

APPROVED BY
BUREAU OF EXPLOSIVES

DATE 10/14/03

LOADING AND BRACING[•] IN END OPENING ISO CONTAINERS OF UNPALLETIZED 105MM CARTRIDGES PACKED IN WOODEN BOXES

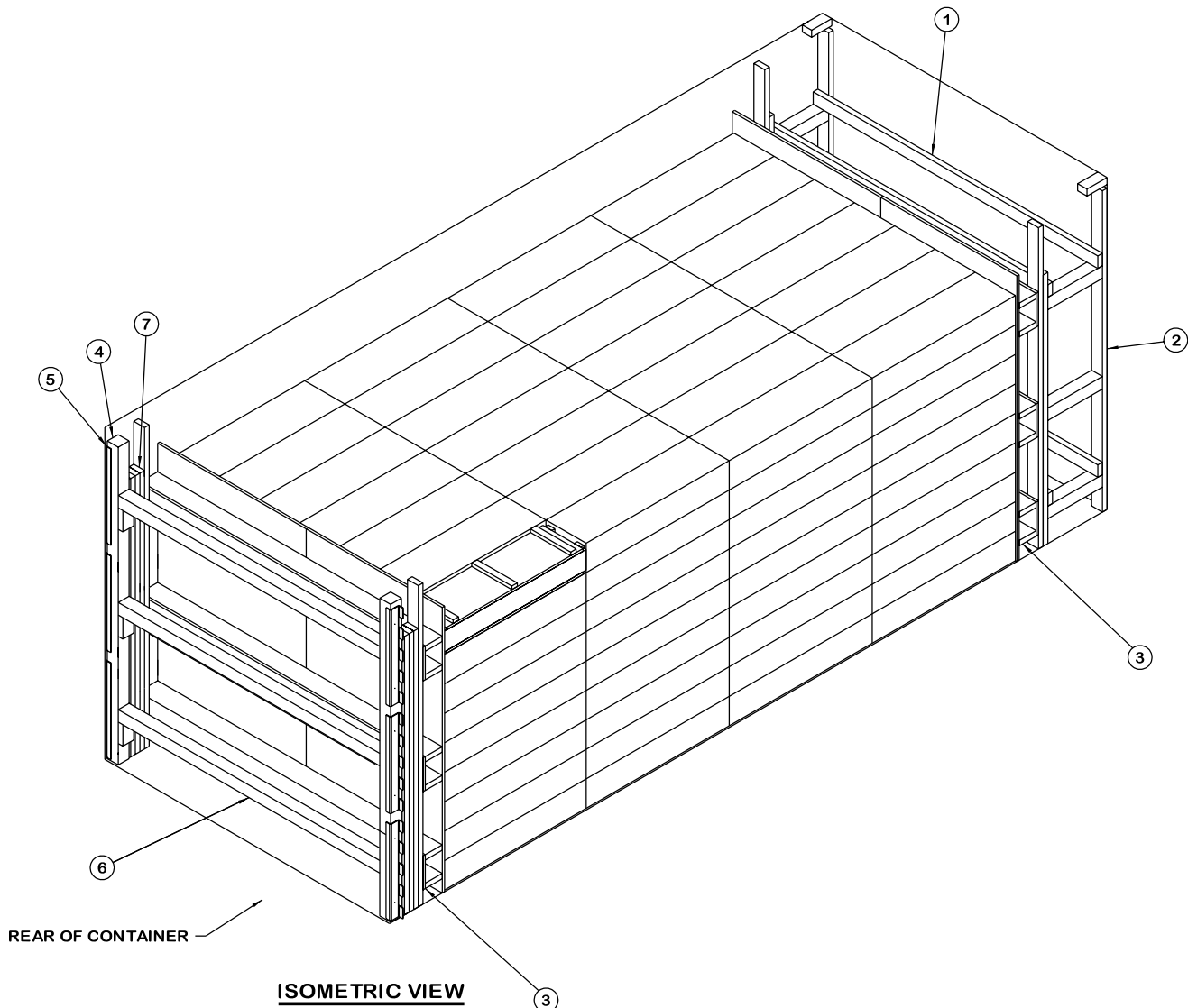
INDEX

<u>ITEM</u>	<u>PAGE(S)</u>
252 BOX LOAD - - - - -	2
GENERAL NOTES AND MATERIAL SPECIFICATIONS - - - - -	3
BOX DETAIL - - - - -	4
DETAILS - - - - -	5-6

• 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 OPERATIONS SUPPORT COMMAND 	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 6.		DO NOT SCALE		SEPTEMBER 2003
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND 	ENGINEER OR TECHNICIAN	BASIC REV.	MELVIN D. SIX		
U.S. ARMY DEFENSE AMMUNITION CENTER	TRANSPORTATION ENGINEERING DIVISION 	VALIDATION ENGINEERING DIVISION 	ENGINEERING DIRECTORATE 	TESTED	SPECIAL DRAWING
					DET 0301



ISOMETRIC VIEW

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
WOODEN BOX	252	36,540 LBS
DUNNAGE		850 LBS
CONTAINER		4,700 LBS
TOTAL WEIGHT		42,090 LBS (APPROX)

KEY NUMBERS

- ① STRUT ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.
- ② SPREADER PIECE, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-7") (4 REQD). NAIL TO THE BUFFER PIECES OF THE STRUT ASSEMBLIES W/2-10d NAILS AT EACH END.
- ③ FORWARD/REAR BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 5.
- ④ DOOR POST VERTICAL (2 REQD). SEE THE DETAIL ON PAGE 5 AND "DETAIL A" ON PAGE 6.
- ⑤ 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 6, AND GENERAL NOTE "K" ON PAGE 3.
- ⑥ DOOR SPANNER, 4" X 4" MATERIAL CUT TO A LENGTH THAT WILL PROVIDE A DRIVE FIT (REF: 7'-1-3/8") (3 REQD). TOENAIL TO THE DOOR POST VERTICAL W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 6.
- ⑦ FILL MATERIAL, 4" WIDE BY 6'-6" LONG MATERIAL (AS REQD). NAIL THE FIRST PIECE TO THE REAR BLOCKING ASSEMBLY W/6 NAILS OF A SUITABLE SIZE (10d 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. SEE "DETAIL A" ON PAGE 6.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	14	45
2" X 4"	133	89
2" X 6"	91	91
4" X 4"	59	79
NAILS	NO. REQD	POUNDS
6d (2")	308	2
10d (3")	100	1-3/4
12d (3-1/4")	20	1/2
PLYWOOD, 3/4"	137.13 SQ FT REQD	282.83 LBS
UNIVERSAL LOAD RETAINER	6 REQD	39 LBS

- K. SIX UNIVERSAL LOAD RETAINERS ARE DEPICTED IN THE LOAD ON PAGE 2. SIX UNIVERSAL LOAD RETAINERS ARE REQUIRED WHEN LOADING SIX-HIGH TO NINE-HIGH WOODEN BOX LOADS, FOUR UNIVERSAL LOAD RETAINERS ARE REQUIRED WHEN LOADING THREE-HIGH TO FIVE-HIGH WOODEN BOX LOADS, AND TWO UNIVERSAL LOAD RETAINERS ARE REQUIRED WHEN LOADING ONE-HIGH OR TWO-HIGH WOODEN BOX LOADS. THIS IS AN EXCEPTION TO THE ESTABLISHED PROCEDURES; HOWEVER, THE EXCEPTION IS PERMITTED FOR THE AMMUNITION PACK COVERED BY THIS DRAWING. REFER TO DEPARTMENT OF THE ARMY DRAWING DA-116 FOR DETAILS OF THE UNIVERSAL LOAD RETAINER CONSTRUCTION, INSTALLATION TO THE DOOR POST VERTICAL, PLACEMENT INTO THE CONTAINER, AND FOR OTHER METHODS OF REAR-OF-LOAD RESTRAINT.
- L. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDEWALL, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.
- M. **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.
- N. REQUIREMENTS CITED WITHIN THE ASSOCIATION OF AMERICAN RAILROADS (AAR) IN 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 CHASSIS EQUIPPED WITH TWO BOGIE ASSEMBLIES WHEN BEING MOVED TOFC SERVICE.
 - 2. THE LOAD LIMIT OF 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 THE LOAD LIMIT OF THAT CAR.
- O. 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.
- P. 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.
- Q. THE QUANTITY OF BOXES SHOWN IN THE LOAD ON PAGE 2 MAY BE REDUCED FOR SHIPMENT, IF DESIRED. SEE THE FILLER ASSEMBLY ON PAGE 4. WHEN A CONTAINER IS LOADED WITH A REDUCED NUMBER 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.
- R. IF THE CONTAINER BEING LOADED IS EQUIPPED WITH PRE-WELDED LOAD RETAINERS, THE DOOR POST VERTICAL AND UNIVERSAL LOAD RETAINER, PIECES MARKED ④ AND ⑤ ON PAGE 2, WILL BE OMITTED. ADDITIONAL FILL MATERIAL MAY NEED TO BE ADDED.

- 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 CARTRIDGES PACKED IN WOODEN BOXES. SUBSEQUENT REFERENCE TO BOX HEREIN MEANS THE BOX WITH AMMUNITION ITEMS. SEE PAGE 4 FOR DETAIL OF THE BOX. **CAUTION:** REGARDLESS OF THE QUANTITY OF BOXES 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 BOXES, 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 ADDING ADDITIONAL PIECES OF PLYWOOD AT THE SIDE OF THE LOAD.
- 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 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. **CAUTION:** DO NOT NAIL DUNNAGE MATERIAL TO THE CONTAINER WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.
- J. 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.

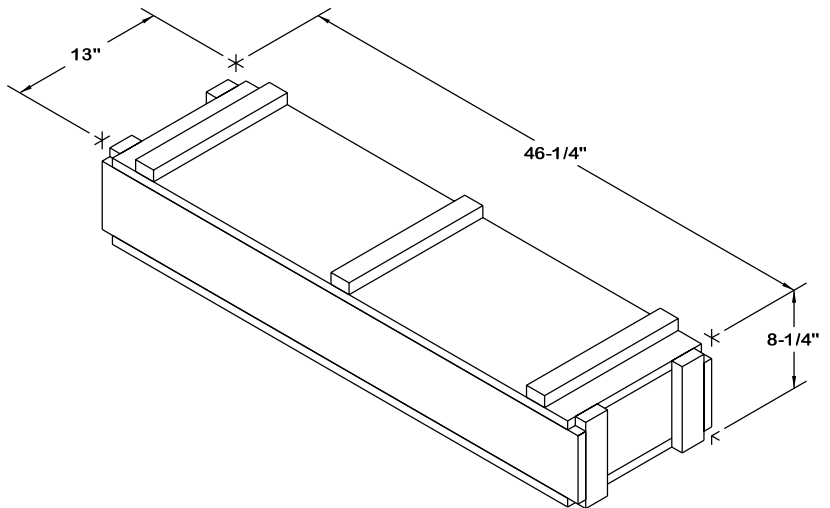
(CONTINUED AT LEFT)

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.

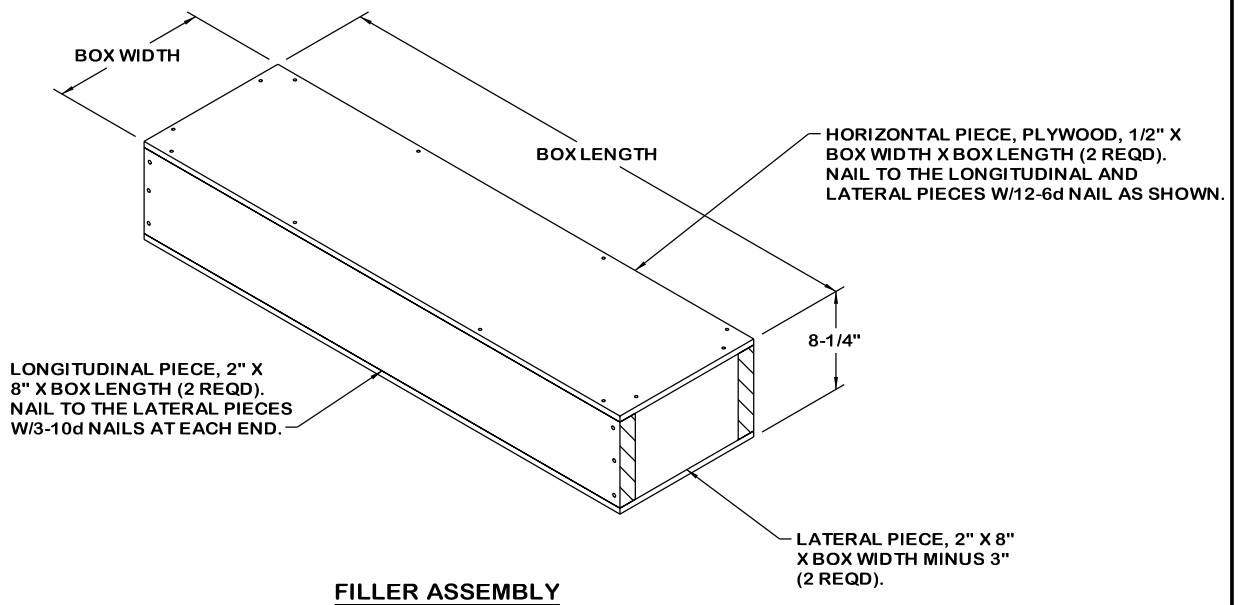
RECOMMENDED SEQUENTIAL LOADING PROCEDURES:

1. PREFABRICATE TWO FORWARD/REAR BLOCKING ASSEMBLIES, TWO STRUT ASSEMBLIES, TWO DOOR POST VERTICALS, AND NAIL THREE UNIVERSAL LOAD RETAINERS TO EACH DOOR POST VERTICAL.
2. INSTALL THE TWO STRUT ASSEMBLIES AND NAIL THE SPREADER PIECES TO THE STRUT ASSEMBLIES.
3. INSTALL THE FORWARD BLOCKING ASSEMBLY AGAINST THE STRUT ASSEMBLIES.
4. LOAD 252 BOXES.
5. INSTALL REAR BLOCKING ASSEMBLY.
6. INSTALL THE TWO DOOR POST VERTICAL ASSEMBLIES.
7. INSTALL TWO DOOR SPANNER PIECES (ONE AT THE LOWEST POSITION AND ONE AT THE UPPERMOST POSITION).
8. INSTALL THE SOLID FILL.
9. INSTALL THE REMAINING DOOR SPANNER.



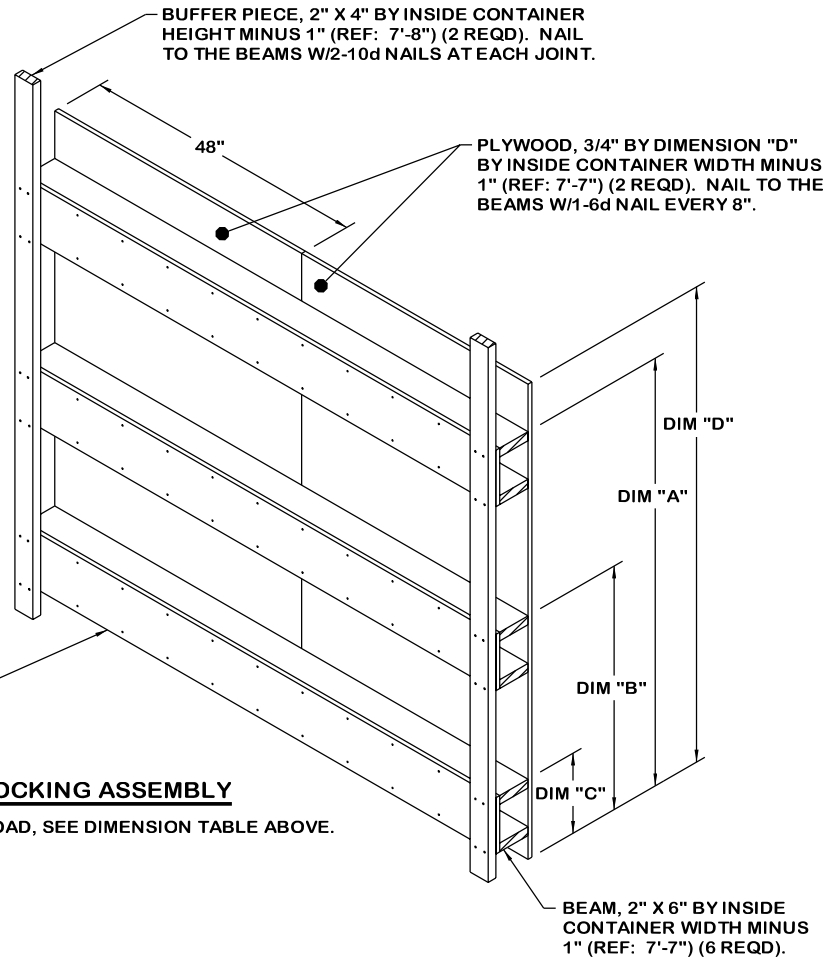
WOODEN BOX

GROSS WEIGHT (W/2 105MM CARTRIDGES) - - - - 145 LBS (APPROX)
 CUBE - - - - - 2.9 CUBIC FEET (APPROX)



DIMENSION TABLE				
LAYERS OF BOXES	DIMENSIONS			
	"A"	"B"	"C"	"D"
9	72"	41"	13-1/2"	6'-8"
8	64"	37"	13-1/2"	72"
7	56"	33"	13-1/2"	64"
6	*	42"	17"	50"
5	*	34"	13-1/2"	42"
4	*	27"	13-1/2"	35"
3	*	23"	9-1/2"	31"
2	*	*	13-1/2"	22"
1	*	*	9-1/2"	18"

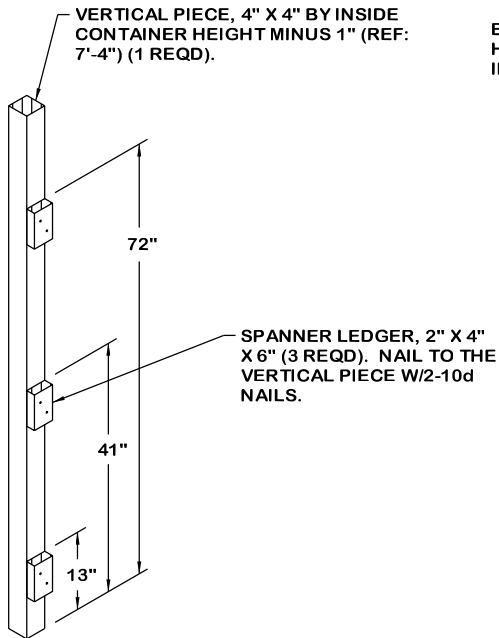
* NOT REQUIRED FOR THIS LAYER.



PLYWOOD, 3/4" X 9-1/2" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-7") (3 REQD). NAIL TO THE BEAMS W/1-6d NAIL EVERY 8".

FORWARD/REAR BLOCKING ASSEMBLY

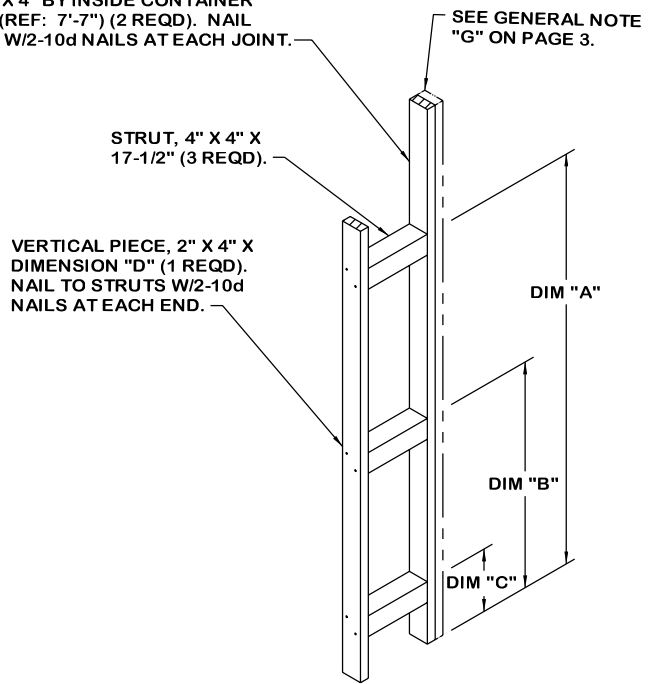
NOTE: FOR A REDUCED HEIGHT LOAD, SEE DIMENSION TABLE ABOVE.



DOOR POST VERTICAL

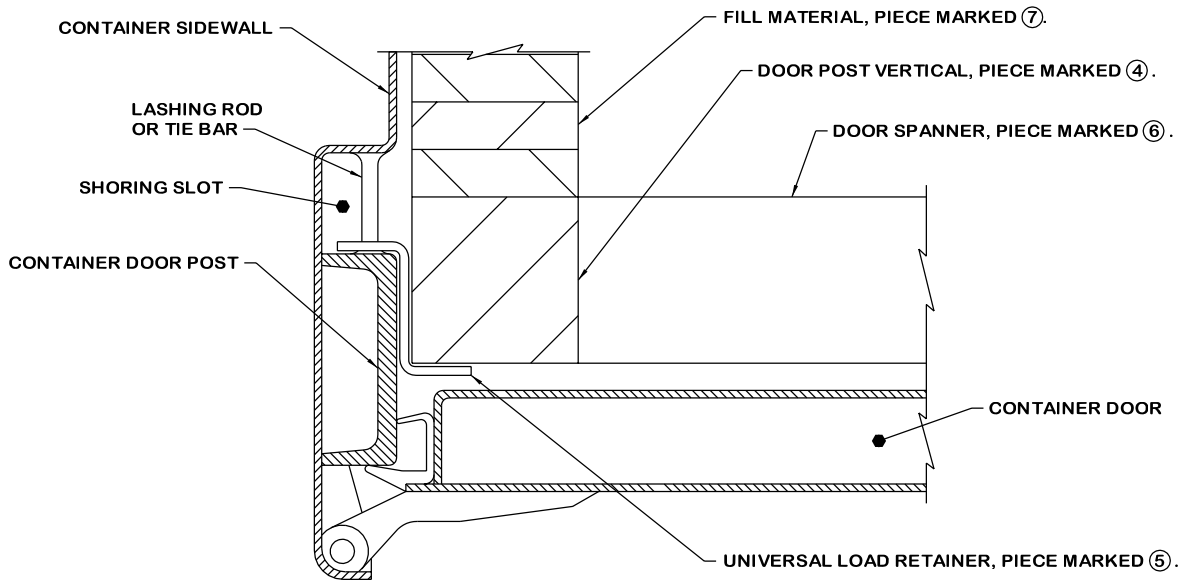
NOTE: THREE DOOR SPANNERS ARE REQUIRED FOR A SIX TO NINE-HIGH LOAD, AND TWO DOOR SPANNERS ARE REQUIRED FOR A LESS THAN SIX LOAD.

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



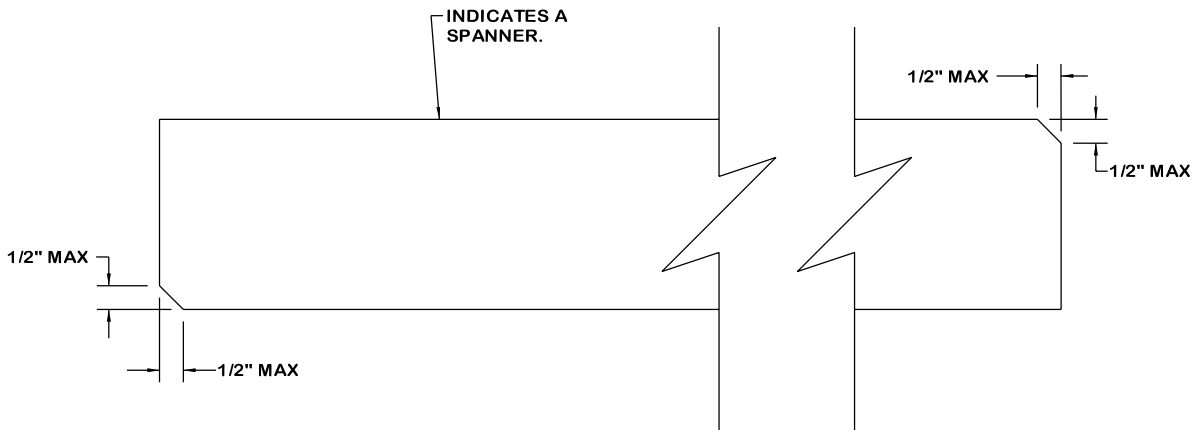
STRUT ASSEMBLY

NOTE: USE DIMENSION TABLE ABOVE TO DETERMINE NUMBER OF STRUTS REQUIRED AND THE LOCATION OF THE 4" X 4" STRUTS.



DETAIL A

A PARTIAL PLAN VIEW OF THE LEFT REAR PORTION OF THE CONTAINER IS SHOWN DEPICTING THE PROPER POSITION OF THE UNIVERSAL LOAD RETAINER AND ADJACENT DUNNAGE PIECES. SEE DEPARTMENT OF ARMY DRAWING DA-116 FOR ADDITIONAL DETAILS AND PROCEDURES FOR OTHER TYPES OF RETAINERS THAT MAY BE USED FOR REAR-OF-LOAD RESTRAINT.



BEVEL-CUT

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