

BOLTS, NUTS, RODS, BANDS, WIRES, WIRE ROPE, CABLE, CHAINS, NON-METALLIC STRAPPING, BAND OR WIRE PROTECTORS, POINTS OF ATTACHMENT, SUBSTITUTIONS PERMISSIBLE, TURNBUCKLES, CLEAVISES/SHACKLES AND CONSTANT TENSIONING DEVICES:

Corresponding AAR Open Top Loading Rule 16

BAR, BOLTS, NUTS, RODS, AND WASHERS

Rods or bolts, having rolled threads of the same diameter as that of U.S. Standard cut threads, may be used. Bending of threaded portion of rods or bolts is prohibited.

When rods are used for tie-downs passing through large diameter holes in the lading, a plate or plates of sufficient strength to prevent bending must be placed between the lading and the nut of the rod.

When rods, etc., used to secure loads not covered in detailed figures are passed through car floor, a 4 in. x 4 in. x 18 in. hardwood cleat or 1/2 in. x 4 in. x 18 in. steel plate must be placed lengthwise of car under floor on wood, nailable steel floor and composite wood and steel flooring. Length of steel plate may be reduced to 1/2 in. x 4 in. x 6 in. on cars with floors constructed of steel plates. When rods, etc., pass through stake pocket, a 1/2 in. x 4 in. x 10 in. steel plate must be placed lengthwise of car under stake pocket.

The use of rods with open hook ends on load or car is prohibited.

Where bolts, with washers to prevent splitting, are specified for clamping pieces, they may be substituted with 1-1/4 in. tension bands, sealed in conformance with "Minimum Joint Strength - Pounds" shown in table of High- Tension Bands under Paragraph (j) of this rule.

To retain nuts in original position, three or more threads on rods or bolts must be nicked, chisel hacked, flattened or otherwise distorted immediately behind single or double nuts or nuts tack welded to rods to ensure that nuts will not back off. When less than three threads extend beyond nuts, there must be sufficient length for rods or bolts to be riveted over to prevent nuts from backing off. Not required when nut locks or lock nuts are used. Lock washers are not acceptable substitutes.

The bending of rods around stake pockets and then welding the overlapping portion to the main rod is prohibited.

Rods should be located so that they are not in contact with each other. When rods do contact each other, suitable means to prevent chafing or wear must be provided.

One splice is permitted for securement items 18 ft. or less in length, made from bars and/or rods. When necessary to increase length, one splice may be added for each additional 18 ft. or less in length.

When necessary to weld threaded rod to flat bar or rods for the purpose of securement or when necessary to splice the tie-down item to increase length, there must be sufficient overlap with continuous weld on both sides to equal the strength of the original securement item. The strength of the weld is to be based on a value of 600 lbs. per 1/16-inch fillet 1 inch long. All welding must be done by a qualified welder.

FLAT BAR AND PLATE DIMENSIONS AND BREAKING STRENGTH *					
Size (in.)	Minimum Breaking Strength (lb)	Size (in.)	Minimum Breaking Strength (lb)	Size (in.)	Minimum Breaking Strength (lb)
1/16 x 2	5,800	1/4 x 10	102,500	1/2 x 3	57,000
1/16 x 3 1/2	10,300	1/4 x 12	123,000	1/2 x 4	76,000
1/8 x 1	5,500	3/8 x 7/8	12,800	1/2 x 5	95,000
1/8 x 1 3/4	9,600	3/8 x 1 1/8	16,500	1/2 x 6	114,000
1/8 x 2 1/2	13,800	3/8 x 1 1/2	22,000	1/2 x 12	228,000
1/8 x 3 1/2	19,300	3/8 x 1 7/8	27,400	5/8 x 1	23,100
1/8 x 4 1/2	24,800	3/8 x 2	29,250	5/8 x 1 1/8	26,000
3/16 x 2	16,100	3/8 x 2 3/8	34,700	5/8 x 1 1/2	34,700
3/16 x 5	40,350	3/8 x 2 7/8	42,000	5/8 x 1 3/4	40,500
1/4 x 1/2	5,100	3/8 x 3	43,900	5/8 x 2	46,300
1/4 x 7/8	9,000	3/8 x 3 1/2	51,200	5/8 x 3	69,400
1/4 x 1 1/4	12,800	3/8 x 4	58,500	3/4 x 3/4	20,300
1/4 x 1 3/4	18,000	3/8 x 5	73,100	3/4 x 1	27,000
1/4 x 2 1/4	23,100	3/8 x 6	87,750	3/4 x 1 1/4	33,800
1/4 x 2 3/4	28,200	3/8 x 12	175,500	3/4 x 1 1/2	40,500
1/4 x 3	30,750	1/2 x 7/8	16,600	3/4 x 1 3/4	46,300
1/4 x 3 3/4	38,500	1/2 x 1 1/8	21,400	3/4 x 2	54,000
1/4 x 4	41,000	1/2 x 1 3/8	26,100	3/4 x 2 1/2	67,500
1/4 x 4 1/4	43,600	1/2 x 1 3/4	33,300	3/4 x 3	81,000
1/4 x 6	61,500	1/2 x 2	38,000	3/4 x 6	162,000
1/4 x 7	71,750	1/2 x 2 1/8	40,400	1 x 6	210,000
1/4 x 9	92,250	1/2 x 2 5/8	50,000	1 1/8 x 6	229,500

* When holes or slots exist in flat bar or plates, breaking strength must be based on sectional area of material measured across the hole or slot.

RODS AND BOLTS SIZE AND MINIMUM BREAKING STRENGTH	
Diameter (in.)	Minimum Breaking Strength (lb.)*
1/2	5,200
5/8	8,100
3/4	11,700
7/8	16,200
1	21,100
1 1/8	25,800
1 1/4	32,800
1 3/8	38,600
1 1/2	46,900
* At root of thread	