

# LOADING AND BRACING<sup>⊕</sup> IN END OPENING ISO CONTAINERS OF 105MM M1, M67, M84 OR M327 CARTRIDGES PACKED IN M152 CYLINDRICAL METAL CONTAINERS, PALLETIZED

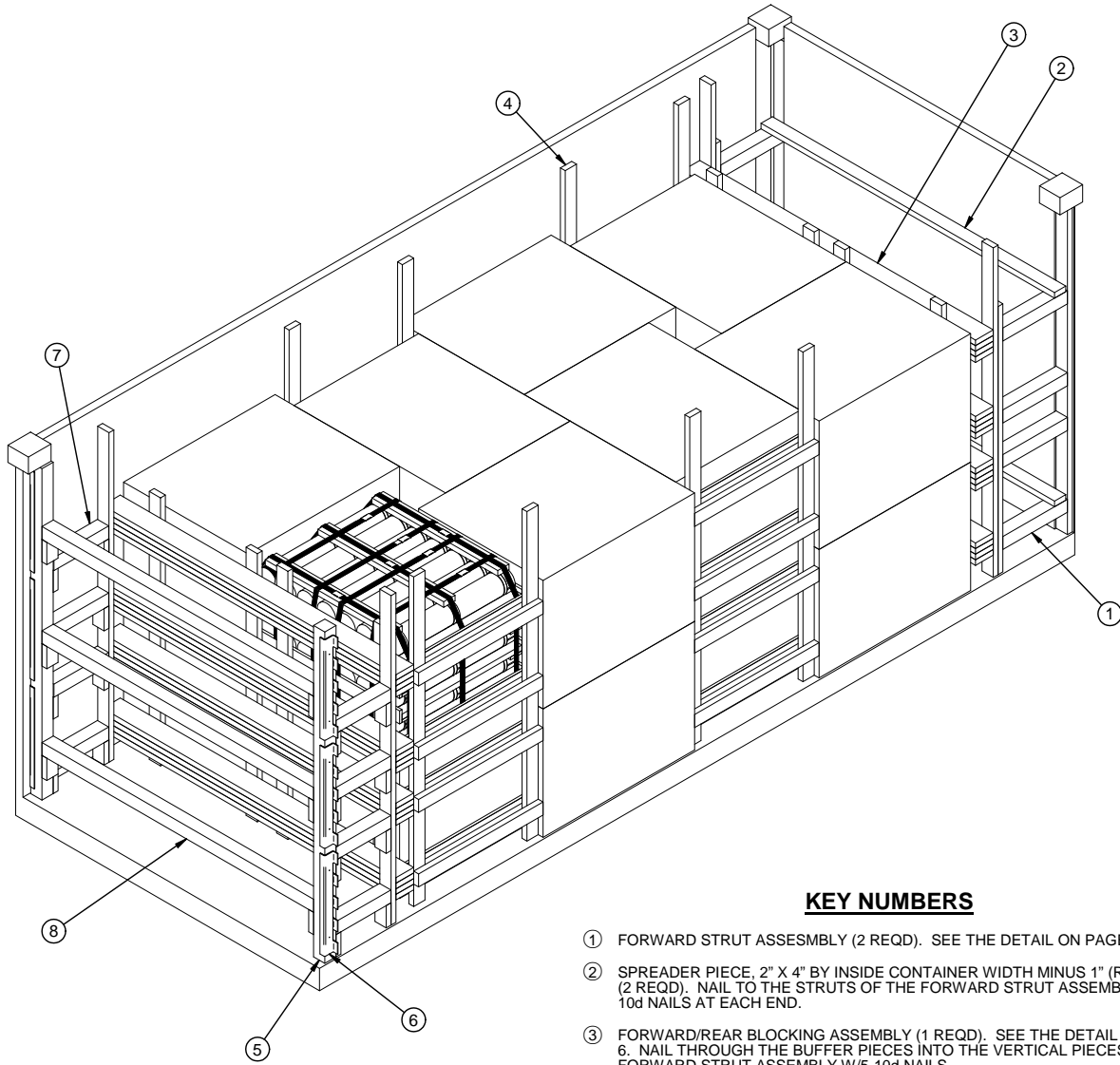
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<sup>⊕</sup> THE PROCEDURES SHOWN HEREIN ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL, MOTOR, OR WATER CARRIERS.

## U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND		<b>CAUTION: VERIFY PRIOR TO USE AT WWW.DAC.ARMY.MIL THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 10</b>			
RUS.ALLEN.J .1230354282	Digitally signed by RUS.ALLEN.J.1230354282 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=RUS.ALLEN.J.1230354282 Date: 2012.10.24 11:38:02 -05'00'	DO NOT SCALE		<b>JUNE 1986</b>	
		ENGINEER OR TECHNICIAN	BASIC REV.		
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND		TRANSPORTATION ENGINEERING DIVISION	FIEFFER.LAUR A.A.1230375727	REVISION NO. 1	
SHIMP.UPTON .R.1231257183		VALIDATION ENGINEERING DIVISION	BARICKMAN, PHILIP.W.12 30202202	FEBRUARY 2012	
U.S. ARMY DEFENSE AMMUNITION CENTER		ENGINEERING DIRECTORATE	BEAVER.JERRY .W.1230949952	SEE THE REVISION LISTING ON PAGE 3	
				CLASS	DIVISION
				DRAWING	FILE
				19	48
				4215/4	15PM1013



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① FORWARD STRUT ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 8.
- ② SPREADER PIECE, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-7") (2 REQD). NAIL TO THE STRUTS OF THE FORWARD STRUT ASSEMBLIES W/2-10d NAILS AT EACH END.
- ③ FORWARD/REAR BLOCKING ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 6. NAIL THROUGH THE BUFFER PIECES INTO THE VERTICAL PIECES OF THE FORWARD STRUT ASSEMBLY W/5-10d NAILS.
- ④ SIDE FILL ASSEMBLY B (4 REQD). SEE THE DETAIL ON PAGE 7.
- ⑤ DOOR POST VERTICAL (2 REQD). SEE THE DETAIL ON PAGE 8, "DETAIL A" ON PAGE 9, AND GENERAL NOTE "Q" ON PAGE 3.
- ⑥ UNIVERSAL LOAD RETAINER (6 REQD, 3 PER SIDE). NAIL THROUGH THE HOLES INTO THE DOOR POST VERTICAL W/2-10d NAILS. SEE DEPARTMENT OF ARMY DRAWING DA-116, "DETAIL A" ON PAGE 9, AND GENERAL NOTE "Q" ON PAGE 3.
- ⑦ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 17") (8 REQD). TOENAIL TO THE BUFFER PIECES OF THE REAR BLOCKING ASSEMBLY AND THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 9.
- ⑧ DOOR SPANNER, 4" X 4" MATERIAL CUT TO A LENGTH THAT WILL PROVIDE A DRIVE FIT (REF: 7'-1-1/4") (3 REQD). TOENAIL TO THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 9.

**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	52	18
2" X 4"	199	133
2" X 6"	243	243
4" X 4"	47	62
NAILS	NO. REQD	POUNDS
10d (3")	548	8-1/2
12d (3-1/4")	76	1-1/4
UNIVERSAL LOAD RETAINER	6 REQD	39 LBS

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	16	34,352 LBS
DUNNAGE		917 LBS
CONTAINER		6,050 LBS
<b>TOTAL WEIGHT</b>		<b>41,319 LBS (APPROX)</b>

## 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 105MM M1, M67, M84 OR M327 CARTRIDGES PACKED IN M152 SERIES METAL CONTAINERS. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT WITH AMMUNITION ITEMS. SEE PAGE 4 AND AMC DRAWING 19-48-4079/4-20PM1002 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 BEARING PIECES ON THE SIDE FILL ASSEMBLIES. NAIL EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS AND/OR QUANTITY OF THE VERTICAL OR HORIZONTAL PIECES IN THE SIDE FILL ASSEMBLIES MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE SIZE OF THE PALLET UNIT.
- E. THIS DRAWING DEPICTS AN 8-PALLET UNIT MAXIMUM CONFIGURATION, WITH A LADING WEIGHT OF 41,319 POUNDS. DUE TO RESTRICTIONS ENACTED BY THE SURFACE DEPLOYMENT AND DISTRIBUTION COMMAND AND THE JOINT MUNITIONS COMMAND, ANY ISO CONTAINER DESTINED TO BE MOVED OVER CONUS HIGHWAYS CAN NOT EXCEED 40,000 POUNDS GROSS WEIGHT. IN ORDER TO COMPLY WITH THIS RESTRICTION, ONE PALLET UNIT MUST BE ELIMINATED FROM THE 8-PALLET UNIT MAXIMUM LOAD. THIS WILL RESULT IN A 7-PALLET UNIT LOAD WITH A GROSS WEIGHT OF 39,230 POUNDS. SEE THE "LESS-THAN-FULL" LOAD PROCEDURES ON PAGE 10 FOR DETAILS.
- 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 OR FORWARD STRUT 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 RIGHT)

## (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 LOADS ON PAGES 2 AND 4 MAY BE REDUCED FOR SHIPMENT, IF DESIRED. SEE THE "LESS-THAN-FULL-LOAD PROCEDURES" ON PAGE 10.
1. IF A LOAD IS REDUCED BY ONLY A SMALL AMOUNT (ONE, TWO OR THREE LADING UNITS), LADING UNITS NORMALLY MAY BE ELIMINATED FROM THE CENTER OF THE LOAD.
  2. IF A LOAD IS REDUCED BY A LARGE AMOUNT (MORE THAN THREE 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.
- Q. SIX UNIVERSAL LOAD RETAINERS, AS DEPICTED IN THE LOADS ON PAGES 2, 4 AND 10, ARE REQUIRED WHEN LOADING TWO HIGH LOADS, AND FOUR ARE REQUIRED WHEN LOADING ONE HIGH LOADS. REFER TO DAC DRAWING ACV00682 FOR DETAILS OF THE UNIVERSAL LOAD RETAINER CONSTRUCTION, AND TO DEPARTMENT OF THE ARMY DRAWING DA-116 FOR DETAILS FOR INSTALLATION TO THE DOOR POST VERTICAL, PLACEMENT INTO THE CONTAINER, AND FOR OTHER METHODS OF REAR-OF-LOAD RESTRAINT.
- R. 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.

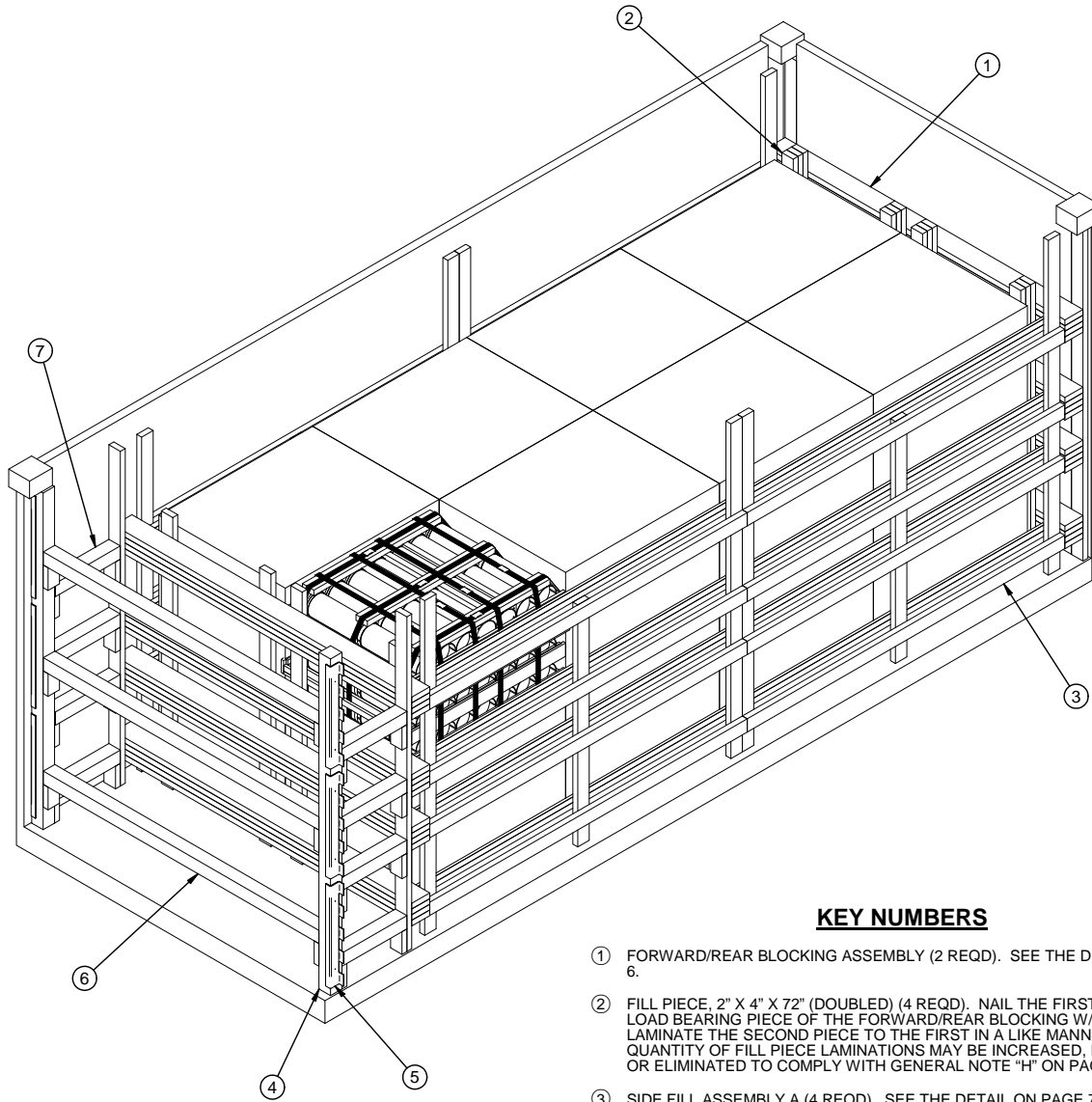
## MATERIAL SPECIFICATIONS

<u>LUMBER</u> - - - - -	:: SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.
<u>NAILS</u> - - - - -	:: ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMMS).
<u>WIRE, CARBON STEEL</u> - - - - -	:: ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, 0.0800" DIA, GRADE 1006 OR BETTER.
<u>STEEL, STRUCTURAL</u> - - - - -	:: ASTM A36; 36,000 PSI MINIMUM YIELD OR BETTER.

## REVISION

REVISION NO. 1, DATED JANUARY 2012, CONSISTS OF:

1. UPDATING DRAWING FORMAT
2. ADDING CHIMNEYED LOADING PROCEDURE



**ISOMETRIC VIEW**

**KEY NUMBERS**

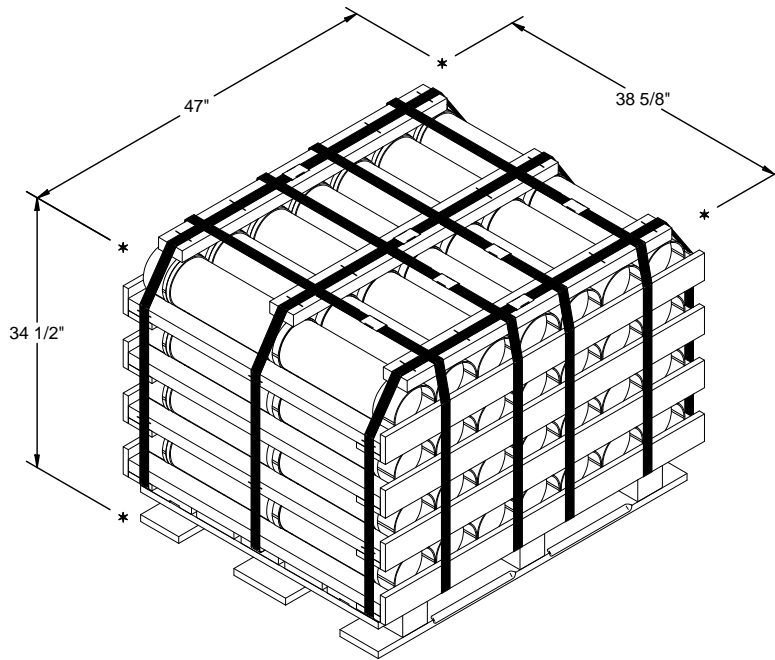
- ① FORWARD/REAR BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 6.
- ② FILL PIECE, 2" X 4" X 72" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE LOAD BEARING PIECE OF THE FORWARD/REAR BLOCKING W/6-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER. THE QUANTITY OF FILL PIECE LAMINATIONS MAY BE INCREASED, DECREASED OR ELIMINATED TO COMPLY WITH GENERAL NOTE "H" ON PAGE 3.
- ③ SIDE FILL ASSEMBLY A (4 REQD). SEE THE DETAIL ON PAGE 7.
- ④ DOOR POST VERTICAL (2 REQD). SEE THE DETAIL ON PAGE 8, "DETAIL A" ON PAGE 9, AND GENERAL NOTE "Q" ON PAGE 3.
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- ⑦ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 22") (8 REQD). TOENAIL TO THE BUFFER PIECES OF THE REAR BLOCKING ASSEMBLY AND THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 9.

**BI LL OF MATERIAL**

LUMBER	LI NEAR FEET	BOARD FEET
1" X 4"	65	22
2" X 4"	500	333
2" X 6"	243	243
4" X 4"	37	49
NAI LS	NO. REQD	POUNDS
6d (2")	128	3/4
10d (3")	796	12-1/4
12d (3-1/4")	44	3/4
UNI VERSAL LOAD RETAI NER	6 REQD	39 LBS

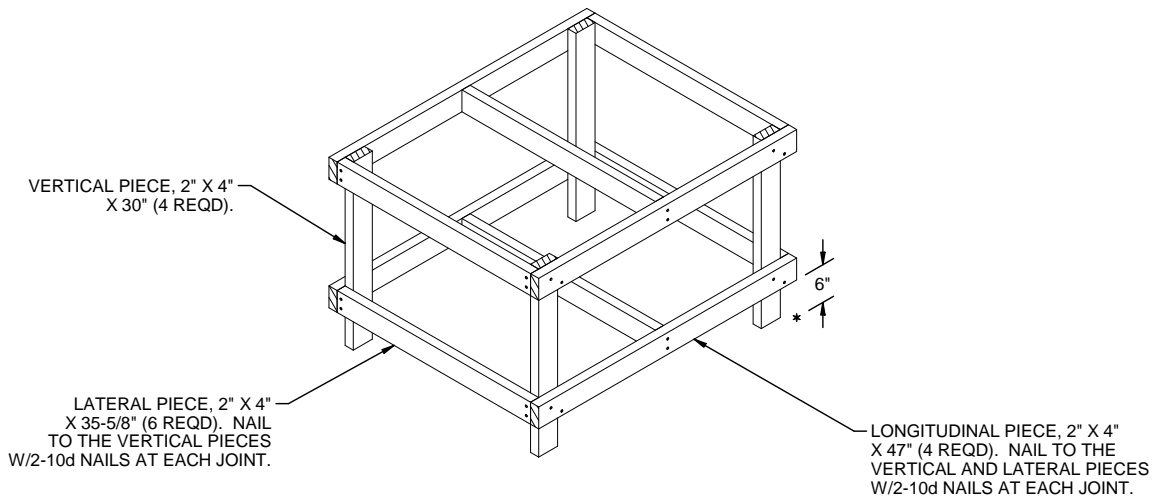
**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNI T	16	34,352 LBS
DUNNAGE		1,304 LBS
CONTAI NER		6,050 LBS
<b>TOTAL WEIGHT</b>		<b>41,706 LBS (APPROX)</b>



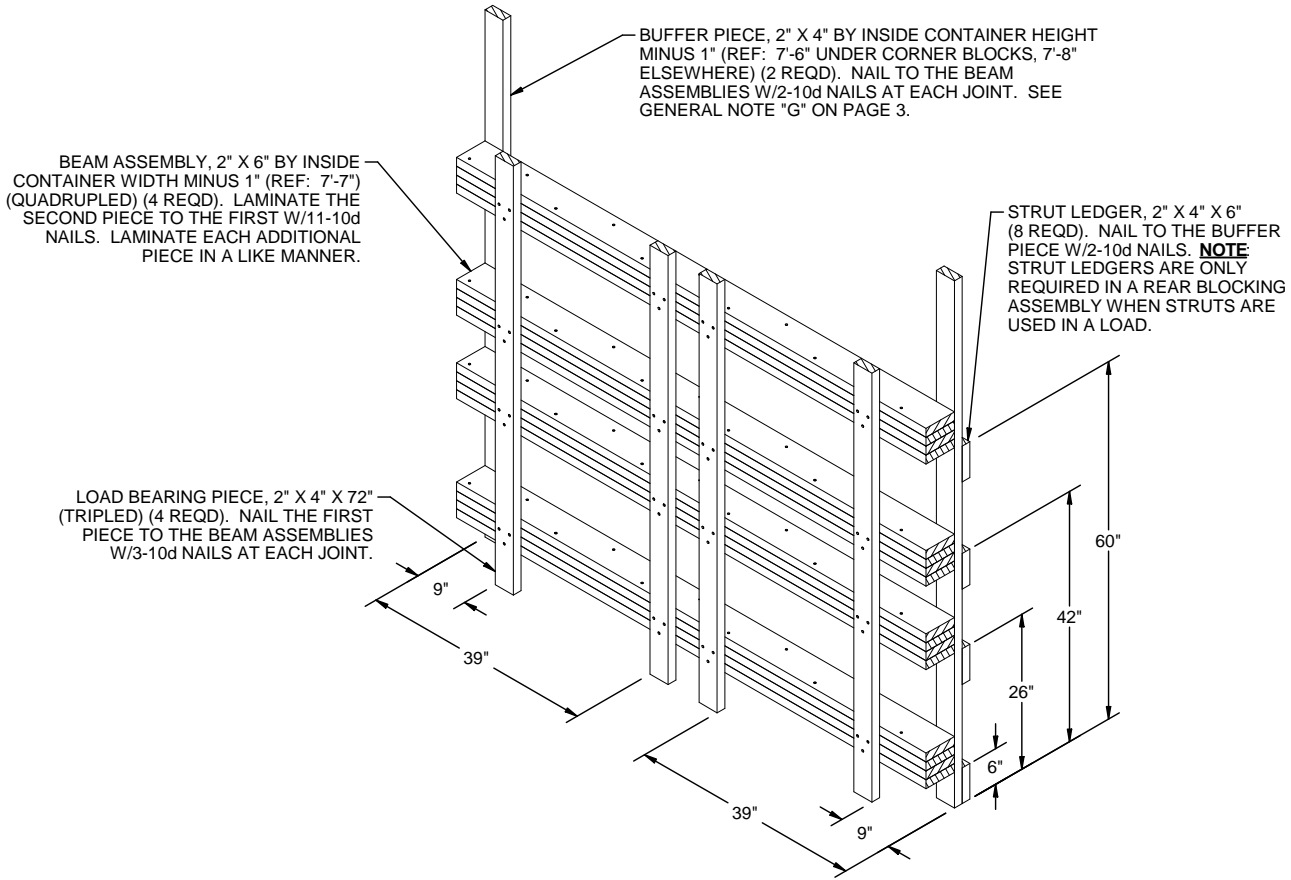
**PALLET UNIT DATA**

GROSS WEIGHT - - - - - 2,147 LBS  
 CUBE - - - - - 36.2 CU FT



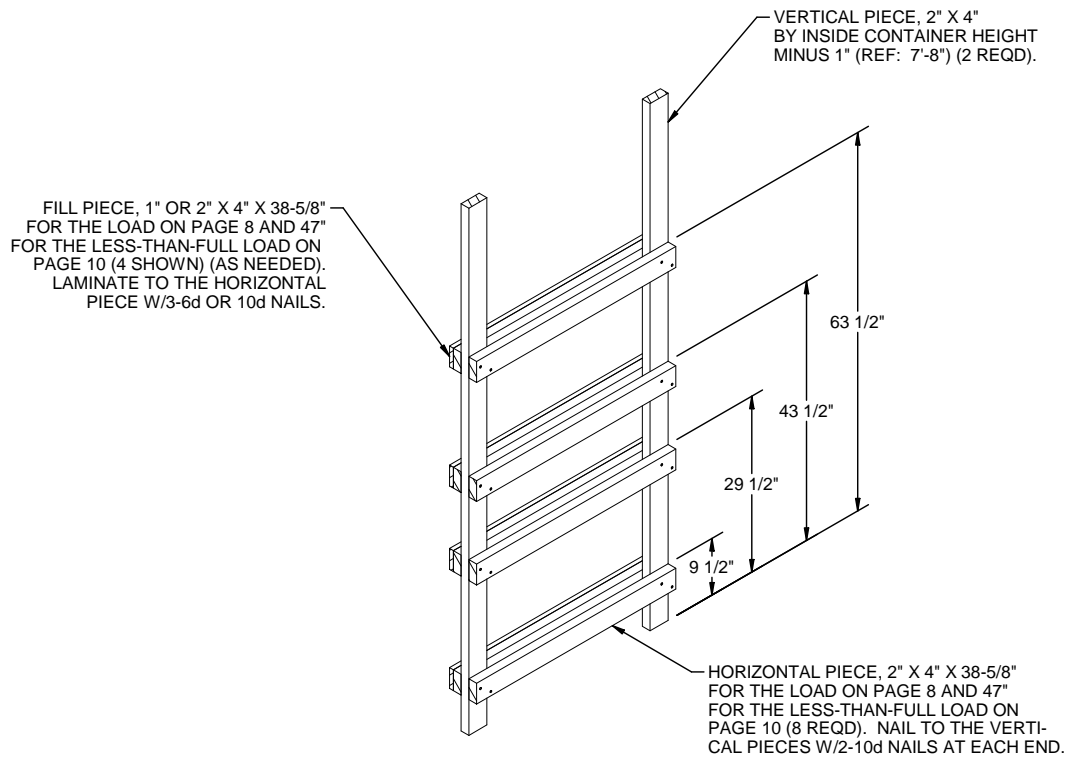
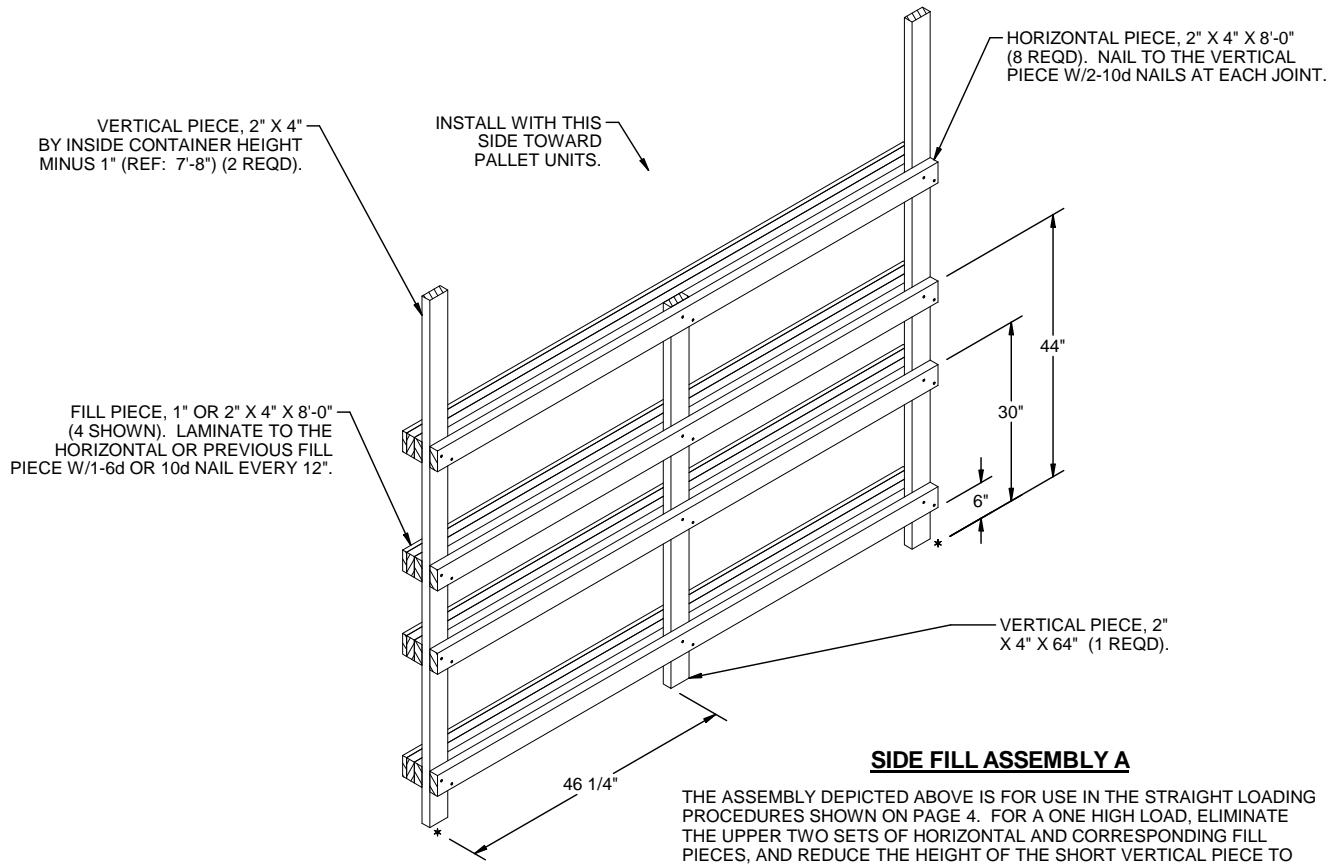
**FILLER ASSEMBLY**

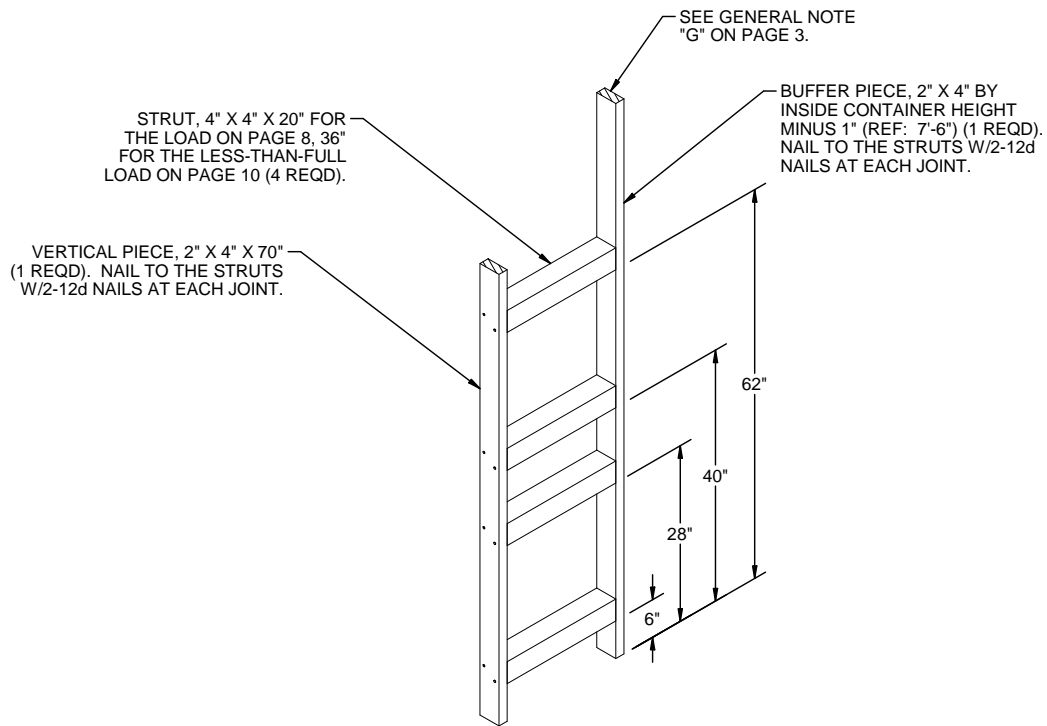
THE ASSEMBY DEPICTED ABOVE IS FOR USE IN PLACE OF AN OMITTED PALLET UNIT. FILLER ASSEMBLIES MUST BE WIRE TIED TO AN ADJACENT PALLET UNIT STRAP OR SIDE FILL ASSEMBLY TO PREVENT UNDUE MOVEMENT. NO MORE THAN THREE FILLER ASSEMBLIES WILL BE USED IN ANY TWO HIGH LOAD, AND NO MORE THAN ONE IN A ONE HIGH LOAD.



**FORWARD/REAR BLOCKING ASSEMBLY**

FOR A ONE HIGH LOAD, ELIMINATE THE TWO UPPER BEAM ASSEMBLIES AND REDUCE THE HEIGHT OF THE LOAD BEARING PIECES TO 38".

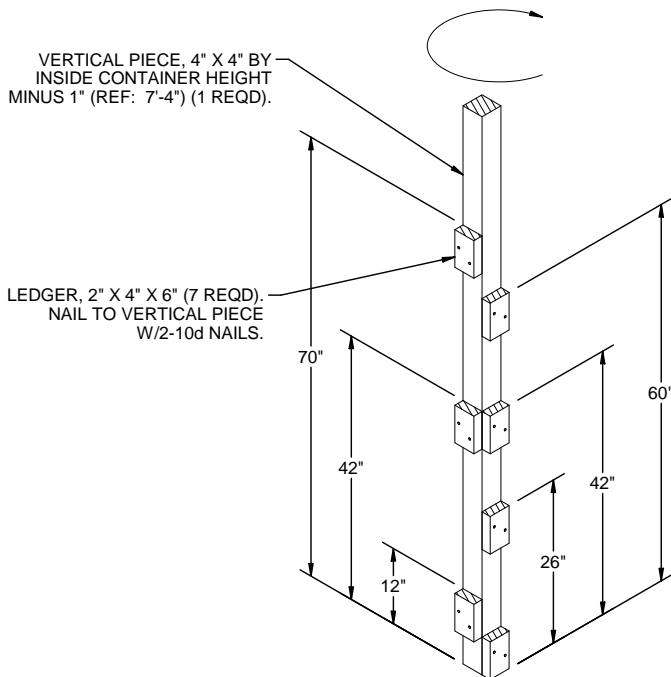




**FORWARD STRUT ASSEMBLY**

FOR A ONE HIGH LOAD, ELIMINATE THE TWO UPPER STRUTS AND REDUCE THE HEIGHT OF THE VERTICAL PIECE TO 38".

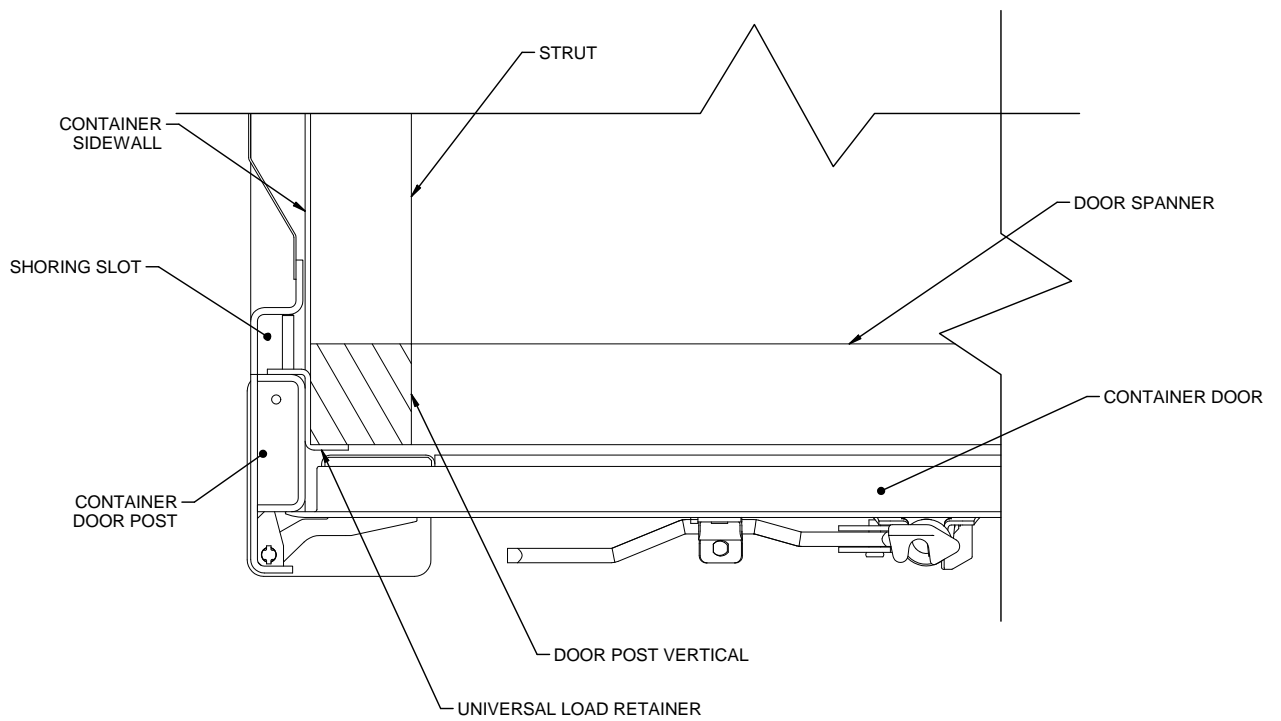
ROTATED 90° FROM THE ISOMETRIC VIEWS ON PAGES 2, 8 AND 10



**DOOR POST VERTICAL**

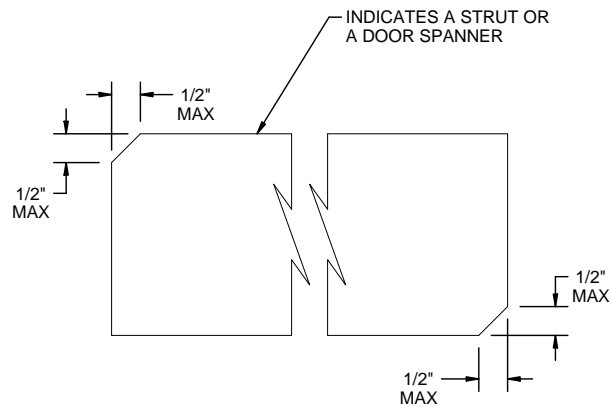
FOR A ONE HIGH LOAD, ELIMINATE THE UPPER TWO STRUT LEDGERS AND THE UPPER DOOR SPANNER LEDGER, AND REPOSITION THE MIDDLE DOOR SPANNER LEDGER AT 39".





**DETAIL A**

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.

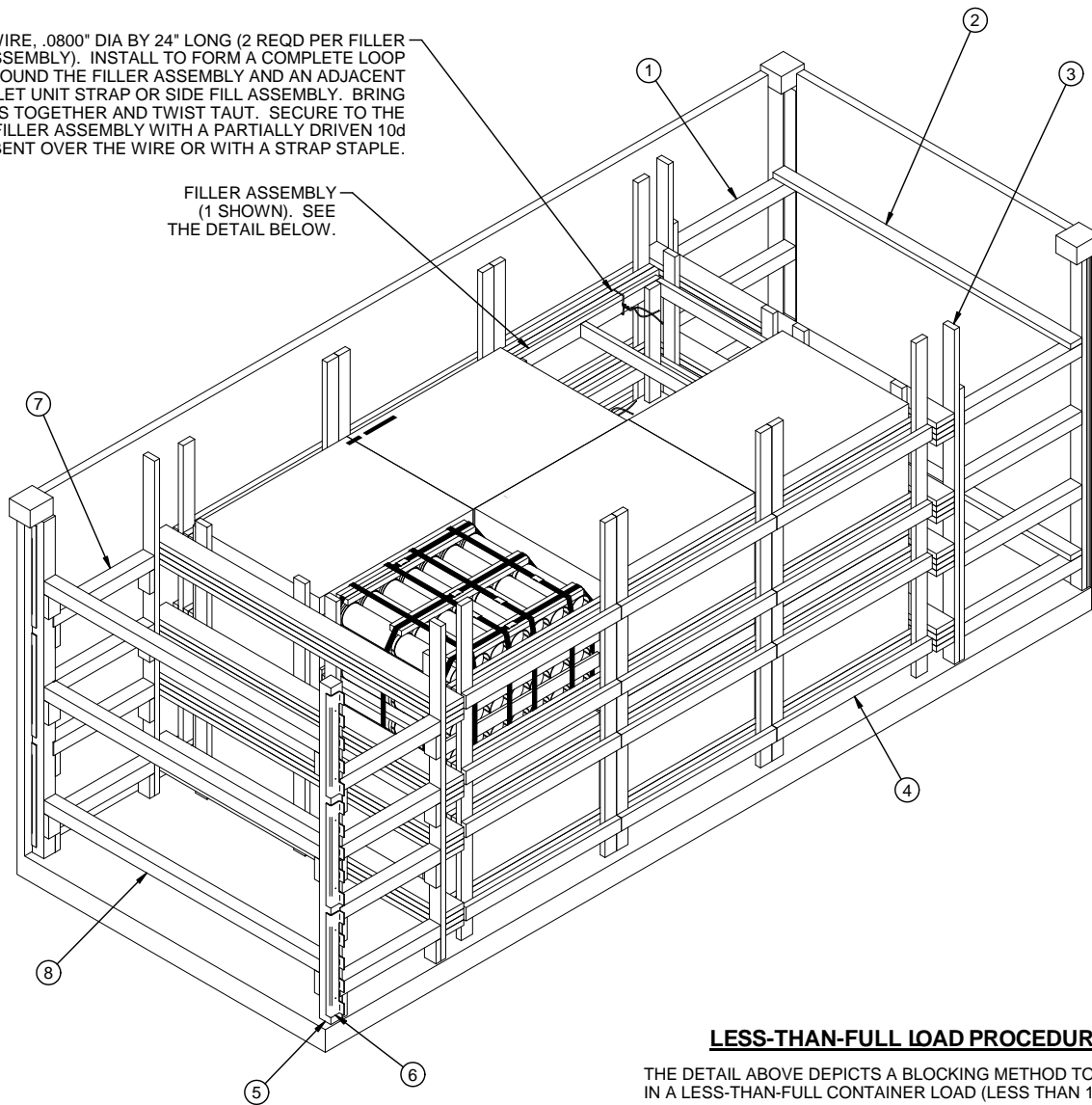


**BEVEL CUT**

IF DESIRED, EACH END OF A STRUT MAY BE BEVEL-CUT AS SHOWN ABOVE TO FACILITATE INSTALLING THE STRUTS WITH A "DRIVE" FIT.

TIE WIRE, .0800" DIA BY 24" LONG (2 REQD PER FILLER ASSEMBLY). INSTALL TO FORM A COMPLETE LOOP AROUND THE FILLER ASSEMBLY AND AN ADJACENT PALLET UNIT STRAP OR SIDE FILL ASSEMBLY. BRING ENDS TOGETHER AND TWIST TAUT. SECURE TO THE FILLER ASSEMBLY WITH A PARTIALLY DRIVEN 10d NAIL BENT OVER THE WIRE OR WITH A STRAP STAPLE.

FILLER ASSEMBLY (1 SHOWN). SEE THE DETAIL BELOW.



**ISOMETRIC VIEW**

**LESS-THAN-FULL LOAD PROCEDURES**

THE DETAIL ABOVE DEPICTS A BLOCKING METHOD TO BE USED IN A LESS-THAN-FULL CONTAINER LOAD (LESS THAN 16 UNITS). KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 2. SEE GENERAL NOTES "H" AND "P" ON PAGE 3.