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LATTICE GIRDERS

INTRODUCTION

Lattice Girders have been developed for special demands in the field of Tunneling. The system has been extensively tested and used successfully for numerous tunnel projects throughout the world.

Lattice Girders ensure an immediate support in the open span area. Contrary to standard solid-web girders, Lattice Girders are entirely integrated in the shotcrete lining; porous zones and shotcrete spray shadows are avoided.

The load-bearing capacity of Lattice Girders has been investigated in terms of various loading tests and by numerical analysis. Flexibility regarding geometry and bearing capacity characterizes this passive support system for underground applications.

Look to JENNMAR Civil for quality USA manufacturing and development of ground support elements. We provide designs and products for Lattice Girders used in SEM/NATM construction.

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THE SYSTEM

Fields of Application

- SEM/NATM excavation
- Passive support system for the excavated cross section
- Profile template for the excavation geometry
- Bearing for pre-support elements

Main Advantages

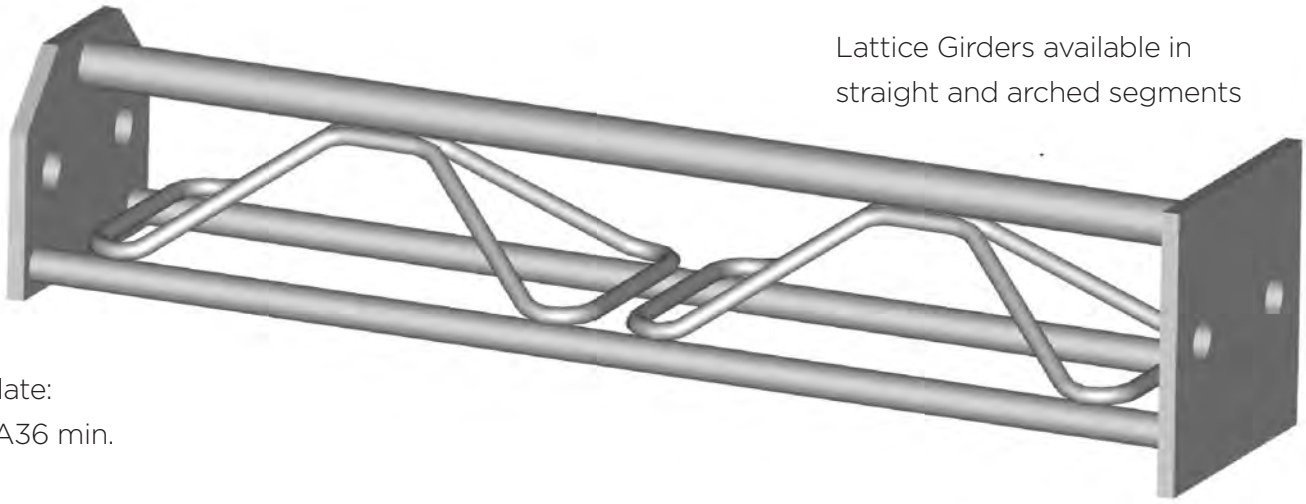
- Immediate support in the excavation area
- Partial static support action even without shotcrete embedding
- Utilization as a true-to-form template for shotcrete application
- Easy and quick assembly
- Simple handling and installation by a small crew
- Optimum bond and interconnection with the shotcrete lining
- Simple adjustment and shaping to the excavation geometry
- Ideal bearing for spiles and lagging boards
- Spiles may be installed both above or through the lattice girders
- No need for investment in major equipment

System Description

- Load-bearing elements according to the particular demands in Tunneling
- Application in combination with shotcrete
- Spatial 3-bar or 4-bar girder construction, connected via stiffening elements (spiders)
- Reduction of girder buckling lengths by stiffeners
- 3-bar girder: single bar by default at the excavation side
- 4-bar girder: application as wallplate beam or stiff cross girder
- Caverns with side drifts: combined use of 3-bar and 4-bar bar girders
- Assembly of the full girder profile by connecting single girder elements
- Load transmission even before shotcrete application
- Integral part of the shotcrete lining reinforcement
- Proven bond according to the design principles of reinforced concrete

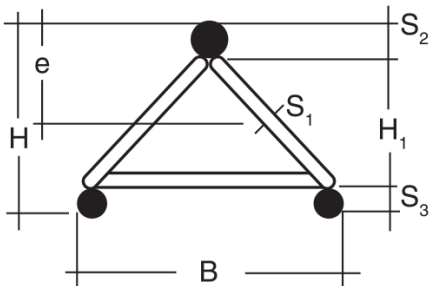
LATTICE GIRDERS AND STEEL ARCHES

3-Bar Type



Lattice Girders available in straight and arched segments

Joint Plate:
ASTM A36 min.



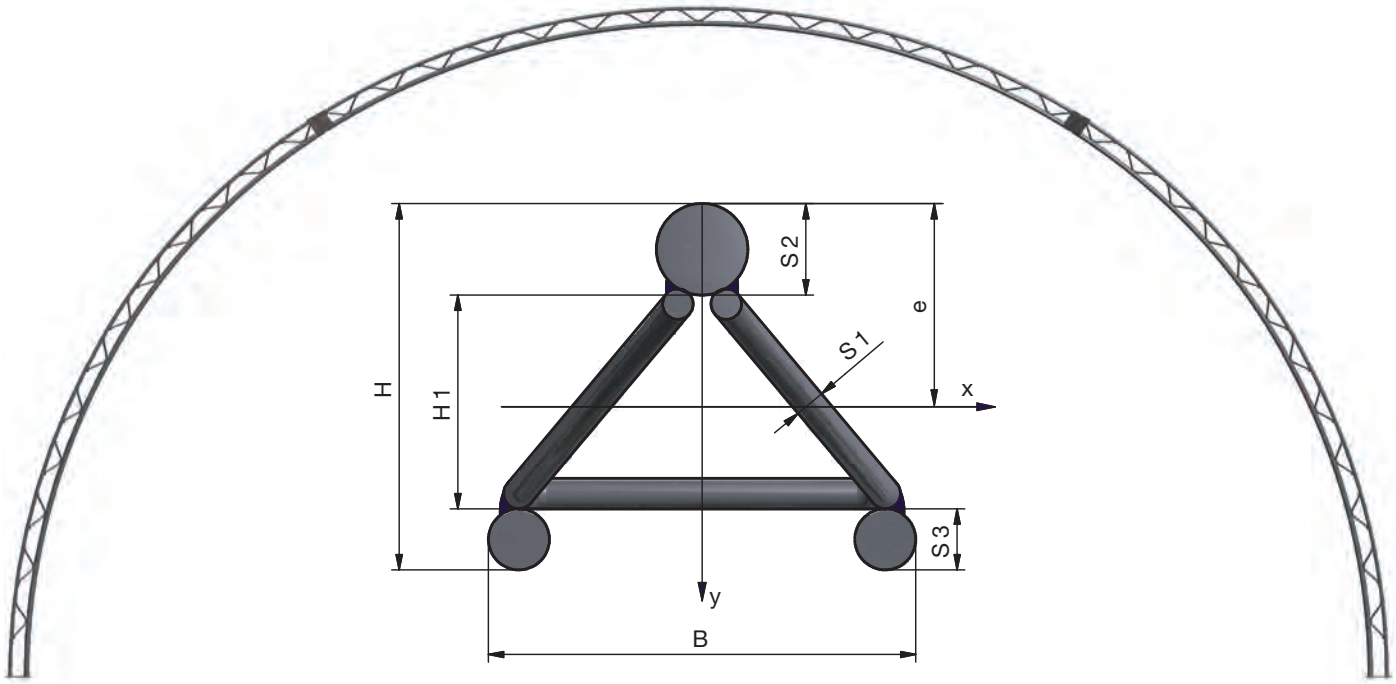
Lattice Girder Bar Material:
Tensile Strength 80ksi (550 MPa) min.
Yield Strength 70ksi (480 MPa) min.
Elongation 10% minimum

Connecting Bolts:
ASTM A 325N Ø 3/4" minimum

Dimensions

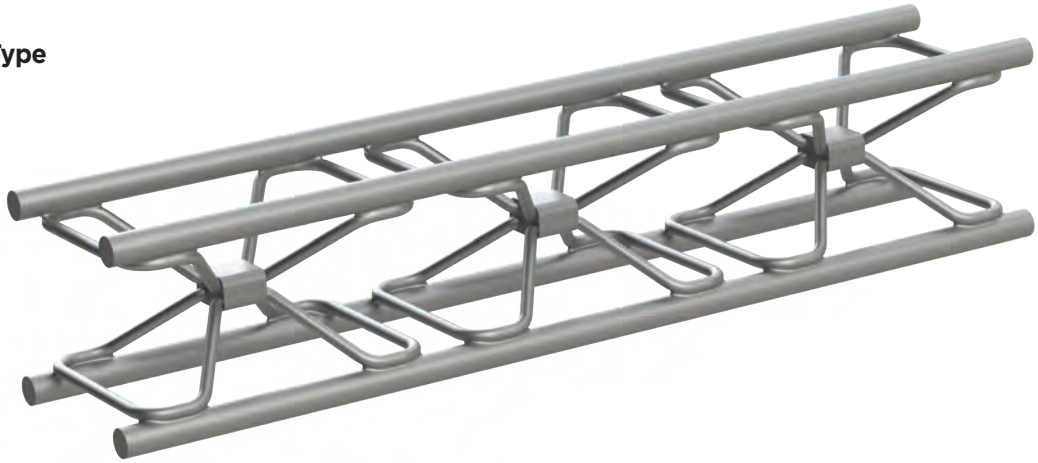
O.P. Type	Bar Size			Weight (lbs/ ft.)	H (in.)	B (in.)	e (in.)	H1 (in.)	Ix (in.²)	Sx (in.²)	Iy (in.²)	By (in.²)	Joint Plate			Foot Plate	
	S3	S2	S1										Size (in.)	Length (in.)	Unit Wt (lbs)	Size (in.)	Unit Wt (lbs.)
50	6	8	0.39	6.72	3.70	3.94	2.01		3.441	1.716	2.324	1.180	L4 × 3 × 3/8	4 9/16	3.2	3/8 × 5 × 5	2.7
	6	10		8.26	3.94		1.88		4.676	2.226	2.395	1.216		4 9/16	3.2		
70	6	8	0.39	6.95	4.50	5.60	2.42	2.75	5.544	2.295	5.064	1.846		5 5/16	3.5	3/8 × 6 × 6	3.8
	6	10		8.59	4.77		2.20		7.376	2.886	5.135	1.867		5 1/2	3.7		
	8	11		11.83	5.16		2.69		12.108	4.465	8.226	2.991		5 3/4	3.9		
95	6	8	0.39	7.07	5.50	7.09	2.94	3.76	8.937	3.036	8.950	2.526		5 9/16	4.4	3/8 × 7 × 8	6.0
	6	10		8.70	5.77		2.59		11.741	3.751	9.028	2.548		6 3/4	4.6		
	8	11		12.05	6.16		3.18		18.883	5.854	14.840	4.188		7 1/16	4.8		
115	6	8	0.47	7.94	6.25	8.66	3.37	4.50	12.182	3.636	13.906	3.21	L5 × 3 × 1/2	7 11/16	8.0	3/8 × 8 × 9-1/2	8.1
	6	10		9.58	6.52		2.91		15.849	4.416	13.985	3.229		7 13/16	8.1		
	8	11		12.92	6.91		3.69		25.208	6.953	23.342	5.390		8 1/8	8.4		
130	6	8	0.47	7.76	6.87	8.66	3.69	5.12	15.015	4.068	13.906	3.211		8 1/8	8.4	3/8 × 8 × 9-1/2	8.1
	6	10		9.39	7.14		3.15		19.379	4.929	13.977	3.229		8 5/16	8.6		
	8	11		12.73	7.53		3.93		30.623	7.794	23.342	5.390		8 3/4	9.3		

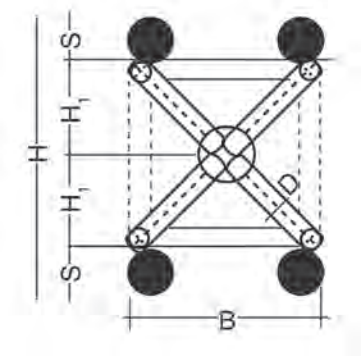
SPECIFICATIONS 3-BAR GIRDERS



LATTICE GIRDERS AND STEEL ARCHES

4-Bar Type





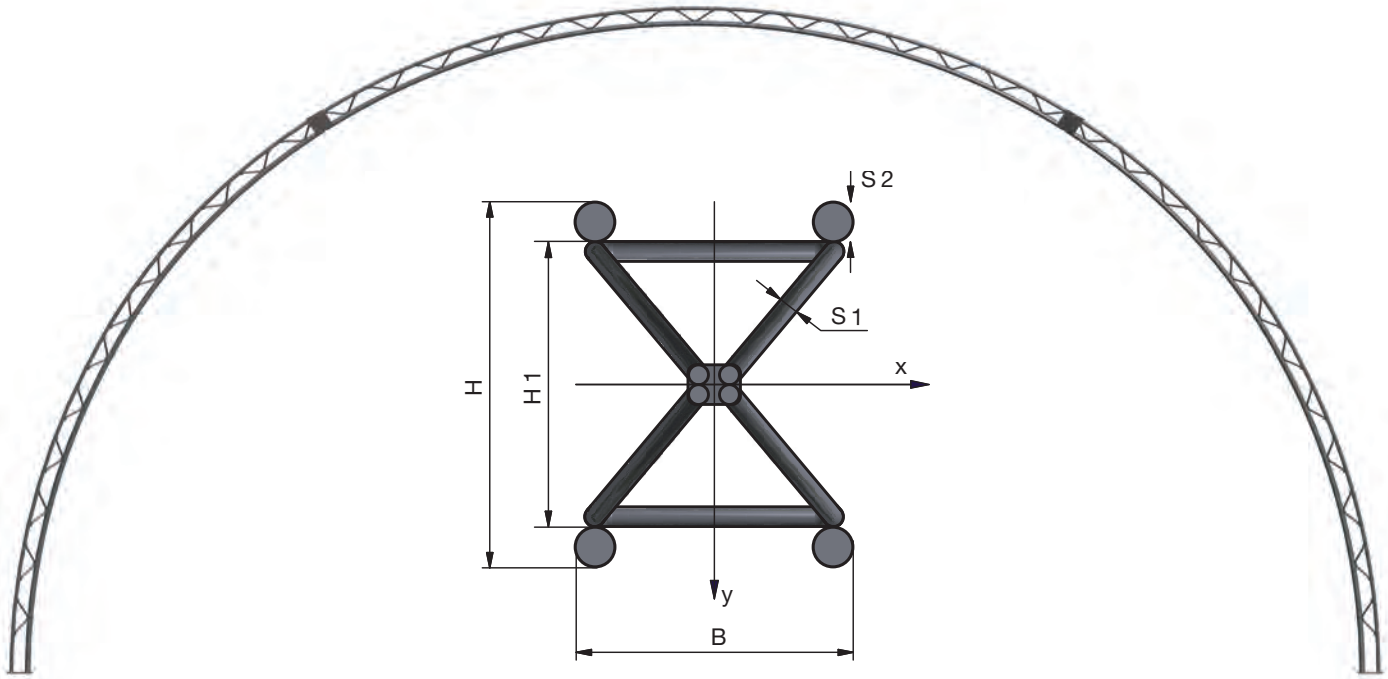
Lattice Girder Bar Material:
Tensile Strength 80ksi (550 MPa) min.
Yield Strength 70ksi (480 MPa) min.
Elongation 10% minimum

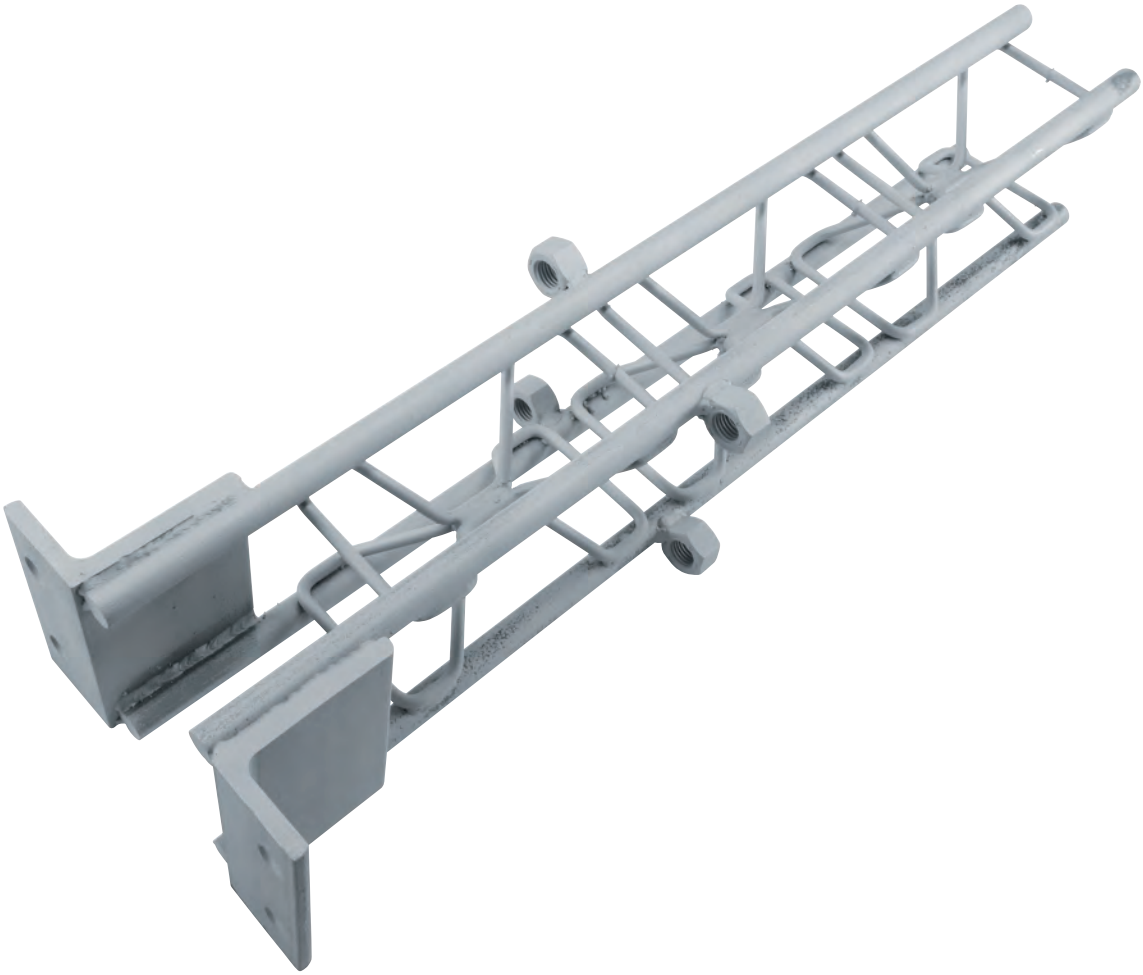
Connecting Bolts:
ASTM A 325N Ø 3/4" minimum

Dimensions

O.P. Type	D (mm)	S Bar Size	Weight (lbs/ ft.)	H (in.)	B (in.)	A Bars ($in.^2$)	Ix ($in.^2$)	Sx ($in.^2$)	Iy ($in.^2$)	Sy ($in.^2$)	Joint Plate			Foot Plate	
											Size (in.)	Length (in.)	Unit W (lbs)	Size (in.)	Unit Wt (lbs)
100	10	5	7.61	5.19	3.94	1.2	6.42	2.47	3.40	1.72	L5 × 3 x 1/2	51/4	5.6	1/2 × 5 × 7	5.0
		6	8.88	5.44		1.8	9.77	3.59	4.56	2.31		51/2	5.9		
		7	10.23	5.69		2.4	10.04	4.94	5.75	2.92		53/4	6.1		
		8	13.43	5.94		3.1	19.34	6.52	6.97	3.54		6	6.4		
		10	17.16	6.44		4.9	33.50	10.41	9.34	4.75		61/2	6.9		
140	10	5	7.88	6.76	5.51	1.2	11.54	3.42	7.32	2.66		63/4	7.2	1/2 × 7 × 9	8.3
		6	9.14	7.01		1.8	17.32	4.95	10.03	3.65		7	7.5		
		7	10.51	7.26		2.4	24.55	6.77	12.98	4.72		71/4	7.7		
		8	13.71	7.51		3.1	33.38	8.90	16.10	5.66		71/2	8		
		10	17.42	8.01		4.9	56.39	14.10	22.65	8.24		8	8.5		
180	10	5	8.51	8.34	7.09	1.2	20.28	4.64	12.85	3.63		83/8	8.9	1/2 × 8 × 10-1/2	11.9
		6	9.78	8.59		1.8	30.13	6.70	17.82	5.03		85/8	9.2		
		7	11.51	8.84		2.4	42.29	9.14	23.34	6.58		87/8	9.6		
		8	14.35	9.09		3.1	56.94	11.99	29.32	8.27		81/8	9.7		
		10	18.06	9.59		4.9	94.44	18.89	42.33	11.94		85/8	10.3		
220	12	5	9.80	9.91	6.66	1.2	28.45	5.55	19.84	4.58		915/16	10.6	5/8 × 10 × 12	21.2
		6	11.06	10.16		1.8	42.06	8.01	27.71	6.40		103/16	10.9		
		7	12.43	10.41		2.4	58.75	10.93	36.57	8.44		107/8	11.1		
		8	15.63	10.66		3.1	78.74	14.32	46.29	10.65		1011/16	11.8		
		10	19.34	11.16		4.9	129.41	22.51	67.88	15.68		118/16	11.9		

SPECIFICATIONS 4-BAR GIRDERS





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