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# LOADING AND BRACING<sup>⊕</sup> IN SIDE OPENING ISO CONTAINERS OF 90MM M71 CARTRIDGE, PACKED IN M159 CYLINDRICAL METAL CON- TAINERS, PALLETIZED

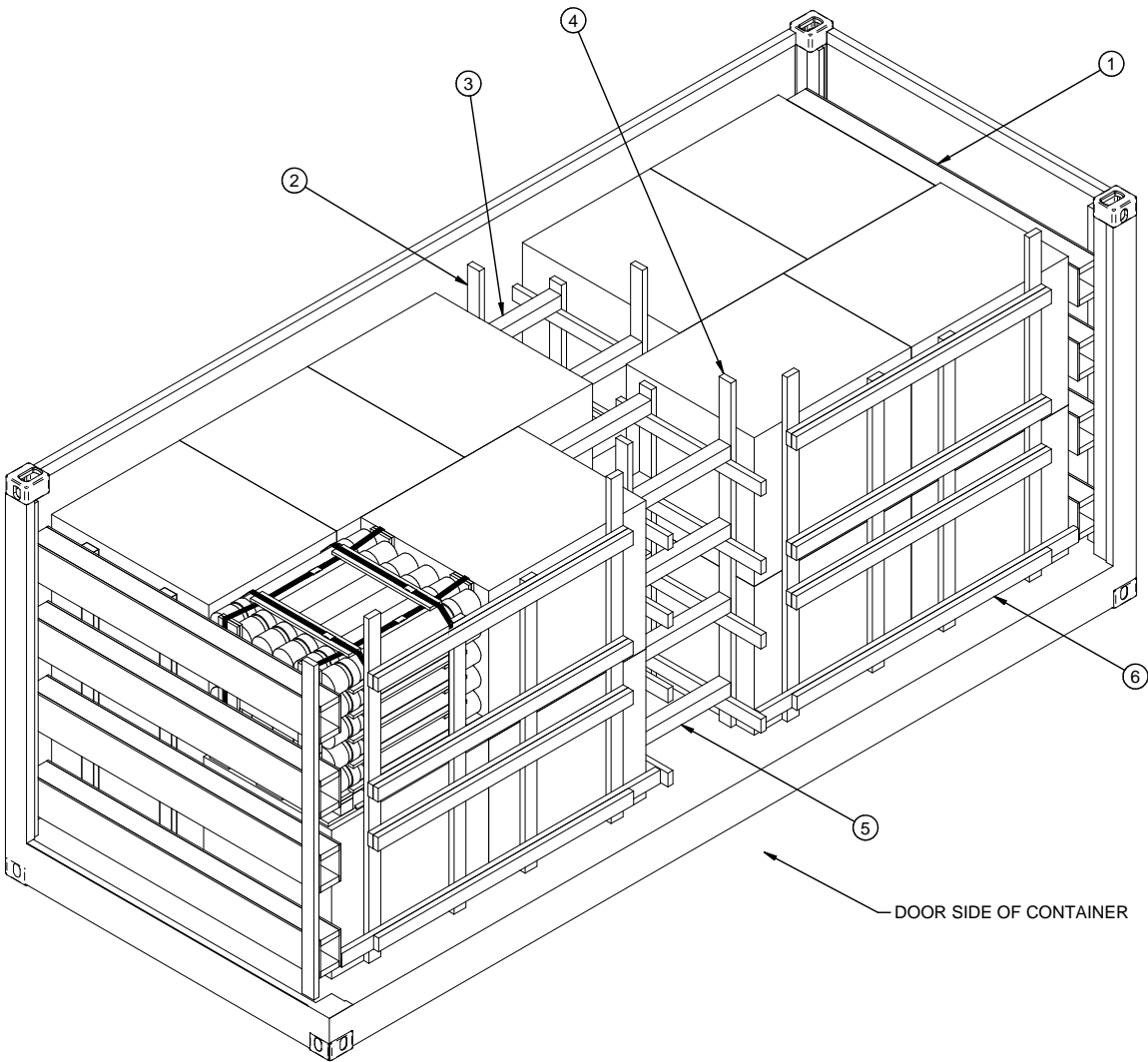
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⊕ THE PROCEDURES SHOWN HEREIN ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL, MOTOR, OR WATER CARRIERS.

## U.S. ARMY MATERIEL COMMAND DRAWING

<p>APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND</p> <p>RUS.ALLEN.J .1230354282</p> <small>Digitally signed by RUS.ALLEN.J.1230354282 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=RUS.ALLEN.J.1230354282 Date: 2010.09.28 09:30:40 -05'00'</small>		<p><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 8.</b></p>			
		<p><b>DO NOT SCALE</b></p>		<p><b>AUGUST 2010</b></p>	
<p>ENGINEER OR TECHNICIAN</p>		<p>BASIC REV.</p>	<p>CANH TRAN</p>		
<p>APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND</p> <p>CARNEY.GARY.BURTON.1038708038</p> <small>Digitally signed by CARNEY.GARY.BURTON.1038708038 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=CARNEY.GARY.BURTON.1038708038 Date: 2010.10.08 07:07:00 -05'00'</small>		<p>TRANSPORTATION ENGINEERING DIVISION</p>	<p>FIEFFER.LAUR A.A.1230375727</p> <small>Digitally signed by FIEFFER.LAURA.A.1230375727 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=FIEFFER.LAURA.A.1230375727 Date: 2010.08.09 10:46:24 -05'00'</small>		
		<p>VALIDATION ENGINEERING DIVISION</p>	<p>BARICKMAN, PHILIP.W.123 0202202</p> <small>Digitally signed by BARICKMAN.PHILIP.W.1230202202 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=BARICKMAN.PHILIP.W.1230202202 Date: 2010.08.12 10:58:59 -05'00'</small>	<p>TESTED</p>	<p>CLASS</p>
<p>U.S. ARMY DEFENSE AMMUNITION CENTER</p>		<p>ENGINEERING DIRECTORATE</p>	<p>BEAVER.JERRY W.1230949952</p> <small>Digitally signed by BEAVER.JERRY.W.1230949952 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=BEAVER.JERRY.W.1230949952 Date: 2010.09.07 08:30:17 -05'00'</small>	<p>DIVISION</p>	<p>DRAWING</p>
			<p>19</p>	<p>48</p>	<p>4265/3</p>
					<p>FILE</p>
					<p>15PM1014</p>



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① END BLOCKING ASSEMBLY (2 REQD, ONE RIGHT HAND AND ONE LEFT HAND). SEE DETAIL ON PAGE 5.
- ② CENTER GATE A (2 REQD). SEE THE DETAIL ON PAGE 6.
- ③ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 23-1/2") (8 REQD). TOENAIL TO THE CENTER GATES W/2-12d NAILS AT EACH END. SEE THE "BEVEL CUT" DETAIL ON PAGE 4.
- ④ CENTER GATE B (2 REQD). SEE THE DETAIL ON PAGE 6.
- ⑤ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 29-3/4") (8 REQD). TOENAIL TO THE CENTER GATES W/2-12d NAILS AT EACH END. SEE THE "BEVEL CUT" DETAIL ON PAGE 4.
- ⑥ SIDE FILL ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.

**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	326	217
2" X 6"	116	116
4" X 4"	36	47
NAI LS	NO. REQD	POUNDS
6d (2")	320	1.88
10d (3")	284	4.37
12d (3-1/4")	64	1.07
PLYWOOD, 1/2" --- 91.57 SQ FT REQD		126 LBS

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	18	39,168 LBS
DUNNAGE		894 LBS
CONTAINER		6,500 LBS
<b>TOTAL WEIGHT</b>		<b>46,562 LBS</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 90MM CARTRIDGES PACKED IN M159 CYLINDRICAL METAL CONTAINERS, UNITIZED ON A WOODEN PALLET. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT WITH AMMUNITION ITEMS. SEE PAGE 4 AND AMC DRAWING 19-48-4079/3-20PM1002 FOR DETAILS OF THE PALLET UNIT. **CAUTION:** REGARDLESS OF THE QUANTITY OF CONTAINERS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE SIDE OPENING ISO CONTAINER MUST NOT BE EXCEEDED.
- C. THE LOAD AS SHOWN IS BASED ON A 6,500 POUND 20' LONG BY 8' WIDE BY 8'-6" HIGH SIDE OPENING ISO CONTAINER WITH INSIDE DIMENSIONS OF 19'-6-1/4" LONG BY 90" WIDE BY 89" HIGH, WITH A MAXIMUM GROSS WEIGHT OF 52,910 POUNDS. OLDER/OTHER CONTAINERS MAY HAVE DIFFERENT INSIDE MEASUREMENTS, VERIFY INSIDE CONTAINER DIMENSIONS 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 UNLOCKED 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 SIDE FILL ASSEMBLIES. NAIL EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS AND/OR QUANTITY OF THE HORIZONTAL PIECES IN THE SIDE 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 BE-SIDE A NAIL IN A LOWER PIECE.
- G. IN SOME CONTAINERS THERE IS A SLOT AT THE CORNERS OF THE ENDWALL. PIECES OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE END BLOCKING ASSEMBLIES 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 ENDWALLS, 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.
- 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.

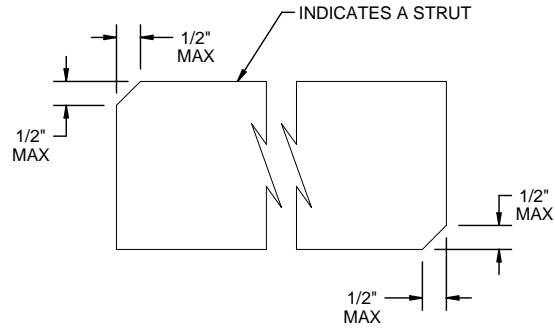
(CONTINUED AT RIGHT)

## (GENERAL NOTES CONTINUED)

- 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 "LESS-THAN-FULL-LOAD PROCEDURE" ON PAGE 7.
1. 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.
  2. IF A LOAD IS REDUCED BY A LARGE AMOUNT (MORE THAN TWO LADING UNITS), LADING UNITS SHOULD BE ELIMINATED AS REQUIRED AND THE VOID IN THE LONGITUDINAL CENTER OF THE CONTAINER 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. LOAD-BLOCKING STRUTS WHICH ARE 48" OR LONGER MUST BE STIFFENED BY THE APPLICATION OF HORIZONTAL AND VERTICAL STRUT BRACING AS SHOWN IN THE "TYPICAL STRUT BRACING" DETAIL ON PAGE 73 OF DRAWING AMC 19-48-4267-15PA1009. BRACING IS NOT REQUIRED IF THE STRUTS FOR THE LOAD BEING SHIPPED ARE SHORTER THAN 48". THE LENGTH OF THE LOAD-BLOCKING STRUTS SHOULD BE KEPT AS SHORT AS POSSIBLE (APPROX 18" MINIMUM), BUT IN THE EVENT IT IS NECESSARY TO USE STRUTS WHICH ARE 8'-0" OR MORE IN LENGTH, IT WILL BE NECESSARY TO APPLY AN ADDITIONAL SET OF HORIZONTAL AND VERTICAL STRUT BRACING PIECES. STRUT BRACING SHOULD BE APPLIED SO AS TO PROVIDE NEARLY EQUAL SPACES BETWEEN THE BRACING PIECES AND THE CENTER GATES AND/OR BETWEEN ADJACENT STRUT BRACING PIECES. NOTE THAT HORIZONTAL STRUT BRACING PIECES FOR THE UPPER LEVEL OF STRUTS FOR ALL BUT THE UPPERMOST TIER OF A LOAD MAY BE DIFFICULT TO APPLY TO THE TOP SURFACES OF THE STRUT AS DEPICTED. STRUT BRACING WILL BE EQUALLY EFFECTIVE IF APPLIED TO THE UNDER SIDE OF THOSE STRUTS.
- R. RECOMMENDED SEQUENTIAL LOADING PROCEDURES:
1. PREFABRICATE TWO END BLOCKING ASSEMBLIES, TWO CENTER GATES "A", TWO CENTER GATES "B" AND TWO SIDE FILL ASSEMBLIES.
  2. INSTALL ONE END BLOCKING ASSEMBLY.
  3. LOAD FOUR PALLET UNITS.
  4. INSTALL ONE END BLOCKING ASSEMBLY.
  5. LOAD SIX PALLET UNITS.
  6. INSTALL THE CENTER GATES "A" AND EIGHT STRUTS.
  7. LOAD REMAINING EIGHT PALLET UNITS.
  8. INSTALL THE CENTER GATES "B" AND EIGHT STRUTS.
  9. INSTALL THE SIDE FILL ASSEMBLIES.

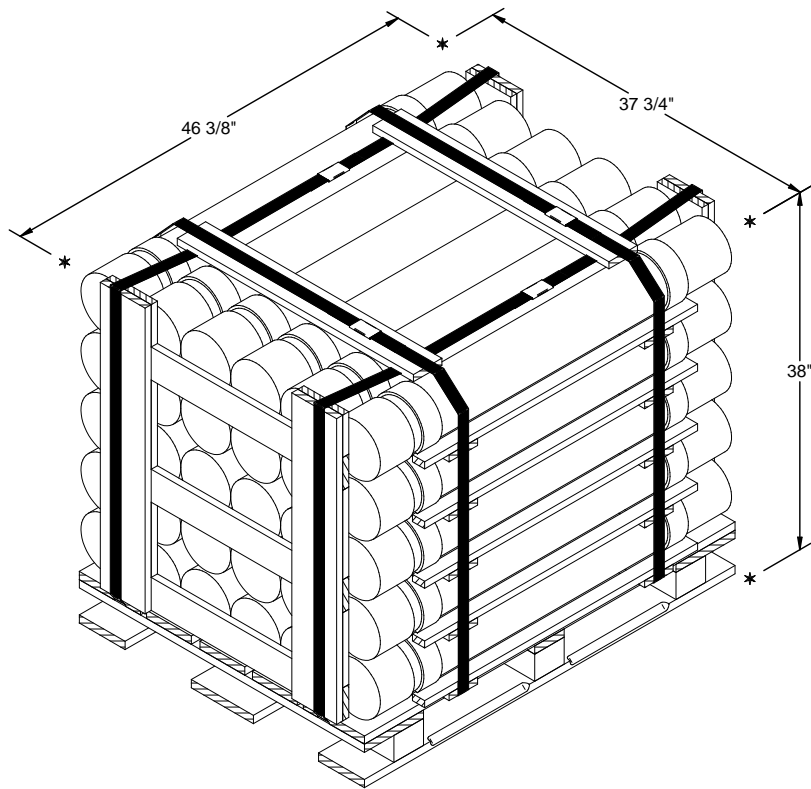
## MATERIAL SPECIFICATIONS

- 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.
- WIRE, CARBON STEEL** - : ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, 0.0800" DIA, GRADE 1006 OR BETTER.
- STAPLE** - - - - - : ASTM F1667; STFCs-189 OR STFCs-207, 15/16" OR 1" CROWN WIDTH X 3/4" LEG LENGTH FOR 3/4" STRAPPING, OR STFCs-224, 1-17/32" CROWN WIDTH X 3/4" LEG LENGTH FOR 1-1/4" STRAPPING.



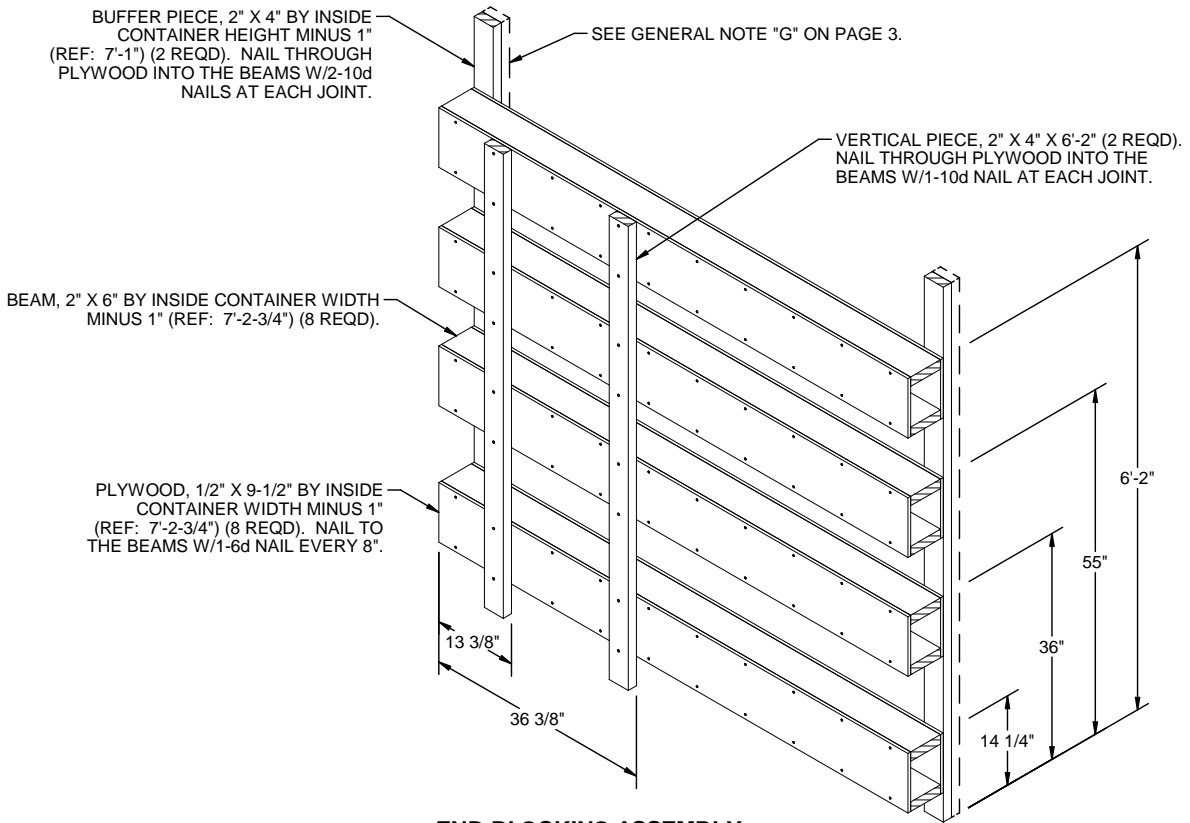
**BEVEL CUT**

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



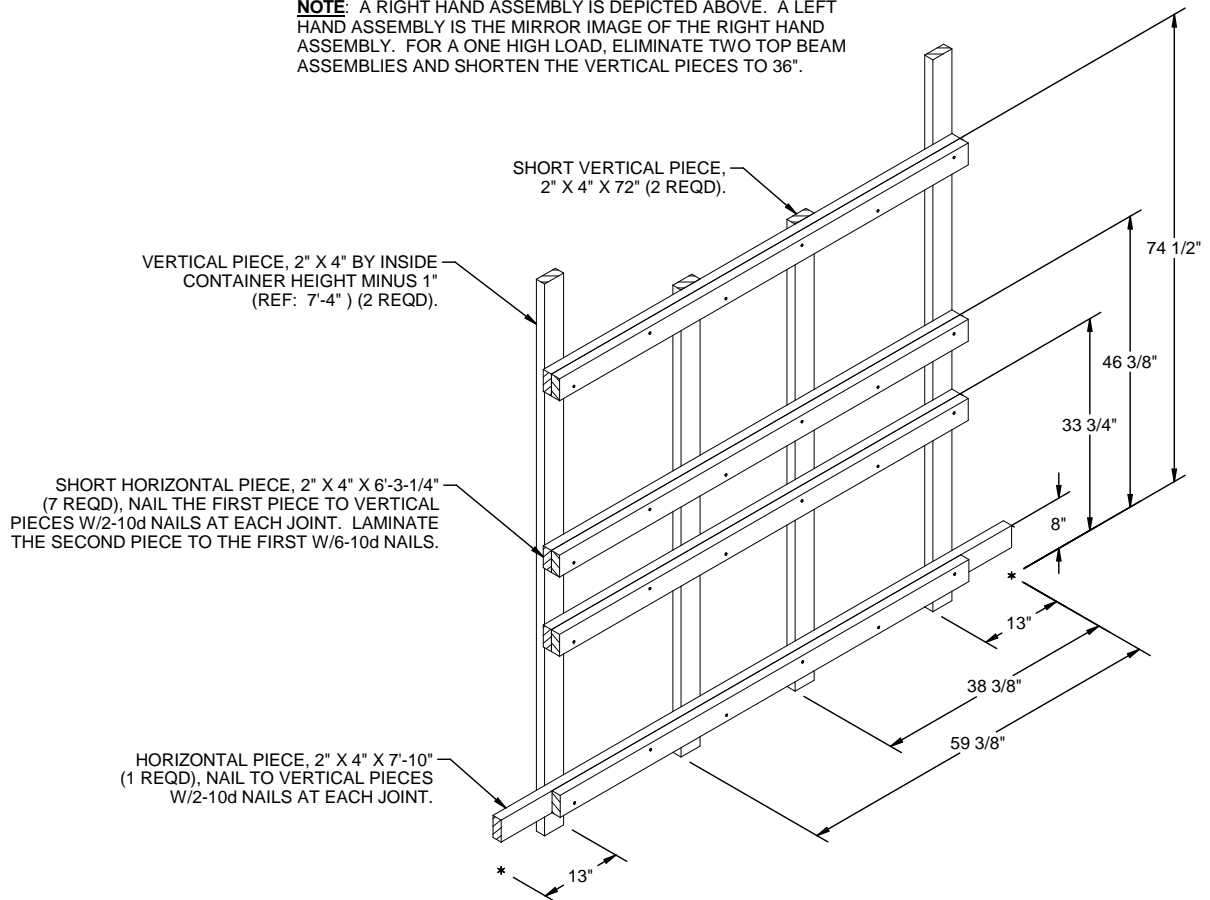
**PALLET UNIT DATA**

GROSS WEIGHT - - - - - 2,176 LBS (APPROX)  
 VOLUME - - - - - 38.5 CU FT (APPROX)



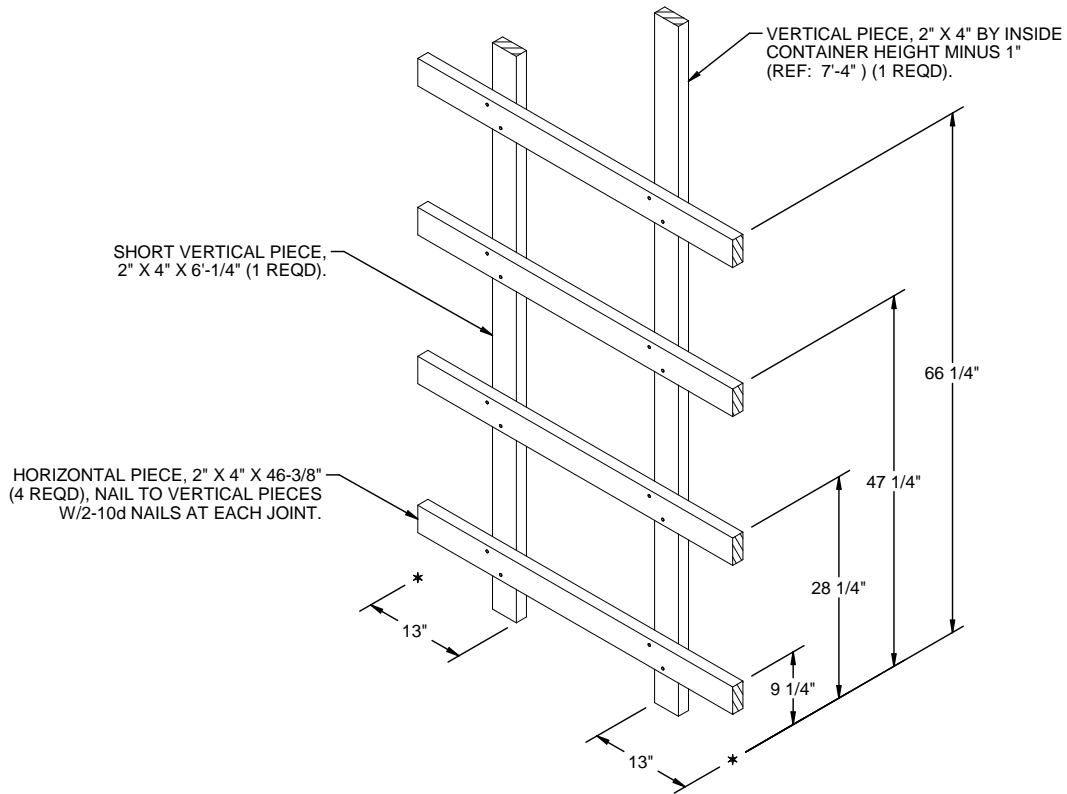
**END BLOCKING ASSEMBLY**

**NOTE:** A RIGHT HAND ASSEMBLY IS DEPICTED ABOVE. A LEFT HAND ASSEMBLY IS THE MIRROR IMAGE OF THE RIGHT HAND ASSEMBLY. FOR A ONE HIGH LOAD, ELIMINATE TWO TOP BEAM ASSEMBLIES AND SHORTEN THE VERTICAL PIECES TO 36".



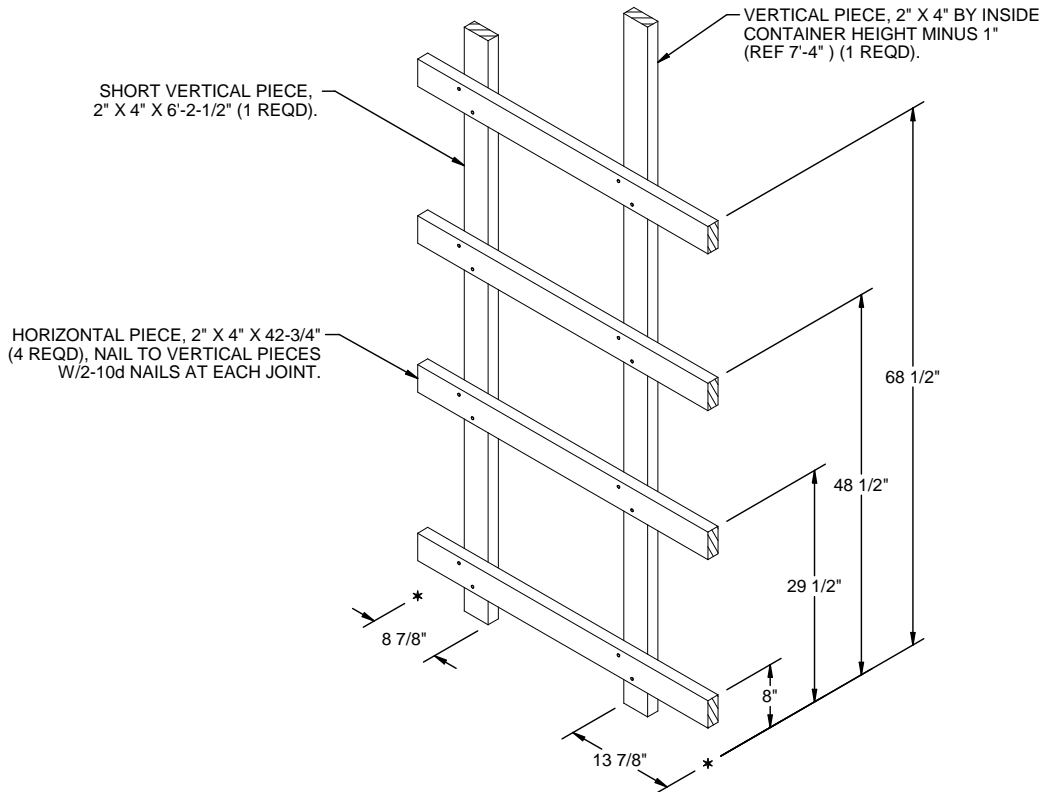
**SIDE FILL ASSEMBLY**

**NOTE:** FOR A ONE HIGH LOAD, ELIMINATE TWO TOP HORIZONTAL ASSEMBLIES AND SHORTEN THE SHORT VERTICAL PIECES TO 46-1/2".



**CENTER GATE A**

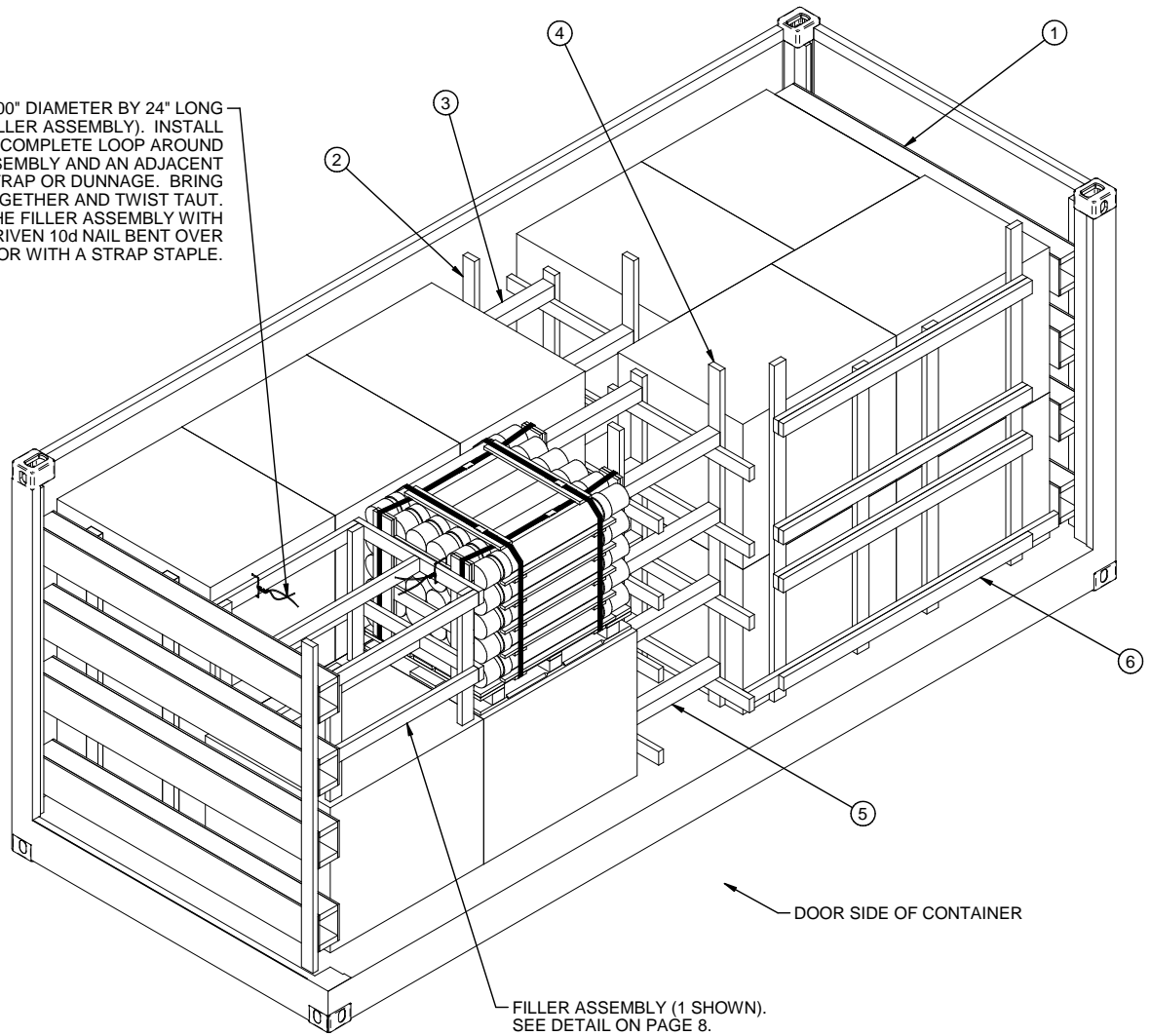
**NOTE:** FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND SHORTEN THE SHORT VERTICAL PIECE TO 34'-1/4".



**CENTER GATE B**

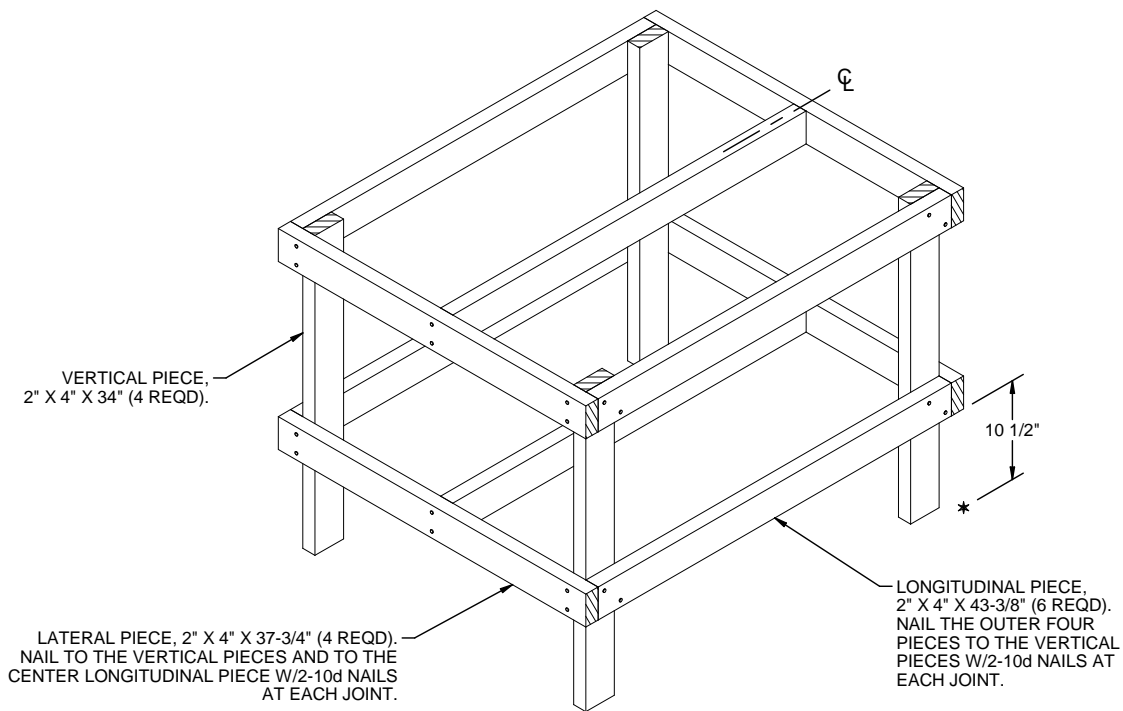
**NOTE:** A RIGHT HAND ASSEMBLY IS DEPICTED ABOVE. A LEFT HAND ASSEMBLY IS THE MIRROR IMAGE OF THE RIGHT HAND ASSEMBLY. FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND SHORTEN THE VERTICAL PIECES TO 35'-1/2".

TIE WIRE, 0.0800" DIAMETER 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 DUNNAGE. 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.



**LESS-THAN-FULL-LOAD PROCEDURE**

KEY NUMBERS REFER TO THE KEY NUMBERS ON PAGE 2.  
SEE GENERAL NOTES "H" AND "P" ON PAGE 3.



### **FILLER ASSEMBLY**

THE ASSEMBLY DEPICTED ABOVE IS FOR USE IN PLACE OF AN OMITTED PALLET UNIT. FILLER ASSEMBLIES MUST BE WIRE TIED TO ADJACENT PALLET UNITS TO PREVENT UNDUE MOVEMENT. NO MORE THAN TWO FILLER ASSEMBLIES MAY BE USED IN ANY LOAD. DO NOT INSTALL A FILLER ASSEMBLY IMMEDIATELY ADJACENT TO ANOTHER FILLER ASSEMBLY OR TO A CENTER GATE.