REVISION NO. 2 APPROVED BY BUREAU OF EXPLOSIVES

DATE 4-20-98

LOADING AND BRACING • IN END OPENING ISO CONTAINERS OF COMPLETE ROUNDS PACKED IN CYLINDRICAL METAL CONTAINERS

PA98 SERIES CONTAINERS

INDEX

• LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY INDUSTRIAL OPERATIONS COMMAND

Timothy Fore

APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND

William Ernst

U.S. ARMY DEFENSE AMMUNITION CENTER

ENGINEER	BASIC		
	REV.	MICHAEL SARDONE	
TECHNICIAN	BASIC	RICHARD HAYNES	
	REV.		
DRAFTSMAN	BASIC		
	REV.		
TRANSPORTATION ENGINEERING DIVISION		W. R. Francis	
VALIDATION ENGINEERING DIVISION		Jerome H. Hahn TESTED	
LOGISTICS ENGINEERING OFFICE		William Ernst	

DO NOT SCALE

WEBSITE: HTTP://WWW.DAC.ARMY.MIL

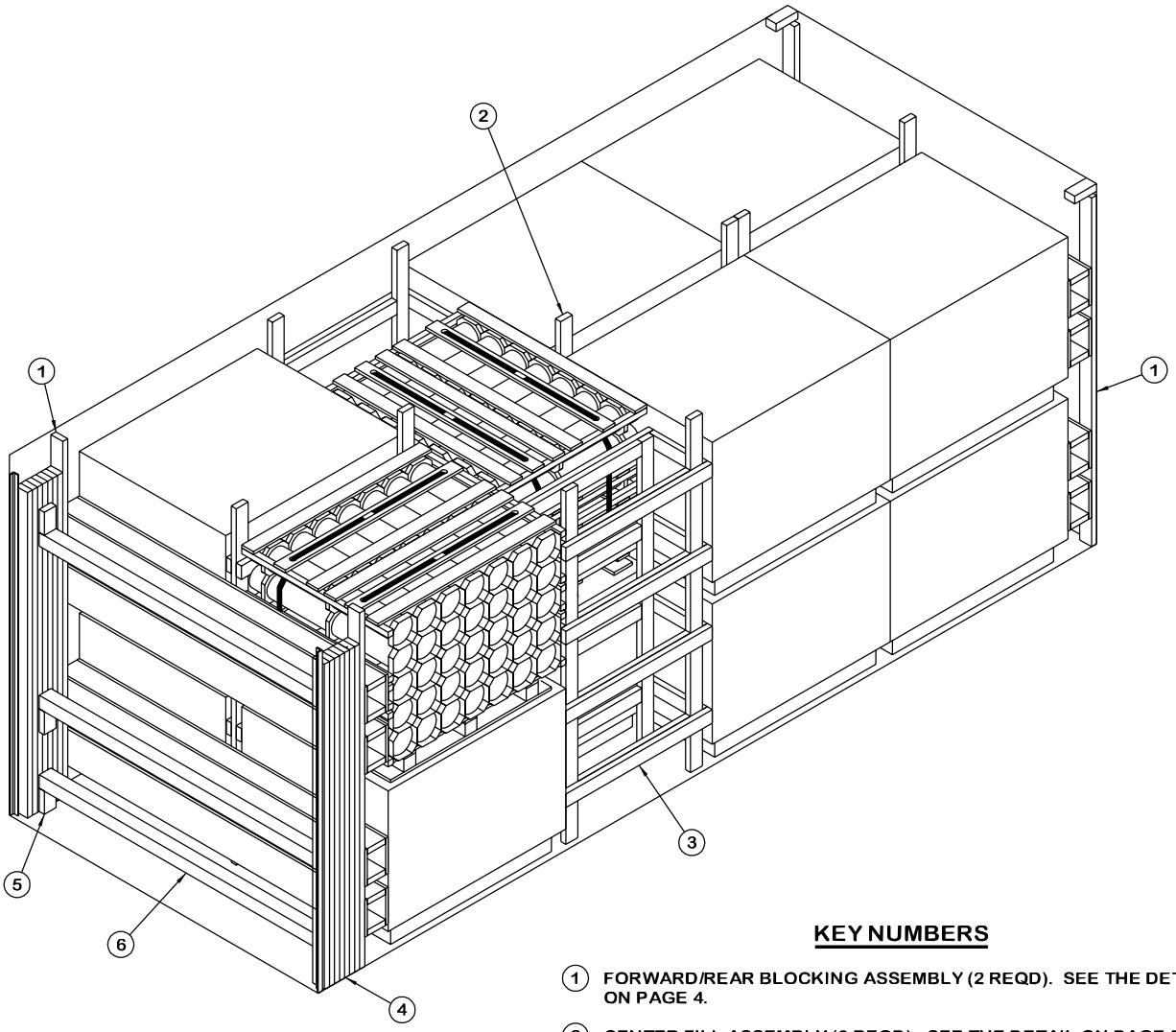
JULY 1986

REVISION NO. 2 — SEPTEMBER 1998

SEE THE REVISION LISTING ON PAGE 4

CLASS	DIVISION	DRAWING	FILE
19	48	4215/5	15PM1013

PROJECT CA 228/5-85



ISOMETRIC VIEW

KEY NUMBERS

(1) FORWARD/REAR BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 4.

(2) CENTER FILL ASSEMBLY (3 REQD). SEE THE DETAIL ON PAGE 5.

(3) CRIB FILL ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.

(4) FILL MATERIAL, 4" WIDE BY 7'-0" LONG MATERIAL (AS REQD). NAIL THE FIRST PIECE TO THE REAR BLOCKING ASSEMBLY W/7 NAILS OF A SUITABLE SIZE (10d NAILS FOR 2" THICK MATERIAL). NAIL EACH ADDITIONAL PIECE TO THE PREVIOUS PIECE IN A SIMILAR MANNER. NOTE: MULTIPLE PIECES MAY BE LAMINATED TOGETHER FIRST AND THEN TOENAILED TO THE REAR BLOCKING ASSEMBLY.

(5) STRUT LEDGER, 2" X 4" X 6" (6 SHOWN - OPTIONAL). INSTALL IF DESIRED TO AID IN THE INSTALLATION OF SPANNER PIECES. NAIL TO THE FILL MATERIAL W/2-10d NAILS.

(6) DOOR SPANNER, 4" X 4" MATERIAL, CUT TO A LENGTH THAT WILL PROVIDE FOR A DRIVE FIT (REF: 7'-1-3/8") (3 REQD). TOENAIL TO THE FILL MATERIAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 7 AND THE "SPANNER/FILL INSTALLATION" ON PAGE 8. NOTE THAT THESE PIECES ARE NOT REQUIRED IF THE SPACE BETWEEN THE REAR BLOCKING ASSEMBLY AND THE LOAD RETAINER IS NOT GREATER THAN 6".

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4" 2" X 6" 4" X 4"	464 122 22	310 122 30
NAILS	NO. REQD	POUNDS
6d (2") 10d (3") 12d (3-1/4")	352 494 12	2-1/4 7-3/4 1/4
PLYWOOD, 3/4" - - - - 96 SQFT REQD - - - 198-3/4 LBS		

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	14	39,130 LBS
DUNNAGE		1,133 LBS
CONTAINER		4,700 LBS
TOTAL WEIGHT		44,963 LBS (APPROX)

PROJECT CA 228/5-85

GENERAL NOTES

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).

B. THE SPECIFIED OUTLOADING PROCEDURES ARE APPLICABLE TO LOADS OF COMPLETE ROUNDS PACKED IN PA98 SERIES METAL CONTAINERS. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT WITH AMMUNITION ITEMS. SEE PAGE 6 AND AMC DRAWING 19-48-4079/5-20PM1002 FOR DETAILS OF THE PALLET UNIT. CAUTION: REGARDLESS OF THE QUANTITY OF CONTAINERS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE END OPENING ISO CONTAINER MUST NOT BE EXCEEDED.

C. THE LOAD AS SHOWN IS BASED ON A 4,700 POUND 20' LONG BY 8' WIDE BY 8'-6" HIGH END OPENING ISO CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 92" WIDE BY 93" HIGH, WITH A MAXIMUM GROSS WEIGHT OF 52,910 POUNDS. OLDER/OTHER CONTAINERS MAY HAVE A TOTAL INSIDE HEIGHT OF 95", BUT A CLEAR HEIGHT UNDER THE ROOF BOWS OF 93", VERIFY INSIDE CONTAINER HEIGHT PRIOR TO FABRICATING DUNNAGE. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (T/COFC) SHIPMENT, HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY OTHER SURFACE MODES OF TRANSPORT. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN BE USED.

D. WHEN LOADING PALLET UNITS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE DUNNAGE ASSEMBLIES). THE UNBLOCKED SPACE ACROSS THE WIDTH OF A LOAD BAY IS NOT TO EXCEED 1-1/2". EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE HORIZONTAL PIECES ON THE CENTER FILL ASSEMBLIES. NAIL EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS AND/OR QUANTITY HORIZONTAL PIECES IN THE CENTER FILL ASSEMBLIES MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE SIZE OF THE PALLET UNIT.

E. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE.

F. A STAGGERED NAILING PATTERN WILL BE USED WHENEVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

G. IN SOME CONTAINERS THERE IS A SLOT AT THE CORNERS OF THE FORWARD WALL. PIECES OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE FORWARD BLOCKING ASSEMBLY TO PROVIDE A FLAT SURFACE FOR THE BUFFER PIECES. A PIECE OF 2" X 4", 2" X 3" OR A SPECIAL WIDTH PIECE CUT-TO-FIT CAN BE USED. THIS FILL PIECE WILL BE NAILED WITH ONE APPROPRIATELY SIZED NAIL EVERY 12". NOTE THAT SOME CONTAINERS ARE EQUIPPED WITH "TIE-BARS" IN THE CORNER SLOT, WHICH PRECLUDE THE USE OF A FULL HEIGHT FILL PIECE. WHEN "TIE-BARS" ARE PRESENT, THE FILL PIECE MUST BE INSTALLED IN SEGMENTS DESIGNED TO FIT BETWEEN THE "TIE-BARS" VERTICALLY. THE FILL PIECE(S) IS NOT REQUIRED WHEN THE CORNER PORTIONS OF THE CONTAINER FORWARD WALL ARE SMOOTH AND FLAT. DO NOT ALLOW ANY DUNNAGE ASSEMBLY TO CONTACT THE CONTAINER FORWARD WALL, ONLY THE CORNER POSTS OF THE CONTAINER SHOULD BE USED FOR FORWARD LONGITUDINAL BLOCKING.

H. WHETHER A CONTAINER IS FULL OR IS LOADED WITH A REDUCED QUANTITY OF LADING UNITS, THE LENGTHWISE CENTER OF GRAVITY OF THE LOAD MUST BE WITHIN 12", IN EITHER DIRECTION, OF THE MID-POINT OF THE CONTAINER.

J. CAUTION: DO NOT NAIL DUNNAGE MATERIAL TO THE CONTAINER WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.

K. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDEWALL, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

L. MAXIMUM LOAD WEIGHT CRITERIA:

THE MAXIMUM LOAD WEIGHTS ARE CONTROLLED BY EQUIPMENT CAPABILITY FACTORS. ALTHOUGH THE HEAVIEST MAXIMUM LOADS ARE DELINEATED IN THE LOAD VIEWS, PROVISIONS ARE INCLUDED WITHIN THIS DRAWING SO THAT THE BASIC LOADS CAN BE ADJUSTED TO SATISFY A LESSER QUANTITY OF LADING UNITS. DEPENDING ON TRANSPORTATION ROUTING, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY "WEIGHT LAWS" OF CERTAIN STATES. ALSO, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY OTHER WEIGHT RESTRICTIONS IMPOSED ON THE INTERMODAL CONTAINER SYSTEM.

(CONTINUED AT LEFT)

(GENERAL NOTES CONTINUED)

M. REQUIREMENTS CITED WITHIN THE ASSOCIATION OF AMERICAN RAILROADS (AAR) INTERMODAL LOADING GUIDE APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC). SPECIAL T/COFC NOTES FOLLOW:

1. A LOADED CONTAINER MUST BE ON A CHASSIS EQUIPPED WITH TWO BOGIE ASSEMBLIES WHEN BEING MOVED IN TOFC SERVICE.

2. THE LOAD LIMIT OF A T/COFC RAILCAR MUST NOT BE EXCEEDED, NOR WILL A CAR BE LOADED SO THAT THE TRUCK UNDER ONE END OF THE CAR CARRIES MORE THAN ONE-HALF OF THE LOAD LIMIT FOR THAT CAR.

N. DURING INTRASTATE AND/OR INTERSTATE MOVES BY MOTOR CARRIER, A PROPER CHASSIS OR MODIFIED FLATBED TRAILER MUST BE USED TO PRECLUDE VIOLATION OF ONE OR MORE "WEIGHT LAWS" APPLICABLE TO THE STATE OR STATES INVOLVED.

O. CONVERSION TO METRIC EQUIVALENTS: DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY, THE METRIC EQUIVALENTS MAY BE COMPUTED ON THE BASIS OF ONE INCH EQUALS 25.4MM AND ONE POUND EQUALS 0.454 KG.

P. THE QUANTITY OF PALLET UNITS SHOWN IN THE LOAD ON PAGE 2 MAY BE REDUCED FOR SHIPMENT, IF DESIRED. SEE THE FILLER ASSEMBLY ON PAGE 6.

Q. IF A LOAD IS REDUCED BY ONLY A SMALL AMOUNT (ONE OR TWO LADING UNITS), LADING UNITS NORMALLY MAY BE ELIMINATED FROM THE CENTER OF THE LOAD.

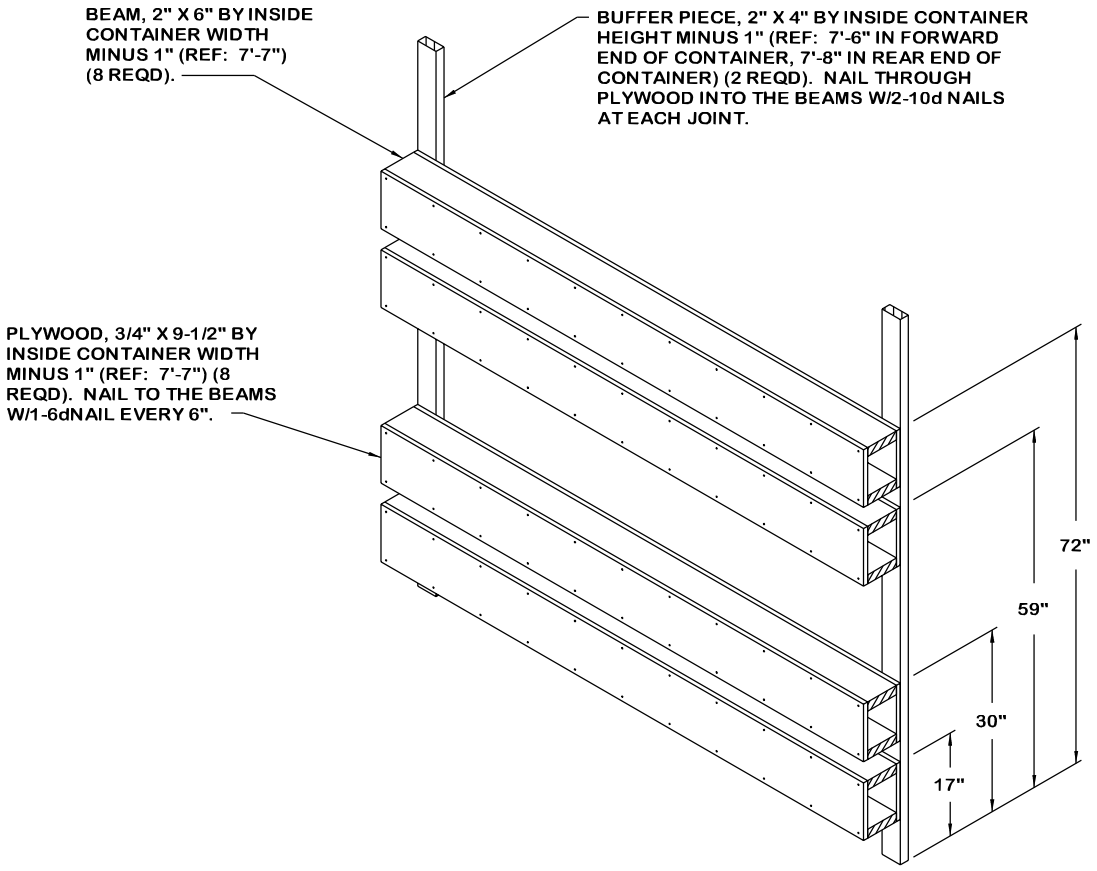
R. IF A LOAD IS REDUCED BY A LARGE AMOUNT (MORE THAN TWO LADING UNITS), LADING UNITS SHOULD BE ELIMINATED AS REQUIRED AND THE TOTAL LOAD SHIFTED FORE OR AFT, AS NECESSARY, TO ACHIEVE A SYMMETRICAL WEIGHT DISTRIBUTION. THE DEPICTED PROCEDURES WILL BE FOLLOWED AS CLOSELY AS POSSIBLE, MAKING ONLY THOSE ADJUSTMENTS TO THE DUNNAGE WHICH ARE REQUIRED TO ACCOMMODATE THE NUMBER OF UNITS TO BE SHIPPED.

S. AS REQUIRED BY THE ASSOCIATION OF AMERICAN RAILROADS (AAR), ALL 1-1/4" AND 2" STEEL STRAPPING USED FOR LOAD RESTRAINT MUST BE MARKED AS SPECIFIED WITHIN THE APPLICABLE AAR RULES GOVERNING LOADING, BLOCKING AND BRACING OF FREIGHT WITHIN THE CONVEYANCE. FOR THE SPECIFIC MARKING SIZE, FREQUENCY, ETC., REQUIRED, REFER TO THE APPROPRIATE AAR LOADING RULES.

T. DOOR SPANNERS AND DOOR SPANNER LEDGERS ARE NOT REQUIRED AND MAY BE OMITTED IF LESS THAN 6" OF FILL MATERIAL, PIECE MARKED ④ ON PAGE 2, IS REQUIRED ON EITHER SIDE OF THE REAR OF THE LOAD.

MATERIAL SPECIFICATIONS

LUMBER - - - - - - - -:	SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.
NAILS - - - - - - - -:	ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMMS).
PLYWOOD - - - - - - -:	COMMERCIAL ITEM DESCRIPTION A-A-55057, INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.
STEEL, STRUCTURAL - - - - - -:	ASTM A501, STEEL STRUCTURAL TUBING; AND ASTM A570, STEEL, STRIP, HOT-ROLLED, GRADE 36 (MINIMUM).



FORWARD/REAR BLOCKING ASSEMBLY

NOTE: FOR A ONE-HIGH LOAD, ELIMINATE THE TOP TWO BOX BEAM ASSEMBLIES.

RECOMMENDED SEQUENTIAL LOADING PROCEDURES

1. PREFABRICATE TWO FORWARD/REAR BLOCKING ASSEMBLIES, THREE CENTER FILL ASSEMBLIES, AND TWO CRIB FILL ASSEMBLIES.
2. INSTALL THE FORWARD BLOCKING ASSEMBLY.
3. LOAD FOUR PALLET UNITS AND INSTALL ONE CENTER FILL ASSEMBLY.
4. REPEAT STEP 3.
5. INSTALL TWO CRIB FILL ASSEMBLIES AND LOAD TWO PALLET UNITS.
6. REPEAT STEP 3.
7. INSTALL THE REAR BLOCKING ASSEMBLY.
8. INSTALL THE FILL MATERIAL BETWEEN THE REAR BLOCKING ASSEMBLY AND THE LOAD RETAINERS.
9. INSTALL THE SIX STRUT LEDGERS AND THE THREE DOOR SPANNER PIECES.

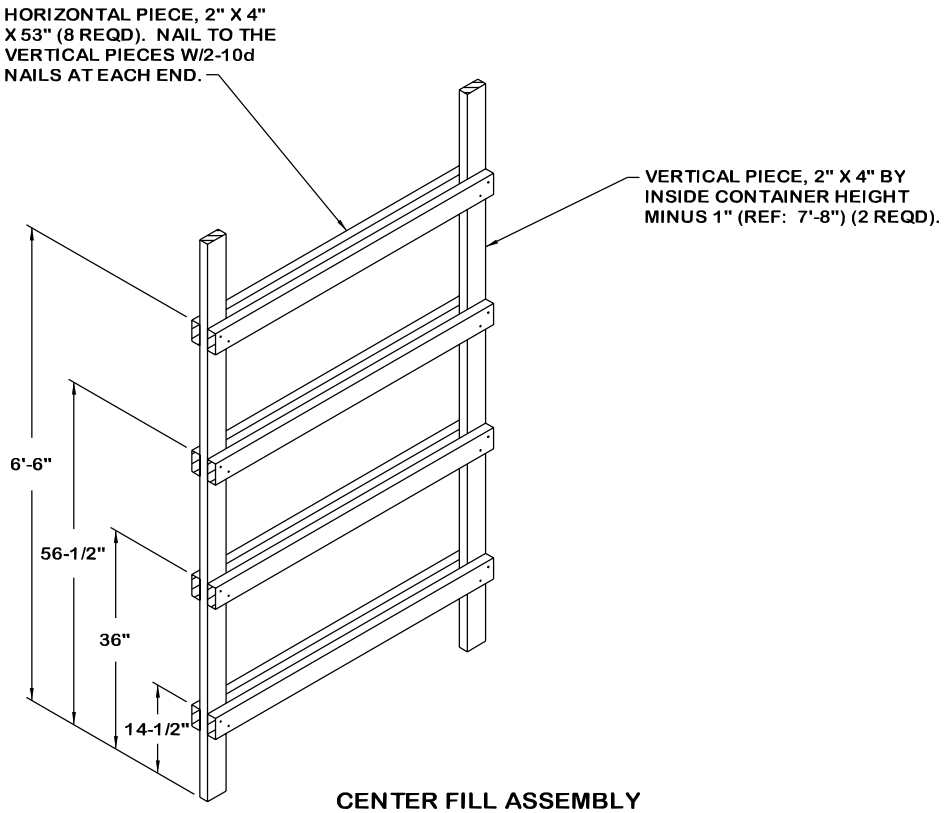
REVISIONS

REVISION NO. 1, DATED SEPTEMBER 1996, CONSISTS OF

STREAMLINING DUNNAGE METHODS.

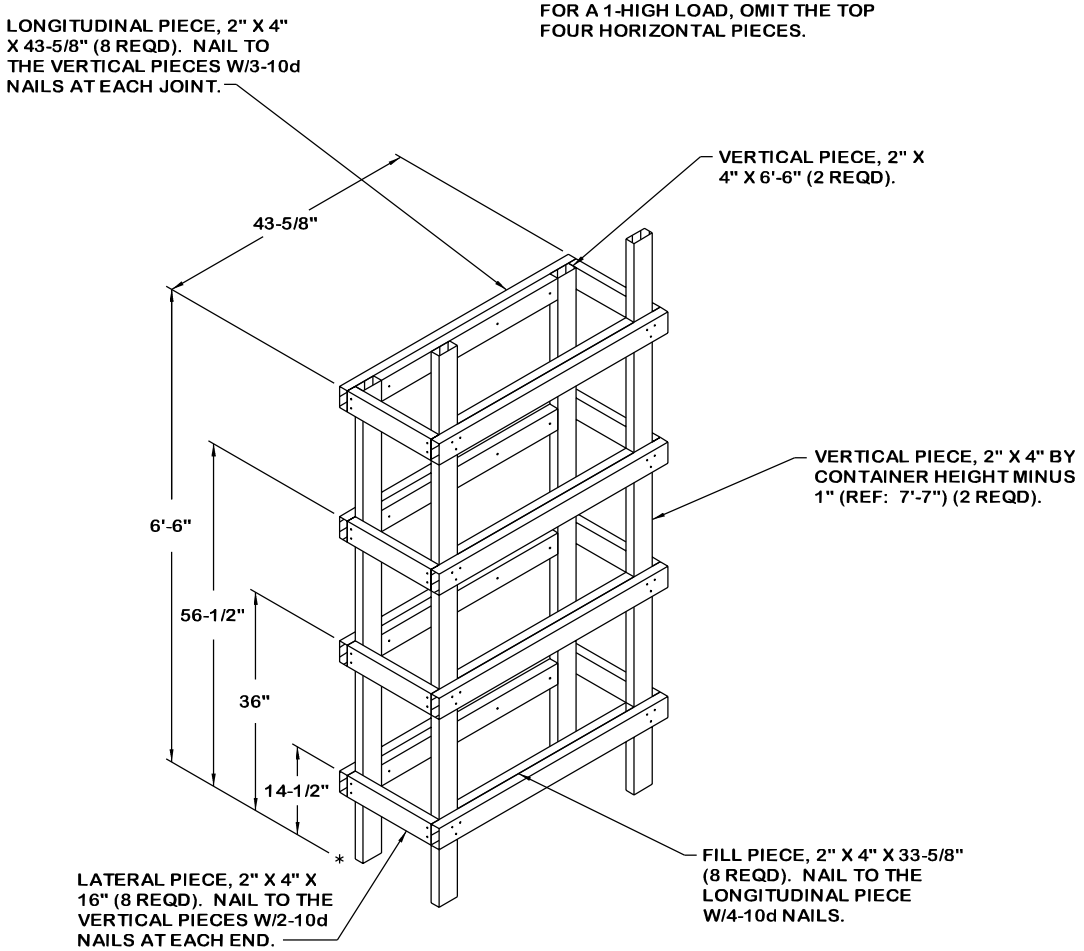
REVISION NO. 2, DATED SEPTEMBER 1998, CONSISTS OF

1. RECONFIGURING LOAD.
2. UPDATING GENERAL NOTES AND DRAWING FORMAT.



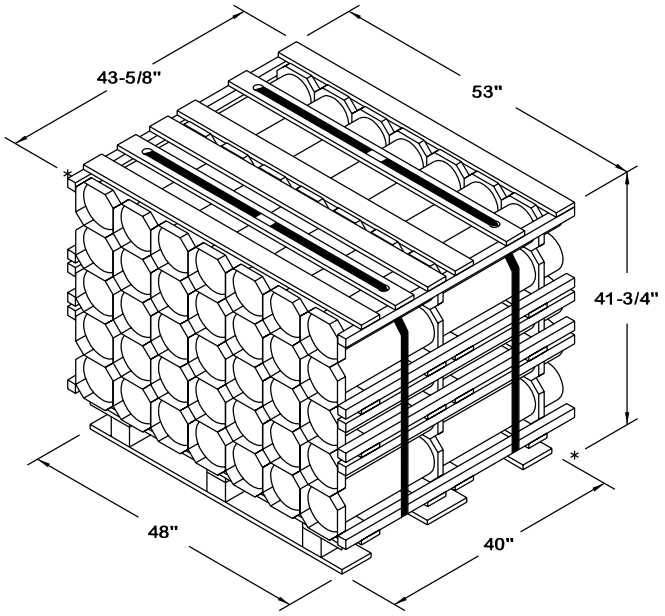
CENTER FILL ASSEMBLY

FOR A 1-HIGH LOAD, OMIT THE TOP FOUR HORIZONTAL PIECES.



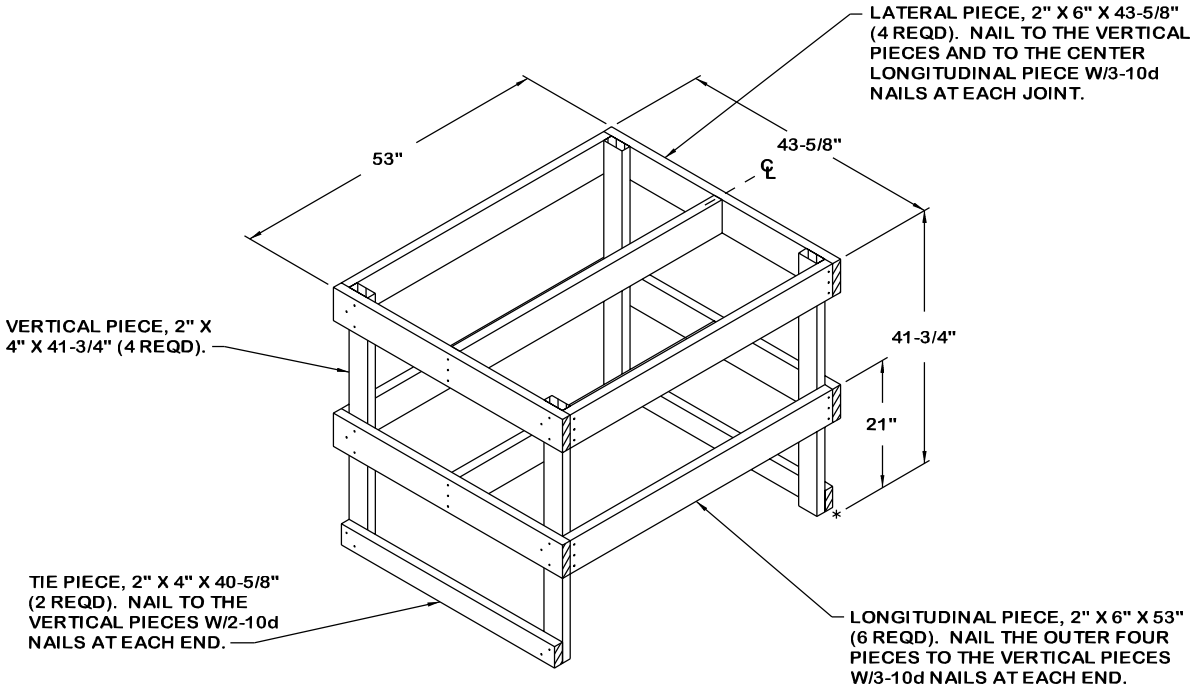
CRIB FILL ASSEMBLY

FOR A 1-HIGH LOAD, ELIMINATE THE TOP FOUR LONGITUDINAL PIECES, THE TOP FOUR FILL PIECES, AND THE TOP FOUR LATERAL PIECES. REDUCE THE SHORT VERTICAL PIECES TO 36".



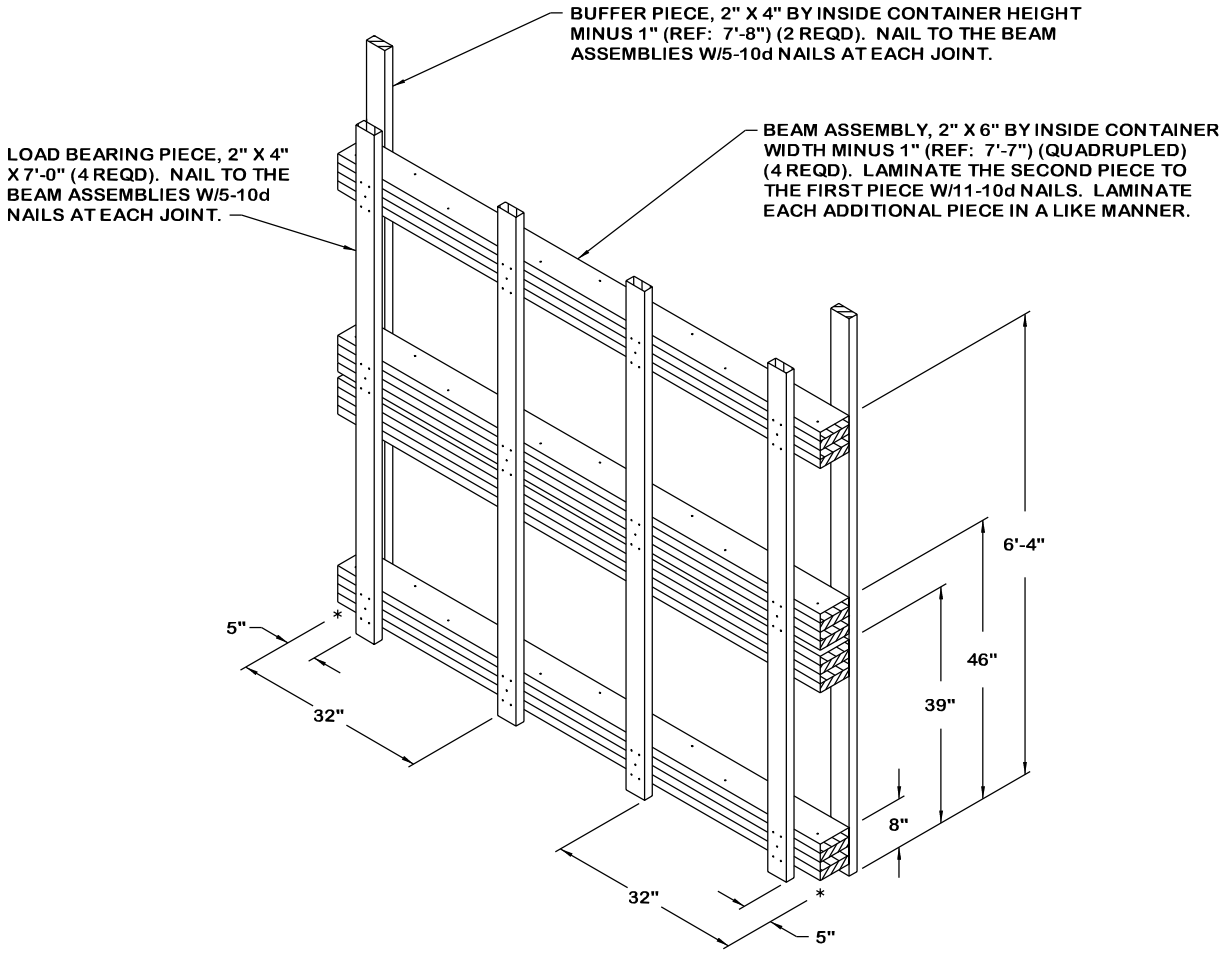
PALLET UNIT

UNIT WEIGHT - - - - - - 2,795 POUNDS
CUBE - - - - - - - - - - 55.9 CUBIC FEET



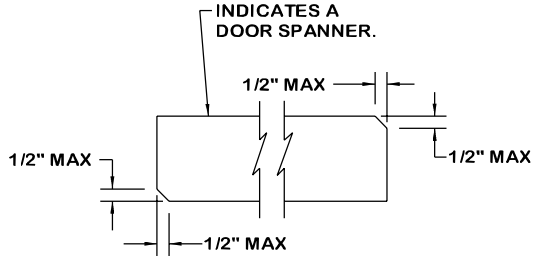
FILLER ASSEMBLY

THE ASSEMBLY DEPICTED ABOVE IS FOR USE IN THE PLACE OF AN OMITTED PALLET UNIT. NO MORE THAN FOUR FILLER ASSEMBLIES MAY BE USED PER LOAD. DO NOT INSTALL A FILLER ASSEMBLY IMMEDIATELY ADJACENT TO ANOTHER FILLER ASSEMBLY.



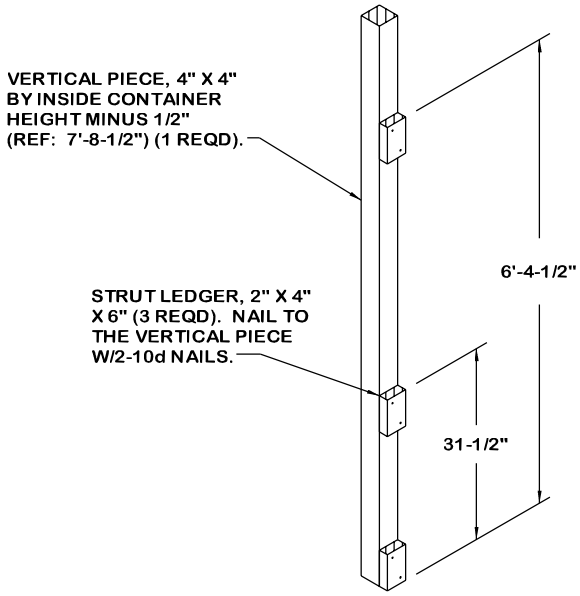
ALTERNATIVE FORWARD/REAR BLOCKING ASSEMBLY

NOTE: THE ALTERNATIVE FORWARD/REAR BLOCKING ASSEMBLY MAY BE USED IN PLACE OF THE FORWARD/REAR BLOCKING ASSEMBLY DEPICTED IN THE LOAD ON PAGE 2, IF DESIRED.

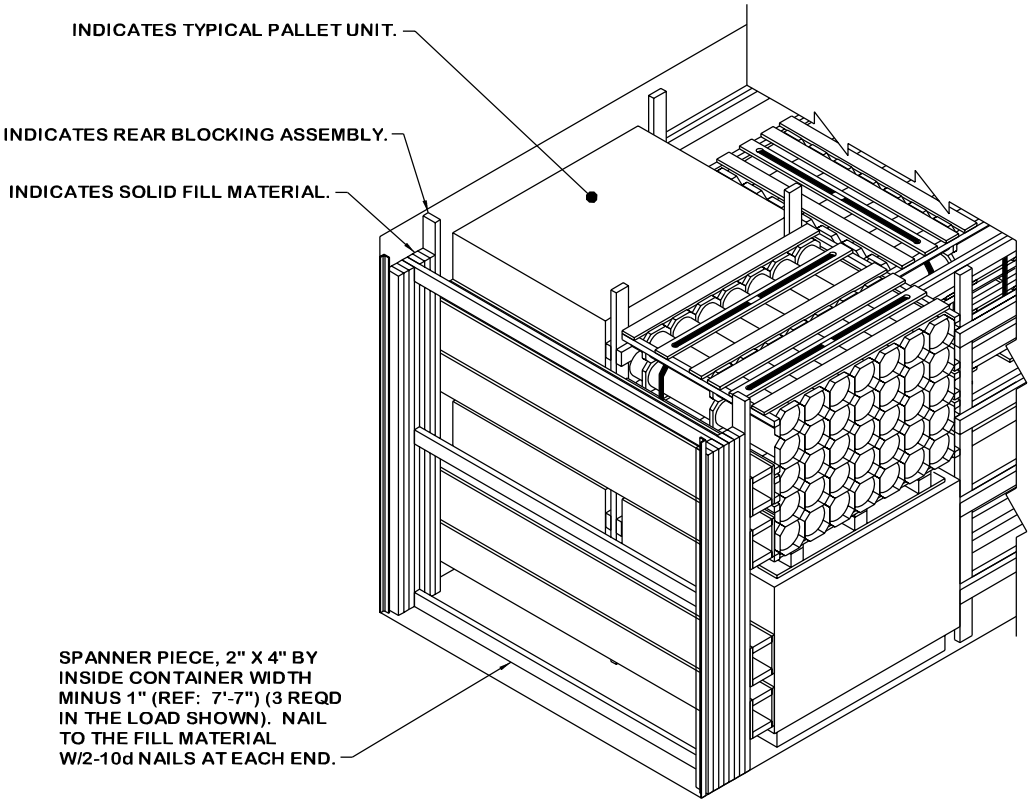


BEVEL-CUT

IF DESIRED, EACH END OF A DOOR SPANNER PIECE MAY BE BEVEL-CUT AS SHOWN ABOVE TO FACILITATE THE ACHIEVEMENT OF A TIGHT DOOR-POST-TO-DOOR-POST FIT.



DOOR POST VERTICAL

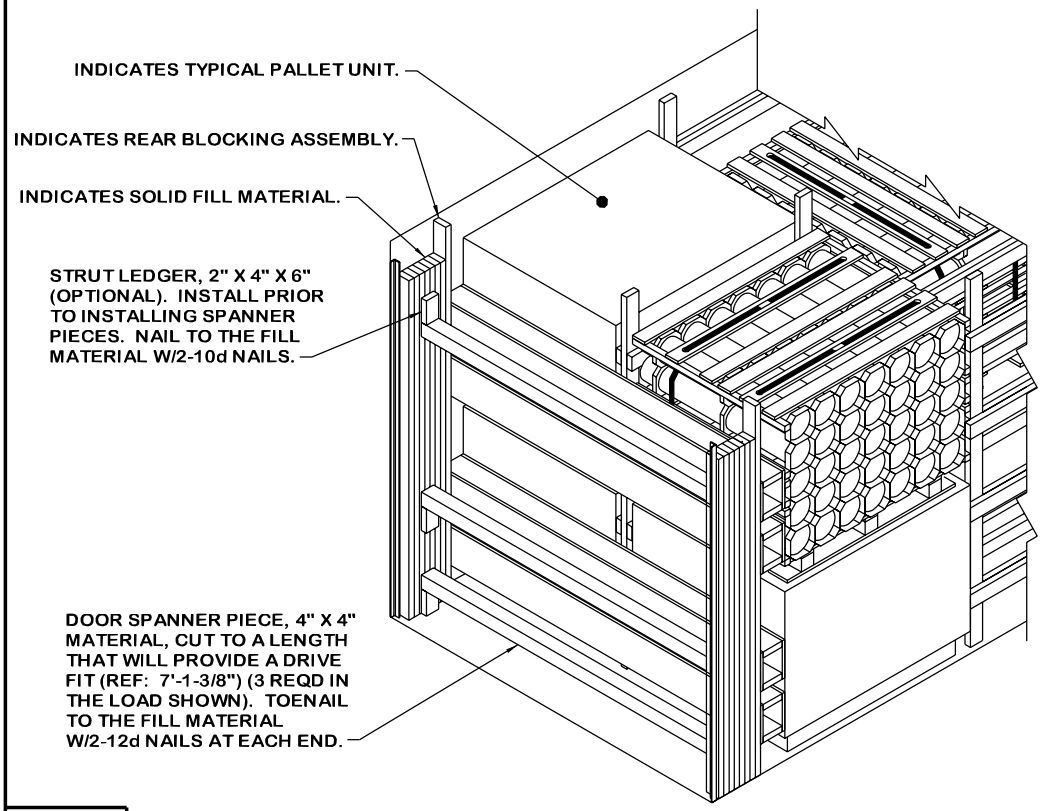


NOTE:

SPANNER PIECES SHOWN IN THE DETAIL AT LEFT MUST BE INSTALLED AS FOLLOWS. INSTALL THE UPPER SPANNER PIECE SUCH THAT THE TOP EDGE OF THE TOP SPANNER PIECE IS FLUSH WITH THE TOP EDGE OF THE FILL MATERIAL. INSTALL THE LOWER SPANNER PIECE ON THE FLOOR OF THE CONTAINER. INSTALL THE MIDDLE SPANNER PIECE SO THAT IT IS APPROXIMATELY CENTERED BETWEEN THE TOP OF THE FILL AND THE FLOOR OF THE CONTAINER.

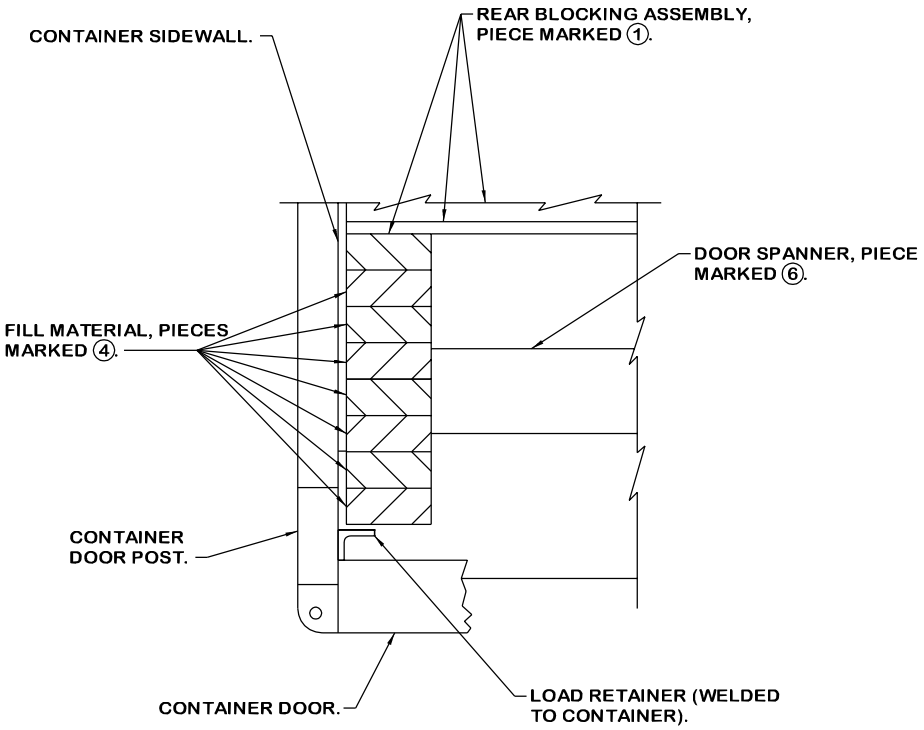
SPANNER/FILL INSTALLATION

THE DETAILS ABOVE AND BELOW DEPICT THE PROCEDURES TO BE USED WHEN INSTALLING MORE THAN 6" OF SOLID FILL MATERIAL AT THE REAR OF THE LOAD. ONE SET OF THREE SPANNER PIECES AND FOUR CUT-TO-FIT FILL PIECES OR THREE DOOR SPANNER PIECES AND THE OPTIONAL STRUT LEDGERS MUST BE INSTALLED WHEN A REAR BLOCKING ASSEMBLY IS ASSEMBLED USING MORE THAN TWO BOX BEAM ASSEMBLIES. IF ONLY TWO OR LESS BOX BEAM ASSEMBLIES ARE USED IN THE REAR BLOCKING ASSEMBLY, ONLY TWO SPANNER PIECES OR TWO DOOR SPANNERS ARE REQUIRED. THE HEIGHT OF THE SOLID FILL PIECES USED SHOULD BE AT LEAST THE HEIGHT OF THE TOP OF THE UPPERMOST BEAM ASSEMBLY OR BOX BEAM ASSEMBLY IN THE REAR BLOCKING ASSEMBLY PLUS 6". NOTE: IF MORE THAN 6" OF SOLID FILL IS REQUIRED, FILL MATERIAL MAY BE ADDED TO BOTH THE FORWARD AND REAR BLOCKING ASSEMBLIES IN LIEU OF THE "SPANNER/FILL INSTALLATION" PROCEDURES DEPICTED ON THIS PAGE.



NOTE:

DOOR SPANNER PIECES SHOWN IN THE DETAIL AT LEFT MUST BE INSTALLED AS FOLLOWS. INSTALL THE UPPER SPANNER PIECE SUCH THAT THE TOP EDGE OF THE TOP SPANNER PIECE IS AT THE SAME HEIGHT AS THE TOP EDGE OF THE TOP BOX BEAM ASSEMBLY IN THE REAR BLOCKING ASSEMBLY. INSTALL THE LOWER SPANNER PIECE SUCH THAT THE BOTTOM OF THE LOWER SPANNER PIECE IS AT THE SAME HEIGHT AS THE BOTTOM EDGE OF THE LOWEST BOX BEAM ASSEMBLY. INSTALL THE MIDDLE SPANNER PIECE SUCH THAT THE TOP EDGE OF THE SPANNER PIECE IS AT THE SAME HEIGHT AS THE TOP EDGE OF THE SECOND BEAM ASSEMBLY OR BEAM ASSEMBLY FROM THE FLOOR.

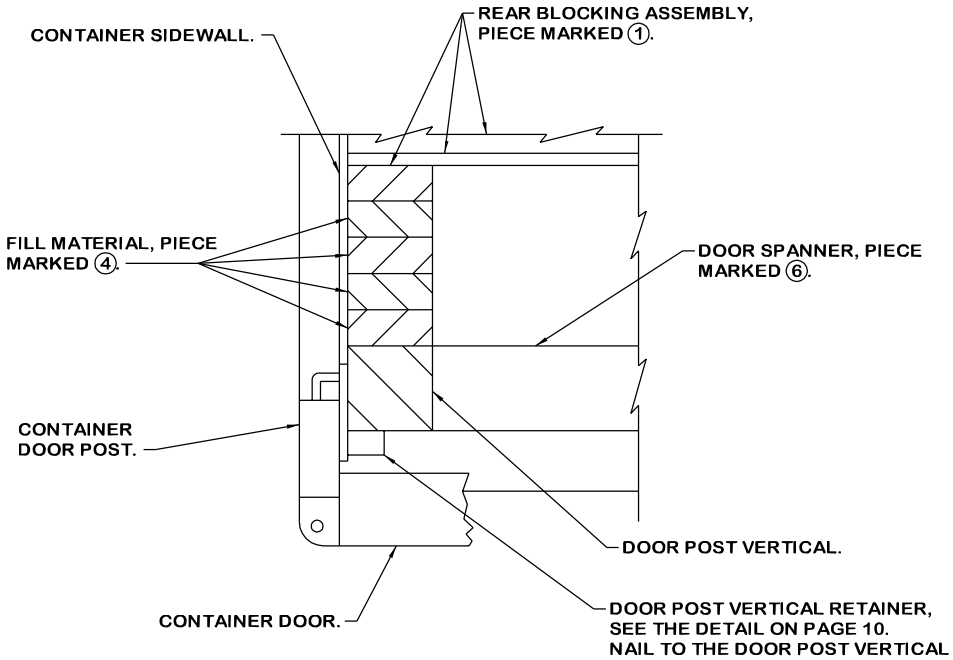


DETAIL A

A PARTIAL PLAN VIEW OF THE LEFT REAR PORTION OF THE CONTAINER IS SHOWN DEPICTING THE PROPER POSITION OF THE FILL MATERIAL AND ADJACENT DUNNAGE PIECES.

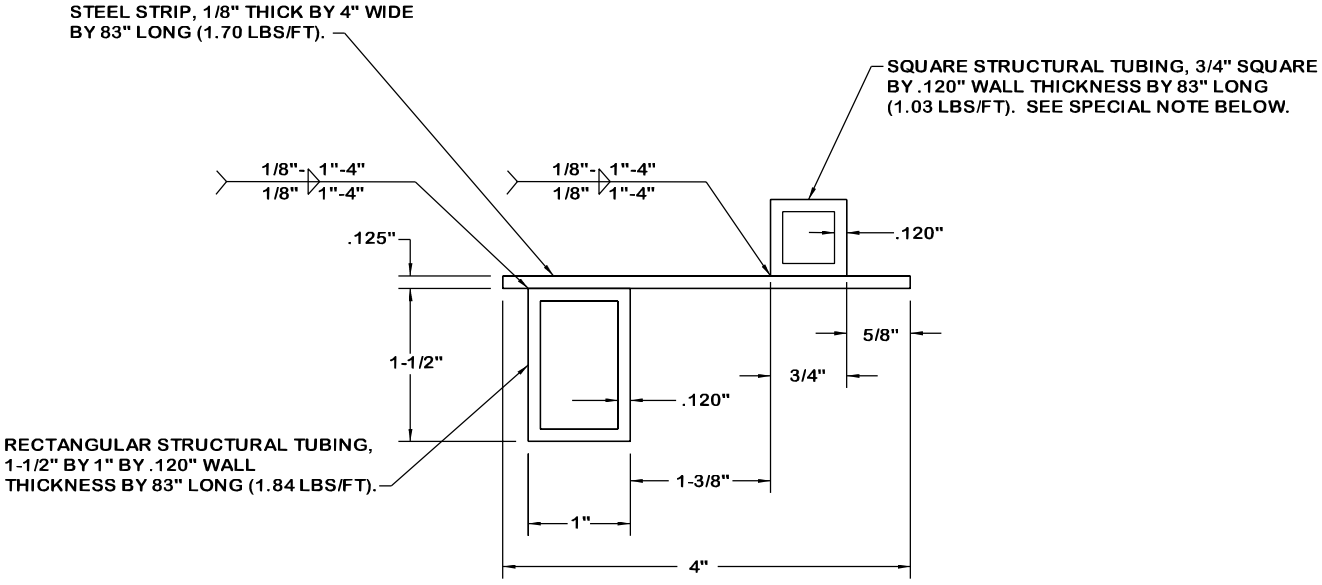
SPECIAL NOTE:

WHEN ISO CONTAINERS ARE NOT EQUIPPED WITH PRE-WELDED LOAD RETAINERS, AS DEPICTED IN "DETAIL A" ABOVE, DOOR POST VERTICALS, DOOR POST VERTICAL RETAINERS AND DOOR SPANNERS WILL BE REQUIRED FOR THE LOAD DEPICTED ON PAGE 2. SEE VARIOUS LOADS WITHIN AMC DRAWING 19-48-4153-15PA1002 FOR EXAMPLES. SEE PAGE 8 FOR DETAILS OF THE METAL DOOR POST VERTICAL RETAINER.

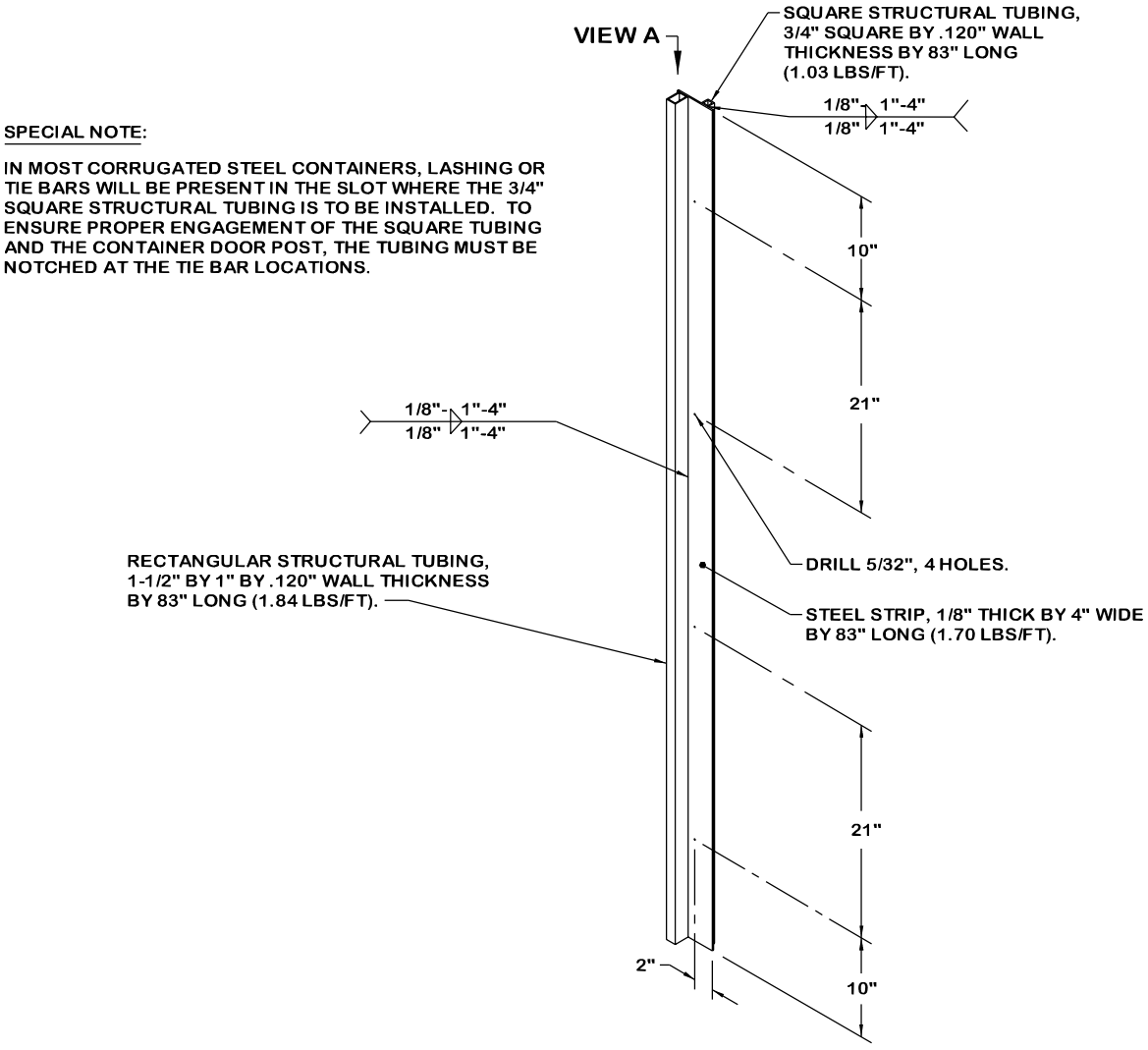


DETAIL B

A PARTIAL PLAN VIEW OF THE LEFT REAR PORTION OF THE CONTAINER IS SHOWN DEPICTING THE PROPER POSITION OF THE DOOR POST VERTICAL RETAINER AND ADJACENT DUNNAGE PIECES.



VIEW A



SPECIAL NOTE:

IN MOST CORRUGATED STEEL CONTAINERS, LASHING OR TIE BARS WILL BE PRESENT IN THE SLOT WHERE THE 3/4" SQUARE STRUCTURAL TUBING IS TO BE INSTALLED. TO ENSURE PROPER ENGAGEMENT OF THE SQUARE TUBING AND THE CONTAINER DOOR POST, THE TUBING MUST BE NOTCHED AT THE TIE BAR LOCATIONS.

DOOR POST VERTICAL RETAINER

NOTE: THE ABOVE ASSEMBLY HAS BEEN SHOWN ROTATED 90° FROM THE ORIENTATION IN WHICH IT IS INSTALLED IN THE LEFT REAR CORNER OF THE CONTAINER. THE ASSEMBLY HAS BEEN ROTATED FOR HOLE LOCATION CLARITY.