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Static Analysis of Steel Structure of Reboiler Equipment Using Staad.Pro Software

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ABSTRACT

The study employs STAAD.Pro software to perform a static analysis of a steel structure supporting reboiler equipment. The primary aim is to evaluate the structural performance and stability of the framework under various loading conditions, including dead loads, live loads, and equipment-specific loads. A comprehensive 3D model of the reboiler support structure was developed, incorporating material properties and connection details in accordance with industry standards. The analysis focuses on assessing key structural parameters such as deflections, shear forces, and bending moments to ensure compliance with safety and design codes. The results demonstrate that the structure maintains adequate load-carrying capacity and stiffness, with maximum deflections well within permissible limits. The analysis also identified critical points in the structure that require reinforcement to enhance overall stability and resilience. This study underscores the effectiveness of STAAD.Pro in conducting comprehensive static analyses for complex industrial applications and emphasizes the importance of thorough design practices in ensuring the reliability and safety of steel structures in the chemical processing sector. Future work may include dynamic analysis and fatigue assessment to further enhance the structural design under varying operational conditions.

INTRODUCTION

Steel structures are crucial in modern infrastructure, used in commercial and residential buildings, bridges, towers, and industrial facilities. Their design and analysis require consideration of strength, stability, and durability. Advanced software tools allow engineers and architects to efficiently design, analyse, and simulate steel structures' behaviour under various loads and conditions.

Staad Pro is a popular software package used in civil engineering for steel structure design and analysis. It offers comprehensive tools for modelling, analysing, and designing steel structures, including beams, columns, trusses, and frames. With its user-friendly interface and advanced calculation engine, Staad Pro enables engineers to quickly and accurately analyse steel structures, ensuring compliance with relevant building codes and standards.

LITERATURE REVIEW

Steel structures are essential for supporting reboiler equipment in industries such as chemical and petrochemical, where they must endure various loads, including dead loads, live loads, thermal stresses, wind, and seismic forces. Steel is widely used because of its high strength, flexibility, and ease of fabrication, making it suitable for complex industrial setups. The American Institute of Steel Construction (AISC) code offers comprehensive guidelines for designing steel structures to ensure stability and safety under combined loading conditions. STAAD.Pro software, which follows AISC standards, enables accurate structural analysis by calculating bending moments, shear forces, and axial stresses. It helps simulate load interactions effectively, enhancing design precision and material efficiency. However, challenges persist in modeling thermal expansion and joint flexibility in steel structures. Thermal load guidelines can sometimes be conservative, and better connection modeling is needed to reflect real-world conditions accurately. Advancements in thermal load simulation and joint behavior analysis could further improve the safety and performance of steel support structures for reboilers.

AIM

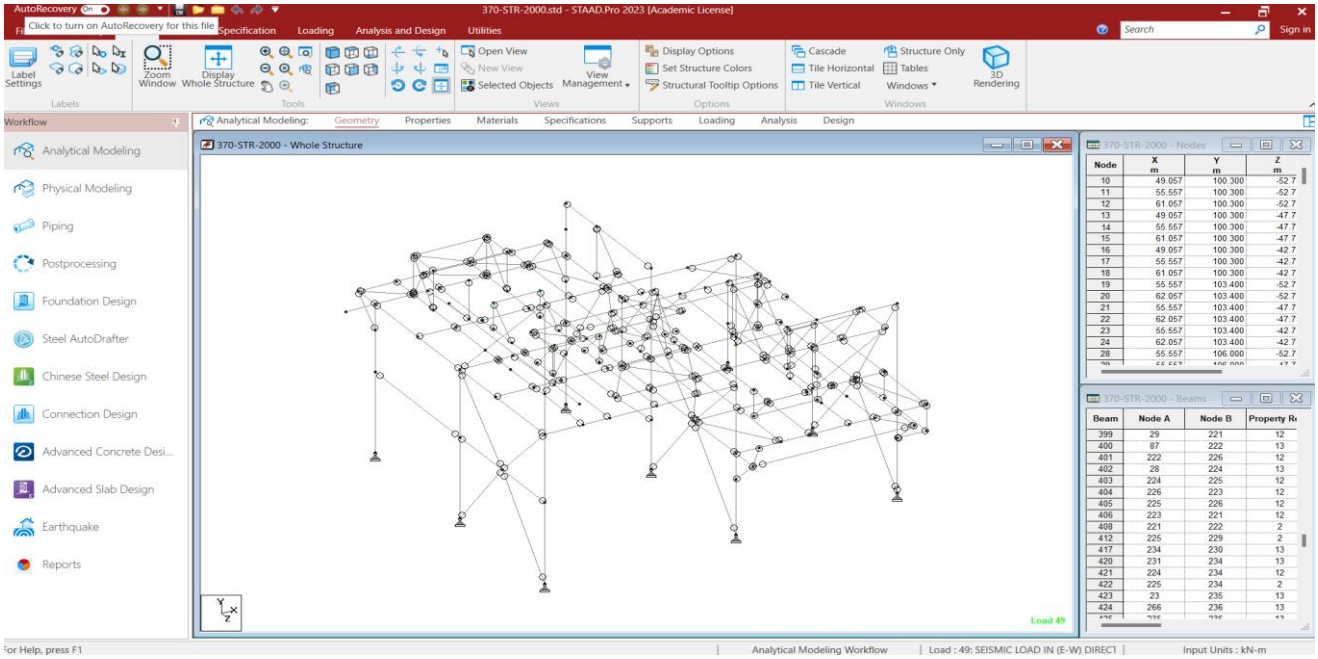
TO ANALYSE STEEL STRUCTURE OF REBOILER EQUIPMENT USING STAAD.Pro SOFTWARE.

OBJECTIVE

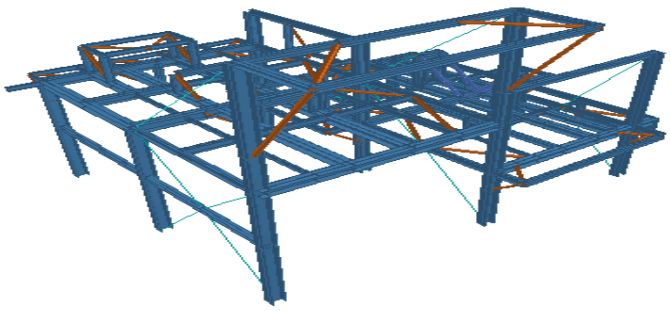
- Analysis of support structure of reboiler equipment by AISC.

METHODOLOGY

Isometric view



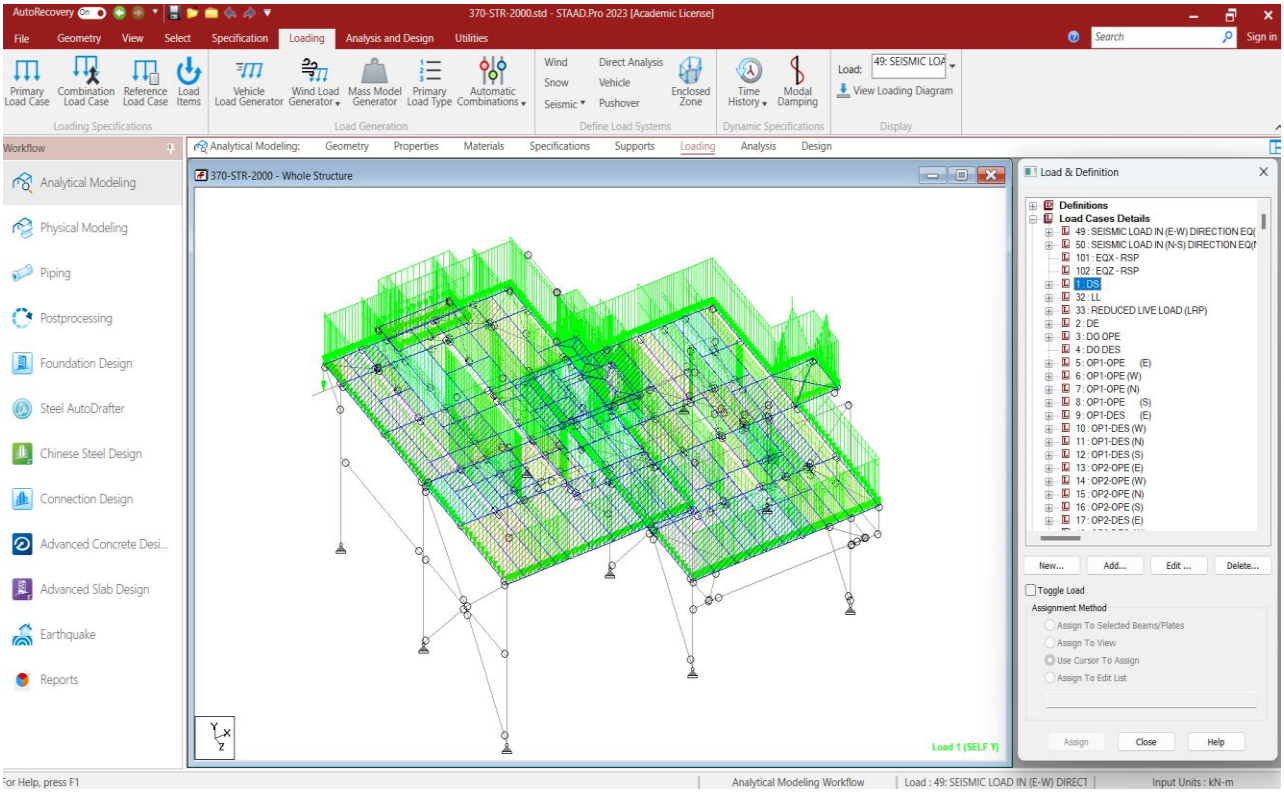
3D Rendering view



Primary Loading:-

Dead Load

In structural engineering, **dead loads** refer to the permanent static forces acting on a structure, including the self-weight of structural members and other permanently attached elements such as flooring, roofing, cladding, and fixed equipment. In **STAAD.Pro**, dead loads are essential for accurate analysis and design, especially for **steel structures**, which are lighter and more flexible compared to concrete structures.



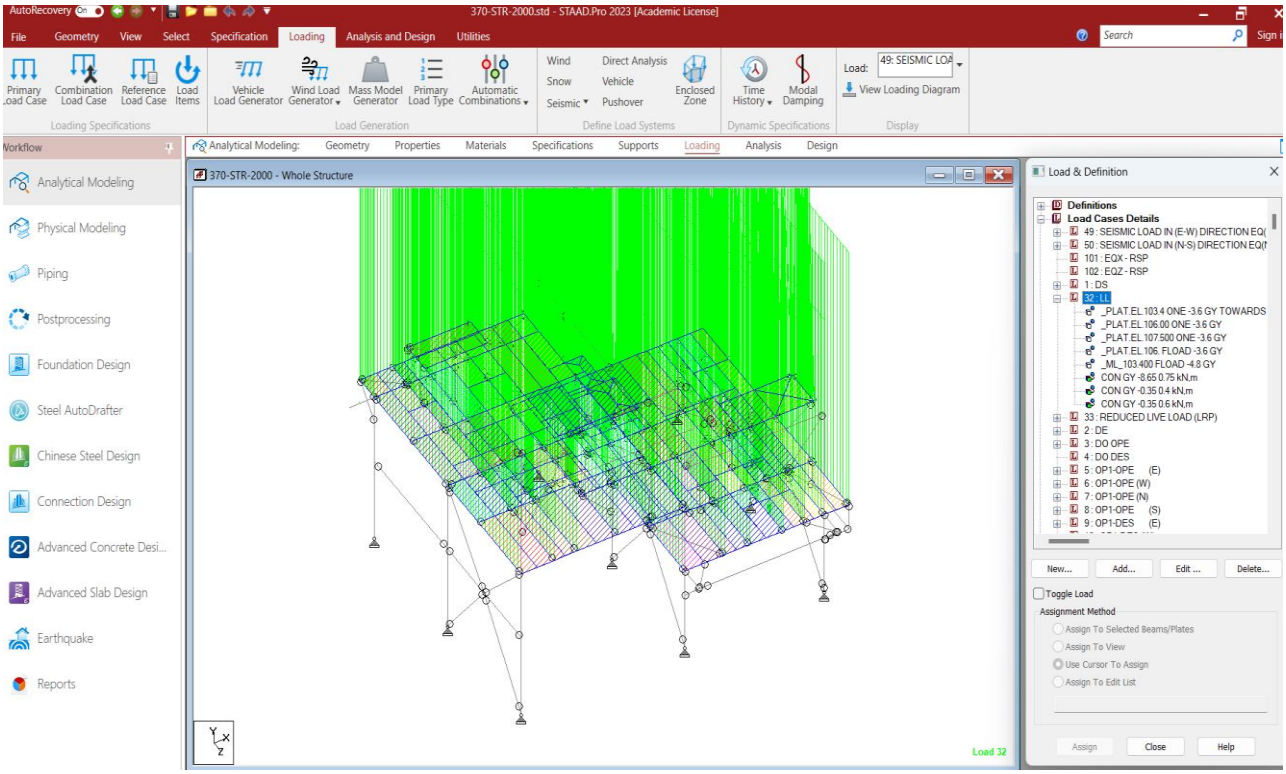
- Self-weight Concrete & steel are considered as 1 & 1.15 (15% extra for connections) respectively.
- Grating Load (32 Thk.) = 0.5 kN/ m2.
- Handrail Load =0.3 kN/m.
- Stair Dead Load = 2.25 kN/m Height.
- Cage Ladder Load = 0.35 kN/m.
- Fireproofing Load = Material considered with density of 25 kN/m3 for heavy concrete fireproofing and 8.5 kN/m3 for Light fireproofing & generated in STAAD Specifications.

Live Load

Live load is a critical factor in the analysis and design of steel structures. It represents temporary or moving forces that act on the structure during its lifetime. Unlike dead loads, which remain constant, live loads vary in magnitude and location. In STAAD.Pro, live loads must be applied correctly to ensure compliance with design codes such as:

- AISC 360 (American Institute of Steel Construction) – Governs the design of steel structures.
- ASCE 7 (Minimum Design Loads for Buildings and Other Structures) – Provides live load values and combinations.

These standards ensure that steel structures are designed to withstand service loads, strength requirements, and deflection limits.



- Staircase Live Load = 4.8 kN/ m2
- Live Load on Operating/Access Platform & Walkways = 3.6 kN/ m2
- Live load is applied on Beam as one way Floor load.

Wind Load :-

Wind load on Process Structure in accordance with 'General Design rules for Foundation & Structures' 4398-AX-SG-2G00200000001 (SA-AMI-G00-TECI-003195), ASCE 7-05 and Wind load for petrochemical and other industrial facilities document.

Wind load applied to the main frames along Moment and Braced direction using STAAD wind load generator command. Pressure coefficient Cf for Structural members are considered as 1.80. Wind Load on Equipment are validated and adopted from Mechanical data sheet.

Wind load on pipes are calculated based on maximum spanning of pipe as 9m and respective diameter. As per the Wind load for petrochemical and other industrial facilities document, frame load + Equipment load + Piping load (FT) in one axis, simultaneously acting 50% wind on frame on other orthogonal direction (FS) applied in STAAD. Refer Below Figure. Wind load on Process Structure in accordance with 'General Design rules for Foundation & Structures' 4398-AX-SG-2G00200000001 (SA-AMI-G00-TECI-003195), ASCE 7-05 and Wind load for petrochemical and other industrial facilities document.

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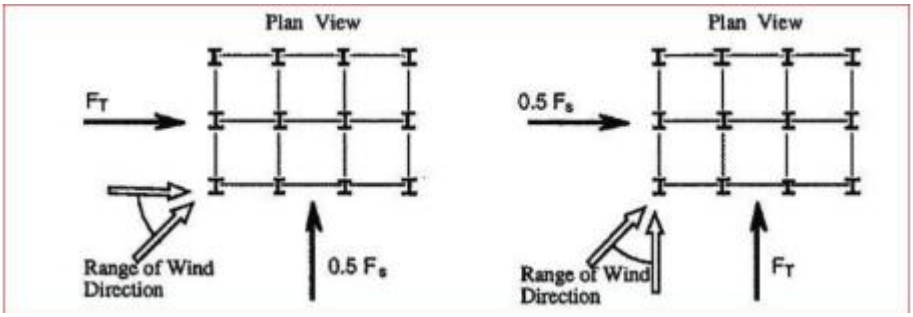
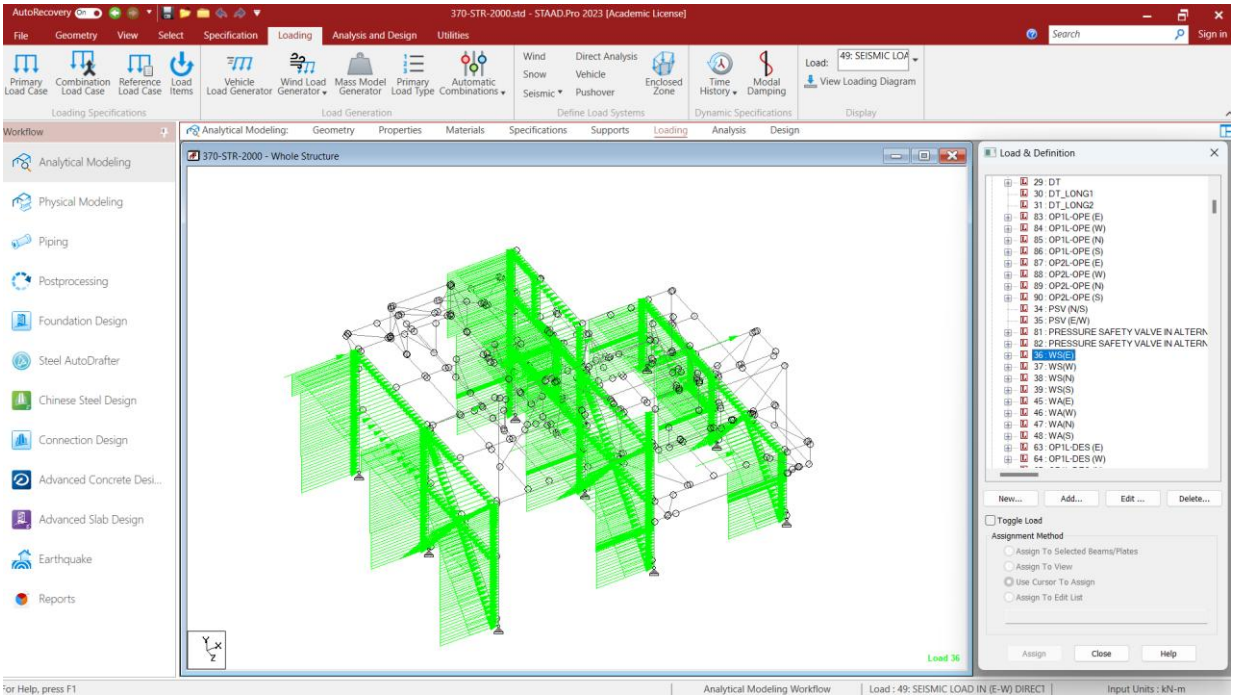
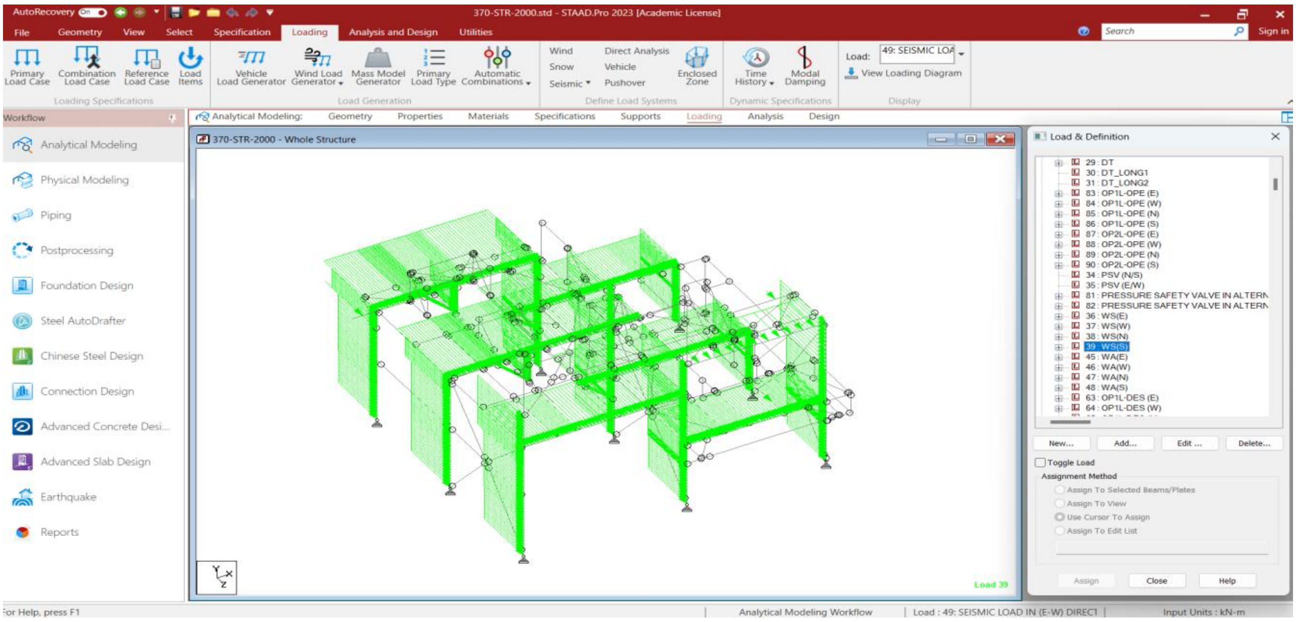
As per the Wind load for petrochemical and other industrial facilities document, frame load + Equipment load + Piping load (FT) in one axis, simultaneously acting 50% wind on frame on other orthogonal direction (FS) applied in STAAD. Refer Below Figure.

Variation of wind pressure over the height of the structure is simulated by defining different pressure values over different heights as per ASCE 7-05 & pressure intensity is updated in STAAD wind load generator command. Variation of wind pressure over the height of the structure is simulated by defining different pressure values over different heights as per ASCE 7-05 & pressure intensity is updated in STAAD wind load generator command






370-STR-2000.std - STAAD.Pro 2023 [Academic License]
File Geometry View Select Specification Loading Analysis and Design Utilities
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Vehicle Load Generator Wind Load Generator Mass Model Generator Primary Load Type Automatic Combinations
Wind Snow Seismic Direct Analysis Vehicle Pushover Enclosed Zone
Time History Modal Damping
Load: 49: SEISMIC LOA
View Loading Diagram
Workflow
Analytical Modeling
Physical Modeling
Piping
Postprocessing
Foundation Design
Steel AutoDrafter
Chinese Steel Design
Connection Design
Advanced Concrete Desi...
Advanced Slab Design
Earthquake
Reports
370-STR-2000 - Whole Structure
Load & Definition
29 : DT
30 : DT_LONG1
31 : DT_LONG2
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84 : OP1L-OPE (W)
85 : OP1L-OPE (N)
86 : OP1L-OPE (S)
87 : OP2L-OPE (E)
88 : OP2L-OPE (W)
89 : OP2L-OPE (N)
90 : OP2L-OPE (S)
34 : PSV (N/S)
35 : PSV (E/W)
81 : PRESSURE SAFETY VALVE IN ALTERN
82 : PRESSURE SAFETY VALVE IN ALTERN
36 : WS(E)
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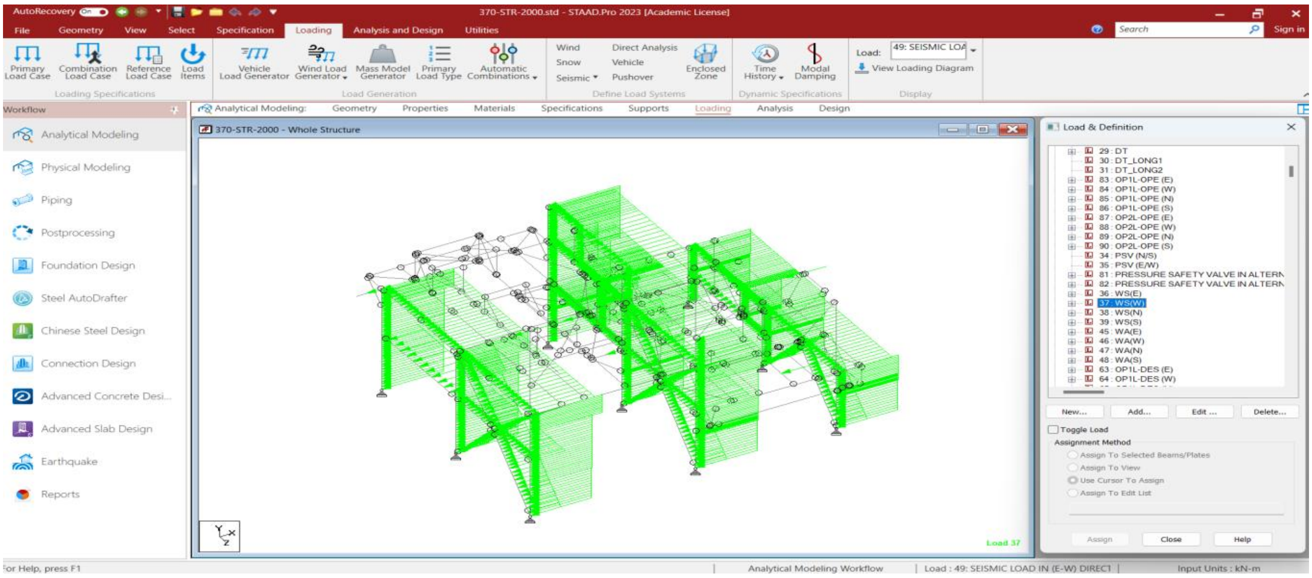
For Help, press F1
Analytical Modeling Workflow
Load : 49: SEISMIC LOAD IN (E-W) DIRECT
Input Units : kN-m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Analytical Modeling Workflow
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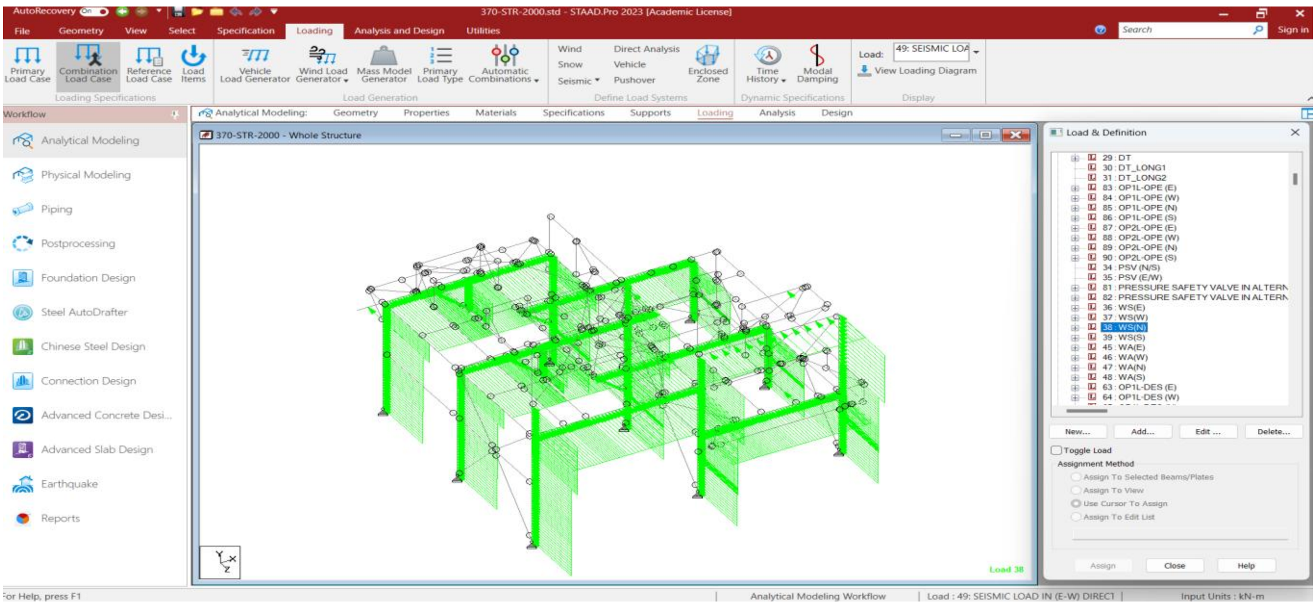
Input Units : kN-m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For Help, press F1
Analytical Modeling Workflow
Load : 49: SEISMIC LOAD IN (E-W) DIRECT
Input Units : kN-m

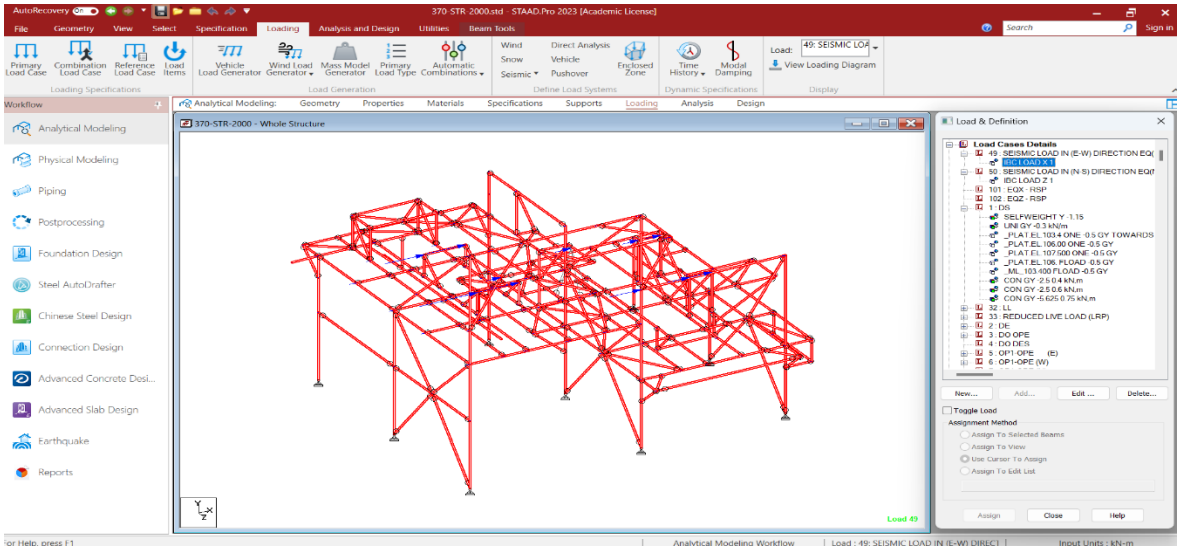
Seismic Load

Seismic load is as per clause 4.5 of 4398-AX-SG-2F00200000001(SA-AMI-G00-TCMT-003195)

TYPE OF STRUCTURE		R
Moment-resisting frame system:		
Steel	Ordinary moment-resisting frame	3
	Ordinary braced frames	3

Seismic parameters

MCE spectral response acceleration parameter at short periods:	S_s= 0,09 g	(AMIES-A-112 Table 1)
MCE spectral response acceleration parameter at a period of 1 s:	S_1= 0,03 g	(AMIES-A-112 Table 1)
Site Class:	D	(AMIES-A-112 Table 1)
Short-period site coefficient (at 0.2 s-period)	F_a= 1,6	(ASCE 7-05 Table 11.4-1)
Long-period site coefficient (at 1.0 s-period)	F_v= 2,4	(ASCE 7-05 Table 11.4-2)
MCE Spectral Response Acceleration Parameter adjusted for site class effect = F_a x S_s	S_{MS}= 0,14 g	(ASCE 7-05 Eq. 11.4-1)
MCE Spectral Response Acceleration at a period of 1s adjusted for site class effects = F_v x S_1	S_{M1}= 0,07 g	(ASCE 7-05 Eq. 11.4-2)
Design spectral acceleration parameters at short period S_{DS}=2/3 S_{MS}	S_{DS}= 0,09 g	(ASCE 7-05 Eq. 11.4-3)
Design spectral acceleration parameters at a period of 1s S_{D1}=2/3 S_{M1}	S_{D1}= 0,05 g	(ASCE 7-05 Eq. 11.4-4)
Start of plateu T_o= 0.2 S_{D1}/S_{DS}	T_o= 0,11	(ASCE 7-05 Para. 11.4.5)
End of plateu T_S= S_{D1}/S_{DS}	T_S= 0,55	(ASCE 7-05 Para. 11.4.5)
Occupancy Category:	IV	(AMIES-M-001 Para. 6.5.4)
Importance Factor:	I= 1.5	(ASCE 7-05 Table 11.5-1 & AMIES-M-001 Para. 6.5.4)
Seismic Design Category based on short period response acceleration parameter:	A	(ASCE 7-05 Table 11.6-1)
Seismic Design Category based on 1 second period response acceleration parameter:	A	(ASCE 7-05 Table 11.6-2)



Load Application (As per AISC 360-16 LRFD)

Loads are applied in compliance with **AISC 360-16 LRFD** and **ASCE 7-16**.

Dead Load (DL)

- Self-weight of structural members (automatically included in STAAD.Pro).
- Additional dead load from:

Live Load (LL)

- Applied uniformly distributed loads as per ASCE 7-16.
- Considered floor and roof live loads based on occupancy type.
- Used live load reduction for large tributary areas.

Wind Load (WL) – ASCE 7-16

- Wind pressure calculated using:

q=0.00256×Kz×Kd×Ke×V2

Where:

- Kz = Exposure coefficient
- Kd = Directionality factor
- Ke = Elevation factor
- V2 = Basic wind speed (mph)

Applied as lateral forces at each floor level due to the absence of bracing.

Seismic Load (SL) – ASCE 7-16

- Base shear calculated as: V=Cs×WV = C_s \times WV=Cs×W Where:
  - CsC_ = Seismic response coefficient
  - WWW = Total building weight
- Applied seismic forces laterally at multiple levels since the structure has no bracing.
- Ensured frame stability using rigid connections and moment-resisting frames.

Load Combinations (As per AISC 360-16 LRFD)

The following **LRFD load combinations** were applied:

1. 1.4D1.4D1.4D
2. 1.2D+1.6L1.2D + 1.6L1.2D+1.6L
3. 1.2D+1.0L+0.5W1.2D + 1.0L + 0.5W1.2D+1.0L+0.5W
4. 1.2D+1.0W+0.5L1.2D + 1.0W + 0.5L1.2D+1.0W+0.5L
5. 1.2D+1.0E+0.5L1.2D + 1.0E + 0.5L1.2D+1.0E+0.5L
6. 0.9D+1.0W0.9D + 1.0W0.9D+1.0W
7. 0.9D+1.0E0.9D + 1.0E0.9D+1.0E

RESULT

WORK	RESULT
Project Setup	The project was successfully set up in STAAD.Pro, with all relevant project details, unit preferences, and design standards initialized
Structural Geometry Definition	The geometry accurately represents the design requirements and is ready for further analysis.

Load Combination	Loads including dead load, live load, wind load, and seismic loads were defined and applied based AISC 360. The loads were correctly applied, and load combinations are prepared for analysis.
Check for utilization Ratio	The **Utilization Ratio (UR)** in STAAD.Pro shows how much of a member's strength is being used compared to its maximum allowable limit.: • **UR ≤ 1.0** → The member is **safe**. • **UR > 1.0** → The member **fails** and needs resizing or strengthening.

- **Utilization Ratio - For Strength**
- **Utilization Ratio - For Serviceability**
- **Utilization Ratio - For Beam Local Check**
- **Utilization Ratio - For Strength**

UTILIZATION RATIO-STRENGTH CASE								
Beam	Parameter	Design Property	Status	Actual Ratio	Allowable Ratio	Code	Clause	L/C
10	Parameter 1	HE340A	Pass	0.133	1	360-16 L	Eq.H1-3a|H1	8024
11	Parameter 1	HE340A	Pass	0.139	1	360-16 L	Eq.H1-3a|H1	8024
12	Parameter 1	HE340A	Pass	0.201	1	360-16 L	Eq.H1-1b	8028
13	Parameter 1	HE340A	Pass	0.255	1	360-16 L	Eq.H1-1b	8002
14	Parameter 1	HE340A	Pass	0.161	1	360-16 L	Eq.H1-3a|H1	8029
15	Parameter 1	HE340A	Pass	0.213	1	360-16 L	Eq.H1-3a|H1	8023
19	Parameter 1	HE340A	Pass	0.253	1	360-16 L	Eq.H1-1b	11030
20	Parameter 1	HE340A	Pass	0.547	1	360-16 L	Eq.H1-3a|H1	11027
21	Parameter 1	HE340A	Pass	0.203	1	360-16 L	Eq.H1-3a|H1	8025
22	Parameter 1	HE340A	Pass	0.168	1	360-16 L	Eq.H1-3a|H1	8027
23	Parameter 1	HE340A	Pass	0.31	1	360-16 L	Eq.H1-3a|H1	8026
24	Parameter 1	HE340A	Pass	0.151	1	360-16 L	Eq.H1-3a|H1	8029
25	Parameter 1	HE340A	Pass	0.232	1	360-16 L	Eq.H1-3a|H1	8027
26	Parameter 1	HE340A	Pass	0.497	1	360-16 L	Eq.H1-3a|H1	7029
27	Parameter 1	HE340A	Pass	0.232	1	360-16 L	Eq.H1-3a|H1	8028
29	Parameter 1	HE300A	Pass	0.369	1	360-16 L	Eq.H1-1b	8028
31	Parameter 1	HE300A	Pass	0.538	1	360-16 L	Eq.H1-1b	8029
33	Parameter 1	HE300A	Pass	0.339	1	360-16 L	Eq.H1-1b	8027
34	Parameter 1	HE180A	Pass	0.111	1	360-16 L	Eq.H1-1b	8029
35	Parameter 1	HE180A	Pass	0.083	1	360-16 L	Eq.H1-1b	8027
36	Parameter 1	IPE270	Pass	0.044	1	360-16 L	Eq.H1-1b	11028
37	Parameter 1	HE200A	Pass	0.312	1	360-16 L	Eq.H1-1b	11030
38	Parameter 1	IPE270	Pass	0.089	1	360-16 L	Eq.H1-1b	8015
39	Parameter 1	HE300A	Pass	0.108	1	360-16 L	Eq.H1-1b	11030
40	Parameter 1	IPE270	Pass	0.477	1	360-16 L	Cl.F2.2	10004
41	Parameter 1	HE300A	Pass	0.123	1	360-16 L	Eq.H1-1b	7015
42	Parameter 1	IPE270	Pass	0.49	1	360-16 L	Eq.H1-1b	10001
43	Parameter 1	IPE270	Pass	0.622	1	360-16 L	Cl.F2.2	7014
44	Parameter 1	HE300A	Pass	0.427	1	360-16 L	Eq.H1-1b	8028
45	Parameter 1	HE400A	Pass	0.183	1	360-16 L	Cl.G1	11028
46	Parameter 1	HE180A	Pass	0.114	1	360-16 L	Eq.H1-1b	8029
47	Parameter 1	STAR70X7	Pass	0.183	1	360-16 L	Cl.E3	8035
48	Parameter 1	STAR70X7	Pass	0.391	1	360-16 L	Eq.H1-1a	8035
49	Parameter 1	STAR70X7	Pass	0.304	1	360-16 L	Eq.H1-1a	8033
50	Parameter 1	STAR70X7	Pass	0.424	1	360-16 L	Eq.H1-1a	8033
51	Parameter 1	IPE270	Pass	0.072	1	360-16 L	Eq.H1-1b	8025
52	Parameter 1	STAR70X7	Pass	0.253	1	360-16 L	Eq.H1-1a	8061
53	Parameter 1	STAR70X7	Pass	0.691	1	360-16 L	Eq.H1-1a	8035
54	Parameter 1	STAR70X7	Pass	0.344	1	360-16 L	Eq.H1-1a	8031
55	Parameter 1	STAR70X7	Pass	0.729	1	360-16 L	Eq.H1-1a	8030
57	Parameter 1	STAR70X7	Pass	0.836	1	360-16 L	Eq.H1-1a	11006
58	Parameter 1	STAR70X7	Pass	0.394	1	360-16 L	Eq.H1-1a	8031
60	Parameter 1	IPE200	Pass	0.294	1	360-16 L	Eq.H1-1b	8036
61	Parameter 1	IPE200	Pass	0.035	1	360-16 L	Cl.D2	8033
62	Parameter 1	IPE200	Pass	0.033	1	360-16 L	Cl.D2	8032
63	Parameter 1	IPE200	Pass	0.26	1	360-16 L	Cl.F2.2	10004
64	Parameter 1	HE400A	Pass	0.204	1	360-16 L	Eq.H1-3a|H1	11030
67	Parameter 1	HE400A	Pass	0.294	1	360-16 L	Eq.H1-3a|H1	11028
73	Parameter 1	HE340A	Pass	0.251	1	360-16 L	Eq.H1-1b	11030
74	Parameter 1	HE340A	Pass	0.268	1	360-16 L	Eq.H1-3a|H1	8027
75	Parameter 1	L70X70X7	Pass	0.382	1	360-16 L	Eq.H2-1	10004
76	Parameter 1	L70X70X7	Pass	0.38	1	360-16 L	Eq.H2-1	10004
77	Parameter 1	L70X70X7	Pass	0.269	1	360-16 L	Eq.H2-1	8032
78	Parameter 1	L70X70X7	Pass	0.296	1	360-16 L	Eq.H2-1	8033
81	Parameter 1	HE400A	Pass	0.374	1	360-16 L	Cl.G1	7015
82	Parameter 1	HE400A	Pass	0.195	1	360-16 L	Eq.H1-3a|H1	8024
83	Parameter 1	HE400A	Pass	0.409	1	360-16 L	Cl.F2.2	7025

SERVICEABILITY CHECK

Allowable Lateral Displacement of structure is considered as H/200 as per 4398-AX-SG-2F00200000001 (SA-AMI-G00-TCMT-003195) - General design rules for foundations and structures – Clause 13.2.

Allowable Inter-story drift is considered as h/200 as per 4398-AX-SG-2F00200000001 (SA-AMI-G00- TCMT-003195) - General design rules for foundations and structures – Clause 13.2.

Where, H = Total Height of Structure

h = Inter-story Height.

Beam	Parameter	Design Property	Status	Actual Ratio	Allowable Ratio	Code	Clause	L/C
597	Parameter 2	HE200A	Pass	0.153	1	360-16 L	Deflection	13004
596	Parameter 2	HE180A	Pass	0.096	1	360-16 L	Deflection	13004
595	Parameter 2	HE200A	Pass	0.108	1	360-16 L	Deflection	13001
594	Parameter 2	HE200A	Pass	0.109	1	360-16 L	Deflection	13003
593	Parameter 2	HE200A	Pass	0.108	1	360-16 L	Deflection	13002
592	Parameter 2	HE200A	Pass	0.109	1	360-16 L	Deflection	13003
591	Parameter 2	HE200A	Pass	0.131	1	360-16 L	Deflection	13002
590	Parameter 2	HE200A	Pass	0.131	1	360-16 L	Deflection	13001
589	Parameter 2	HE200A	Pass	0.167	1	360-16 L	Deflection	13004
588	Parameter 2	HE200A	Pass	0.131	1	360-16 L	Deflection	13002
587	Parameter 2	HE200A	Pass	0.719	1	360-16 L	Deflection	13001
586	Parameter 2	HE200A	Pass	0.131	1	360-16 L	Deflection	13002
585	Parameter 2	HE300A	Pass	0.074	1	360-16 L	Deflection	13002
582	Parameter 2	HE300A	Pass	0.177	1	360-16 L	Deflection	13001
581	Parameter 2	HE300A	Pass	0.558	1	360-16 L	Deflection	13004
580	Parameter 2	HE400A	Pass	0.241	1	360-16 L	Deflection	13002
579	Parameter 2	HE400A	Pass	0.241	1	360-16 L	Deflection	13002
569	Parameter 2	HE300A	Pass	0.485	1	360-16 L	Deflection	13002
568	Parameter 2	HE300A	Pass	0.319	1	360-16 L	Deflection	13004
567	Parameter 2	HE300A	Pass	0.107	1	360-16 L	Deflection	13002
563	Parameter 2	IPE160	Pass	0.021	1	360-16 L	Deflection	13002
562	Parameter 2	IPE200	Pass	0.925	1	360-16 L	Deflection	13004
561	Parameter 2	IPE160	Pass	0.018	1	360-16 L	Deflection	13004
560	Parameter 2	IPE200	Pass	0.925	1	360-16 L	Deflection	13004
559	Parameter 2	IPE160	Pass	0.018	1	360-16 L	Deflection	13002
558	Parameter 2	IPE200	Pass	0.925	1	360-16 L	Deflection	13004
557	Parameter 2	IPE160	Pass	0.018	1	360-16 L	Deflection	13003
556	Parameter 2	IPE200	Pass	0.925	1	360-16 L	Deflection	13004
554	Parameter 2	HE300A	Pass	0.029	1	360-16 L	Deflection	13001
551	Parameter 2	HE300A	Pass	0.678	1	360-16 L	Deflection	13004
550	Parameter 2	HE300A	Pass	0.657	1	360-16 L	Deflection	13004
539	Parameter 2	HE300A	Pass	0.472	1	360-16 L	Deflection	13002
537	Parameter 2	HE300A	Pass	0.585	1	360-16 L	Deflection	13004
534	Parameter 2	IPE270	Pass	0.002	1	360-16 L	Deflection	13001
530	Parameter 2	HE200A	Pass	0.004	1	360-16 L	Deflection	13003
529	Parameter 2	HE200A	Pass	0.003	1	360-16 L	Deflection	13003
528	Parameter 2	HE200A	Pass	0.027	1	360-16 L	Deflection	13001
527	Parameter 2	HE200A	Pass	0.027	1	360-16 L	Deflection	13001
526	Parameter 2	HE200A	Pass	0.719	1	360-16 L	Deflection	13001
523	Parameter 2	IPE270	Pass	0.027	1	360-16 L	Deflection	13002
521	Parameter 2	HE300A	Pass	0.472	1	360-16 L	Deflection	13002
516	Parameter 2	HE180A	Pass	0.221	1	360-16 L	Deflection	13002
511	Parameter 2	IPE160	Pass	0.002	1	360-16 L	Deflection	13004
510	Parameter 2	IPE270	Pass	0.384	1	360-16 L	Deflection	13001
509	Parameter 2	HE300A	Pass	0.107	1	360-16 L	Deflection	13002
508	Parameter 2	IPE270	Pass	0.384	1	360-16 L	Deflection	13001
507	Parameter 2	IPE270	Pass	0.631	1	360-16 L	Deflection	13002
506	Parameter 2	IPE270	Pass	0.384	1	360-16 L	Deflection	13001
505	Parameter 2	IPE270	Pass	0.631	1	360-16 L	Deflection	13002
504	Parameter 2	HE200A	Pass	0.269	1	360-16 L	Deflection	13001
503	Parameter 2	IPE270	Pass	0.014	1	360-16 L	Deflection	13001
501	Parameter 2	HE300A	Pass	0.013	1	360-16 L	Deflection	13001
500	Parameter 2	HE300A	Pass	0.025	1	360-16 L	Deflection	13002
499	Parameter 2	IPE160	Pass	0.003	1	360-16 L	Deflection	13002
498	Parameter 2	HE300A	Pass	0.018	1	360-16 L	Deflection	13002
467	Parameter 2	HE300A	Pass	0.143	1	360-16 L	Deflection	13004
466	Parameter 2	IPE270	Pass	0.049	1	360-16 L	Deflection	13003
465	Parameter 2	IPE270	Pass	0.094	1	360-16 L	Deflection	13001
463	Parameter 2	IPE270	Pass	0.094	1	360-16 L	Deflection	13001
462	Parameter 2	IPE270	Pass	0.004	1	360-16 L	Deflection	13003
459	Parameter 2	IPE270	Pass	0.049	1	360-16 L	Deflection	13003
456	Parameter 2	IPE270	Pass	0.002	1	360-16 L	Deflection	13003
452	Parameter 2	HE200A	Pass	0.711	1	360-16 L	Deflection	13001
449	Parameter 2	IPE270	Pass	0.002	1	360-16 L	Deflection	13003

UTILIZATION RATIO - BEAM LOCAL CHECK STRENGTH CASE								
Beam	Parameter	Design Property	Status	Actual Ratio	Allowable Ratio	Code	Clause	L/C
596	Parameter 1	HE180A	Pass	0.428	1	360-16 L	Eq.H1-1b	12061
504	Parameter 1	HE200A	Pass	0.535	1	360-16 L	Eq.H1-1b	12003
425	Parameter 1	IPE270	Pass	0.273	1	360-16 L	Cl.F2.2	12001
299	Parameter 1	HE180A	Pass	0.513	1	360-16 L	Eq.H1-1b	12003

CONCLUSION

The static analysis of the steel structure of reboiler equipment using STAAD.Pro software has provided valuable insights into its structural performance under various loading conditions. The analysis, conducted as per AISC code using the LRFD method, ensured accurate load combinations and strength evaluation. The results indicate that the structure meets safety and design standards, with acceptable utilization ratios and minimal deflection. This study highlights the effectiveness of STAAD.Pro in optimizing steel structure design, ensuring reliability and cost efficiency.

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