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DRAFT HANDBOOK ON STRUCTURE WITH REINFORCED CONCRETE PORTAL FRAME WITHOUT CRANES USING LIMIT STATE METHOD

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Abstract

Sp-43:1987 has analyzed and given details of RC portal frames for certain parametric variation in respect of span and spacing of frame and height of column for dead, live and wind load. In this dissertation single bay single storey portals with span length of 9m,12m,18m and 6m frame spacing and 6.5m column height with fixed base having slope of rafter as 1 in 3 have been analyzed for dead, live and earthquake load. The sections having designed using limit state method.

***Keywords**- Gable Portal Frame, Single Bay, Eaves Point, Ridge Point, Galvaluime Roofing*

I. INTRODUCTION

All manuscripts must be in English. This Reinforced concrete portal frame is one of the structural systems that can be adopted for construction of industrial buildings. The resistance of vertical loads and to lateral loads (due to wind, earthquake, etc) in the transverse direction in such buildings is generally derived from the frame action, whereas the resistance to lateral loads in the longitudinal direction is provided by means of longitudinal column bracings in the end bays. Industrial sheds using reinforced concrete portal frame as the main load carrying system may be with or without cranes. The draft handbook gives information only about portal frames without cranes but subjected to dead load, live load and seismic load according to appropriate Indian Standards.

II. TERMIBOLOGY

- **Bay** - The space between successive bents.
- **Bracing -** Single or diagonal members which form a truss system with columns or Rafter to provide stability and resist horizontal load.
- **Cladding -** Members carrying side sheeting and supported by columns.
- **Columns - Runners** Members generally vertical which primarily resist axial load and bending moment.
- **Column height-** The height of the column from top of the foundation to the junction of the centre lines of rafter and column.
- **Purlins -** Members carrying roof sheeting and supported by rafters.
- **Roof Slopes-** The slope of the rafter with respect to the span length. It is obtained by dividing the rise of the portal frame by half the span length.
- **Spacing of Frames -** The centre line distance of two adjacent portal frames in the longitudinal direction.
- **Span –** The centre line distance between the columns at top of the foundation in the transverse direction.

III. Portal Frame Configuration

For portal frames, of fixed type, prismatic rafters are adopted. For frames with fixed support condition, prismatic column members are adopted Purlins and cladding runners are assumed to be located at a maximum spacing of 3.6 and 1.0 m on the rafter and column members respectively.

3.1. Material

In this draft handbook M-25 concrete is used for rafter beams, columns and footing. And in Steel high yield Strength deformed bars (Fe-415) are used.

For roof covering we are using Galvaluime Sheet due to its light weight which is supported on Steel Tubular Truss Purlin.

IV. ANALYSIS OF PORTAL FRAMES

4.1. Loads

Dead Load - The purlins, cladding runners and portal frames are designed for their self-weight according to IS: 875 (Part I)-1987.
Live Load -The purlins and portal frames are designed for live loads according to IS: 875 (Part II)-1987.
Seismic Load- The purlins and portal frames are designed for seismic loads according to IS: 1393:2000.

4.2 Analysis of Purlins and Cladding Runners.

In this draft handbook we considered Steel Truss Tubular Section. Steel truss tubular section is combination of purlins and cladding runners. The maximum spacing of purlins is assumed to be 3.16m center to centre supporting Galvaluime Sheet. Purlins are analyzed as simply supported beams subjected to biaxial moment due to dead load, Live load and Seismic Load.

Cladding runners of span 6.0 m and 12.0 m span are analyzed as simply supported beams for the loads described in clause no.4.1

Table 1: Input data for Structure 1

Span	**9m**
Frame Spacing	**6m**
Column Height	**6.5m**
Roof Slope	**1 in 3**
Rafter Length	**4.74m**
Support Condition	**Fixed**

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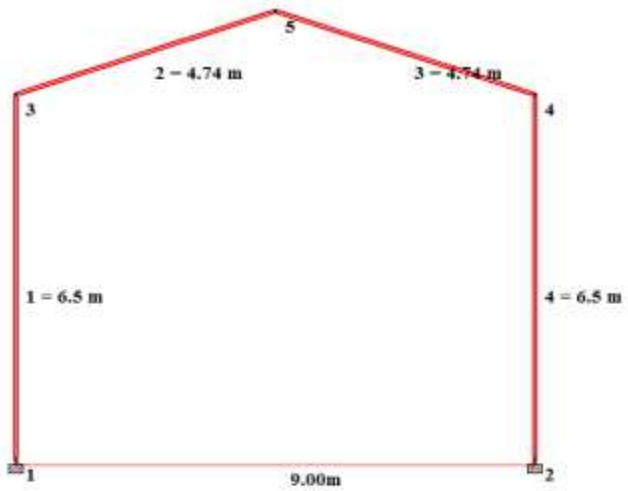

Fig 1: Structure 1

Table 2 Design Forces for Structure 1

Member No.	Cross Section	Node No.	BM (KN.m)	SHEAR FORCE (KN)	AXIAL FORCE (KN)
1	230 X 500	1	64.2	19.7	98.3
		2	63.8	19.7	71.4
2	230 X 450	3	63.8	35.2	25.9
		4	39.3	7.42	17.7

Table 3: Input data for Structure 2

Span	**12m**
Frame Spacing	**6m**
Column Height	**6.5m**
Roof Slope	**1 in 3**
Rafter Length	**6.32m**
Support Condition	**Fixed**

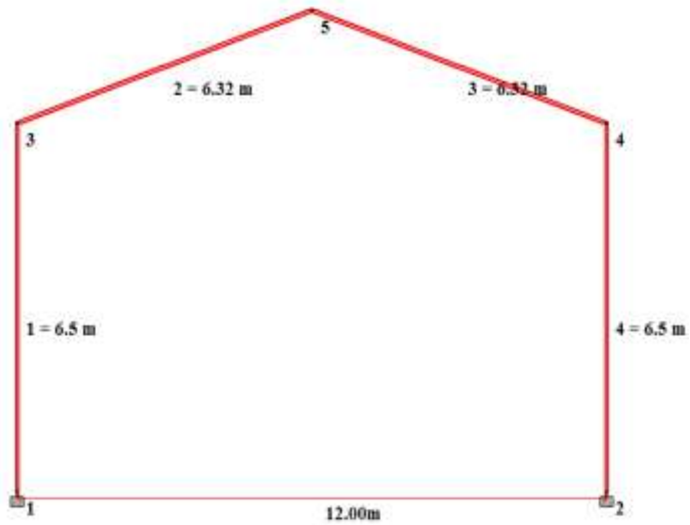

Fig 2: Structure 2

Table 4 Design Forces for Structure 2

Member No.	Cross Section	Node No.	BM (KN.m)	SHEAR FORCE (KN)	AXIAL FORCE (KN)
1	300 x 600	1	123	36.6	147
		2	115	36.6	105
2	300 x 500	3	115	53	48.7
		4	60.2	4.84	31.9

Table 5: Input data for Structure 3

Span	**18m**
Frame Spacing	**6m**
Column Height	**6.5m**
Roof Slope	**1 in 3**
Rafter Length	**9.49m**
Support Condition	**Fixed**

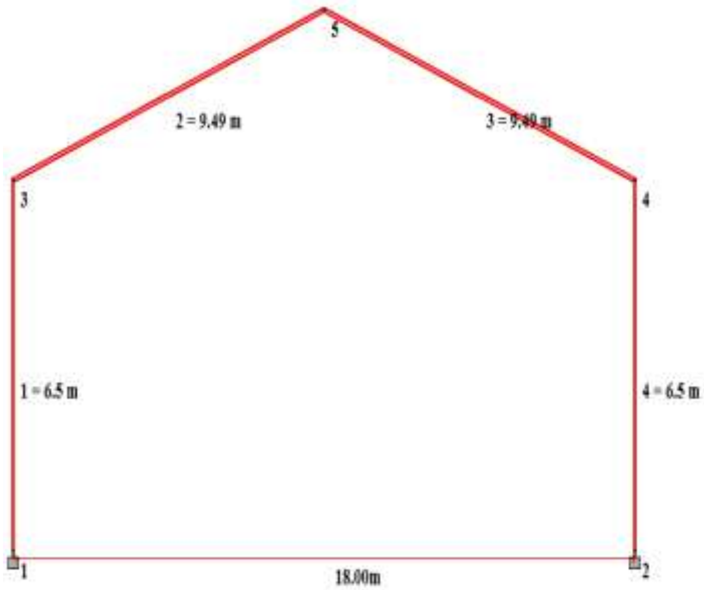

Fig 2: Structure 3

Table 6 Design Forces for Structure 3

Member No.	Cross Section	Node No.	BM (KN.m)	SHEAR FORCE (KN)	AXIAL FORCE (KN)
1	300 x 700	1	275	79.3	206
		2	252	79.3	157
2	230 X 450	3	252	85	15
		4	89	17	72.6

V CONCLUSION

Bending moment at base of the column and bending moment at top of the column are practically same. Maximum sagging moment in rafter develops near the ridge in frames having larger span and spacing.

VI FUTURE SCOPE OF WORK

In this present study, we kept cross section of reinforced concrete members as a prismatic concrete section now for further we can also take non-prismatic section. Analysis and Design of Multi-Bay portals frames.

VII REFRENCES

1. Krishna Raju, "Advanced Reinforced Concrete Design", CBS Publisher 2013
2. Reddy, C.S., "Basic Structural Analysis" ,Tata McGraw-Hill Education 2010
3. P. Dayaratnam, "Design of Reinforced Concrete Structures", Oxford & IBH Publication 2011
4. Pillai and Devdas Menon, "Reinforced Concrete Design", Tata McGraw-Hill Education 2013
5. Weaver, Jr and Gere, J.M. "Matrix Analysis of Framed Structure", Springer 2010
6. Kulkarni J.G., Kore P. N., S. B. Tanawade, "Analysis of Multi-storey Building Frames Subjected to Gravity and Seismic Loads with Varying Inertia", International Journal of Engineering and Innovative Technology (IJEIT), Volume 2, Issue 10, April 2013
7. M.G.Kalyanshetti, G.S. Mirajkar, "Comparison Between Conventional Steel Structures And Tubular Steel Structures", International Journal of Engineering Research and Applications (IJERA), Volume 2, Issue 6, November- December 2012, pp.1460-1464
8. Neeta K. Meshram, Dr. P.S.Pajgade, "Comparative Study of Water Tank Using Limit State Method and Working Stress Method", International Journal of Engineering and Innovative Technology (IJEIT), Volume 3, Issue 12, June 2012
9. Raja Verma, "Study Tthe Working Stress Method and Limit State Method in Rcc Chimney Design", International Journal of Technical Research and Applications, Volume 2, Issue 1, January-February 2014. pp. 33-35.
10. IS: 456:2000 "Code for Practice for Plain and Reinforced Concrete", Bureau of Indian Standard, New Delhi.
11. IS: 1893(Part-I):2002 "Code of Earthquake Resistance Design of Structure", Bureau of Indian Standard, New Delhi.
12. IS: 875(Part-1)-1987. Code of practice for design loads (other than earthquake)for buildings and structures, Dead loads, unit weights of building materials and stored materials. Bureau of Indian Standard, New Delhi.
13. IS: 875(Part-II):1987 "Code of Practice for Design Loads (Imposed Load)", Bureau of Indian Standard, New Delhi.
14. SP-6(7), "Handbook for Structural Engineers: Structural Steel Section", Bureau of Indian Standard, New Delhi
15. SP-16 "Design Aids for Reinforced Concrete to IS: 456:1978", Bureau of Indian Standard, New Delhi.
16. SP-38:1987, "Handbook of Typified Design for Structures with Steel Roof Trusses (With And Without Cranes)", Bureau of Indian Standard, New Delhi.
17. SP-43:1987 "Handbook on Structures with Reinforced Concrete Portal Frame (Without Cranes)", Bureau of Indian Standard, New Delhi.