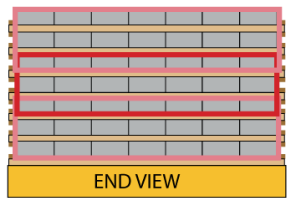
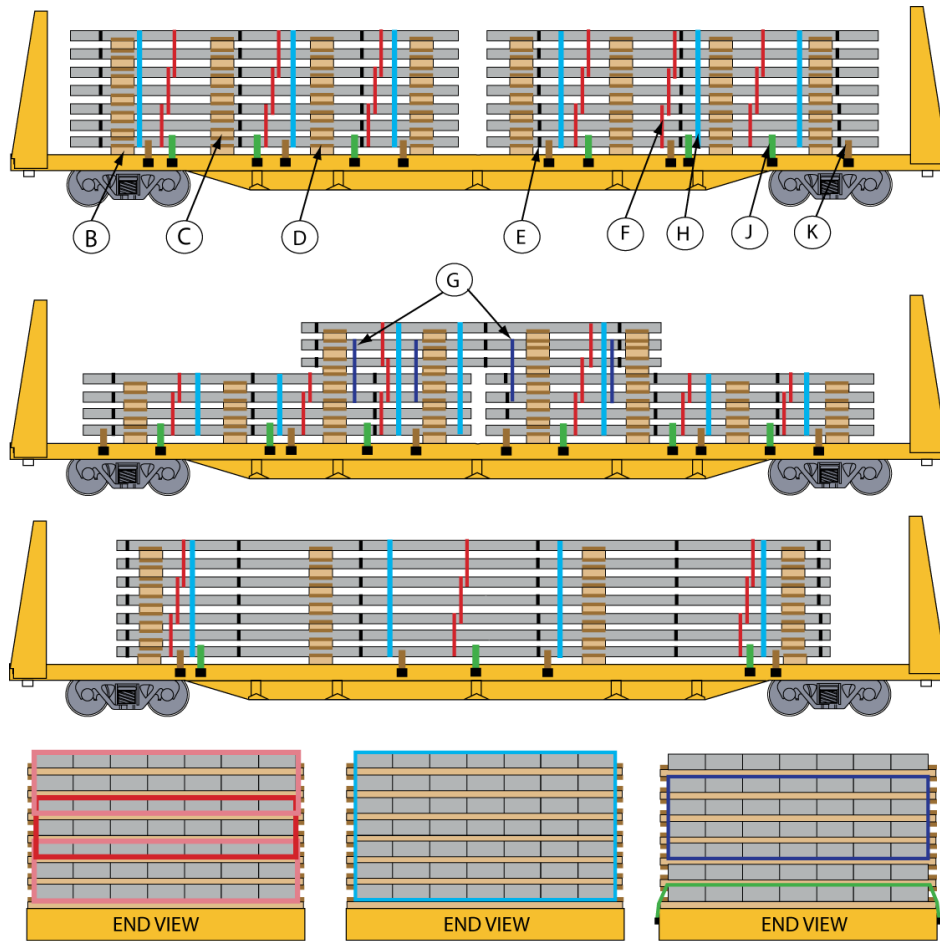


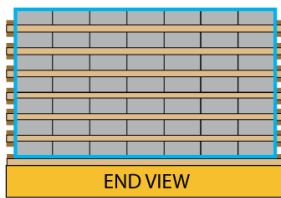
TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
OVER - BULKHEAD FLATCARS

RAC 12154A

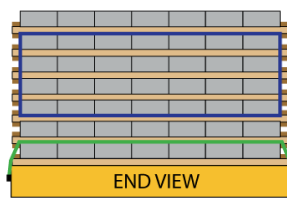
Revised 01-2024 AAR Ref: Fig. 154A



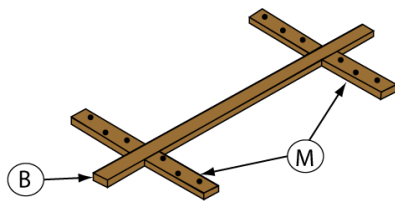
SKETCH 2 ITEM F



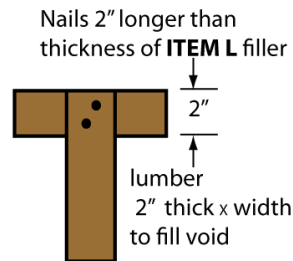
SKETCH 3 ITEM H



SKETCH 4 ITEM G /J



SKETCH 1

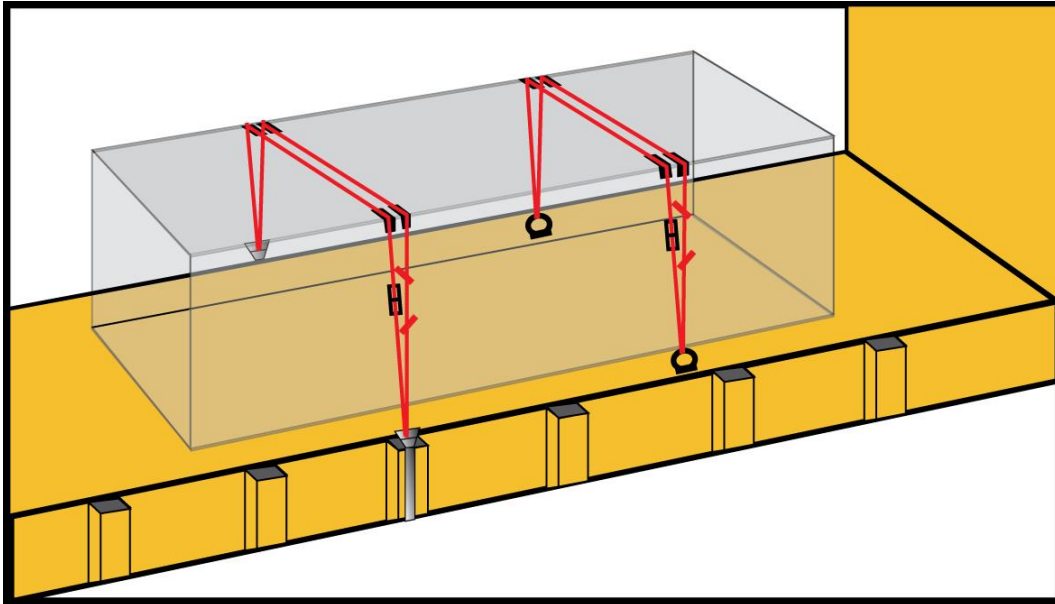


Sample filler blocking
SKETCH 5

**TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
OVER - BULKHEAD FLATCARS**

RAC 12154A (Continued)

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DOUBLE TIE-DOWN APPLICATION



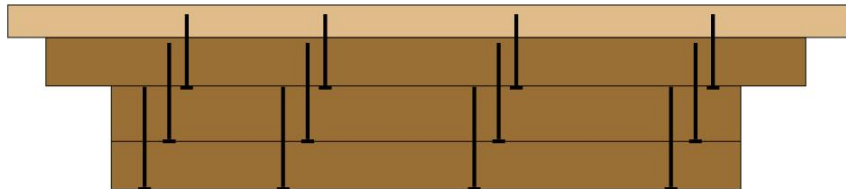
**J-HOOK
PHOTO 1**



**LADDER BUCKLE
PHOTO 2**



**CORNER PROTECTOR
PHOTO 3**



DETAIL A

TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
OVER - BULKHEAD FLATCARS

RAC 12154A (Continued)

Revised 01-2024 AAR Ref: Fig. 154A

Item	No. of Pcs.	Description
A		Vacant.
B	4 per each single pile 40 ft long or less. Add 1 for each additional 10 ft or less. Double piles 20 ft or less, 3 per pile.	Bearing pieces: hardwood, minimum 2 in. x 4 in., must not be taller than wide, length equal to width of car. Locate end pieces 2 ft. to 4 ft. from each end of pile with intermediate bearing pieces equally spaced. Secure each to car floor with six 20-D nails equally spaced across length of bearing pieces. Lamination of hardwood is not permitted. For nailable steel floors where bearing piece will not be nailed, or when taller than 2 inches, see Sketch 1 and Item M .
C	4 per each single pile 40 ft long or less. Add 1 for each additional 10 ft or less. Double piles 20 ft or less, 3 per pile.	Separators: hardwood, minimum 2 in. x 4 in. Length must extend a minimum of 6 in. beyond the side of load but must not extend beyond deck of car. length equal to width of load. Locate between each layer, of each pile equally spaced.
D	2 per each Item B. 4 per each Item C.	Chock blocks: lumber, 2 in. x 4 in. x 6 in. Use if top tier is narrowed. Locate at each end of ITEMS B against side of tubing and secure each with three 16-D nails. On ITEMS C , locate one top and bottom on each side of load against tubing and secure each with three 16-D nails.
E	3 per package 20 ft. or less. Add 1 for each additional 10 ft. or less	Package bands: 1 1/4 in. x 0.029 in. high tension bands. Space equally over length of packages and avoid contact with dunnage.

TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
OVER - BULKHEAD FLATCARS

RAC 12154A (Continued)

Revised 01-2024 AAR Ref: Fig. 154A

Item	No. of Pcs.	Description
F	3 per layer per pile	Interlacing bands: 1 1/4 in. × .029 in. high tension bands. Bands to encircle the first, second, and third layers of each pile. The next set of bands to encircling packages in the third, fourth, and fifth layers of each pile. Interlacing must be repeated in this manner between each additional group of three layers or less to top of load per pile. See SKETCH 2 . May be substituted with Type 1A Grade 7 polyester strap.
G	2 pair per bridged pile 34 ft long or less. Add 1 pair for each additional 10 ft or less.	Unitizing bands: 1 1/4 in. × .029 in high tension bands. For unitizing top bridged pile to piles below. Secure top pile to each pile below with the required number of bands. Bands are to encircle the top two layers of base piles and bottom two layers of top pile. Minimum of 2 bands per each base pile going up to bridging pile. See SKETCH 4 . May be substituted with Type 1A Grade 7 polyester strap.
H	3 per pile, 34 ft long or less. Add 1 for each additional 10 ft or less	Encircling bands: 2 in. × .044 in. high tension bands. Locate one at each end of pile with others equally spaced. Each 2 in. × .044 in. high tension band may be substituted by two 1 1/4 in. × .029 in. high tension bands or the 2 in. x 0.044 in. high tension band may be substituted by Type 1A Grade 7 polyester strap. See Note 2 & 6 and SKETCH 3 for additional information.
J	3 per bottom pile	Tie-down straps: AAR approved Type 1A Grade 8 non-metallic strapping. Place over bottom layer and secure by single strap method (two buckles) or double tie-down method (one buckle) to either lading strap anchors or stake pockets with appropriate hooks and/or buckles. See SKETCH 4 .

TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
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RAC 12154A (Continued)

Revised 01-2024 AAR Ref: Fig. 154A

Item	No. of Pcs.	Description
K	4 pairs per pile 40 ft long or less. Add 1 additional pair for each 10 ft or less. Double piles, 3 pairs per each pile 20 ft long or less	Stub stakes: hardwood, 4 in. × 4 in., equally spaced. Length to extend from bottom of stake pocket to 10 in. above car floor.
L	As required.	Wooden fillers: hardwood, suitably located to fill voids in load. Secure to separators (ITEM C) to prevent displacement. See SKETCH 5 .
M	4 per each item B.	Cleats: 2 in. × 6 in. × 2 ft. Locate approximately 18 in. from side of car, two on each side of Item B. Secure each to car deck with three 20-D nails and toenail each cleat to the bearing piece for lateral securement. See SKETCH 1 . Not required when ITEM B bearing pieces are secured to car floor.

Notes:

1. Height of load not to exceed 9 ft 6 in above car floor.
2. High tension bands shown are sufficient for loads up to 110,000 lb. Add one band of each designation for each additional 20,000 lb. or less of load weight. All high-tension bands may be substituted with AAR approved Type 1A Grade 7 Polyester Strap.

Load Weight	Additional Bands per Designation on Sketch
110,000 or less	0
110,001 to 130,000	1
130,001 to 150,000	2
150,001 to 170,000	3
170,001 to 190,000	4

TUBING, STEEL, SQUARE AND RECTANGULAR, 16 IN. X 16 IN. OR LESS,
LOOSE OR PACKAGED, 12 FT LONG OR
OVER - BULKHEAD FLATCARS

RAC 12154A (Concluded)

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3. Tubing less than 12 ft long must not be loaded to this figure.
4. Sweet gum is an acceptable substitute for hardwood in this figure.
5. Douglas fir (coast type) is acceptable for use as bearing pieces and separators in this figure where hardwood is specified for loads weighing 140,000 lbs. or less. Separators must be minimum full 3 in. × 4 in.
6. All sharp edges must be protected by appropriate edge protection for strapping used. Edge protection is not required if all corner radii are no less than 125% of wall thickness and wall thickness is no less than .063”.
7. Bridging of piles is permitted, bridging pile must be centered over piles below with a minimum of 10 ft. Overlap of each lower pile. Secure bridged pile to piles below as per Item G.
8. When load has bridge configuration, it will be essentially 3 separate piles therefore requiring minimum 9 Encircling Bands Item H 3 per pile.
9. When two or more piles are placed end to end on car deck, they require a minimum of 10 in. space between piles with a maximum of 24 in.
10. Load must be centrally located on the rail car at origin.
11. Heaviest load concentration should be placed in the lower part of the load when possible.
12. When mixed-height packages are loaded in a layer, shorter height packages must be located in center of layer. Outside packages must be of equal height, except in the top layer. Item C separators must be laminated to fill void in load. Laminated material must be hardwood, length sufficient to fill void. Each piece of lamination to be a minimum 2 in. thick and secured with a minimum of four 20-D nails (power-driven is acceptable), equally spaced across length. See **DETAIL A**.
13. Tie-down assemblies, consisting of a winch, ratchet, and polyester woven straps 4 in. wide with 20,000 MBS. May be used as a substitute for Item J if cars are equipped.
14. Deck of rail car must be free of debris, ice and snow prior to loading.
15. If a tarp is used, it must be secured per AAR section 1, General Rules 1.2.26, 1.2.27, and 1.2.28.

Reference the General Rules in Section 1 of the *Open Top Loading Rules Manual* for additional details.