International Journal of Science, Strategic Management and Technology
Volume **02** Issue **04** April-**2026** | ISSN: **3108-1762 (Online)** | Impact Factor: 3.8
An International, Peer-Reviewed, Open Access Scholarly Journal Indexed in recognized academic databases

Design and Detailing of Roof Top Plateform for Mechanical Units as Per AISC Design

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https://doi.org/10.55041/ijsmt.v2i3.405

Cite this Article: D.Dhavashankaran, , P.Aarthi, & R.Keerthana, (2026). Design and Detailing of Roof Top Plateform for Mechanical Units as Per AISC Design. International Journal of Science, Strategic Management and Technology, *02*(04). https://doi.org/10.55041/ijsmt.v2i3.405

Abstract—

The installation of mechanical equipment on building rooftops requires the design of safe, efficient, and code-compliant structural platforms. This study focuses on the design and detailing of rooftop platforms in accordance with the provisions of the American Institute of Steel Construction (AISC). The platform is designed to support static and dynamic loads from mechanical units such as HVAC systems, including dead loads, live loads, wind loads, and vibration effects. The design methodology follows the guidelines of AISC 360 and AISC 303, ensuring structural safety, serviceability, and constructability using Load and Resistance Factor Design (LRFD) principles. Member selection, connection design, and stability checks are carried out with careful consideration of load transfer mechanisms, anchorage to the existing roof structure, and lateral bracing systems. Additionally, detailing aspects such as fabrication, erection, corrosion protection, drainage, and maintenance accessibility are addressed. Vibration isolation and fatigue considerations are also included to enhance durability. The outcome is a practical and efficient design framework that meets AISC standards while ensuring safety and economy in roof top platform construction.

Key words: American Institute of Construction (AISC), Heat Ventilation Air Cooling (HVAC), AISC 360,AISC 303, Load and Resistance Factor Desgin (LRFD).

I. INTRODUCTION

The project focuses on the structural design and detailing of a rooftop platform intended to support mechanical equipment such as HVAC units, chillers, and other service installations. The design is carried out in accordance with the standards and guidelines provided by the American Institute of Steel Construction (AISC), ensuring safety, reliability, and compliance with modern engineering practices.The rooftop platform is typically constructed using structural steel members, selected for their strength, durability, and ease of fabrication. The design process involves determining the appropriate size and type of beams, columns, bracings, and connections required to safely transfer loads from the mechanical units to the building structure. These loads include dead loads (self-weight of structure and equipment), live loads (maintenance personnel), wind loads, and sometimes seismic forces.AISC design principles such as Load and Resistance Factor Design (LRFD) or Allowable Strength Design (ASD) are applied to ensure that all structural components perform within safe limits under various loading conditions. The project also emphasizes proper detailing, including connection design (bolted or welded), base plate arrangements, anchorage systems, and corrosion protection measures.In addition, practical considerations such as ease of installation, accessibility for maintenance, vibration control, and drainage are incorporated into the design. The final outcome of the project includes detailed structural drawings, design calculations, material specifications, and fabrication guidelines, all aligned with AISC standards.

4.4 isometric view

An isometric view is a way of representing a three-dimensional object on a two-dimensional plane. It shows length, width, and height simultaneously at equal angles, usually 30° from the horizontal.

Figure 4.3 isometric view

II. WF Beam to Stiffened WF Column Web:

1. SC-2.3A-Extended Shear Tab (Single Column) (3/4" A325N BOLTS)
2. SC-2.4A-Extended Shear Tab (Double Column) (3/4" A325N BOLTS)
3. SC-2.4B-Extended Shear Tab (Double Column) (1" A325N BOLTS)

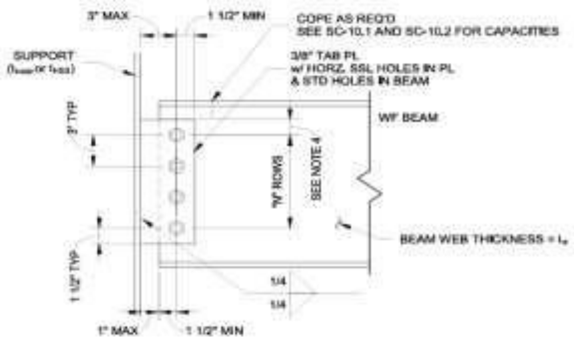


Figure 6.1 WF Beam to WF Girder SC-2.1A-Shear Tab

STANDARD SHEAR TAB CONNECTION:

AISC Codes: ASD

WF Beam Information:
Size: W16X26

Grade: A992

WF Beam Cope:

Max.Length: c:= 5 in Top
Depth: dct:= 2.5 in

Bottom Depth: dcb:= 0 in

Bolt Information:

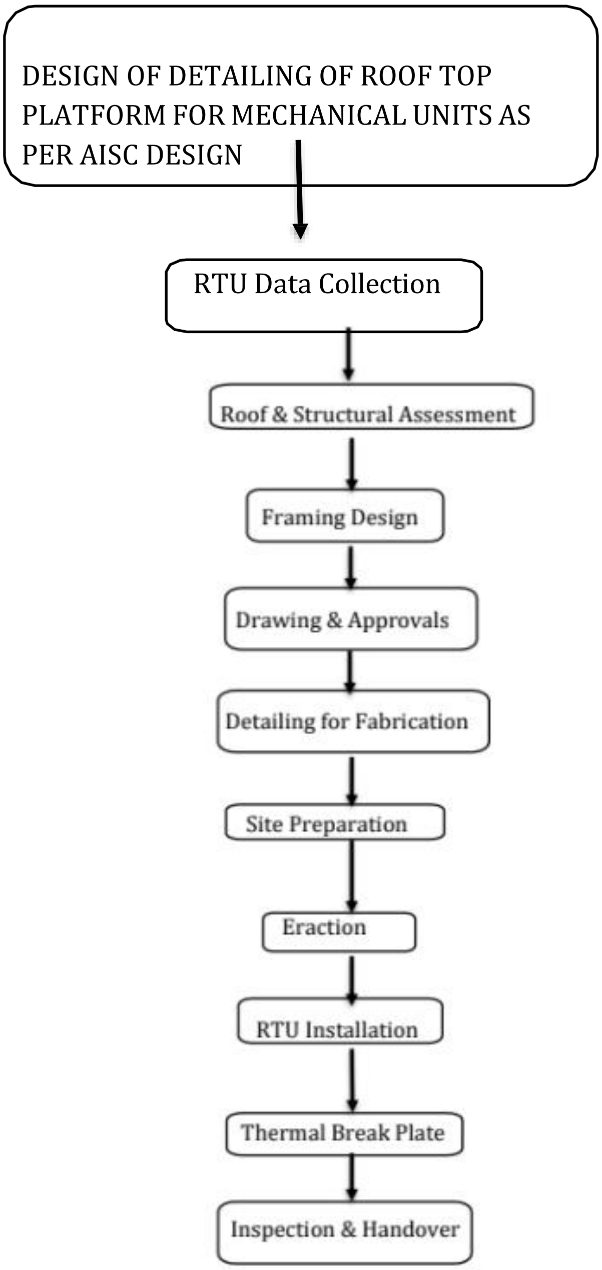
Bolt Size: ¾ Grade: A325N Hole Type: SSL

Table 6.1 WF Beam to WF Column Web connection strength

CONNECTION STRENGTH (KIPS)

Nf Rows	ASD	LRFD	$k_{s,avg}$	$t_{e,min}$	$t_{e,min}$
2	16	24	0.23	1/4	1/4
3	29	45	0.22	1/4	1/4
4	42	62	—	3/16	3/16
5	54	82	—	3/16	3/16
6	67	100	—	3/16	3/16
7	79	118	—	3/16	3/16
8	91	136	—	3/16	3/16
9	103	154	—	3/16	3/16
8	103	154	—	3/16	3/16
10	115	172	—	3/16	3/16

METHODOLOGY



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III.RESULTS AND DISCUSSION

The results of the design and detailing of the rooftop platform for mechanical units, based on guidelines from the American Institute of Steel Construction, demonstrate that the structure is safe, stable, and efficient under various loading conditions. The platform successfully resists dead loads, live loads, equipment loads, and wind loads, with all structural members designed within

permissible stress limits. Beam deflections were found to be within allowable limits, ensuring proper serviceability without excessive deformation. The inclusion of adequate bracing systems improved overall stability and minimized vibrations caused by mechanical equipment. Connection detailing, including bolted and welded joints, base plates, and anchor bolts, ensured effective load transfer from the platform to the supporting roof structure. Additionally, the use of thermal break plates helped in reducing heat transfer, enhancing performance. The study also highlights that proper material selection, accurate load estimation, and adherence to AISC standards lead to an economical and durable design. Overall, the rooftop platform provides a reliable solution for supporting mechanical units while ensuring safety, ease of installation, and long-term performance.

DETAILING OF CONNECTION STRENGTH:

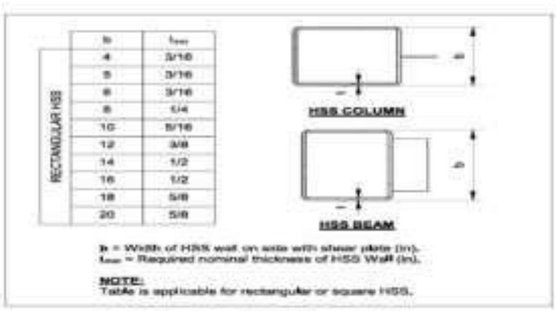

Figure 6.7 rectangular HSS Beam & column

1. Capacities may be reduced by multiplying by a factor of "less/tess" when HSS wall

thickness is less than s Tin. See note below on HSS support sizes.

2. Capacities shown above are not applicable at coped beams. Contact SSE if cope is Present.
3. Table 6.7 single cope beam strength:

TABLE SC-10.1		SINGLE COPE BEAM STRENGTH											
		OPTION #1				OPTION #2				OPTION #3			
BEAM DEPTH	MIN. WEIGHT	MAX. COPE DEPTH (Dct or Dcb)	MAX. COPE LENGTH (Lc)	ASD (K)	LRFD (K)	MAX. COPE DEPTH (Dct or Dcb)	MAX. COPE LENGTH (Lc)	ASD (K)	LRFD (K)	MAX. COPE DEPTH (Dct or Dcb)	MAX. COPE LENGTH (Lc)	ASD (K)	LRFD (K)
W8	x10	1"	4"	17	25	1-1/4"	5"	12	18	1-3/4"	6"	8	13
	x13	1"	4"	28	42	1-1/4"	5"	21	32	1-3/4"	6"	15	23
W10	x12	1-1/2"	5"	20	30	1-3/4"	6"	15	23	2"	7"	12	18
	x15	1-1/2"	5"	29	44	1-3/4"	6"	23	34	2"	7"	18	27
W12	x14	1-3/4"	5"	27	41	2-1/2"	6"	19	29	4"	7"	12	18
	x16	1-3/4"	5"	34	51	2-1/2"	6"	24	37	4"	7"	15	23
	x35	1-3/4"	5"	64	96	2-1/2"	6"	53	79	4"	7"	33	50
W14	x22	2-1/2"	5"	44	66	4"	6"	27	42	7"	7"	12	18
	x34	2-1/2"	5"	65	95	4"	6"	46	69	7"	7"	20	30
W16	x26	2-1/2"	5"	64	97	4"	6"	42	63	7"	7"	21	32
	x36	2-1/2"	5"	79	118	4"	6"	63	96	7"	7"	31	47
W18	x35	2-1/2"	5"	91	136	4"	6"	76	115	7"	7"	42	63
	x46	2-1/2"	5"	112	168	4"	6"	101	152	7"	7"	63	95
W21	x44	2-1/2"	5"	127	191	4"	6"	116	175	7"	7"	80	120
	x68	2-1/2"	5"	159	239	4"	6"	147	220	7"	7"	121	181
W24	x55	3"	6"	162	244	4"	7"	154	232	7"	8"	112	169
	x84	3"	6"	198	297	4"	7"	188	283	7"	8"	160	241
W27	x84	3"	6"	218	327	4"	7"	208	313	7"	8"	181	271
	x114	3"	6"	277	415	4"	7"	265	398	7"	8"	231	347
W30	x90	3"	6"	249	373	4"	7"	239	359	7"	8"	211	317
	x132	3"	6"	335	503	4"	7"	323	485	7"	8"	286	429

IV.CONCLUSION

The rooftop platform project was successfully designed, detailed, fabricated, and erected following AISC 360-16 (15th Edition) standards, ensuring structural integrity and safety. All steel members were accurately cut, drilled, and welded, and bolted connections were installed with proper pretension to meet design requirements. Quality control procedures, including inspections of welds, bolts, and alignments, ensured compliance with standards. Challenges such as coping, skewed members, and height-related risks were addressed through careful planning and safety protocols. The erection sequence and workflow were executed efficiently, maintaining stability and alignment. The project demonstrates the practical application of structural design principles in a real-world scenario. It provides a functional, durable, and reliable rooftop platform capable of carrying the intended loads. Overall, this project highlights the importance of design accuracy, quality assurance, and safety in structural engineering projects.

ACKNOWLEDGMENT

I express my sincere gratitude to the American Institute of Steel Construction for providing comprehensive design guidelines that formed the foundation for this study on the design and detailing of rooftop platforms for mechanical units. I would like to thank my faculty members and project guide for their valuable guidance, continuous support, and constructive suggestions throughout the completion of this work. Their expertise greatly contributed to the successful understanding and execution of the project.

I also extend my heartfelt thanks to my institution for providing the necessary resources and a conducive learning environment to carry out this study effectively. I am grateful to my friends and classmates for their encouragement and cooperation during the course of this project. Finally, I thank my family for their constant support, motivation, and understanding, which helped me complete this work successfully.

REFERENCES

1. **Ahmed, S., and Khan, M. (2023),** "Design Optimization of Steel Frames Using AISC Standards," *International Journal of Steel Structures*, Vol. 23, No. 1, pp. 112–125.
2. **Brown, T., Wilson, P., and Davis, K. (2023),** "Load and Resistance Design of Steel Platforms under Equipment Loads," *Engineering Structures*, Vol. 210, No. 15, pp. 110379-1–110379-
12.
3. **Chen, X., Liu, Y., and Zhao, H. (2025),** "Vibration Control in Steel Platforms Supporting Mechanical Units," *Thin-*
4. Li, Y., and Chen, J. (2026),"Experimental Study on Steel
5. Platform Connections," Journal of Constructional Steel Research, Vol. 210, No. 6, pp. 108001-1–108001-10.
.Liu, J. (2020), "Additive Manufacturing for Structural Steel Applications," Engineering Journal, Vol. 62, No. 4, pp. 195–202.
6. Li, C.-H., Richards, P. W., Saxey, B. W., and Richards, H. L. (2020), "Seismic Design and Performance of Buckling Restrained Braced Frames with Eccentric Brace Configurations," Engineering Journal, Vol. 63, No. 1, pp. 49–105.
7. Patel, R., and Singh, A. (2022), "Structural Analysis of Steel Platform Systems under Dynamic Loads," Structures, Vol. 36, No. 5, pp. 456–468.
8. Sharma, S., Shafaei, S., Varma, A., and Klemencic, R. (2022), "Design of Noncontact Lap Splice Connections for C-PSW/CF Systems," Engineering Journal, Vol. 63, No. 1, pp. 27–47.