

**CONSTRUCTION AND INSTALLATIONS OF CANTILEVER TYPE CAR  
PARKING BAY AT COLLEGE OF ENGINEERING, UMARU ALI SHINKAFI  
POLYTECHNIC SOKOTO - MAIN CAMPUS**

Yakubu Idris and Abdullahi Abubakar  
Umaru Ali Shinkafi Polytechnic Sokoto  
[ykbidris8390@gmail.com](mailto:ykbidris8390@gmail.com)

**ABSTRACT**

*The construction of the three No. cantilever type car parking bay at the College of Engineering was carried out by using galvanized hollow circular steel stanchions. Before the erection of the cantilever car parking bay; site visits and clearance, setting out and excavation processes were done in order to achieve quality work. The height of the stanchions used was 2.4m, the width was 4m and length was 8.1m, and the breadth, length, and depth of the foundation were 300x400x600 respectively. The stanchions were properly erected vertically with the use of spirit level and builders' line while a concrete mix of 1:2:4 was used for the foundation work. The cantilever car parking bay comprises of four (4) stanchions to make three car parking bay. The galvanized steel was cut into various sizes as specified in the drawing plan before the welding was done. The aluminum roofing sheet was used for the roofing throughout. The connection made for the galvanized hollow steel circular stanchions was made to a standard that no adverse effect or failure will affect it when subjected to significant stresses or applied load.*

**Keywords:** Construction, Car park, Cantilever, Stanchions, Excavation

**INTRODUCTION**

Car parks are commonly found at railway stations, airport, and hospital and city centers. They form part of mixed use development retail and entertainment centers. Car parking bay should be easily identifiable for potential users but at the same time be integrated into the overall urban design. Car parking bay is usually above the ground normally as permanent structures although there is ground demand for temporary demountable car parking bay, underground and basement car parking bay. Car parking bay is unique buildings which in all elements of the public. Galvanized steel is a durable framing material it will, and it gives a long life with minimum maintenance. Steel, on the other hand, creeps only at very high stresses at normal temperature, or even at low pressures at very high temperatures, and in both cases, a time-dependent failure occurs (Neville and Brooks, 2003).

In most cases, all that is required is a repaint at the first maintenance period, which twenty to thirty years or more depending on the first protection specified. The durability of the corrosion protection system is primarily influenced by the corrosiveness of the environment (Daffy and Akoy, 2005) if a car parking bay is used by the heavier vehicles than it was designed for, damage to the construction is very likely to occur. It is essential that the construction should be done by using adequate materials in developing a car parking bay plan, several important details should be

considered. Car parking bay is a process that is used to help managing cars in parking areas or organization in order to avoid congestion and arrange a car in an allocated position. This method of parking bay is convenient for drivers, and they need not have to walk in search of parking space by constructing this car parking bay, the chance of vehicle getting damaged due to harsh weather condition will be considerably reduced.

The parking system help both users and drivers to have a conducive and free environment for their parking activities (Daffy and Akoy, 2005) of a parking facility for a particular development a public car parking bay needs to be defined as well as the likely hood of any particular requirement for the vehicle with none standard dimension. Consideration should also be being given to the potential for the future development of the car park. Car parking bay, by their very nature, exists in an environment that is far from ideal. It is adequate for the potential used, most local planning authorities have specific car parking standards, and these vary between authorities.

In general, suitable parking bay should be provided adjacent to new development or organization to ensure that vehicle are not parked at the carriageway of a road where they may impede traffic flow and constitute a safety hazard. All underground utilities should be protected or relocated before grading, and all topsoil should be removed, low-quality materials, lime asphalt or other mixtures, laboratory test are recommended to evaluate the load supporting characteristics of the sub-grade soil. However, construction of car park is frequently selected after solid field evaluation base an experienced knowledge of local soil consideration (Chanakya, 1994).The area to be developed should have all rocks, debris and vegetation removed and the area should be treated with a soil sterility to inhibit future growth (McGraw-hill Dictionary, 2003). There are commonly used arrangements of parking space that are parallel, perpendicular parking and angle parking, but this project is a concern with the vertical method of parking, in this method cars are parked side to side perpendicular to each other.

This kind of car parking fit more cars than parallel parking and is therefore commonly used as car parking lots and car parking structures. Sometimes a single row of perpendicular car parking bay is marked in the Centre of the poles or columns, and car is required to drive in forward and drive out forward without an accident (Litman, 2004).The car parking bay was constructed using galvanized iron poles as the main materials due to its workability, durability and its ability to resist change in weather and other environmental factors, the car parking bay was done in order to provide shade for vehicles and to prevent vehicles from the effect of harsh weather condition such as rain, and so on. The aim of this study is to construct 3-No.Cantilever type car parking bay at the College of Engineering in a bid to provide a parking facility for members of staff of the college.

The study seeks to achieve the following objectives:

- \* To select a proper location which would be suitable for the construction of cantilever car parking bay, that would be convenient for the users.
- \* To carry out site visits and preparation of the selected area for the construction work.
- \* To select and construct proper foundation of the intended structure.

- \* To carry out setting out, using the appropriate method to achieve accurate measurement of the area.
- \* To use quality and standard materials that would meet the requirements of the construction

### **SIGNIFICANCE OF THE STUDY**

The car park is one of the major parts to be considered in the development process, especially in an organization or public places where different vehicle owners tend to have their car safe. Planning and construction of the car parking should be firstly considered to influence the use by various car owners in an organization.

Meanwhile, parking as part of an overall transportation system is one of the crucial issues of our time. As the number of cars increases exponentially around the school especially in the premises of college of engineering, there is need to have a parking facility close to staff offices. Parking facilities need to be provided for the safe and efficient parking and passage of other motorists and pedestrian movement.

Moreover, planning, designing, and construction of parking facility require integrated design approach of many professionals.

### **METHODOLOGY**

Standard materials based on British specification were used for this project work. The aluminum roofing sheet of size 0.72m x 2.4m, purlins of 1 ½ (0.037m) and hollow circular steel stanchion of 3inch (150mm) diameter was used. The steel was cut in their required dimension, as specified in the drawing which was utilized for the steel frame work. The method of connection in joining the component was by welding, and for this project, in particular, the permanent joint was used throughout. It is possible that on a large structure such as a bridge rust can cause structural failure leading to collapse. Steel is usually coated for example the golden gate bridge in San Francisco receives a new coat of rust resists braise paint energy five years. Hence in extremely hot climate, extra protection against frost or sun shine is required (Gupta and Gupta, 2008).

### **Construction Procedure**

The construction procedure of the cantilever car parking bay was done in stages. The first stage was the clearing of the site, setting out and excavating the position where the stanchions were to be erected, the height of the bay was 3m, while the width was 4m and the length was 9m. The excavated position for the stanchions was blinded with 50mm thick concrete mix of 1:2:4 to provide an additional cover to the base of the stanchion and to prevent further seepage of water. Formwork of 300mm x 600mm<sup>2</sup> was made for the stanchions, the form work was positioned in the excavated trench, and the steel stanchions were properly erected vertically with the help of spirit level (plumb) and line. When the corrected line was achieved, the concrete mix of 1:2:4 was pounded in layers and are properly compacted into each stanchion immediately, and the stanchions were ranged to maintain proper alignment. The standard criteria for the suitability of water for preparing concrete are that water fit for human consumption (drinking) is appropriate for concrete



making also (Gupta, 2008). Therefore, water used for this construction fit for drinking. Few days after curing and adequately hardened, the aluminum roofing sheet was fixed to the purlins to prevent from rainwater.

### **Site Clearance and setting out**

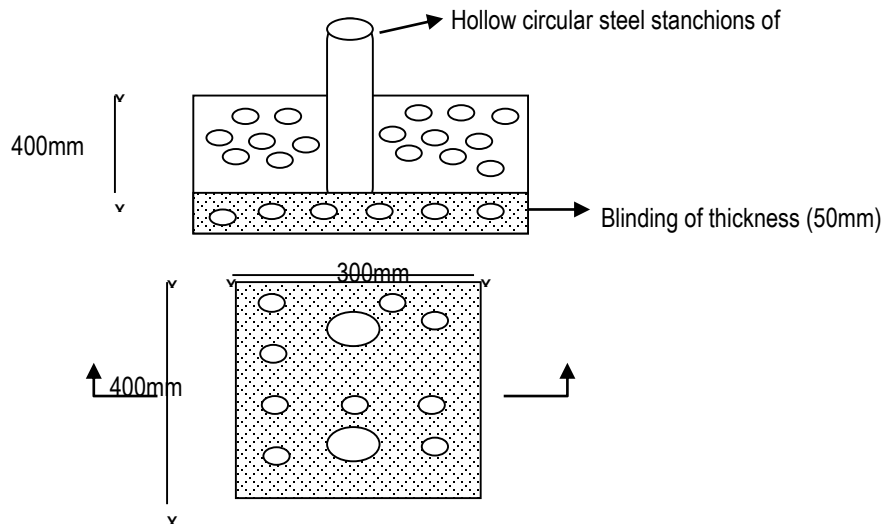
The site clearance for this project was done by clearing away top soil and all wastes material found on the site such as leathers, stones, leaves, etc. After the site has been cleared up of all rubbishes, the setting out process began by establishing a reference point, then immediately a builder's square was used to get the square of the cantilever car parking bay and was pegged alongside with builder's line to get the accurate line and dimension. Four (4) pegs were used to get the four corners square and four corners of the rectangular pad Foundation and were dug into the required size of 300 x 400 x 600mm. The materials used for setting out include builder's square, builder's line, measuring tape, marker and steel pegs.

### **Excavation**

The foundation was dug to reach the sufficient depth that can support the structure. The strength and stability of the cantilever car parking bay rely heavily on the prepared foundation. The excavation was done manually by using the following tools digger and shovels. Excavation required experience and skilled personnel to make sure that the job is done rightly (Barry, 1976).

### **Pad Foundation**

The foundation used for this project was pad foundation of size 300x400x600mm in the form of a rectangular pad of concrete. The area of the pad foundation depends on the load bearing and the shear strength of the sub soil and its thickness on the strength of the foundation materials.



**Fig. 2.1. Cross section of a Pad Foundation**

### **Installation of the Stanchion**

Four circular hollow steel stanchions were used for this project work labeled: Stanchion 1, Stanchion 2, Stanchion 3 and Stanchion 4. Each stanchion was installed into the excavated foundation one after the other. The installation began with the stanchion one it was plumbed by the use of spirit level alongside with line immediately after the corrected line and level has been achieved, it was braced (support) using 2x4 timber members.

Concrete mix of 1:2:4 was cast. The casted stanchions4 was installed with the same procedure to ensure that the remaining two (2) stanchions are aligned, the same procedure was applied to stanchions 2 and the stanchion 3. This procedure was done to get a suitable and accurate alignment that will not affect the roofing. Curing the foundation was carried out for 7days (1 week).

## **MATERIALS**

### **Concrete**

The foundation of the structure is considered to be the most important part of the construction work. The technology is designing concrete for a specified purpose called concrete design. All concrete materials are designed mainly to possess two properties minimum strength and maximum (durability). (.Burges and white, 1979).

For this project work, the batching of materials was done by volume method. The curing of the pad foundation was done after the casting of the pad footings for about seven days. The curing was achieved by spraying of water on the surface of the casted footings. Most freshly mixed concrete contains considerably more water that is required for complete hydration of concrete; however, any appreciable loss of water by exploration or other with delay will prevent dehydration.

### **Steel Pole**

This is a structural member who combines the best properties of cast iron (Galvanized). The steel stanchion used in this construction is a vertical pole used to support a space from the roof, and it was braced of the various interval of 0.6m and space in between the stanchions was a 2.7m interval.

### **Aluminium Roofing Sheet**

Aluminum of very light in weight, corrosion resistance, light natural emissivity and reduced conductivity of heat due to reflection was used in this project work. The aluminum roofing sheet was used as a covering layer which serves as a protection against rainfall and sunlight and other related effects of weather. Standard length and width for corrugated aluminum roofing sheet are 8, 10 and 12 feet the width varies considerably depending on the style of roofing (Barry, 1976). The tools used for roofing in project work include gloves, safety goggles, measuring tape, utility knife, roofing staples, roofing nails and nut, screw driver, hammer, and washers, etc. Suitable precautions and standard procedures were done in the course of construction of trusses and roofing system for this project work. In some structures, however, the torsional resistance of the beam is

relied upon for strength. Such lasers include roof gutter and beams supporting canopy slabs (Victor, 2005).

### **Checking of Angles and Dimensions**

These were carried out by the use of steel rule, measuring tape and try square. It was made for all the angles and dimensions on both the main frame and other attached to the steel stanchions. It was done to ascertain the accuracy of the length and angles of the cantilever car parking bay.

### **Riveting**

Riveting is a process of joining permanently two pieces of sheet metal with rivets. The special rivet called thinners rivet was used for such purpose. This rivet is made of soft iron and is usually coated with tin (Barry, 1976). The aluminum material is fixed outside the purlins of 1½" to create a facial board at the front of the cantilever car parking bay thereby to produce strong joint between metallic and non-metallic materials. It also provides good and quality surface finishing.

### **Assembling of the Component Frame**

As the name implies, it means putting together all the parts of the galvanized metal that have been cut into pieces to form a complete improve steel stanchions (Blodgett, 1986). The working process was first put together and arranged according to the design plan; then a light tackling was made by using electric welding rod to confirm if final welding can give a good result, it was squared by placing try square at the angles to see that it is accurate. All the necessary adjustment was made before final welding.

### **Painting**

The painting was done so that the material surface wear or rust can be reduced by covering the metal so that the atmosphere and rain cannot have direct contact to the galvanized steel stanchions. However, emulsion paint was carried out to the entire steel members used in this construction.



Figure 2.1: Car Park constructed at the College of Engineering



Figure 2.2: A view of a cantilever type car parking bay at the College of Engineering.

## **SUMMARY**

The frame is made up of 3" (75mm) diameter hollow circular steel stanchions, 1" (25mm) diameter galvanized hollow circular steel stanchions and rectangular hollow steel purlins of 1½" (37.5mm). Galvanized steel was chosen for this project work because of its ability to resist bending stresses and other deformation that could likely to occur. The cantilever car parking bay was made up of four (4) stanchions with the height of 2.4m and the width was 4m, and the total length was 8.1m, the depth, width, and length the foundation was 300x400x600mm respectively and was cast with a concrete mix of 1:2:4. The curing age of one week (7 days) was done to the concrete cast. The connection of the cantilever car parking bay was made by welding process before the construction work. The location of the site was first determined for the construction work followed by the site clearance. The site clearance was done using Cutlass and rake. After the site clearance has been achieved, the excavation process was done manually using diggers and shovels. After all these processes have been completed, the erection of the stanchions was done using a spirit level to get the alignment of the beams. After a successful construction of the stanchions, the painting work was done; finally, the roofing process was done by the use of red color aluminum roofing sheet

## **CONCLUSION AND RECOMMENDATIONS**

### **Conclusion**

The cantilever car parking bay was constructed using hollow steel stanchions as the main materials. The cantilever car parking bay was done to provide shade for vehicles and to prevent the vehicles from the adverse effect of the element of weather such as sun, rain and so on. The car park is commonly found at railway stations, airport, and hospitals, and various organizations and city centers. And after all the construction procedures have been duly observed the aim and objectives for this project work was achieved by constructing three No. cantilever type car parking bay at the college of engineering.

### **Recommendations**

In the light of the above conclusion, the following recommendations have been drawn:

- Frequent monitoring and utilization should be ensured on the constructed bay to serve its intended purpose.
- The cantilever car parking bay should be increased in numbers in future, to accommodate more cars in the college.
- The personnel on constructions should set out buildings correctly and carry out standard tests on materials to ascertain their strength and durability, to prevent selection of poor or substandard materials during construction whenever they are assigned to.



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