

HEAVY DUTY STEEL DESIGN CRITERIA






Design Criteria

The following pages show capacities on the basis of vehicular load distribution and concentrated loading per foot of grating width for a given span. Calculations for concentrated load are similar in format to those for Light Duty Steel grating shown on page 40, except $F = 20,000$ psi. Calculations for vehicular loadings are based on AASHTO Standard Specifications for Highway Bridges and utilize the following formulas:

- | | |
|---|---|
| M = Bending Moment | a = Partial Load Contact Parallel to Span - inches |
| S = Section Modulus - in ³ /ft of grating width | s = Center-to-Center Spacing Between Bearing Bars - in. |
| I = Moment of Inertia - in ⁴ /bar | b = Partial Load Contact Dimension at 90° to Span - in. |
| E = Modulus of Elasticity (29,000,000 psi) | b = a + (2s) |
| F = Allowable Bending Stress (20,000 psi) | P = Total Wheel or Partial Load Including Load Impact - lbs. |
| L = Simple Clear Span - inches | P₁ = P per bearing bar |
| D = Deflection - inches | P₁ = P x (s/b) |

Step 1. Determine M:	$M = \frac{FS}{12}$
Step 2. Substituting for M, solve for L:	(i) $a > L$ (ii) $a < L$ $M = \frac{PL^2}{8ab}$ $M = \frac{P(.25L - .125a)}{b}$
Step 3. Check D*:	$D = \frac{P_1[(2L^3) - (a^2L) + (a^3/4)]}{96EI}$

*Deflection should be limited to 1/400 span.

Maximum Traffic Conditions	Wheel Load (lbs.) (1/2 of Axle Load + 30% Impact)	Loading	Load Distribution**	
			a	b
Truck Traffic 32,000 Lb. Axle Load Dual Wheels 	20,800	H-20	20"	20" + (2s)
Truck Traffic 24,000 Lb. Axle Load Dual Wheels 	15,600	H-15	15"	15" + (2s)
10,000 Lb. Capacity Lift Truck 14,400 Lb. Vehicle 24,400 Lb. Total Load 85% Drive Axle Load (Rubber Tires) 	13,480	5 Ton	11"	11" + (2s)
6,000 Lb. Capacity Lift Truck 9,800 Lb. Vehicle 15,800 Lb. Total Load 85% Drive Axle Load (Rubber Tires) 	8,730	3 Ton	7"	7" + (2s)
2,000 Lb. Capacity Lift Truck 4,200 Lb. Vehicle 6,200 Lb. Total Load 85% Drive Axle Load (Rubber Tires) 	3,425	1 Ton	4"	4" + (2s)

- NOTES:**
- (1) For continuous spans, use continuity factor = .80.
 - (2) This distribution results in larger grating sizes for lighter trucks on shorter spans. Spans shown for H15/H20 reflect the more critical condition.
 - (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 the factory.
 - (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.

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