

VULCRAFT®

STEEL BAR GRATING



NUCOR®
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Powerful Partnerships.
Powerful Results

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INTRODUCTION

WHY GRATING?

- Easy Installation and Fabrication
- Adaptable to Complex Floor Layouts
- Allows Passage of Light and Air
- High Strength-to-Weight Ratio
- Durable and Long Lasting Surface

APPLICATIONS

- Industrial Flooring
- Walkways
- Bridge Decks
- Trenches
- Steel Mills
- Warehouses
- Chemical Plants
- Water Treatment Plants
- Power Plants
- Oil Refineries
- Agricultural Facilities

STANDARD DUTY (SD)

Standard

Standard Welded Grating is the most common type of grating used in the industrial flooring market. The open grid construction provides for maximum passage for light, air circulation and drainage.

Close Mesh

When a certain bar depth must be held but standard duty is not sufficient, Close Mesh moves the bars closer to gain more strength and stiffness. This may also be warranted if the bar gap on Standard is wider than desired.

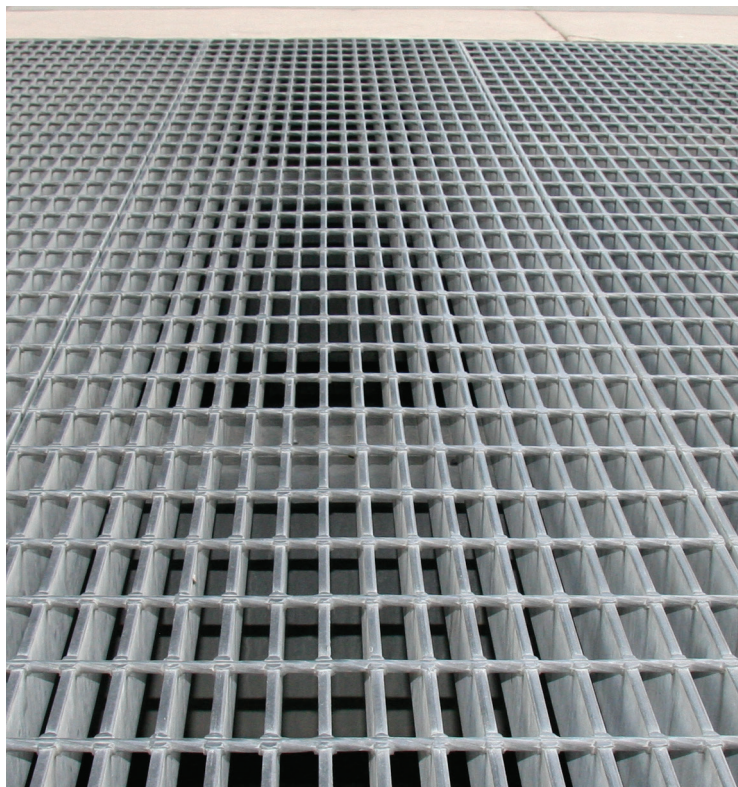
ADA-Compliant

When the Grating needs to adhere to the guidelines of the Americans-with-Disabilities Act (ADA), an even-smaller bar gap is required.



HEAVY DUTY (HD)

Heavy-Duty Welded Grating has the strength for heavy-duty load areas such as airfields, industrial plants, truck and bus terminals, parking lots and railroad yards. Common uses are flooring, driveways, subway and tunnel ventilation grilles, curb inlet grates, ramps, docks, etc.



STAIR TREADS

Welded steel stair treads are the most widely used for their strength and ease of installation and are universally used in most industrial and commercial applications. Stair Treads can be ordered with a serrated surface for additional safety.



INTRODUCTION | WHO WE ARE

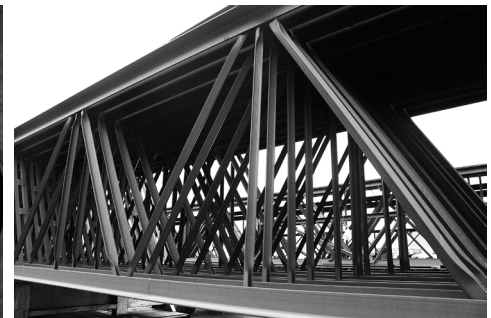
Nucor offers steel products that range from bar grating to the heaviest hot rolled beam sections.

Through implementation and refinement of best practices, we continue to grow as a company. Nucor's pay-for-performance policy reflects a commitment to manufacturing the highest quality products while maintaining a safety record that is the envy of the industry.

Nucor serves the agricultural, automotive, construction, energy, furniture, machinery, metal building, railroad, recreational equipment, shipbuilding, heavy truck, and trailer industries. Which is to say, we are integral to North American industry.

Nucor and its subsidiary divisions manufacture:

- Bars (carbon and alloy steel)
- Sheets/Flatrolled
- Open Web Steel Joists
- Steel Decks
- Cold finished steel
- Metal building systems
- Steel Grating
- Wire and wire mesh
- Conduit
- Beams
- Plates
- Joist Girders
- Fabricated concrete reinforcing steel
- Steel fasteners
- Piling
- Tube



SALES CONTACTS

GENERAL SALES INQUIRIES:

WEST

salesvcw@vulcraft.ca

Vulcraft Canada West

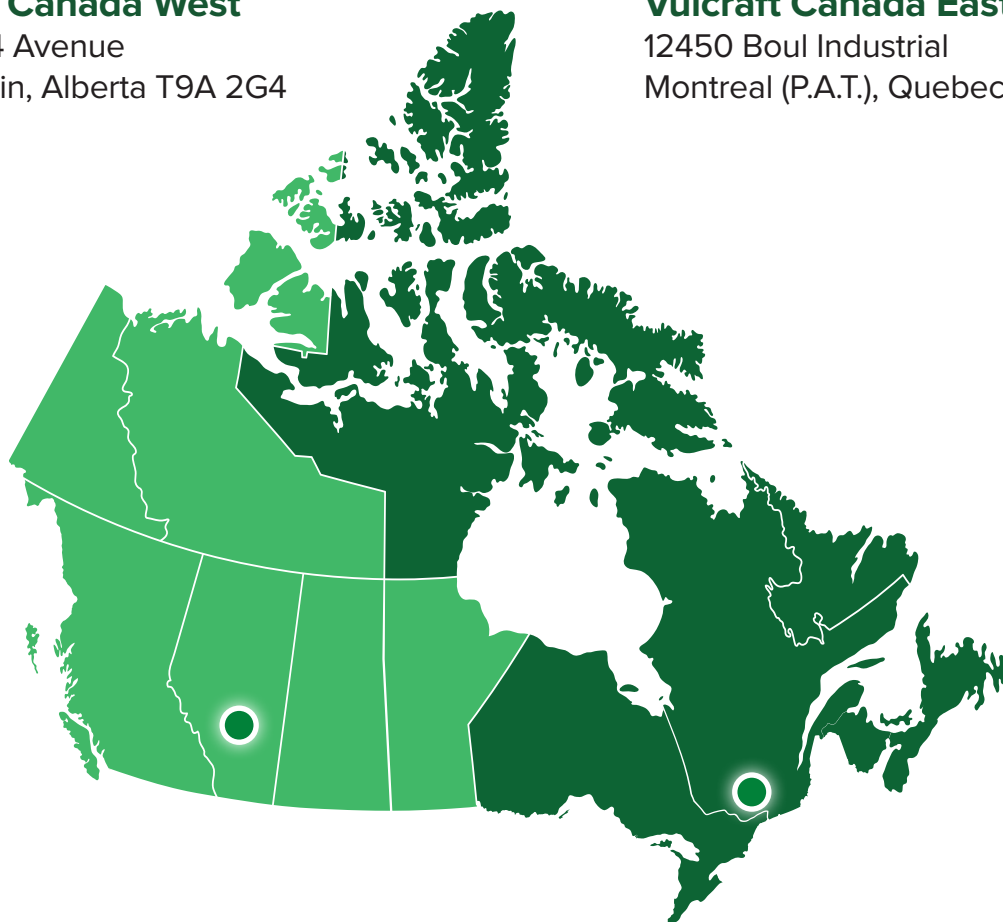
4609 - 64 Avenue
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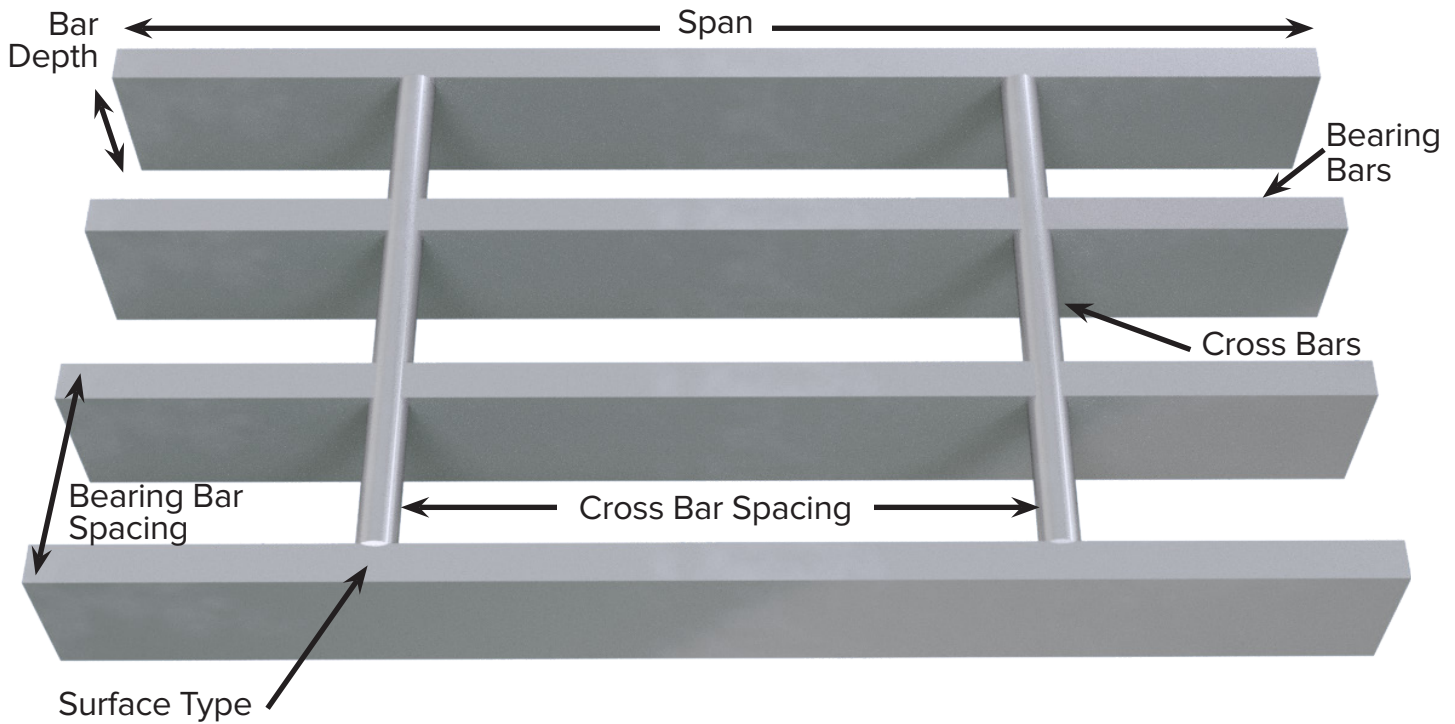


FOR PROJECTS WITH GRATING IN PLATFORMS, WALKWAYS, STAIRS, ETC.
VISIT THE **CONTACT US** PAGE AT WWW.VULCRAFT.CA
TO FIND YOUR LOCAL VULCRAFT SALES OFFICE.

tip

If you are interested in a grating type not represented in this manual, please contact a sales representative.

ENGINEERING | NOMENCLATURE



- Bearing Bars** load carrying, span of grating
- Cross Bars** connecting bars, runs along width of grating
- Finish** coating applied-painted black, galvanized
- Serrated** notching process for non-slip surface
- Widths** overall dimension measured perpendicular to bearing bars
- Span** distance running along direction of bearing bars
- Banding** bar of the same size as bearing bar used to close open ends
- Kick Plate** flat bar welded to outer edge with projection above grating

Bar Spacing —
of mm from center
to center of vertical
bearing bars

Cross Bar —
Spacing in mm of
the cross bars

Surface —
SMO = Smooth
SER = Serrated

24W102 25 x 3

Construction Type —
W = Welded

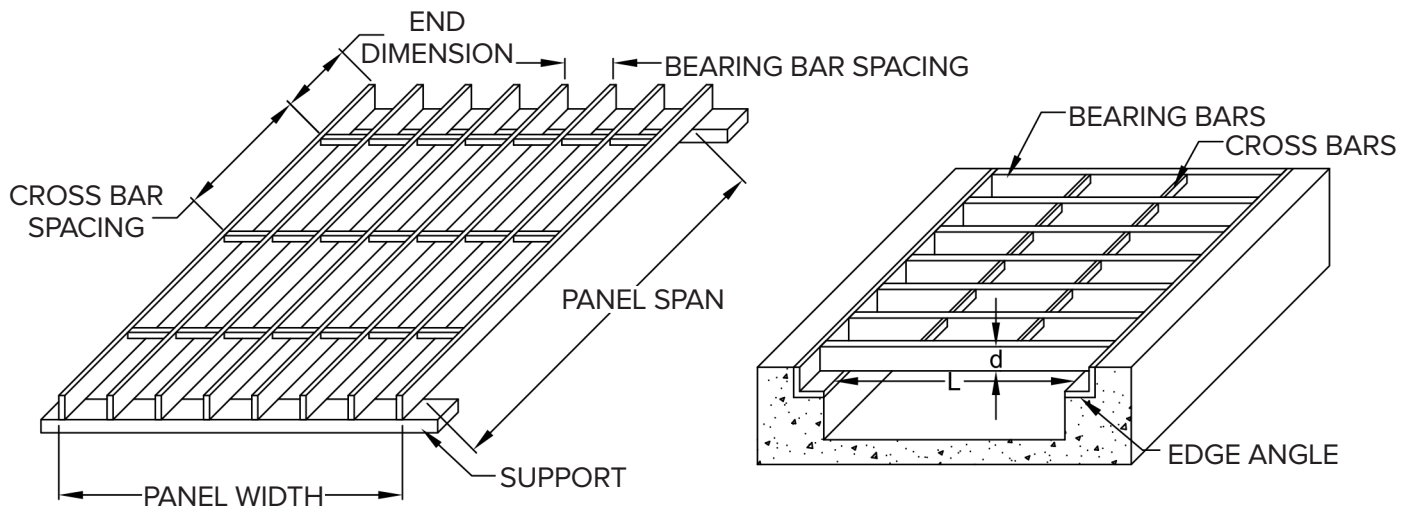
Bar Size —
Size of bearing bars

SER BLK

Finish —
UNP = Unpainted
GAL = Galvanized
BLK = Black Paint

LOAD-CARRYING CAPABILITY SPAN

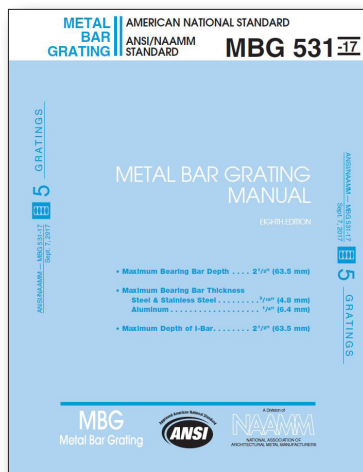
Usually this space has structural supports to carry the load. The distance between supports is called the span. Bearing bars run in the direction of the span. Deflection is generally limited to 6mm (1/4") only in order to limit an uncomfortable movement of the traffic surface.



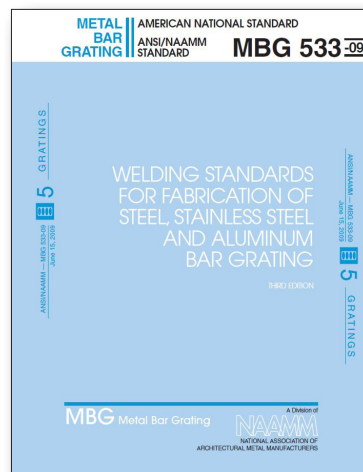
ENGINEERING | CONTROLLING STANDARDS

For additional specifications, tolerances, engineering and welding data please refer to National Associations of Architectural Metal Manufacture's (NAAMM) Guides.

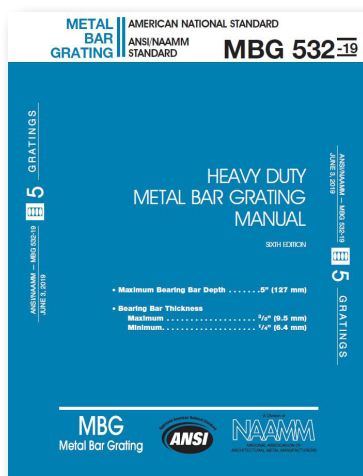
See the NAAMM guides for additional information such as Standard Specifications and Code of Standard Practice.



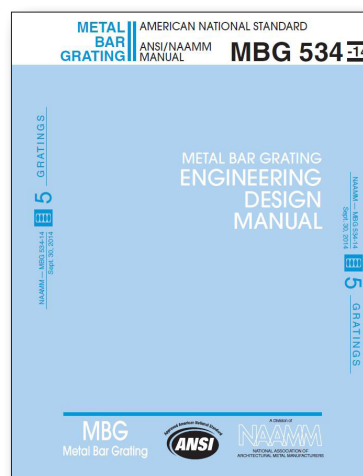
ANSI/NAAMM MBG 531-17
Metal Bar Grating Manual, 8th Ed



ANSI/NAAMM MBG 533-09
Welding Standards for Fabrication of Steel, Stainless Steel and Aluminum Bar Grating, 3rd Ed



ANSI/NAAMM MBG 532-19
Heavy Duty Metal Bar Grating Manual, 6th Ed



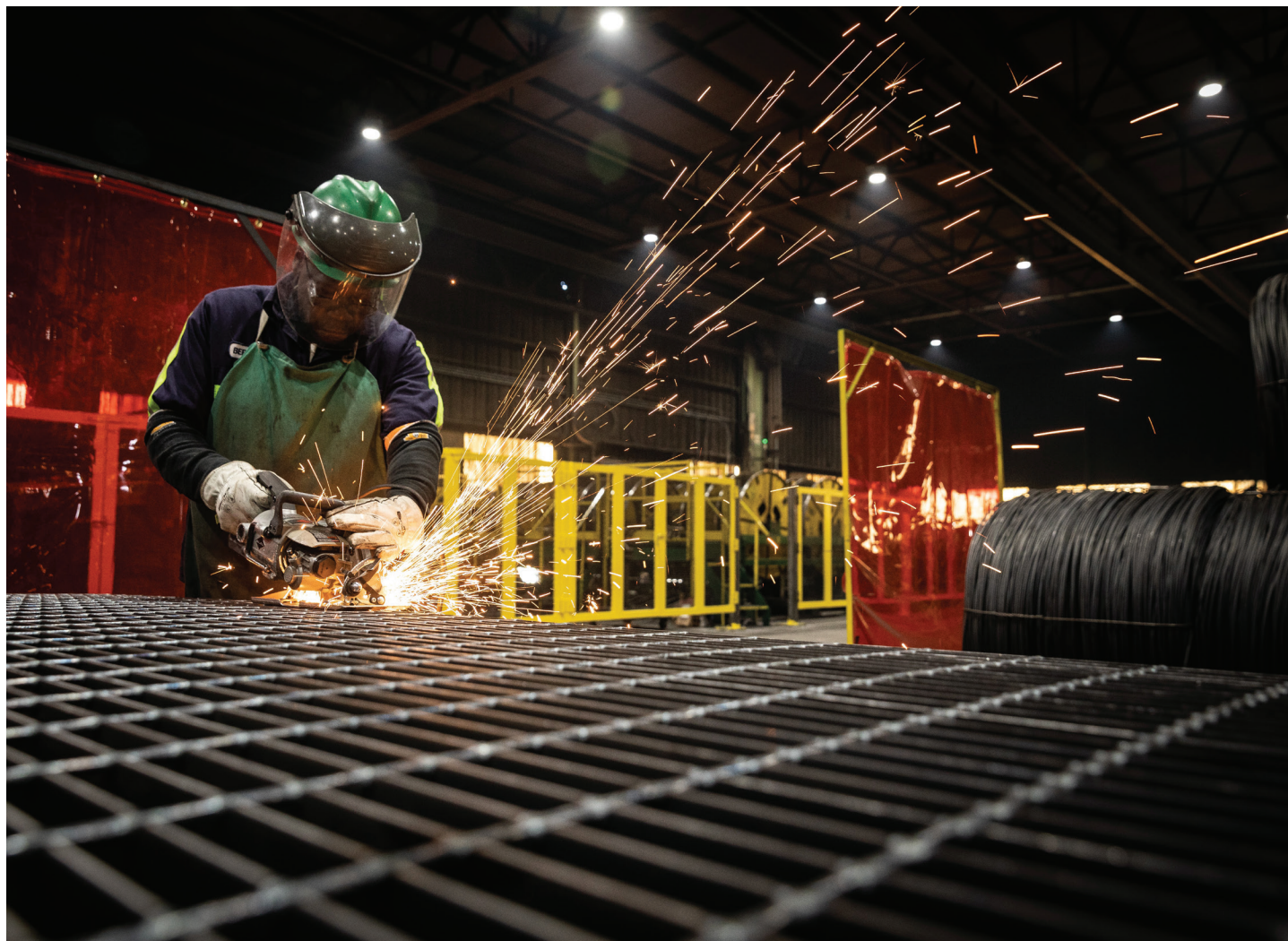
NAAMM MBG 534-14
Metal Bar Grating Engineering Design Manual

FABRICATION

NOT JUST GRATING FABRICATION

Your partner for structural steel as well as grating detailing and fabrication. Vulcraft Grating has the capability and capacity to handle even the toughest structural steel detailing and fabrication projects.

Contact us today with how we can assist you in meeting your customer's needs.



ENGINEERING

Standard

- Description of Grating (see pp. 6)
- Drawing Showing:
 - area to be covered, with cutouts
 - span with direction of bearing
 - method of support
 - all critical dimensions
- Type of Anchorage
- Finish

Stair Treads

- Description of Grating (see pp. 6)
- Type of Nosing
- Dimensions (length and width of tread)
- Number of Treads
- Finish

Heavy Duty

- Description of Grating (see pp. 6)
- Drawing Showing:
 - area to be covered, with cutouts
 - span with direction of bearing
 - method of support
 - all critical dimensions
- Type of Anchorage
- Finish

Grating Specification/Detailing Checklist

☐ Grating Description

- ☐ Grating Type (30W102, 24W102, etc.)
- ☐ Bar Size
- ☐ Finish
- ☐ Smooth/Serrated
- ☐ Banding/Kick Plate/Hand Rails

☐ Stair Tread Description

- ☐ Grating Type (30W102, 24W102, etc.)
- ☐ Bar Size
- ☐ Finish
- ☐ Smooth/Serrated
- ☐ Nosing Type

☐ Attachment

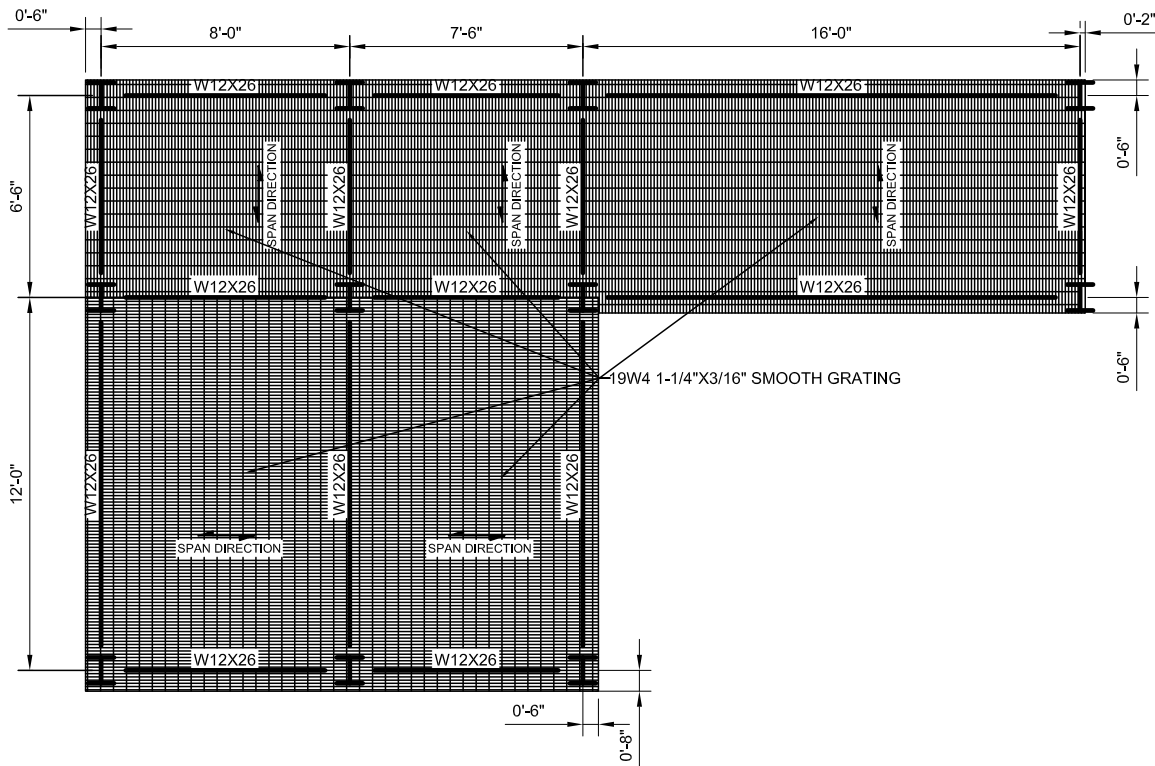
- ☐ Clips
- ☐ Welds
- ☐ Lugs

☐ Layout

- ☐ Area to be Covered (See Drawing Example)
- ☐ Edge Conditions
- ☐ Cutouts
- ☐ Span
- ☐ Supports



DRAWING AND GENERAL NOTES EXAMPLE



General Notes Examples

The following are examples of suggested notes that should be included on drawings where Grating products are being specified:

Grating

Unless otherwise noted on the drawings, interior grating use 19W4 1 1/4" x 3/16" smooth, painted black. Exterior grating use 19W4 1 1/2" x 3/16" serrated, galvanized. Attachment is clip type or indicate that grating to be welded to supports.

Treads

Unless otherwise noted on the drawings, treads are to be the same grating type as walkway grating, stair treads are to have checkered plate nosing.

Edge Sections:

Edge conditions sections are a very important part of proper grating detailing and fabrication. Items to be shown in section drawings should be:

- Grating edge dimension in relation to grid line or support
- Kick Plates
- Hand Rail Conditions

Sections should also be shown for any cutouts that need to be created in the grating panels.

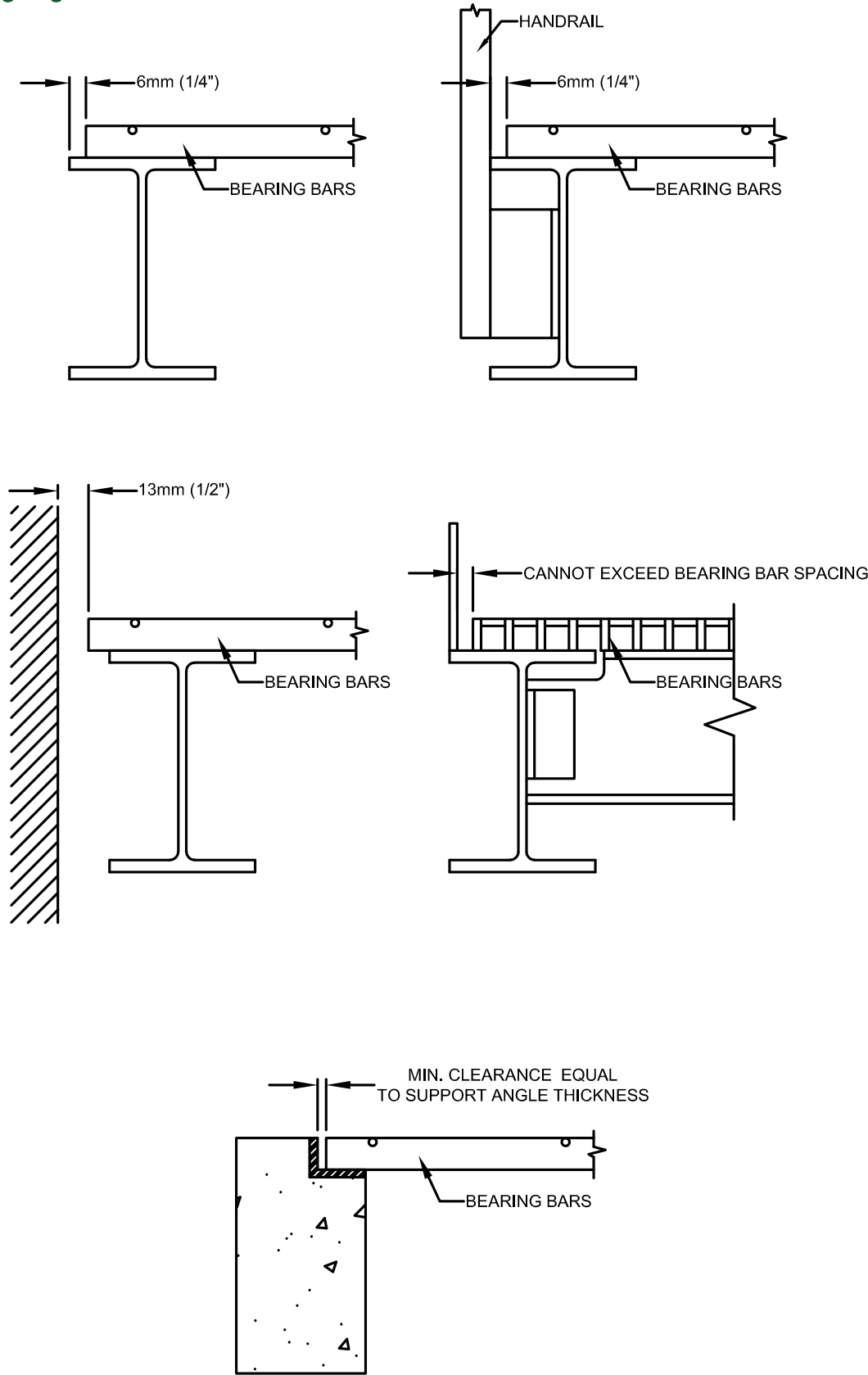
Sections can be shown as independent sections specific to grating or as a part of the typical construction section drawings, as long as the grating requirements are clearly shown.

The following pages show examples of some typical grating sections.

These sections can be downloaded from our website www.vulcraft.ca/products/grating.

ENGINEERING | HOW TO SPECIFY

Example Grating Edge Sections:



Guidance for Grating Plan View:

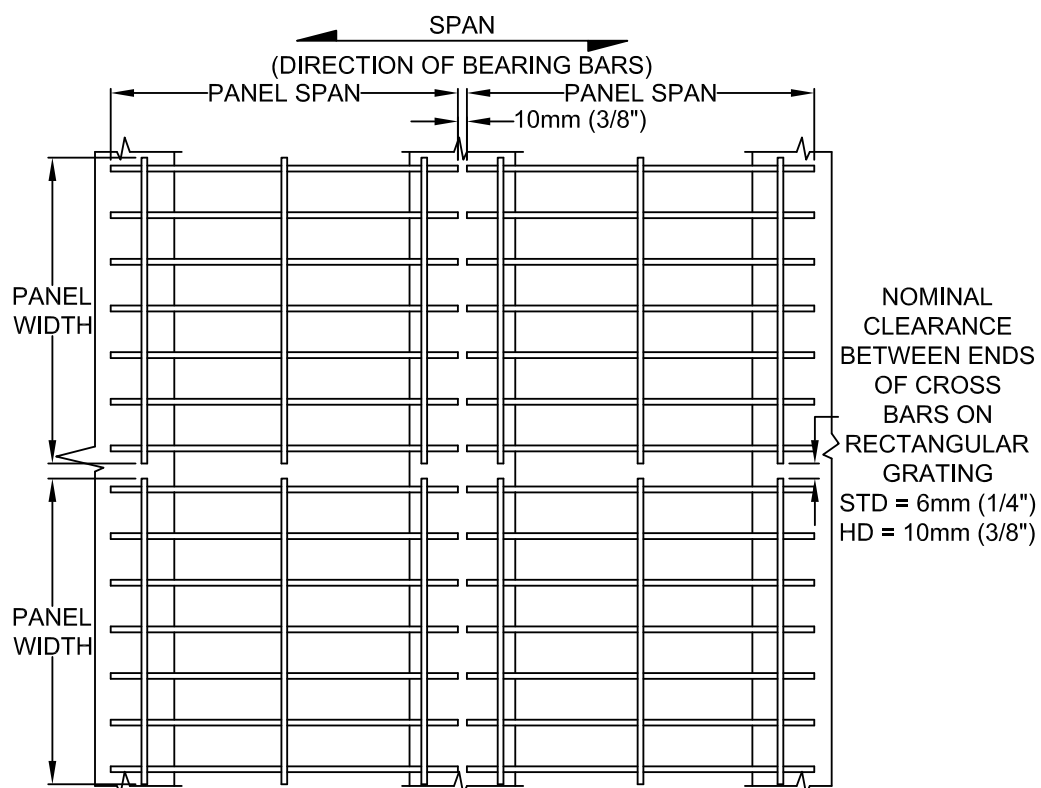


Figure 1

Guidance for Specifying Cutouts:

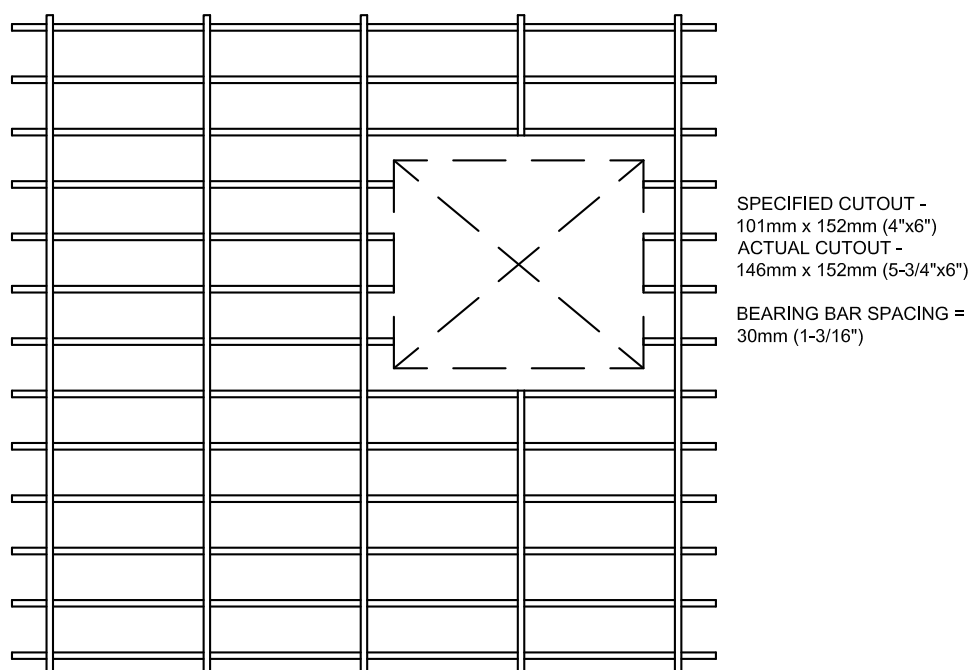


Figure 2

ENGINEERING | SAFE INSTALLATION

- Grating panels must be installed with cross bars on top side.
- It is NOT recommended to notch bearing bars at supports to maintain proper elevation. If notching is required for installation, manufacturer should be consulted.
- Metal should always be used for grating supports.
- A minimum of 1" (25mm) support bearing shall be provided for steel grating having bearing bar depths up to 2 1/4" (57mm) and 2" support bearing for bar depths of 2 1/2" (64mm) and greater.
- Clearances shown in Figure 1 (pg 13) are recommended, but may vary in accordance with dimensional tolerances.
- Standard and Heavy duty grating should be designed to have structural support under each bearing bar at cutouts.
- As shown in Figure 2 (pg 13), all rectangular cutouts are made to the next bearing bar beyond the penetration with a clearance not to exceed bearing bar spacing.
- Cutouts for circular obstructions are recommended to be at least 51mm (2") larger in diameter than the obstruction. It is further recommended that cutouts for all piping 102mm (4") or less be made in the field.



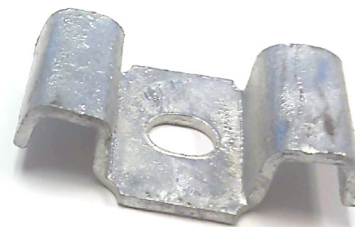
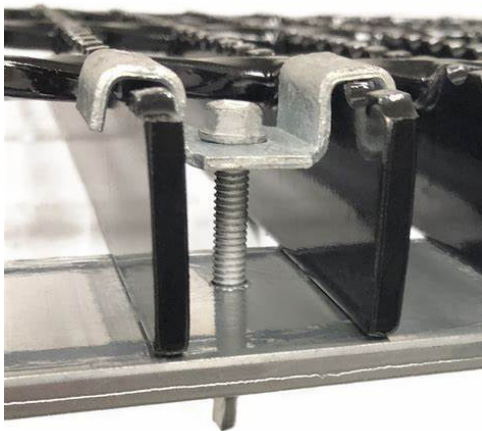
ANCHORAGE TYPES

CLIP (SD)

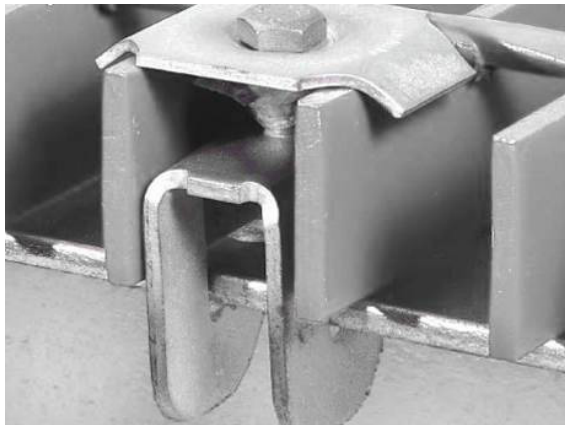
The clip bridges two bearing bars and is attached with 6mm (¼") self-tapping bolt, 6mm (¼") self threader, 6mm (¼") weld stud or 6mm (¼") bolt and nut when hole is drilled through supporting flange. Fasteners should be specified separate from clips. (Bolts not included)



F-10 CLIPS

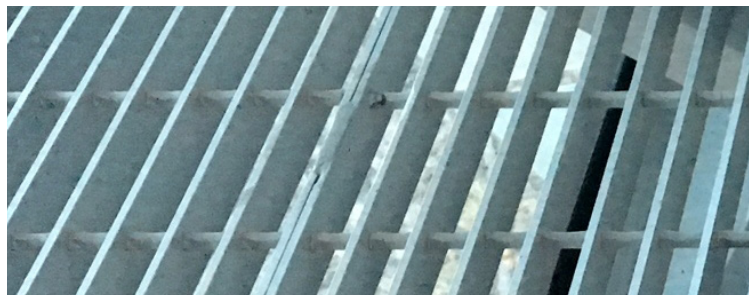


G CLIPS



FIELD WELDED

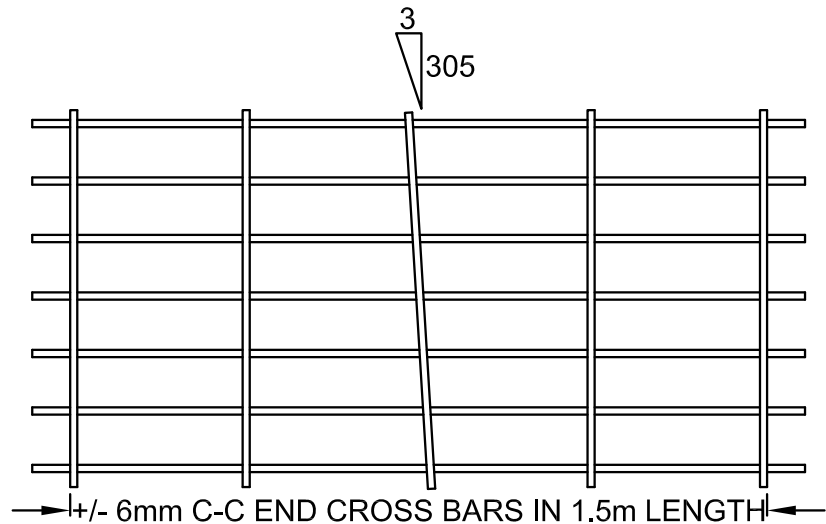
Recommended for all permanently installed grating panels. Welds should be 5mm (3/16") fillet welds, 19mm (3/4") long located approximately 152mm (6") from each side of panel (4 locations) and one weld in middle of panel at each intermediate support.



BEARING BAR AND CROSS ROD TOLERANCES

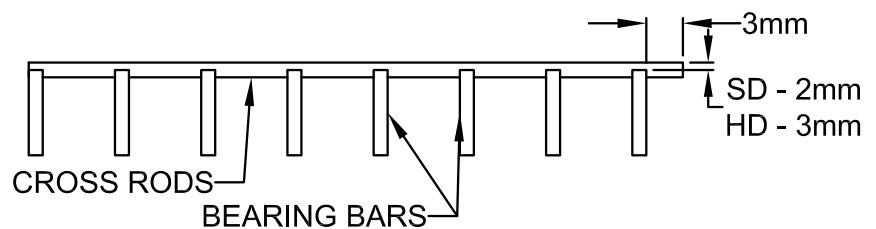
Cross Rod Spacing and Alignment

Cross rods should not vary more than a slope of 3mm ($\frac{1}{8}$ " to 305mm (12") in either direction from perpendicular alignment with bearing bars. The tolerance of the cross bar spacing for 1.5m (5') in length is ± 6 mm ($\frac{1}{4}$ "



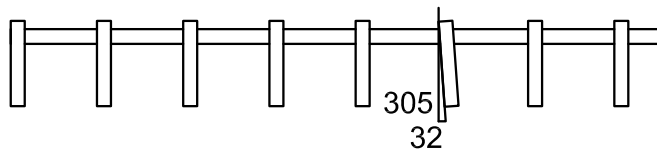
Cross Rod Position

The top of the cross rod should not project more than 2mm ($\frac{1}{16}$ " above the top of the bearing bars for standard grating (3mm ($\frac{1}{8}$ " for heavy-duty) and should not extend more than 3mm ($\frac{1}{8}$ " from side of bearing bars.



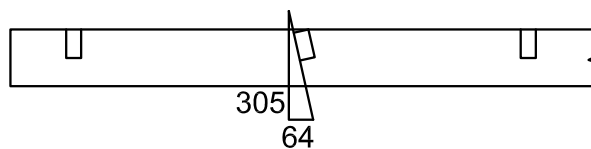
Bearing Bar Lean

Bearing bar lean must not exceed a slope of 32mm (1- $\frac{1}{4}$ " to 305 (12).



Cross Bar Lean

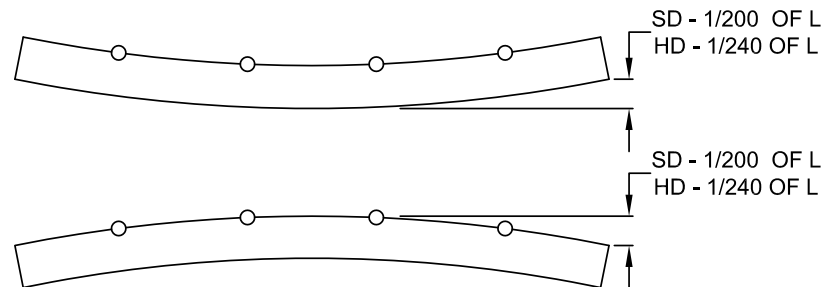
Cross bar lean must not exceed a slope of 64mm (2- $\frac{1}{2}$ " to 305 (12).



PANEL TOLERANCES

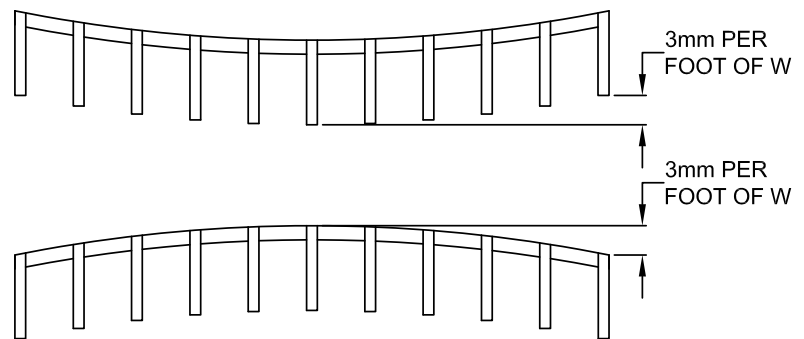
Longitudinal Bow

Longitudinal bow should be less than $1/200$ of the length for the standard grating ($1/240$ for heavy duty).



Traverse Bow

Before banding, the traverse bow should be less than 3mm ($1/8$ ") per foot or width.

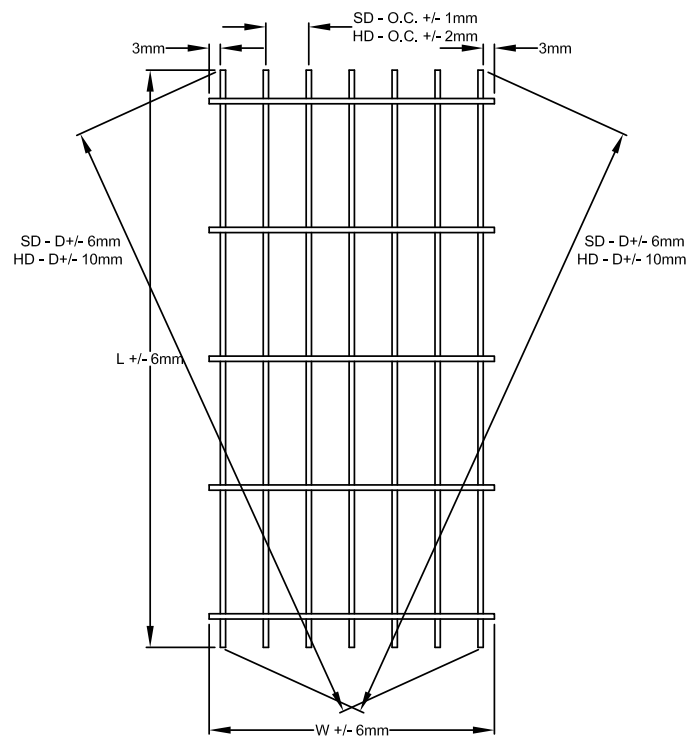


Overall Dimension and Squareness

D = Overall diagonal dimension

W = Width of panel including cross rod extensions outside of bearing bars

L = Length of bearing bars

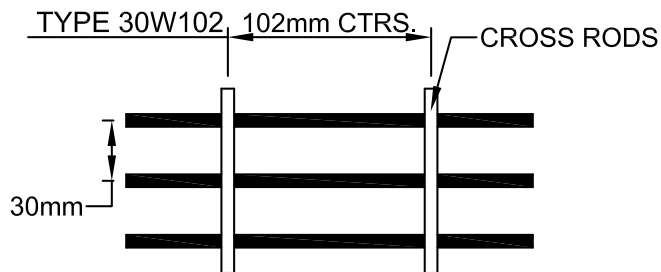


SWEEP $1/200$ OF SPAN

LOAD TABLES | STANDARD, METRIC

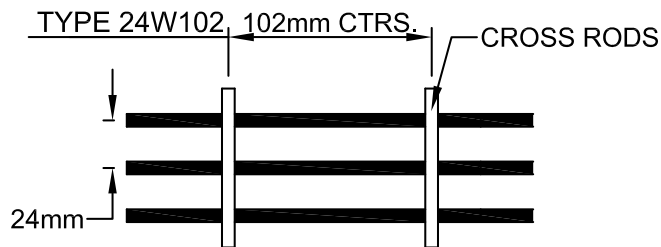
OVERVIEW

Standard



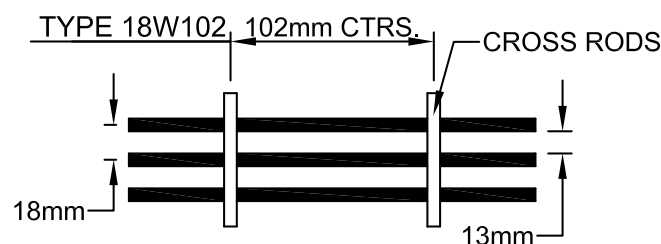
Standard Welded Grating is the most common type of grating used in the industrial flooring market. The open grid construction provides for maximum passage for light, air circulation and drainage.

Close-Mesh (Special Order)



When a certain bar depth must be held but standard duty is not sufficient, Close Mesh moves the bars closer to gain more strength and stiffness. This may also be warranted if the bar gap on Standard Duty is wider than desired.

ADA-Compliant (Special Order)



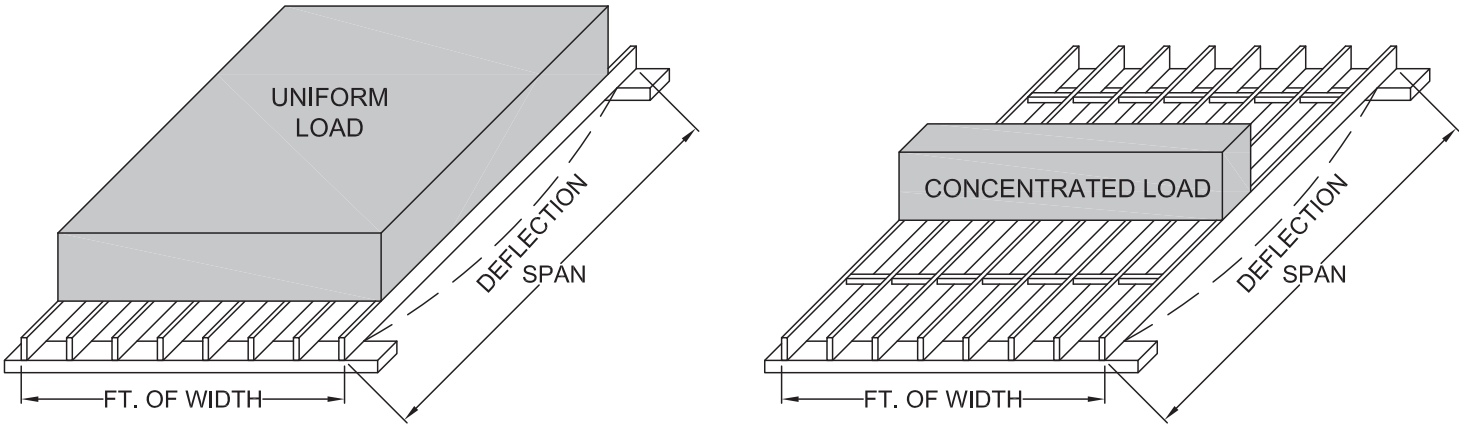
When the Grating needs to adhere to the guidelines of the Americans-with-Disabilities Act (ADA), an even-smaller bar gap is required. The ADA requires no more than a 13mm opening as part of Chapter 3, Section 302.3 of the ADA Guide published by the United States Access Board.

Panel widths shown are out-to-out of bearing bars

Bars	ADA-COMPLIANT 18 SPACE (18mm ctrs)		CLOSE MESH 24 SPACE (24mm ctrs)		STANDARD 30 SPACE (30mm ctrs)	
	3.2 mm	4.8 mm	3.2 mm	4.8 mm	3.2 mm	4.8 mm
2	21	22	27	29	33	35
3	38	40	51	52	64	65
4	56	57	75	76	94	95
5	73	75	98	100	124	125
6	90	92	122	124	154	156
7	108	110	146	148	184	186
8	125	127	170	171	214	216
9	143	144	194	195	244	246
10	160	162	217	219	275	276
11	178	179	241	243	305	306
12	195	197	265	267	335	337
13	213	214	289	291	365	367
14	230	232	313	314	395	397
15	248	249	337	338	425	427
16	265	267	360	362	456	457
17	283	284	384	386	486	487
18	300	302	408	410	516	518
19	318	319	432	433	546	548
20	335	337	456	457	576	578
21	352	354	479	481	606	608
22	370	371	503	505	637	638
23	387	389	527	529	667	668
24	405	406	551	552	697	699
25	422	424	575	576	727	729
26	440	441	598	600	757	759
27	457	459	622	624	787	789
28	475	476	646	648	818	819
29	492	494	670	672	848	849
30	510	511	694	695	878	879
31	527	529	718	719	908	910
32	545	546	741	743		
33	562	564	765	767		
34	579	581	789	791		
35	597	598	813	814		
36	614	616	837	838		
37			860	862		
38			884	886		
39			908	910		

All metric dimensions are based on a "soft" conversion.

DESIGN CRITERIA



	Uniform Load	Concentrated Load
Determine M:	$M = \frac{FS}{12}$	$M = \frac{FS}{12}$
Determine U or C:	$U = \frac{8M}{L^2}$	$C = \frac{4M}{L}$
Check D*:	$D = \frac{5UL \cdot L^3}{384 EI}$	$D = \frac{C \cdot L^3}{48 EI}$

*Deflection should be limited to 7mm under .45kN uniform load to afford pedestrian comfort.

- U = Uniform Load - kPa
- C = Concentrated Load - kN/m of grating width
- S = Section Modulus - mm³/m of grating width
- I = Moment of Inertia - mm⁴/m of grating width
- L = Simple Clear Span - m
- D = Deflection - mm
- E = Modulus of Elasticity - kPa
- F = Allowable Bending Stress - kPa
- M = Bending Moment - kN-m



Vulcraft Online Bar Grating Design Tools

If you are uncertain about which type of grating to use, try our on-line calculator. Enter your project specs and our calculator will recommend the appropriate grating. This powerful on-line tool allows you to compare alternatives so you can optimize weight, cost, or both. It saves you valuable time by eliminating manual calculations and the risk of errors. Visit www.vulcraft.com/DesignTools/BarGratingDesignAid

LOAD TABLES | STANDARD, METRIC

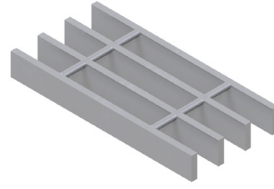
LOAD TABLES - SD

Grating Type: **30W102**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Smooth**



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

Bearing Bar Size (mm)	Approx. Wiegth (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties	
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m	
25 x 3	25.0	1,312.00	U	30.6	19.6	13.6	10.0	7.7	6.0									11,470	
			D _u	1.9	3.0	4.3	5.8	7.6	9.6										
			C	9.3	7.5	6.2	5.3	4.7	4.2										
			D _c	1.5	2.4	3.4	4.6	6.1	7.7									145.66E+3	
25 x 5	35.9	1,452.00	U	45.9	29.4	20.4	15.0	11.5	9.1	7.4							17,200		
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8									
			C	14.0	11.2	9.3	8.0	7.0	6.2	5.6									
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5							218.49E+3		
32 x 3	30.5	1,552.00	U	48.0	30.7	21.3	15.7	12.0	9.5	7.7	6.3						17,980		
			D _u	1.5	2.4	3.4	4.6	6.0	7.7	9.4	11.4								
			C	14.6	11.7	9.8	8.4	7.3	6.5	5.9	5.3								
			D _c	1.2	1.9	2.7	3.7	4.8	6.1	7.6	9.1						285.84E+3		
32 x 5	44.1	1,718.00	U	72.0	46.1	32.0	23.5	18.0	14.2	11.5	9.5	8.0					26,970		
			D _u	1.5	2.4	3.4	4.6	6.0	7.7	9.4	11.4	13.6							
			C	21.9	17.6	14.6	12.5	11.0	9.8	8.8	8.0	7.3							
			D _c	1.2	1.9	2.7	3.7	4.8	6.1	7.6	9.1	10.9					428.77E+3		
38 x 3	39.0	1,778.00	U	68.9	44.1	30.6	22.5	17.2	13.6	11.0	9.1	7.7					25,810		
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4							
			C	21.0	16.8	14.0	12.0	10.5	9.3	8.4	7.6	7.0							
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1					491.61E+3		
38 x 5	52.1	1,967.00	U	103.3	66.1	45.9	33.7	25.8	20.4	16.5	13.7	11.5	9.8				38,710		
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3						
			C	31.5	25.2	21.0	18.0	15.8	14.0	12.6	11.5	10.5	9.7						
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7				737.42E+3		
45 x 5	60.3	2,210.00	U	140.9	90.2	62.7	46.0	35.2	27.9	22.6	18.6	15.7	13.4	11.5	10.0		52,810		
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.2	15.2				
			C	43.0	34.4	28.7	24.6	21.5	19.1	17.2	15.6	14.3	13.2	12.3	11.5				
			D _c	0.9	1.4	1.9	2.6	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.1		1.17E+6		
51 x 5	68.4	2,441.00	U	183.6	117.6	81.6	60.0	45.9	36.3	29.4	24.3	20.4	17.4	15.0	13.1	11.5	68,820		
			D _u	0.9	1.5	2.1	2.9	3.8	4.8	5.9	7.2	8.5	10.0	11.6	13.3	15.1			
			C	56.0	44.8	37.3	32.0	28.0	24.9	22.4	20.4	18.7	17.2	16.0	14.9	14.0			
			D _c	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1	1.75E+6		
64 x 5	84.7	2,886.00	U	286.9	183.7	127.6	93.7	71.8	56.7	45.9	38.0	31.9	27.2	23.4	20.4	18.0	107,530		
			D _u	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1			
			C	87.5	70.0	58.4	50.0	43.8	38.9	35.0	31.8	29.2	26.9	25.0	23.3	21.9			
			D _c	0.6	0.9	1.4	1.9	2.4	3.1	3.8	4.6	5.4	6.4	7.4	8.5	9.7	3.41E+6		

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

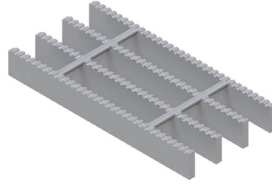
LOAD TABLES - SD

Grating Type: **30W102**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Serrated**



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

Bearing Bar Size (mm)	Approx. Wieht (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties		
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m		
25 x 3	25.0	1,055.00	U	17.1	11.0	7.6											6,420			
			D _u	2.5	4.0	5.7														
			C	5.2	4.2	3.5														
			D _c	2.0	3.2	4.6											60.97E+3			
25 x 5	35.9	1,168.00	U	25.7	16.4	11.4	8.4	6.4									9,630			
			D _u	2.5	4.0	5.7	7.7	10.1												
			C	7.8	6.3	5.2	4.5	3.9												
			D _c	2.0	3.2	4.6	6.2	8.1									91.45E+3			
32 x 3	30.5	1,312.00	U	30.6	19.6	13.6	10.0	7.7	6.0								11,470			
			D _u	1.9	3.0	4.3	5.8	7.6	9.6											
			C	9.3	7.5	6.2	5.3	4.7	4.2											
			D _c	1.5	2.4	3.4	4.6	6.1	7.7								145.66E+3			
32 x 5	44.1	1,452.00	U	45.9	29.4	20.4	15.0	11.5	9.1	7.4							17,200			
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8										
			C	14.0	11.2	9.3	8.0	7.0	6.2	5.6										
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5							218.49E+3			
38 x 3	35.9	1,549.00	U	47.7	30.5	21.2	15.6	11.9	9.4	7.6	6.3						17,870			
			D _u	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.5									
			C	14.5	11.6	9.7	8.3	7.3	6.5	5.8	5.3									
			D _c	1.2	1.9	2.7	3.7	4.9	6.1	7.6	9.2						283.16E+3			
38 x 5	52.1	1,714.00	U	71.5	45.8	31.8	23.4	17.9	14.1	11.4	9.5	8.0					26,800			
			D _u	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.5	13.6								
			C	21.8	17.4	14.5	12.5	10.9	9.7	8.7	7.9	7.3								
			D _c	1.2	1.9	2.7	3.7	4.9	6.1	7.6	9.2	10.9					424.73E+3			
45 x 5	60.3	1,967.00	U	103.3	66.1	45.9	33.7	25.8	20.4	16.5	13.7	11.5	9.8					38,710		
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3							
			C	31.5	25.2	21.0	18.0	15.8	14.0	12.6	11.5	10.5	9.7							
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7					737.42E+3		
51 x 5	68.4	2,207.00	U	140.3	89.8	62.4	45.8	35.1	27.7	22.5	18.6	15.6	13.3	11.5	10.0			52,570		
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.3	15.2					
			C	42.8	34.2	28.5	24.5	21.4	19.0	17.1	15.6	14.3	13.2	12.2	11.4					
			D _c	0.9	1.4	1.9	2.7	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.2			1.17E+6		
64 x 5	84.7	2,665.00	U	232.0	148.5	103.2	75.8	58.0	45.9	37.1	30.7	25.8	22.0	19.0	16.5	14.5	86,940			
			D _u	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.5				
			C	70.8	56.6	47.2	40.4	35.4	31.5	28.3	25.7	23.6	21.8	20.2	18.9	17.7				
			D _c	0.7	1.1	1.5	2.1	2.7	3.4	4.2	5.1	6.1	7.1	8.2	9.5	10.8			2.48E+6	

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STANDARD, METRIC

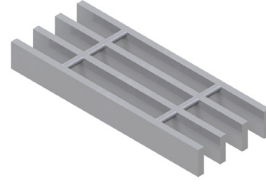
LOAD TABLES - CLOSE-MESH

Grating Type: **24W102**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Smooth**



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

Bearing Bar Size (mm)	Approx. Wieht (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties					
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m					
25 x 3	30.1	1,387.00	U	38.3	24.5	17.0	12.5	9.6	7.6	6.1								14,340					
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8													
			C	11.7	9.3	7.8	6.7	5.8	5.2	4.7													
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5								182.08E+3					
25 x 5	43.5	1,535.00	U	57.4	36.7	25.5	18.7	14.4	11.3	9.2	7.6								21,510				
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8	14.3												
			C	17.5	14.0	11.7	10.0	8.8	7.8	7.0	6.4												
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.4								273.12E+3				
32 x 3	36.9	1,641.00	U	60.0	38.4	26.7	19.6	15.0	11.9	9.6	7.9								22,470				
			D _u	1.5	2.4	3.4	4.6	6.0	7.7	9.4	11.4												
			C	18.3	14.6	12.2	10.5	9.1	8.1	7.3	6.7												
			D _c	1.2	1.9	2.7	3.7	4.8	6.1	7.6	9.1								357.31E+3				
32 x 5	53.7	1,817.00	U	89.9	57.6	40.0	29.4	22.5	17.8	14.4	11.9	10.0								33,710			
			D _u	1.5	2.4	3.4	4.6	6.0	7.7	9.4	11.4	13.6											
			C	27.4	21.9	18.3	15.7	13.7	12.2	11.0	10.0	9.1											
			D _c	1.2	1.9	2.7	3.7	4.8	6.1	7.6	9.1	10.9								535.96E+3			
38 x 3	46.7	1,880.00	U	86.1	55.1	38.3	28.1	21.5	17.0	13.8	11.4	9.6	8.2								32,260		
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3										
			C	26.3	21.0	17.5	15.0	13.1	11.7	10.5	9.6	8.8	8.1										
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7								614.52E+3		
38 x 5	63.6	2,080.00	U	129.1	82.7	57.4	42.2	32.3	25.5	20.7	17.1	14.4	12.2	10.5								48,390	
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3	15.5									
			C	39.4	31.5	26.3	22.5	19.7	17.5	15.8	14.3	13.1	12.1	11.3									
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7	12.4								921.77E+3	
45 x 5	73.8	2,337.00	U	176.1	112.8	78.3	57.5	44.1	34.8	28.2	23.3	19.6	16.7	14.4	12.5	11.0		66,010					
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.2	15.2	17.3							
			C	53.7	43.0	35.8	30.7	26.9	23.9	21.5	19.5	17.9	16.5	15.4	14.3	13.4							
			D _c	0.9	1.4	1.9	2.6	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.1	13.8							
51 x 5	83.7	2,581.00	U	229.5	146.9	102.1	75.0	57.4	45.4	36.8	30.4	25.5	21.8	18.8	16.3	14.4	86,020						
			D _u	0.9	1.5	2.1	2.9	3.8	4.8	5.9	7.2	8.5	10.0	11.6	13.3	15.1							
			C	70.0	56.0	46.7	40.0	35.0	31.1	28.0	25.5	23.3	21.6	20.0	18.7	17.5							
			D _c	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1							
64 x 5	103.8	3,052.00	U	358.6	229.6	159.5	117.2	89.7	70.9	57.4	47.5	39.9	34.0	29.3	25.5	22.5	134,410						
			D _u	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1							
			C	109.4	87.5	72.9	62.5	54.7	48.6	43.8	39.8	36.5	33.7	31.3	29.2	27.4							
			D _c	0.6	0.9	1.4	1.9	2.4	3.1	3.8	4.6	5.4	6.4	7.4	8.5	9.7							

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

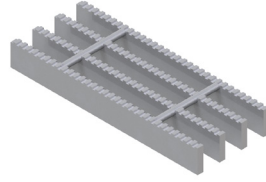
LOAD TABLES - CLOSE-MESH

Grating Type: 24W102

Design Code: NAAMM MBG 534

Material: ASTM A1011CS Type B

Surface: Serrated



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

Bearing Bar Size (mm)	Approx. Wiegth (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties									
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m									
25 x 3	30.1	1,116.00	U	21.4	13.7	9.5	7.0	5.4										8,020									
			D _u	2.5	4.0	5.7	7.7	10.1																			
			C	6.5	5.2	4.4	3.7	3.3																			
			D _c	2.0	3.2	4.6	6.2	8.1										76.21E+3									
25 x 5	43.5	1,235.00	U	32.1	20.6	14.3	10.5	8.0	6.3										12,030								
			D _u	2.5	4.0	5.7	7.7	10.1	12.8																		
			C	9.8	7.8	6.5	5.6	4.9	4.4																		
			D _c	2.0	3.2	4.6	6.2	8.1	10.2										114.32E+3								
32 x 3	36.9	1,387.00	U	38.3	24.5	17.0	12.5	9.6	7.6	6.1										14,340							
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8																	
			C	11.7	9.3	7.8	6.7	5.8	5.2	4.7																	
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5										182.08E+3							
32 x 5	53.7	1,535.00	U	57.4	36.7	25.5	18.7	14.4	11.3	9.2	7.6										21,510						
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8	14.3																
			C	17.5	14.0	11.7	10.0	8.8	7.8	7.0	6.4																
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.4										273.12E+3						
38 x 3	43.5	1,638.00	U	59.6	38.1	26.5	19.5	14.9	11.8	9.5	7.9										22,330						
			D _u	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.5																
			C	18.2	14.5	12.1	10.4	9.1	8.1	7.3	6.6																
			D _c	1.2	1.9	2.7	3.7	4.9	6.1	7.6	9.2										353.95E+3						
38 x 5	63.6	1,812.00	U	89.4	57.2	39.7	29.2	22.4	17.7	14.3	11.8	9.9										33,500					
			D _u	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.5	13.6															
			C	27.3	21.8	18.2	15.6	13.6	12.1	10.9	9.9	9.1															
			D _c	1.2	1.9	2.7	3.7	4.9	6.1	7.6	9.2	10.9										530.92E+3					
45 x 5	73.8	2,080.00	U	129.1	82.7	57.4	42.2	32.3	25.5	20.7	17.1	14.4	12.2	10.5										48,390			
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3	15.5													
			C	39.4	31.5	26.3	22.5	19.7	17.5	15.8	14.3	13.1	12.1	11.3													
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7	12.4										921.77E+3			
51 x 5	83.7	2,333.00	U	175.3	112.2	78.0	57.3	43.9	34.7	28.1	23.2	19.5	16.6	14.3	12.5	11.0										65,710	
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.3	15.2	17.3											
			C	53.5	42.8	35.7	30.6	26.7	23.8	21.4	19.5	17.8	16.5	15.3	14.3	13.4											
			D _c	0.9	1.4	1.9	2.7	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.2	13.8										1.46E+6	
64 x 5	103.8	2,818.00	U	290.0	185.6	128.9	94.7	72.5	57.3	46.4	38.4	32.2	27.5	23.7	20.6	18.2	108,680										
			D _u	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.5											
			C	88.4	70.8	59.0	50.6	44.2	39.3	35.4	32.2	29.5	27.2	25.3	23.6	22.1											
			D _c	0.7	1.1	1.5	2.1	2.7	3.4	4.2	5.1	6.1	7.1	8.2	9.5	10.8	3.10E+6										

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STANDARD, METRIC

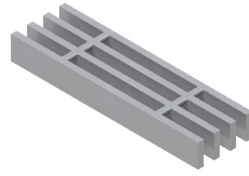
LOAD TABLES - ADA

Grating Type: **18W102**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Smooth**



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

Bearing Bar Size (mm)	Approx. Wiegth (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties	
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m	
25 x 5	59.8	1,673.00	U	81.0	51.9	36.0	26.5	20.3	16.0	13.0	10.7						30,360		
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8	14.3								
			C	24.7	19.8	16.5	14.1	12.4	11.0	9.9	9.0								
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.4						385.58E+3		
32 x 5	74.0	1,980.00	U	127.0	81.3	56.5	41.5	31.8	25.1	20.3	16.8	14.1	12.0				47,590		
			D _u	1.5	2.4	3.4	4.6	6.0	7.7	9.4	11.4	13.6	16.0						
			C	38.7	31.0	25.8	22.1	19.4	17.2	15.5	14.1	12.9	11.9				756.65E+3		
			D _c	1.2	1.9	2.7	3.7	4.8	6.1	7.6	9.1	10.9	12.8						
38 x 5	88.0	2,268.00	U	182.3	116.7	81.0	59.6	45.6	36.0	29.2	24.1	20.3	17.3	14.9	13.0		68,310		
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3	15.5	17.7				
			C	55.6	44.5	37.1	31.8	27.8	24.7	22.2	20.2	18.5	17.1	15.9	14.8		1.30E+6		
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7	12.4	14.2				
45 x 5	102.3	2,548.00	U	248.7	159.2	110.6	81.2	62.2	49.2	39.8	32.9	27.7	23.6	20.3	17.7	15.6	93,190		
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.2	15.2	17.3			
			C	75.8	60.7	50.6	43.3	37.9	33.7	30.3	27.6	25.3	23.3	21.7	20.2	19.0			
			D _c	0.9	1.4	1.9	2.6	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.1	13.8	2.07E+6		
51 x 5	116.3	2,814.00	U	324.0	207.4	144.1	105.9	81.1	64.1	51.9	42.9	36.0	30.7	26.5	23.1	20.3	121,440		
			D _u	0.9	1.5	2.1	2.9	3.8	4.8	5.9	7.2	8.5	10.0	11.6	13.3	15.1			
			C	98.8	79.1	65.9	56.5	49.4	43.9	39.5	36.0	33.0	30.4	28.3	26.4	24.7			
			D _c	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1	3.08E+6		
64 x 5	144.5	3,326.00	U	506.3	324.1	225.1	165.4	126.7	100.1	81.1	67.0	56.3	48.0	41.4	36.0	31.7	189,750		
			D _u	0.8	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.8	8.0	9.3	10.6	12.1			
			C	154.4	123.6	103.0	88.3	77.2	68.7	61.8	56.2	51.5	47.5	44.1	41.2	38.6			
			D _c	0.6	0.9	1.4	1.9	2.4	3.1	3.8	4.6	5.4	6.4	7.4	8.5	9.7	6.02E+6		

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

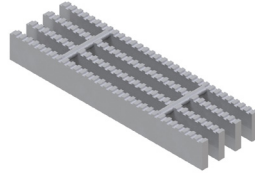
LOAD TABLES - ADA

Grating Type: **18W102**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Serrated**



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 124.11 MPa

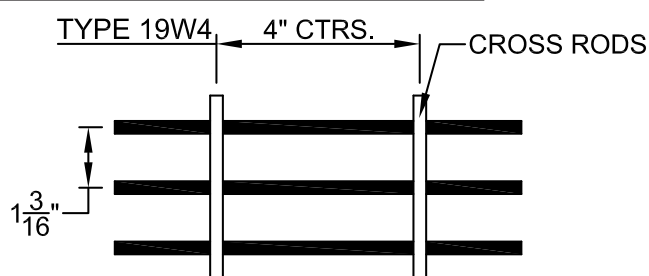
Bearing Bar Size (mm)	Approx. Wiegth (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties						
				610	762	915	1067	1220	1372	1524	1677	1829	1982	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m						
25 x 5	59.8	1,346.00	U	45.3	29.0	20.2	14.8	11.3											16,990					
			D _u	2.5	4.0	5.7	7.7	10.1	12.8															
			C	13.8	11.1	9.2	7.9	6.9	6.1															
			D _c	2.0	3.2	4.6	6.2	8.1	10.2										161.39E+3					
32 x 5	74.0	1,673.00	U	81.0	51.9	36.0	26.5	20.3	16.0	13.0	10.7										30,360			
			D _u	1.9	3.0	4.3	5.8	7.6	9.6	11.8	14.3													
			C	24.7	19.8	16.5	14.1	12.4	11.0	9.9	9.0													
			D _c	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.4										385.58E+3			
38 x 5	88.0	1,976.00	U	126.2	80.8	56.1	41.2	31.6	24.9	20.2	16.7	14.0	12.0										47,290	
			D _u	1.5	2.4	3.4	4.6	6.1	7.7	9.5	11.5	13.6	16.0											
			C	38.5	30.8	25.7	22.0	19.2	17.1	15.4	14.0	12.8	11.8											
			D _c	1.2	1.9	2.7	3.7	4.9	6.1	7.6	9.2	10.9	12.8										749.53E+3	
45 x 5	102.3	2,268.00	U	182.3	116.7	81.0	59.6	45.6	36.0	29.2	24.1	20.3	17.3	14.9	13.0		68,310							
			D _u	1.3	2.0	2.8	3.9	5.0	6.4	7.9	9.5	11.4	13.3	15.5	17.7									
			C	55.6	44.5	37.1	31.8	27.8	24.7	22.2	20.2	18.5	17.1	15.9	14.8									
			D _c	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.1	10.7	12.4	14.2		1.30E+6							
51 x 5	116.3	2,543.00	U	247.5	158.5	110.1	80.9	61.9	48.9	39.6	32.8	27.5	23.5	20.2	17.6	15.5	92,770							
			D _u	1.1	1.7	2.4	3.3	4.3	5.5	6.8	8.2	9.7	11.4	13.3	15.2	17.3								
			C	75.5	60.4	50.3	43.2	37.8	33.6	30.2	27.5	25.2	23.2	21.6	20.1	18.9								
			D _c	0.9	1.4	1.9	2.7	3.5	4.4	5.4	6.5	7.8	9.1	10.6	12.2	13.8	2.06E+6							
64 x 5	144.5	3,072.00	U	409.4	262.1	182.0	133.8	102.4	80.9	65.6	54.2	45.5	38.8	33.5	29.1	25.6	153,430							
			D _u	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.5								
			C	124.9	99.9	83.3	71.4	62.5	55.5	50.0	45.4	41.6	38.4	35.7	33.3	31.2								
			D _c	0.7	1.1	1.5	2.1	2.7	3.4	4.2	5.1	6.1	7.1	8.2	9.5	10.8	4.38E+6							

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STANDARD, IMPERIAL

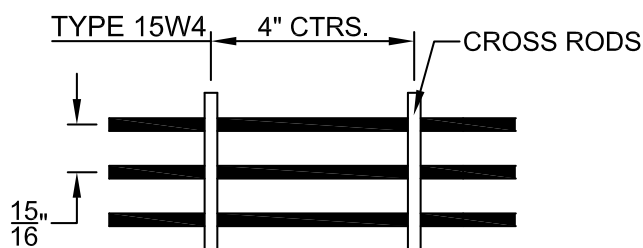
OVERVIEW

Standard



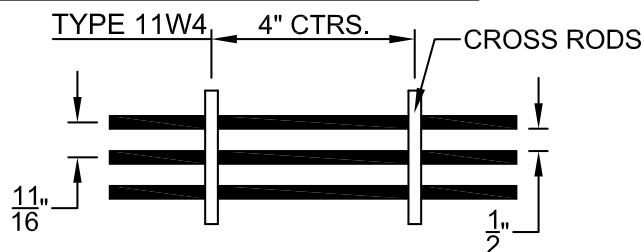
Standard Welded Grating is the most common type of grating used in the industrial flooring market. The open grid construction provides for maximum passage for light, air circulation and drainage.

Close-Mesh (Special Order)



When a certain bar depth must be held but standard duty is not sufficient, Close Mesh moves the bars closer to gain more strength and stiffness. This may also be warranted if the bar gap on Standard Duty is wider than desired.

ADA-Compliant (Special Order)



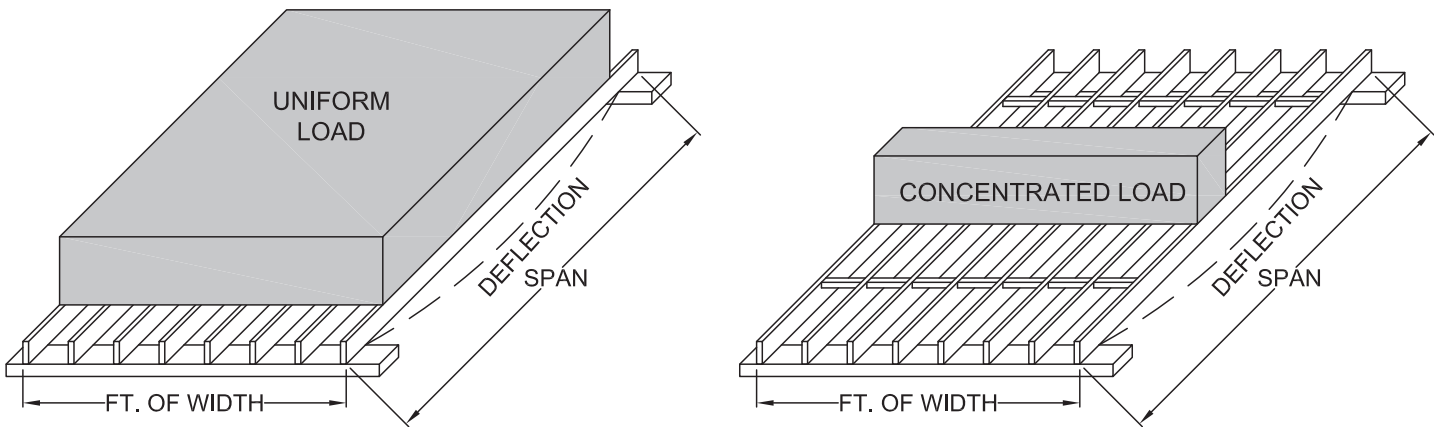
When the Grating needs to adhere to the guidelines of the Americans-with-Disabilities Act (ADA), an even-smaller bar gap is required. The ADA requires no more than a 1/2" opening as part of Chapter 3, Section 302.3 of the ADA Guide published by the United States Access Board.

Panel widths shown are out-to-out of bearing bars

Bars	ADA-COMPLIANT 11 SPACE (11/16" ctrs)		CLOSE MESH 15 SPACE (15/16" ctrs)		STANDARD 19 SPACE (1 3/16" ctrs)	
	1/8"	3/16"	1/8"	3/16"	1/8"	3/16"
2	13/16	7/8	1 1/16	1 1/8	1 5/16	1 3/8
3	1 1/2	1 9/16	2	2 1/16	2 1/2	2 9/16
4	2 3/16	2 1/4	2 15/16	3	3 11/16	3 3/4
5	2 7/8	2 15/16	3 7/8	3 15/16	4 7/8	4 15/16
6	3 9/16	3 5/8	4 13/16	4 7/8	6 1/16	6 1/8
7	4 1/4	4 5/16	5 3/4	5 13/16	7 1/4	7 5/16
8	4 15/16	5	6 11/16	6 3/4	8 7/16	8 1/2
9	5 5/8	5 11/16	7 5/8	7 11/16	9 5/8	9 11/16
10	6 5/16	6 3/8	8 9/16	8 5/8	10 13/16	10 7/8
11	7	7 1/16	9 1/2	9 9/16	12	12 1/16
12	7 11/16	7 3/4	10 7/16	10 1/2	13 3/16	13 1/4
13	8 3/8	8 7/16	11 3/8	11 7/16	14 3/8	14 7/16
14	9 1/16	9 1/8	12 5/16	12 3/8	15 9/16	15 5/8
15	9 3/4	9 13/16	13 1/4	13 5/16	16 3/4	16 13/16
16	10 7/16	10 1/2	14 3/16	14 1/4	17 15/16	18
17	11 1/8	11 3/16	15 1/8	15 3/16	19 1/8	19 3/16
18	11 13/16	11 7/8	16 1/16	16 1/8	20 5/16	20 3/8
19	12 1/2	12 9/16	17	17 1/16	21 1/2	21 9/16
20	13 3/16	13 1/4	17 15/16	18	22 11/16	22 3/4
21	13 7/8	13 15/16	18 7/8	18 15/16	23 7/8	23 15/16
22	14 9/16	14 5/8	19 13/16	19 7/8	25 1/16	25 1/8
23	15 1/4	15 5/16	20 3/4	20 13/16	26 1/4	26 5/16
24	15 15/16	16	21 11/16	21 3/4	27 7/16	27 1/2
25	16 5/8	16 11/16	22 5/8	22 11/16	28 5/8	28 11/16
26	17 5/16	17 3/8	23 9/16	23 5/8	29 13/16	29 7/8
27	18	18 1/16	24 1/2	24 9/16	31	31 1/16
28	18 11/16	18 3/4	25 7/16	25 1/2	32 3/16	32 1/4
29	19 3/8	19 7/16	26 3/8	26 7/16	33 3/8	33 7/16
30	20 1/16	20 1/8	27 5/16	27 3/8	34 9/16	34 5/8
31	20 3/4	20 13/16	28 1/4	28 5/16	35 3/4	35 13/16
32	21 7/16	21 1/2	29 3/16	29 1/4		
33	22 1/8	22 3/16	30 1/8	30 3/16		
34	22 13/16	22 7/8	31 1/16	31 1/8		
35	23 1/2	23 9/16	32	32 1/16		
36	24 3/16	24 1/4	32 15/16	33		
37			33 7/8	33 15/16		
38			34 13/16	34 7/8		
39			35 3/4	35 13/16		

DESIGN CRITERIA

The following tables of safe loads have been calculated using these design parameters:



	Uniform Load	Concentrated Load
Determine M:	$M = \frac{FS}{12}$	$M = \frac{FS}{12}$
Determine U or C:	$U = \frac{8M}{L^2}$	$C = \frac{4M}{L}$
Check D*:	$D = \frac{5UL(L \times 12)^3}{384 EI}$	$D = \frac{C(L \times 12)^3}{48 EI}$

*Deflection should be limited to ¼” under 100lb/ft² uniform load to afford pedestrian comfort.

- U = Uniform Load - lbs/ft²
- C = Concentrated Load - lbs/ft of grating width
- S = Section Modulus - in³/ft of grating width
- I = Moment of Inertia - in⁴/ft of grating width
- L = Simple Clear Span - feet
- D = Deflection - inches
- E = Modulus of Elasticity
- F = Allowable Bending Stress
- M = Bending Moment



Vulcraft Online Bar Grating Design Tools

If you are uncertain about which type of grating to use, try our on-line calculator. Enter your project specs and our calculator will recommend the appropriate grating. This powerful on-line tool allows you to compare alternatives so you can optimize weight, cost, or both. It saves you valuable time by eliminating manual calculations and the risk of errors. Visit www.vulcraft.com/DesignTools/BarGratingDesignAid

LOAD TABLES | STANDARD, IMPERIAL

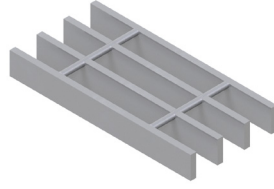
LOAD TABLES - SD

Grating Type: **19W4**

Design Code: **NAAMM MBG 534**

Material: **ASTM A1011CS Type B**

Surface: **Smooth**



U = Safe Uniform Load (lbs/ft²)

D_u = Deflection Due to Safe Uniform Load (in)

C = Safe Concentrated Load (lbs/ft of grating width)

D_c = Deflection Due to Safe Concentrated Load (in)

Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties								
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	I _x (in ⁴)/ft								
1" x ⅛"	5.14	51	U	632	404	281	206	158											0.211							
			D _u	0.07	0.12	0.17	0.23	0.30	125 0.38																	
			C	632	505	421	361	316	281										0.105							
			D _c	0.06	0.09	0.13	0.18	0.24	0.30																	
1" x ⅜"	7.33	57	U	947	606	421	309	237	187	152										0.316						
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47																
			C	947	758	632	541	474	421	379										0.158						
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37																
1 ¼" x ⅛"	6.23	61	U	987	632	439	322	247	195	158	130										0.329					
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45															
			C	987	789	658	564	493	439	395	359										0.206					
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36															
1 ¼" x ⅜"	8.98	67	U	1,480	947	658	483	370	292	237	196	164										0.493				
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	0.54														
			C	1,480	1,184	987	846	740	658	592	538	493										0.308				
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43														
1 ½" x ⅛"	7.33	70	U	1,421	909	632	464	355	281	227	188	158										0.474				
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45														
			C	1,421	1,137	947	812	711	632	568	517	474										0.355				
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36														
1 ½" x ⅜"	10.63	77	U	2,132	1,364	947	696	533	421	341	282	237	202										0.711			
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52													
			C	2,132	1,705	1,421	1,218	1,066	947	853	775	711	656										0.533			
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42													
1 ¾" x ⅜"	12.27	87	U	2,901	1,857	1,289	947	725	573	464	384	322	275	237	206										0.967	
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60											
			C	2,901	2,321	1,934	1,658	1,451	1,289	1,161	1,055	967	893	829	774										0.846	
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48											
2" x ⅜"	13.92	96	U	3,789	2,425	1,684	1,237	947	749	606	501	421	359	309	269	237										1.263
			D _u	0.04	0.06	0.08	0.11	0.15	0.19	0.23	0.28	0.34	0.39	0.46	0.52	0.60										
			C	3,789	3,032	2,526	2,165	1,895	1,684	1,516	1,378	1,263	1,166	1,083	1,011	947										1.263
			D _c	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48										
2 ½" x ⅜"	17.21	113	U	5,921	3,789	2,632	1,933	1,480	1,170	947	783	658	561	483	421	370	1.974									
			D _u	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48										
			C	5,921	4,737	3,947	3,383	2,961	2,632	2,368	2,153	1,974	1,822	1,692	1,579	1,480	2.467									
			D _c	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.21	0.25	0.29	0.34	0.38										

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

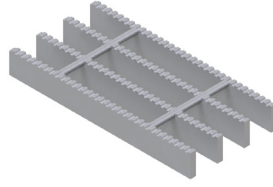
LOAD TABLES - SD

Grating Type: 19W4

Design Code: NAAMM MBG 534

Material: ASTM A1011CS Type B

Surface: Serrated



U = Safe Uniform Load (lbs/ft²)

D_u = Deflection Due to Safe Uniform Load (in)

C = Safe Concentrated Load (lbs/ft of grating width)

D_c = Deflection Due to Safe Concentrated Load (in)

Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	
																		I _x (in ⁴)/ft
1" x 1/8"	5.14	42	U	355	227	158											0.118	
			D _u	0.10	0.16	0.22	0.30											
			C	355	284	237	203											
			D _c	0.08	0.12	0.18	0.24										0.044	
1" x 3/16"	7.33	46	U	533	341	237	174	133								0.178		
			D _u	0.10	0.16	0.22	0.30	0.40										
			C	533	426	355	305	266										
			D _c	0.08	0.12	0.18	0.24	0.32								0.067		
1 1/4" x 1/8"	6.23	51	U	632	404	281	206	158	125							0.211		
			D _u	0.07	0.12	0.17	0.23	0.30	0.38									
			C	632	505	421	361	316	281									
			D _c	0.06	0.09	0.13	0.18	0.24	0.30							0.105		
1 1/4" x 3/16"	8.98	57	U	947	606	421	309	237	187	152						0.316		
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47								
			C	947	758	632	541	474	421	379								
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37						0.158		
1 1/2" x 1/8"	7.33	61	U	987	632	439	322	247	195	158	130					0.329		
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45							
			C	987	789	658	564	493	439	395	359							
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36					0.206		
1 1/2" x 3/16"	10.63	67	U	1,480	947	658	483	370	292	237	196	164				0.493		
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	0.54						
			C	1,480	1,184	987	846	740	658	592	538	493						
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43				0.308		
1 3/4" x 3/16"	12.27	77	U	2,132	1,364	947	696	533	421	341	282	237	202					0.711
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52					
			C	2,132	1,705	1,421	1,218	1,066	947	853	775	711	656					
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42					0.533
2" x 3/16"	13.92	87	U	2,901	1,857	1,289	947	725	573	464	384	322	275	237	206			0.967
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60			
			C	2,901	2,321	1,934	1,658	1,451	1,289	1,161	1,055	967	893	829	774			
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48			0.846
2 1/2" x 3/16"	17.21	105	U	4,796	3,069	2,132	1,566	1,199	947	767	634	533	454	392	341	300	1.599	
			D _u	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53		
			C	4,796	3,837	3,197	2,741	2,398	2,132	1,918	1,744	1,599	1,476	1,370	1,279	1,199		
			D _c	0.03	0.04	0.06	0.08	0.11	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.42	1.799	

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STANDARD, IMPERIAL

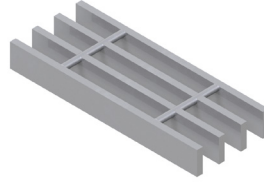
LOAD TABLES - CLOSE-MESH

Grating Type: 15W4

Design Code: NAAMM MBG 534

Material: ASTM A1011CS Type B

Surface: Smooth



U = Safe Uniform Load (lbs/ft²)

D_u = Deflection Due to Safe Uniform Load (in)

C = Safe Concentrated Load (lbs/ft of grating width)

D_c = Deflection Due to Safe Concentrated Load (in)

Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	
																		I _x (in ⁴)/ft
1" x 1/8"	6.27	55	U	800	512	356	261	200	158								0.267	
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47								
			C	800	640	533	457	400	356	320							0.133	
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37								
1" x 3/16"	9.03	60	U	1,200	768	533	392	300	237								0.400	
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47								
			C	1,200	960	800	686	600	533	480							0.200	
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37								
1 1/4" x 1/8"	7.65	65	U	1,250	800	556	408	313	247	200								0.417
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	165					0.260		
			C	1,250	1,000	833	714	625	556	500	455							
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36							
1 1/4" x 3/16"	11.10	71	U	1,875	1,200	833	612	469	370	300	248						0.625	
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	208						
			C	1,875	1,500	1,250	1,071	938	833	750	682	625				0.391		
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43						
1 1/2" x 1/8"	9.03	74	U	1,800	1,152	800	588	450	356	288	238	200						0.600
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	170					
			C	1,800	1,440	1,200	1,029	900	800	720	655	600	554				0.450	
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42					
1 1/2" x 3/16"	13.18	82	U	2,700	1,728	1,200	882	675	533	432	357	300	256				0.900	
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52	220				
			C	2,700	2,160	1,800	1,543	1,350	1,200	1,080	982	900	831	771		0.675		
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42	0.49				
1 3/4" x 3/16"	15.25	92	U	3,675	2,352	1,633	1,200	919	726	588	486	408	348	300	261	230	1.225	
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68		
			C	3,675	2,940	2,450	2,100	1,838	1,633	1,470	1,336	1,225	1,131	1,050	980	919	1.072	
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48	0.54		
2" x 3/16"	17.32	102	U	4,800	3,072	2,133	1,567	1,200	948	768	635	533	454	392	341	300	1.600	
			D _u	0.04	0.06	0.08	0.11	0.15	0.19	0.23	0.28	0.34	0.39	0.46	0.52	0.60		
			C	4,800	3,840	3,200	2,743	2,400	2,133	1,920	1,745	1,600	1,477	1,371	1,280	1,200	1.600	
			D _c	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48		
2 1/2" x 3/16"	21.46	120	U	7,500	4,800	3,333	2,449	1,875	1,481	1,200	992	833	710	612	533	469	2.500	
			D _u	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48		
			C	7,500	6,000	5,000	4,286	3,750	3,333	3,000	2,727	2,500	2,308	2,143	2,000	1,875	3.125	
			D _c	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.21	0.25	0.29	0.34	0.38		

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

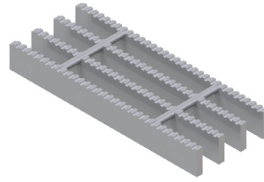
LOAD TABLES - CLOSE-MESH

Grating Type: 15W4

Design Code: NAAMM MBG 534

Material: ASTM A1011CS Type B

Surface: Serrated



U = Safe Uniform Load (lbs/ft²)

D_u = Deflection Due to Safe Uniform Load (in)

C = Safe Concentrated Load (lbs/ft of grating width)

D_c = Deflection Due to Safe Concentrated Load (in)

Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties				
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in³)/ft					
																		I _x (in⁴)/ft				
1" x ⅛"	6.27	44	U	450	288	200	147									0.150						
			D _u	0.10	0.16	0.22	0.30	113 0.40														
			C	450	360	300	257	225														
			D _c	0.08	0.12	0.18	0.24	0.32								0.056						
1" x ⅜₁₆"	9.03	49	U	675	432	300	220	169	133								0.225					
			D _u	0.10	0.16	0.22	0.30	0.40	0.50													
			C	675	540	450	386	338	300													
			D _c	0.08	0.12	0.18	0.24	0.32	0.40								0.084					
1 ¼" x ⅛"	7.65	55	U	800	512	356	261	200	158	128								0.267				
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47												
			C	800	640	533	457	400	356	320												
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37								0.133				
1 ¼" x ⅜₁₆"	11.10	60	U	1,200	768	533	392	300	237	192								0.400				
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47												
			C	1,200	960	800	686	600	533	480												
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37								0.200				
1 ½" x ⅛"	9.03	65	U	1,250	800	556	408	313	247	200	165								0.417			
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45											
			C	1,250	1,000	833	714	625	556	500	455											
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36								0.260			
1 ½" x ⅜₁₆"	13.18	71	U	1,875	1,200	833	612	469	370	300	248	208								0.625		
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	0.54										
			C	1,875	1,500	1,250	1,071	938	833	750	682	625										
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43								0.391		
1 ¾" x ⅜₁₆"	15.25	82	U	2,700	1,728	1,200	882	675	533	432	357	300	256	220								0.900
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52	0.61								
			C	2,700	2,160	1,800	1,543	1,350	1,200	1,080	982	900	831	771								
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42	0.49								0.675
2" x ⅜₁₆"	17.32	92	U	3,675	2,352	1,633	1,200	919	726	588	486	408	348	300	261	230		1.225				
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68						
			C	3,675	2,940	2,450	2,100	1,838	1,633	1,470	1,336	1,225	1,131	1,050	980	919						
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48	0.54		1.072				
2 ½" x ⅜₁₆"	21.46	111	U	6,075	3,888	2,700	1,984	1,519	1,200	972	803	675	575	496	432	380	2.025					
			D _u	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53						
			C	6,075	4,860	4,050	3,471	3,038	2,700	2,430	2,209	2,025	1,869	1,736	1,620	1,519	2.278					
			D _c	0.03	0.04	0.06	0.08	0.11	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.42						

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STANDARD, IMPERIAL

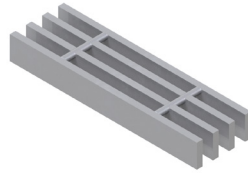
LOAD TABLES - ADA

Grating Type: 11W4

Design Code: NAAMM MBG 534

Material: ASTM A1011CS Type B

Surface: Smooth



U = Safe Uniform Load (lbs/ft²)

D_u = Deflection Due to Safe Uniform Load (in)

C = Safe Concentrated Load (lbs/ft of grating width)

D_c = Deflection Due to Safe Concentrated Load (in)

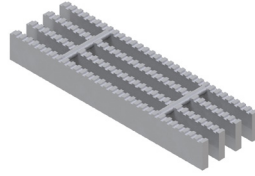
Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	
																		I _x (in ⁴)/ft
1" x 1/8"	8.25	59	U	1,091	698	485	356	273	215	175							0.364	
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47								
			C	1,091	873	727	623	545	485	436							0.182	
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37								
1 1/4" x 3/16"	14.82	77	U	2,557	1,636	1,136	835	639	505	409	338	284	242			0.852		
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	0.54	0.63					
			C	2,557	2,045	1,705	1,461	1,278	1,136	1,023	930	852	787			0.533		
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43	0.50					
1 1/2" x 3/16"	17.64	89	U	3,682	2,356	1,636	1,202	920	727	589	487	409	349	301	262		1.227	
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52	0.61	0.70			
			C	3,682	2,945	2,455	2,104	1,841	1,636	1,473	1,339	1,227	1,133	1,052	982		0.920	
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42	0.49	0.56			
1 3/4" x 3/16"	20.45	99	U	5,011	3,207	2,227	1,636	1,253	990	802	663	557	474	409	356	313	1.670	
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68		
			C	5,011	4,009	3,341	2,864	2,506	2,227	2,005	1,822	1,670	1,542	1,432	1,336	1,253	1.462	
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48	0.54		
2" x 3/16"	23.27	110	U	6,545	4,189	2,909	2,137	1,636	1,293	1,047	866	727	620	534	465	409	2.182	
			D _u	0.04	0.06	0.08	0.11	0.15	0.19	0.23	0.28	0.34	0.39	0.46	0.52	0.60		
			C	6,545	5,236	4,364	3,740	3,273	2,909	2,618	2,380	2,182	2,014	1,870	1,745	1,636	2.182	
			D _c	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48		
2 1/2" x 3/16"	28.90	130	U	10,227	6,545	4,545	3,340	2,557	2,020	1,636	1,352	1,136	968	835	727	639	3.409	
			D _u	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.31	0.36	0.42	0.48		
			C	10,227	8,182	6,818	5,844	5,114	4,545	4,091	3,719	3,409	3,147	2,922	2,727	2,557	4.261	
			D _c	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.21	0.25	0.29	0.34	0.38		

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES - ADA

Grating Type: **11W4**
 Design Code: **NAAMM MBG 534**
 Material: **ASTM A1011CS Type B**
 Surface: **Serrated**



U = Safe Uniform Load (lbs/ft²)
 D_u = Deflection Due to Safe Uniform Load (in)
 C = Safe Concentrated Load (lbs/ft of grating width)
 D_c = Deflection Due to Safe Concentrated Load (in)
 Allowable Extreme Fiber Stress = 18 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties		
				2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	I _x (in ⁴)/ft		
1" x 1/8"	8.25	48	U	614	393	273	200											0.205		
			D _u	0.10	0.16	0.22	0.30	0.40												
			C	614	491	409	351	307												
			D _c	0.08	0.12	0.18	0.24	0.32										0.077		
1 1/4" x 3/16"	14.82	65	U	1,636	1,047	727	534	409	323	262	216						0.545			
			D _u	0.07	0.12	0.17	0.23	0.30	0.38	0.47	0.56									
			C	1,636	1,309	1,091	935	818	727	655	595						0.273			
			D _c	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45									
1 1/2" x 3/16"	17.64	77	U	2,557	1,636	1,136	835	639	505	409	338	284	242					0.852		
			D _u	0.06	0.09	0.13	0.18	0.24	0.30	0.37	0.45	0.54	0.63							
			C	2,557	2,045	1,705	1,461	1,278	1,136	1,023	930	852	787					0.533		
			D _c	0.05	0.07	0.11	0.15	0.19	0.24	0.30	0.36	0.43	0.50							
1 3/4" x 3/16"	20.45	89	U	3,682	2,356	1,636	1,202	920	727	589	487	409	349	301	262				1.227	
			D _u	0.05	0.08	0.11	0.15	0.20	0.25	0.31	0.38	0.45	0.52	0.61	0.70					
			C	3,682	2,945	2,455	2,104	1,841	1,636	1,473	1,339	1,227	1,133	1,052	982				0.920	
			D _c	0.04	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.36	0.42	0.49	0.56					
2" x 3/16"	23.27	99	U	5,011	3,207	2,227	1,636	1,253	990	802	663	557	474	409	356	313		1.670		
			D _u	0.04	0.07	0.10	0.13	0.17	0.22	0.27	0.32	0.38	0.45	0.52	0.60	0.68				
			C	5,011	4,009	3,341	2,864	2,506	2,227	2,005	1,822	1,670	1,542	1,432	1,336	1,253		1.462		
			D _c	0.03	0.05	0.08	0.10	0.14	0.17	0.21	0.26	0.31	0.36	0.42	0.48	0.54				
2 1/2" x 3/16"	28.90	120	U	8,284	5,302	3,682	2,705	2,071	1,636	1,325	1,095	920	784	676	589	518		2.761		
			D _u	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53				
			C	8,284	6,627	5,523	4,734	4,142	3,682	3,314	3,012	2,761	2,549	2,367	2,209	2,071		3.107		
			D _c	0.03	0.04	0.06	0.08	0.11	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.42				

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | HEAVY DUTY, METRIC

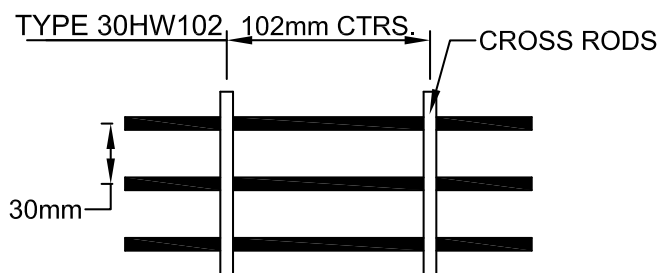
OVERVIEW

Heavy-Duty Welded Grating has the strength for heavy-duty load areas such as airfields, industrial plants, truck and bus terminals, parking lots and railroad yards. Common uses are flooring, driveways, subway and tunnel ventilation grilles, curb inlet grates, ramps, docks, etc.

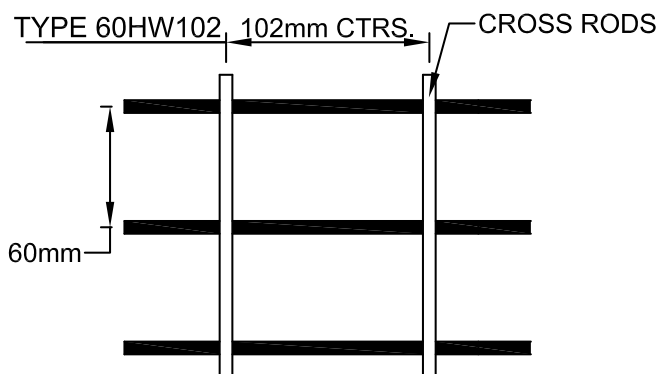
It is a sturdy grating to carry loads and maintain the same level over many years of use. Whenever rolling wheel loads are to be used over the grating, we recommend that the grating be load banded to add lateral strength. Serrations are available on bars up to 10mm thick to provide additional traction for rolling loads.

Standard heavy-duty bar grating is resistance-welded for durability, strength and safety using an automated electric/hydraulic welding process. High temperatures, combined with high pressure fuse the bearing bars and cross bars together to form a permanent joint.

Heavy-Duty



Wide Mesh



Panel widths shown are out-to-out of bearing bars

Bars	HEAVY DUTY 30 SPACE (30mm ctrs)		WIDE MESH 60 SPACE (60mm ctrs)	
	6 mm	10 mm	6 mm	10 mm
2	37	40	67	70
3	67	70	127	130
4	97	100	187	191
5	127	130	248	251
6	157	160	308	311
7	187	191	368	371
8	217	221	429	432
9	248	251	489	492
10	278	281	549	552
11	308	311	610	613
12	338	341	670	
13	368	371	730	
14	398	402	791	
15	429	432	851	
16	459	462	911	
17	489	492		
18	519	522		
19	549	552		
20	579	583		
21	610	613		
22	640			
23	670			
24	700			
25	730			
26	760			
27	791			
28	821			
29	851			
30	881			
31	911			

All metric dimensions are based on a "soft" conversion.

DESIGN CRITERIA

The load and deflection tables on the following pages have been prepared to provide the designer with a convenient reference for the load carrying capabilities of typical heavy duty grating.

Static Loads
Uniform loads and concentrated loads per foot of grating width are given on 152.4mm increments for spans from 300mm to 2,438mm. The values in these load tables are based on allowable stresses for static loads.

Determine M:	$M = \frac{FS}{12}$
Substituting for M, solve for L:	(i) $a > L$ $M = \frac{PL^2}{8ab}$ (ii) $a < L$ $M = \frac{P(.25L - .125a)}{b}$
Check D*:	$D = \frac{P_1[(2L^3) - (a^2L) + (a^3/4)]}{96EI}$

*Deflection should be limited to 1/400 span.

- M = Bending Moment

S = Section Modulus - mm³/m of grating width

I = Moment of Inertia - mm³/m of grating width

E = Modulus of Elasticity

F = Allowable Bending Stress

L = Simple Clear Span - mm

D = Deflection - mm
- a = Partial Load Contact Parallel to Span - mm

s = Center-to-Center Spacing Between Bars - mm

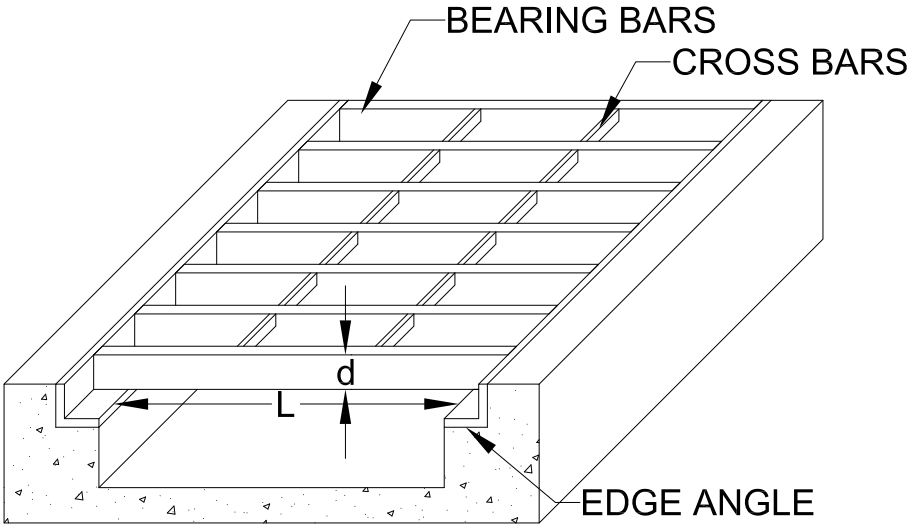
b = Partial Load Contact Dimension at 90° to span - mm

b = a + (2s)

P = Total Wheel of Partial Load Including Impact - kN.

P₁ = P per bearing bar

P₁ = P x (s/b)



LOAD TABLES | HEAVY DUTY, METRIC

VEHICULAR LOADS

Vehicular load tables are designed in accordance with the 16th Edition of the American Association of State Highway and Transportation Officials (AASHTO) for H-10 through H-25 loads with deflection limited to the lesser of .125 inches (3.175 mm) or L/400 to a maximum simple span of 8'- 0" (2,438mm). Automobile and forklift loads are similarly evaluated

with loads calculated and distributed in accordance with the criteria shown below. If the load conditions of your application are not adequately addressed in the criteria presented, please contact Vulcraft for assistance in determining the proper grating for your application.

Vehicular Load Table Criteria	H-25 ⁵ 	H-20/ HL-93 ⁶ 	H-15 	H-10 ² 	Passenger Vehicles 	5 Ton Forklifts ³ 	3 Ton Forklifts ³ 	1 Ton Forklifts ³ 
Truck/ Vehicle Weight (kN)					28	64	44	19
Load Capacity (kN)					16	44	27	9
Axle Load (kN)	178	142	107	71				
Impact Factor	30%	30%	30%	30%	30%	30%	30%	30%
Total Load (kN)	231	185	139	93	21	58	35	12
% of Load on Drive Axel					60%	85%	85%	85%
Wheel Load (kN)	116	93	69	46	10	29	17	6
A-Length of distribution perpendicular to axle or parallel to main bars (mm)	635	508	381	254	229	279	178	102
C-Width of distribution parallel to axle or perpendicular to main bars (mm)	635	508	381	254	229	279	178	102

Notes:

1. For continuous spans, use continuity factor = .80.
2. This distribution results in larger grating sizes for lighter trucks on shorter spans.
3. The fork lift wheel loads and load distribution patterns depicted above, generally, and only partially, represent the broad range of rubber-tired lift trucks available. For those applications falling outside of these examples, please contact Vulcraft.
4. Wheeled vehicles with urethane tires should NEVER be used in conjunction with open grid bar grating.
5. HS20 is the same as H20 and HS15 is the same as H15. The "S" stands for semi-trailer.
6. The "HL-93" notation shown with "H-20" represents AASHTO's truck loading standard post-1993. Since, 1993, H-10, H-20, etc. have been retired in lieu of the "HL-93" loading which represents all trucks.

VEHICULAR LOADS

Note: All loads based on Smooth surface

30HW102

Bearing Bar Size	S _x mm ³ /m	I _x mm ⁴ /m	Unit Wt. kPa	Maximum Clear Span Between Supports (mm)							
				H-25	H-20 / HL-93	H-15	H-10	Auto Traffic	5-Ton Forklift	3-Ton Forklift	1-Ton Forklift
25 x 6	22,940	291.33E+3	47.87	393	331	270	212	324	210	165	183
32 x 6	35,960	571.69E+3	58.59	435	374	314	259	442	250	208	258
38 x 6	51,610	983.22E+3	69.14	486	426	369	318	586	299	261	349
38 x 10	76,610	1.46E+6	100.76	571	513	458	413	822	378	347	498
51 x 6	91,760	2.33E+6	90.41	618	561	508	466	954	422	395	580
64 x 6	143,370	4.55E+6	111.68	786	733	686	657	1,326*	581	567	878
76 x 6	206,450	7.87E+6	132.95	993	944	905	890	1,589*	776	777	1,242
76 x 10	306,450	11.68E+6	197.65	1,330	1,289	1,262	1,271	1,818*	1,094	1,121	1,557*
102 x 6	367,020	18.64E+6	175.48	1,518	1,480	1,460	1,483	2,116*	1,270	1,312	1,812*
102 x 10	544,800	27.68E+6	260.79	1,752*	1,752*	1,762*	1,793*	2,421*	1,689*	1,730*	2,075*

* Indicates that value was controlled by $L/400 \leq 1/8"$ deflection limit.

Note: All loads based on Smooth surface

60HW102

Bearing Bar Size	S _x mm ³ /m	I _x mm ⁴ /m	Unit Wt. kPa	Maximum Clear Span Between Supports (mm)							
				H-25	H-20 / HL-93	H-15	H-10	Auto Traffic	5-Ton Forklift	3-Ton Forklift	1-Ton Forklift
25 x 6	11,470	145.66E+3	26.61	358	296	236	177	241	181	137	142
32 x 6	17,980	285.84E+3	31.96	381	320	261	206	312	205	164	193
38 x 6	25,810	491.61E+3	37.24	409	349	292	241	399	233	197	255
38 x 10	38,310	729.74E+3	53.41	455	397	343	297	542	280	250	357
51 x 6	45,880	1.17E+6	47.87	481	424	371	329	621	306	280	414
64 x 6	71,680	2.28E+6	58.51	572	519	472	442	906	400	388	618
76 x 6	103,230	3.93E+6	69.14	684	635	596	581	1,255	514	520	868
76 x 10	153,230	5.84E+6	102.94	868	826	799	808	1,538*	701	735	1,276
102 x 6	183,510	9.32E+6	90.41	970	932	912	935	1,790*	805	855	1,503
102 x 10	272,400	13.84E+6	134.51	1,296	1,271	1,272	1,338	2,048*	1,138	1,238	1,829*

* Indicates that value was controlled by $L/400 \leq 1/8"$ deflection limit.



LOAD TABLES | HEAVY DUTY, METRIC

VEHICULAR LOADS

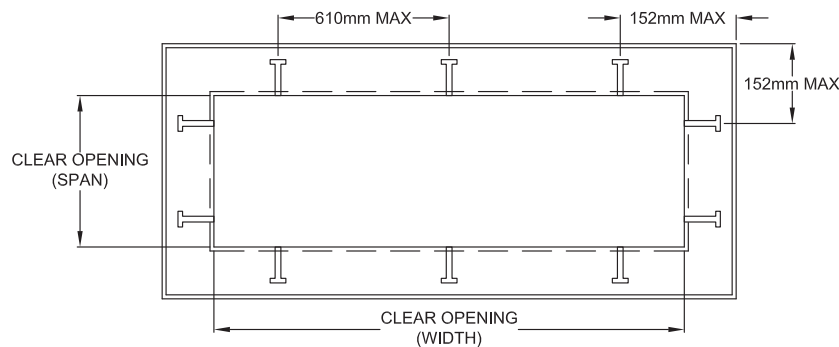
Grating Frames

Vulcraft's structural fabrication services can be leveraged to further aid you in getting a superior solution for covering your concrete opening by also obtaining an Embed Frame with your grating. A steel embed frame can improve the quality and lifespan of your project by:

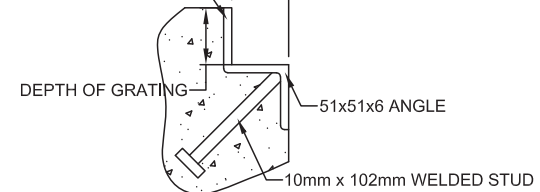
- Shielding the concrete at the opening edges from cracking and chipping,
- Providing an edge for the opening when forming the concrete pour,
- Providing uniform elevation for the opening to minimize potential for uneven surfaces,

- And providing a smooth and uniform bearing surface for the grating, allowing for easier attachment and better performance over its lifetime.

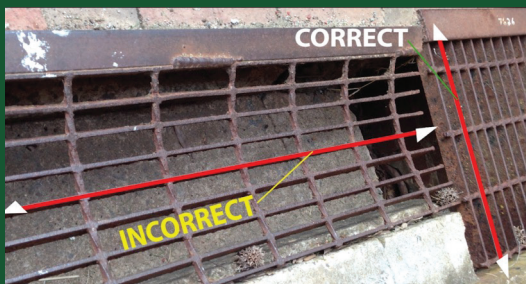
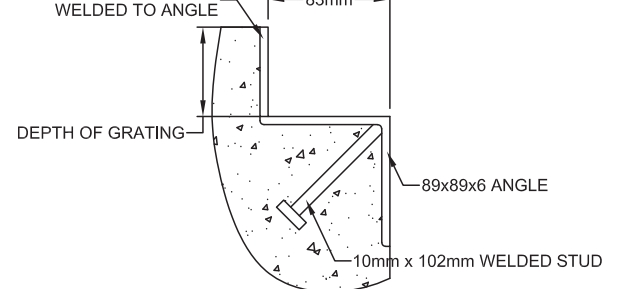
Frames are available in normal rectangular configurations only and will be supplied as a fully-assembled, four-sided unit in sizes up to those that can safely be transported via normal flatbed carriers. Sizes or configurations other than this should be discussed with Vulcraft. Embed frames can be supplied mill finished, painted, or hot-dipped galvanized. To order, please include a detail similar to the following with the Clear Opening Width and Span clearly defined as well as the desired quantities and finish.



6mm FLAT BAR WELDED TO ANGLE 44mm **Standard Duty**



6mm FLAT BAR WELDED TO ANGLE 83mm **Heavy Duty**



Cross Bars are not load bearing

The bearing bars are the bars that carry the load and the cross bars hold the bearing bars in place creating the shape of the panel. In order to function properly, make sure that both ends of each bearing bar is supported by the load bearing structure and avoid the situation depicted in the picture to the left.

tip

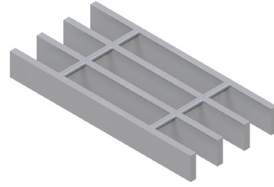
NOTES

This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are 20 columns and 20 rows of squares, creating a total of 400 square units. The grid covers the entire area of the page, leaving no margins or additional markings.

LOAD TABLES | HEAVY DUTY, METRIC

LOAD TABLES - HD

Grating Type: 30HW102
Design Code: NAAMM MBG 534
Material: ASTM A36M
Surface: Smooth



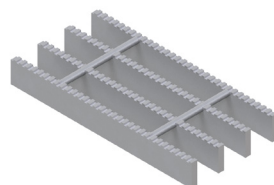
U = Safe Uniform Load (kPa)
 D_u = Deflection Due to Safe Uniform Load (mm)
 C = Safe Concentrated Load (kN/meter of grating width)
 D_c = Deflection Due to Safe Concentrated Load (mm)
 Allowable Extreme Fiber Stress = 137.9 MPa

Bearing Bar Size (mm)	Approx. Weight (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)														Section Properties	
				305	457	610	762	915	1067	1219	1372	1524	1677	1829	1981	2134	2286	2438	S _x (mm ³)/m I _x (mm ⁴)/m
25 x 6	46.7	1,560.00	U	272.0	121.0	68.1	43.6	30.3	22.2	17.0	13.4	10.9	9.0						22,940
			D _u	0.5	1.2	2.1	3.3	4.7	6.4	8.4	10.6	13.1	15.9						
			C	41.5	27.7	20.7	16.6	13.8	11.9	10.4	9.2	8.3	7.5						291.33E+3
			D _c	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7						
32 x 6	57.6	1,846.00	U	426.4	189.6	106.7	68.3	47.4	34.8	26.7	21.1	17.1	14.1	11.9	10.1				35,960
			D _u	0.4	0.9	1.7	2.6	3.8	5.1	6.7	8.5	10.5	12.7	15.1	17.7				
			C	65.0	43.4	32.5	26.0	21.7	18.6	16.3	14.5	13.0	11.8	10.8	10.0				571.69E+3
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2	12.1	14.2				
38 x 6	68.4	2,114.00	U	612.1	272.2	153.1	98.0	68.1	50.0	38.3	30.3	24.5	20.3	17.0	14.5	12.5			51,610
			D _u	0.4	0.8	1.4	2.2	3.2	4.3	5.6	7.1	8.8	10.6	12.6	14.8	17.2			
			C	93.3	62.2	46.7	37.4	31.1	26.7	23.3	20.8	18.7	17.0	15.6	14.4	13.3			983.22E+3
			D _c	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0	8.5	10.1	11.8	13.7			
38 x 10	101.1	2,334.00	U	908.6	404.0	227.3	145.5	101.0	74.2	56.8	44.9	36.4	30.1	25.3	21.5	18.6	16.2	14.2	76,610
			D _u	0.4	0.8	1.4	2.2	3.2	4.3	5.6	7.1	8.8	10.6	12.6	14.8	17.2	19.7	22.4	
			C	138.6	92.4	69.3	55.4	46.2	39.6	34.7	30.8	27.7	25.2	23.1	21.3	19.8	18.5	17.3	1.46E+6
			D _c	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0	8.5	10.1	11.8	13.7	15.8	17.9	
51 x 6	90.1	2,623.00	U	1,088.2	483.8	272.2	174.2	121.0	88.9	68.1	53.8	43.6	36.0	30.3	25.8	22.2	19.4	17.0	91,760
			D _u	0.3	0.6	1.1	1.6	2.4	3.2	4.2	5.3	6.6	7.9	9.5	11.1	12.9	14.8	16.8	
			C	165.9	110.7	83.0	66.4	55.3	47.4	41.5	36.9	33.2	30.2	27.7	25.5	23.7	22.1	20.8	2.33E+6
			D _c	0.2	0.5	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.4	
64 x 6	111.8	3,101.00	U	1,700.2	756.0	425.3	272.3	189.1	138.9	106.4	84.0	68.1	56.3	47.3	40.3	34.7	30.3	26.6	143,370
			D _u	0.2	0.5	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.4	
			C	259.3	172.9	129.7	103.8	86.5	74.1	64.9	57.6	51.9	47.2	43.2	39.9	37.1	34.6	32.4	4.55E+6
			D _c	0.2	0.4	0.7	1.1	1.5	2.1	2.7	3.4	4.2	5.1	6.1	7.1	8.2	9.5	10.8	
76 x 6	133.5	3,556.00	U	2,448.3	1,088.6	612.5	392.0	272.3	200.1	153.2	121.0	98.0	81.0	68.1	58.0	50.0	43.6	38.3	206,450
			D _u	0.2	0.4	0.7	1.1	1.6	2.1	2.8	3.5	4.4	5.3	6.3	7.4	8.6	9.9	11.2	
			C	373.4	249.0	186.7	149.4	124.5	106.7	93.4	83.0	74.7	67.9	62.3	57.5	53.4	49.8	46.7	7.87E+6
			D _c	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0	
76 x 10	199.7	3,925.00	U	3,634.3	1,615.9	909.2	581.9	404.2	297.0	227.4	179.7	145.5	120.3	101.1	86.1	74.3	64.7	56.9	306,450
			D _u	0.2	0.4	0.7	1.1	1.6	2.1	2.8	3.5	4.4	5.3	6.3	7.4	8.6	9.9	11.2	
			C	554.2	369.6	277.2	221.8	184.8	158.4	138.6	123.2	110.9	100.8	92.4	85.3	79.2	73.9	69.3	11.68E+6
			D _c	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0	
89 x 6	155.2	3,991.00	U	3,332.5	1,481.7	833.7	533.6	370.6	272.3	208.5	164.7	133.4	110.3	92.7	79.0	68.1	59.3	52.2	281,000
			D _u	0.2	0.3	0.6	0.9	1.4	1.8	2.4	3.0	3.8	4.5	5.4	6.3	7.4	8.4	9.6	
			C	508.2	338.9	254.2	203.4	169.5	145.3	127.1	113.0	101.7	92.4	84.7	78.2	72.6	67.8	63.6	12.49E+6
			D _c	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0	3.6	4.3	5.1	5.9	6.8	7.7	
89 x 10	231.9	4,406.00	U	4,946.6	2,199.5	1,237.5	792.1	550.1	404.2	309.5	244.5	198.1	163.7	137.6	117.2	101.1	88.0	77.4	417,110
			D _u	0.2	0.3	0.6	0.9	1.4	1.8	2.4	3.0	3.8	4.5	5.4	6.3	7.4	8.4	9.6	
			C	754.4	503.0	377.3	301.9	251.6	215.6	188.7	167.7	151.0	137.2	125.8	116.1	107.8	100.6	94.4	18.54E+6
			D _c	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0	3.6	4.3	5.1	5.9	6.8	7.7	
102 x 6	176.9	4,412.00	U	4,352.6	1,935.3	1,088.9	697.0	484.0	355.6	272.3	215.2	174.3	144.0	121.0	103.1	88.9	77.5	68.1	367,020
			D _u	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.7	5.6	6.4	7.4	8.4	
			C	663.8	442.6	332.0	265.6	221.4	189.7	166.0	147.6	132.8	120.8	110.7	102.2	94.9	88.6	83.0	18.64E+6
			D _c	0.1	0.2	0.4	0.7	0.9	1.3	1.7	2.1	2.6	3.2	3.8	4.4	5.1	5.9	6.7	
102 x 10	264.1	4,870.00	U	6,460.9	2,872.8	1,616.3	1,034.6	718.5	527.9	404.2	319.4	258.7	213.8	179.7	153.1	132.0	115.0	101.1	544,800
			D _u	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.7	5.6	6.4	7.4	8.4	
			C	985.3	657.0	492.8	394.3	328.6	281.6	246.4	219.1	197.2	179.2	164.3	151.7	140.8	131.4	123.3	27.68E+6
			D _c	0.1	0.2	0.4	0.7	0.9	1.3	1.7	2.1	2.6	3.2	3.8	4.4	5.1	5.9	6.7	

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES - HD

Grating Type: 30HW102
Design Code: NAAMM MBG 534
Material: ASTM A36M
Surface: Serrated



U = Safe Uniform Load (kPa)
 D_u = Deflection Due to Safe Uniform Load (mm)
 C = Safe Concentrated Load (kN/meter of grating width)
 D_c = Deflection Due to Safe Concentrated Load (mm)
 Allowable Extreme Fiber Stress = 137.9 MPa

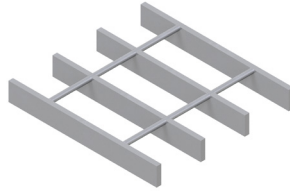
Bearing Bar Size (mm)	Approx. Wieght (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)																Section Properties			
				305	457	610	762	915	1067	1219	1372	1524	1677	1829	1981	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m			
25 x 6	46.7	1,255.00	U	152.2	67.7	38.1	24.4	16.9	12.4	9.5	7.5										12,840		
			D _u	0.7	1.6	2.8	4.4	6.3	8.6	11.2	14.2												
			C	23.2	15.5	11.6	9.3	7.7	6.6	5.8	5.2												
			D _c	0.6	1.3	2.2	3.5	5.1	6.9	9.0	11.4										121.94E+3		
32 x 6	57.6	1,560.00	U	272.0	121.0	68.1	43.6	30.3	22.2	17.0	13.4	10.9	9.0								22,940		
			D _u	0.5	1.2	2.1	3.3	4.7	6.4	8.4	10.6	13.1	15.9										
			C	41.5	27.7	20.7	16.6	13.8	11.9	10.4	9.2	8.3	7.5										
			D _c	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7								291.33E+3		
38 x 6	68.4	1,842.00	U	423.7	188.4	106.0	67.8	47.1	34.6	26.5	20.9	17.0	14.0	11.8	10.0						35,730		
			D _u	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7	15.2	17.8								
			C	64.6	43.1	32.3	25.9	21.5	18.5	16.2	14.4	12.9	11.8	10.8	9.9								
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2	12.1	14.2						566.31E+3		
38 x 10	101.1	2,033.00	U	629.0	279.7	157.3	100.7	69.9	51.4	39.3	31.1	25.2	20.8	17.5	14.9	12.9						53,040	
			D _u	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7	15.2	17.8	20.6							
			C	95.9	64.0	48.0	38.4	32.0	27.4	24.0	21.3	19.2	17.4	16.0	14.8	13.7							
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2	12.1	14.2	16.5						840.62E+3	
51 x 6	90.1	2,371.00	U	831.2	369.6	207.9	133.1	92.4	67.9	52.0	41.1	33.3	27.5	23.1	19.7	17.0	14.8	13.0		70,090			
			D _u	0.3	0.7	1.2	1.9	2.7	3.7	4.8	6.1	7.5	9.1	10.8	12.7	14.7	16.9	19.2					
			C	126.8	84.5	63.4	50.7	42.3	36.2	31.7	28.2	25.4	23.1	21.1	19.5	18.1	16.9	15.9					
			D _c	0.2	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0	7.3	8.7	10.2	11.8	13.5	15.4		1.56E+6			
64 x 6	111.8	2,864.00	U	1,374.8	611.3	343.9	220.1	152.9	112.3	86.0	68.0	55.0	45.5	38.2	32.6	28.1	24.5	21.5	115,930				
			D _u	0.2	0.5	0.9	1.5	2.1	2.9	3.7	4.7	5.8	7.1	8.4	9.9	11.5	13.1	15.0					
			C	209.7	139.8	104.9	83.9	69.9	59.9	52.4	46.6	42.0	38.1	35.0	32.3	30.0	28.0	26.2					
			D _c	0.2	0.4	0.7	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.7	7.9	9.2	10.5	12.0	3.31E+6				
76 x 6	133.5	3,329.00	U	2,054.3	913.4	513.9	329.0	228.5	167.9	128.5	101.6	82.3	68.0	57.1	48.7	42.0	36.6	32.2	173,230				
			D _u	0.2	0.4	0.8	1.2	1.7	2.3	3.1	3.9	4.8	5.8	6.9	8.1	9.4	10.8	12.2					
			C	313.3	208.9	156.7	125.4	104.5	89.6	78.4	69.7	62.7	57.0	52.2	48.2	44.8	41.8	39.2					
			D _c	0.2	0.3	0.6	1.0	1.4	1.9	2.4	3.1	3.8	4.6	5.5	6.5	7.5	8.6	9.8	6.05E+6				
76 x 10	199.7	3,675.00	U	3,049.4	1,355.9	762.9	488.3	339.1	249.2	190.8	150.7	122.1	100.9	84.8	72.3	62.3	54.3	47.7	257,140				
			D _u	0.2	0.4	0.8	1.2	1.7	2.3	3.1	3.9	4.8	5.8	6.9	8.1	9.4	10.8	12.2					
			C	465.0	310.1	232.6	186.1	155.1	132.9	116.3	103.4	93.1	84.6	77.5	71.6	66.5	62.0	58.2					
			D _c	0.2	0.3	0.6	1.0	1.4	1.9	2.4	3.1	3.8	4.6	5.5	6.5	7.5	8.6	9.8	8.97E+6				
89 x 6	155.2	3,774.00	U	2,869.9	1,276.1	718.0	459.5	319.2	234.5	179.5	141.9	114.9	95.0	79.8	68.0	58.6	51.1	44.9	242,000				
			D _u	0.2	0.4	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.8	6.8	7.9	9.1	10.3					
			C	437.7	291.8	218.9	175.1	146.0	125.1	109.5	97.3	87.6	79.6	73.0	67.4	62.6	58.4	54.8					
			D _c	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.9	4.7	5.5	6.3	7.3	8.3	9.98E+6				
89 x 10	231.9	4,166.00	U	4,260.0	1,894.2	1,065.7	682.1	473.8	348.1	266.5	210.6	170.6	141.0	118.5	100.9	87.0	75.8	66.7	359,220				
			D _u	0.2	0.4	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.8	6.8	7.9	9.1	10.3					
			C	649.7	433.2	324.9	260.0	216.6	185.7	162.5	144.4	130.0	118.2	108.3	100.0	92.9	86.7	81.3					
			D _c	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.9	4.7	5.5	6.3	7.3	8.3	14.82E+6				
102 x 6	176.9	4,202.00	U	3,821.5	1,699.2	956.0	611.9	425.0	312.3	239.1	188.9	153.0	126.5	106.3	90.6	78.1	68.0	59.8	322,240				
			D _u	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0					
			C	582.8	388.6	291.5	233.2	194.3	166.6	145.8	129.6	116.6	106.0	97.2	89.7	83.3	77.7	72.9					
			D _c	0.1	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.5	6.3	7.2	15.34E+6				
102 x 10	264.1	4,638.00	U	5,672.6	2,522.2	1,419.1	908.3	630.8	463.5	354.9	280.4	227.1	187.7	157.7	134.4	115.9	101.0	88.8	478,330				
			D _u	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0					
			C	865.1	576.8	432.7	346.2	288.5	247.3	216.4	192.3	173.1	157.4	144.3	133.2	123.7	115.4	108.2					
			D _c	0.1	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.5	6.3	7.2	22.77E+6				

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | HEAVY DUTY, METRIC

LOAD TABLES - WIDE MESH

Grating Type: 60HW102
Design Code: NAAMM MBG 534
Material: ASTM A36M
Surface: Smooth



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

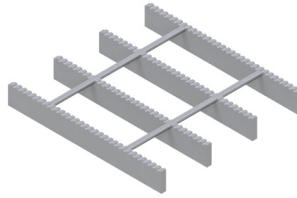
Allowable Extreme Fiber Stress = 137.9 MPa

Bearing Bar Size (mm)	Approx. Wight (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)																Section Properties			
				305	457	610	762	915	1067	1219	1372	1524	1677	1829	1981	2134	2286	2438	S _x (mm ³)/m	I _x (mm ⁴)/m			
25 x 6	26.2	1,312.00	U	136.0	60.5	34.0	21.8	15.1	11.1	8.5											11,470		
			D _u	0.5	1.2	2.1	3.3	4.7	6.4	8.4	10.6												
			C	20.7	13.8	10.4	8.3	6.9	5.9	5.2	4.6												
			D _c	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5										145.66E+3		
32 x 6	31.7	1,552.00	U	213.2	94.8	53.3	34.1	23.7	17.4	13.3	10.5	8.5	7.1									17,980	
			D _u	0.4	0.9	1.7	2.6	3.8	5.1	6.7	8.5	10.5	12.7										
			C	32.5	21.7	16.3	13.0	10.8	9.3	8.1	7.2	6.5	5.9										
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2									285.84E+3	
38 x 6	37.0	1,778.00	U	306.0	136.1	76.6	49.0	34.0	25.0	19.1	15.1	12.3	10.1	8.5							25,810		
			D _u	0.4	0.8	1.4	2.2	3.2	4.3	5.6	7.1	8.8	10.6	12.6									
			C	46.7	31.1	23.3	18.7	15.6	13.3	11.7	10.4	9.3	8.5	7.8							491.61E+3		
			D _c	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0	8.5	10.1									
38 x 10	52.8	1,962.00	U	454.3	202.0	113.6	72.7	50.5	37.1	28.4	22.5	18.2	15.0	12.6	10.8						38,310		
			D _u	0.4	0.8	1.4	2.2	3.2	4.3	5.6	7.1	8.8	10.6	12.6	14.8								
			C	69.3	46.2	34.7	27.7	23.1	19.8	17.3	15.4	13.9	12.6	11.6	10.7						729.74E+3		
			D _c	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0	8.5	10.1	11.8								
51 x 6	47.9	2,206.00	U	544.1	241.9	136.1	87.1	60.5	44.5	34.0	26.9	21.8	18.0	15.1	12.9	11.1	9.7			45,880			
			D _u	0.3	0.6	1.1	1.6	2.4	3.2	4.2	5.3	6.6	7.9	9.5	11.1	12.9	14.8						
			C	83.0	55.3	41.5	33.2	27.7	23.7	20.8	18.4	16.6	15.1	13.8	12.8	11.9	11.1						
			D _c	0.2	0.5	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8			1.17E+6			
64 x 6	58.7	2,608.00	U	850.1	378.0	212.7	136.1	94.5	69.5	53.2	42.0	34.0	28.1	23.6	20.1	17.4	15.1	13.3	71,680				
			D _u	0.2	0.5	0.8	1.3	1.9	2.6	3.4	4.3	5.3	6.4	7.6	8.9	10.3	11.8	13.4					
			C	129.6	86.4	64.8	51.9	43.2	37.1	32.4	28.8	25.9	23.6	21.6	20.0	18.5	17.3	16.2					
			D _c	0.2	0.4	0.7	1.1	1.5	2.1	2.7	3.4	4.2	5.1	6.1	7.1	8.2	9.5	10.8	2.28E+6				
76 x 6	69.6	2,990.00	U	1,224.2	544.3	306.2	196.0	136.1	100.0	76.6	60.5	49.0	40.5	34.0	29.0	25.0	21.8	19.2	103,230				
			D _u	0.2	0.4	0.7	1.1	1.6	2.1	2.8	3.5	4.4	5.3	6.3	7.4	8.6	9.9	11.2					
			C	186.7	124.5	93.4	74.7	62.3	53.4	46.7	41.5	37.4	34.0	31.1	28.7	26.7	24.9	23.4					
			D _c	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0	3.93E+6				
76 x 10	103.1	3,300.00	U	1,817.1	808.0	454.6	291.0	202.1	148.5	113.7	89.8	72.8	60.1	50.5	43.1	37.1	32.3	28.4	153,230				
			D _u	0.2	0.4	0.7	1.1	1.6	2.1	2.8	3.5	4.4	5.3	6.3	7.4	8.6	9.9	11.2					
			C	277.1	184.8	138.6	110.9	92.4	79.2	69.3	61.6	55.5	50.4	46.2	42.7	39.6	37.0	34.7					
			D _c	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0	5.84E+6				
89 x 6	80.4	3,356.00	U	1,666.2	740.9	416.8	266.8	185.3	136.1	104.2	82.4	66.7	55.1	46.3	39.5	34.0	29.7	26.1	140,500				
			D _u	0.2	0.3	0.6	0.9	1.4	1.8	2.4	3.0	3.8	4.5	5.4	6.3	7.4	8.4	9.6					
			C	254.1	169.4	127.1	101.7	84.7	72.6	63.6	56.5	50.8	46.2	42.4	39.1	36.3	33.9	31.8					
			D _c	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0	3.6	4.3	5.1	5.9	6.8	7.7	6.25E+6				
89 x 10	119.2	3,705.00	U	2,473.3	1,099.7	618.7	396.0	275.1	202.1	154.7	122.3	99.0	81.9	68.8	58.6	50.5	44.0	38.7	208,560				
			D _u	0.2	0.3	0.6	0.9	1.4	1.8	2.4	3.0	3.8	4.5	5.4	6.3	7.4	8.4	9.6					
			C	377.2	251.5	188.7	150.9	125.8	107.8	94.3	83.9	75.5	68.6	62.9	58.1	53.9	50.3	47.2					
			D _c	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0	3.6	4.3	5.1	5.9	6.8	7.7	9.27E+6				
102 x 6	91.3	3,710.00	U	2,176.3	967.7	544.4	348.5	242.0	177.8	136.2	107.6	87.1	72.0	60.5	51.6	44.5	38.7	34.1	183,510				
			D _u	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.7	5.6	6.4	7.4	8.4					
			C	331.9	221.3	166.0	132.8	110.7	94.9	83.0	73.8	66.4	60.4	55.3	51.1	47.4	44.3	41.5					
			D _c	0.1	0.2	0.4	0.7	0.9	1.3	1.7	2.1	2.6	3.2	3.8	4.4	5.1	5.9	6.7	9.32E+6				
102 x 10	135.3	4,095.00	U	3,230.5	1,436.4	808.1	517.3	359.3	264.0	202.1	159.7	129.4	106.9	89.8	76.5	66.0	57.5	50.6	272,400				
			D _u	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.7	5.6	6.4	7.4	8.4					
			C	492.6	328.5	246.4	197.1	164.3	140.8	123.2	109.5	98.6	89.6	82.2	75.8	70.4	65.7	61.6					
			D _c	0.1	0.2	0.4	0.7	0.9	1.3	1.7	2.1	2.6	3.2	3.8	4.4	5.1	5.9	6.7	13.84E+6				

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES - WIDE MESH

Grating Type: 60HW102
Design Code: NAAMM MBG 534
Material: ASTM A36M
Surface: Serrated



U = Safe Uniform Load (kPa)

D_u = Deflection Due to Safe Uniform Load (mm)

C = Safe Concentrated Load (kN/meter of grating width)

D_c = Deflection Due to Safe Concentrated Load (mm)

Allowable Extreme Fiber Stress = 137.9 MPa

Bearing Bar Size (mm)	Approx. Wiegth (kg/m ²)	Ped. Span (mm)	Load / Deflection	SPAN (mm)																Section Properties		
				305	457	610	762	915	1067	1219	1372	1524	1677	1829	1981	2134	2286	2438	S _x (mm ³)/m			
																				I _x (mm ⁴)/m		
25 x 6	26.2	1,055.00	U	76.1	33.8	19.0	12.2	8.5												6,420		
			D _u	0.7	1.6	2.8	4.4	6.3	8.6													
			C	11.6	7.7	5.8	4.6	3.9	3.3													
			D _c	0.6	1.3	2.2	3.5	5.1	6.9											60.97E+3		
32 x 6	31.7	1,312.00	U	136.0	60.5	34.0	21.8	15.1	11.1	8.5	6.7											11,470
			D _u	0.5	1.2	2.1	3.3	4.7	6.4	8.4	10.6											
			C	20.7	13.8	10.4	8.3	6.9	5.9	5.2	4.6											
			D _c	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5											145.66E+3
38 x 6	37.0	1,549.00	U	211.9	94.2	53.0	33.9	23.6	17.3	13.3	10.5	8.5	7.0					17,870				
			D _u	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7									
			C	32.3	21.5	16.2	12.9	10.8	9.2	8.1	7.2	6.5	5.9					283.16E+3				
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2									
38 x 10	52.8	1,710.00	U	314.5	139.8	78.7	50.4	35.0	25.7	19.7	15.5	12.6	10.4	8.7			26,520					
			D _u	0.4	0.9	1.7	2.6	3.8	5.2	6.7	8.5	10.5	12.7	15.2								
			C	48.0	32.0	24.0	19.2	16.0	13.7	12.0	10.7	9.6	8.7	8.0			420.31E+3					
			D _c	0.3	0.8	1.3	2.1	3.0	4.1	5.4	6.8	8.4	10.2	12.1								
51 x 6	47.9	1,994.00	U	415.6	184.8	104.0	66.6	46.2	34.0	26.0	20.5	16.6	13.8	11.6	9.8	8.5			35,050			
			D _u	0.3	0.7	1.2	1.9	2.7	3.7	4.8	6.1	7.5	9.1	10.8	12.7	14.7						
			C	63.4	42.3	31.7	25.4	21.1	18.1	15.9	14.1	12.7	11.5	10.6	9.8	9.1			778.03E+3			
			D _c	0.2	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0	7.3	8.7	10.2	11.8						
64 x 6	58.7	2,408.00	U	687.4	305.6	172.0	110.1	76.4	56.2	43.0	34.0	27.5	22.7	19.1	16.3	14.0	12.2	10.8	57,960			
			D _u	0.2	0.5	0.9	1.5	2.1	2.9	3.7	4.7	5.8	7.1	8.4	9.9	11.5	13.1	15.0				
			C	104.8	69.9	52.4	41.9	35.0	30.0	26.2	23.3	21.0	19.1	17.5	16.1	15.0	14.0	13.1		1.65E+6		
			D _c	0.2	0.4	0.7	1.2	1.7	2.3	3.0	3.8	4.7	5.7	6.7	7.9	9.2	10.5	12.0				
76 x 6	69.6	2,800.00	U	1,027.2	456.7	257.0	164.5	114.2	83.9	64.3	50.8	41.1	34.0	28.6	24.3	21.0	18.3	16.1	86,610			
			D _u	0.2	0.4	0.8	1.2	1.7	2.3	3.1	3.9	4.8	5.8	6.9	8.1	9.4	10.8	12.2				
			C	156.6	104.5	78.3	62.7	52.2	44.8	39.2	34.8	31.3	28.5	26.1	24.1	22.4	20.9	19.6		3.02E+6		
			D _c	0.2	0.3	0.6	1.0	1.4	1.9	2.4	3.1	3.8	4.6	5.5	6.5	7.5	8.6	9.8				
76 x 10	103.1	3,090.00	U	1,524.7	677.9	381.4	244.1	169.6	124.6	95.4	75.4	61.1	50.5	42.4	36.1	31.2	27.1	23.9	128,570			
			D _u	0.2	0.4	0.8	1.2	1.7	2.3	3.1	3.9	4.8	5.8	6.9	8.1	9.4	10.8	12.2				
			C	232.5	155.0	116.3	93.0	77.5	66.5	58.2	51.7	46.5	42.3	38.8	35.8	33.2	31.0	29.1		4.49E+6		
			D _c	0.2	0.3	0.6	1.0	1.4	1.9	2.4	3.1	3.8	4.6	5.5	6.5	7.5	8.6	9.8				
89 x 6	80.4	3,173.00	U	1,435.0	638.0	359.0	229.8	159.6	117.2	89.8	70.9	57.5	47.5	39.9	34.0	29.3	25.5	22.5	121,000			
			D _u	0.2	0.4	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.8	6.8	7.9	9.1	10.3				
			C	218.8	145.9	109.5	87.6	73.0	62.6	54.7	48.7	43.8	39.8	36.5	33.7	31.3	29.2	27.4		4.99E+6		
			D _c	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.9	4.7	5.5	6.3	7.3	8.3				
89 x 10	119.2	3,503.00	U	2,130.0	947.1	532.9	341.1	236.9	174.0	133.3	105.3	85.3	70.5	59.2	50.5	43.5	37.9	33.3	179,610			
			D _u	0.2	0.4	0.6	1.0	1.5	2.0	2.6	3.3	4.0	4.9	5.8	6.8	7.9	9.1	10.3				
			C	324.8	216.6	162.5	130.0	108.3	92.9	81.2	72.2	65.0	59.1	54.2	50.0	46.4	43.3	40.6		7.41E+6		
			D _c	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.2	3.9	4.7	5.5	6.3	7.3	8.3				
102 x 6	91.3	3,533.00	U	1,910.8	849.6	478.0	306.0	212.5	156.1	119.5	94.5	76.5	63.2	53.1	45.3	39.0	34.0	29.9	161,120			
			D _u	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0				
			C	291.4	194.3	145.7	116.6	97.2	83.3	72.9	64.8	58.3	53.0	48.6	44.9	41.7	38.9	36.5		7.67E+6		
			D _c	0.1	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.5	6.3	7.2				
102 x 10	135.3	3,900.00	U	2,836.3	1,261.1	709.5	454.2	315.4	231.8	177.4	140.2	113.6	93.9	78.9	67.2	57.9	50.5	44.4	239,160			
			D _u	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.5	4.2	5.0	5.9	6.9	7.9	9.0				
			C	432.5	288.4	216.3	173.1	144.2	123.6	108.2	96.2	86.6	78.7	72.1	66.6	61.8	57.7	54.1		11.38E+6		
			D _c	0.1	0.3	0.4	0.7	1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.5	6.3	7.2				

Spans and loads in red exceed a deflection of 6mm for uniform loads of 5kPa. Experience has shown that 6mm deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | HEAVY DUTY, IMPERIAL

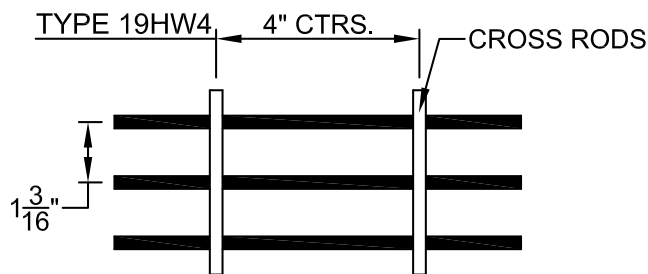
OVERVIEW

Heavy-Duty Welded Grating has the strength for heavy-duty load areas such as airfields, industrial plants, truck and bus terminals, parking lots and railroad yards. Common uses are flooring, driveways, subway and tunnel ventilation grilles, curb inlet grates, ramps, docks, etc.

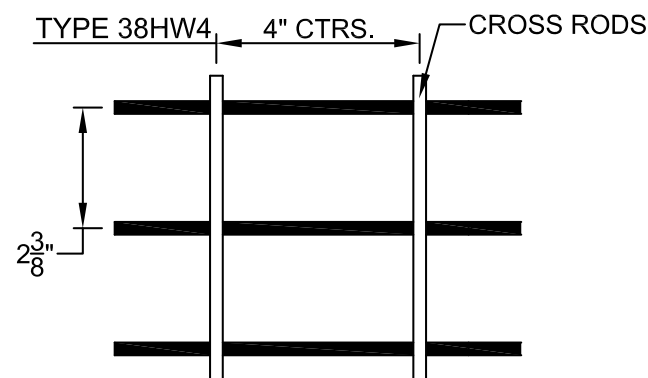
It is a sturdy grating to carry loads and maintain the same level over many years of use. Whenever rolling wheel loads are to be used over the grating, we recommend that the grating be load banded to add lateral strength. Serrations are available on bars up to $\frac{3}{8}$ " thick to provide additional traction for rolling loads.

Standard heavy-duty bar grating is resistance-welded for durability, strength and safety using an automated electric/hydraulic welding process. High temperatures, combined with high pressure fuse the bearing bars and cross bars together to form a permanent joint.

Heavy-Duty



Wide Mesh



Panel widths shown are out-to-out of bearing bars

Bars	HEAVY DUTY 19 SPACE (1 $\frac{3}{16}$ " ctrs)		WIDE MESH 38 SPACE (2 $\frac{3}{8}$ " ctrs)	
	1/4"	3/8"	1/4"	3/8"
2	1 $\frac{7}{16}$	1 $\frac{9}{16}$	2 $\frac{5}{8}$	2 $\frac{3}{4}$
3	2 $\frac{5}{8}$	2 $\frac{3}{4}$	5	5 $\frac{1}{8}$
4	3 $\frac{13}{16}$	3 $\frac{15}{16}$	7 $\frac{3}{8}$	7 $\frac{1}{2}$
5	5	5 $\frac{1}{8}$	9 $\frac{3}{4}$	9 $\frac{7}{8}$
6	6 $\frac{3}{16}$	6 $\frac{5}{16}$	12 $\frac{1}{8}$	12 $\frac{1}{4}$
7	7 $\frac{3}{8}$	7 $\frac{1}{2}$	14 $\frac{1}{2}$	14 $\frac{5}{8}$
8	8 $\frac{9}{16}$	8 $\frac{11}{16}$	16 $\frac{7}{8}$	17
9	9 $\frac{3}{4}$	9 $\frac{7}{8}$	19 $\frac{1}{4}$	19 $\frac{3}{8}$
10	10 $\frac{15}{16}$	11 $\frac{1}{16}$	21 $\frac{5}{8}$	21 $\frac{3}{4}$
11	12 $\frac{1}{8}$	12 $\frac{1}{4}$	24	24 $\frac{1}{8}$
12	13 $\frac{5}{16}$	13 $\frac{7}{16}$	26 $\frac{3}{8}$	
13	14 $\frac{1}{2}$	14 $\frac{5}{8}$	28 $\frac{3}{4}$	
14	15 $\frac{11}{16}$	15 $\frac{13}{16}$	31 $\frac{1}{8}$	
15	16 $\frac{7}{8}$	17	33 $\frac{1}{2}$	
16	18 $\frac{1}{16}$	18 $\frac{3}{16}$	35 $\frac{7}{8}$	
17	19 $\frac{1}{4}$	19 $\frac{3}{8}$		
18	20 $\frac{7}{16}$	20 $\frac{9}{16}$		
19	21 $\frac{5}{8}$	21 $\frac{3}{4}$		
20	22 $\frac{13}{16}$	22 $\frac{15}{16}$		
21	24	24 $\frac{1}{8}$		
22	25 $\frac{3}{16}$			
23	26 $\frac{3}{8}$			
24	27 $\frac{9}{16}$			
25	28 $\frac{3}{4}$			
26	29 $\frac{15}{16}$			
27	31 $\frac{1}{8}$			
28	32 $\frac{5}{16}$			
29	33 $\frac{1}{2}$			
30	34 $\frac{11}{16}$			
31	35 $\frac{7}{8}$			

DESIGN CRITERIA

The load and deflection tables on the following pages have been prepared to provide the designer with a convenient reference for the load carrying capabilities of typical heavy duty grating.

Static Loads

Uniform loads and concentrated loads per foot of

grating width are given on six inch increments for simple spans ranging from one foot to eight feet. Metric tables provide loads per meter of grating width in 152.4 millimeters increments for spans from 304.8 millimeters to 2438.4 millimeters. The values in these load tables are based on allowable stresses for static loads.

Determine M:	$M = \frac{FS}{12}$
Substituting for M, solve for L:	(i) $a > L$ $M = \frac{PL^2}{8ab}$ (ii) $a > L$ $M = \frac{P(.25L - .125a)}{b}$
Check D*:	$D = \frac{P_1[(2L^3) - (a^2L) + (a^3/4)]}{96EI}$

*Deflection should be limited to 1/400 span.

M = Bending Moment

S = Section Modulus - in³/ft of grating width

I = Moment of Inertia - in⁴/ft of grating width

E = Modulus of Elasticity

F = Allowable Bending Stress

L = Simple Clear Span - inches

D = Deflection - inches

a = Partial Load Contact Parallel to Span - inches

s = Center-to-Center Spacing Between Bars - inches

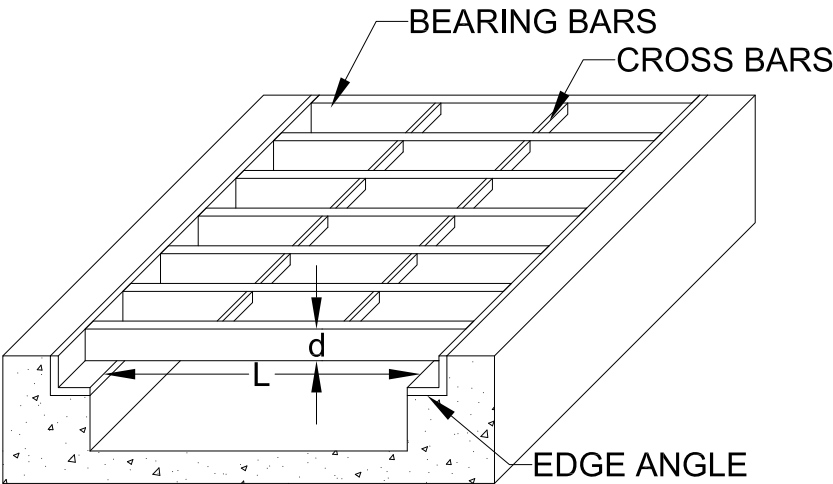
b = Partial Load Contact Dimension at 90° to span - inches

b = a + (2s)

P = Total Wheel of Partial Load Including Impact - lbs.

P₁ = P per bearing bar

P₁ = P x (s/b)



LOAD TABLES | HEAVY DUTY, IMPERIAL

VEHICULAR LOADS

Vehicular load tables are designed in accordance with the 16th Edition of the American Association of State Highway and Transportation Officials (AASHTO) for H-10 through H-25 loads with deflection limited to the lesser of .125 inches (3.175 mm) or L/400 to a maximum simple span of 8'- 0" (2,438mm). Automobile and forklift

loads are similarly evaluated with loads calculated and distributed in accordance with the criteria shown below. If the load conditions of your application are not adequately addressed in the criteria presented, please contact Vulcraft for assistance in determining the proper grating for your application.

Vehicular Load Table Criteria	H-25 ⁵ 	H-20/ HL-93 ⁶ 	H-15 	H-10 ² 	Passenger Vehicles 	5 Ton Forklifts ³ 	3 Ton Forklifts ³ 	1 Ton Forklifts ³ 
Truck/ Vehicle Weight (kN)					28	64	44	19
Load Capacity (kN)					16	44	27	9
Axle Load (kN)	178	142	107	71				
Impact Factor	30%	30%	30%	30%	30%	30%	30%	30%
Total Load (kN)	231	185	139	93	57	141	91	36
% of Load on Drive Axel					60%	85%	85%	85%
Wheel Load (kN)	116	93	69	46	17	60	39	15
A-Length of distribution perpendicular to axle or parallel to main bars (mm)	635	508	381	254	229	279	178	102
C-Width of distribution parallel to axle or perpendicular to main bars (mm)	635	508	381	254	229	279	178	102

Notes:

1. For continuous spans, use continuity factor = .80.
2. This distribution results in larger grating sizes for lighter trucks on shorter spans.
3. The fork lift wheel loads and load distribution patterns depicted above, generally, and only partially, represent the broad range of rubber-tired lift trucks available. For those applications falling outside of these examples, please contact Vulcraft.
4. Wheeled vehicles with urethane tires should NEVER be used in conjunction with open grid bar grating.
5. HS20 is the same as H20 and HS15 is the same as H15. The "S" stands for semi-trailer.
6. The "HL-93" notation shown with "H-20" represents AASHTO's truck loading standard post-1993. Since, 1993, H-10, H-20, etc. have been retired in lieu of the "HL-93" loading which represents all trucks.

VEHICULAR LOADS

Note: All loads based on Smooth surface

19HW4

Bearing Bar Size	S _x in ³ /ft.	I _x in ⁴ /ft.	Unit Wt. lb/ft ²	Maximum Clear Span Between Supports (in)							
				H-25	H-20 / HL-93	H-15	H-10	Auto Traffic	5-Ton Forklift	3-Ton Forklift	1-Ton Forklift
1 x ¼	0.421	0.211	9.92	15	13	11	8	13	8	7	7
1-¼ x ¼	0.658	0.411	12.06	17	15	12	10	17	10	8	10
1-½ x ¼	0.947	0.711	14.21	19	17	15	13	23	12	10	14
1-½ x ⅜	1.421	1.066	20.83	22	20	18	16	32*	15	14	20
2 x ¼	1.684	1.684	18.51	24	22	20	18	38*	17	16	23
2-½ x ¼	2.632	3.289	22.80	31	29	27	26	47*	23	22	35
3 x ¼	3.789	5.684	27.10	39	37	36	35	56*	31	31	48*
3 x ⅜	5.684	8.526	40.70	47*	47*	47*	48*	64*	43	44	55*
4 x ¼	6.737	13.474	35.69	55*	54*	55*	55*	75*	50	52	64*
4 x ⅜	10.105	20.211	53.58	62*	62*	62*	63*	85*	60*	61*	73*

* Indicates that value was controlled by $L/400 \leq 1/8"$ deflection limit.

Note: All loads based on Smooth surface

38HW4

Bearing Bar Size	S _x in ³ /ft.	I _x in ⁴ /ft.	Unit Wt. lb/ft ²	Maximum Clear Span Between Supports (in)							
				H-25	H-20 / HL-93	H-15	H-10	Auto Traffic	5-Ton Forklift	3-Ton Forklift	1-Ton Forklift
1 x ¼	0.211	0.105	5.62	14	12	9	7	9	7	5	6
1-¼ x ¼	0.329	0.206	6.70	15	13	10	8	12	8	6	8
1-½ x ¼	0.474	0.355	7.77	16	14	11	9	16	9	8	10
1-½ x ⅜	0.711	0.533	11.17	18	16	13	12	21	11	10	14
2 x ¼	0.842	0.842	9.92	19	17	15	13	24	12	11	16
2-½ x ¼	1.316	1.645	12.06	23	20	19	17	36	16	15	24
3 x ¼	1.895	2.842	14.21	27	25	23	23	48*	20	21	34
3 x ⅜	2.842	4.263	21.37	34	33	31	32	54*	28	29	48*
4 x ¼	3.368	6.737	18.51	38	37	36	37	63*	32	34	57*
4 x ⅜	5.053	10.105	27.82	51	50	50	53	72*	45	49	65*

* Indicates that value was controlled by $L/400 \leq 1/8"$ deflection limit.



LOAD TABLES | HEAVY DUTY, IMPERIAL

VEHICULAR LOADS

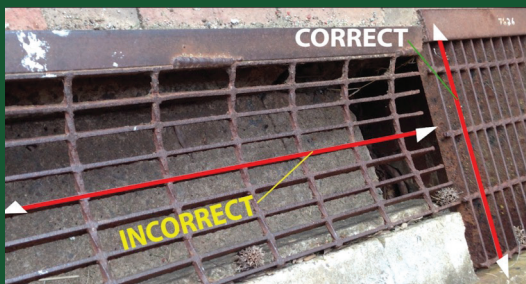
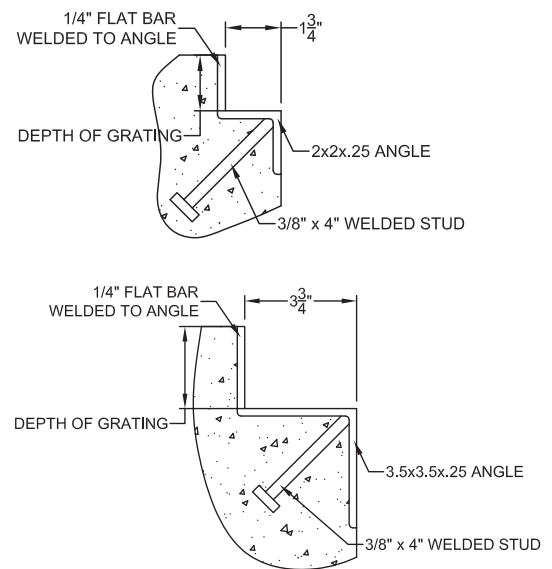
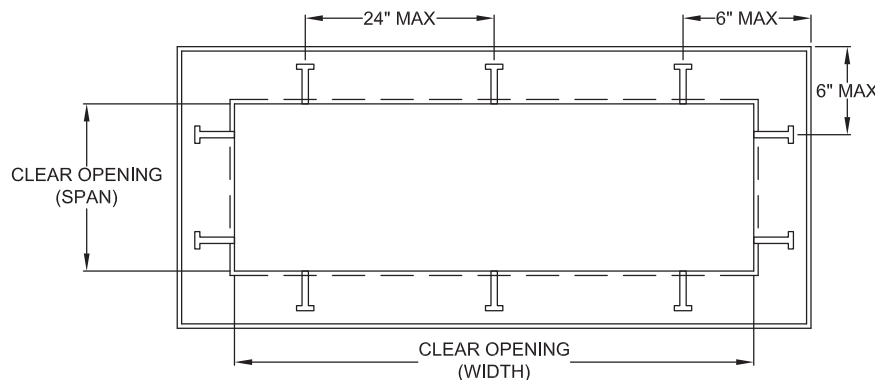
Grating Frames

Vulcraft's structural fabrication services can be leveraged to further aid you in getting a superior solution for covering your concrete opening by also obtaining an Embed Frame with your grating. A steel embed frame can improve the quality and lifespan of your project by:

- Shielding the concrete at the opening edges from cracking and chipping,
- Providing an edge for the opening when forming the concrete pour,
- Providing uniform elevation for the opening to minimize potential for uneven surfaces,

- And providing a smooth and uniform bearing surface for the grating, allowing for easier attachment and better performance over its lifetime.

Frames are available in normal rectangular configurations only and will be supplied as a fully-assembled, four-sided unit in sizes up to those that can safely be transported via normal flatbed carriers. Sizes or configurations other than this should be discussed with Vulcraft. Embed frames can be supplied mill finished, painted, or hot-dipped galvanized. To order, please include a detail similar to the following with the Clear Opening Width and Span clearly defined as well as the desired quantities and finish.



Cross Bars are not load bearing

The bearing bars are the bars that carry the load and the cross bars hold the bearing bars in place creating the shape of the panel. In order to function properly, make sure that both ends of each bearing bar is supported by the load bearing structure and avoid the situation depicted in the picture to the left.

tip

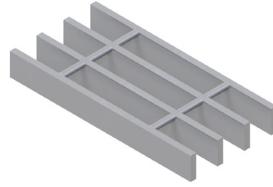
NOTES

LOAD TABLES - HD IMPERIAL

LOAD TABLES | HEAVY DUTY, IMPERIAL

LOAD TABLES - HD

Grating Type: 19HW4
Design Code: NAAMM MBG 534
Material: ASTM A36
Surface: Smooth



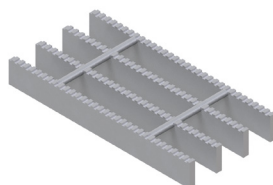
U = Safe Uniform Load (lbs/ft²)
D_u = Deflection Due to Safe Uniform Load (in)
C = Safe Concentrated Load (lbs/ft of grating width)
D_c = Deflection Due to Safe Concentrated Load (in)
Allowable Extreme Fiber Stress = 20 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)															Section Properties
				1' - 0"	1' - 6"	2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft
																			I _x (in ⁴)/ft
1" x ¼"	9.53	61	U	5,614	2,495	1,404	898	624	458	351	277	225	186					0.421	
			D _u	0.02	0.05	0.08	0.13	0.19	0.25	0.33	0.42	0.52	0.63						
			C	2,807	1,871	1,404	1,123	936	802	702	624	561	510						
			D _c	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50						
1 ¼" x ¼"	11.72	72	U	8,772	3,899	2,193	1,404	975	716	548	433	351	290	244					0.658
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50	0.60					
			C	4,386	2,924	2,193	1,754	1,462	1,253	1,096	975	877	797	731					0.411
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40	0.48					
1 ½" x ¼"	13.92	83	U	12,632	5,614	3,158	2,021	1,404	1,031	789	624	505	418	351	299	258			0.947
			D _u	0.01	0.03	0.06	0.09	0.12	0.17	0.22	0.28	0.34	0.42	0.50	0.58	0.68			
			C	6,316	4,211	3,158	2,526	2,105	1,805	1,579	1,404	1,263	1,148	1,053	972	902			0.711
			D _c	0.01	0.02	0.04	0.07	0.10	0.14	0.18	0.22	0.28	0.33	0.40	0.47	0.54			
1 ½" x ⅜"	20.78	92	U	18,947	8,421	4,737	3,032	2,105	1,547	1,184	936	758	626	526	448	387	337	296	1.421
			D _u	0.01	0.03	0.06	0.09	0.12	0.17	0.22	0.28	0.34	0.42	0.50	0.58	0.68	0.78	0.88	
			C	9,474	6,316	4,737	3,789	3,158	2,707	2,368	2,105	1,895	1,722	1,579	1,457	1,353	1,263	1,184	1.066
			D _c	0.01	0.02	0.04	0.07	0.10	0.14	0.18	0.22	0.28	0.33	0.40	0.47	0.54	0.62	0.71	
2" x ¼"	18.31	103	U	22,456	9,981	5,614	3,593	2,495	1,833	1,404	1,109	898	742	624	532	458	399	351	1.684
			D _u	0.01	0.02	0.04	0.06	0.09	0.13	0.17	0.21	0.26	0.31	0.37	0.44	0.51	0.58	0.66	
			C	11,228	7,485	5,614	4,491	3,743	3,208	2,807	2,495	2,246	2,041	1,871	1,727	1,604	1,497	1,404	1.684
			D _c	0.01	0.02	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53	
2 ½" x ¼"	22.70	122	U	35,088	15,595	8,772	5,614	3,899	2,864	2,193	1,733	1,404	1,160	975	830	716	624	548	2.632
			D _u	0.01	0.02	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53	
			C	17,544	11,696	8,772	7,018	5,848	5,013	4,386	3,899	3,509	3,190	2,924	2,699	2,506	2,339	2,193	3.289
			D _c	0.01	0.01	0.03	0.04	0.06	0.08	0.11	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.42	
3" x ¼"	27.10	140	U	50,526	22,456	12,632	8,084	5,614	4,125	3,158	2,495	2,021	1,670	1,404	1,196	1,031	898	789	3.789
			D _u	0.01	0.02	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.25	0.29	0.34	0.39	0.44	
			C	25,263	16,842	12,632	10,105	8,421	7,218	6,316	5,614	5,053	4,593	4,211	3,887	3,609	3,368	3,158	5.684
			D _c	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35	
3" x ⅜"	40.99	154	U	75,789	33,684	18,947	12,126	8,421	6,187	4,737	3,743	3,032	2,505	2,105	1,794	1,547	1,347	1,184	5.684
			D _u	0.01	0.02	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.25	0.29	0.34	0.39	0.44	
			C	37,895	25,263	18,947	15,158	12,632	10,827	9,474	8,421	7,579	6,890	6,316	5,830	5,414	5,053	4,737	8.526
			D _c	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35	
3 ½" x ¼"	31.49	157	U	68,772	30,565	17,193	11,004	7,641	5,614	4,298	3,396	2,751	2,273	1,910	1,628	1,404	1,223	1,075	5.158
			D _u	0.01	0.01	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38	
			C	34,386	22,924	17,193	13,754	11,462	9,825	8,596	7,641	6,877	6,252	5,731	5,290	4,912	4,585	4,298	9.026
			D _c	0.00	0.01	0.02	0.03	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.20	0.23	0.27	0.30	
3 ½" x ⅜"	47.57	173	U	103,158	45,848	25,789	16,505	11,462	8,421	6,447	5,094	4,126	3,410	2,865	2,442	2,105	1,834	1,612	7.737
			D _u	0.01	0.01	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38	
			C	51,579	34,386	25,789	20,632	17,193	14,737	12,895	11,462	10,316	9,378	8,596	7,935	7,368	6,877	6,447	13.539
			D _c	0.00	0.01	0.02	0.03	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.20	0.23	0.27	0.30	
4" x¼"	35.88	173	U	89,825	39,922	22,456	14,372	9,981	7,333	5,614	4,436	3,593	2,969	2,495	2,126	1,833	1,597	1,404	6.737
			D _u	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.33	
			C	44,912	29,942	22,456	17,965	14,971	12,832	11,228	9,981	8,982	8,166	7,485	6,910	6,416	5,988	5,614	13.474
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.13	0.15	0.17	0.20	0.23	0.26	
4" x ⅜"	54.16	192	U	134,737	59,883	33,684	21,558	14,971	10,999	8,421	6,654	5,389	4,454	3,743	3,189	2,750	2,395	2,105	10.105
			D _u	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.33	
			C	67,368	44,912	33,684	26,947	22,456	19,248	16,842	14,971	13,474	12,249	11,228	10,364	9,624	8,982	8,421	20.211
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.13	0.15	0.17	0.20	0.23	0.26	

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES - HD

Grating Type: 19HW4
Design Code: NAAMM MBG 534
Material: ASTM A36
Surface: Serrated



U = Safe Uniform Load (lbs/ft²)
D_u = Deflection Due to Safe Uniform Load (in)
C = Safe Concentrated Load (lbs/ft of grating width)
D_c = Deflection Due to Safe Concentrated Load (in)
Allowable Extreme Fiber Stress = 20 ksi

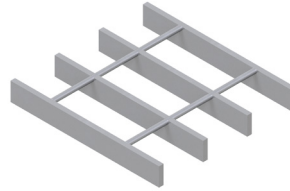
Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)																Section Properties									
				1' - 0"	1' - 6"	2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³ /ft)										
																				I _x (in ⁴ /ft)									
1" x ¼"	9.53	49	U	3,158	1,404	789	505	351	258	197											0.237								
			D _u	0.03	0.06	0.11	0.17	0.25	0.34	0.44																			
			C	1,579	1,053	789	632	526	451	395																			
			D _c	0.02	0.05	0.09	0.14	0.20	0.27	0.35											0.089								
1 ¼" x ¼"	11.72	61	U	5,614	2,495	1,404	898	624	458	351	277	225											0.421						
			D _u	0.02	0.05	0.08	0.13	0.19	0.25	0.33	0.42	0.52																	
			C	2,807	1,871	1,404	1,123	936	802	702	624	561											0.211						
			D _c	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41																	
1 ½" x ¼"	13.92	72	U	8,772	3,899	2,193	1,404	975	716	548	433	351	290											0.658					
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50																
			C	4,386	2,924	2,193	1,754	1,462	1,253	1,096	975	877	797											0.411					
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40																
1 ½" x ⅜"	20.78	80	U	13,158	5,848	3,289	2,105	1,462	1,074	822	650	526	435	365	311											0.987			
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50	0.60	0.70														
			C	6,579	4,386	3,289	2,632	2,193	1,880	1,645	1,462	1,316	1,196	1,096	1,012											0.617			
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40	0.48	0.56														
2" x ¼"	18.31	93	U	17,193	7,641	4,298	2,751	1,910	1,404	1,075	849	688	568	478	407	351	306											1.289	
			D _u	0.01	0.03	0.05	0.07	0.11	0.14	0.19	0.24	0.30	0.36	0.43	0.50	0.58	0.67												
			C	8,596	5,731	4,298	3,439	2,865	2,456	2,149	1,910	1,719	1,563	1,433	1,323	1,228	1,146											1.128	
			D _c	0.01	0.02	0.04	0.06	0.09	0.12	0.15	0.19	0.24	0.29	0.34	0.40	0.46	0.53												
2 ½" x ¼"	22.70	113	U	28,421	12,632	7,105	4,547	3,158	2,320	1,776	1,404	1,137	940	789	673	580	505	444											2.132
			D _u	0.01	0.02	0.04	0.06	0.08	0.11	0.15	0.19	0.23	0.28	0.33	0.39	0.45	0.52	0.59											
			C	14,211	9,474	7,105	5,684	4,737	4,060	3,553	3,158	2,842	2,584	2,368	2,186	2,030	1,895	1,776											2.398
			D _c	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.18	0.22	0.26	0.31	0.36	0.41	0.47											
3" x ¼"	27.10	131	U	42,456	18,869	10,614	6,793	4,717	3,466	2,654	2,097	1,698	1,404	1,179	1,005	866	755	663											3.184
			D _u	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42	0.48											
			C	21,228	14,152	10,614	8,491	7,076	6,065	5,307	4,717	4,246	3,860	3,538	3,266	3,033	2,830	2,654											4.378
			D _c	0.01	0.01	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.22	0.25	0.29	0.34	0.39											
3" x ⅜"	40.99	145	U	63,684	28,304	15,921	10,189	7,076	5,199	3,980	3,145	2,547	2,105	1,769	1,507	1,300	1,132	995											4.776
			D _u	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42	0.48											
			C	31,842	21,228	15,921	12,737	10,614	9,098	7,961	7,076	6,368	5,789	5,307	4,899	4,549	4,246	3,980											6.567
			D _c	0.01	0.01	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.22	0.25	0.29	0.34	0.39											
3 ½" x ¼"	31.49	148	U	59,298	26,355	14,825	9,488	6,589	4,841	3,706	2,928	2,372	1,960	1,647	1,404	1,210	1,054	927											4.447
			D _u	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41											
			C	29,649	19,766	14,825	11,860	9,883	8,471	7,412	6,589	5,930	5,391	4,942	4,561	4,236	3,953	3,706											7.227
			D _c	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.22	0.25	0.29	0.33											
3 ½" x ⅜"	47.57	164	U	88,947	39,532	22,237	14,232	9,883	7,261	5,559	4,392	3,558	2,940	2,471	2,105	1,815	1,581	1,390											6.671
			D _u	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41											
			C	44,474	29,649	22,237	17,789	14,825	12,707	11,118	9,883	8,895	8,086	7,412	6,842	6,353	5,930	5,559											10.840
			D _c	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.22	0.25	0.29	0.33											
4" x¼"	35.88	165	U	78,947	35,088	19,737	12,632	8,772	6,445	4,934	3,899	3,158	2,610	2,193	1,869	1,611	1,404	1,234											5.921
			D _u	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35											
			C	39,474	26,316	19,737	15,789	13,158	11,278	9,868	8,772	7,895	7,177	6,579	6,073	5,639	5,263	4,934											11.102
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.11	0.13	0.16	0.19	0.22	0.25	0.28											
4" x ⅜"	54.16	183	U	118,421	52,632	29,605	18,947	13,158	9,667	7,401	5,848	4,737	3,915	3,289	2,803	2,417	2,105	1,850											8.882
			D _u	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35											
			C	59,211	39,474	29,605	23,684	19,737	16,917	14,803	13,158	11,842	10,766	9,868	9,109	8,459	7,895	7,401											16.653
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.11	0.13	0.16	0.19	0.22	0.25	0.28											

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | HEAVY DUTY, IMPERIAL

LOAD TABLES - WIDE MESH

Grating Type: **38HW4**
 Design Code: **NAAMM MBG 534**
 Material: **ASTM A36**
 Surface: **Smooth**



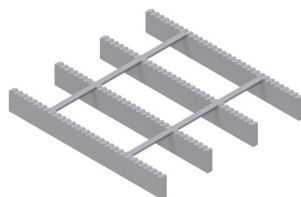
U = Safe Uniform Load (lbs/ft²)
 D_u = Deflection Due to Safe Uniform Load (in)
 C = Safe Concentrated Load (lbs/ft of grating width)
 D_c = Deflection Due to Safe Concentrated Load (in)
 Allowable Extreme Fiber Stress = 20 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft - in)																Section Properties	
				1' - 0"	1' - 6"	2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³)/ft	I _x (in ⁴)/ft	
1" x ¼"	5.55	51	U	2,807	1,248	702	449	312	229	175	139 0.42 312 0.34									0.211	
			D _u	0.02	0.05	0.08	0.13	0.19	0.25	0.33											
			C	1,404	936	702	561	468	401	351											
			D _c	0.02	0.04	0.07	0.10	0.15	0.20	0.26											
1 ¼" x ¼"	6.68	61	U	4,386	1,949	1,096	702	487	358	274	217	175	145 0.50 399 0.40						0.329		
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41									
			C	2,193	1,462	1,096	877	731	627	548	487	439									
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33									
1 ½" x ¼"	7.82	70	U	6,316	2,807	1,579	1,011	702	516	395	312	253	209	175 0.50 526 0.40					0.474		
			D _u	0.01	0.03	0.06	0.09	0.12	0.17	0.22	0.28	0.34	0.42								
			C	3,158	2,105	1,579	1,263	1,053	902	789	702	632	574								
			D _c	0.01	0.02	0.04	0.07	0.10	0.14	0.18	0.22	0.28	0.33								
1 ½" x ⅜"	11.22	77	U	9,474	4,211	2,368	1,516	1,053	773	592	468	379	313	263	224 0.58 729 0.47					0.711	
			D _u	0.01	0.03	0.06	0.09	0.12	0.17	0.22	0.28	0.34	0.42	0.50							
			C	4,737	3,158	2,368	1,895	1,579	1,353	1,184	1,053	947	861	789							
			D _c	0.01	0.02	0.04	0.07	0.10	0.14	0.18	0.22	0.28	0.33	0.40							
2" x ¼"	10.08	87	U	11,228	4,990	2,807	1,796	1,248	917	702	554	449	371	312	266	229	200 0.58 749 0.47			0.842	
			D _u	0.01	0.02	0.04	0.06	0.09	0.13	0.17	0.21	0.26	0.31	0.37	0.44	0.51					
			C	5,614	3,743	2,807	2,246	1,871	1,604	1,404	1,248	1,123	1,021	936	864	802					
			D _c	0.01	0.02	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41					
2 ½" x ¼"	12.35	102	U	17,544	7,797	4,386	2,807	1,949	1,432	1,096	866	702	580	487	415	358	312	274	1.316		
			D _u	0.01	0.02	0.03	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53			
			C	8,772	5,848	4,386	3,509	2,924	2,506	2,193	1,949	1,754	1,595	1,462	1,350	1,253	1,170	1,096			
			D _c	0.01	0.01	0.03	0.04	0.06	0.08	0.11	0.13	0.17	0.20	0.24	0.28	0.32	0.37	0.42			
3" x ¼"	14.62	117	U	25,263	11,228	6,316	4,042	2,807	2,062	1,579	1,248	1,011	835	702	598	516	449	395	1.895		
			D _u	0.01	0.02	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.25	0.29	0.34	0.39	0.44			
			C	12,632	8,421	6,316	5,053	4,211	3,609	3,158	2,807	2,526	2,297	2,105	1,943	1,805	1,684	1,579			
			D _c	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35			
3" x ⅜"	21.86	130	U	37,895	16,842	9,474	6,063	4,211	3,093	2,368	1,871	1,516	1,253	1,053	897	773	674	592	2.842		
			D _u	0.01	0.02	0.03	0.04	0.06	0.08	0.11	0.14	0.17	0.21	0.25	0.29	0.34	0.39	0.44			
			C	18,947	12,632	9,474	7,579	6,316	5,414	4,737	4,211	3,789	3,445	3,158	2,915	2,707	2,526	2,368			
			D _c	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35			
3 ½" x ¼"	16.88	132	U	34,386	15,283	8,596	5,502	3,821	2,807	2,149	1,698	1,375	1,137	955	814	702	611	537	2.579		
			D _u	0.01	0.01	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38			
			C	17,193	11,462	8,596	6,877	5,731	4,912	4,298	3,821	3,439	3,126	2,865	2,645	2,456	2,292	2,149			
			D _c	0.00	0.01	0.02	0.03	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.20	0.23	0.27	0.30			
3 ½" x ⅜"	25.26	146	U	51,579	22,924	12,895	8,253	5,731	4,211	3,224	2,547	2,063	1,705	1,433	1,221	1,053	917	806	3.868		
			D _u	0.01	0.01	0.02	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38			
			C	25,789	17,193	12,895	10,316	8,596	7,368	6,447	5,731	5,158	4,689	4,298	3,968	3,684	3,439	3,224			
			D _c	0.00	0.01	0.02	0.03	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.20	0.23	0.27	0.30			
4" x¼"	19.15	146	U	44,912	19,961	11,228	7,186	4,990	3,666	2,807	2,218	1,796	1,485	1,248	1,063	917	798	702	3.368		
			D _u	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.33			
			C	22,456	14,971	11,228	8,982	7,485	6,416	5,614	4,990	4,491	4,083	3,743	3,455	3,208	2,994	2,807			
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.13	0.15	0.17	0.20	0.23	0.26			
4" x ⅜"	28.66	161	U	67,368	29,942	16,842	10,779	7,485	5,499	4,211	3,327	2,695	2,227	1,871	1,595	1,375	1,198	1,053	5.053		
			D _u	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.33			
			C	33,684	22,456	16,842	13,474	11,228	9,624	8,421	7,485	6,737	6,124	5,614	5,182	4,812	4,491	4,211			
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.13	0.15	0.17	0.20	0.23	0.26			

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES - WIDE MESH

Grating Type: 38HW4
Design Code: NAAMM MBG 534
Material: ASTM A36
Surface: Serrated



U = Safe Uniform Load (lbs/ft²)
D_u = Deflection Due to Safe Uniform Load (in)
C = Safe Concentrated Load (lbs/ft of grating width)
D_c = Deflection Due to Safe Concentrated Load (in)
Allowable Extreme Fiber Stress = 20 ksi

Bearing Bar Size (inches)	Approx. Weight (lbs/ft ²)	Ped. Span (inches)	Load / Deflection	Span (ft -in)														Section Properties		
				1' - 0"	1' - 6"	2' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	4' - 6"	5' - 0"	5' - 6"	6' - 0"	6' - 6"	7' - 0"	7' - 6"	8' - 0"	S _x (in ³ /ft I _x (in ⁴ /ft	
1" x ¼"	5.55	42	U	1,579	702	395	253	175											0.118	
			D _u	0.03	0.06	0.11	0.17	0.25	0.34											
			C	789	526	395	316	263	226											
			D _c	0.02	0.05	0.09	0.14	0.20	0.27										0.044	
1 ¼" x ¼"	6.68	51	U	2,807	1,248	702	449	312	229	175	139								0.211	
			D _u	0.02	0.05	0.08	0.13	0.19	0.25	0.33	0.42									
			C	1,404	936	702	561	468	401	351	312									
			D _c	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34								0.105	
1 ½" x ¼"	7.82	61	U	4,386	1,949	1,096	702	487	358	274	217	175	145						0.329	
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50							
			C	2,193	1,462	1,096	877	731	627	548	487	439	399							
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40						0.206	
1 ½" x ⅜"	11.22	67	U	6,579	2,924	1,645	1,053	731	537	411	325	263	217	183				0.493		
			D _u	0.02	0.04	0.07	0.10	0.15	0.20	0.26	0.34	0.41	0.50	0.60						
			C	3,289	2,193	1,645	1,316	1,096	940	822	731	658	598	548						
			D _c	0.01	0.03	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40	0.48				0.308		
2" x ¼"	10.08	78	U	8,596	3,821	2,149	1,375	955	702	537	425	344	284	239	203				0.645	
			D _u	0.01	0.03	0.05	0.07	0.11	0.14	0.19	0.24	0.30	0.36	0.43	0.50					
			C	4,298	2,865	2,149	1,719	1,433	1,228	1,075	955	860	781	716	661					
			D _c	0.01	0.02	0.04	0.06	0.09	0.12	0.15	0.19	0.24	0.29	0.34	0.40				0.564	
2 ½" x ¼"	12.35	95	U	14,211	6,316	3,553	2,274	1,579	1,160	888	702	568	470	395	336	290	253	222	1.066	
			D _u	0.01	0.02	0.04	0.06	0.08	0.11	0.15	0.19	0.23	0.28	0.33	0.39	0.45	0.52	0.59		
			C	7,105	4,737	3,553	2,842	2,368	2,030	1,776	1,579	1,421	1,292	1,184	1,093	1,015	947	888		
			D _c	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.18	0.22	0.26	0.31	0.36	0.41	0.47		1.199
3" x ¼"	14.62	110	U	21,228	9,435	5,307	3,396	2,359	1,733	1,327	1,048	849	702	590	502	433	377	332	1.592	
			D _u	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42	0.48		
			C	10,614	7,076	5,307	4,246	3,538	3,033	2,654	2,359	2,123	1,930	1,769	1,633	1,516	1,415	1,327		
			D _c	0.01	0.01	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.22	0.25	0.29	0.34	0.39	2.189	
3" x ⅜"	21.86	122	U	31,842	14,152	7,961	5,095	3,538	2,599	1,990	1,572	1,274	1,053	885	754	650	566	498	2.388	
			D _u	0.01	0.02	0.03	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42	0.48		
			C	15,921	10,614	7,961	6,368	5,307	4,549	3,980	3,538	3,184	2,895	2,654	2,449	2,274	2,123	1,990		
			D _c	0.01	0.01	0.02	0.04	0.05	0.07	0.10	0.12	0.15	0.18	0.22	0.25	0.29	0.34	0.39	3.284	
3 ½" x ¼"	16.88	125	U	29,649	13,177	7,412	4,744	3,294	2,420	1,853	1,464	1,186	980	824	702	605	527	463	2.224	
			D _u	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41		
			C	14,825	9,883	7,412	5,930	4,942	4,236	3,706	3,294	2,965	2,695	2,471	2,281	2,118	1,977	1,853		
			D _c	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.22	0.25	0.29	0.33	3.613	
3 ½" x ⅜"	25.26	138	U	44,474	19,766	11,118	7,116	4,942	3,631	2,780	2,196	1,779	1,470	1,235	1,053	908	791	695	3.336	
			D _u	0.01	0.01	0.03	0.04	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41		
			C	22,237	14,825	11,118	8,895	7,412	6,353	5,559	4,942	4,447	4,043	3,706	3,421	3,177	2,965	2,780		
			D _c	0.01	0.01	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.22	0.25	0.29	0.33	5.420	
4" x ¼"	19.15	139	U	39,474	17,544	9,868	6,316	4,386	3,222	2,467	1,949	1,579	1,305	1,096	934	806	702	617	2.961	
			D _u	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35		
			C	19,737	13,158	9,868	7,895	6,579	5,639	4,934	4,386	3,947	3,589	3,289	3,036	2,820	2,632	2,467		
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.11	0.13	0.16	0.19	0.22	0.25	0.28	5.551	
4" x ⅜"	28.66	154	U	59,211	26,316	14,803	9,474	6,579	4,834	3,701	2,924	2,368	1,957	1,645	1,401	1,208	1,053	925	4.441	
			D _u	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.31	0.35		
			C	29,605	19,737	14,803	11,842	9,868	8,459	7,401	6,579	5,921	5,383	4,934	4,555	4,229	3,947	3,701		
			D _c	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.11	0.13	0.16	0.19	0.22	0.25	0.28	8.326	

Spans and loads in red exceed a deflection of 1/4" for uniform loads of 100 lbs./sq. ft. Experience has shown that 1/4" deflection is the maximum deflection to give pedestrian comfort, but can be exceeded for other types of loads at the discretion of the specifying professional.

LOAD TABLES | STAIR TREADS

Welded steel stair treads are the most widely used for their strength and ease of installation and are universally used in most industrial and commercial applications. Both can be ordered with a serrated surface for additional safety.

Rectangular bar stair treads provide a high strength and stiffness-to-weight ratio and are available with a serrated surface when additional safety is required.

All stair treads are custom fabricated to meet the size, width and length specifications of a particular job. In addition, end plates can be custom fabricated to meet special bolt hole size or location requirements.

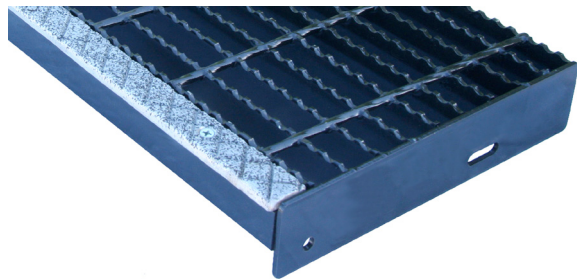
Steel nosings are available to add strength at the point of greatest impact and provide a definitive visible edge for extra safety. Choose our checkered plate nosing for normal use.



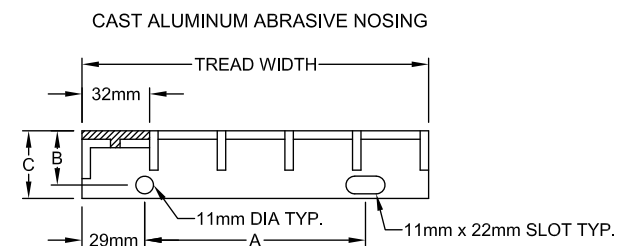
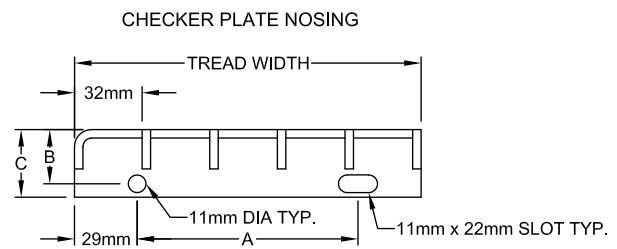
Stair Tread Types



Checker Plate Nosing (CP)



Cast Aluminum Abrasive Nosing (CAAN)



End Plate Dimensions		
Grating Depth	"B" Dimension	"C" Dimension
up to 32m	44mm	64mm
38mm	57mm	76mm

See Tread Width and Bolt Hole Spacing for "A" Dimension

End Plate Dimensions		
Grating Depth	"B" Dimension	"C" Dimension
up to 1-1/4"	1-3/4"	2-1/2"
1-1/2"	2-1/4"	3"

See Tread Width and Bolt Hole Spacing for "A" Dimension

Tread Width and Bolt Hole Spacing		
30W102		
No. of Bearing Bars and Nosing	Bearing Bar	**Bolt Hole Spacing “A”
	5mm	
Tread Width		
5	157mm	64mm
6	187mm	115mm
7	217mm	115mm
8	248mm	178mm
9	278mm	178mm
10	308mm	178mm

**See Drawing Above

Tread Width and Bolt Hole Spacing		
19W4		
No. of Bearing Bars and Nosing	Bearing Bar	**Bolt Hole Spacing "A"
	3/16"	
Tread Width		
5	6-3/16"	2-1/2"
6	7-3/8"	4-1/2"
7	8-9/16"	4-1/2"
8	9-3/4"	7"
9	10-15/16"	7"
10	12-1/8"	7"

**See Drawing Above

Maximum Tread Length (mm)		
Bar Size (mm)	Smooth	Serrated
	30W102	30W102
25 x 5	1041	863
32 x 5	1422	1270
38 x 5	1676	1600

Data Created Based on NAAMM 531-17:

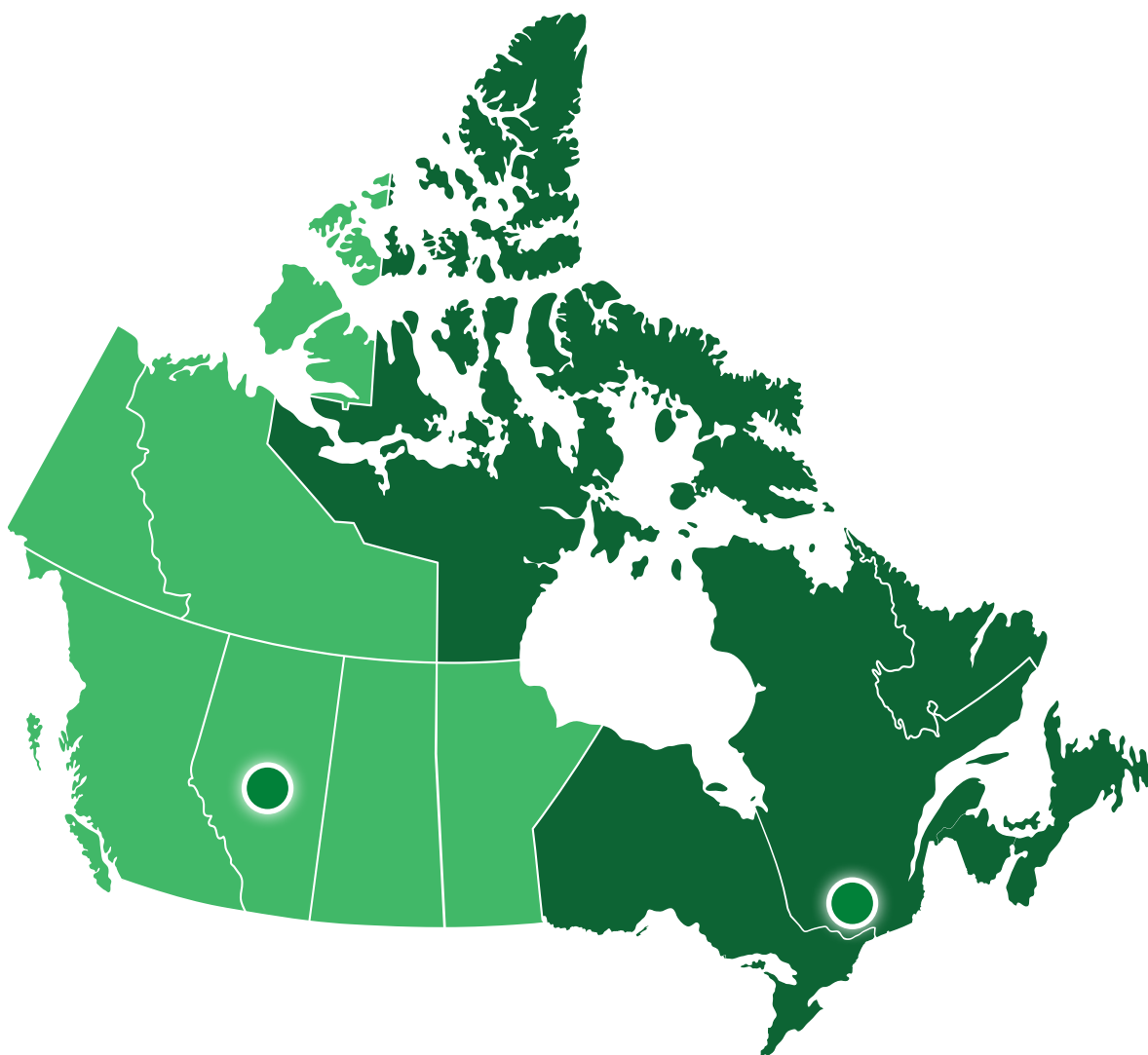
- 1.32kN point load at center, loading only first five bars, up to 1.7m.
- 1.32kN point loads at third-points, loading only first five bars, when > 1.7m.
- L/240 deflection limit on both.

Maximum Tread Length (in)		
Bar Size (in)	Smooth	Serrated
	19W4	19W4
1 x 3/16	41	34
1/4 x 3/16	56	50
1/2 x 3/16	66	63

Data Created Based on NAAMM 531-17:

- 300-lb point load at center, loading only first five bars, up to 5'-6".
- 300-lb point loads at third-points, loading only first five bars, when > 5'-6".
- L/240 deflection limit on both.

Vulcraft Grating Plant Locations



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