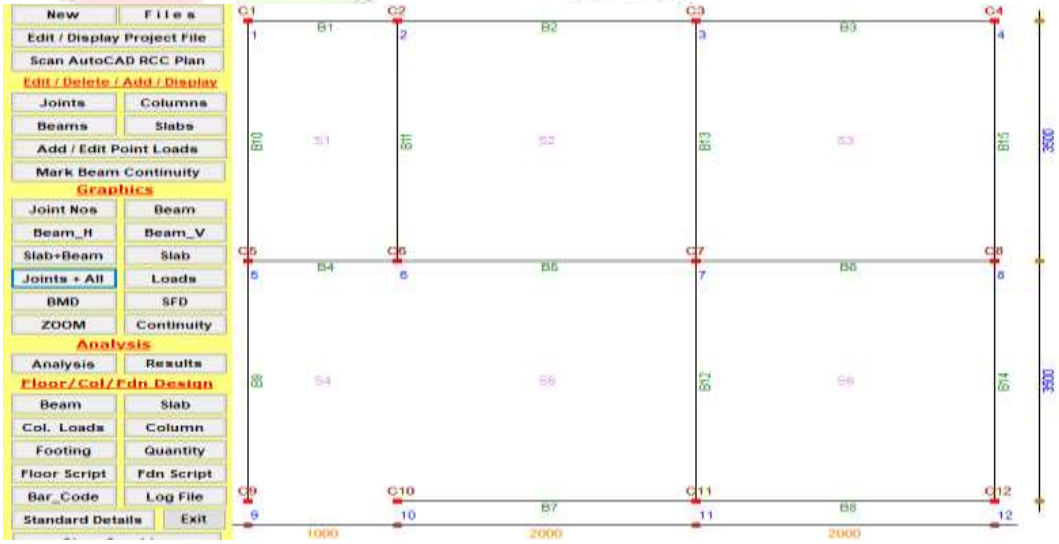


Figure 1 location of beam (B), column (C) and Sslab (S)

In the floor plan designed in this RCF software, a large number of joints are established. Each joint in this plan represents intersection of 2 or more beams and a column. The beams are shown in the plan in the form of Right Hand Side (R.H.S) joint and Left Hand Side (R.H.S) joint number. Every joint will consists of X & Y co-ordinates. Top left corner will be considered as origin (0, 0). The numbering of the joints/ column/ beam/ slab should always be start with the"1" and numbering should not be repeated. This RCF software will automatically generate joint/ beam/ column and slab numbers from the input provided by the user in project file. It may be possible that some of these numbers are

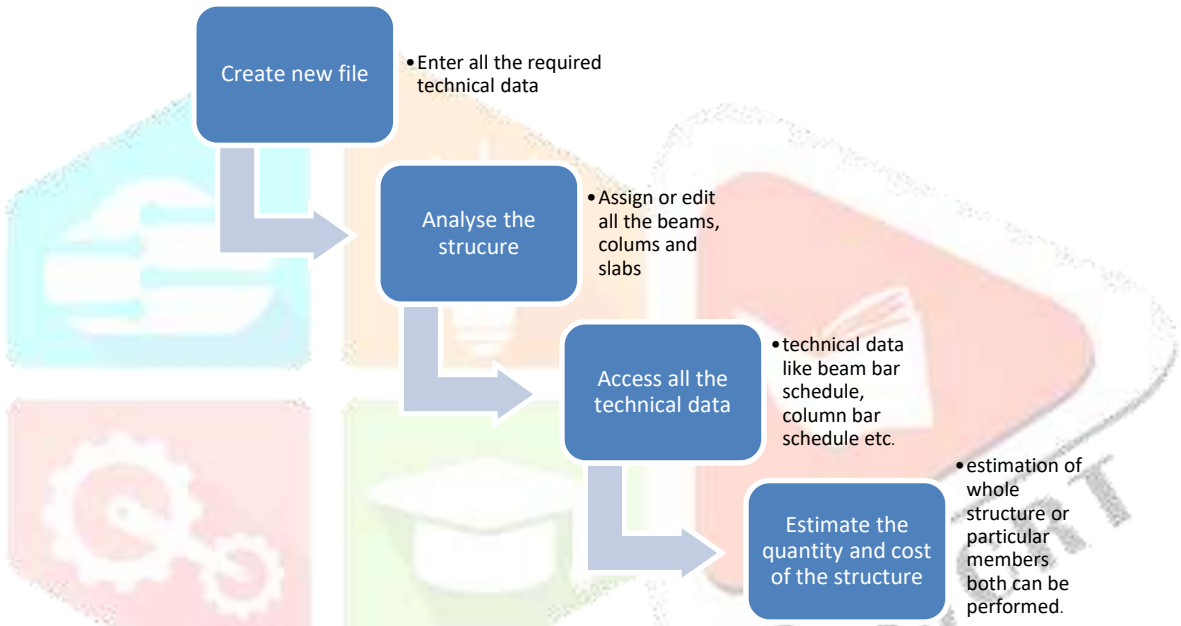
not required in the plan and hence can be deleted in systematic manner. At final result floor plan and final plan graphics should look exactly same.

2. METHODOLOGY/ANALYSIS

This research is conducted while designing the ground floor plan in the RCF software, the method applied in the research is fixed and sequential. To avoid any unexpected result, this sequence need to be strictly followed. The steps performed are very easy so that a fresher can also design the structure. The UI of the software is also uncomplicated.

Create a new project file and enter the required data like floor width and length (x-axis for horizontal distance and y-axis for vertical distance) in mm, number of vertical and horizontal grids, name of the project, grade of the concrete used and other information as required. The next step is to enter the horizontal and vertical distance between the grids. The floor plan so prepared can be seen by using "joint+all" tab. Addition, removal or editing of any beam, column and slab can be done using their respective tabs, so that the desired plan can be achieved. The software is so designed that the graphical representation of the plan, BMD/SFD of members and other details can be seen and corrections can be made according to this.

When designing and locating of all the beam, column ad slabs are done, structure has to be analyzed using the "analysis" tab. This structural analysis will lead the user to the technical details of the components of the structure. Column details, slab details, load on beam, simply supported reactions and Fixed End Moment (FEM), bending moments and reactions, shear corrected bending moments, beam reinforcement schedule, column reinforcement schedule, and schedule of foundation, quantity and cost estimation of the structure are some of the technical data which can be calculated using the RCF software by just clicking to their respective tabs. These data can be further use in the construction industry.



3. RESULTS AND OBSERVATIONS

Beam			Bottom Steel			Extra LHS Support Steel			Extra RHS Support Steel				Skin
No.	Width	Depth	Straight	Curtail	Top Steel	#	Top	Bottom	#	Top	Bottom	Stirrups	Steel
1	230	450	2 T 8		2 T 8	C1	2 T 8		C2	2 T 8		T 8 @ 300	
2	230	450	2 T 8	1 T 8	2 T 8	C2	2 T 8	2 T 8	C3	2 T 8	2 T 8	T 8 @ 300	
3	230	450	2 T 8	1 T 8	2 T 8	C3	2 T 8	2 T 8	C4	2 T 8	2 T 8	T 8 @ 300	
4	230	450	2 T 8		2 T 8	C5	2 T 8		C6	2 T 8		T 8 @ 300	
5	230	450	2 T 10	1 T 8	2 T 8	C6	2 T 8	2 T 8	C7	2 T 8	2 T 8	T 8 @ 300	
6	230	450	2 T 10	1 T 8	2 T 8	C7	2 T 8	2 T 8	C8	2 T 8	2 T 8	T 8 @ 300	
7	230	450	2 T 8	1 T 8	2 T 8	C10	2 T 8	2 T 8	C11	2 T 8	2 T 8	T 8 @ 300	
8	230	450	2 T 10	1 T 8	2 T 8	C11	2 T 8	2 T 8	C12	2 T 8	2 T 8	T 8 @ 300	
9	230	450	2 T 12	2 T 10	2 T 8	C9	2 T 8	2 T 8	C5	2 T 8		T 8 @ 300	
10	230	450	2 T 12	2 T 10	2 T 8	C5	2 T 8	2 T 8	C1	2 T 8		T 8 @ 300	
11	230	450	2 T 16	2 T 10	2 T 8	C6	3 T 8	2 T 8	C2	3 T 8	2 T 8	T 8 @ 300	
12	230	450	2 T 16	1 T 16	2 T 8	C11	3 T 8	2 T 8	C7	3 T 8	2 T 8	T 8 @ 300	
13	230	450	2 T 16	1 T 16	2 T 8	C7	3 T 8	2 T 8	C3	3 T 8	2 T 8	T 8 @ 300	
14	230	450	2 T 12	2 T 12	2 T 8	C12	3 T 8	2 T 8	C8	3 T 8	2 T 8	T 8 @ 300	
15	230	450	2 T 12	2 T 12	2 T 8	C8	3 T 8	2 T 8	C4	3 T 8	2 T 8	T 8 @ 300	

Figure 2 beam reinforcement schedule

Slab		Steel Along Shorter Direction			Steel Along Longer Direction		
No.	Thickness	Btm Straight	Bottom Cut	@ Support Top	Btm straight	Bottom Cut	@ Support Top
S1	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240
S2	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240
S3	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240
S4	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240
S5	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240
S6	150	T 8 @ 240		T 8 @ 240	T 8 @ 240		T 8 @ 240

Figure 3 slab reinforcement schedule

Col. #	Load	Col. X-X Dim	Col. Y-Y Dim	Ftg X-X Dim	Ftg Y-Y Dim	Type	Edge Thk
C1	6.441	600	300	0.74	0.6	Uniform	150
C2	9.766	600	300	0.87	0.6	Uniform	150
C3	10.73	600	300	0.92	0.62	Uniform	150
C4	7.404	600	300	0.79	0.6	Uniform	150
C5	9.262	600	300	0.87	0.6	Uniform	150
C6	14.602	600	300	1.02	0.72	Uniform	165
C7	17.239	600	300	1.09	0.79	Uniform	185
C8	11.899	600	300	0.94	0.64	Uniform	150
C9	4.806	600	300	0.67	0.6	Uniform	150
C10	8.13	600	300	0.82	0.6	Uniform	150
C11	12.23	600	300	0.97	0.67	Uniform	160
C12	8.905	600	300	0.84	0.6	Uniform	150

Figure 4 column reinforcement schedule

Column No.	Length in MM	Width in MM	Height in M	Load in Tons
C1	600	300	3	6.441
C2	600	300	3	9.766
C3	600	300	3	10.73
C4	600	300	3	7.404
C5	600	300	3	9.262
C6	600	300	3	9.875
C7	600	300	3	17.239
C8	600	300	3	11.899
C9	600	300	3	4.806
C10	600	300	3	3.403
C11	600	300	3	12.23
C12	600	300	3	8.905

Figure 5 load on column

Project # : 2

Concrete Grade : M20

Total Concrete in M20 Grade in M3 = 15.184
Total Concrete Cost = 75920
Total Reinforcement in Tons = 1.143
Total Reinforcement Cost = 57150
Total Masonry in M2 = 83.49
Total Masonry Cost = 25047
Total Plaster in M2 = 302.479
Total Plaster Cost = 45372
Total Painting in M2 = 302.479
Total Painting Cost = 30248

REINFORCEMENT SUMMARY IN KG

6 MM Dia :	115.215
8 MM Dia :	346.674
10 MM Dia :	21.875
12 MM Dia :	36.026
16 MM Dia :	625.063
20 MM Dia :	0
25 MM Dia :	0
32 MM Dia :	0

Bldg. ID : Admin

fy = 415

SBC in T/M2 : 20

Fdn. below GL in M = 1.5

No. of Floors = 1

Effective Cover - Beams = 40 MM
Effective Cover - Slabs = 20 MM
Effective Cover - Columns = 50 MM
Effective Cover - Foundation = 60 MM

Total Flooring in M2 = 35
Total Flooring Cost = 10500
Total Door / Window in M2 = 5.25
Total Door / Window Cost = 13125
Total Excavation+Refilling in M3 = 10.166
Total Excavation+Refilling Cost = 1524.9
Total Cement Bags in Nos. = 185
Total Sand in M3 = 18.313
Total Aggragates in M3 = 13.035
Total Project Cost = 258887
Total Floor Area in M2 = 35
Cost per M2 = 7396.768
Cost per sft = 688.071
Cement Bags per sft = 0.491
Reinforcement in Kg per sft = 3.037
Steel in Kg / M3 of Concrete = 75.276
Conc. Cost as % of Total = 29.325
Steel Cost as % of Total = 22.075
Masonry Cost as % of Total = 9.674

Figure 6 quantity and cost estimation of the structure

4. CONCLUSION

Use of the RCF software in construction industry is very much recommendable. Construction industry nowadays hugely depend upon the software which are very highly priced but the same work can be carried out in the RCF software which is cheaper than any other software. All the technical data like bam reinforcement schedule, column reinforcement schedule, slab reinforcement schedule, load on beam and column, quantity and cost estimation etc. has been discussed in this research paper briefly. This research has been performed on various plans and structures and found to be reliable. This RCF software is highly productive and can be used in all the consultancy firms. The software not only gives output with great precision but also time saving, providing flexibility to the software user in case of adjustment of drawing during the construction work which sometimes take place in actual work.

5. REFERANCES

1. Asmaa G. Salih, & Heba A. Ahmed. (2014). "The effective contribution of software application in various disciplines of Civil Engineering." *IJCIET*.
2. Chetan Sonkar, Prof. N.K Dhapekar, & Prof. Honey Gaur. (2020). "Estimation and Costing of RCC Floors, Column and Footing using RCF Software." *IJCRT*.
3. Dhapekar, N. (2014). "Structural health monitoring of concrete structures evaluating elastic constants and stress strain parameters by X-ray diffraction technique." *International journal of civil engineering and technology(IJCIET)*.
4. M.F Mohd Mukelas, E.M Ahmad Zawari, Z. Alias, & K. Mohd Sukur. (2014). "The effect of construction cost estimating (CCE) software on job performance: An improvement plan." *EDP Sciences*.
5. N.K. Dhapekar. (2012). "Design principles for earthquake resistant buildings and post earthquake study by structural engineering perspectives." *International journal of advances in management ,technology and engineering sciences.(IJAMTES)*.
6. N.K. Dhapekar. (2013). "Structural health monitoring of historical monuments by rapid visual screening:Case study of Bhand Deval temple,Arang,Chhattisgarh,India." *International Journal of Civil,Structural,Environmental and infrastructure engineering research and development(IJCSEIERD)*.
7. N.K. Dhapekar. (2015). "Role of magnetic grey water in power generation." *National Conference on knowledge innovation in technology and engineering(NCKITE-2015)*.
8. NK Dhapekar, & SP Mishra. (2017). "Effective utilization of construction and demolition waste recycled concrete-Review." *Research Journal of Engineering*.
9. Shinde, A., Salunke, M., & Navale, N. (2018). "Computer application in Civil Engineering." *International Journal of Advance Engineering and Research*.