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Design of Factory Shed

Aman Deep[1], Arinjay Dhar[2], Shubhadwip Sarkar[3], Priyanka Ghosh[4], Abhijit Das[5], SubhadeepCharan[6], Ankit Kumar Singh[7],Sumit Bose[8]

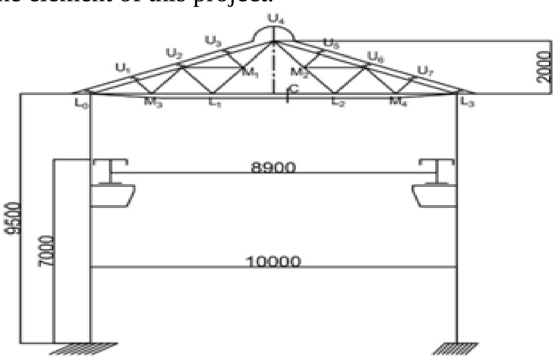
[1,2,3,4,5,6,7] *Graduate students, Civil Engineering Department, JIS College of Engineering, Kalyani, WB*

[8]*Assistant Professor, Civil Engineering Department, JIS College of Engineering, Kalyani, WB*

***Abstract*— The mainly large number of industrial sites are factories such as manufacturing plants or production plant. These are mainly industrial buildings consisting of large machinery where these machines are operated or used for producing products in large numbers modern economic production is a critical part of factories these modern factories have large warehouses with heavy equipment which work for the production of assembly the line now the integral part of these factories are their structural shed which are used in industries to store materials for production and these sheds are made through predesign engineering in our project we are making the factory shed design by limit state method which is based on 800-2007lsm application of load was done for the analysis part. There are 5 no of bays which is 5m cc and 2m is the height of it above spring point. 10 m is the span of roof trusses, the project factory shed is all about its design of loads like dead load, live load, and wind load analysis which are acting on the members of the structure of the factory shed. These loads are calculated as per Indian standards IS 875:1987(part 1) IS 875:1987(part 2) and IS 875:1987(part 3). Snow load is not taken care of because of warm climate conditions in the native area. the method of making the structure in an economical the way which can carry more capacity load and have enough strength to overcome earthquake, this is the main aim of our project.**

1.INTRODUCTION

It is not possible to design an Industrial Shed without prior Knowledge of Engineering subjects like Structural Design, Drawing, Estimating, etc. However, we have tried our best to do a project on the 'DESIGN OF INDUSTRIAL SHED' according to the guidelines as per IS 800:2007. The Major component of the Industrial shed is the Truss frame, Which is made by connecting various members at their ends with a gusset plate to form a system of triangles. The members we are using in this project are rolled steel sections such as angles, T sections, I sections, Plates and Channels. Trusses are placed in parallel rows on a wall or column at specific intervals. Over the trusses, purlins are fixed with a cleat to the principal rafters, over the purlins roof covering corrugated a.c. or g.i. Sheets are directly fixed with nuts and screws. This report further contains the design and analysis of the structure and the element of this project.



2. DESIGN OF CENTRAL TIE

Tie beams are beams that connect two or more columns or rafters in a roof or roof truss or at any height above floor level to make the entire structure more stiff and stable at the foundation level. Tie beams are primarily used at the roof truss, floor level, and plinth. The length of the member taken is 4.28 m. And the Maximum tensile force considered is 38.45 KN. It is designed with 2 IAS 75X50X6 sections with Area Ag=2X716=1432mm².

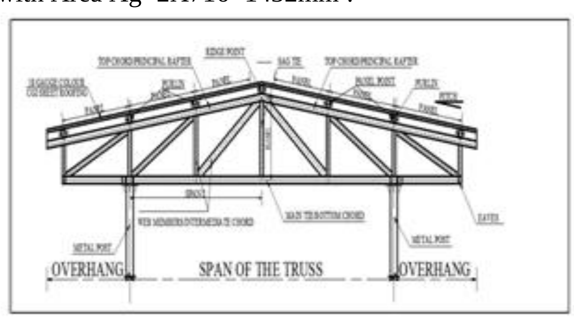


Fig. Central Tie
Source. Google

3. DESIGN OF RAFTER

Rafter is a component used for making roof, they are out in series. They are made up of wood or steel. they are the key components for roof making it runs from the ridge board to the wall plate length of the member used is 5.4m max tensile force is 101.566 kn. area required is 446.89 mm² .

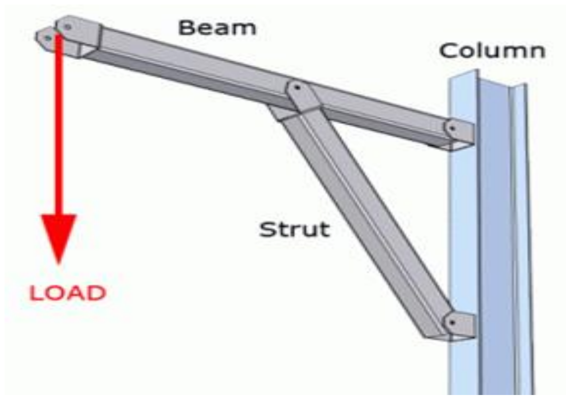
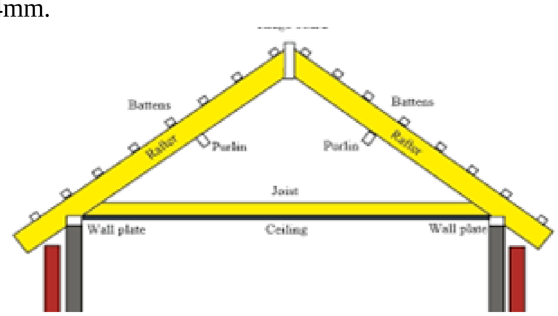


Fig. Rafter
Source. Google

4. DESIGN OF STRUT

A strut is a structural element that is forced in two directions. A strut is said to "resist compression." A tie is a structural element that is pulled in two directions. A tie is said to "works in tension." A structure's vertical structural elements are called columns. The length of the member taken is .59m. And the Maximum tensile force considered is 24.273KN. It is designed with IAS 75X50X6sections with Area Ag=716 mm². And weld size is taken as 4mm.



5. DESIGN OF PURLIN

A purlin (also purline, purloined, purling, or purling) is a horizontal, longitudinal structural element in a roof. Purlin plate, major purlin, and common purlin are the three forms of purlin used in traditional timber framing. Steel frame construction also uses purlins. For environmental protection, steel purlins can be coated or greased. Purlins sustain the roof deck or sheathing loads and are supported by rafters, building walls, steel beams, and other structural elements. Purlins are commonly used in pre-engineered metal construction systems and both the ancient post-and-beam and contemporary pole construction approaches for frame construction, as opposed to closely spaced rafters. Bending moment of the major axis is 5.019 kNm , BM of minor axis is 1.969 kNm, shear force in z direction is 1575 KN, shear force in y direction is 4015 kN.

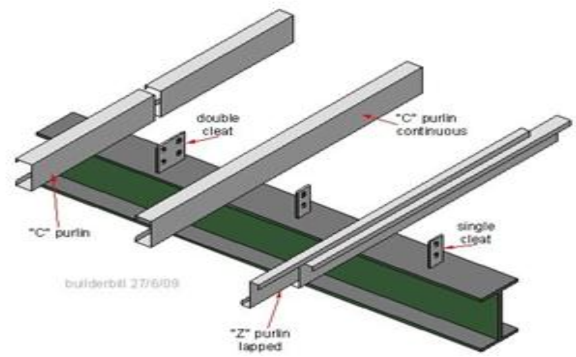
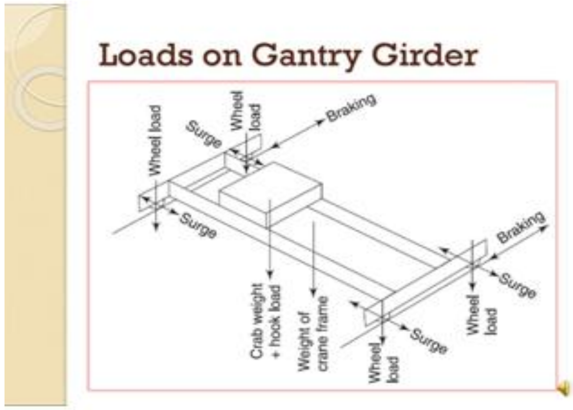


Fig. Purlin
Source. Google

6. DESIGN OF GANTRY GIRDER

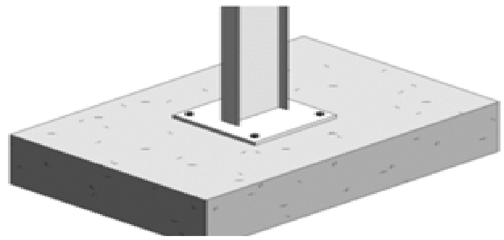
The gantry girders are girders that support the loads that are conveyed by the crane's travelling wheels. The crane girder spans from column to column and generally lacks lateral support at intermediate points, unless a walkway is built at the top of the girder. The gantry girder connects brackets to columns, which can be steel or reinforced concrete. As a result, the span of the gantry girder equals the column center to center spacing. The rails are supported by gantry girders. Maximum load on crane considered as 140KN and maximum factored load is 210KN, maximum static load that the crane carry as UDL is 180KN, maximum factored uniform load is 30.34KN and maximum wheel load on each wheel of crane is 160.71KN.



Source:-Google

7. DESIGN OF COLOUMN WITH BASE PLATE

In architecture and structural engineering, a column or pillar is a structural member that conveys the weight of the structure above to other structural components below by compression. A column, in other terms, is a compression member. There are several types of columns used in various portions of constructions. A column is a vertical structural element that mostly carries compression stresses. It may carry loads to a floor or foundations from a ceiling, floor slab, roof slab, or beam. Columns commonly have bending moments along one or both cross-section axes. Length of column is 7.0m maximum axial force is 302.28 KN max BM is 438.07 KNm. Because loads are carried from the superstructure to the foundation via the base plate, base plate design is critical in any building design. The base plate connects the superstructure and the foundation, completing the load passage into the foundation.



Estimation of Material

Item No.	Profile	No.	Length (m)	Breadth (m)	Quantity or content (m)	Unit weight (kg/m)	Total weight or quantity (kg)
1.	ISA 75×50×6	12	4.28	-	51.36	5.604	287.8214
2.	ISA 60×60×6	12	5.4	-	64.8	5.4	349.92
3.	ISA 75×50×6	6	0.95	-	5.7	5.604	31.9428
4.	ISMC 150	40	5	-	200	16.4	3820
6.	ISWB 450	10	0.65	-	6.5	79.40	516.1
7.	ISMC 250	10	0.33	-	3.3	30.4	100.32
8.	ISMB 400	12	7	-	84	61.6	5174.4
11.	18 Gauge Galvanized corrugated Iron (G.I) roofing including all fittings, nuts, bolts, washers etc. complete	10	5	5.38	269		

Abstract of Estimatedcost

Item No.	Description of item	Quantity	Unit	Rate Rs. p.	Unit of rate.	AmountRs. P.
1.	M.S. structural works in roof truss	102.8	Qtl	1250	Qtl	128506.30
2.	18 Gauge Galvanized corrugated Iron (G.I) roofing including all fittings, nuts, bolts, washers etc. complete	269	Sq. m	125	Sq. m	33625

Total = Rs 162131.3

7. LITERATURE REVIEW

The load on structure i.e., live load, dead load of various material, wind load on trusses & structure are taken as per IS 875:1987 part 1, 2 & 3 (code of practice for design loads – other than earthquake).

For calculation of design wind speed & design wind pressure a structure & truss the various provision of IS 875:1987 are used.

1. The roof truss part is studied from textbook of "Design the Steel Structure" by Arya &Ajmani. The various guidelines & clauses of IS 800:2007 (code of practice for general construction in steel) are followed for design of roof trusses.
2. sp:6(i) 1964 – 181 hand books for structural engineers – structural steel section is used for dimension & properties like sectional area, moment of inertia, radius of gyration, section modulus, center of gravity of angle sections used in trusses.
3. IS: 875 (part i) – 1987 for dead loads, Indian Standard code of practice for design loads (other than earthquake) for buildings and structures.
4. IS: 875 (part ii) – 1987 for imposed loads, Indian standard code of practice for design loads (other than earthquake) for buildings and structures.
5. IS: 875 (part iii) – 2015 for wind loads, Indian standard code of practice for design loads (other than earthquake) for buildings and structures.
6. The India seismic code IS: 1893 (part i & ii) – 1962 is followed for this project.

8.CONCLUSION

The calculation of various loads acting on the structure was done using Indian Code provisions. The analysis of the structure was carried out manually. Then load combinations were developed. The design of different parts of shed was done. The results shown in the design of the shed. The deflection values were found to be less than the calculated allowable deflection. The estimation of material was also carried out. Thus, the structure is safe against deflection.

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