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Design And Estimation Of Wifi Park Using Tekla Structure

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Abstract- Design and estimation of a Wi-Fi park using Tekla Structures software focuses on creating a smart and sustainable public space equipped with wireless connectivity and recreational facilities. The design process ensures structural stability, durability, and safety, while also meeting functional and aesthetic needs of modern urban environments. Using Tekla Structures, accurate 3D modeling, detailing, and clash detection are performed to achieve precision in elements such as foundations, columns, pergolas, lighting poles, benches, and landscape structures. The software supports material optimization, which helps minimize wastage and control project cost effectively. Consideration of wind, live, and environmental loads ensures that the design is reliable under varying conditions. The estimation stage includes preparation of a detailed Bill of Materials (BOM), cost estimation, and fabrication details, enabling smooth project planning and execution. This integrated methodology enhances construction accuracy, improves efficiency, and reduces human error compared to traditional design methods, resulting in a cost-effective, innovative, and structurally sound Wi-Fi park for contemporary use. The project involves designing a smart and sustainable Wi-Fi park using Tekla Structures for accurate 3D modeling and detailing. It ensures structural stability, safety, and cost efficiency through material optimization and load considerations. The estimation process includes BOM preparation and cost analysis for effective project execution.

Keywords-Wi-Fi Park, Tekla Structures (2025), Structural Design, 3D Modeling, Material Estimation

I. INTRODUCTION

The design and estimation of a Wi-Fi park involve creating a 3D model in Tekla Structures to ensure accuracy in detailing, stability, and functionality of all park components. Structural members such as lighting poles, seating supports, and pergola frames are designed as per standards, considering wind and environmental effects. Estimation includes preparing a bill of materials, cost analysis, and fabrication details, enabling safe, economical, and efficient construction of the Wi Fi park. The development of smart infrastructure has become a key focus in modern urban planning, where public spaces are designed not only for recreation but also for connectivity and sustainability. A Wi-Fi park represents an innovative approach to integrating digital access with outdoor environments, providing users with seamless internet connectivity while enjoying recreational facilities. This project focuses on the design and estimation of a Wi-Fi park using Tekla Structures, a powerful Building Information Modeling (BIM) tool known for its accuracy and efficiency in structural design.

The design process emphasizes structural stability, safety, and durability while also addressing aesthetic and functional requirements. Various structural elements such as foundations, columns, pergolas, benches, and lighting systems are modeled in a 3D environment to ensure precision and coordination. Tekla Structures enables detailed modeling, clash detection, and efficient material usage, reducing errors and minimizing wastage during construction.

In addition to design, the project includes a comprehensive estimation process involving the preparation of a Bill of Materials (BOM) and cost analysis. Load considerations such as wind, live, and environmental loads are incorporated to ensure the reliability of the structure under different conditions. This integrated approach improves construction planning, enhances accuracy, and reduces project costs. Overall, the project aims to deliver a sustainable, cost- effective, and technologically advanced Wi-Fi park suitable for contemporary urban needs.

II. TYPES OF STRUCTURES

The structural systems adopted in a Wi-Fi park are designed to ensure safety, functionality, and aesthetic appeal while supporting modern urban requirements. Based on their purpose and configuration, the structures are broadly classified into several categories.
Pergola and shade structures are provided to offer protection from sunlight and create comfortable recreational zones. Seating and shelter structures are

designed to accommodate users, ensuring both comfort and durability.

Lighting pole structures play a crucial role in enhancing visibility and safety during night-time usage. Wi-Fi towers and poles are essential components that support communication equipment and ensure uninterrupted network connectivity throughout the park.
In addition, fencing and boundary structures are incorporated to define the park limits and provide security. Composite structures, which combine materials such as steel with concrete or timber, are also used to achieve better strength, durability, and architectural flexibility. These structural systems collectively contribute to the efficient functioning and visual enhancement of the Wi-Fi park environment.

III. COMPONENTS OF PARK STRUCTURES

The primary components of park structures include beams and columns, which form the basic load-resisting framework. Trusses and frames are used to support roofing systems and provide structural stability. Girders and cross beams help in distributing loads effectively across the structure, while purlins act as secondary members supporting roof coverings. Bracings and stiffeners are incorporated to improve structural rigidity and resist lateral forces such as wind loads. Gusset plates and connection plates are used to join different structural members, ensuring proper load transfer. Ties and struts provide additional support and stability to the framework.
Roof covering or cladding materials are selected based on durability and environmental resistance. Fasteners and connections, including bolts and welds, ensure the integrity of joints. Finally, the foundation forms the base of the structure, transferring all loads safely to the ground and ensuring overall stability.

IV. ORIENTATION

Orientation in park structures refers to proper positioning and alignment of beams, columns, pergolas, lighting poles, and Wi-Fi towers to ensure stability, efficient load transfer, and safety. Correct orientation allows elements to perform optimally, resist wind and environmental forces, and maintain balance. It also facilitates proper connections, fabrication, installation, and functional layout of park facilities.

Proper orientation also enhances the overall aesthetics and functionality of the Wi-Fi park by aligning structures with natural lighting and ventilation. It supports accessibility and movement of maintenance vehicles without obstruction. In Tekla Structures, accurate orientation ensures precise modeling, clash-free detailing, and easier assembly during construction. It minimizes material wastage and enhances project efficiency.
Furthermore, correct alignment ensures long-term durability and minimizes maintenance requirements. Thus, proper orientation is a crucial factor for both structural integrity and user comfort in Wi-Fi park design.

It ensures that service lines such as electrical conduits and Wi-Fi cables are efficiently routed without interference. Overall, it contributes to sustainable park development with improved performance and reduced operational costs. Proper orientation also improves the integration of green spaces and seating zones, creating a comfortable atmosphere for visitors.
It enhances visual connectivity between different park elements, such as pathways, canopies, and Wi Fi kiosks. Orientation planning ensures that security cameras and lighting poles cover the entire area effectively. It also reduces the impact of harsh sunlight and wind on user zones, improving comfort.

V. METHODOLOGY

VI. PLANNING

6.1 General Specifications:

- Type of Structure - Wi-Fi Park Structure
- Hight of structure - 15000 mm
- Types of Base Plate - B.P with Anchor Rod
- Total gross area - 11,62,50,00,000 sq.mm
- Column Profile - ISMB500
- Beam Profile - ISMB300
- Total number of columns - 114 no's
- Number of beam - 282 no's
- Material of Steel - IS2062
- Number of Bolts - 2508 no's
- Footing - M30 grade
- Footing size - 1500 * 500
- Rod size - 20 mm
- Total number of Rod used - 448 no's

DESCRIPTION	PROFILE'S
• Main Beam	- ISMB300
• Main Column	- ISMB500
• Base Plate	- PLT600×500×25
• End Plate	- PLT8 mm
• Rod Profile	- S275
• Plate size	- PL10*138 mm
• Stiffeners	- S275
• Plate Profile	- S275

6.1.1 PLAN @ 0

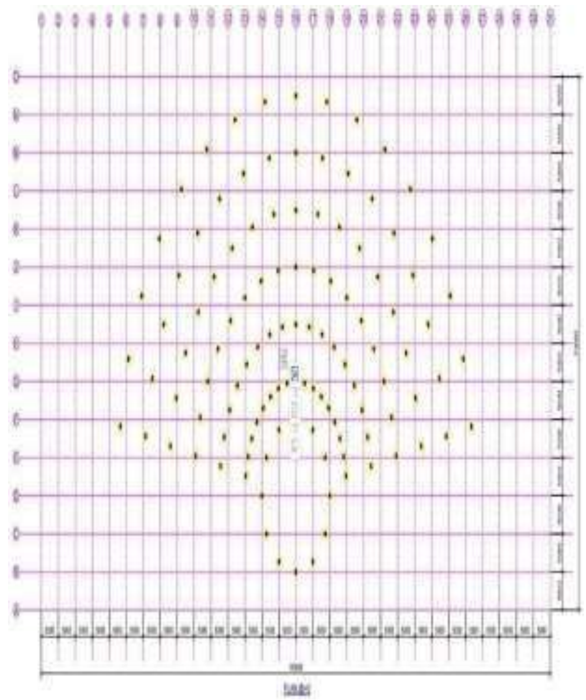

Fig.6.1 Plan @ 0

6.1.2 PLAN @ 3000

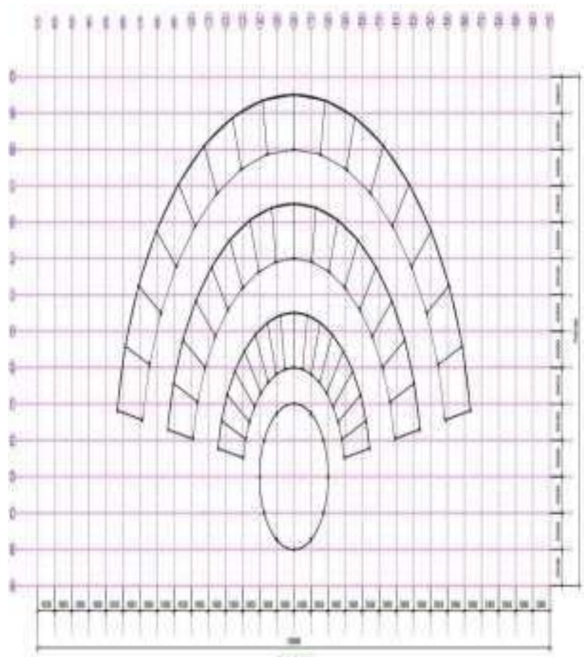

Fig.6.2 Plan @ 3000

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6.1.3 PLAN @ 6000

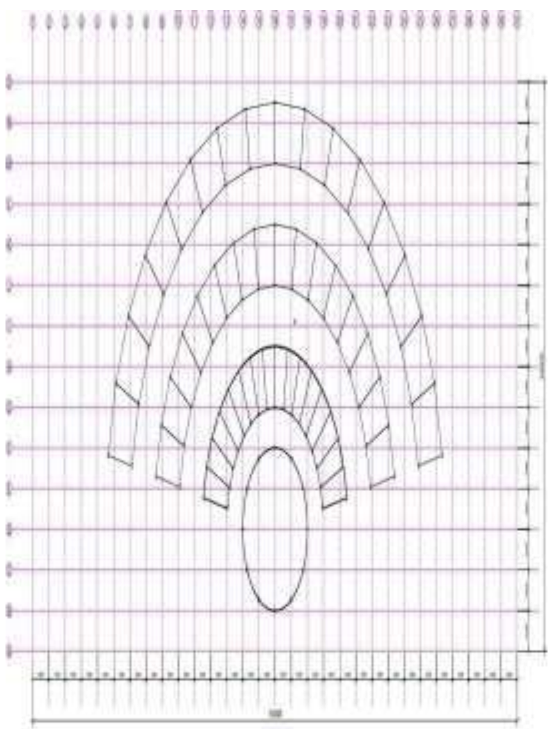


Fig.6.3 Plan @ 6000

6.1.4 PLAN @ 9000

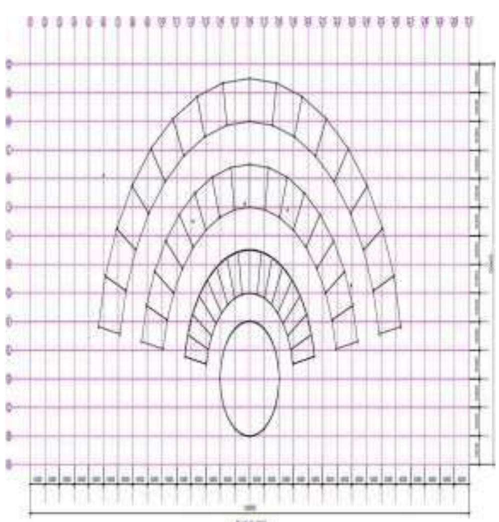


Fig.6.4 Plan @ 9000

PLAN @ 12000

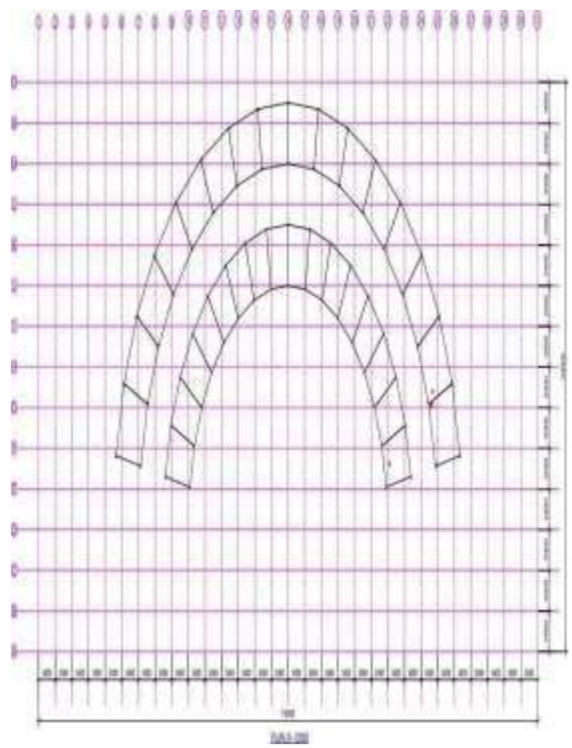


Fig.6.5 Plan @ 12000

6.1.6 PLAN @ 15000

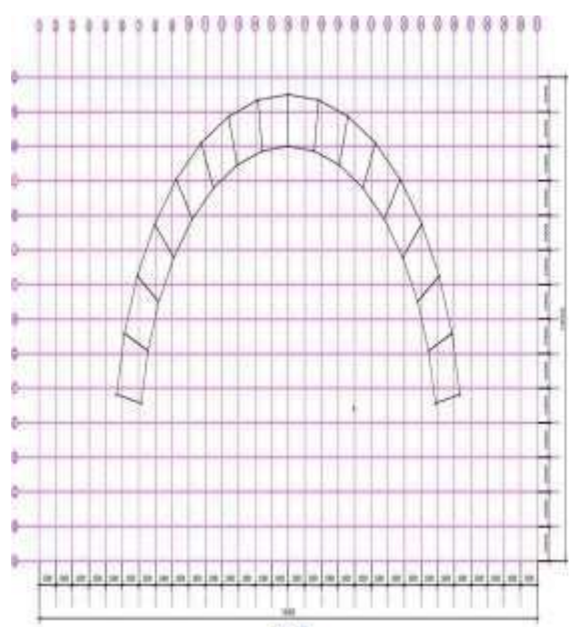
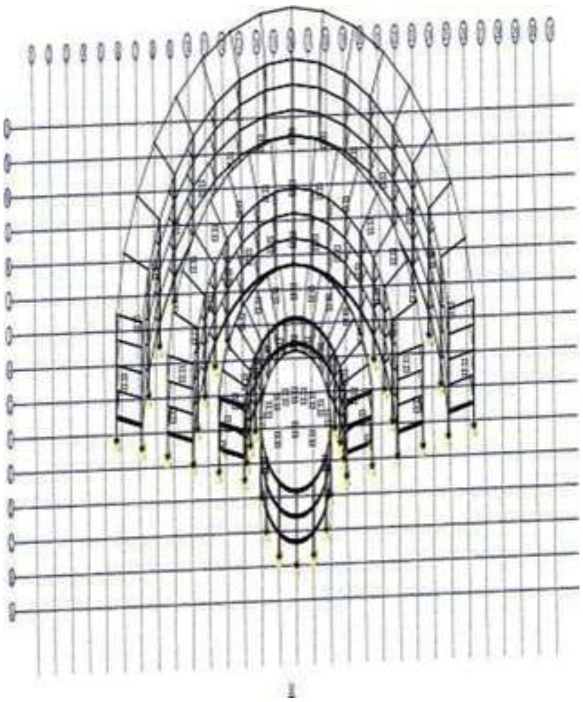


Fig.6.6 Plan @ 15000

6.1.7 3D View:



. Fig.6.7 3D View

6.1.8 Detail - A

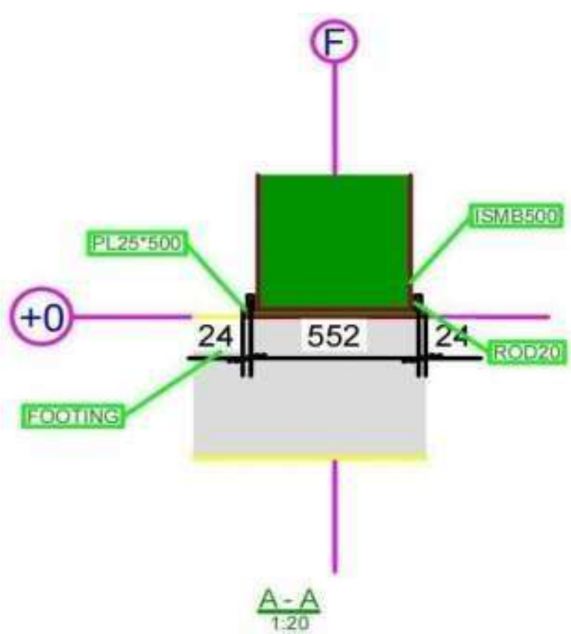


Fig.6.8 Detail - A

6.1.9 Detail – B

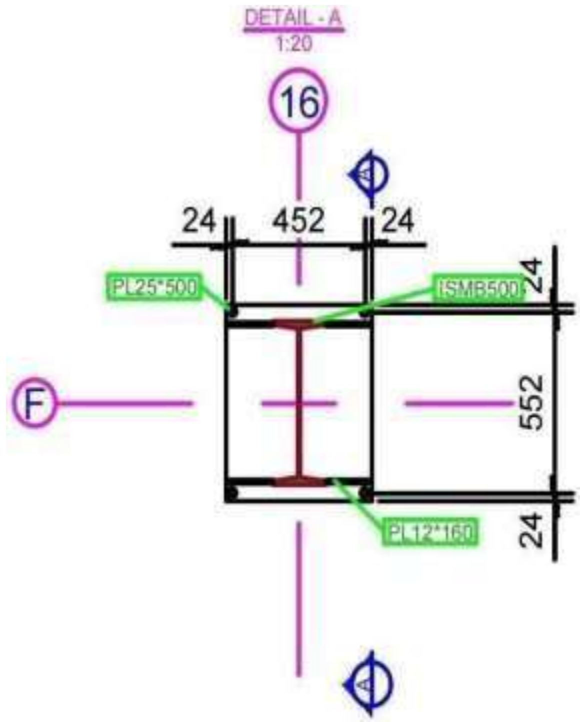


Fig 6.9 Detail - B

6.1.10 Section A-A

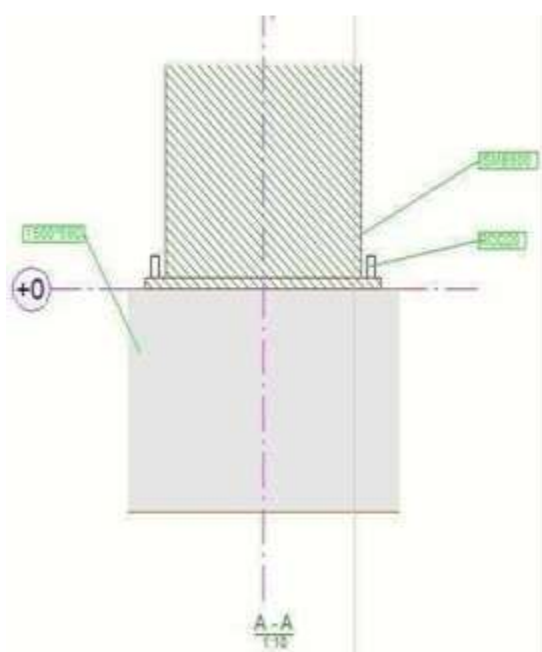


Fig.6.10 Section A-A

6.1.11 Section B-B

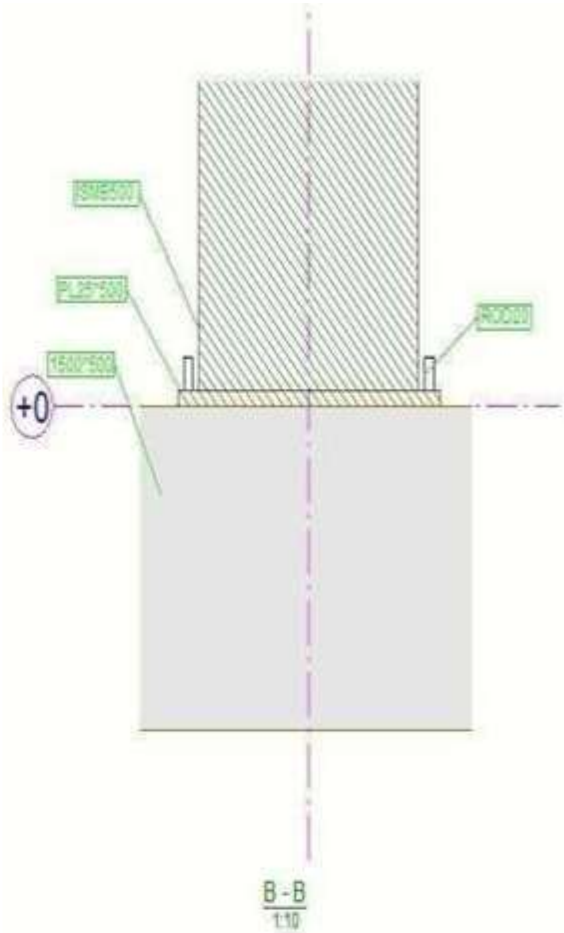


Fig.6.11 Section B-B

VII. PROJECT IMPLEMENTATION

INPUT OF DATA

The Design and Estimation of a Wi-Fi Park using Tekla Structures focuses on developing an accurate 3D model that includes key components such as pergolas, shelters, lighting poles, Wi-Fi towers, benches, and cable supports. Tekla Structures enables modeling of each element with precise dimensions, material specifications, and connections. Load factors such as dead load, live load, wind load, and seismic load are considered to ensure safety and stability. The software also produces fabrication drawings, general arrangement plans, and a Bill of Materials (BOM) to support cost estimation, material procurement, and efficient construction planning for the Wi-Fi park.

7.1.1 Grid Properties

Fig.7.1 Grid Properties

7.1.2 Column Assembly

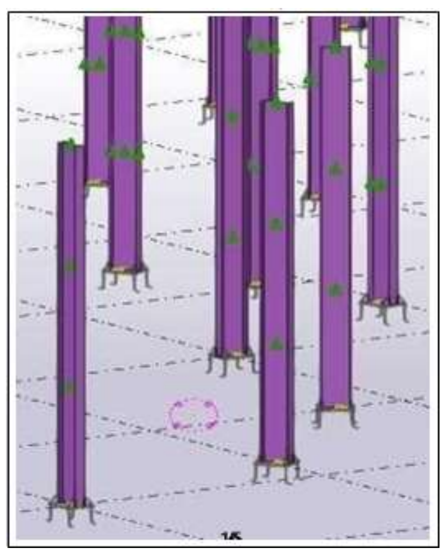


Fig.7.2 Column Assembly

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7.1.3 Wifi Park

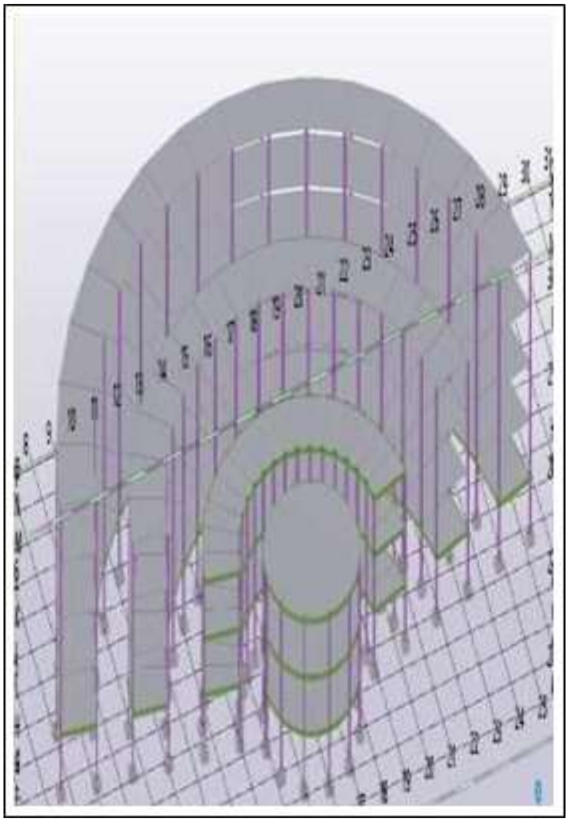

Fig.7.3 Wifi Park

VIII. ESTIMATION

8.1 BILL OF MATERIALS

A Bill of Materials (BOM) is a comprehensive list of all materials, components, and parts required to design, fabricate, and construct a structure. It acts like a shopping list and assembly guide for engineers, fabricators, and procurement teams. In the Design and Estimation of a Wi-Fi Park using Tekla Structures, the BOM provides detailed information on all structural and architectural elements such as steel sections, bolts, base plates, concrete, lighting poles, Wi-Fi towers, benches, and pergolas. Tekla Structures automatically generates the BOM directly from the 3D model, ensuring accuracy and consistency in quantity estimation. Although preparing a manual BOM is time-consuming, the software simplifies this process and supports efficient planning, material tracking, and cost control throughout the Wi-Fi park project.

8.1.1 Material List

TEKLA STRUCTURES MATERIAL LIST FOR CONTRACT No:1000 Page: 1
TITLE: Trimble Solutions*** Date: 13.10.2025

Size	Grade	Qty.	Length(mm)	Area(m²)	Weight(kg)
1500*500	M20	114	1500	7.5	2700.0
			171000	855.0	307800.0
D16	S275	8	566	0.0	0.8
			4526	0.2	6.6
ISMB300	IS2062	63	7466	8.1	343.4
ISMB300	IS2062	45	3405	3.7	156.6
ISMB300	IS2062	39	2096	2.3	96.4
ISMB300	IS2062	36	5210	5.6	239.7
ISMB300	IS2062	16	8640	9.4	397.4
ISMB300	IS2062	16	7331	8.0	337.2
ISMB300	IS2062	16	6022	6.5	277.0
ISMB300	IS2062	14	4714	5.1	216.8
ISMB300	IS2062	3	3405	3.7	156.6
ISMB300	IS2062	3	2097	2.3	96.5
ISMB300	IS2062	3	2096	2.3	96.4
ISMB300	IS2062	3	2096	2.3	96.4
ISMB300	IS2062	2	7483	8.1	344.2
ISMB300	IS2062	1	4714	5.1	216.8
ISMB300	IS2062	1	4714	5.1	216.8
ISMB300	IS2062	1	2619	2.8	120.5
			1516172	1644.3	69745.5
ISMB500	IS2062	46	8975	14.6	782.0
ISMB500	IS2062	24	14975	24.3	1304.8
ISMB500	IS2062	24	11975	19.4	1043.4
			1329150	2156.2	115815.5
PL10*138	S275	560	220	0.1	2.4
			123200	38.0	1334.6
PL12*160	S275	456	200	0.1	2.3
			91200	25.9	1052.4
PL25*300	S275	114	600	0.7	58.9
			68400	74.7	6711.5
PLT10*2911	IS2062	48	7729	49.1	1917.0
			370975	2354.7	92016.0

Fig.8.1 Material List

IX. CONCLUSION

Tekla's capacity to incorporate wind loads, seismic forces, and self- weight into the analysis enhances the structural safety of all park components. The estimation process further aids in optimizing material usage, minimizing waste, and ensuring the economic feasibility of the Wi- Fi park project. Overall, the integration of Tekla Structures into the design and estimation process not only streamlines project management but also provides a robust, sustainable, and practical solution for public infrastructure. This approach sets a benchmark for future urban park projects, emphasizing the role of digital tools in modern construction and design.

Overall, the integration of Tekla Structures into the design and estimation process not only streamlines project management but also provides a robust, sustainable, and practical solution for Wi-Fi park infrastructure. This approach sets a benchmark for future urban park projects, emphasizing the transformative role of digital tools in modern construction and public space development

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