

# LOADING AND BRACING<sup>⊕</sup> IN END OPENING ISO CONTAINERS OF MK82 500 POUND BOMBS ON MHU- 149 METAL PALLETS

## INDEX

ITEM	PAGE(S)
TYPICAL LOADING PROCEDURES - - - - -	2
GENERAL NOTES AND MATERIAL SPECIFICATIONS - - - - -	3
PALLET UNIT DETAIL - - - - -	4
DETAILS - - - - -	4-8
LESS-THAN-FULL-LOAD PROCEDURES - - - - -	7

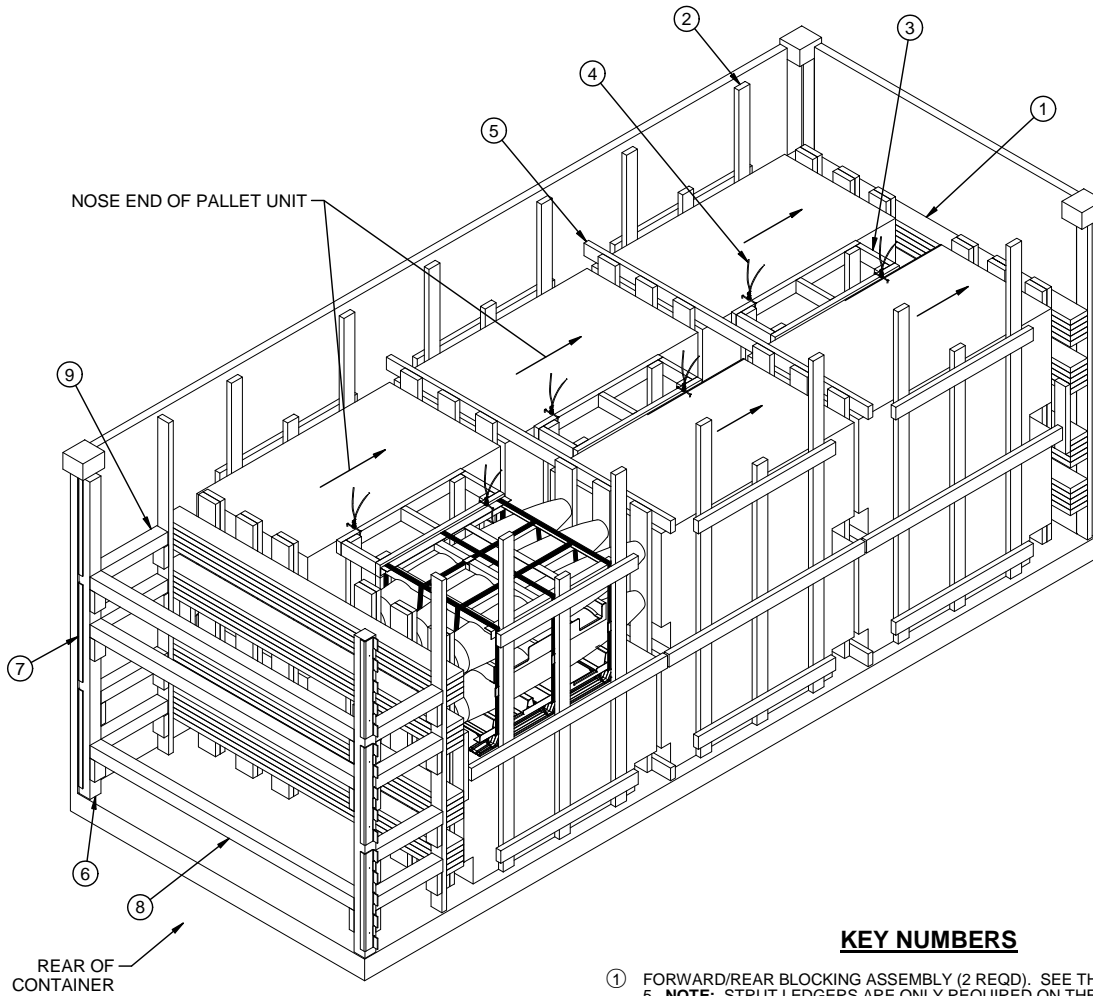
**DISTRIBUTION STATEMENT A:**

APPROVED FOR PUBLIC RELEASE  
DISTRIBUTION IS UNLIMITED.

⊕ 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>RUS.ALLEN.J</b> .1230354282 <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: 2015.05.01 09:39:18 -05'00'</small>		<b>CAUTION: VERIFY PRIOR TO USE AT <a href="https://mhp.redstone.army.mil">HTTPS://MHP.REDSTONE.ARMY.MIL</a> THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 8.</b>			
		<b>DO NOT SCALE</b>		<b>MARCH 1998</b>	
		ENGINEER OR TECHNICIAN	BASIC REV.	LAURA FIEFFER SPENCER HOVEY	
		ENGINEERING DIVISON	FIEFFER.LAUR A.A.1230375727	REVISION NO. 1	MAY 2015
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  <b>SHIMP.UPTON</b> .R.1231257183 <small>Digitally signed by SHIMP.UPTON.R.1231257183 DN: cn=US, ou=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=SHIMP.UPTON.R.1231257183 Date: 2015.05.12 07:51:11 -05'00'</small>		TEST ENGINEER	TRAN.CANH.THA NG.1385731813	<b>SEE THE REVISION LISTING ON PAGE 3</b>	
		TEST REPORT	NA	CLASS	DIVISION
U.S. ARMY DEFENSE AMMUNITION CENTER  ENGINEERING DIRECTORATE		ENGINEERING DIRECTORATE	CUMMINS.PAU L.A.1231883122	19	48
				DRAWING	FILE
				8643	SP15PB12



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① FORWARD/REAR BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5. **NOTE:** STRUT LEDGERS ARE ONLY REQUIRED ON THE REAR BLOCKING ASSEMBLY. DO NOT INSTALL STRUT LEDGERS ON THE FORWARD BLOCKING ASSEMBLY.
- ② SIDE FILL ASSEMBLY (6 REQD). SEE THE DETAIL ON PAGE 6.
- ③ CENTER FILL ASSEMBLY (3 REQD). SEE THE DETAIL ON PAGE 6.
- ④ TIE WIRE, .0800" DIA WIRE 24" LONG (6 REQD, 2 PER CENTER FILL ASSEMBLY). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE LONGITUDINAL PIECE OF THE CENTER FILL ASSEMBLY AND THE TOP FRAME OF THE LADING UNIT.
- ⑤ SEPARATOR GATE (2 REQD). SEE THE DETAIL ON PAGE 5.
- ⑥ DOOR POST VERTICAL (2 REQD). SEE THE DETAIL ON PAGE 4, "DETAIL A" ON PAGE 7 AND GENERAL NOTE "Q" ON PAGE 3.
- ⑦ 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 7, AND GENERAL NOTE "Q" ON PAGE 3.
- ⑧ DOOR SPANNER, 4" X 4" MATERIAL, CUT TO A LENGTH THAT WILL PROVIDE FOR A DRIVE FIT (REF: 7-5/8") (3 REQD). TOENAIL TO THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 4.
- ⑨ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 21-5/8") (8 REQD). TOENAIL TO THE BUFFER PIECE OF THE REAR BLOCKING ASSEMBLY AND THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 4.

**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	426	284
2" x 6"	515	515
4" X 4"	50	67
NAI LS	NO. REQD	POUNDS
10d (3")	1,144	18
12d(3-1/4")	44	3/4
WI RE, .0800" DIA GAGE	12' REQD	NIL
UNI VERSAL LOAD RETAI NER	6 REQD	39.00 LBS

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	12	36,420 LBS
DUNNAGE		1,759 LBS
CONTAINER		4,700 LBS
<b>TOTAL WEIGHT</b>		<b>42,879 LBS (APPROX)</b>

## GENERAL NOTES

## (GENERAL NOTES CONTINUED)

- 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 MK82 500 POUND BOMBS ON MHU-149 METAL PALLETS. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE MHU-149 METAL PALLET WITH MK82 BOMBS INSTALLED. SEE PAGE 4 AND AIR FORCE TPO 01-006-5657 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 LONGITUDINAL PIECES ON THE CENTER FILL ASSEMBLIES. ADDITIONALLY, THE LENGTH OF THE LATERAL PIECES IN THE CENTER 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 INCREASING THE LENGTH OF THE STRUTS ON ONE END OF THE LOAD.
- E. THIS DRAWING DEPICTS A 12-PALLET UNIT MAXIMUM CONFIGURATION, WITH A LADING WEIGHT OF 43,193 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, TWO PALLET UNITS MUST BE ELIMINATED FROM THE 12-PALLET UNIT MAXIMUM LOAD. THIS WILL RESULT IN A 10-PALLET UNIT LOAD WITH A GROSS WEIGHT OF 37,123 POUNDS. SEE THE "LESS-THAN-FULL" LOAD PROCEDURES ON PAGE 7 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 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.
- 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 8 AND THE "LESS-THAN-FULL LOAD PROCEDURES" 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 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 AND 7, ARE REQUIRED WHEN LOADING A TWO HIGH LOAD AND FOUR ARE REQUIRED WHEN LOADING A ONE HIGH LOAD. 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.
- S. RECOMMENDED SEQUENTIAL LOADING PROCEDURES:
1. PREFABRICATE TWO FORWARD/REAR BLOCKING ASSEMBLIES, SIX SIDE FILL ASSEMBLIES (THREE LEFT HAND AND THREE RIGHT HAND), THREE CENTER FILL ASSEMBLIES, TWO SEPARATOR GATES AND TWO DOOR POST VERTICALS (ONE LEFT HAND AND ONE RIGHT HAND).
  2. INSTALL THE FORWARD BLOCKING ASSEMBLY.
  3. INSTALL TWO SIDE FILL ASSEMBLIES (ONE LEFT HAND AND ONE RIGHT HAND).
  4. LOAD FOUR PALLET UNITS.
  5. INSTALL ONE CENTER FILL ASSEMBLY WITH TIE WIRES.
  6. INSTALL ONE SEPARATOR GATE.
  7. REPEAT STEPS 3 THRU 6 TWICE.
  8. INSTALL THE REAR BLOCKING ASSEMBLY.
  9. INSTALL THE TWO DOOR POST VERTICALS, SIX UNIVERSAL LOAD RETAINERS AND THREE DOOR SPANNERS.
  10. INSTALL THE EIGHT STRUTS.

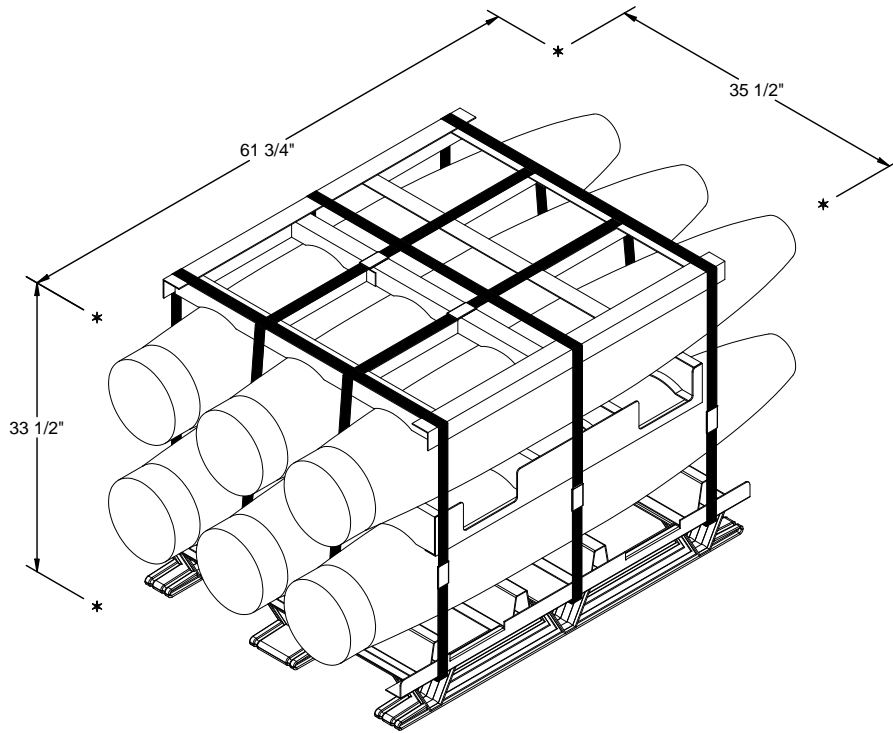
## REVISION

REVISION NO. 1, DATED MAY 2015, CONSISTS OF:  
ADJUSTING LENGTH OF LATERAL PIECE ON THE OMITTED UNIT ASSEMBLY.

## MATERIAL SPECIFICATIONS

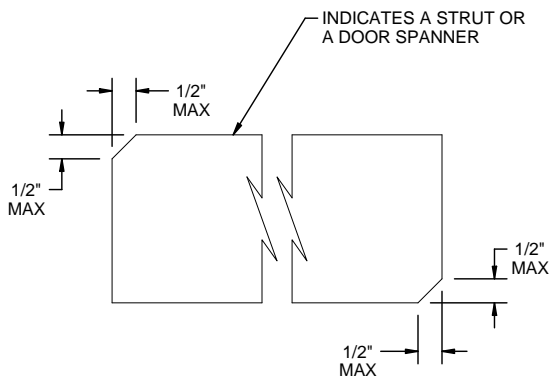
- LUMBER** - - - - - : SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.
- NAILS** - - - - - : ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMS).
- WIRE, CARBON STEEL** - - - - - : ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, 0.0800" DIA, GRADE 1006 OR BETTER.
- STEEL STRUCTURAL**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

(CONTINUED AT RIGHT)



**PALLET UNIT DATA**

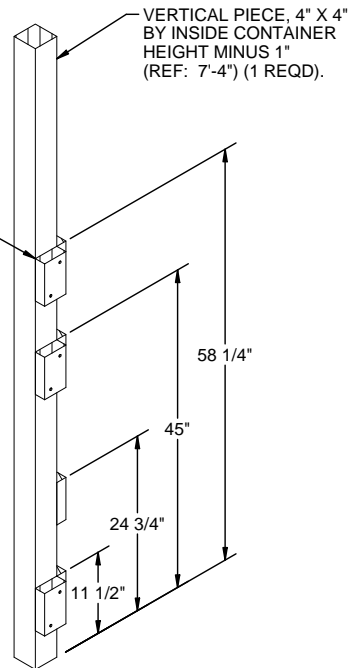
GROSS WEIGHT - - - - - 3,035 LBS (APPROX)  
 CUBE - - - - - 40.2 CU FT (APPROX)



**BEVEL CUT**

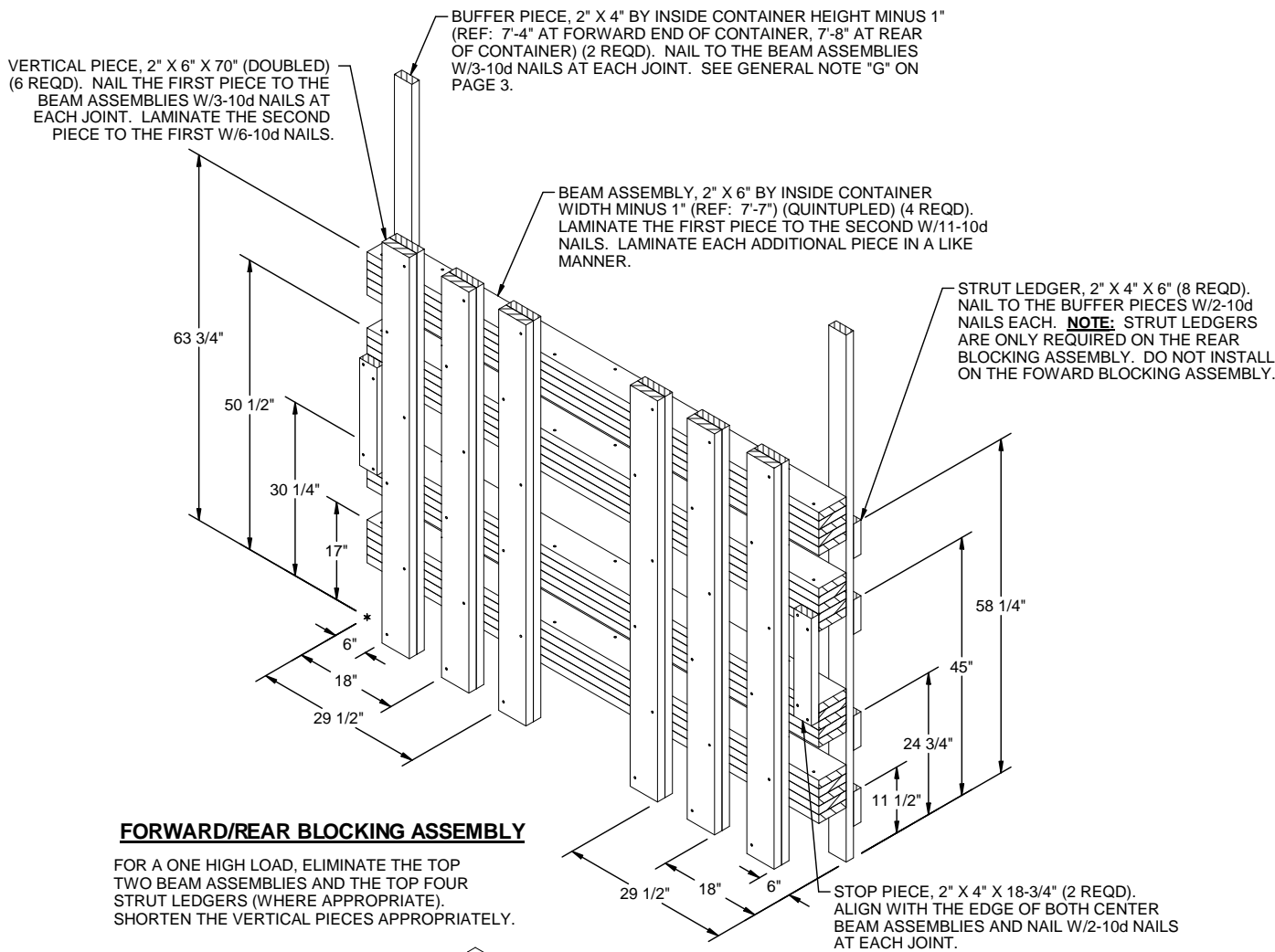
IF DESIRED, EACH END OF A STRUT OR DOOR SPANNER MAY BE BEVEL-CUT AS SHOWN ABOVE TO FACILITATE INSTALLING THE STRUTS OR DOOR SPANNERS WITH A "DRIVE" FIT.

LEDGER, 2" X 4" X 6" (7 REQD).  
 NAIL TO THE VERTICAL PIECE  
 W/2-10d NAILS.



**DOOR POST VERTICAL**

A LEFT HAND ASSEMBLY IS DEPICTED, A RIGHT HAND ASSEMBLY IS ALSO REQUIRED. FOR A ONE HIGH LOAD, ELIMINATE THE UPPER TWO STRUT LEDGERS AND THE UPPER DOOR SPANNER LEDGER. RELOCATE THE MIDDLE DOOR SPANNER LEDGER AT 24-3/4".



**FORWARD/REAR BLOCKING ASSEMBLY**

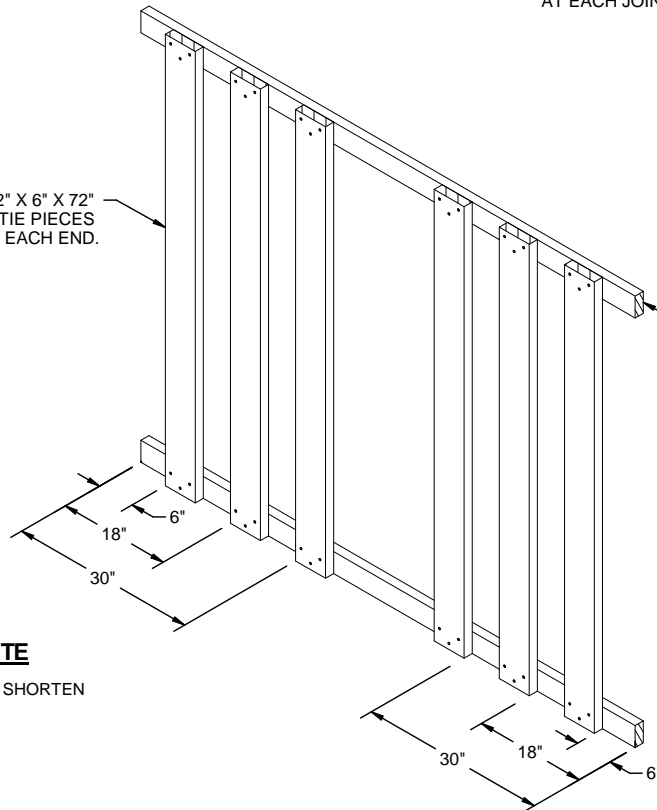
FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO BEAM ASSEMBLIES AND THE TOP FOUR STRUT LEDGERS (WHERE APPROPRIATE). SHORTEN THE VERTICAL PIECES APPROPRIATELY.

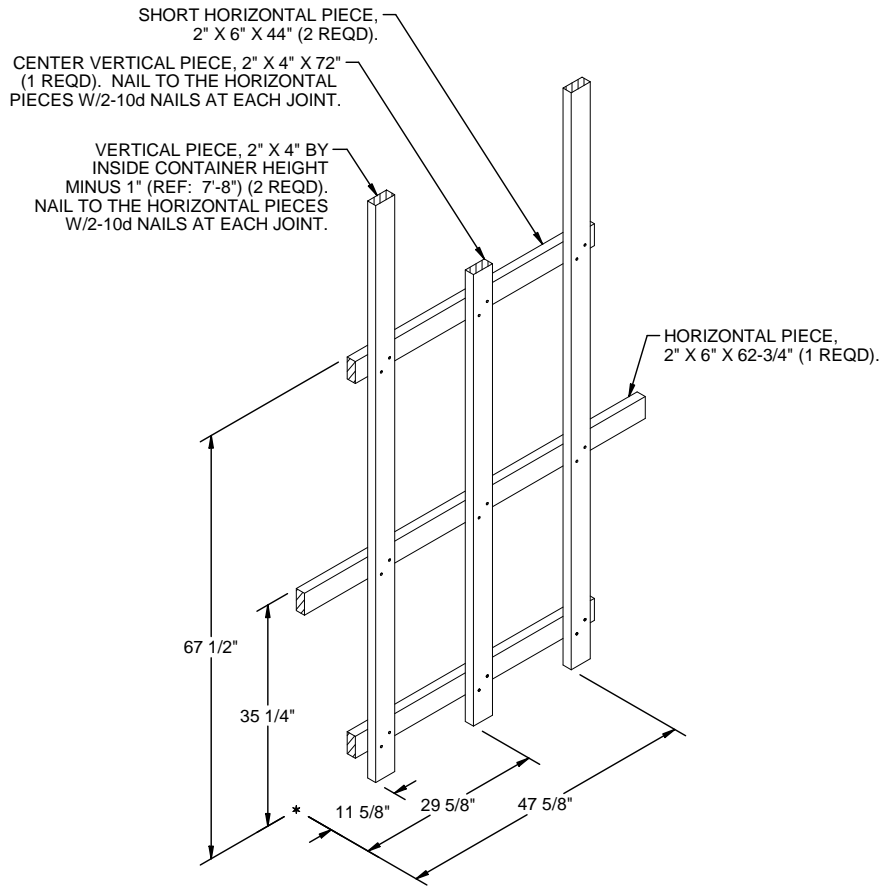
**VERTICAL PIECE, 2" X 6" X 72"** (6 REQD). NAIL TO THE TIE PIECES W/3-10d NAILS AT EACH END.

**TIE PIECE, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1"** (REF: 7'-7") (2 REQD).

**SEPARATOR GATE**

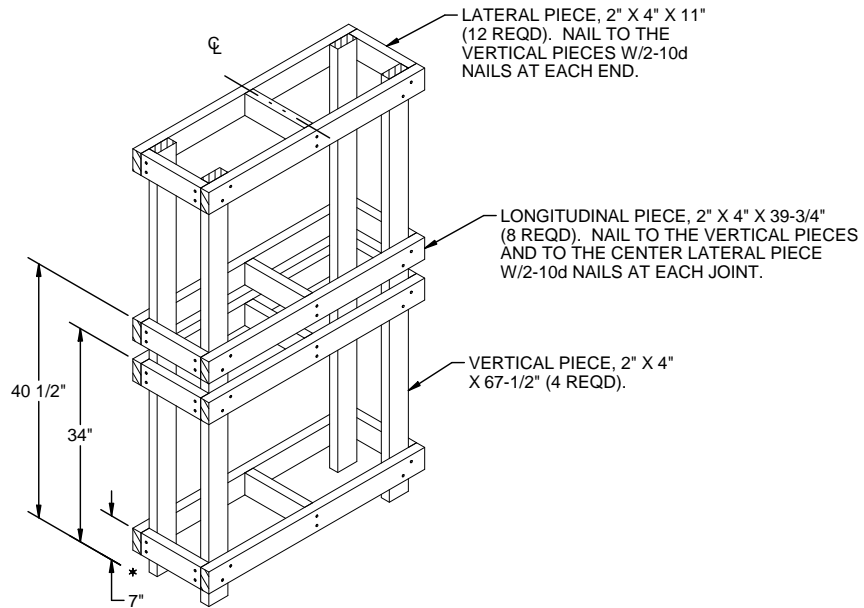
**NOTE:** FOR A ONE HIGH LOAD, SHORTEN THE VERTICAL PIECES TO 36".





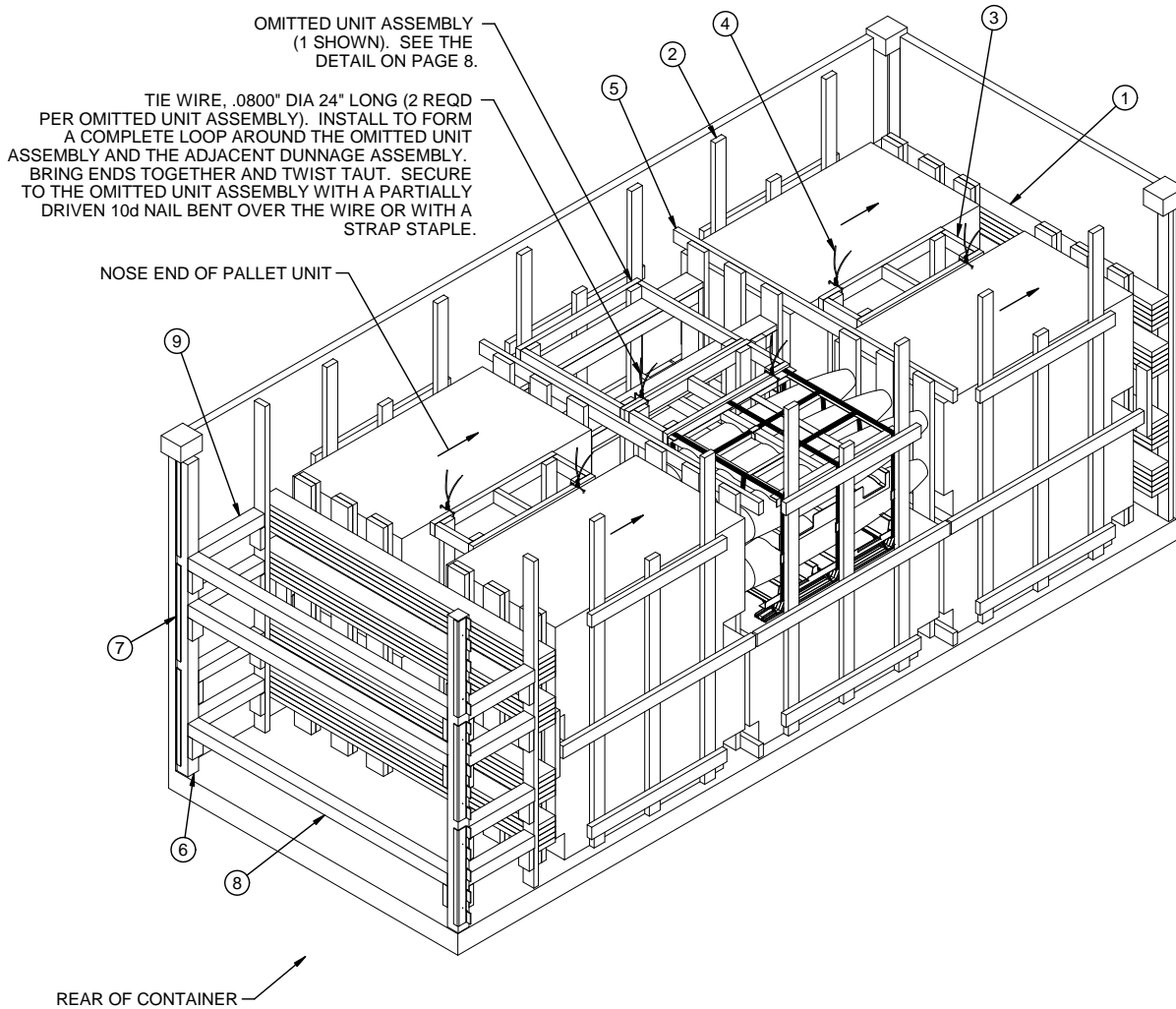
**SIDE FILL ASSEMBLY**

**NOTE:** FOR A ONE HIGH LOAD, ELIMINATE THE TOP HORIZONTAL PIECE, LOWER THE MIDDLE HORIZONTAL PIECE TO 34", AND SHORTEN THE CENTER VERTICAL PIECE TO 36".



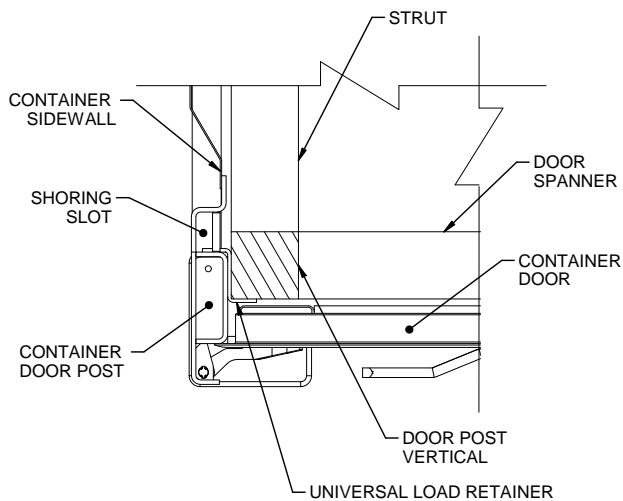
**CENTER FILL ASSEMBLY**

**NOTE:** FOR A ONE HIGH LOAD, ELIMINATE THE TOP FOUR LONGITUDINAL PIECES AND THE TOP SIX LATERAL PIECES AND SHORTEN THE VERTICAL PIECES TO 34".



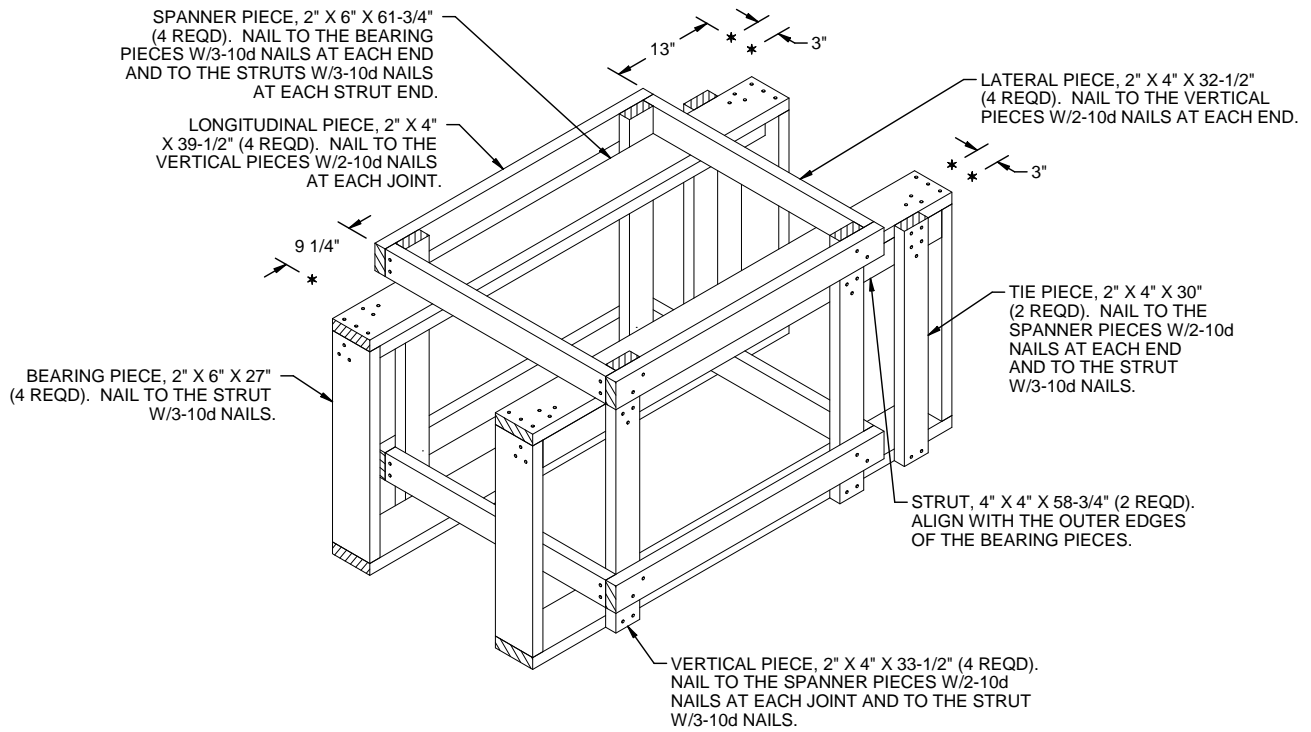
**LESS-THAN-FULL-LOAD PROCEDURES**

THE DETAIL ABOVE DEPICTS A BLOCKING METHOD TO BE USED IN A LESS-THAN-FULL CONTAINER LOAD (LESS THAN 12 UNITS). KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 2. SEE GENERAL NOTES "H" AND "P" ON PAGE 3.

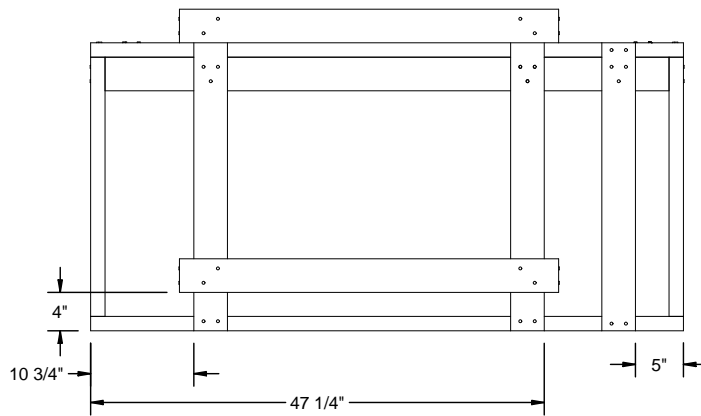


**DETAIL A**

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



**OMITTED UNIT ASSEMBLY**



**SIDE VIEW**