



# Planning, Analysis and Design of Twindeck Industrial Structure

Southamirajan S<sup>1</sup>, Manoshaparisha P<sup>2</sup>, Vishwabharathi P<sup>3</sup>, Inbatamilan S<sup>4</sup>

<sup>1</sup>Civil/Assistant Professor, Kongunadu College of engineering and technology, Trichy, India

<sup>2</sup>Civil/Student, Kongunadu College of engineering and technology, Trichy, India

<sup>3</sup>Civil/Student, Kongunadu College of engineering and technology, Trichy, India

<sup>4</sup>Civil/Student, Kongunadu College of engineering and technology, Trichy, India

corresponding Author Email address: [inbatamilancivil@gmail.com](mailto:inbatamilancivil@gmail.com)

ORCID ID: <https://orcid.org/0000-0003-0702-2221>

## How to Cite this Article:

P, M., P, V. & S, I. (2026). Planning, Analysis and Design of Twindeck Industrial Structure. International Journal of Creative and Open Research in Engineering and Management, 2(10), 1-9.  
<https://doi.org/10.55041/ijcope.v2i10.183>

## License:

This article is published under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and the source are credited.

© The Author(s). Published by International Journal of Creative and Open Research in Engineering and Management.



<https://doi.org/10.55041/ijcope.v2i10.183>

**Abstract**— The project entitled “Planning, Analysis and Design of Twindeck Industrial Structure” is about the planning, modeling, analysis, and designing of an industrial structure consisting of two decks made up of steel to accommodate and facilitate the storage and handling of steel profiles and PVC pipes. The primary aim is to make a safe, stable, functional, and economical structure, which should be capable of providing efficient storage facility and material handling. The structural planning involves the determination of dimensions, bay arrangements, deck levels, storage requirements, and provision of access facilities. Three-dimensional modeling of the structure is done using the software Tekla Structures, which is very accurate in terms of modeling, detailing, connections, and drawings. The structural analysis takes into account the dead load, imposed load, wind load, earthquake load, and crane loads. Structural members are analyzed for strength, stability, and serviceability according to Indian Standards, such as IS 800, IS 875, and IS 1893.

**Keywords**— Tekla Structures (2026), Twin Deck System, Steel Structure, Tekla Modeling, Steel Design, Material Storage.



## 1. Introduction

Storage facilities of industries need to have well-planned structural systems to allow proper storage of goods. The use of steel structures is quite common for industries since it provides structural strength and flexibility to arrange the structural system. Twindeck industrial structure ensures the availability of two storage levels within one structural system. Created a three-dimensional structural model for batch plant supporting structure using Tekla Structures software.

Designing structural elements according to standard loading conditions and Indian Standard codes. Accurate quantity take-offs were obtained for steel, plates, and bolts.

The current research deals with the design and analysis of a two-tier industrial steel framework aimed at storage purposes for steel profiles and PVC pipes. The design features include columns, beams, trusses, bracings, purlins, deck plates, stairs, roof, crane beams and connections among others. The design of a structure requires appropriate planning and load estimation in order to ensure structural stability and safety during the operations with material.

The work is executed using Tekla Structures for 3D modeling and detailing together with STAAD.Pro for structural analysis.

### 1.1 Significance of Structural Design

The design of the structure is crucial to ensure the safety, stability, strength, and durability of the industrial structure. In the twindeck industrial structure, appropriate design will be useful in ensuring that the steel profiles, PVC pipes, and the load from the cranes are supported appropriately. The design will also ensure proper utilization of space by the presence of two storage levels. Analysis of dead loads, imposed loads, wind loads, and seismic loads will help in analyzing the performance of the structure.

## 1.2 Role of Tekla Structures

Tekla Structures is BIM software that is used for creating a three-dimensional model of the twindeck industrial structure. The software allows for modeling columns, beams, trusses, bracings, stairs, roof coverings, deck plates, and structural connections. The use of Tekla Structures helps visualize the entire structure and coordinate its elements. In addition, Tekla Structures allows preparing general arrangements, fabrication drawings, and Bills of Material. The use of modeling helps to increase the accuracy of detail design, estimate the quantities of materials, and decrease the probability of modeling mistakes.

## 2. Related Work

### 2.1. Seismic Behaviour of Steel Storage Structures

Authors: Claudio Galeotti, Federico Gusella, Maurizio Orlando, and Paolo Spinelli (2021), Structures, Vol. 34, pp. 3806–3817, 2021.

### 2.2. Influence of Slenderness and Sliding Pallets on Seismic Design of Steel Storage Racks

Authors: Eduardo Nuñez, Ramón Mata, Jorge Castro, Nelson Maureira, Néstor Guerrero, and Ángel Roco (2022), Buildings, Vol. 12, No. 11, 2022.

### 2.3. Full-Scale Testing of Industrial Steel Storage Structures

Authors: Martina Bernardi, Nadia Baldassino, Riccardo Zandonini, and Arturo di Gioia (2023), Structures, Vol. 57, 2023.

### 2.4. Analysis and Design of Roof Trusses for Industrial Shed Structures Using STAAD.Pro

Authors: Amey Khedikar, Nayana Sangode, and Sunayana Meshram (2025), SSRN Electronic Journal, 2025.

### 2.5. Seismic Performance Analysis of Braced Steel Structures

Authors: Nan Cui and Shuangshuang Liu (2025), PLOS ONE, Vol. 20, No. 5, 2025.



### 3. Introduction of BIM

Building Information Modelling is a digitally-based system that uses an integrated three-dimensional model to manage and represent construction project information. BIM includes geometry, structure, and materials and thus differs from conventional 2D drawings in that regard, and this helps coordinate work among engineers, designers, and construction companies. In addition, it enhances precision, reduces mistakes, and supports better decision-making during construction projects. BIM is an essential digitally-based system used in industrial construction to manage steel structures and structural details. In this case, Tekla Structures, which is one of the BIM software used in the process, is utilized to construct a detailed 3D model of the twindeck industrial structure, with columns, beams, trusses, bracings, and connections. It further helps in the estimation of material amounts and in creating drawings. BIM further allows 5D integration, where model information is coupled with cost information.

### 4. Experimental Method/Procedure/Design

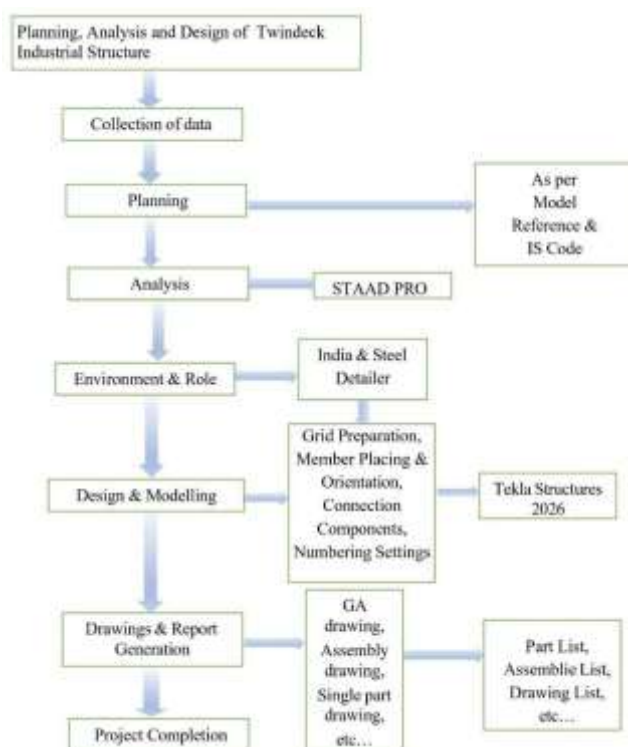


**Figure 1. Flowchart**

The methodology of Planning, Analysis and Design of Twindeck Industrial Structure commences with data collection which includes the structural dimensions, material properties, loading and the project specifications. This planning process takes place in

consideration of the structural model, the available reference data and Indian Standard codes of construction. Structural analysis is done via STAAD.Pro software in order to study the performance of the structure under different load conditions.

Then comes the identification process of the structural components and their functions. Modeling process takes place using Tekla Structures 2026 in line with steel detailing procedures. Arrangements of grid, positioning of members, connections, orientations, and numbers are set in order to establish a precise three-dimensional model of the twindeck industrial structure.

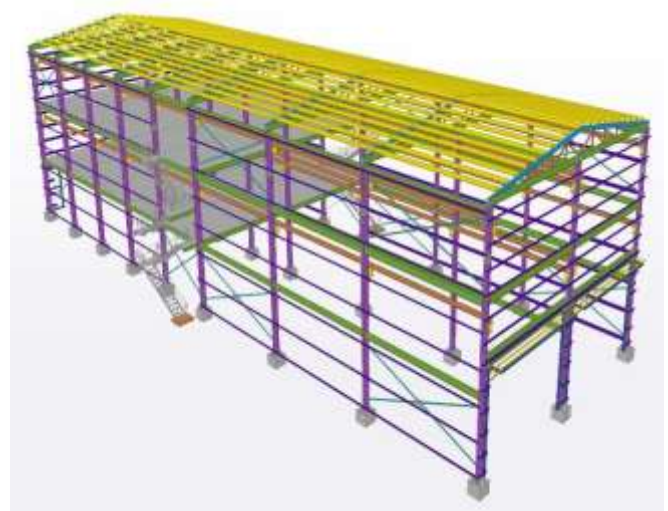
Upon completing the modeling process, different drawings and reports are created. Such as the GA drawings, Assembly drawings and Single Part drawings. All the data regarding materials and drawings are then organized in Part lists, assembly lists, and drawing lists respectively.

### 5. Model Implementaion

#### 5.1 3D Model

The construction of the 3D BIM model of the twindeck industrial building in Tekla Structures 2026 is part of this project, which involves columns, beams, trusses, bracing, purlin, roof, staircase, and deck modeling. The material estimates are made from the model. Such method enhances visualization, coordination, detail, and material optimization as well as preparation of the fabrication drawings.

**Figure 2. 3D Model**





## 5.2 Reports generated

Material list generation in Tekla Structures is the method of creating a comprehensive material list of the materials used in the Twindeck industrial structure. The creation of the material list is done after the 3D model has been completed through the use of pre-defined templates. The material list comprises information on profile sizes, material grades, length and weight.

-----  
 TEKLA STRUCTURES ASSEMBLY LIST FOR CONTRACT 1000 Page: 1  
 TITLE: Trimble India PHASE: Date: 17.10.2026  
 -----

| Sno | Size           | Grade  | Length (mm) | Weight(kg) |
|-----|----------------|--------|-------------|------------|
| 1   | BLL80*80*10    | IS2062 | 22000.0     | 259.1      |
| 2   | CHS100*5       | IS2062 | 381489.7    | 4395.7     |
| 3   | D25            | IS2062 | 132738.5    | 503.0      |
| 4   | ISA75X75X5     | IS2062 | 9880.0      | 56.4       |
| 5   | ISA90X90X8     | IS2062 | 80640.0     | 873.6      |
| 6   | ISMB250        | IS2062 | 186059.6    | 6937.7     |
| 7   | ISMB300        | IS2062 | 501750.0    | 23081.0    |
| 8   | ISMB400        | IS2062 | 988042.6    | 60808.1    |
| 9   | ISMB450        | IS2062 | 34776.0     | 2517.0     |
| 10  | ISMB500        | IS2062 | 392670.0    | 34215.3    |
| 11  | ISMC75         | IS2062 | 107952.0    | 771.2      |
| 12  | ISMC200        | IS2062 | 108712.8    | 2432.2     |
| 13  | L185*100*10    | IS2062 | 38760.0     | 836.7      |
| 14  | L272.98*100*10 | IS2062 | 8280.0      | 235.9      |
| 15  | PD50*5         | IS2062 | 354846.9    | 1921.1     |
| 16  | PD50*12        | IS2062 | 6075.0      | 66.6       |
| 17  | PNL_M100-50*** | IS2062 | 77112***    | 24607***   |
| 18  | RHS150*8       | IS2062 | 62416.0     | 2226.4     |
| 19  | SHS80*5        | IS2062 | 9691.2      | 106.4      |
| 20  | SHS100*5       | IS2062 | 176143.3    | 2475.9     |
| 21  | SHS150*8       | IS2062 | 68800.0     | 2454.1     |
| 22  | ZZ200-5-30-100 | IS2062 | 25909***    | 44745.6    |
| 23  | PLT 5          | IS2062 | 51600.0     | 191.9      |
| 24  | PLT 8          | IS2062 | 225453.1    | 76785.0    |
| 25  | PLT 10         | IS2062 | 310222.7    | 3908.8     |
| 26  | PLT 12         | IS2062 | 96184.9     | 1433.8     |
| 27  | PLT 15         | IS2062 | 18720.0     | 374.7      |
| 28  | PLT 16         | IS2062 | 37620.0     | 661.5      |
| 29  | PLT 20         | IS2062 | 39142.8     | 1319.9     |
| 30  | PLT 25         | IS2062 | 20250.0     | 1987.0     |
| 31  | PLT 1000       | M30    | 27000.0     | 48600.0    |
| 32  | PLT 1500       | M30    | 2400.0      | 1728.0     |

-----  
 , Tonnage:- , 27896\*\*\*  
 -----

**Table 1. Material List**



### 5.3 General Arrangement Drawings

The General Arrangement (GA) drawings are drawn for presenting the general layout of the twin deck industrial storage structure, which includes the arrangement, dimensions, and positioning of all the major structural elements such as columns, beams, trusses, braces, stairs, roof, and storage decks. This drawing will help in getting an idea about the entire structure's geometry.

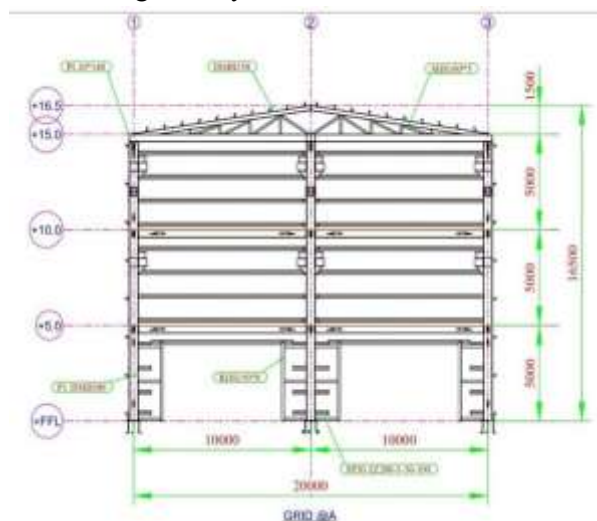


Figure 3. View at Front

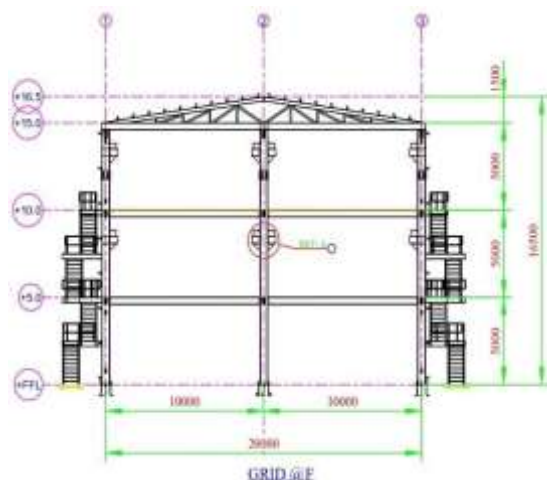


Figure 4. View at Staircase

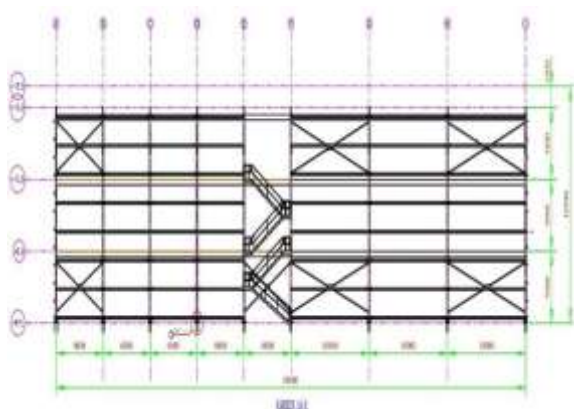


Figure 5. View at Longitudinal View

### Conclusion and Future Scope

This project of Planning, Analysis, and Design of Twindeck Industrial Structure reflects the efficient utilization of Building Information Modelling (BIM) in structural engineering of industry. The structure was created using Tekla Structures software, which has enabled the creation of a 3D model including important structural elements such as columns, beams, trusses, bracing, staircase, roof, connections, and two storage decks. STAAD.Pro software was used for analyzing the structure.

Utilization of 3D modelling and structural analysis can contribute to enhanced visualization, coordination, and quantification of materials. General arrangement drawings, fabrication drawings, and material lists help in planning the construction process and fabrication process. Future innovations can include the optimization of structures, connection design, sustainability of materials, and incorporation of advanced BIM techniques.

### Data Availability

No datasets were generated or analysed during the current study.

### Conflict of Interest

regarding the publication of this paper.

### Funding Source

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Authors' Contributions3

Author 4 conceptualization, structural modelling, analysis and preparation. Author 4 collected and analysed the data. Author 1 wrote and reviewed the manuscript. All authors read and approved.

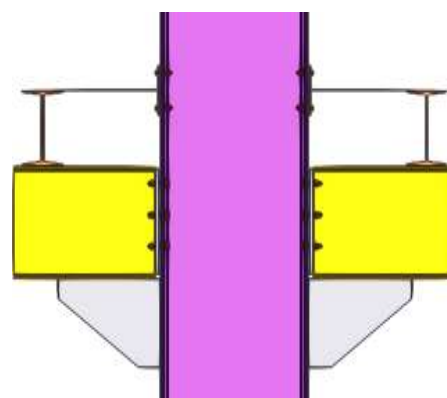


Figure 6. Crane Brackets



## Acknowledgements

- [1] Trimble Inc., Tekla Structures 2026 – User Assistance, Trimble Solutions Corporation, 2026.
- [2] Bureau of Indian Standards, IS 800:2007 – General Construction in Steel – Code of Practice, New Delhi, India, 2007.
- [3] Bureau of Indian Standards, IS 875 (Part 1):1987 – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures: Dead Loads, New Delhi, India, 1987.
- [4] Bureau of Indian Standards, IS 875 (Part 2):1987 – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures: Imposed Loads, New Delhi, India, 1987.
- [5] Bureau of Indian Standards, IS 875 (Part 3):2015 – Design Loads (Other than Earthquake) for Buildings and Structures: Wind Loads, New Delhi, India, 2015.
- [6] Bureau of Indian Standards, IS 1893 (Part 1):2016 – Criteria for Earthquake Resistant Design of Structures, New Delhi, India, 2016.
- [7] S. S. Bhavikatti, Design of Steel Structures, New Delhi: I.K. International Publishing House, 2010.
- [8] S. K. Duggal, Limit State Design of Steel Structures, New Delhi: Tata McGraw-Hill, 2010.
- [9] Bentley Systems, STAAD.Pro CONNECT Edition – Technical Documentation, Bentley Systems.

## Reference:

1. Trimble Solutions Corporation (2026), “Tekla Structures User Assistance”. This official guide provides practical instructions on 3D modelling, structural detailing, drawing generation, and quantity reporting for industrial steel structures.
2. McCormac, J.C. and Csernak, S.F. (2012), Structural Steel Design. Pearson. This book explains the analysis and design of steel beams, columns, trusses, and connections used in industrial steel structures.
3. Geschwindner, L.F. (2012), Unified Design of Steel Structures. John Wiley & Sons. This book provides fundamental principles for steel member design, structural stability, and the behaviour of steel frames.
4. IS 800:2007 – General Construction in Steel – Code of Practice. This standard provides guidelines for the design of steel columns, beams, trusses, bracings, and connections in the twindeck industrial structure.

5. IS 875 (Part 1):1987 – Dead Loads. This standard provides unit weights of construction materials and helps calculate the dead loads of structural members, roofing, and deck plates.
6. IS 875 (Part 2):1987 – Imposed Loads. This standard provides guidelines for determining imposed loads on industrial platforms, storage decks, and other accessible areas.
7. IS 875 (Part 3):2015 – Wind Loads. This standard explains the calculation of wind pressure and wind loads acting on the roof and structural frame of the industrial storage structure.
8. IS 1893 (Part 1):2016 – Criteria for Earthquake Resistant Design of Structures. This standard provides guidelines for determining seismic loads and evaluating the earthquake resistance of the industrial steel structure.
9. Trimble Solutions Corporation (2026), “Tekla Structures User Assistance”. This official guide explains structural modelling, general arrangement drawings, fabrication drawings, and Bill of Materials generation for steel structures.
10. STAAD.Pro Technical Documentation, Bentley Systems. This documentation provides guidance on structural modelling, load application, structural analysis, and design verification for industrial steel structures.