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Research paper

Construction of steel shed: a case study of automobile service center, bells university of technology, Sango-Ota, Ogun state, Nigeria

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Abstract

The construction of steel shed for Automobile Service Centre at the Bells University, Sango-Ota, Ogun State, Southwestern Nigeria was deemed necessary in order to expand the existing structure, ensure safety and bring economic gains to the Institution. This paper therefore presents a report of the construction of steel shed at the Automobile Service Centre where activities such as automobile checks, repairs and so on are been carried out. In carrying out the project, the following methods were adopted: evaluation of design/working drawings, selection and fabrication of structural members, construction work and finishing. All methods follow standard procedures as specified in relevant British standards. The assemblage and completed work were the results of the methods mentioned above and it was confirmed that the members were adequate to carry the live and dead loads that they may be subjected to. The aim of the project was achieved.

Keywords:*Automobile;Bells University; Construction; Shed; Steel.*

1. Introduction

An industrial shed is a cost-effective solution for housing and storing, mining plants, or machinery. With features such as tilt panels, open sides, and concrete flooring available, an industrial shed is an ideal structure to store, maintain and transport equipment. Sheds are used to store home and garden tools and equipment such as lawn tractors, and gardening supplies. In addition, sheds can be used to store items that are not suitable for indoor storage, such as petrol (gasoline), pesticides, or herbicides (Clearspan, 2019).

Any building structure used by industry to store raw materials or for manufacturing products of industry is known as an Industrial Building. These buildings are used for workshop, warehouse etc. Steel is extensively used in the construction of industrial buildings of larger spans where concrete construction is not feasible or when construction tome is critical. The important elements of industrial buildings are purlins, rafters, roof trusses, wind bracing and columns. Steel constructions are most popular because of their ease in construction, low cost, availability of manpower for erection and fabrication and availability of standard specifications and codes of practice. For industrial buildings, the economy of the structure plays an important role. For longer spans the design is optimized in order to minimize the use of materials, costs, and installation efforts (Wankhade et al, 2014). Buildings are designed to reduce energy costs and to achieve a high degree of sustainability. To reduce the costs, manufacturer adopt the Pre-engineering Building concept. Pre-engineering Building is a metal building that consists of light gauge metal standing seam roof and steel purlins spanning between rigid frames with light gauge metal wall cladding (Rao, 2011).

Over time we have seen industrial sheds transform from humble storage spaces, into valuable assets for commercial and industrial businesses alike. The uses for industrial sheds these days are seemingly endless – but not all sheds are built equal. With the help of the qualified engineers and designers, one can customize industrial shed to create a highly customized, functional building that will deliver the best results for businesses.The materials used to construct buildings or industrial sheds have a direct effect on the stability of these buildings and sheds. Steel frames have therefore become the best choice for construction of buildings and industrial sheds. Some benefits of structural steel industrial sheds and buildings include: stability; strength; ability to resist cracking or warping; resistance to weather related contraction and expansion; ability to remain unbent under heavy loads; ability to resist shifting during construction; lightness in comparison to any other construction material; ease of use; cost effectiveness Fabricating structural steel industrial sheds and buildings may cost you more. However, the industrial sheds and buildings made with steel framing will prove cost-effective in the long run. (Clearspan, 2019).

Construction of steel shed for Automobile Service Centre at the Bells University, Sango-Ota has therefore become necessary. The aim of the project was to construct a steel shed for the Institution. The specific objectives of the project were to: (i) evaluate the design/working drawings; (ii) procure and fabricate the structural members; and (iii) construct steel shed.

1.1 Description of the study area

The Project is located within the Bells University of Technology, Sango-Ota. Sango Ota is situated within Ado-Odo/Ota Local Government, one of the 20 local governments of Ogun state in the southwestern part of Nigeria (see Figure 1). The Local Government is the second largest in Ogun state and its headquarters is at Ota. The Local Government lies between Longitudes 2°53'E and 3°14'E, and Latitudes 6°39'N and 6°30'N. It covers an area of 1460 square Kilometersand shares boundaries with Lagos state in the south, Yewa South (Egbado) and Ifo Local Government in the west, and Ipokia Local Government in the north east. Ado-Odo/Ota Local Government has an estimated population of 527,242, with about four hundred and fifty (450) towns, villages and settlements (Ogunyemi et al., 2017).

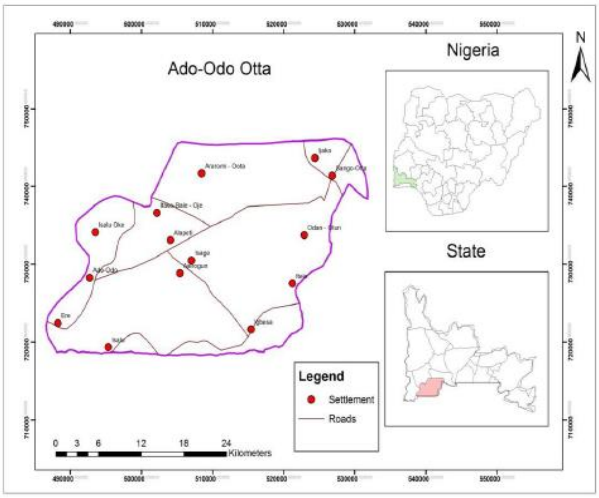

Fig. 1: Map of Ado – Odo Ota Local Government Area.

2. Materials and methods

The main materials used for the project were metal sheets, mild steel and galvanized pipes obtained from a dealer in Ota/Ijako, Ogun State, Nigeria. Table 1 presents a list of some elements, components and items used for the project. Table 2 contains the list of the various tools, equipment and machines used for the project. Some were available for use at the Fabrication Workshop of the Department of Mechanical Engineering, Bells University of Technology, Sango-Ota; while others were made handy for use at the site.

Figure 2 presents the sequence of operation and methods employed in the execution of the work. The design/working drawings were obtained from the design office and subsequently studied/evaluated. Preparation and fabrication of various steel members (Table 1) were carried out in the Fabrication Workshop. Mild steel was used to fabricate each of the elements and they were immediately coated with red oxide to prevent corrosion, and the assemblage and finishing were carried out at the site. Site clearing was done before the actual construction, which included substructure and superstructure. All steel works and construction were done in accordance with standard procedures as detailed in BS 648 (1964), BS 5950 (2001), BS 6399 (1988). The construction was also carried out following the working drawings which was made available.

Table 1: Some Elements, Components and Items Used

Material	Length (mm)	Total number used
Sag rods	8000	4
Principal rafter	8000	3
Roof truss	8000	3
Z-purlin	8000	7
Connection (Bracket)	-----	4
Column (Galvanizes pipe)	2700, 3050, 3400	2, 2, 2
Bracing	-----	8
Column base	600	6
Roofing sheet (0.1443inch/3.67mm thick	9000	11
Electrode	----	Consumables
Red oxide	----	Consumables
Bolt and nut	----	Consumables

Table 2: List of Equipment, Tools and Machines

Equipment	Purpose
Welding machine	Welding
Grinding machine	To redress to surfaces
Manually operated crane	Lifter
Rope	Collection
Spraying machine	For painting
Brush	Removal dust and diet
Hark saw	For cutting
Shovel	Digging
Digger	Digging

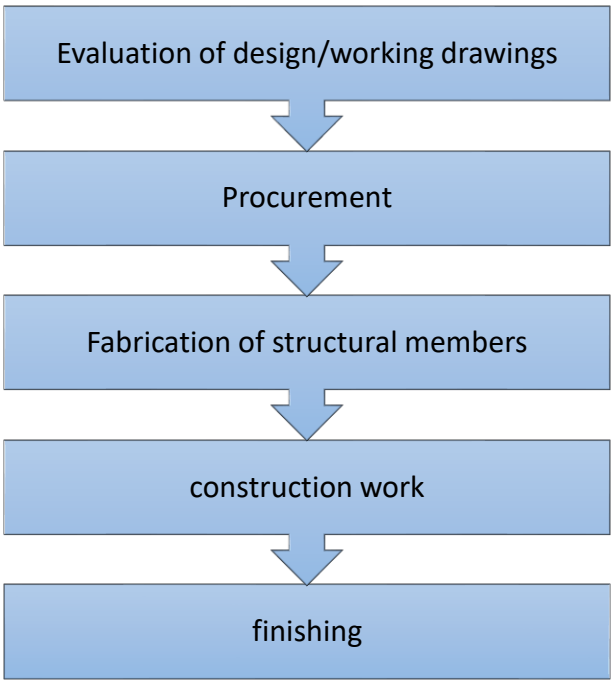

Fig. 2: Sequence of Operation and Methods.

3. Results and discussion

Figure 3 shows the layout of the construction area while Figures 4 and 5 show section and welding of components. Plates 1 to 3 show different stages of the construction while Plate 4 shows the completed project. The assemblage of structural members and completion of the work were the results of the methods described above. It was confirmed that the members were adequate to carry the live and dead loads that they may be subjected to. The effect of wind was also taken care of. With the finishing (double coat painting on the members and roof covering), the effect of weather (rain, sun) is adequately taken care of.

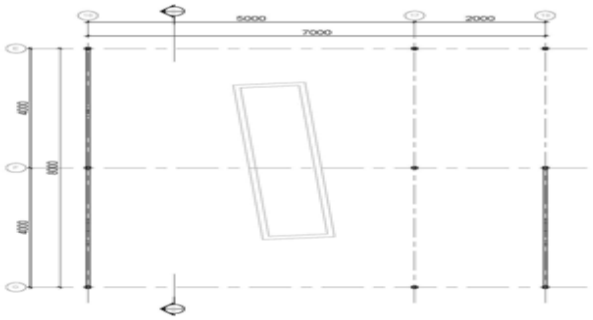

Fig. 3: Layout of the Construction Area.

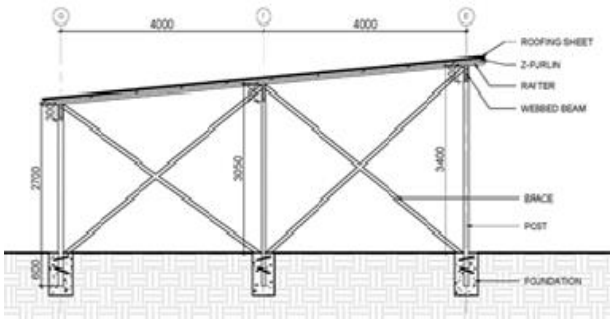

Fig. 4: Longitudinal Section.

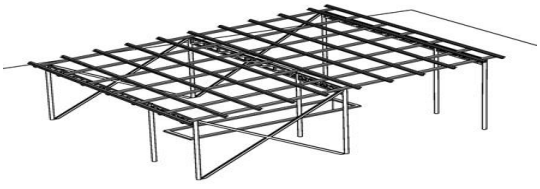

Fig. 5: Tacking and Welding of Top and Bottom Component.

Plate 1: Erection of Poles.

Plate 2: Installation of Trusses and Z Purlins.

Plate 3: Roofing in Progress.

Plate 4: Completed Project.

4. Conclusion

The construction of a steel shed has been carried out for Automobile Service Centre at Bells University of Technology, Sango-Ota. Selection of materials and actual construction were undertaken using environment-friendly approach. Not only is the steel shed light compared to conventional steel structures, it is at the same time several times cheaper and eco-friendly. In the course of the project, extensive practical knowledge and experience were acquired on welding, fabrication and coating of iron.The aim of the project has been successfully achieved.

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