

# LOADING AND BRACING<sup>⊕</sup> IN SIDE OPENING ISO CONTAINERS OF MODULAR ARTILLERY CHARGE SYSTEM (MACS), M232 AND M232A1, PACKED IN PA103A2 CYLINDRICAL METAL CONTAINERS, ON WOODEN PALLETS WITH METAL TOP LIFT

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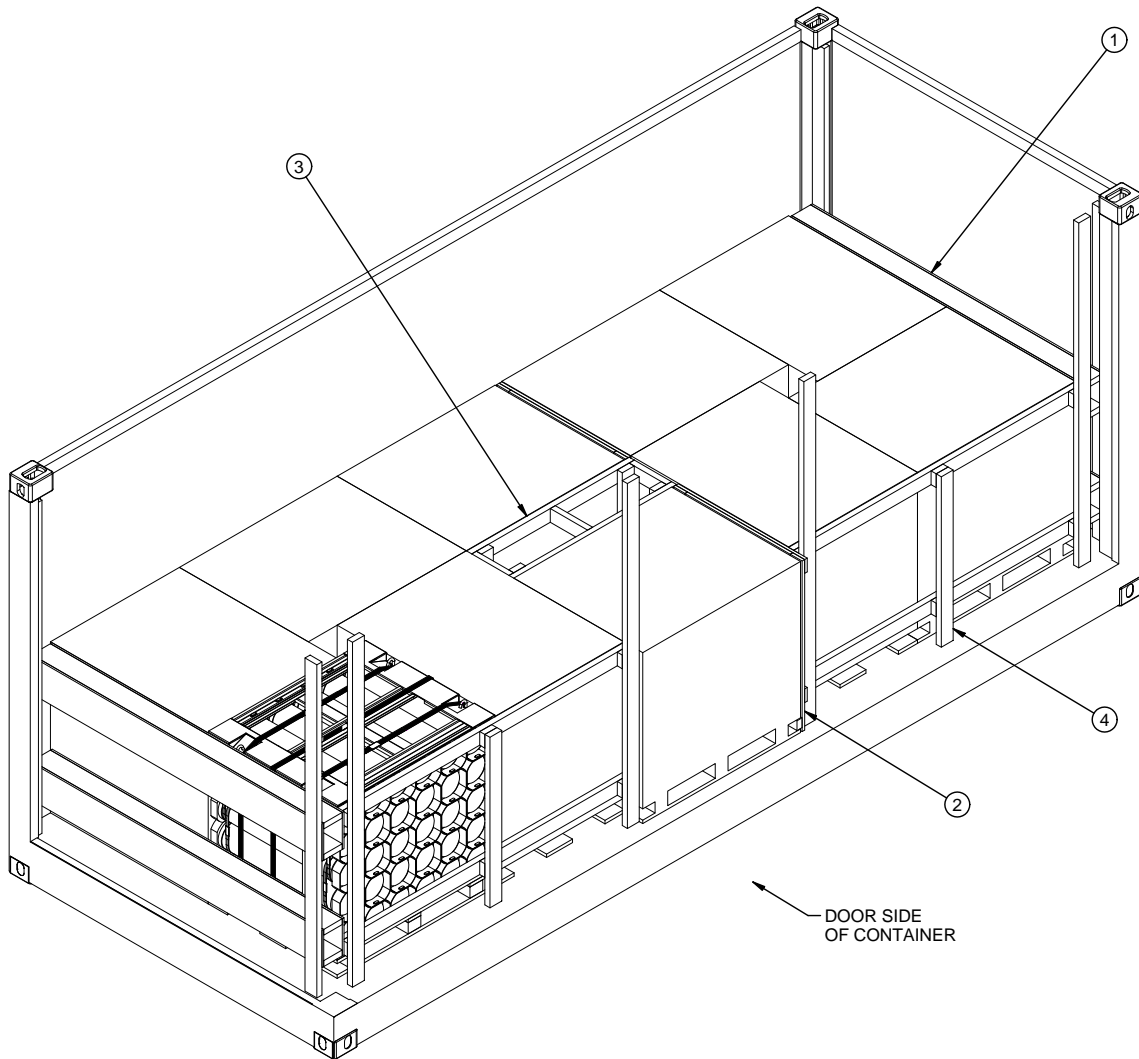
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⊕ THE PROCEDURES SHOWN HEREIN ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL, MOTOR, OR WATER CARRIERS.

## U.S. ARMY MATERIEL COMMAND DRAWING

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	<p>DESIGN ENGINEER</p>	<p>BASIC</p>	<p>CANH TRAN</p>			
<p>APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND</p>		<p>ENGINEERING DIVISION</p>	<p>FIEFFER.LAUR A.A.1230375727</p> <p><small>Digitally signed by FIEFFER.LAUR.A.1230375727 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cr=FIEFFER.LAUR.A.1230375727 Date: 2013.04.01 08:15:34 -0500</small></p>	<p>TESTED</p>		
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	<p>EXPLOSIVE SAFETY DIRECTORATE</p>	<p>WILLIAMS.KENY ON.L.1231212392</p> <p><small>Digitally signed by WILLIAMS.KENYON.L.1231212392 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cr=WILLIAMS.KENYON.L.1231212392 Date: 2013.04.29 12:55:25 -0500</small></p>	<p>19</p>	<p>48</p>	<p>4334/50A</p>	<p>15PM1025</p>



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① END BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.
- ② CENTER BLOCKING ASSEMBLY (2 REQD). INSTALL AS SHOWN, WITH THE HOLD DOWN PIECES AGAINST THE CENTER PALLET UNIT. SEE THE DETAIL ON PAGE 6.
- ③ CENTER FILL ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 6.
- ④ SIDE FILL ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.

**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	38	13
2" X 4"	138	92
2" X 6"	57	57
NAI LS	NO. REQD	POUNDS
6d (2")	196	1.15
10d (3")	128	1.97
PLYWOOD, 1/2" - - 45.39 SQ FT REQD - - 62.41 LBS		

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	10	18,350 LBS
DUNNAGE		389 LBS
CONTAINER		6,050 LBS
<b>TOTAL WEIGHT</b>		<b>24,789 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 UNLOADING PROCEDURES ARE APPLICABLE TO LOADS OF MODULAR ARTILLERY CHARGE SYSTEM (MACS), M232 AND M232A1, PACKED IN PA103A2 CYLINDRICAL METAL CONTAINERS ON WOODEN PALLETS WITH METAL TOP LIFT. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNIT WITH MACS ITEMS. SEE PAGE 4 AND AMC DRAWING 19-48-4326/50A-20PM1012 FOR DETAILS OF THE PALLET UNIT. **CAUTION:** REGARDLESS OF THE QUANTITY OF PALLET UNITS 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 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 LONGITUDINAL PIECES ON THE CENTER FILL ASSEMBLIES. NAIL EACH ADDITIONAL PIECE W/ APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS, AND/OR QUANTITY OF THE VERTICAL PIECES IN THE SIDE FILL ASSEMBLIES MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE SIZE OF THE PALLET UNIT. THE LOADS MUST BE AS TIGHT AS POSSIBLE LONGITUDINALLY, BUT THE VOID MUST NOT EXCEED 3/4" OVERALL. EXCESSIVE SLACK CAN BE ELIMINATED BY ADJUSTING THE THICKNESS, AND/OR QUANTITY OF THE HORIZONTAL PIECES IN THE CENTER FILL ASSEMBLIES.
- E. 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.
- F. 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 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 ENDWALLS, ONLY THE CORNER POSTS OF THE CONTAINER SHOULD BE USED FOR FORWARD LONGITUDINAL BLOCKING.
- G. 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.
- H. **CAUTION:** DO NOT NAIL DUNNAGE MATERIAL TO THE CONTAINER WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.
- J. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDEWALL, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.
- K. **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.

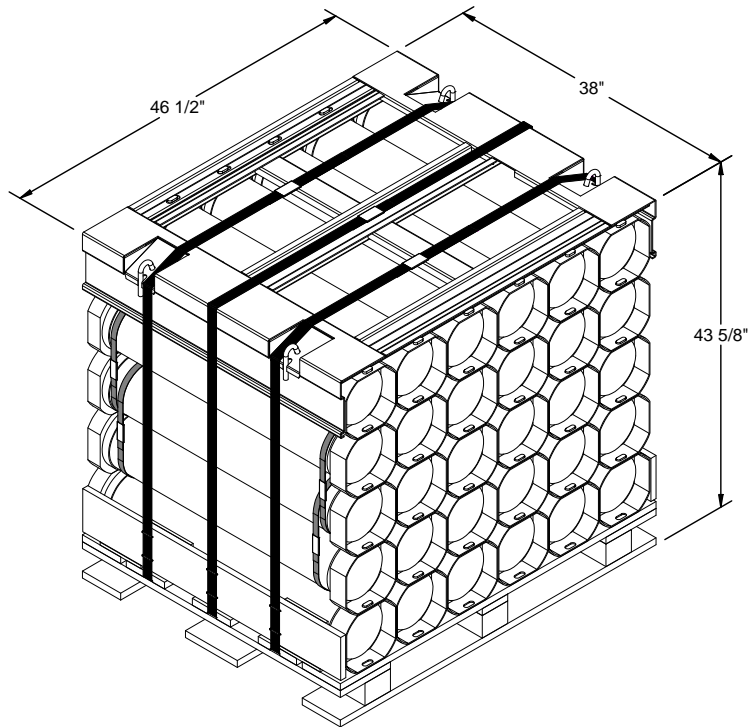
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## (GENERAL NOTES CONTINUED)

- L. 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.
- M. 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.
- N. 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.
- O. 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 PROCEDURES" ON PAGE 8.
- P. 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.
- 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 TIE 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. ANTI-CHAFING MATERIAL MAY BE INSTALLED AT POINTS OF CONTACT BETWEEN PALLET UNITS, OR BETWEEN PALLET UNITS AND THE SIDE OPENING CONTAINER, IF DESIRED, TO PREVENT CHAFING DAMAGE TO CONTAINER PAINT AND MARKINGS.
- S. RECOMMENDED SEQUENTIAL LOADING PROCEDURES:
1. PREFABRICATE TWO END BLOCKING ASSEMBLIES, TWO SIDE FILL ASSEMBLIES, TWO CENTER BLOCKING ASSEMBLIES, AND ONE CENTER FILL ASSEMBLY.
  2. INSTALL ONE END BLOCKING ASSEMBLY.
  3. LOAD FOUR PALLET UNITS.
  4. REPEAT STEPS 2 AND 3.
  5. LOAD ONE PALLET UNIT.
  6. INSTALL THE CENTER BLOCKING ASSEMBLY.
  7. INSTALL THE CENTER FILL ASSEMBLY.
  8. REPEAT STEPS 5 AND 6.
  9. INSTALL THE SIDE FILL ASSEMBLIES.

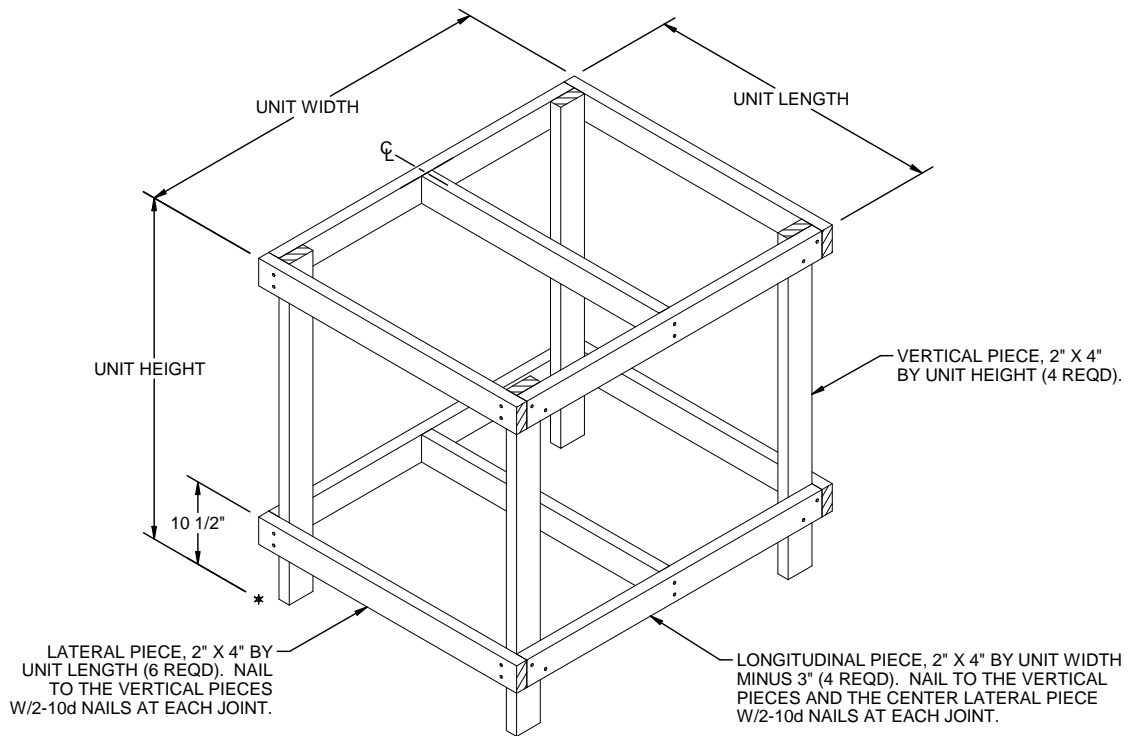
## MATERIAL SPECIFICATIONS

- 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.
- ANTI-CHAFING MATERIAL - - - - - : MIL-PRF-121 (OR EQUAL); NEUTRAL BARRIER MATERIAL.



**PALLET UNIT DATA**

GROSS WEIGHT ----- 1,835 LBS  
 CUBE ----- 44.6 CU FT



**FILLER ASSEMBLY**

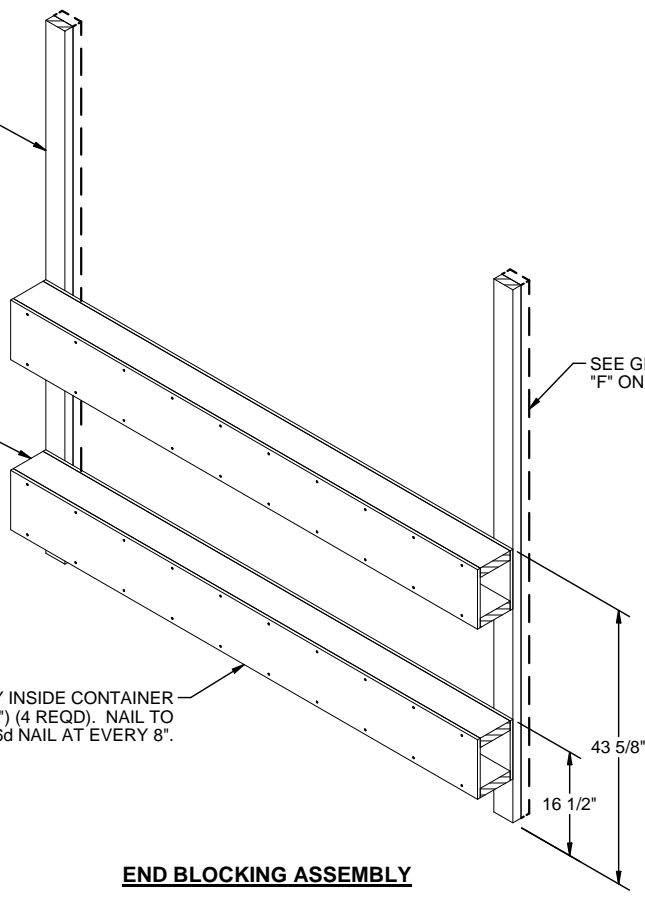
THE ASSEMBLY DEPICTED ABOVE IS FOR USE IN PLACE OF AN OMITTED PALLET. FILLER ASSEMBLY MUST BE WIRE TIED TO PALLET UNITS TO PREVENT UNDUE MOVEMENT.

BUFFER PIECE, 2" X 4" BY  
INSIDE CONTAINER HEIGHT  
MINUS 1" (REF: 7'-1") (2 REQD).  
NAIL TO THE BEAM ASSEMBLIES  
W/2-10d NAILS AT EACH JOINT.

BEAM, 2" X 6" BY INSIDE  
CONTAINER WIDTH MINUS  
1" (REF: 7'-2") (8 REQD).

PLYWOOD, 1/2" X 9-1/2" BY INSIDE CONTAINER  
WIDTH MINUS 1" (REF: 7'-2") (4 REQD). NAIL TO  
THE BEAMS W/1-6d NAIL AT EVERY 8".

SEE GENERAL NOTE  
"F" ON PAGE 3.



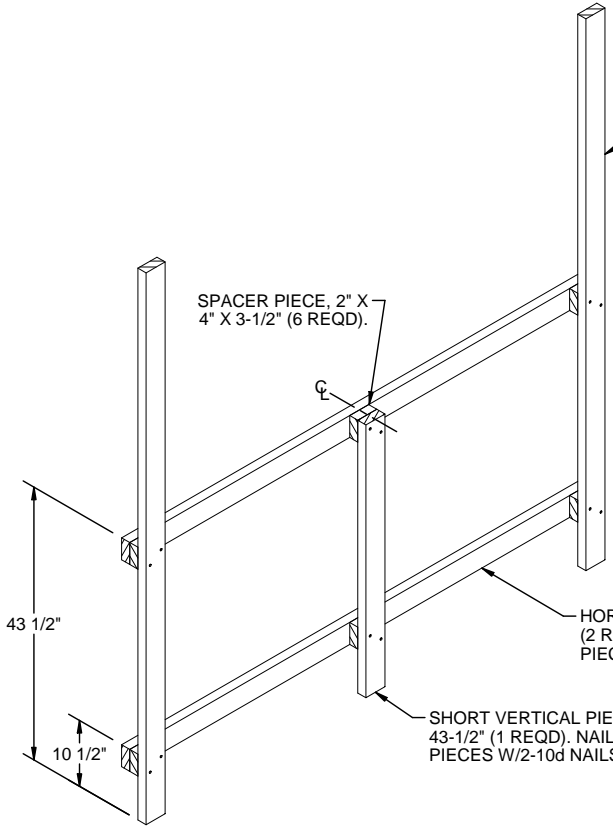
**END BLOCKING ASSEMBLY**

VERTICAL PIECE, 2" X 4" BY  
INSIDE CONTAINER HEIGHT  
MINUS 1" (REF: 7'-4") (2 REQD).  
NAIL TO THE SPACER PIECES  
W/2-10d NAILS AT EACH JOINT.

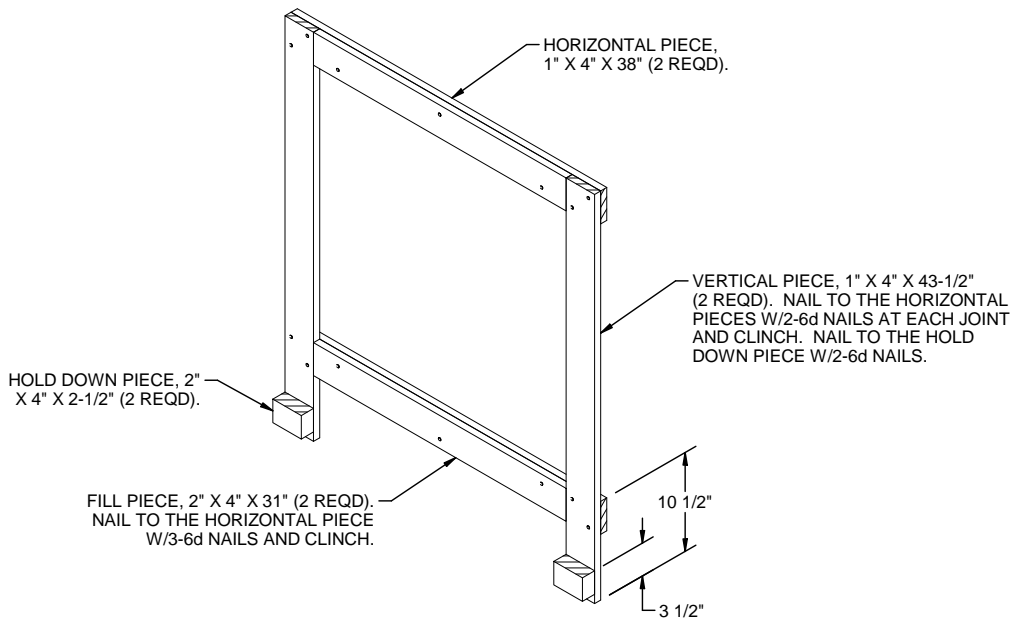
SPACER PIECE, 2" X  
4" X 3-1/2" (6 REQD).

HORIZONTAL PIECE, 2" X 4" X 7'-1/2"  
(2 REQD). NAIL TO THE SPACER  
PIECES W/2-10d NAILS AT EACH JOINT.

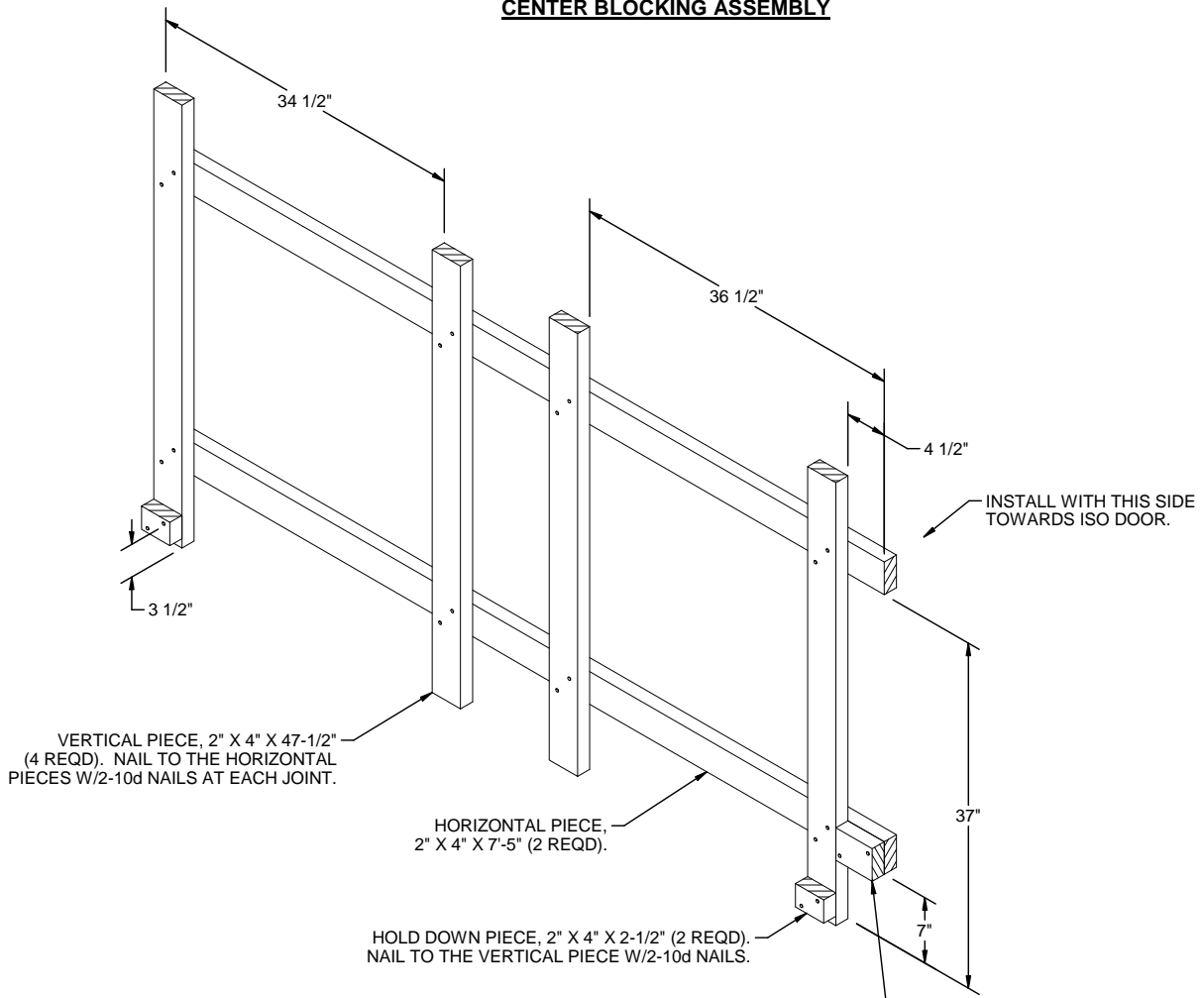
SHORT VERTICAL PIECE, 2" X 4" X  
43-1/2" (1 REQD). NAIL TO THE SPACER  
PIECES W/2-10d NAILS AT EACH JOINT.



**SIDE FILL ASSEMBLY**

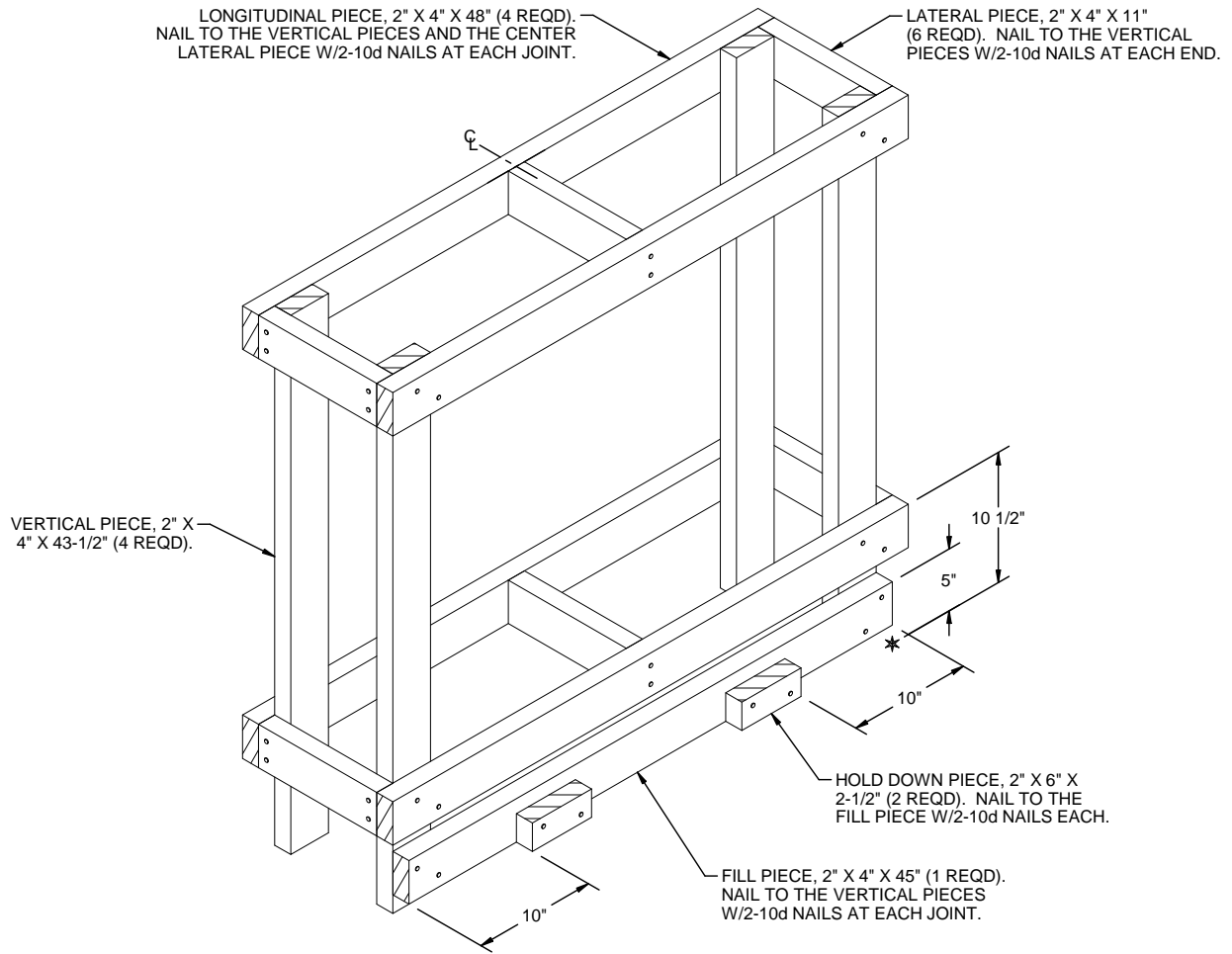


**CENTER BLOCKING ASSEMBLY**

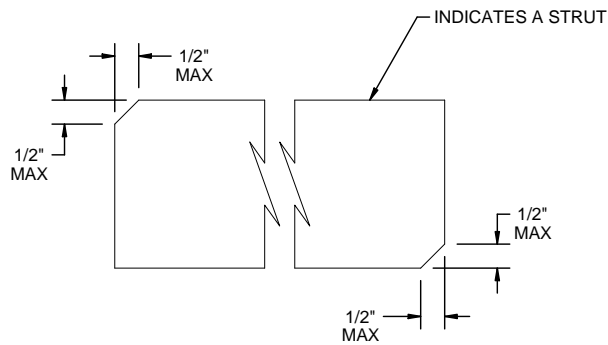


**CENTER GATE**

A LEFT HAND GATE IS SHOWN ABOVE. ONE LEFT HAND GATE AND ONE RIGHT HAND GATE ARE REQUIRED. LEFT HAND GATE AND RIGHT HAND GATE ARE MIRRORED IMAGES OF EACH OTHER.

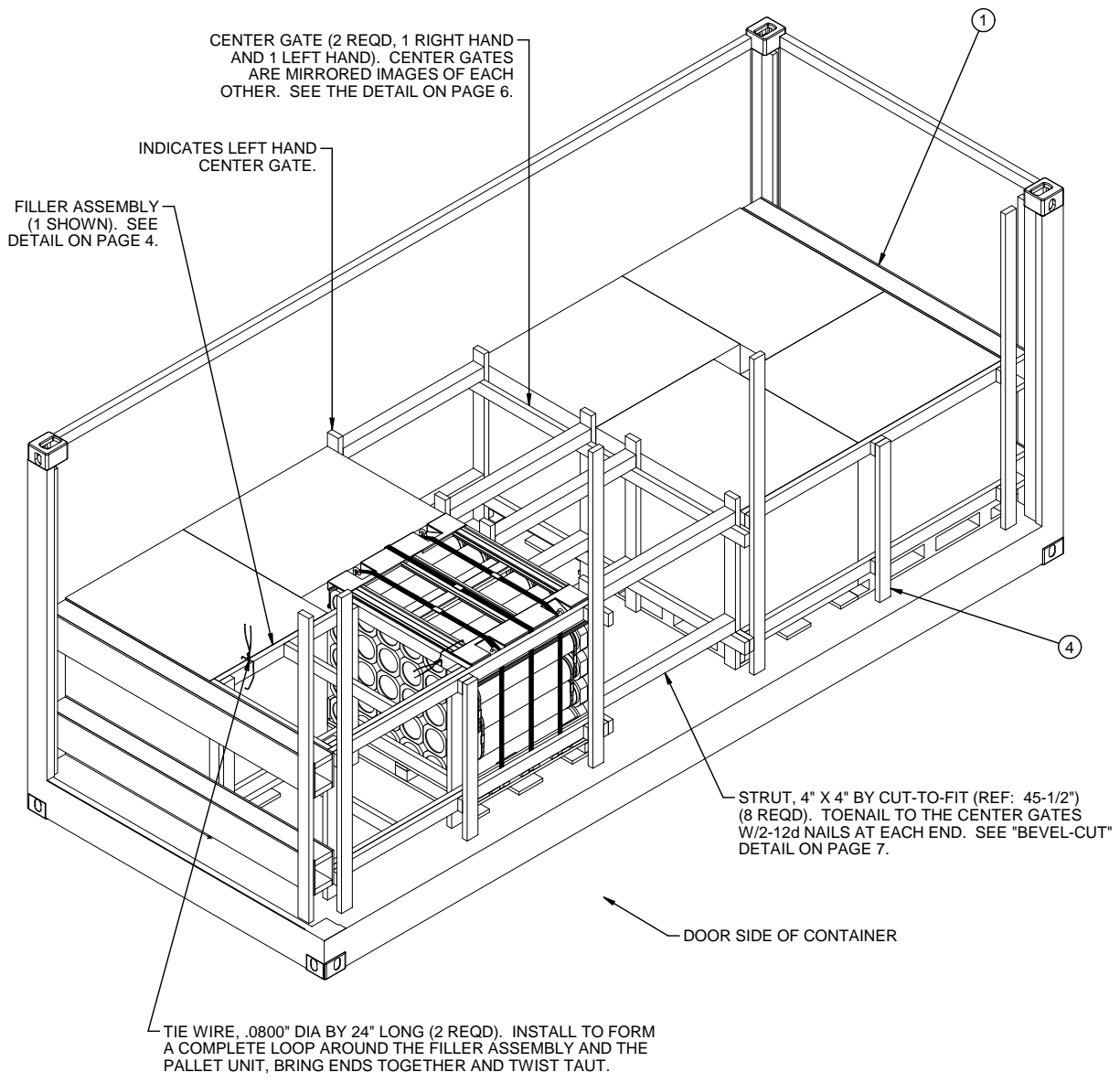


**CENTER FILL ASSEMBLY**



**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.



**LESS-THAN-FULL-LOAD PROCEDURES**

THE DETAIL ABOVE DEPICTS A BLOCKING METHOD TO BE USED IN A LESS-THAN-FULL CONTAINER LOAD (LESS THAN 10 UNITS). KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 2. SEE GENERAL NOTES "G" AND "Q" ON PAGE 3.