

Design and Analysis of Isolated footings using RCF Software

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Abstract - The analysis and design are of utmost importance before to designing of residential buildings. This paper highlights the analysis and design of isolated footings using RCF software. The research paper includes the analysis and design of isolated footings of residential buildings using RCF software which given economical design within a brief period of your time. An analytical method for tapered and uniform footings is discussed well intimately in detail and 40% economy is often achieved in tapered footing.

Key Words: RCF Software, Isolated footings, economical.

Introduction

Foundations are constructions that transfer different types of loading from structures and machines directly onto the bottom. Today three main groups of foundations could also be listed: monopole, deep and shallow foundations. Shallow foundations are used under lightweight constructions or just in case of excellent ground conditions. Within the case of soils with low load-bearing capacity, deep foundations are utilized. This type of foundation provides stability when lower layers of the bottom with appropriate bearing capacity are reached in the case of piles, the friction forces are more than the transferred forces from construction on the bottom. The last group of foundations is monopoles. These large-diameter constructions provide stable support under chimneys and other large constructions. The isolated footing is a pad or spread footing which is also known as a shallow foundation. And carry and spread of concentration loads like columns and pillars. It is able to design and compute the settlement, rotation, and bearing capacity of footing. The ongoing demands of the development industry for the faster construction processes, economical viability, better quality, higher performance, and standardized construction methods are enhancing the prefabrication concept and gaining in popularity. Ferroconcrete foundations, or footings, transmit loads from a structure to the supporting soil layer. All kind of footing are design supported the character of load combination, footing type, and soil properties. An isolated footing foundation is made using normal reinforcement cement by wooden framework or normal steel plates. The major requirements to be satisfied for the design of foundations. Provision of an adequate factor of safety against failure of the foundation material. Failure of the foundation may lead to the failure of material and design and should also case failure of the whole structure. The availability of damage to the structure which could be caused by differential settlements of the foundations.

Methodology/analysis



Figure-1

The method of study through RCF is described as follows.

When the program starts, the menu above is displayed under the footing/col./beam/slab design heading. Now click the footing option Design of Isolated footings.

Under the Floor/Column/Foundation design heading.

- **Beam**
- **Slab**
- **Column loads**
- **Column design**
- **Footing design**
- **Quantity**
- **Floor script for AutoCAD Dwg.**
- **Foundation script for AutoCAD Dwg.**
- Double click the 1st option, "Create Footing Data File"
- Following confirmation window is displayed.
- In order to design foundation of building, we must first RUN the column design option, which



Figure-2



Figure-3

Calculates cumulative floor loads for each column, aside from designing them. The cumulative load of 1st floor columns is taken as a compressive load on the foundation.

Tensile load or bending moments from either direction is not allowed. Isolated footings could be tapered or uniform. Usually tapered footings are 40 % cheaper than uniform footings; however, the quality of construction suffers due to taper shape. an offset of 50 - 100 MM is provided when footing's taper meets the column.

If yes is clicked, the following dialogue window is displayed.

1. Open the existing column "Example. Data "file.
2. The file message will appear.

Click the OK Button. Now proceed to display/edit footing data from Foundation menu. Following confirmation message will open up.

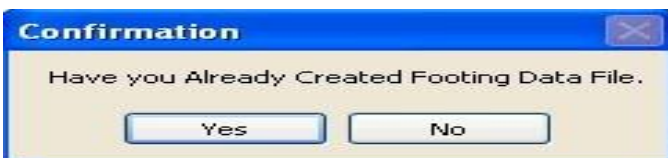


Figure-4

Click YES, if it is true. Following dialogue window will appear.

Open the existing column-footing data file. Following table is displayed.

It may be noted from above table that you can edit load on



Figure-5

Column (Pedestal) size, footing size, edge thickness and type of footing

(Uniform or Tapered). Isolated footing size is arrived by the program

After considered applied column load, SBC and foundation depth.

Click Read Me Button, following info + design philosophy is described.

DISPLAY / EDIT / FOOTING INPUT DATA							
File Name : C:\000RCF\example.dat						Date : 06 January 2009	
Col. #	Load	Col. X-X Dim	Col. Y-Y Dim	Ftg X-X Dim	Ftg Y-Y Dim	Type	Edge Thk
C1	138.965	650	300	2.85	2.5	Tapered	150
C2	217.047	1000	350	3.67	3.02	Tapered	150
C3	178.714	850	300	3.3	2.75	Tapered	150
C4	118.859	600	300	2.62	2.32	Tapered	150
C5	143.321	700	300	2.92	2.52	Tapered	150
C6	414.785	1000	600	4.8	4.4	Tapered	150
C7	311.385	1000	450	4.27	3.72	Tapered	150
C8	198.98	950	300	3.52	2.87	Tapered	150
C9	113.456	600	300	2.57	2.27	Tapered	150
C10	116.303	600	300	2.6	2.29	Tapered	150
C11	309.133	1000	450	4.25	3.7	Tapered	150
C12	176.971	850	300	3.3	2.75	Tapered	150
C13	182.855	850	300	3.35	2.8	Tapered	150
C14	291.597	1000	450	4.15	3.6	Tapered	150
C15	190.351	900	300	3.42	2.82	Tapered	150
C16	108.328	600	300	2.5	2.19	Tapered	150
C17	88.096	600	300	2.27	1.97	Tapered	150
C18	157.885	750	300	3.07	2.62	Tapered	150
C19	142.934	700	300	2.92	2.52	Tapered	150
C20	160.321	750	300	3.1	2.65	Tapered	150
C21	100.507	600	300	2.42	2.12	Tapered	150
C22	116.299	600	300	2.6	2.29	Tapered	150
C23	317.223	1000	450	4.3	3.75	Tapered	150

Record No. : 1 of 32	Column #	Load in Tons	Col. dim. along X-X in MM	Col. dim. along Y-Y in MM
	C1	138.965	650	300
	Footing dimension along X-X in M	2.85	Footing dimension along Y-Y in M	2.5
	Footing Type : Uniform / Tapered	Tapered	Footing Thickness at Edge in MM	150

Figure-6

1. Footings correspond to respective column nos.
2. Column loads in tons.
3. Column X-X dim-> Col. Dimension along x-axis.
4. Column Y-Y dim-> Col. Dimension along the y-axis.
5. Footing X-X dim -> Footing dimension along x-axis.
6. Footing Y-Y dim -> Footing dimension along the y-axis.
7. The minimum footing/edge thickness shall not be

< 150 MM.

Copy all edge thickness -> will copy the chosen edge thickness to any or all column footings.

8. Click on all uniform button will make
9. All footing type as uniform.
10. Click on all tapered button will make
11. All footing type as tapered.
12. A user can increase but not decrease column
13. Loads, column size & footing size.
14. RCF won't design footings under tension and moments.
15. Isolated footings under compression are going to be designed.
16. While performing a frame analysis of bldg. a user shall make all base supports as hinged.
17. Refer to our 2D frame analysis software or the other 2D / 3D frame analysis software.

Now click the OK button to proceed. a user are going to be asked to verify that he/she has created & edited the footing file. Click Ok and again select & open the "Example" file. The subsequent foundation schedules are displayed.

Click the read me button, the following info is described.

1. Steel X-X -> Reinforcement along the X-X Direction.
2. Steel Y-Y -> Reinforcement along the Y-Y Direction.
3. Effective cover is taken as 60 mm.
4. PCC of 50 MM below each footing is assumed.
5. $F_y = 415$: Load factor = 1.5
6. For the design of foundation under tension & bending,
7. Discuss with our SUPER CIVIL CD software.
8. The look won't will not check to overlapping of footings,
9. It's to be checked manually.
10. The 1st floor (G. F.) concrete grade and size of Columns will be taken for the design of footings.
11. The spacing of reinforcement exceeding 1000 mm will be restricted to 1000 mm. Spacing < 100 mm, will not be allowed, instead Bar diameter is increased.
12. Bar diameter exceeding 25 mm is will not be allowed,
13. An error message will be displayed. refer to LOG File.
14. Hence Spacing is restricted to above 100 MM and Below 1000 MM. Isolated footing, Pressure exceeding SBC will not be allowed.
15. Min. steel = 0.12 % in each direction.
16. For tapered footing, average thickness is taken for calculation of minimum steel.
17. For uniform footing edge thickness = Total thickness.

SCHEDULE OF FOUNDATION									
File Name : C:\000RCF\example.dat					Date : 06 January 2009				
Concrete Grade : M20					Depth Below GL in M. = 1.5				
Project # : 8912					SBC in t/m2 = 20				
Col. #	Col. X-X	Col. Y-Y	Fig. X-X	Fig. Y-Y	Thickness	Edge Thk	Steel X-X	Steel Y-Y	
C1	650	300	2.85	2.5	835	150	Tor 10 @ 105 c/c	Tor 10 @ 115 c/c	
C2	1000	350	3.67	3.02	1020	150	Tor 12 @ 125 c/c	Tor 12 @ 140 c/c	
C3	850	300	3.3	2.75	935	150	Tor 12 @ 130 c/c	Tor 10 @ 100 c/c	
C4	600	300	2.62	2.32	770	150	Tor 10 @ 115 c/c	Tor 10 @ 120 c/c	
C5	700	300	2.92	2.52	845	150	Tor 10 @ 105 c/c	Tor 10 @ 110 c/c	
C6	1000	600	4.8	4.4	1455	150	Tor 16 @ 165 c/c	Tor 16 @ 175 c/c	
C7	1000	450	4.27	3.72	1245	150	Tor 12 @ 105 c/c	Tor 12 @ 110 c/c	
C8	950	300	3.52	2.87	980	150	Tor 12 @ 125 c/c	Tor 10 @ 100 c/c	
C9	600	300	2.57	2.27	755	150	Tor 10 @ 120 c/c	Tor 10 @ 125 c/c	
C10	600	300	2.6	2.29	755	150	Tor 10 @ 115 c/c	Tor 10 @ 125 c/c	
C11	1000	450	4.25	3.7	1240	150	Tor 12 @ 105 c/c	Tor 12 @ 115 c/c	
C12	850	300	3.3	2.75	930	150	Tor 12 @ 135 c/c	Tor 10 @ 105 c/c	
C13	850	300	3.35	2.8	955	150	Tor 12 @ 130 c/c	Tor 10 @ 100 c/c	
C14	1000	450	4.15	3.6	1200	150	Tor 12 @ 110 c/c	Tor 12 @ 115 c/c	
C15	900	300	3.42	2.82	970	150	Tor 12 @ 130 c/c	Tor 10 @ 100 c/c	
C16	600	300	2.5	2.19	730	150	Tor 10 @ 120 c/c	Tor 10 @ 130 c/c	
C17	600	300	2.27	1.97	645	150	Tor 10 @ 140 c/c	Tor 10 @ 150 c/c	
C18	750	300	3.07	2.62	880	150	Tor 12 @ 140 c/c	Tor 10 @ 105 c/c	
C19	700	300	2.92	2.52	845	150	Tor 10 @ 105 c/c	Tor 10 @ 115 c/c	
C20	750	300	3.1	2.65	895	150	Tor 12 @ 140 c/c	Tor 10 @ 105 c/c	
C21	600	300	2.42	2.12	695	150	Tor 10 @ 125 c/c	Tor 10 @ 135 c/c	
C22	600	300	2.6	2.29	755	150	Tor 10 @ 115 c/c	Tor 10 @ 125 c/c	
C23	1000	450	4.3	3.75	1260	150	Tor 12 @ 105 c/c	Tor 12 @ 110 c/c	
C24	900	300	3.42	2.82	965	150	Tor 12 @ 130 c/c	Tor 10 @ 100 c/c	
C25	900	300	3.45	2.85	970	150	Tor 12 @ 125 c/c	Tor 10 @ 100 c/c	

Record No.: 1 of 32

Read Me Prev Next Last 1 st Go To Rec Print OK

Figure-7

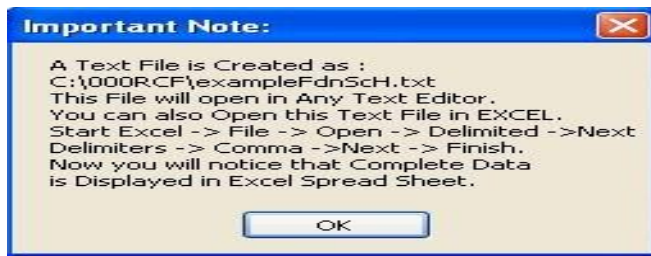


Figure-8



Figure-9

The above message describes creation of foundation schedule in AutoCAD. The steps required to create foundation schedule in AutoCAD is similar to that of Beam / Slab.

Conclusion

The design and Analysis of Isolated footings are explained in this research paper using RCF software. Summary reports and output of RCF software are also mentioned briefly. This software is very effective and may be utilized in consultancy firms which not only gives output with great accuracy but also serves time offering flexibility to the users just in case of alterations of drawings during the development work which frequently happened in actual practice.

References

- [1] M Major, I Major, K Kolinsky- Czestochowa University of Technology, Czestochowa, Poland
5TH Annual International workshop on material science and engineering.
- [2] Shravankumar, Kammari, G.Venkatathnam, Analysis, and Design of Isolated and Combined Footing (2006) International journal and magazine of engineering technology management and research.
- [3] S. Ali Mirza and William Brant Professor Emeritus of Civil Engineering, Lake head University, Thunder Bay, Canada. Structural Engineer, Black & Veatch, Kansas City, KS
- [4] S.Balachandar, D.Narendra Prasad Analysis and Design of Various Types of Isolated Footings (2017), International journal and magazine of engineering technology management and research.

- [5] Fathi Abdardoo, Haki Marania Ibrahim structural design of isolated Coolum footing 2016 Alexandrai engineering journal.
- [6] N.K. Dhapekar, Internatinal Journal of Civil, structural, Environment, and Infrastructure engineering research and development (IJCSEIERD) Volume-3, (2013) Structural health monitoring of historical moments by rapid visual screening: case study of Bhand deval temple, Arang, Chhattisgarh, India.
- [7] N.K. Dhapekar, International journal of advance in management, technology and engineering sciences (IJAMTES) VOLUME-1, (2012) Design principle of earthquake resistant building and post earthquake study by structural engineering perspectives.
- [8] N. K. Dhapekar, International journal of science and research. (IJSR), Volume-8 (2019) Design of pavement by super civil cd software.
- [9] N.K. Dhapekar, Kruti institute of technology and engineering (KITE) Raipur, Volume-1, (NCKITE-2015).
- [10] IS 456:2000 Indian Standard code practices.