WAREHOUSE ANALYSIS USING STAAD PRO

A

PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

of

MR. KAUSHAL KUMAR

ASSISTANT PROFESSOR

by

HARSHIT THAKUR (181604)

YASH GUPTA (181642)

to

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

WAKNAGHAT, SOLAN – 173234

HIMACHAL PRADESH, INDIA

MAY - 2022

STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled **"Design and Analysis of Warehouse Using STAAD PRO"** submitted for partial fulfillment of the requirement for the degree of Bachelor Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is an authentic record of our work carried out under the supervision of **MR. KAUSHAL KUMAR.** This work has not been submitted elsewhere for the reward of any other degree. I am fully responsible for the contents of my project report.

Harshit Thakur
181604
Department of Civil Engineering
Jaypee University of Information Technology, Waknaghat, India
May 2022

Yash Gupta
181642
Department of Civil Engineering
Jaypee University of Information Technology, Waknaghat, India
May 2022

CERTIFICATE

This is to certify that the work which is being presented in the project report titled **Design and Analysis of Warehouse Using STAAD PRO** in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Waknaghat** is an authentic record of work carried out by **Harshit Thakur (181604) and Yash Gupta (181642)** during a period from August 2021 to May 2021 under the supervision of **Mr. KAUSHAL KUMAR** Department of civil Engineering, Jaypee University of Information Technology, Waknaghat. The above statement made is correct to the best of our knowledge

Date: ……………

Signature of Supervisor	Signature of HOD
Mr. Kaushal Kumar	Dr. Ashish Kumar
Assistant Professor	Professor and Head of
Department of Civil Engineering	Department of Civil Engineering
JUIT, Waknaghat	JUIT, Waknaghat

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The completion and success of this project requires a lot of guidance and assistance from many people. We are extremely thankful to have got this all along the final completion of our project. Everything we have done only due to such supervision and continuous assistance.

We are indebted to our project guide Mr. KAUSHAL KUMAR Assistant Professor, Department of Civil Engineering, Jaypee University of Information Technology. We are extremely thankful to the sir for his continuous support and his guidance for the completion of the project.

Thank You

Harshit Thakur

Yash Gupta

ABSTRACT

Due to India's rising industrialization, there is a demand for commodities storage and production, which may be met by a well-designed industrial warehouse. This research provides guidance on how to build an industrial warehouse. With the aid of a literature research, the goal of this project is to learn about the many forms of force/load effects that should be addressed while planning an industrial warehouse. This structure will be designed in accordance with IS 800:2007, and the dead, live, and wind load analysis will be performed in accordance with IS 875:1987. The planned warehouse design space was chosen, and an architectural plan was created to meet the criteria. When one of the members is loaded, the forces acting on the surrounding members are calculated, as are the excess stresses and ratios induced in these linked parts, as well as the moments and forces produced. Then various warehouse members, such as truss members, columns, and connections, were developed, and the ultimate result was attained. Finally, it is concluded that a warehouse may be simply created using a straightforward design approach and IS standards.

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CHAPTER 1
INTRODUCTION

A steel warehouse is a type of industrial facility that stores raw materials and completed goods. Steel warehouse is another name for the industrial complex. Industrial structures are separated into two categories: general industrial structures and specific industrial structures. The most frequent type of warehouse is a simple roofed construction with open frames. For example, cold storage facilities are a type of industrial warehouse. Various sectional dimensions can be found in steel structures such as warehouses, beams, and columns. The steel-framed structure might be built to suit the requirements for multiple bays next to each other. The horizontal and vertical bracings are suitably installed on the structure. These bracings serve to reduce beam deflection or any other structural elements in significant amounts by providing suitable lateral load resistance companies as a result of shifting loads Sheeting, supporting trusses, and purlins on the roofs are all supported by the columns. The function of warehouses throughout the industrial revolution was to store goods. changed and grew more specialised. Over the years, warehouses have changed to accommodate Supply chain system changes, standardisation, mechanisation, technological innovation. In civilizations where commerce had reached critical mass, needing storage at some point during the exchange operation, warehouses were necessary. A warehouse used for storing, lifting, and protecting commodities, importers, exporters, and supplies is known as an industrial warehouse. Single-story steel structures make up the majority of industrial warehouses. Steel is a strong-to-lightweight material. Brick masonry, concrete walls, or GI sheeting may surround these structures. In most industrial structures, bays are used frames that span the breadth direction to achieve the desired length, several similar frames are placed at appropriate spacing. Bays may be built next to each other, depending on the requirements. Horizontal and vertical bracings, as well as trusses, are used to resist wind and other lateral loads in single and multi-story buildings. Crane surge causes a differential in deflection between several frames in industrial structures, which is reduced by these bracings. They help reduce buckling by providing lateral support to columns in both small and large structures. For industrial buildings, a standard structural roof system consists of sheeting, purlins, and supporting roof trusses supported on columns. Top Chord, Bottom Chord, and Web Member are all members of Truss.

WAREHOUSE

A warehouse is a structure that stores products. Manufacturers, importers, exporters, customs, shipping firms, wholesalers, and other businesses all use warehouses. They're often large, simple constructions on the edges of cities, towns, or villages.

1.1 TYPES OF WRAEHOUSE

The most common kind of storage is the warehouse. Some warehouses are huge structures that can concurrently unload a large number of inbound trucks and railroad waggons loaded with suppliers' merchandise while stacking many vehicles for consumer delivery.

1.1.1 PUBLIC WAREHOUSE

Essentially, the public warehouse rented space for short-term distribution needs. If their facilities are full or if they are making a special trip, substantial purchase of merchandise, retailers who manage their own private warehouse may periodically need extra storage space. Retailers, for example, may order additional inventory to preparation for in-store sales or a big quantity of products provided at a cheap promotional price by the supplier.

1.1.2 PRIVARE WAREHOUSE

Channel suppliers and resellers own and run this kind of warehouse, which they employ for their own distribution. A major retailer, for example, may have multiple regional warehouses that supply stores, or a wholesaler may own a warehouse where it receives and distributes items.

1.1.3 AUTOMATED WAREHOUSE

Because of advancements in computer and robotics technology, many warehouses now have automated systems. The level of automation varies from a tiny conveyor belt conveying products in a small area to a completely automated facility where only a few employees are needed to manage thousands of pounds or kilograms of storage of goods. In reality, practically all physical distribution activities in many warehouses are handled by machines, including moving merchandise filled pallets throughout buildings that are several stories tall and the length of two or more football fields. The usage of warehouse robot technology, in which small robots assist with product moving, is the newest trend in warehouse automation.

1.1.5 CLIMATE CONTROL WAREHOUSE

Warehouses store a variety of products, including some that require special care, such as frozen products in freezers, delicate products in humidity-controlled environments, and highly sensitive computer products in dirt-free facilities.

1.1.6 DISTRIBUTION CENTER

Product storage is considered a temporary activity in these areas. These warehouses are the hub of the distribution system, where products are obtained from various suppliers and distributed quickly to a large number of customers. In some cases, such as perishable food distribution centres, most goods arrive early in the morning and are delivered at the end of the day.

1.2 DESIGN TYPES OF WAREHOUSES

1.2.1 CONVENTIONAL STEEL BUILDING (CSB)

Building components that are constructed in a shop before being brought to the construction site are referred to be prefabricated. Smaller steel constructions are often prefabricated or easy enough for anybody to construct. Prefabrication has the advantages of being less expensive and more ecologically friendly than traditional processes. To enable appropriate and safe assembly of the larger steel buildings, professional construction workers, such as ironworkers, are required.

Fig 1.1 Conventional steel building

1.2.2 CONVENTIONAL STRUCTURE WITH PIPE AND TUBE SECTIONS

The economy of an industrial building is determined by the structure's configuration, the type of roof truss and portal frame used, the forces operating on the building, and the steel sections required based on the force applied. There are two types of steel sections: conventional steel sections (channel, angle, rolled, etc.) and hollow steel sections (square hollow section, rectangular hollow section, circular hollow section). The current project entails constructing roof truss components for an industrial building using conventional steel sections and tubular steel sections (circular hollow section), as well as selecting the most appropriate section based on its benefits and drawbacks.

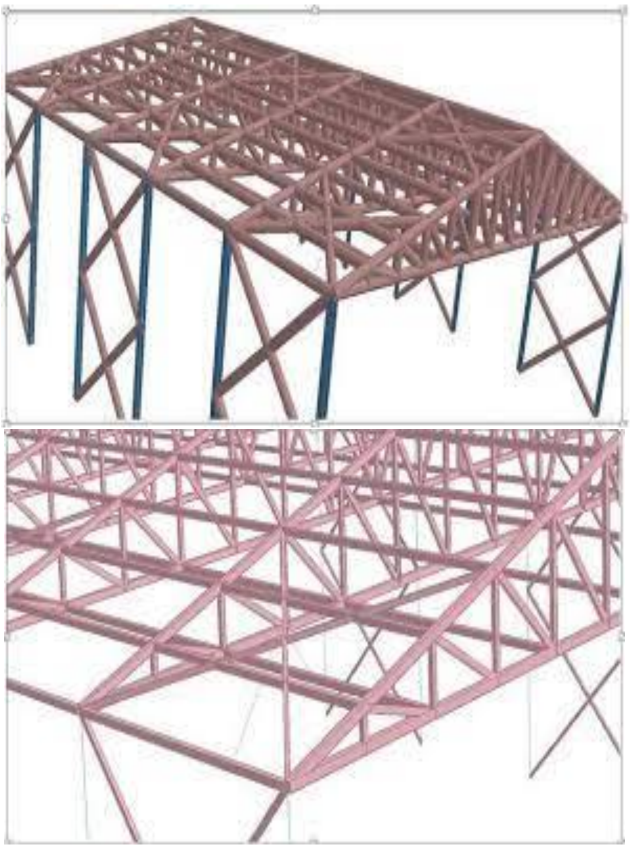


Fig 1.2 Conventional structure with pipe and tube section

1.3 GENERAL

In most industrial structures, bays have frames that span the width direction. To achieve the desired length, several similar frames are placed at appropriate spacing. Several bays may be built next to each other, depending on the requirements. Horizontal and vertical bracings are used to withstand wind and other lateral loads in single and multi-story buildings, as well as trusses. These bracings reduce the difference in deflection between the multiple frames in industrial structures caused by crane surge. They also give lateral support to columns in small and large buildings, which improves buckling resistance. For industrial buildings, a standard structural roof system consists of sheeting, purlins, and supporting roof trusses supported on columns. Top chord, Bottom chord, and Web member are all members of Truss.

1.4 HISTORY OF WRAEHOUSE

A warehouse is a structure used to store large quantities of supplies or goods for commercial purposes. Many factors influence the built form of warehouse facilities across time, including materials, technology, locations, and cultures.

A warehouse is required when there are large numbers of products that cannot be stored in a household storage. However, as evidenced by legislation relating to the imposition of customs, some mediaeval merchants in Europe housed their products in huge household storerooms, generally on the ground floor of cellars.

Dedicated warehouses have been built near ports and other commercial hubs since the Middle Ages to promote large-scale trade. The trading harbor of Bryggen in Bergen, Norway, has warehouses with typical European gabled timber forms originating from the late Middle Ages, albeit following big fires in 1702 and 1955, what is left was mostly rebuilt in the same traditional manner.

The purpose of warehouses evolved and became increasingly specialized during the industrial revolution. Warehouses have responded to standardization, mechanization, technological innovation, and changes in supply chain systems throughout the last few decades.

The industrial revolution of the 18^{th} and 19^{th} centuries encouraged the building of larger and more specialized warehouses, which were typically positioned near transportation centers on canals, railways, and portside. The factory system, which emerged in British textile mills and potteries in the mid-late 1700s, is characterized by task specialization. Work was sped up and labor was deskilled in factories, giving new opportunities. capital investment to profit

The shape of warehouses and the labor done inside them were transformed by technological developments in the early nineteenth century, such as cast-iron columns and subsequently, molded steel supports, saw tooth roofs, and steam power. All were immediately embraced and were in widespread usage by the mid-nineteenth century.

1. Strong, thin cast iron columns began to replace masonry piers or timber supports to carry floors above the ground floor. Steel framing's strength and constructability permitted the construction of the first skyscrapers in the late 1800s. Steel girders replaced timber beams, allowing the warehouse's internal bays to spread further.

2. The saw-tooth roof allowed natural light into the warehouse's top story. It changed the warehouse's shape from rectangular to circular. The classic peaked hip or gable to essentially flat roof was frequently covered by a parapet. Warehouse structures are becoming increasingly horizontal. The vertical glass pans of each saw-tooth on the top floor provided natural lighting over displayed goods, which improved customer scrutiny.

3. Steam-powered hoists and cranes increased the capacity of manual labor to lift and move big goods.

1.5 LOADS AND LOAD COMBINATION

1.5.1 DEAD LOAD

According to IS:875(Part I)- 1987; the structure's self-weight is called dead load, weight of roofing, G.I. sheets, gantry girder, crane girder, purlins, sag rods, bracing and other accessories

1.5.2 LIVE LOAD

According to IS:875 (Part II)- 1987; for the roof with no access provided the live load can be taken as 2 KN/m^2

1.5.3 WIND LOAD

Wind load is calculated as per IS:875 (Part III)-1987; the basic wind speed for the location of the warehouse is 47m/s.

1.5.4 SEISMIC LOAD

As per IS:1893-2002, Seismic loading, or the application of a seismic oscillation to a structure, is one of the fundamental ideas of earthquake engineering. It occurs at a structure's ground or neighbouring structure contact surfaces.

1.5.5 LOAD COMBINATION

According to IS 875 (Part V) – 1987; this IS code is used for deciding load combinations.

1.5.6 IS CODE

- IS 875-1987 for load and load combination
- IS 1893-2002 for seismic load
- IS 800-2007 for steel design

1.6 SCOPE

Raw material purchases are an important aspect of any business. The raw materials must be kept in a secure environment thus warehouses are built to meet this demand. The increasing rise of industrialization will necessitate the construction of cost-effective warehouses in the future. The design will be used for storage, manufacturing, and a motor garage, among other things.

1.7 OBJECTIVE

- To analyze the various Loads acting on the structure.
- To analyze different Load combination as per the code.
- To analyze the Industrial Warehouse as per its details.

CHAPTER 2

LITERATURE STUDY

This section examines the literature review on industrial warehouse design.

A. Jayaraman, by comparing LSM and WSM, this paper examines the behaviour and economics of roof trusses and channel section purlins.

Subhrakant Mohakul, constructed an industrial warehouse and investigated the behaviour of members as a result of connecting joint failure.

M. Suneetha, did numerical research and found that while the weight of a single Truss using Angle and Pipe is less than that of PEB, the weight of a Steel Truss Building is higher due to the weight of Channel Purlin**.**

C.M. Meera, analysed the design frames utilising structural analysis and design software STAAD PRO to compare Pre-Engineered Buildings (PEB) and Conventional Steel Buildings (CSB).

Shaiv Parikh, the relevance of compression members is highlighted, and a brief discussion of the features and behaviour of steel compression members is provided.

Manan D. Maisuri said that the total steel required for warehouse can be decreased by choosing the right truss shape and using hollow steel sections instead of conventional steel sections. As a result, tube portions are the most cost-effective.

Shankaranand SH, Rahul Patange, Megha SP, Deepa CK, Renuka GM, the amount of steel required is determined by the major members and purlins. As frame spacing grew, primary member steel consumption fell, while secondary member steel consumption increased. Industrial buildings can be divided into two categories: standard and exceptional. Common industrial structures are shed-style buildings with rudimentary roof structures on open frames. These structures can be used for workshops, warehouses, and other purposes. These buildings necessitate a large, open area free of columns. The entire process was carried out in accordance with Indian laws. An industrial warehouse can be built using a simple design technique.

Apurv Rajendra Thorat, Santosh K. Patil, this research will confirm IS: 875-1987 for dead loads and wind loads. considered Structure's Self-Weight Purlin Weight, Wind Force in X Direction Negative Wind Pressure in X Direction, Negative Wind Pressure in Z Direction, Wind Force in Z Direction.

Srikant Boga, Ashok Kankuntla, Pradeep Dara, Praveen Mamdyal, the structure's configuration, the type of roof truss and portal frame utilised, the forces acting on the building, and the steel sections necessary based on the force applied are all factors that influence the building's economy. Steel sections are divided into two categories: traditional steel sections and hollow steel sections.

Shivani Mehar, Ruchita Nar, Sadichha Jagadale, Gautami Kalal, the structure's configuration, the type of roof truss and portal frame employed, the stresses acting on the building, and the steel sections all contribute to the building's economy. required based on the force applied. There are two types of steel sections: conventional steel sections and hollow steel sections.

Hemanthkumar.S. K, A.R. Pradeep, concluded that design of structural elements like principal rafter, column, column base and purlins etc. as per IS 800-2001. The steel sections adopted to the warehouse for the design of the structure for maximum loads, maximum bending moment, maximum shear force.

C. M. Meera, this work clearly communicates that PEB structures can be simply developed using simple design techniques that adhere to national standards. In light of the findings, it can be stated that PEB structures are superior to CSB structures in terms of cost effectiveness, construction speed, and erection simplicity. The report also provides easy and cost-effective options for PEBS preliminary design concepts. The illustration aids in the comprehension of the PEB concept design approach.

Yu Zhang, Syed Abdul Rehman Khan, in today's supply chain management, warehouses are critical to meeting customers' needs in terms of delivery to the right client at the right time. In other words, warehouse operations have a direct impact on customer service levels, and organizations can enhance their overall performance and level of service by having efficient and effective warehouse operations. Effective and efficient warehouse operations, on the other hand, help companies build a positive image and reputation among their customers. In this post, we analyzed the dilemma of one distributor and offered a few ideas based on mathematical modelling, including re-designing the warehouse architecture to maximize warehouse space utilization and reduce customer order fulfilment process time.

Swapnil D. Bokade, Laxmikant Vairagade, Steel Truss Buildings employing pipe section and PEB are shown to be more cost effective than Steel Truss Buildings using angle section, as seen by the design. When compared to PEB, the Industrial Steel Truss Building is more cost effective due to good material selection. Design of warehouse and PEB for Multistory Buildings can be studied in the future. The crane load can be considered in the design of industrial buildings and PEBs.

Anisha T. Goswami, Shalaka Sharma, PEB is being used more frequently as a result of earlier advancements, although its use is not uniform across the building industry. In comparison to conventional-to-conventional buildings, PEB structures may be simply created using simple design techniques in accordance with country norms, are energy efficient, quick to construct, save money, are sustainable, and most importantly, are reliable. As a result, the PEB technique must be deployed and investigated for mire outcomes.

K. Prabin Kumar, D. Sunny Prakash, Indian code regulations were used to calculate the various loads occurring on the structure. After that, load combinations were created, and the foundation was designed based on the loads operating on the structure's base. The hanger was designed and the structure was analyzed manually and with the help of the STAAD.PRO program. The results revealed that the hanger designs were similar. Both methods produced deflection values that were less than the calculated allowed deflection. As a result, the structure is safe against deflection.

CHAPTER 3
METHODOLOGY

3.1 PLANNING AND DETAILING

In this project work, Staad Pro software is being used in order to analyse the Industrial warehouse as per the plan. It gives the bending moment, shear forces. The steps includes modelling the structure, applying properties, specification, loads and load combinations and analysing the structure. This software is a powerful and user-friendly tool for creating three-dimensional models.

Table no 3.1. Details of warehouse

TYPE OF STRUCTURE	**SINGLE STOREY INDUSTRIAL BUILDING (WAREHOUSE)**
Location of building	Chandigarh
Type of building	Steel building
Size of building	30m*60m
Area of building	1800 mtr^2
Eave height	6m
Type of truss	Double howe truss
Truss rise	2m
Bay spacing	7.5m
Roof slope	1:5
Number of bays	8

3.2 DEFINATION OF LOADS AND STANDARDS

3.2.1 INTRODUCTION

It is basic knowledge that structures should be designed to withstand damaging forces. To sustain the pressures induced by the loads, structures must be sturdy and rigid. As a result, knowing the expected loading conditions is critical. The allowed stress levels for design are determined by calculating the loads operating on a structure. The design of the building's joints, columns, and beams is determined by these values. Building loads are divided into two major types. lateral loads and gravity load Due to gravity, gravity loads pull vertically downwards, whereas lateral loads operate horizontally. As seen in the diagram, they have subcategories.

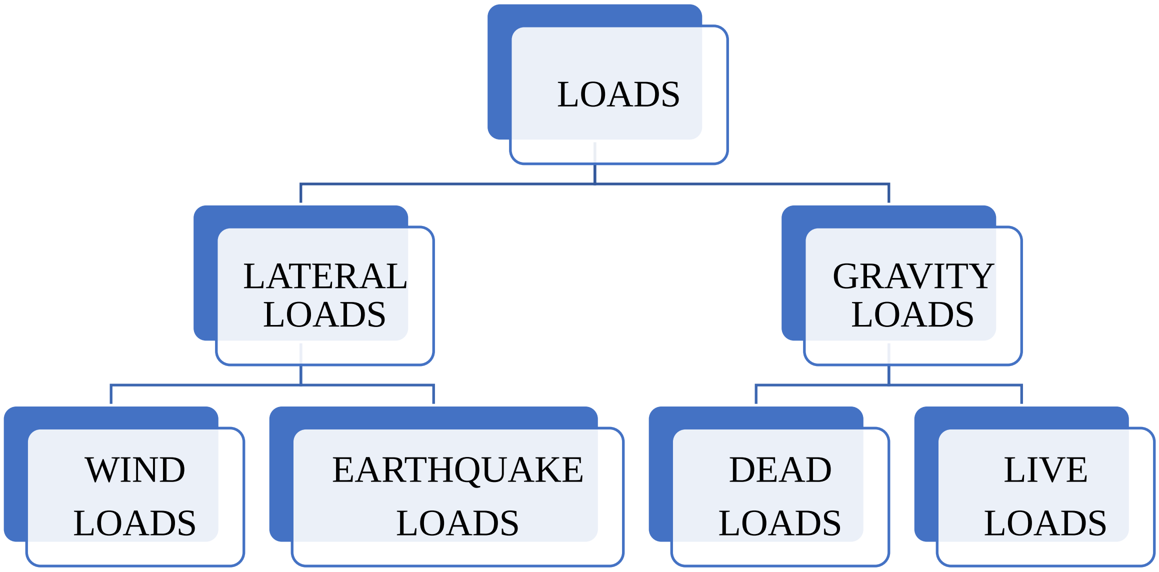


Fig 3.1 Classification of loads

These are the most common types of loads that affect a structure. They can act alone or in groups, as in many cases. Because not all structure parts receive direct forces, tracing the loads from one portion of the building to another is critical. Loads on a surface area are measured in Newtons per square metre (N/m2), whereas loads on linear elements like a beam are measured in Newtons per metre (N/m).

3.2.2 DEAD LOAD

This type of load, as the name implies, does not fluctuate over time and has a permanent effect on the structure. Dead loads are referred to as permanent actions in euro code requirements. According to the definition, "the self-weight of construction operations should be classified as a permanent fixed activity." Dead load also refers to structures that are permanently fixed, such as finishes. In most circumstances, the overall weight of a structure is not readily available. The total weight is also affected by structural changes. The weight is calculated using material parameters such as density and volume of individual elements of the structure.

3.2.3 LIVE LOAD

These loads change throughout time and are only attached to a structure temporarily. They are the effect of using and occupying the structure. Live loads can be caused by environmental or human interactions.

3.2.4 WIND LOAD

Wind blows horizontally across a structure, changing its size and direction over time. Wind pressure may cause the building to respond dynamically. As a result, fatigue strains, particularly on the foundation, may occur in some circumstances. Wind load effects on a structure are influenced by the following factors:

- The height above the ground; ground-level impediments diminish wind speed.
- The building's exposure to its surroundings; trees and other tall structures restrict wind speed.

Good foundation anchoring and the inclusion of stiffening elements are the primary ways to resist wind loads. Because lateral forces cause structures to move horizontally, the foundation is subjected to significant stresses. Braces and other stiffening devices aid in keeping columns in their original place.

3.2.5 EARTHQUAKE LOAD

An earthquake is a vibration that goes through the earth. Depending on the building's height, several forms of vibration are expected. The magnitude of an earthquake varies based on the location of a structure. The earthquake load creates dynamic loads on a building's foundation, causing shear and fatigue stresses as well as structural deformation. The structure must be able to endure some levels of movement at the base, according to the building's design.

The inertia force causes the structure to be damaged. The base of the building travels in one direction while the higher section moves in the opposite way, resulting in inertia force on the roof. The building's columns buckle as a result of this. That is the most basic way in which earthquake damage occurs. It is important that the columns are designed to withstand high buckling forces.

It is critical that the loads are precisely defined at the start. This is usually a major source of errors for the analysis. The loads' forces are calculated using simple hand calculations. The exact loads are also determined using standards.

3.3 STAAD PRO

Software used for analysis:

STAAD Pro has a cutting-edge user interface, visualisation capabilities, and powerful analysis and design engines that handle advanced finite element and dynamic analysis. STAAD Pro is the professional's option for steel, concrete, wood, aluminium, and cold-formed steel design of low and high-rise structures, culverts, petrochemical facilities, tunnels, bridges, piles, and much more, from model creation, analysis, and design through visualisation and result verification.

The following are the components of STAAD Pro: The STAAD Pro Graphical User Interface is used to create the model, which is subsequently analysed by the STAAD engine. The GUI can also be used to examine the results graphically after the analysis and design are completed. The STAAD design and analysis engine: As seen in the STAAD icon, it is a general-purpose structural analysis computation engine. To begin, we used STAAD Pro to answer some sample problems and used analysis calculations to ensure that the results were accurate. The outcomes were satisfactory and accurate. We calculated building loadings and included seismic and wind loads in the early stages of our project. The set of physical laws that make up structural analysis and mathematics, which are both necessary for studying and predicting the behaviour of structures. Structural analysis can be thought of in a broader sense as a way to influence the engineering design process or to show the soundness of a design without having to test it first-hand.

A structural engineer must determine geometry, support conditions, structural load and material properties in order to execute an accurate analysis. Support responses, strains, and displacements are common outcomes of such an investigation. This information is then compared to criteria that identify failure circumstances. Dynamic response, stability, and nonlinear behaviour can all be studied using advanced structural analysis. The goal of analysis is to achieve a reasonable chance that the structures under consideration will work satisfactorily for the duration of their intended lives. They should be able to withstand all of the regular stresses and deformations during construction and usage, as well as have suitable durability and resilience to seismic and wind effects.

Accepted theories, experiment, and experience, as well as the requirement to analyse for durability, should all be considered. The entire analysis, including durability, structure, and use in service, should be addressed. Compliance with well specified standards for materials, manufacture, workmanship, as well as maintenance and use of the structure in service is required to achieve design objectives. The building's analysis is based on the minimum specifications set forth in the Indian Standard Codes.

The minimum structural safety standards for buildings are addressed by determining minimal analysis loads for dead loads, imposed loads, and other external loads that the structure must withstand. The rigorous adherence to the loading standards established in this code is expected to ensure not only the structural safety of the structures under construction.

3.4 MODELLING

Warehouse modelling is the process of designing the warehouse as per IS codes and summarized information of the warehouse. The modelling of warehouse is done by the following procedure: -

3.4.1 SKELETON DIAGRAM OF WAREHOUSE

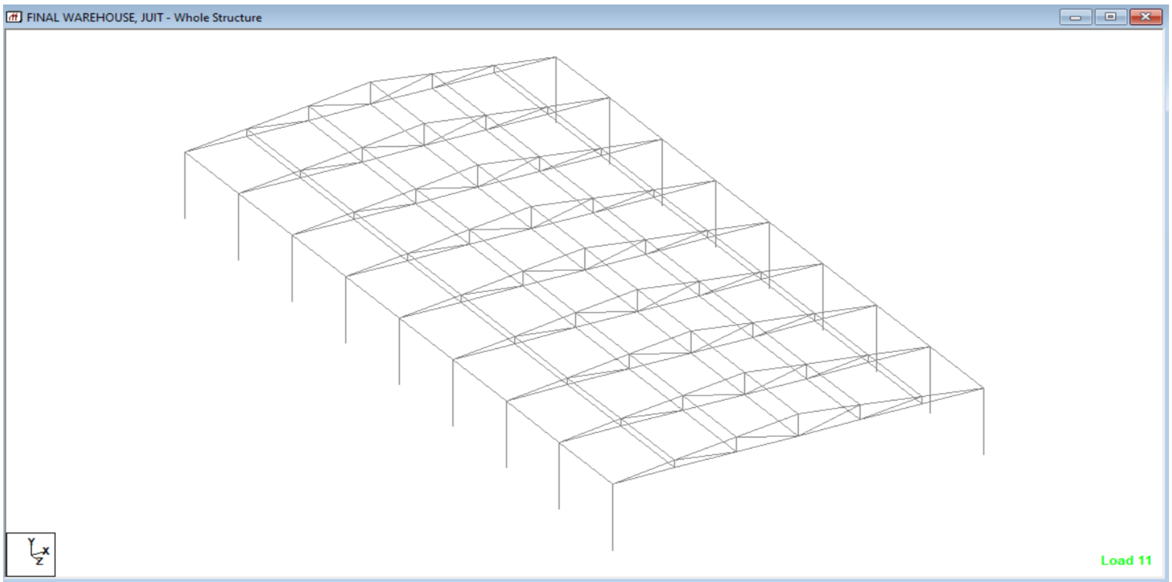


Fig 3.2 Skeleton diagram of warehouse

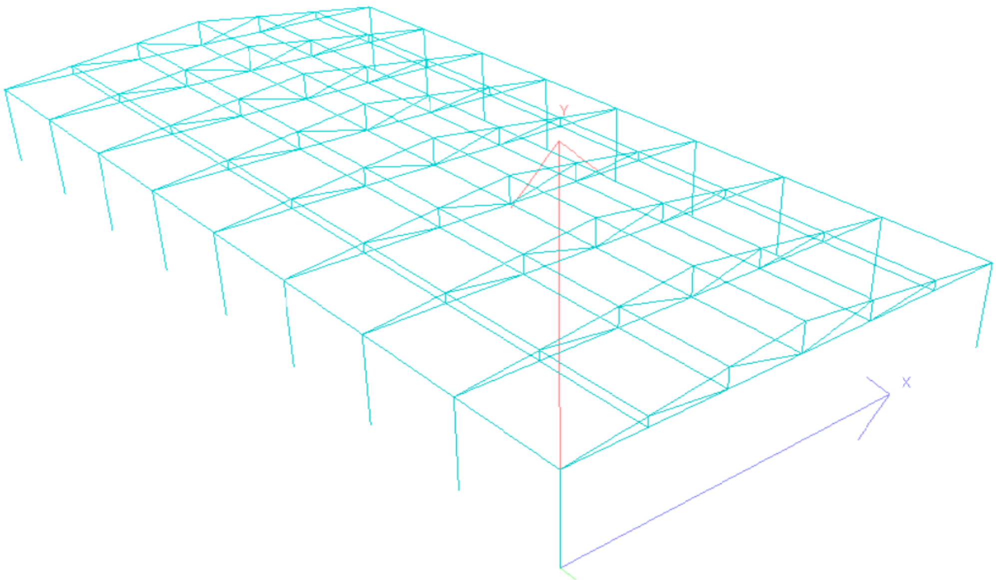


Fig 3.3 3D view diagram of warehouse

3.4.2 ASSIGNING SUPPORTS TO COLUMN

In this warehouse model fixed support is assigned to each column by using support command.

Here for warehouse model Fixed Support is used. Fixed support is the most rigid type of support. It restricts the translation and rotational movement of member (i.e., member cannot move in any direction). The fixed support provides all the necessary constraints to ensure the structure is static. Below fig. shows the fixed support assigned to the warehouse.

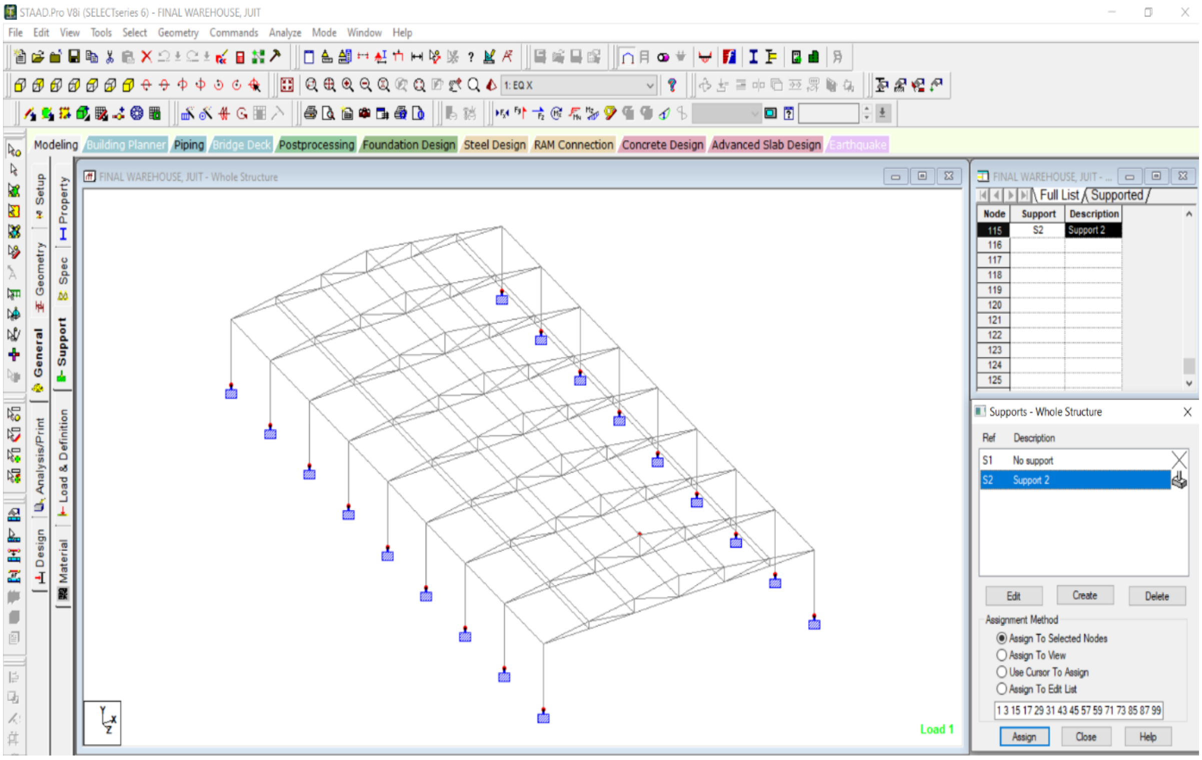


Fig 3.4 Assigned support

3.4.3 ASSIGNING PROPERTY TO MEMBERS

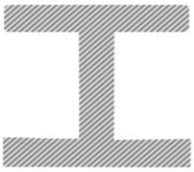
Properties are assigned to each member of the warehouse by using property command.

Here four types of steel section are defined for column, rafter, purlin and extreme diagonals.

3.4.3.1 ASSIGNING PROPERTY TO COLUMN

R1 represent the property assigned to column i.e., **ISHB400**

ISHB 400 (Indian Standard High Weight Beam)



Weight / meter	Weight / feet
77.40 kg/m	23.59152 kg/ft
170.63604 lbs/m	52.0104006 lbs/ft

PROPERTY	VALUE	PROPERTY	VALUE
Name	ISHB 400	Modulus of Section (Z_{xx})	1404.20 cm^3
Common Name	Indian Standard High Weight Beam 400	Modulus of Section (Z_{yy})	218.30 cm^3
Weight per Meter (w)	77.40 Kg/m	Radius at Root (r_1)	14.00 mm
Sectional Area (a)	96.66 cm^2	Radius at Toe (r_2)	7.00 mm
Depth of Section (h)	400 mm	Slope of Flange (D)	94.00 degrees
Width of Flange (b)	250 mm	Connection (h_1)	340.10 mm
Thickness of Flange (t_f)	12.70 mm	Connection (h_2)	29.90 mm
Thickness of Web (t_w)	9.10 mm	Connection (b_1)	120.45 mm
Moment of Inertia (I_{xx})	2083.50 cm^4	Connection (c)	6.05 mm
Moment of Inertia (I_{yy})	2728.30 cm^4	Connection (g)	140 mm
Radius of Gyration (r_{xx})	16.87 cm	Connection (g_l min)	65 mm
Radius of Gyration (r_{yy})	5.26 cm	Max Size of Flange Rivet	32 mm

Fig. 3.5 Properties of ISHB400

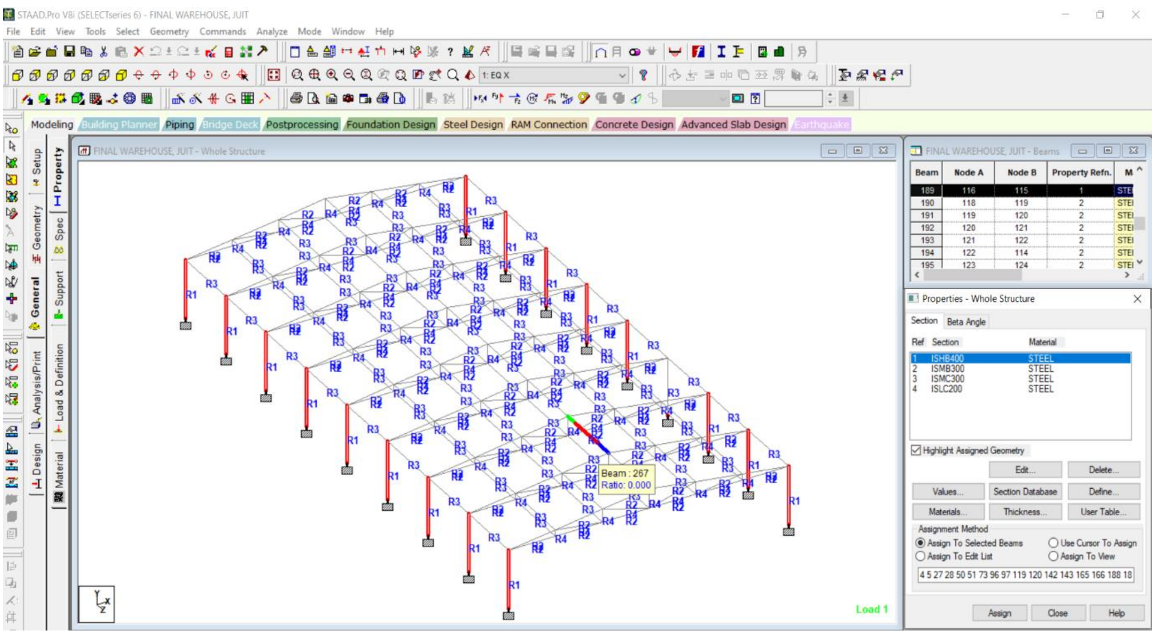


Fig. 3.6 Assigned Properties for Column (R1)

3.4.3.2 ASSIGNING PROPERTY TO RAFTER

R2 represent the property assigned to rafter i.e., **ISMB300**

ISMB 300 (Indian Standard Medium Weight Beam)

Weight / meter	Weight / feet
44.20 kg/m	13.47216 kg/ft
97.44332 lbs/m	29.7010298 lbs/ft

PROPERTY	VALUE	PROPERTY	VALUE
Name	ISMB 300	Modulus of Section (Z_{xx})	573.60 cm^3
Common Name	Indian Standard Medium Weight Beam 300	Modulus of Section (Z_{yy})	64.80 cm^3
Weight per Meter (w)	44.20 Kg/m	Radius at Root (r_1)	14.00 mm
Sectional Area (a)	56.26 cm^2	Radius at Toe (r_2)	7.00 mm
Depth of Section (h)	300 mm	Slope of Flange (D)	98.00 degrees
Width of Flange (b)	140 mm	Connection (h_1)	241.50 mm
Thickness of Flange (t_f)	12.40 mm	Connection (h_2)	29.25 mm
Thickness of Web (t_w)	7.50 mm	Connection (b_1)	66.25 mm
Moment of Inertia (I_{xx})	8603.60 cm^4	Connection (c)	5.25 mm
Moment of Inertia (I_{yy})	453.90 cm^4	Connection (g)	80 mm
Radius of Gyration (r_{xx})	12.37 cm	Connection (g_l min)	65 mm
Radius of Gyration (r_{yy})	2.84 cm	Max Size of Flange Rivet	22 mm

Fig. 3.7 Properties of ISMB300

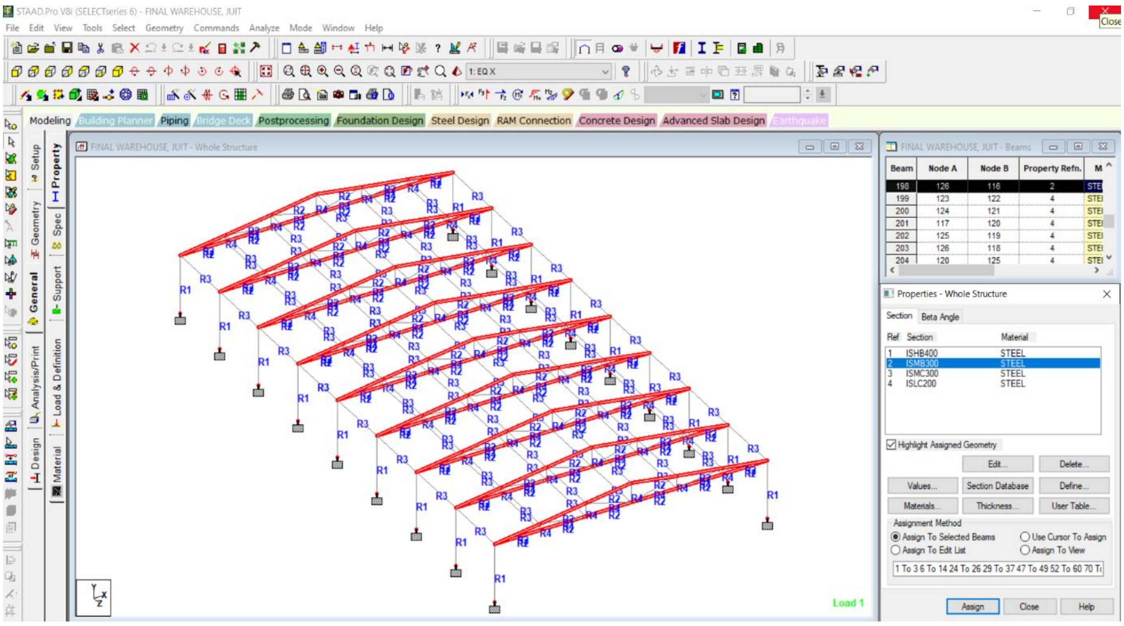
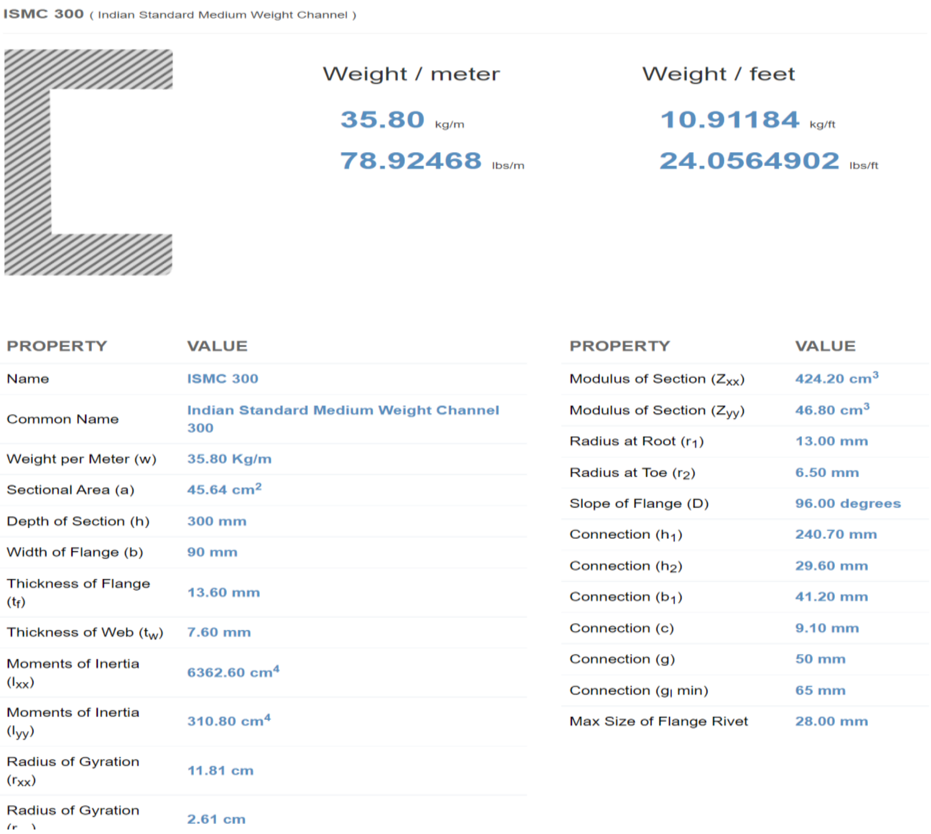


Fig 3.8 Assigned Properties of Rafter (R2)

3.4.3.3 ASSIGNING PROPERTY TO PURLINS

R3 represent the property assigned to purlins i.e., **ISMC300**



ISMC 300 (Indian Standard Medium Weight Channel)

	Weight / meter	Weight / feet
	35.80 kg/m	10.91184 kg/ft
	78.92468 lbs/m	24.0564902 lbs/ft

PROPERTY	VALUE
Name	ISMC 300
Common Name	Indian Standard Medium Weight Channel 300
Weight per Meter (w)	35.80 Kg/m
Sectional Area (a)	45.64 cm^2
Depth of Section (h)	300 mm
Width of Flange (b)	90 mm
Thickness of Flange (t_f)	13.60 mm
Thickness of Web (t_w)	7.60 mm
Moments of Inertia (I_{xx})	6362.60 cm^4
Moments of Inertia (I_{yy})	310.80 cm^4
Radius of Gyration (r_{xx})	11.81 cm
Radius of Gyration	2.61 cm

PROPERTY	VALUE
Modulus of Section (Z_{xx})	424.20 cm^3
Modulus of Section (Z_{yy})	46.80 cm^3
Radius at Root (r_1)	13.00 mm
Radius at Toe (r_2)	6.50 mm
Slope of Flange (D)	96.00 degrees
Connection (h_1)	240.70 mm
Connection (h_2)	29.60 mm
Connection (b_1)	41.20 mm
Connection (c)	9.10 mm
Connection (g)	50 mm
Connection (g_l min)	65 mm
Max Size of Flange Rivet	28.00 mm

Fig. 3.9 Properties of ISMC300

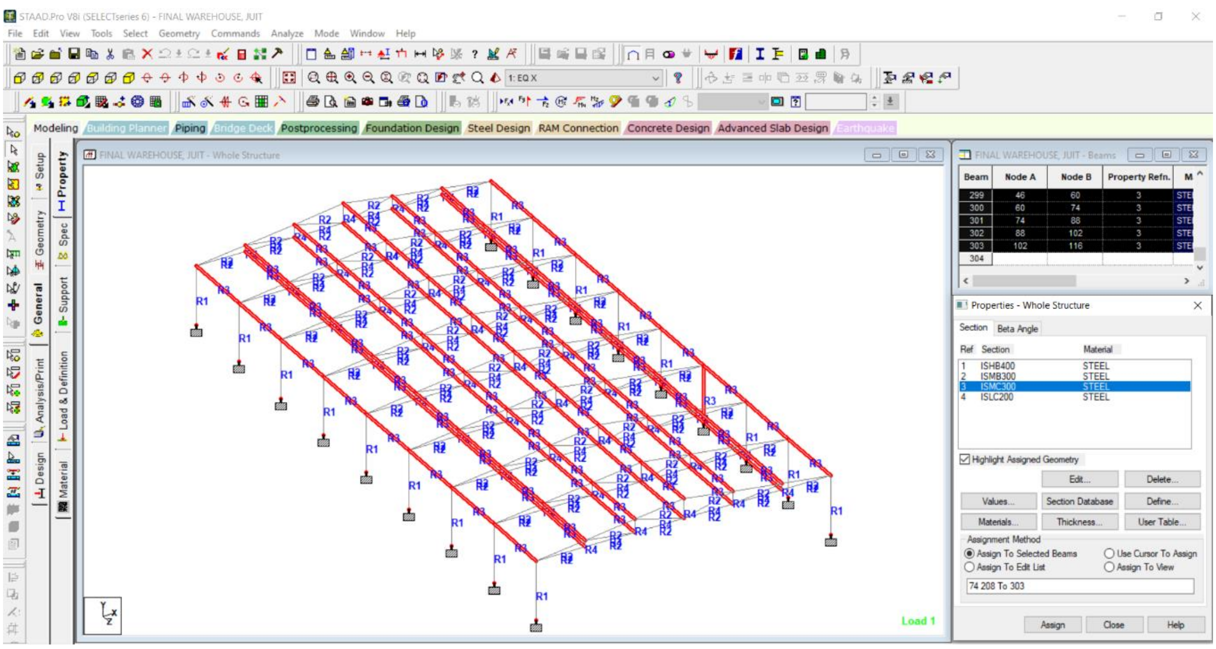


Fig 3.10 Assigned Properties of Purlin (R3)

3.4.3.4 ASSIGNING PROPERTY TO EXTREME DIAGONALS

R4 represents the property assigned to extreme diagonals i.e., **ISLC200**

ISLC 200 (Indian Standard Low Weight Channel)

Weight / meter	Weight / feet
20.60 kg/m	6.27888 kg/ft
45.41476 lbs/m	13.8425614 lbs/ft

PROPERTY	VALUE	PROPERTY	VALUE
Name	ISLC 200	Modulus of Section (Z_{xx})	172.60 cm^3
Common Name	Indian Standard Low Weight Channel 200	Modulus of Section (Z_{yy})	28.50 cm^3
Weight per Meter (w)	20.60 Kg/m	Radius at Root (r_1)	8.50 mm
Sectional Area (a)	26.22 cm^2	Radius at Toe (r_2)	4.50 mm
Depth of Section (h)	200 mm	Slope of Flange (D)	91.50 degrees
Width of Flange (b)	75 mm	Connection (h_1)	160.00 mm
Thickness of Flange (t_f)	10.80 mm	Connection (h_2)	20.00 mm
Thickness of Web (t_w)	5.50 mm	Connection (b_1)	34.80 mm
Moments of Inertia (I_{xx})	1725.50 cm^4	Connection (c)	7.00 mm
Moments of Inertia (I_{yy})	146.90 cm^4	Connection (g)	40 mm
Radius of Gyration (r_{xx})	8.11 cm	Connection (g_l min)	55 mm
Radius of Gyration (r_{yy})	2.37 cm	Max Size of Flange Rivet	25.00 mm
Centre of Gravity (C_{yy})	2.35 mm		

Fig. 3.11 Properties of ISLC200

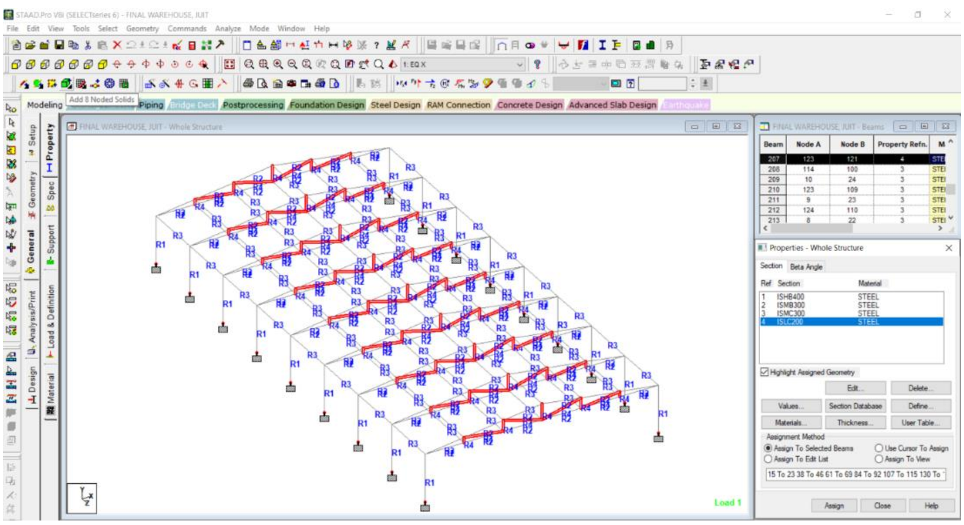


Fig. 3.12 Assigned Properties of Extreme Diagonals (R4)

After assigning all the properties of each member, 3D view of the warehouse is observed using 3D Render view command. Here we can see the actual shape of I sections used for Columns, Rafters, Purlins and…… in partial realistically and modelling of warehouse will done.

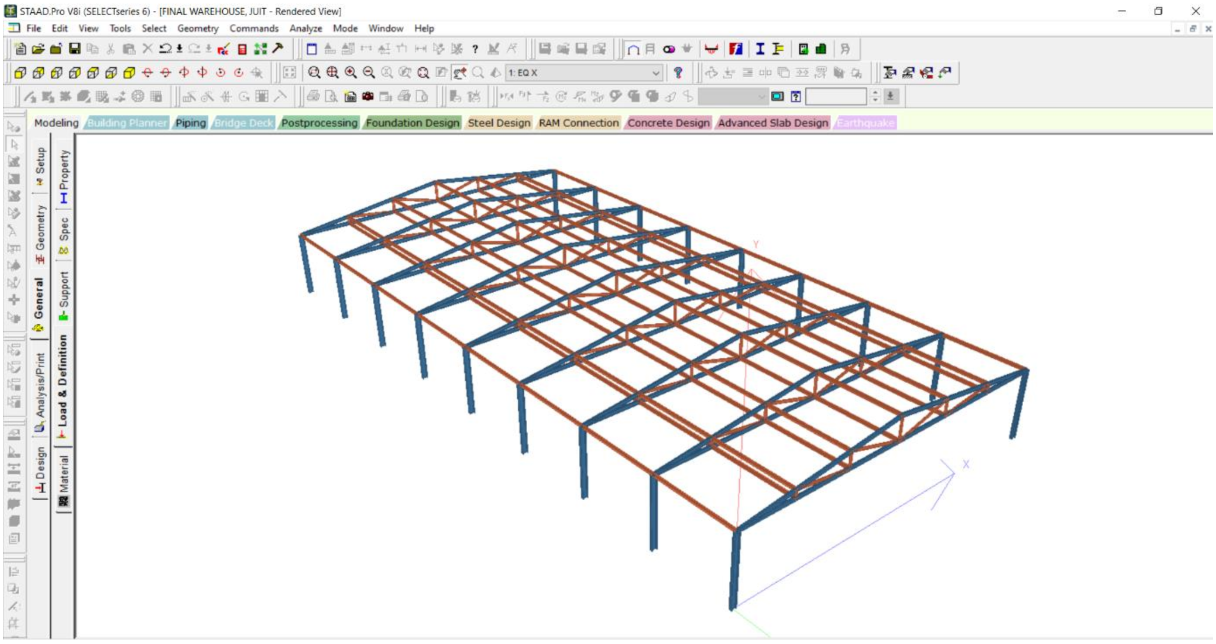


Fig. 3.13 3D Model of Industrial Warehouse

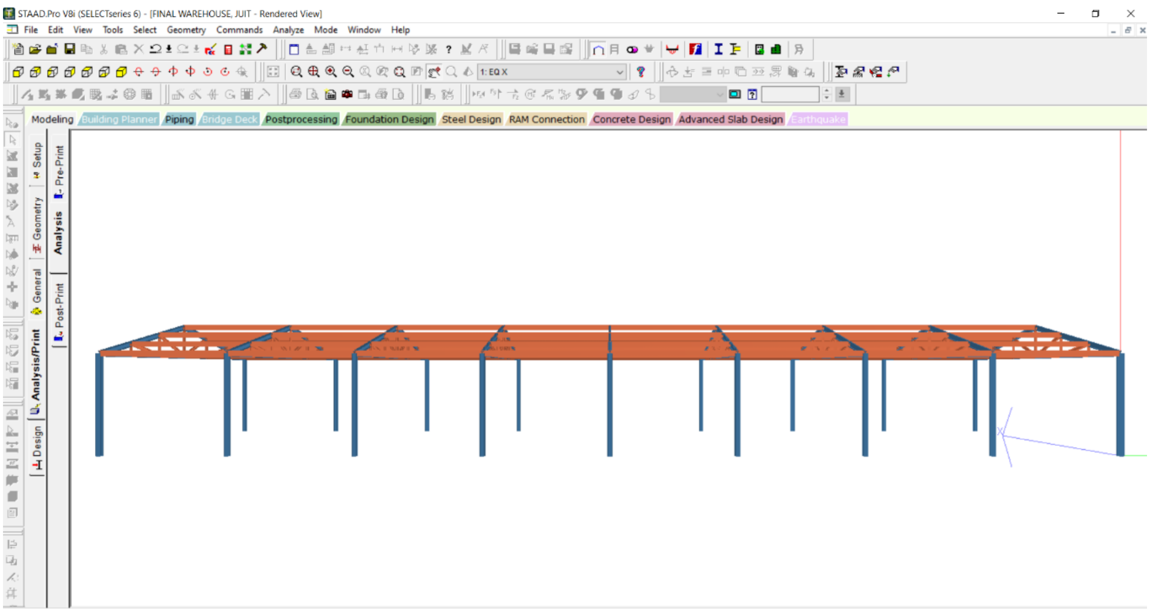


Fig. 3.14 Side view of Industrial Warehouse

3.5 ANALYSIS OF WAREHOUSE

1. For the analysis of warehouse, we need to define load for each member.
2. By using the load and definition command we can assign the loads respectively.

3.5.1 LOADS ASSIGNED DURING THE ANALYSIS OF WAREHOUSE

3.5.1.1 DEAD LOAD (DL)

The dead load on roof trusses in single-story industrial buildings is made up of cladding and purlin dead loads, self-weight of the trusses, and the weight of bracings, among other things.

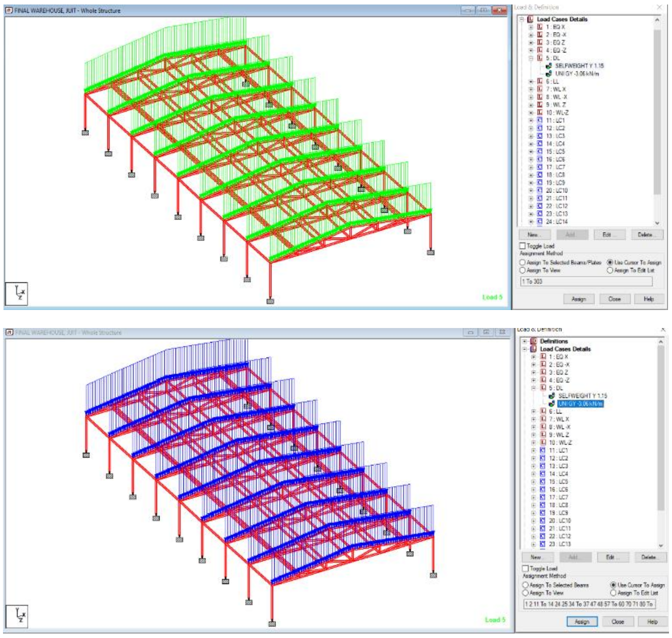


Fig 3.15 Assigned Dead Load

3.5.1.2 LIVE LOAD (LL)

The live load on roof trusses consists of the gravitational load due to erection and servicing as well as dust load etc. and the intensity is taken as per IS:875-1987. Additional special live loads such as snow loads in very cold climates, crane live loads in trusses supporting monorails may have to be considered.

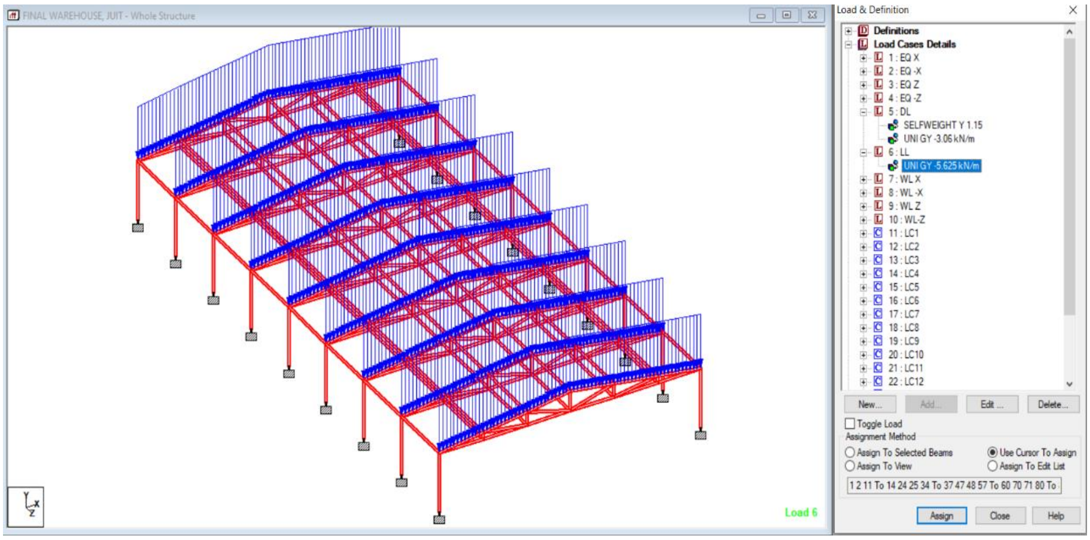


Fig 3.16 Assigned Live Load

3.5.1.3 WIND LOAD (WL)

Unless the roof slope is very steep, the wind load on the roof trusses is normally an uplift force perpendicular to the roof due to the suction action of the wind blowing over the roof. As a result, the wind load on roof trusses normally works in the opposite direction of gravity loads, and its magnitude might be greater than gravity loads, forcing truss member forces to reverse. The wind load is computed according to **IS:875 Part3**.

- Building classification category: As per IS code building classification category is taken as Category 2 for warehouse
- Wind speed: As per **IS:875 (Appendix A, Clause 5.2)** the basic wind speed for Chandigarh is taken as 47m/s**.**
- Exposure category: As per IS code for building or structure with mean roof height less than 9.1m, for such cases exposure category is taken as Exposure B.
- Structure type: As per IS code here structure type is taken as Building structure.

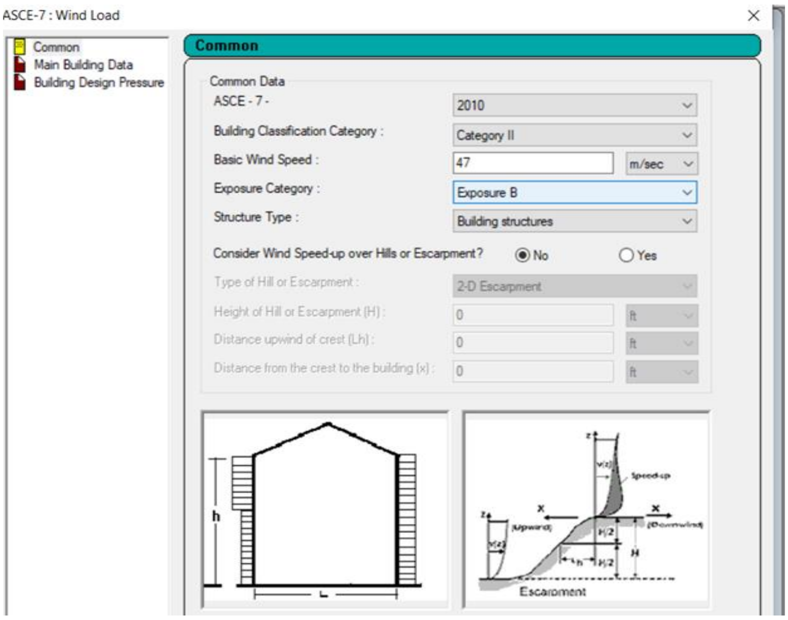


Fig 3.17 Assigning Wind Load

Staad pro software auto generate wind intensity at the different heights of the warehouse and these intensities are as given below

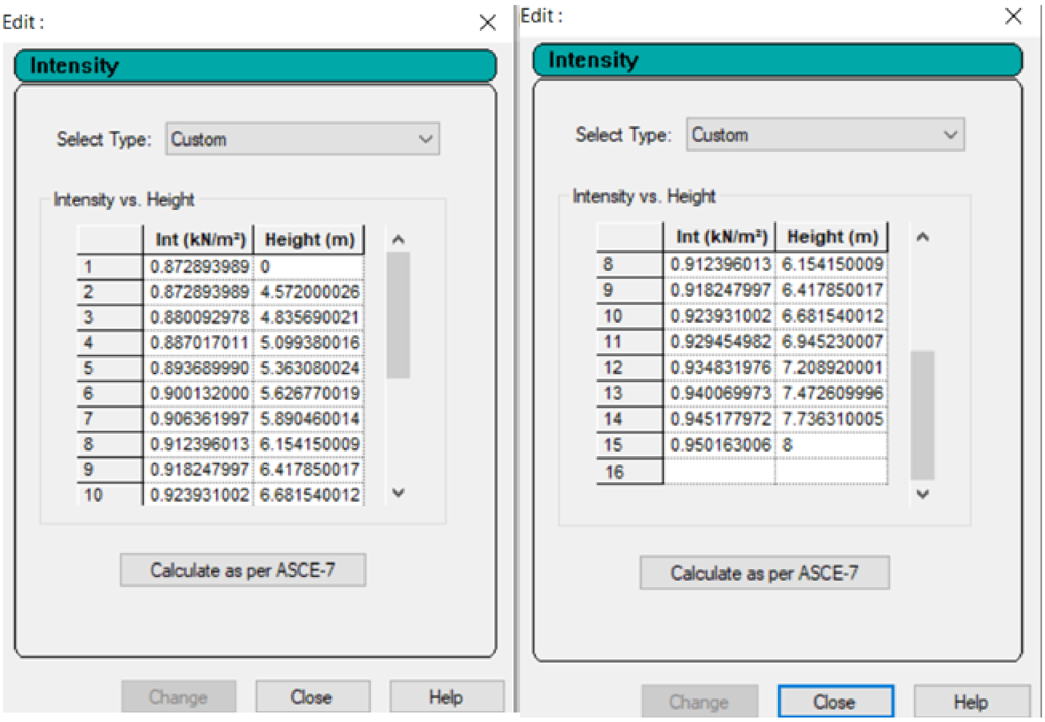


Fig 3.18 Wind Intensity

For warehouse analysis four wind load cases has been defined WL X, WL -X, WL Z, WL -Z

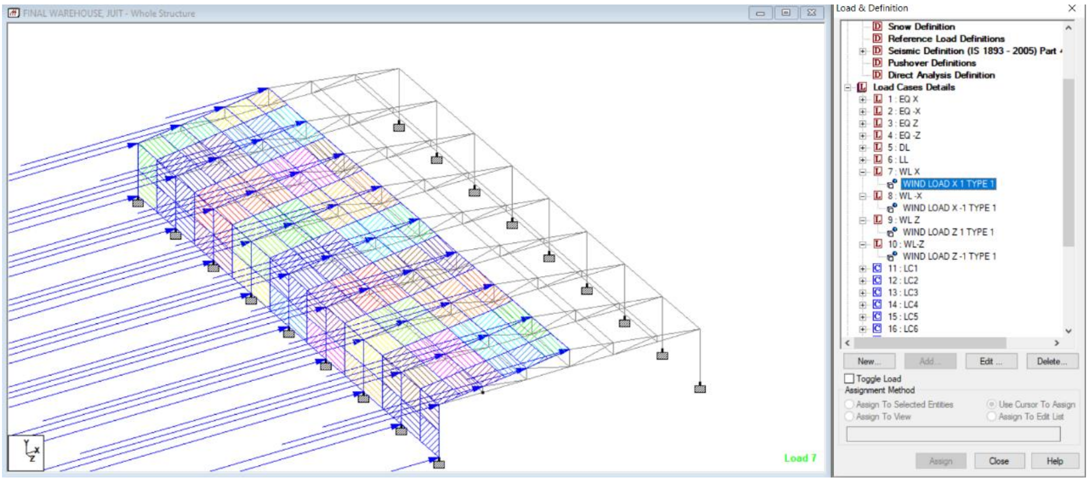


Fig 3.19 Assigned Wind Load in X Direction

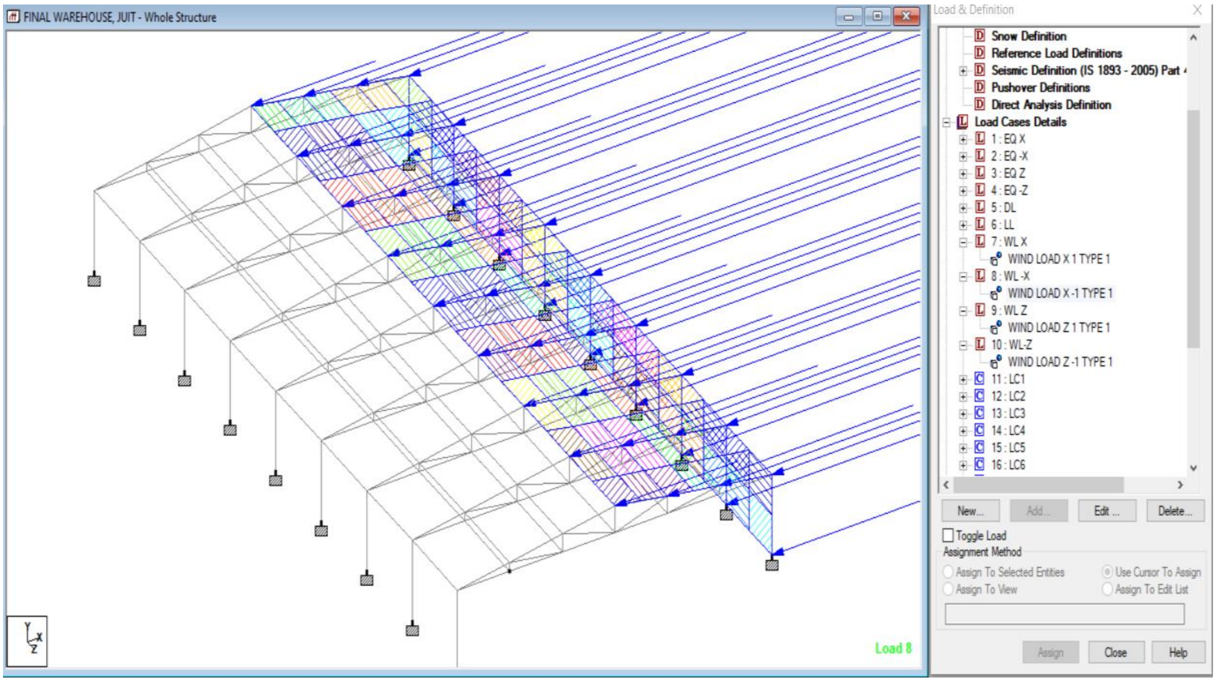


Fig 3.20 Assigned Wind Load in -X Direction

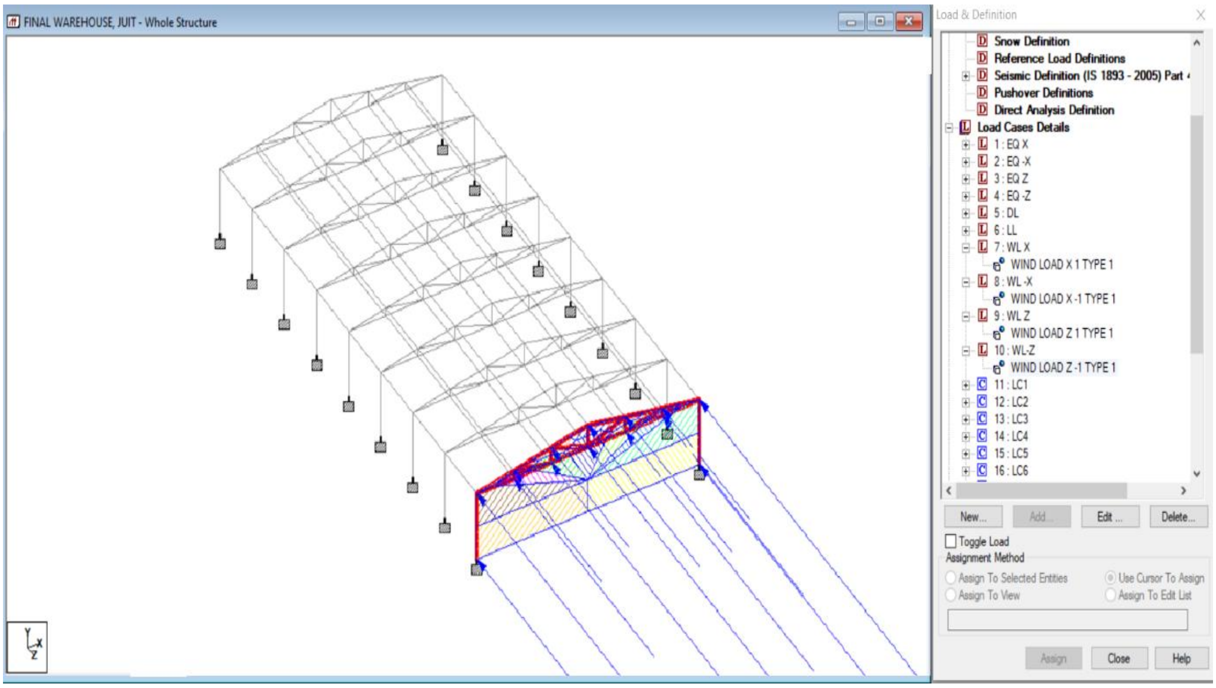


Fig 3.21 Assigned Wind Load in Z Direction

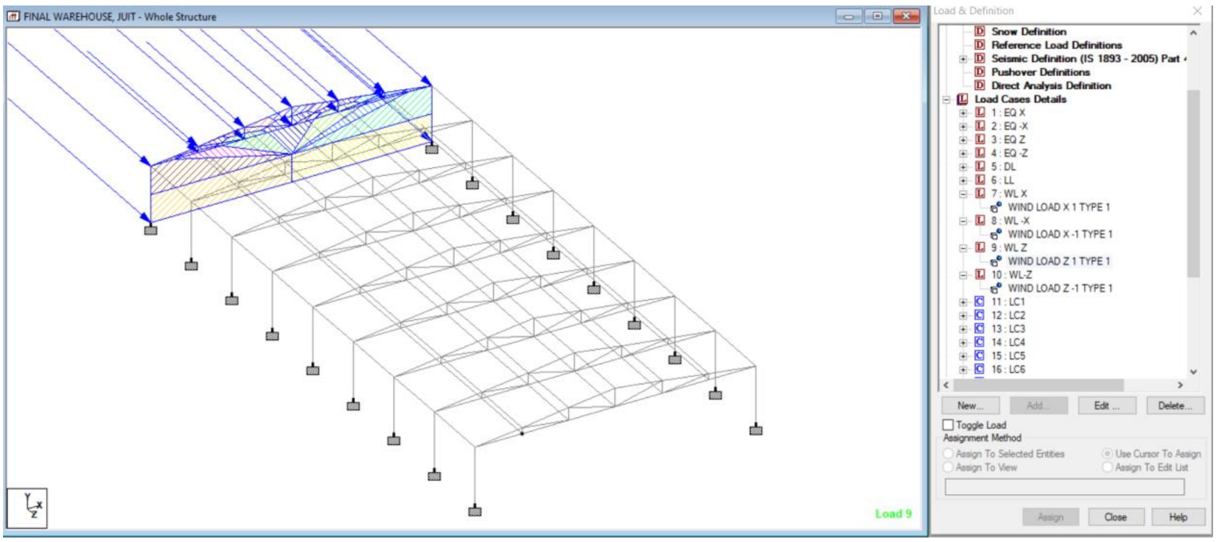


Fig 3.22 Assigned Wind Load in -Z Direction

3.5.1.4 SEISMIC LOAD

As per IS:1893-2002, Seismic loading, or the application of a seismic oscillation to a structure, is one of the fundamental ideas in earthquake engineering. It occurs at a structure's contact surfaces with the ground or with nearby structures. Seismic analysis is a branch of structural analysis that involves calculating a building's seismic responses. As per **IS 1893-2002:**

- Zone: As per IS code 1893 (Clause 6.4.2), Chandigarh comes in zone 4 with severe seismic intensity and here value of Z is taken as 0.24.
- Response reduction factor (RF): As per IS code 1893 (Clause 7.2.6), Response reduction factor for warehouse is taken as 5.
- Importance Factor (I): As per IS code 1893 (Clause 6.4.2), for warehouses importance factor is taken as 1.5.
- Rock and soil site factor (SS): As per IS code 1893, rock and soil factor are 2.
- Type of structure (ST): As per IS code 1893, type of structure is also 2.
- Damping ratio (DM): As per IS code 1893, damping ratio is 0.02.

For warehouse analysis four earthquake load cases has been defined EQ X, EQ -X, EQ Z,

EQ -Z.

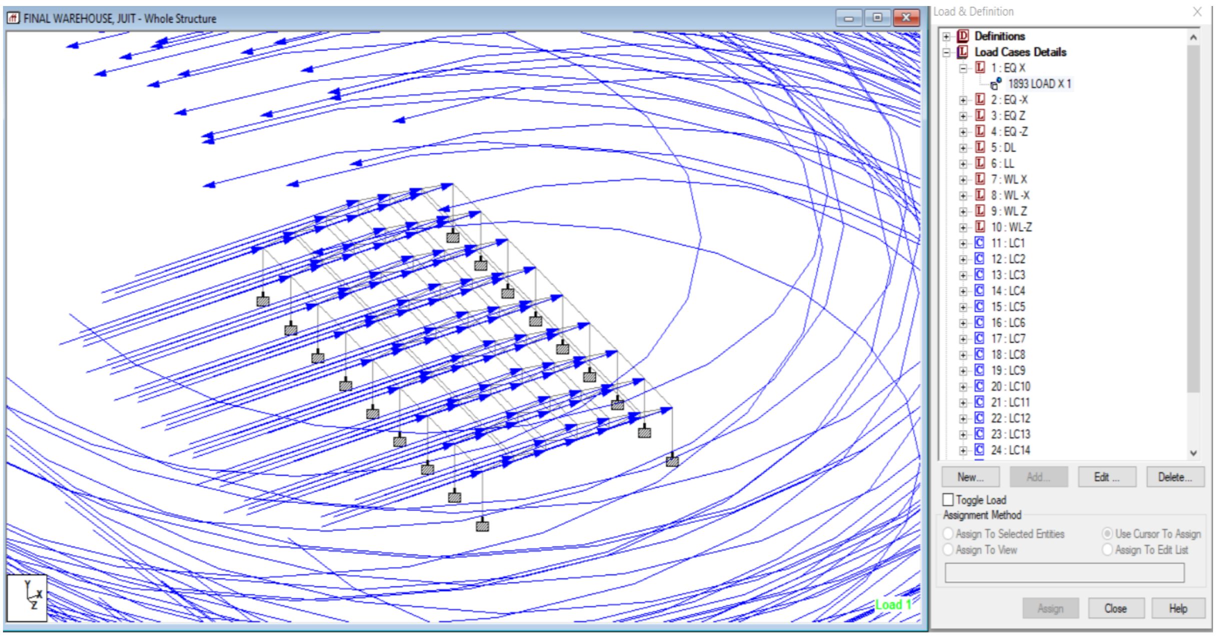


Fig 3.23 Assigned Seismic Load in X Direction

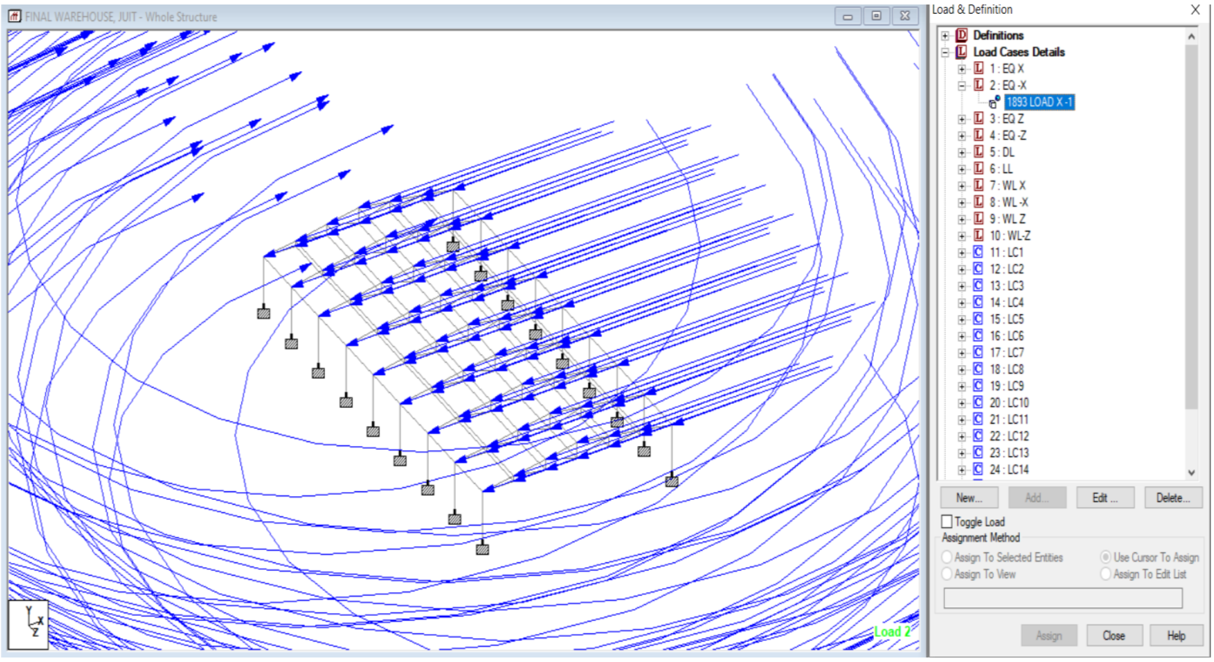


Fig 3.24 Assigned Seismic Load in -X Direction

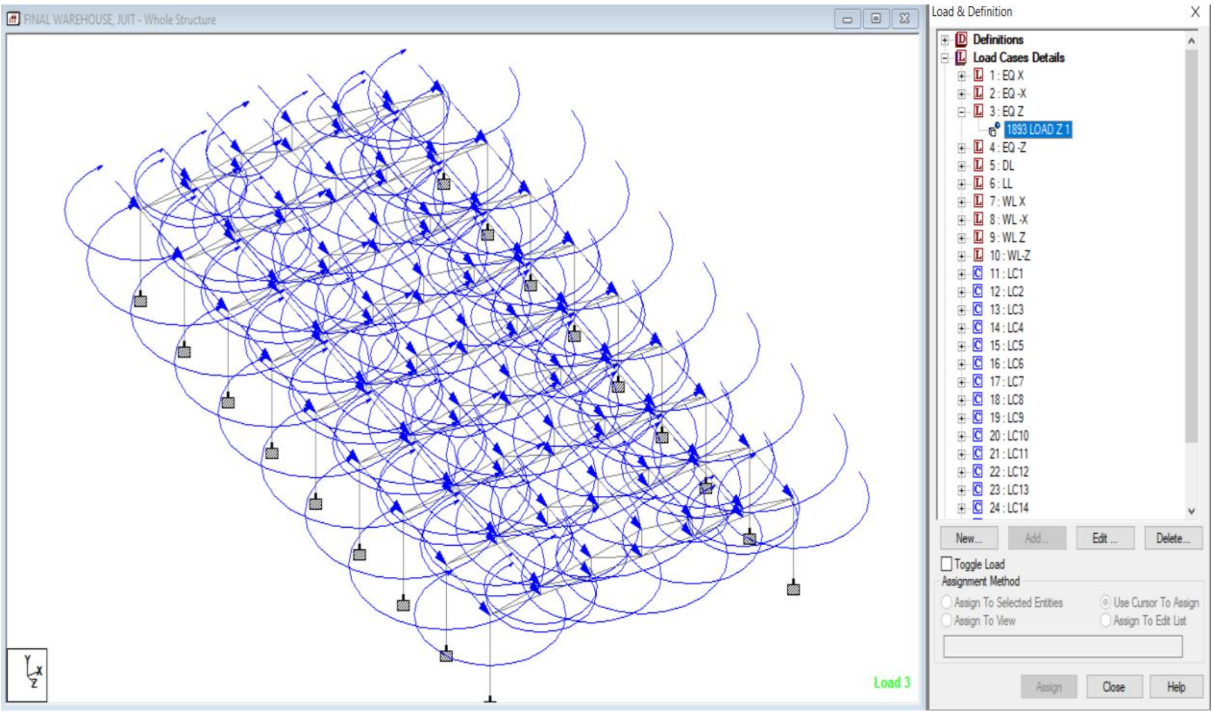


Fig 3.25 Assigned Seismic Load in Z Direction

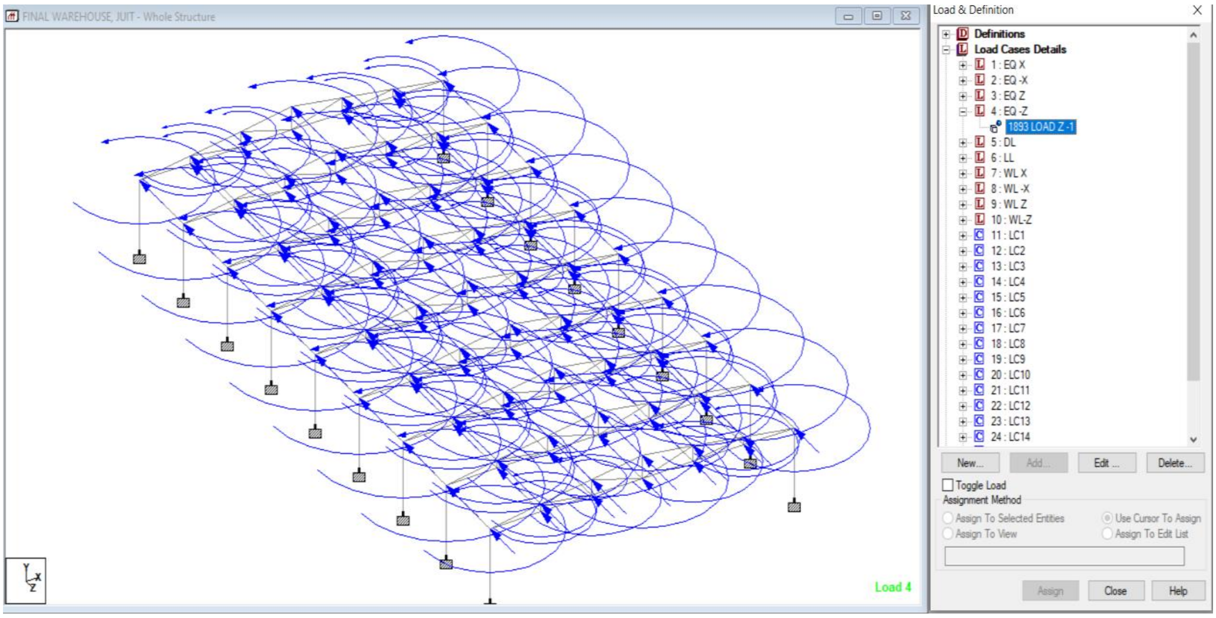


Fig 3.26 Assigned Seismic Load in -Z Direction

3.5.1.5 LOAD COMBINATION

In staad pro load combination can also be defined from IS code or load combination can also be generated through auto load generation command in load case details.

In auto load combination, select load combination code for warehouse analysis select Indian Code and then select generate load option then automatically load combination will be generated for warehouse forty-one load combination has been generated.

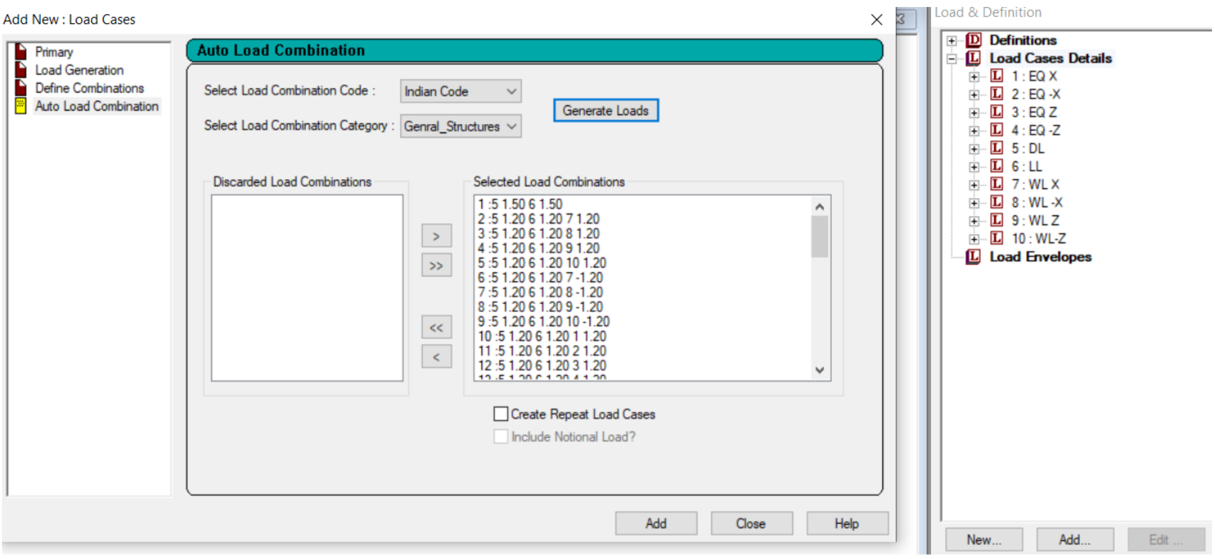


Fig 3.27 Generating Load Combinations

Table No. 2 List of Load Combination

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
11	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.50
		6	LL	1.50
12	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		7	WL X	1.20
13	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		8	WL -X	1.20
14	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		9	WL Z	1.20
15	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		10	WL-Z	1.20
16	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		7	WL X	-1.20
17	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		8	WL -X	-1.20
18	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		9	WL Z	-1.20
19	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		10	WL-Z	-1.20
20	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		1	EQ X	1.20
21	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		2	EQ -X	1.20
22	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		3	EQ Z	1.20
23	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		4	EQ -Z	1.20
24	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		1	EQ X	-1.20
25	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20
		6	LL	1.20
		2	EQ -X	-1.20
26	GENERATED INDIAN CODE GENRAL_S1	5	DL	1.20

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		6	LL	1.20
		3	EQ Z	-1.20
27	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.20
		6	LL	1.20
		4	EQ -Z	-1.20
28	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		7	WL X	1.50
29	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		8	WL -X	1.50
30	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		9	WL Z	1.50
31	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		10	WL-Z	1.50
32	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		7	WL X	-1.50
33	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		8	WL -X	-1.50
34	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		9	WL Z	-1.50
35	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		10	WL-Z	-1.50
36	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		1	EQ X	1.50
37	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		2	EQ -X	1.50
38	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		3	EQ Z	1.50
39	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		4	EQ -Z	1.50
40	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		1	EQ X	-1.50
41	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		2	EQ -X	-1.50
42	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		3	EQ Z	-1.50
43	GENERATED INDIAN CODE GENRAL_ST	5	DL	1.50
		4	EQ -Z	-1.50
44	GENERATED INDIAN CODE GENRAL_ST	5	DL	0.90
		1	EQ X	1.50
45	GENERATED INDIAN CODE GENRAL_ST	5	DL	0.90
		2	EQ -X	1.50
46	GENERATED INDIAN CODE GENRAL_ST	5	DL	0.90
		3	EQ Z	1.50
47	GENERATED INDIAN CODE GENRAL_ST	5	DL	0.90
		4	EQ -Z	1.50

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
48	GENERATED INDIAN CODE GENRAL_S1	5	DL	0.90
		1	EQ X	-1.50
49	GENERATED INDIAN CODE GENRAL_S1	5	DL	0.90
		2	EQ -X	-1.50
50	GENERATED INDIAN CODE GENRAL_S1	5	DL	0.90
		3	EQ Z	-1.50
51	GENERATED INDIAN CODE GENRAL_S1	5	DL	0.90
		4	EQ -Z	-1.50

3.5.2 ANALYSIS OF WAEHOUSE

- To perform the analysis select analyse/ print command, then click on add button

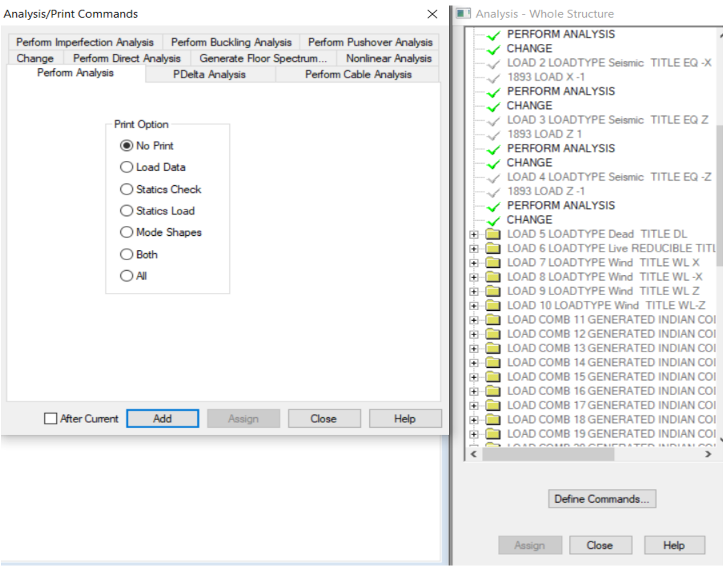


Fig. 3.28 Analysing the Warehouse

- Then click on analyze command, further analysis will be run and zero error should be achieved.

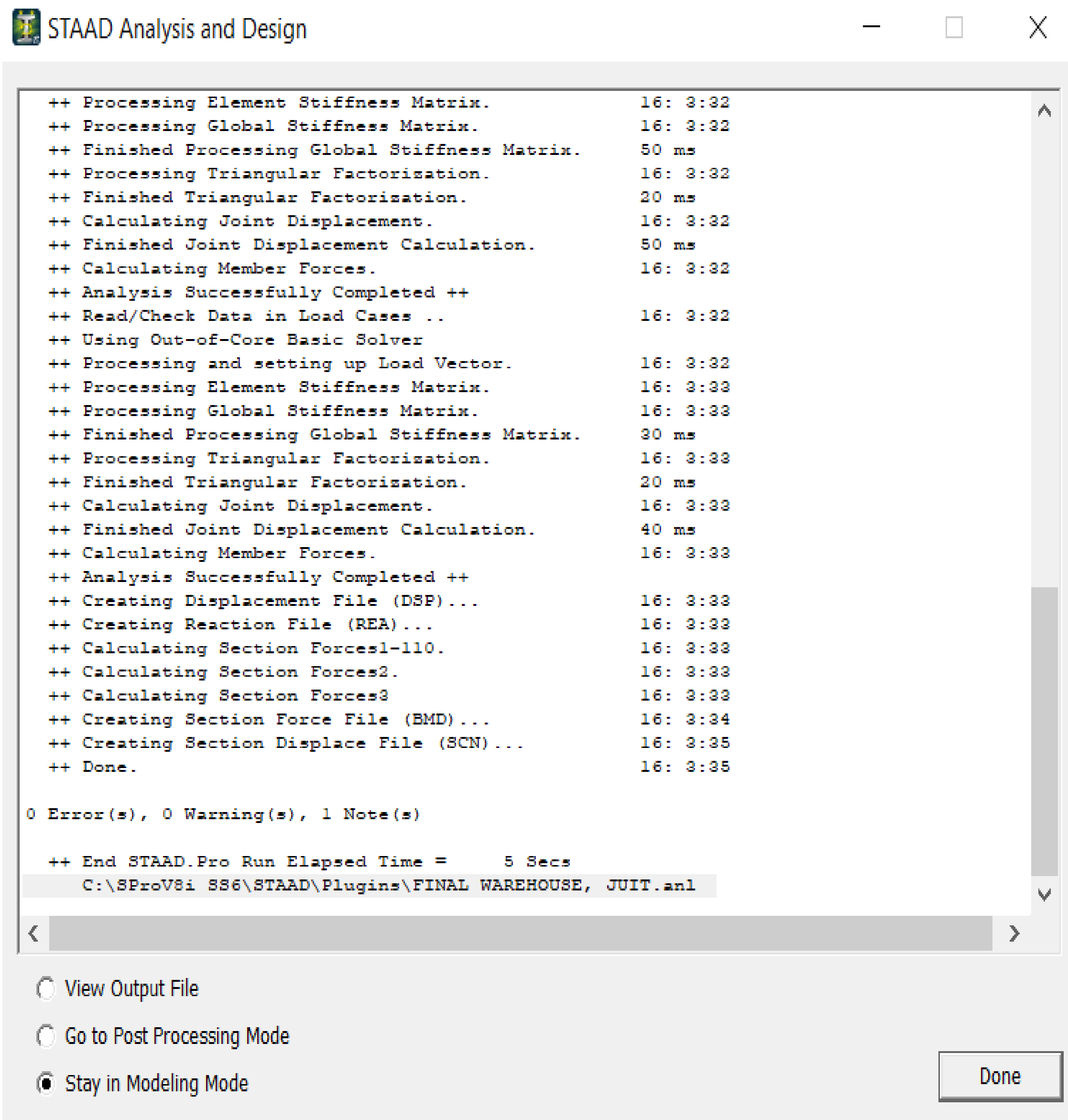


Fig 3.29 Analyzed Result of Warehouse

CHAPTER – 4

RESULTS

4.1 SUPPORT REACTIONS

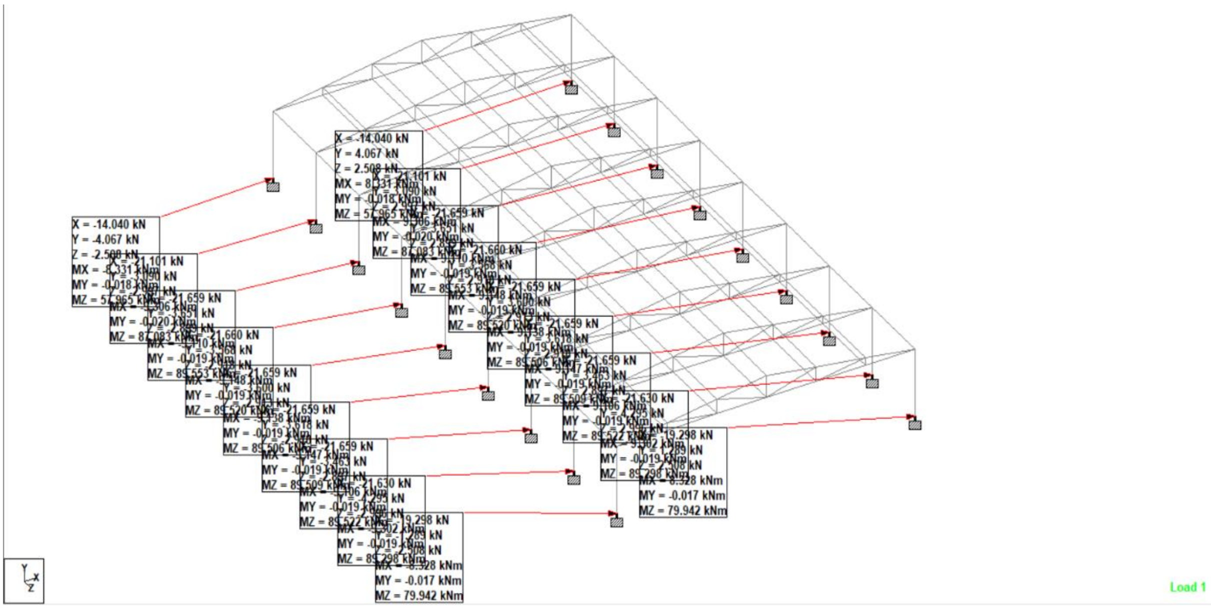


Fig 4.1 Reactions at supports

Table no. 3 Summary of reactions

All Summary Envelope

			Horizontal	Vertical	Horizontal	Moment		
	Node	L/C	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
Max Fx	57	16 GENERAT	**90.915**	109.989	-0.000	-0.000	0.000	-187.585
Min Fx	59	17 GENERAT	**-90.915**	109.989	-0.000	-0.000	-0.000	187.585
Max Fy	1	11 GENERAT	63.356	**147.636**	0.271	0.538	-0.000	-139.722
Min Fy	15	1 EQ X	-21.630	**-4.295**	-2.996	-9.302	-0.019	89.298
Max Fz	3	31 GENERAT	-11.162	16.029	**65.316**	20.797	0.060	24.457
Min Fz	115	30 GENERAT	-11.162	16.029	**-65.316**	-20.797	-0.060	24.457
Max Mx	101	34 GENERAT	-6.490	5.225	7.251	**22.432**	0.050	14.110
Min Mx	17	35 GENERAT	-6.490	5.225	-7.251	**-22.432**	-0.050	14.110
Max My	113	38 GENERAT	10.740	16.703	-4.689	-15.168	**0.102**	-23.048
Min My	1	39 GENERAT	10.740	16.703	4.689	15.168	**-0.102**	-23.048
Max Mz	17	20 GENERAT	-72.820	112.531	3.552	11.076	-0.022	**210.448**
Min Mz	15	21 GENERAT	72.820	112.531	3.552	11.076	0.022	**-210.448**

4.2 DISPLACEMENT

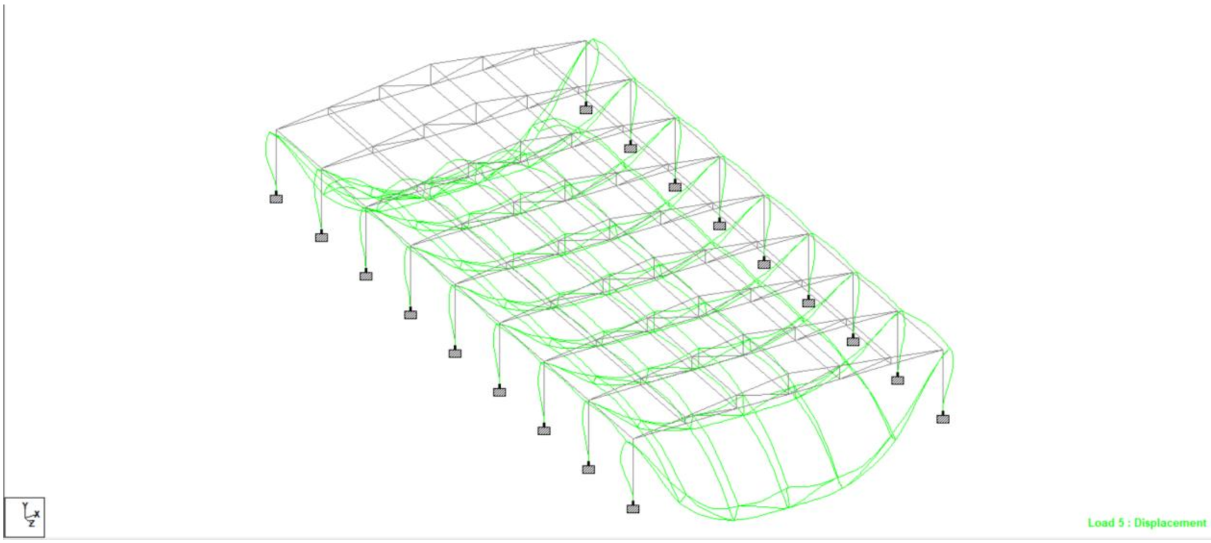


Fig 4.2 Displacement of structure

Table no. 4 Summary of displacement

	Node	L/C	Horizontal X mm	Vertical Y mm	Horizontal Z mm	Resultant mm	Rotational rX rad	rY rad	rZ rad
Max X	91	36 GENERAT	23.098	-3.776	-14.584	27.577	-0.000	0.005	0.001
Min X	93	37 GENERAT	-23.098	-3.776	-14.584	27.577	-0.000	-0.005	-0.001
Max Y	90	1 EQ X	15.133	3.651	-13.285	20.465	-0.000	0.002	0.000
Min Y	8	11 GENERAT	-0.000	-87.938	-0.049	87.938	0.001	-0.000	-0.000
Max Z	5	38 GENERAT	-0.155	-15.286	165.320	166.025	0.002	0.000	-0.000
Min Z	117	39 GENERAT	-0.155	-15.286	-165.320	166.025	-0.002	-0.000	-0.000
Max rX	4	35 GENERAT	0.935	-0.082	25.902	25.919	0.002	0.008	0.001
Min rX	116	34 GENERAT	0.935	-0.082	-25.902	25.919	-0.002	-0.008	0.001
Max rY	2	39 GENERAT	-0.715	-0.061	-18.717	18.731	-0.001	0.014	-0.001
Min rY	114	38 GENERAT	-0.715	-0.061	18.717	18.731	0.001	-0.014	-0.001
Max rZ	6	11 GENERAT	3.971	-59.189	-0.125	59.322	0.001	-0.000	0.009
Min rZ	10	11 GENERAT	-3.971	-59.189	-0.125	59.322	0.001	0.000	-0.009
Max Rs	5	38 GENERAT	-0.155	-15.286	165.320	166.025	0.002	0.000	-0.000

4.3 FORCES ACTING ON WAREHOUSE

Table no. 5 Summary of forces

	Beam	L/C	Node	Fx kN	Fy kN	Fz kN	Mx kNm	My kNm	Mz kNm
Max Fx	11	11 GENERAT	11	591.278	26.506	0.025	-0.002	-0.063	-10.804
Min Fx	7	11 GENERAT	7	**-507.149**	-7.441	-0.005	0.000	0.021	-24.012
Max Fy	19	11 GENERAT	14	49.149	**106.648**	-4.535	0.001	1.511	34.375
Min Fy	15	11 GENERAT	11	49.149	**-106.648**	-4.535	-0.001	1.511	-34.375
Max Fz	28	35 GENERAT	18	13.072	6.490	**7.251**	-0.050	-21.074	24.830
Min Fz	166	34 GENERAT	102	13.072	6.490	**-7.251**	0.050	21.074	24.830
Max Mx	188	38 GENERAT	114	24.551	-10.740	4.689	**0.102**	-12.969	-41.391
Min Mx	4	39 GENERAT	2	24.551	-10.740	-4.689	**-0.102**	12.969	-41.391
Max My	28	35 GENERAT	17	5.225	6.490	7.251	-0.050	**22.432**	-14.110
Min My	166	34 GENERAT	101	5.225	6.490	-7.251	0.050	**-22.432**	-14.110
Max Mz	5	11 GENERAT	4	155.483	63.356	-0.271	0.000	1.086	**240.415**
Min Mz	4	11 GENERAT	2	155.483	-63.356	-0.271	-0.000	1.086	**-240.415**

4.3.1 BENDING MOMENT

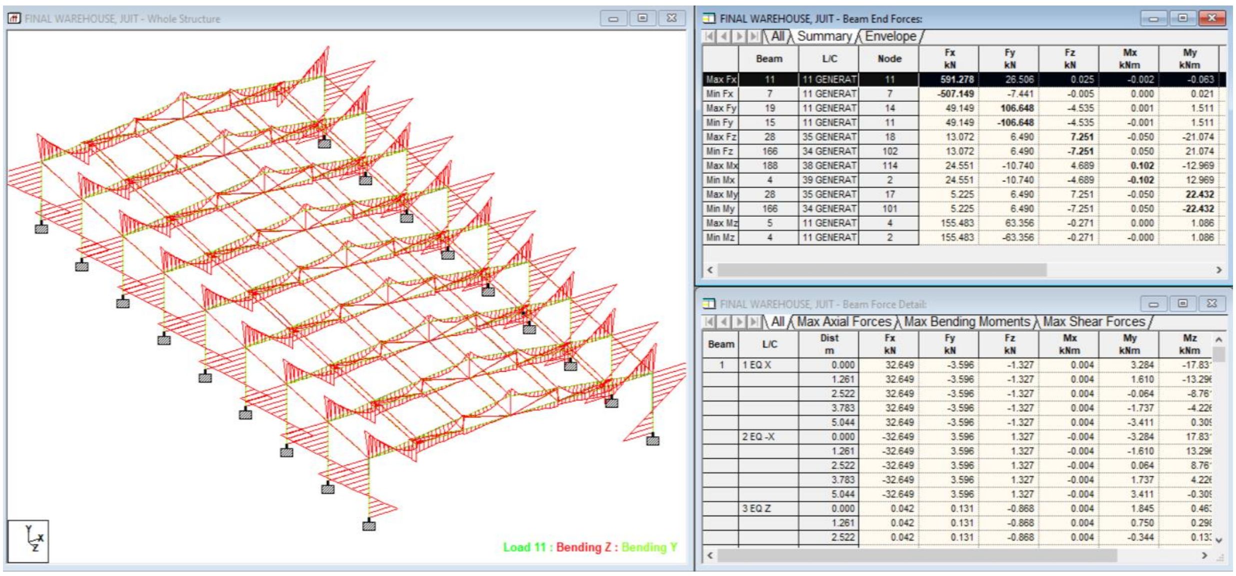


Fig 4.3 Bending moment diagram

4.3.2 SHEAR FORCE

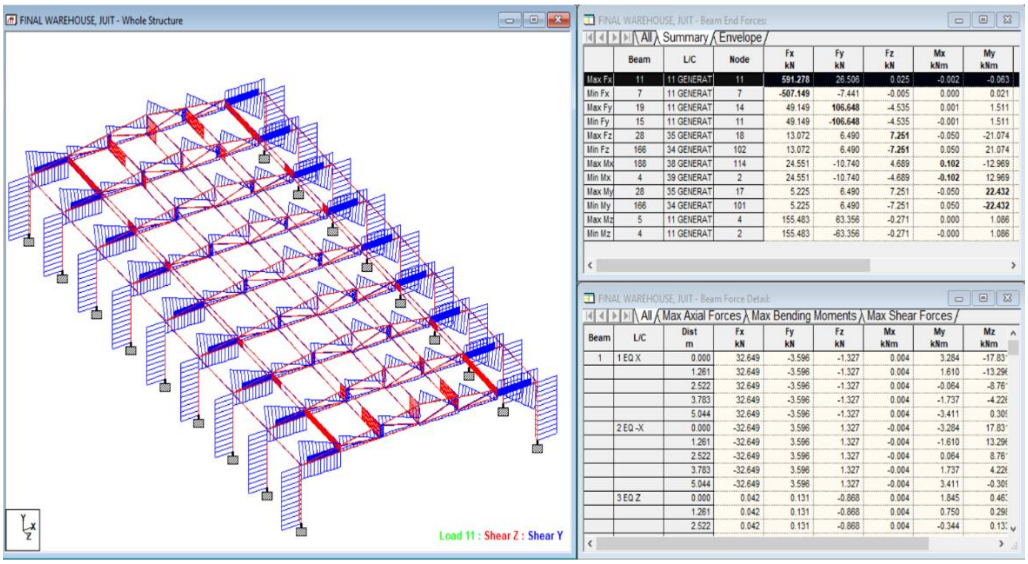


Fig 4.4 Shear force diagram

4.3.3 TORSION

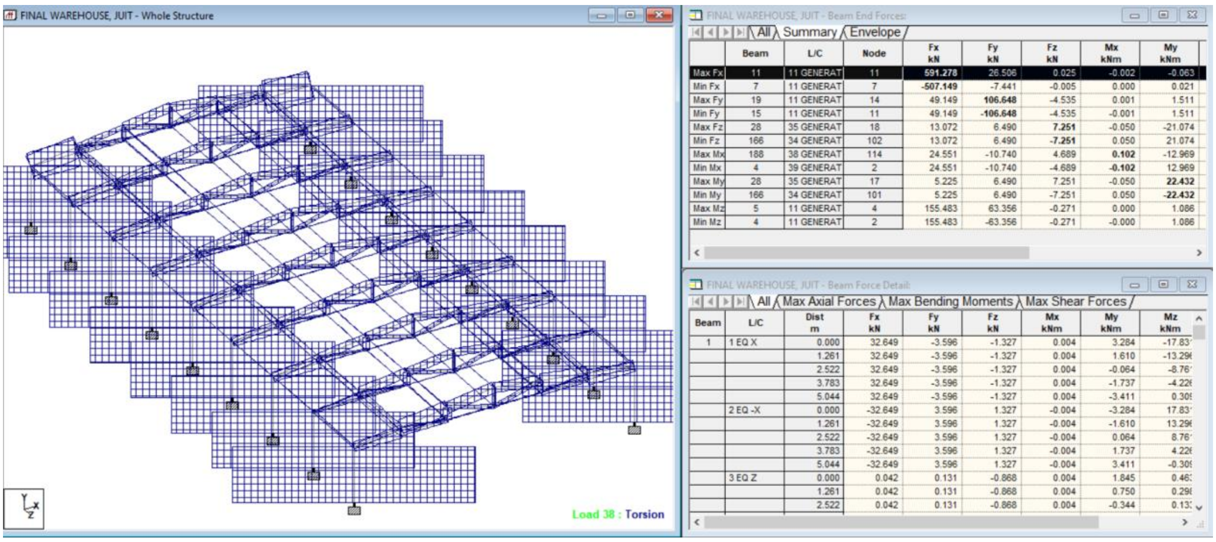


Fig 4.5 Torsion diagram

4.3.4 AXIAL FORCE

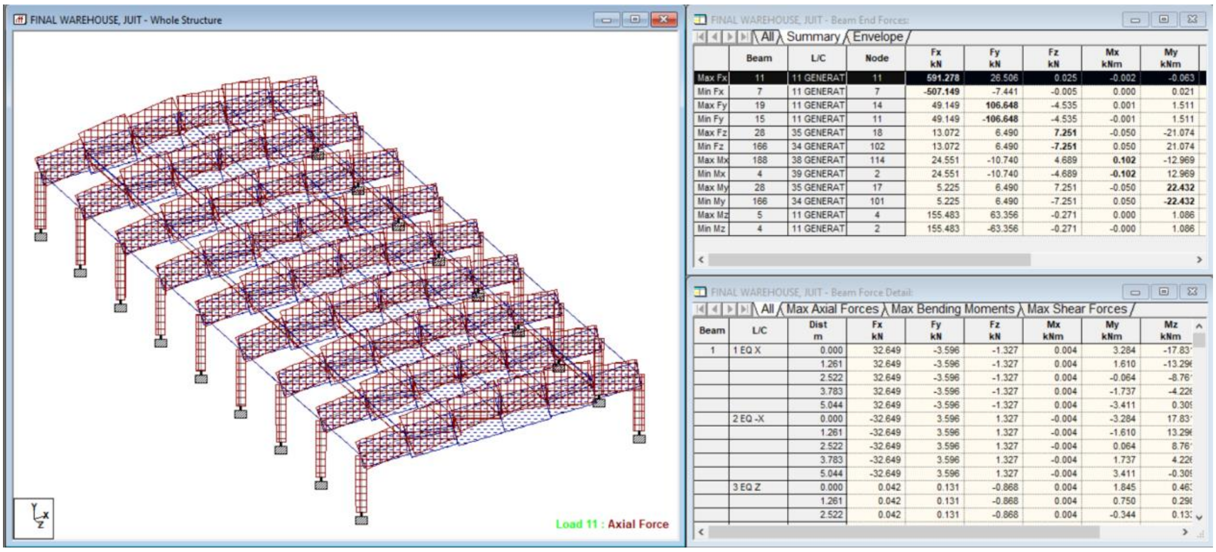


Fig 4.6 Axial force diagram

4.3.5 BENDING STRESS

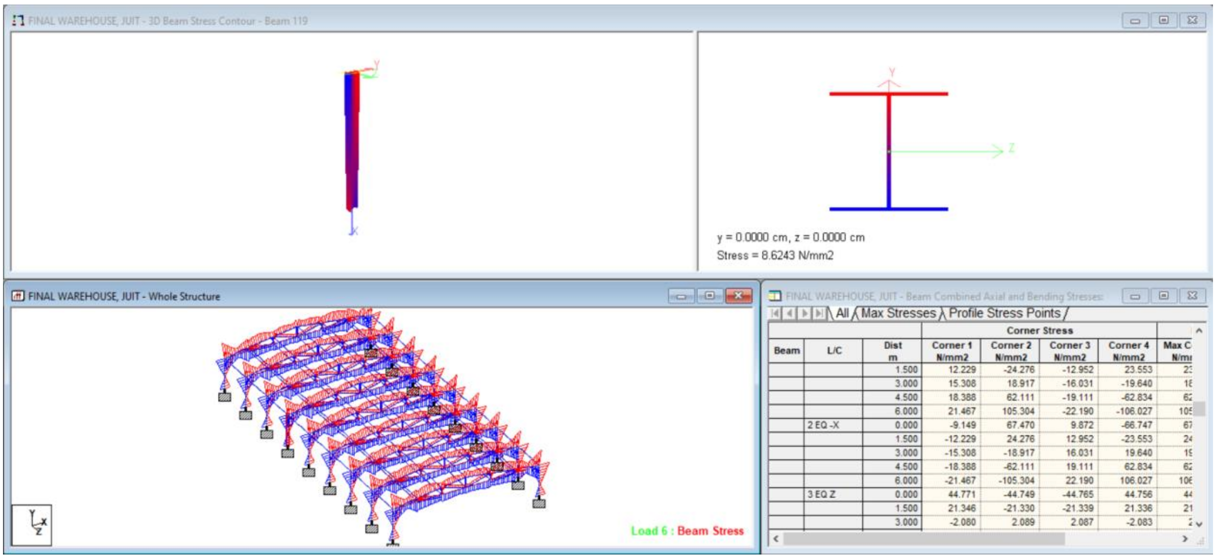


Fig 4.7 Stresses on components

4.4 REPORT FILE GENERATED BY STAAD PRO

Software licensed to	Job No	Sheet No 1	Rev
	Part		
Job Title	Ref		
	By	Date 28-Mar-22	Chd
Client	File FINAL WAREHOUSE, JL	Date/Time 09-May-2022 15:52	

Job Information

	Engineer	Checked	Approved
Name:			
Date:	28-Mar-22		

Structure Type	SPACE FRAME

Number of Nodes	126	Highest Node	126
Number of Elements	303	Highest Beam	303

Number of Basic Load Cases	10
Number of Combination Load Cases	41

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	EQ X
Primary	2	EQ -X
Primary	3	EQ Z
Primary	4	EQ -Z
Primary	5	DL
Primary	6	LL
Primary	7	WL X
Primary	8	WL -X
Primary	9	WL Z
Primary	10	WL-Z
Combination	11	GENERATED INDIAN CODE GENRAL_S
Combination	12	GENERATED INDIAN CODE GENRAL_S
Combination	13	GENERATED INDIAN CODE GENRAL_S
Combination	14	GENERATED INDIAN CODE GENRAL_S
Combination	15	GENERATED INDIAN CODE GENRAL_S
Combination	16	GENERATED INDIAN CODE GENRAL_S
Combination	17	GENERATED INDIAN CODE GENRAL_S
Combination	18	GENERATED INDIAN CODE GENRAL_S
Combination	19	GENERATED INDIAN CODE GENRAL_S
Combination	20	GENERATED INDIAN CODE GENRAL_S
Combination	21	GENERATED INDIAN CODE GENRAL_S
Combination	22	GENERATED INDIAN CODE GENRAL_S
Combination	23	GENERATED INDIAN CODE GENRAL_S
Combination	24	GENERATED INDIAN CODE GENRAL_S
Combination	25	GENERATED INDIAN CODE GENRAL_S
Combination	26	GENERATED INDIAN CODE GENRAL_S
Combination	27	GENERATED INDIAN CODE GENRAL_S
Combination	28	GENERATED INDIAN CODE GENRAL_S

Print Time/Date: 11/05/2022 17:31 STAAD.Pro V8i (SELECTseries 6) 20.07.11.33 Print Run 1 of 20

Job Information Cont...

Type	L/C	Name
Combination	29	GENERATED INDIAN CODE GENRAL_S'
Combination	30	GENERATED INDIAN CODE GENRAL_S'
Combination	31	GENERATED INDIAN CODE GENRAL_S'
Combination	32	GENERATED INDIAN CODE GENRAL_S'
Combination	33	GENERATED INDIAN CODE GENRAL_S'
Combination	34	GENERATED INDIAN CODE GENRAL_S'
Combination	35	GENERATED INDIAN CODE GENRAL_S'
Combination	36	GENERATED INDIAN CODE GENRAL_S'
Combination	37	GENERATED INDIAN CODE GENRAL_S'
Combination	38	GENERATED INDIAN CODE GENRAL_S'
Combination	39	GENERATED INDIAN CODE GENRAL_S'
Combination	40	GENERATED INDIAN CODE GENRAL_S'
Combination	41	GENERATED INDIAN CODE GENRAL_S'
Combination	42	GENERATED INDIAN CODE GENRAL_S'
Combination	43	GENERATED INDIAN CODE GENRAL_S'
Combination	44	GENERATED INDIAN CODE GENRAL_S'
Combination	45	GENERATED INDIAN CODE GENRAL_S'
Combination	46	GENERATED INDIAN CODE GENRAL_S'
Combination	47	GENERATED INDIAN CODE GENRAL_S'
Combination	48	GENERATED INDIAN CODE GENRAL_S'
Combination	49	GENERATED INDIAN CODE GENRAL_S'
Combination	50	GENERATED INDIAN CODE GENRAL_S'
Combination	51	GENERATED INDIAN CODE GENRAL_S'

Nodes

Node	X (m)	Y (m)	Z (m)
1	0.000	0.000	0.000
2	0.000	6.000	0.000
3	30.000	0.000	0.000
4	30.000	6.000	0.000
5	15.000	8.000	0.000
6	25.000	6.000	0.000
7	20.000	6.000	0.000
8	15.000	6.000	0.000
9	10.000	6.000	0.000
10	5.000	6.000	0.000
11	5.000	6.667	0.000
12	10.000	7.333	0.000
13	20.000	7.333	0.000
14	25.000	6.667	0.000
15	0.000	0.000	-7.500
16	0.000	6.000	-7.500

Nodes Cont...

Node	X (m)	Y (m)	Z (m)
17	30.000	0.000	-7.500
18	30.000	6.000	-7.500
19	15.000	8.000	-7.500
20	25.000	6.000	-7.500
21	20.000	6.000	-7.500
22	15.000	6.000	-7.500
23	10.000	6.000	-7.500
24	5.000	6.000	-7.500
25	5.000	6.667	-7.500
26	10.000	7.333	-7.500
27	20.000	7.333	-7.500
28	25.000	6.667	-7.500
29	0.000	0.000	-15.000
30	0.000	6.000	-15.000
31	30.000	0.000	-15.000
32	30.000	6.000	-15.000
33	15.000	8.000	-15.000
34	25.000	6.000	-15.000
35	20.000	6.000	-15.000
36	15.000	6.000	-15.000
37	10.000	6.000	-15.000
38	5.000	6.000	-15.000
39	5.000	6.667	-15.000
40	10.000	7.333	-15.000
41	20.000	7.333	-15.000
42	25.000	6.667	-15.000
43	0.000	0.000	-22.500
44	0.000	6.000	-22.500
45	30.000	0.000	-22.500
46	30.000	6.000	-22.500
47	15.000	8.000	-22.500
48	25.000	6.000	-22.500
49	20.000	6.000	-22.500
50	15.000	6.000	-22.500
51	10.000	6.000	-22.500
52	5.000	6.000	-22.500
53	5.000	6.667	-22.500
54	10.000	7.333	-22.500
55	20.000	7.333	-22.500
56	25.000	6.667	-22.500
57	0.000	0.000	-30.000
58	0.000	6.000	-30.000
59	30.000	0.000	-30.000
60	30.000	6.000	-30.000
61	15.000	8.000	-30.000

Nodes Cont...

Node	X (m)	Y (m)	Z (m)
62	25.000	6.000	-30.000
63	20.000	6.000	-30.000
64	15.000	6.000	-30.000
65	10.000	6.000	-30.000
66	5.000	6.000	-30.000
67	5.000	6.667	-30.000
68	10.000	7.333	-30.000
69	20.000	7.333	-30.000
70	25.000	6.667	-30.000
71	0.000	0.000	-37.500
72	0.000	6.000	-37.500
73	30.000	0.000	-37.500
74	30.000	6.000	-37.500
75	15.000	8.000	-37.500
76	25.000	6.000	-37.500
77	20.000	6.000	-37.500
78	15.000	6.000	-37.500
79	10.000	6.000	-37.500
80	5.000	6.000	-37.500
81	5.000	6.667	-37.500
82	10.000	7.333	-37.500
83	20.000	7.333	-37.500
84	25.000	6.667	-37.500
85	0.000	0.000	-45.000
86	0.000	6.000	-45.000
87	30.000	0.000	-45.000
88	30.000	6.000	-45.000
89	15.000	8.000	-45.000
90	25.000	6.000	-45.000
91	20.000	6.000	-45.000
92	15.000	6.000	-45.000
93	10.000	6.000	-45.000
94	5.000	6.000	-45.000
95	5.000	6.667	-45.000
96	10.000	7.333	-45.000
97	20.000	7.333	-45.000
98	25.000	6.667	-45.000
99	0.000	0.000	-52.500
100	0.000	6.000	-52.500
101	30.000	0.000	-52.500
102	30.000	6.000	-52.500
103	15.000	8.000	-52.500
104	25.000	6.000	-52.500
105	20.000	6.000	-52.500
106	15.000	6.000	-52.500

Nodes Cont...

Node	X (m)	Y (m)	Z (m)
107	10.000	6.000	-52.500
108	5.000	6.000	-52.500
109	5.000	6.667	-52.500
110	10.000	7.333	-52.500
111	20.000	7.333	-52.500
112	25.000	6.667	-52.500
113	0.000	0.000	-60.000
114	0.000	6.000	-60.000
115	30.000	0.000	-60.000
116	30.000	6.000	-60.000
117	15.000	8.000	-60.000
118	25.000	6.000	-60.000
119	20.000	6.000	-60.000
120	15.000	6.000	-60.000
121	10.000	6.000	-60.000
122	5.000	6.000	-60.000
123	5.000	6.667	-60.000
124	10.000	7.333	-60.000
125	20.000	7.333	-60.000
126	25.000	6.667	-60.000

Beams

Beam	Node A	Node B	Length (m)	Property	β (degrees)
1	2	11	5.044	2	0
2	5	13	5.044	2	0
3	4	6	5.000	2	0
4	2	1	6.000	1	0
5	4	3	6.000	1	0
6	6	7	5.000	2	0
7	7	8	5.000	2	0
8	8	9	5.000	2	0
9	9	10	5.000	2	0
10	10	2	5.000	2	0
11	11	12	5.044	2	0
12	12	5	5.044	2	0
13	13	14	5.044	2	0
14	14	4	5.044	2	0
15	11	10	0.667	4	0
16	12	9	1.333	4	0
17	5	8	2.000	4	0
18	13	7	1.333	4	0
19	14	6	0.667	4	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
20	8	13	5.175	4	0
21	7	14	5.044	4	0
22	12	8	5.175	4	0
23	11	9	5.044	4	0
24	16	25	5.044	2	0
25	19	27	5.044	2	0
26	18	20	5.000	2	0
27	16	15	6.000	1	0
28	18	17	6.000	1	0
29	20	21	5.000	2	0
30	21	22	5.000	2	0
31	22	23	5.000	2	0
32	23	24	5.000	2	0
33	24	16	5.000	2	0
34	25	26	5.044	2	0
35	26	19	5.044	2	0
36	27	28	5.044	2	0
37	28	18	5.044	2	0
38	25	24	0.667	4	0
39	26	23	1.333	4	0
40	19	22	2.000	4	0
41	27	21	1.333	4	0
42	28	20	0.667	4	0
43	22	27	5.175	4	0
44	21	28	5.044	4	0
45	26	22	5.175	4	0
46	25	23	5.044	4	0
47	30	39	5.044	2	0
48	33	41	5.044	2	0
49	32	34	5.000	2	0
50	30	29	6.000	1	0
51	32	31	6.000	1	0
52	34	35	5.000	2	0
53	35	36	5.000	2	0
54	36	37	5.000	2	0
55	37	38	5.000	2	0
56	38	30	5.000	2	0
57	39	40	5.044	2	0
58	40	33	5.044	2	0
59	41	42	5.044	2	0
60	42	32	5.044	2	0
61	39	38	0.667	4	0
62	40	37	1.333	4	0
63	33	36	2.000	4	0
64	41	35	1.333	4	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
65	42	34	0.667	4	0
66	36	41	5.175	4	0
67	35	42	5.044	4	0
68	40	36	5.175	4	0
69	39	37	5.044	4	0
70	44	53	5.044	2	0
71	47	55	5.044	2	0
72	46	48	5.000	2	0
73	44	43	6.000	1	0
74	46	45	6.000	1	0
75	48	49	5.000	2	0
76	49	50	5.000	2	0
77	50	51	5.000	2	0
78	51	52	5.000	2	0
79	52	44	5.000	2	0
80	53	54	5.044	2	0
81	54	47	5.044	2	0
82	55	56	5.044	2	0
83	56	46	5.044	2	0
84	53	52	0.667	4	0
85	54	51	1.333	4	0
86	47	50	2.000	4	0
87	55	49	1.333	4	0
88	56	48	0.667	4	0
89	50	55	5.175	4	0
90	49	56	5.044	4	0
91	54	50	5.175	4	0
92	53	51	5.044	4	0
93	58	67	5.044	2	0
94	61	69	5.044	2	0
95	60	62	5.000	2	0
96	58	57	6.000	1	0
97	60	59	6.000	1	0
98	62	63	5.000	2	0
99	63	64	5.000	2	0
100	64	65	5.000	2	0
101	65	66	5.000	2	0
102	66	58	5.000	2	0
103	67	68	5.044	2	0
104	68	61	5.044	2	0
105	69	70	5.044	2	0
106	70	60	5.044	2	0
107	67	66	0.667	4	0
108	68	65	1.333	4	0
109	61	64	2.000	4	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
110	69	63	1.333	4	0
111	70	62	0.667	4	0
112	64	69	5.175	4	0
113	63	70	5.044	4	0
114	68	64	5.175	4	0
115	67	65	5.044	4	0
116	72	81	5.044	2	0
117	75	83	5.044	2	0
118	74	76	5.000	2	0
119	72	71	6.000	1	0
120	74	73	6.000	1	0
121	76	77	5.000	2	0
122	77	78	5.000	2	0
123	78	79	5.000	2	0
124	79	80	5.000	2	0
125	80	72	5.000	2	0
126	81	82	5.044	2	0
127	82	75	5.044	2	0
128	83	84	5.044	2	0
129	84	74	5.044	2	0
130	81	80	0.667	4	0
131	82	79	1.333	4	0
132	75	78	2.000	4	0
133	83	77	1.333	4	0
134	84	76	0.667	4	0
135	78	83	5.175	4	0
136	77	84	5.044	4	0
137	82	78	5.175	4	0
138	81	79	5.044	4	0
139	86	95	5.044	2	0
140	89	97	5.044	2	0
141	88	90	5.000	2	0
142	86	85	6.000	1	0
143	88	87	6.000	1	0
144	90	91	5.000	2	0
145	91	92	5.000	2	0
146	92	93	5.000	2	0
147	93	94	5.000	2	0
148	94	86	5.000	2	0
149	95	96	5.044	2	0
150	96	89	5.044	2	0
151	97	98	5.044	2	0
152	98	88	5.044	2	0
153	95	94	0.667	4	0
154	96	93	1.333	4	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
155	89	92	2.000	4	0
156	97	91	1.333	4	0
157	98	90	0.667	4	0
158	92	97	5.175	4	0
159	91	98	5.044	4	0
160	96	92	5.175	4	0
161	95	93	5.044	4	0
162	100	109	5.044	2	0
163	103	111	5.044	2	0
164	102	104	5.000	2	0
165	100	99	6.000	1	0
166	102	101	6.000	1	0
167	104	105	5.000	2	0
168	105	106	5.000	2	0
169	106	107	5.000	2	0
170	107	108	5.000	2	0
171	108	100	5.000	2	0
172	109	110	5.044	2	0
173	110	103	5.044	2	0
174	111	112	5.044	2	0
175	112	102	5.044	2	0
176	109	108	0.667	4	0
177	110	107	1.333	4	0
178	103	106	2.000	4	0
179	111	105	1.333	4	0
180	112	104	0.667	4	0
181	106	111	5.175	4	0
182	105	112	5.044	4	0
183	110	106	5.175	4	0
184	109	107	5.044	4	0
185	114	123	5.044	2	0
186	117	125	5.044	2	0
187	116	118	5.000	2	0
188	114	113	6.000	1	0
189	116	115	6.000	1	0
190	118	119	5.000	2	0
191	119	120	5.000	2	0
192	120	121	5.000	2	0
193	121	122	5.000	2	0
194	122	114	5.000	2	0
195	123	124	5.044	2	0
196	124	117	5.044	2	0
197	125	126	5.044	2	0
198	126	116	5.044	2	0
199	123	122	0.667	4	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
200	124	121	1.333	4	0
201	117	120	2.000	4	0
202	125	119	1.333	4	0
203	126	118	0.667	4	0
204	120	125	5.175	4	0
205	119	126	5.044	4	0
206	124	120	5.175	4	0
207	123	121	5.044	4	0
208	114	100	7.500	3	0
209	10	24	7.500	3	0
210	123	109	7.500	3	0
211	9	23	7.500	3	0
212	124	110	7.500	3	0
213	8	22	7.500	3	0
214	117	103	7.500	3	0
215	7	21	7.500	3	0
216	125	111	7.500	3	0
217	6	20	7.500	3	0
218	126	112	7.500	3	0
219	4	18	7.500	3	0
220	100	86	7.500	3	0
221	86	72	7.500	3	0
222	72	58	7.500	3	0
223	58	44	7.500	3	0
224	44	30	7.500	3	0
225	30	16	7.500	3	0
226	16	2	7.500	3	0
227	24	38	7.500	3	0
228	38	52	7.500	3	0
229	52	66	7.500	3	0
230	66	80	7.500	3	0
231	80	94	7.500	3	0
232	94	108	7.500	3	0
233	108	122	7.500	3	0
234	109	95	7.500	3	0
235	95	81	7.500	3	0
236	81	67	7.500	3	0
237	67	53	7.500	3	0
238	53	39	7.500	3	0
239	39	25	7.500	3	0
240	25	11	7.500	3	0
241	23	37	7.500	3	0
242	37	51	7.500	3	0
243	51	65	7.500	3	0
244	65	79	7.500	3	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
245	79	93	7.500	3	0
246	93	107	7.500	3	0
247	107	121	7.500	3	0
248	110	96	7.500	3	0
249	96	82	7.500	3	0
250	82	68	7.500	3	0
251	68	54	7.500	3	0
252	54	40	7.500	3	0
253	40	26	7.500	3	0
254	26	12	7.500	3	0
255	22	36	7.500	3	0
256	36	50	7.500	3	0
257	50	64	7.500	3	0
258	64	78	7.500	3	0
259	78	92	7.500	3	0
260	92	106	7.500	3	0
261	106	120	7.500	3	0
262	103	89	7.500	3	0
263	89	75	7.500	3	0
264	75	61	7.500	3	0
265	61	47	7.500	3	0
266	47	33	7.500	3	0
267	33	19	7.500	3	0
268	19	5	7.500	3	0
269	21	35	7.500	3	0
270	35	49	7.500	3	0
271	49	63	7.500	3	0
272	63	77	7.500	3	0
273	77	91	7.500	3	0
274	91	105	7.500	3	0
275	105	119	7.500	3	0
276	111	97	7.500	3	0
277	97	83	7.500	3	0
278	83	69	7.500	3	0
279	69	55	7.500	3	0
280	55	41	7.500	3	0
281	41	27	7.500	3	0
282	27	13	7.500	3	0
283	20	34	7.500	3	0
284	34	48	7.500	3	0
285	48	62	7.500	3	0
286	62	76	7.500	3	0
287	76	90	7.500	3	0
288	90	104	7.500	3	0
289	104	118	7.500	3	0

Beams Cont...

Beam	Node A	Node B	Length (m)	Property	β (degrees)
290	112	98	7.500	3	0
291	98	84	7.500	3	0
292	84	70	7.500	3	0
293	70	56	7.500	3	0
294	56	42	7.500	3	0
295	42	28	7.500	3	0
296	28	14	7.500	3	0
297	18	32	7.500	3	0
298	32	46	7.500	3	0
299	46	60	7.500	3	0
300	60	74	7.500	3	0
301	74	88	7.500	3	0
302	88	102	7.500	3	0
303	102	116	7.500	3	0

Section Properties

Prop	Section	Area (cm^2)	I_{yy} (cm^4)	I_{zz} (cm^4)	J (cm^4)	Material
1	ISHB400	98.700	2.73E+3	28.1E+3	55.900	STEEL
2	ISMB300	58.700	486.000	8.99E+3	34.100	STEEL
3	ISMC300	46.300	311.000	6.42E+3	19.623	STEEL
4	ISLC200	26.300	145.000	1.73E+3	7.348	STEEL

Materials

Mat	Name	E (kN/mm^2)	ν	Density (kg/m^3)	α (/°C)
1	STEEL	205.000	0.300	7.83E+3	12E -6
2	STAINLESSSTEEL	197.930	0.300	7.83E+3	18E -6
3	ALUMINUM	68.948	0.330	2.71E+3	23E -6
4	CONCRETE	21.718	0.170	2.4E+3	10E -6

Supports

Node	X (kN/mm)	Y (kN/mm)	Z (kN/mm)	rX (kN`m/deg)	rY (kN`m/deg)	rZ (kN`m/deg)
1	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
3	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
15	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
17	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
29	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
31	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
43	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
45	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
57	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
59	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
71	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
73	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
85	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
87	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
99	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
101	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
113	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
115	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Releases

There is no data of this type.

Primary Load Cases

Number	Name	Type
1	EQ X	Seismic
2	EQ -X	Seismic
3	EQ Z	Seismic
4	EQ -Z	Seismic
5	DL	Dead
6	LL	Live
7	WL X	Wind
8	WL -X	Wind
9	WL Z	Wind
10	WL-Z	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
11	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		6	LL	1.50
12	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		7	WL X	1.20
13	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		8	WL -X	1.20
14	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		9	WL Z	1.20
15	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		10	WL-Z	1.20
16	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		7	WL X	-1.20
17	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		8	WL -X	-1.20
18	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		9	WL Z	-1.20
19	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		10	WL-Z	-1.20
20	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		1	EQ X	1.20
21	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		2	EQ -X	1.20
22	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		3	EQ Z	1.20
23	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		4	EQ -Z	1.20
24	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		1	EQ X	-1.20
25	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		2	EQ -X	-1.20
26	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		6	LL	1.20
		3	EQ Z	-1.20
27	GENERATED INDIAN CODE GENRAL_S	5	DL	1.20
		6	LL	1.20
		4	EQ -Z	-1.20
28	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		7	WL X	1.50
29	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		8	WL -X	1.50
30	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		9	WL Z	1.50
31	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		10	WL-Z	1.50
32	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		7	WL X	-1.50
33	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		8	WL -X	-1.50
34	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		9	WL Z	-1.50
35	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		10	WL-Z	-1.50
36	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		1	EQ X	1.50
37	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		2	EQ -X	1.50
38	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		3	EQ Z	1.50
39	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		4	EQ -Z	1.50
40	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		1	EQ X	-1.50
41	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		2	EQ -X	-1.50
42	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		3	EQ Z	-1.50
43	GENERATED INDIAN CODE GENRAL_S	5	DL	1.50
		4	EQ -Z	-1.50
44	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		1	EQ X	1.50
45	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		2	EQ -X	1.50
46	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		3	EQ Z	1.50
47	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		4	EQ -Z	1.50

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
48	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		1	EQ X	-1.50
49	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		2	EQ -X	-1.50
50	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		3	EQ Z	-1.50
51	GENERATED INDIAN CODE GENRAL_S	5	DL	0.90
		4	EQ -Z	-1.50

Wind Load Definition : Type 1

Intensity (N/mm^2)	Height (m)
0.001	0.000
0.001	4.572
0.001	4.836
0.001	5.099
0.001	5.363
0.001	5.627
0.001	5.890
0.001	6.154
0.001	6.418
0.001	6.682
0.001	6.945
0.001	7.209
0.001	7.473
0.001	7.736
0.001	8.000

Exposure Factor	Range	Nodes / Height Range (m)
1.000	Nodes	1 - 126

1 EQ X : Seismic Loading

Code	Direction	Factor
	X	1.000

2 EQ -X : Seismic Loading

Code	Direction	Factor
	X	-1.000

3 EQ Z : Seismic Loading

Code	Direction	Factor
	Z	1.000

4 EQ -Z : Seismic Loading

Code	Direction	Factor
	Z	-1.000

5 DL : Beam Loads

Beam	Type		Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
1	UNI	kN/m	GY	-3.060	-	-	-	-
2	UNI	kN/m	GY	-3.060	-	-	-	-
11	UNI	kN/m	GY	-3.060	-	-	-	-
12	UNI	kN/m	GY	-3.060	-	-	-	-
13	UNI	kN/m	GY	-3.060	-	-	-	-
14	UNI	kN/m	GY	-3.060	-	-	-	-
24	UNI	kN/m	GY	-3.060	-	-	-	-
25	UNI	kN/m	GY	-3.060	-	-	-	-
34	UNI	kN/m	GY	-3.060	-	-	-	-
35	UNI	kN/m	GY	-3.060	-	-	-	-
36	UNI	kN/m	GY	-3.060	-	-	-	-
37	UNI	kN/m	GY	-3.060	-	-	-	-
47	UNI	kN/m	GY	-3.060	-	-	-	-
48	UNI	kN/m	GY	-3.060	-	-	-	-
57	UNI	kN/m	GY	-3.060	-	-	-	-
58	UNI	kN/m	GY	-3.060	-	-	-	-
59	UNI	kN/m	GY	-3.060	-	-	-	-
60	UNI	kN/m	GY	-3.060	-	-	-	-
70	UNI	kN/m	GY	-3.060	-	-	-	-
71	UNI	kN/m	GY	-3.060	-	-	-	-
80	UNI	kN/m	GY	-3.060	-	-	-	-
81	UNI	kN/m	GY	-3.060	-	-	-	-
82	UNI	kN/m	GY	-3.060	-	-	-	-
83	UNI	kN/m	GY	-3.060	-	-	-	-
93	UNI	kN/m	GY	-3.060	-	-	-	-

5 DL : Beam Loads Cont...

Beam	Type		Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
94	UNI	kN/m	GY	-3.060	-	-	-	-
103	UNI	kN/m	GY	-3.060	-	-	-	-
104	UNI	kN/m	GY	-3.060	-	-	-	-
105	UNI	kN/m	GY	-3.060	-	-	-	-
106	UNI	kN/m	GY	-3.060	-	-	-	-
116	UNI	kN/m	GY	-3.060	-	-	-	-
117	UNI	kN/m	GY	-3.060	-	-	-	-
126	UNI	kN/m	GY	-3.060	-	-	-	-
127	UNI	kN/m	GY	-3.060	-	-	-	-
128	UNI	kN/m	GY	-3.060	-	-	-	-
129	UNI	kN/m	GY	-3.060	-	-	-	-
139	UNI	kN/m	GY	-3.060	-	-	-	-
140	UNI	kN/m	GY	-3.060	-	-	-	-
149	UNI	kN/m	GY	-3.060	-	-	-	-
150	UNI	kN/m	GY	-3.060	-	-	-	-
151	UNI	kN/m	GY	-3.060	-	-	-	-
152	UNI	kN/m	GY	-3.060	-	-	-	-
162	UNI	kN/m	GY	-3.060	-	-	-	-
163	UNI	kN/m	GY	-3.060	-	-	-	-
172	UNI	kN/m	GY	-3.060	-	-	-	-
173	UNI	kN/m	GY	-3.060	-	-	-	-
174	UNI	kN/m	GY	-3.060	-	-	-	-
175	UNI	kN/m	GY	-3.060	-	-	-	-
185	UNI	kN/m	GY	-3.060	-	-	-	-
186	UNI	kN/m	GY	-3.060	-	-	-	-
195	UNI	kN/m	GY	-3.060	-	-	-	-
196	UNI	kN/m	GY	-3.060	-	-	-	-
197	UNI	kN/m	GY	-3.060	-	-	-	-
198	UNI	kN/m	GY	-3.060	-	-	-	-

5 DL : Selfweight

Direction	Factor	Assigned Geometry
Y	1.150	ALL

6 LL : Beam Loads

Beam	Type		Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
1	UNI	kN/m	GY	-5.625	-	-	-	-
2	UNI	kN/m	GY	-5.625	-	-	-	-
11	UNI	kN/m	GY	-5.625	-	-	-	-
12	UNI	kN/m	GY	-5.625	-	-	-	-
13	UNI	kN/m	GY	-5.625	-	-	-	-
14	UNI	kN/m	GY	-5.625	-	-	-	-
24	UNI	kN/m	GY	-5.625	-	-	-	-
25	UNI	kN/m	GY	-5.625	-	-	-	-
34	UNI	kN/m	GY	-5.625	-	-	-	-
35	UNI	kN/m	GY	-5.625	-	-	-	-
36	UNI	kN/m	GY	-5.625	-	-	-	-
37	UNI	kN/m	GY	-5.625	-	-	-	-
47	UNI	kN/m	GY	-5.625	-	-	-	-
48	UNI	kN/m	GY	-5.625	-	-	-	-
57	UNI	kN/m	GY	-5.625	-	-	-	-
58	UNI	kN/m	GY	-5.625	-	-	-	-
59	UNI	kN/m	GY	-5.625	-	-	-	-
60	UNI	kN/m	GY	-5.625	-	-	-	-
70	UNI	kN/m	GY	-5.625	-	-	-	-
71	UNI	kN/m	GY	-5.625	-	-	-	-
80	UNI	kN/m	GY	-5.625	-	-	-	-
81	UNI	kN/m	GY	-5.625	-	-	-	-
82	UNI	kN/m	GY	-5.625	-	-	-	-
83	UNI	kN/m	GY	-5.625	-	-	-	-
93	UNI	kN/m	GY	-5.625	-	-	-	-
94	UNI	kN/m	GY	-5.625	-	-	-	-
103	UNI	kN/m	GY	-5.625	-	-	-	-
104	UNI	kN/m	GY	-5.625	-	-	-	-
105	UNI	kN/m	GY	-5.625	-	-	-	-
106	UNI	kN/m	GY	-5.625	-	-	-	-
116	UNI	kN/m	GY	-5.625	-	-	-	-
117	UNI	kN/m	GY	-5.625	-	-	-	-
126	UNI	kN/m	GY	-5.625	-	-	-	-
127	UNI	kN/m	GY	-5.625	-	-	-	-
128	UNI	kN/m	GY	-5.625	-	-	-	-
129	UNI	kN/m	GY	-5.625	-	-	-	-
139	UNI	kN/m	GY	-5.625	-	-	-	-
140	UNI	kN/m	GY	-5.625	-	-	-	-
149	UNI	kN/m	GY	-5.625	-	-	-	-
150	UNI	kN/m	GY	-5.625	-	-	-	-
151	UNI	kN/m	GY	-5.625	-	-	-	-
152	UNI	kN/m	GY	-5.625	-	-	-	-
162	UNI	kN/m	GY	-5.625	-	-	-	-
163	UNI	kN/m	GY	-5.625	-	-	-	-
172	UNI	kN/m	GY	-5.625	-	-	-	-

6 LL : Beam Loads Cont...

Beam	Type		Direction	Fa	Da (m)	Fb	Db	Ecc. (m)
173	UNI	kN/m	GY	-5.625	-	-	-	-
174	UNI	kN/m	GY	-5.625	-	-	-	-
175	UNI	kN/m	GY	-5.625	-	-	-	-
185	UNI	kN/m	GY	-5.625	-	-	-	-
186	UNI	kN/m	GY	-5.625	-	-	-	-
195	UNI	kN/m	GY	-5.625	-	-	-	-
196	UNI	kN/m	GY	-5.625	-	-	-	-
197	UNI	kN/m	GY	-5.625	-	-	-	-
198	UNI	kN/m	GY	-5.625	-	-	-	-

7 WL X : Wind Loading

Direction	Type	Factor
X	1	1.000

8 WL -X : Wind Loading

Direction	Type	Factor
X	1	-1.000

9 WL Z : Wind Loading

Direction	Type	Factor
Z	1	1.000

10 WL-Z : Wind Loading

Direction	Type	Factor
Z	1	-1.000

CHAPTER – 5

CONCLUSION

The Staad pro programme can quickly design and analyse an industrial warehouse. The entire procedure was carried out in accordance with Indian regulations. STADD PRO was used to analyse and design an industrial warehouse in this project.

According to the findings of the structural study of these structures, steel sections were assigned to various warehousing models for each member. The load calculations were done after the planning and modelling of warehouse.

Different members, such as truss members, columns, purlins, and so on, were chosen based on this. A basic design technique can be used to create an industrial warehouse.

Finally, we obtained the result of Warehouse, reaction of supports and forces acting on Warehouse.

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