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BUREAU OF EXPLOSIVES

*Jan L. Hays*

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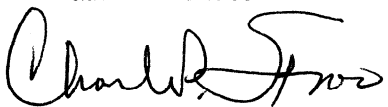
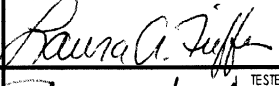
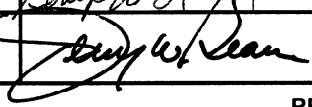
# LOADING AND BRACING \* IN SIDE OPENING ISO CONTAINERS OF AMRAAM (AIM-120) MISSILES PACKED IN CNU-431/E METAL CONTAINERS

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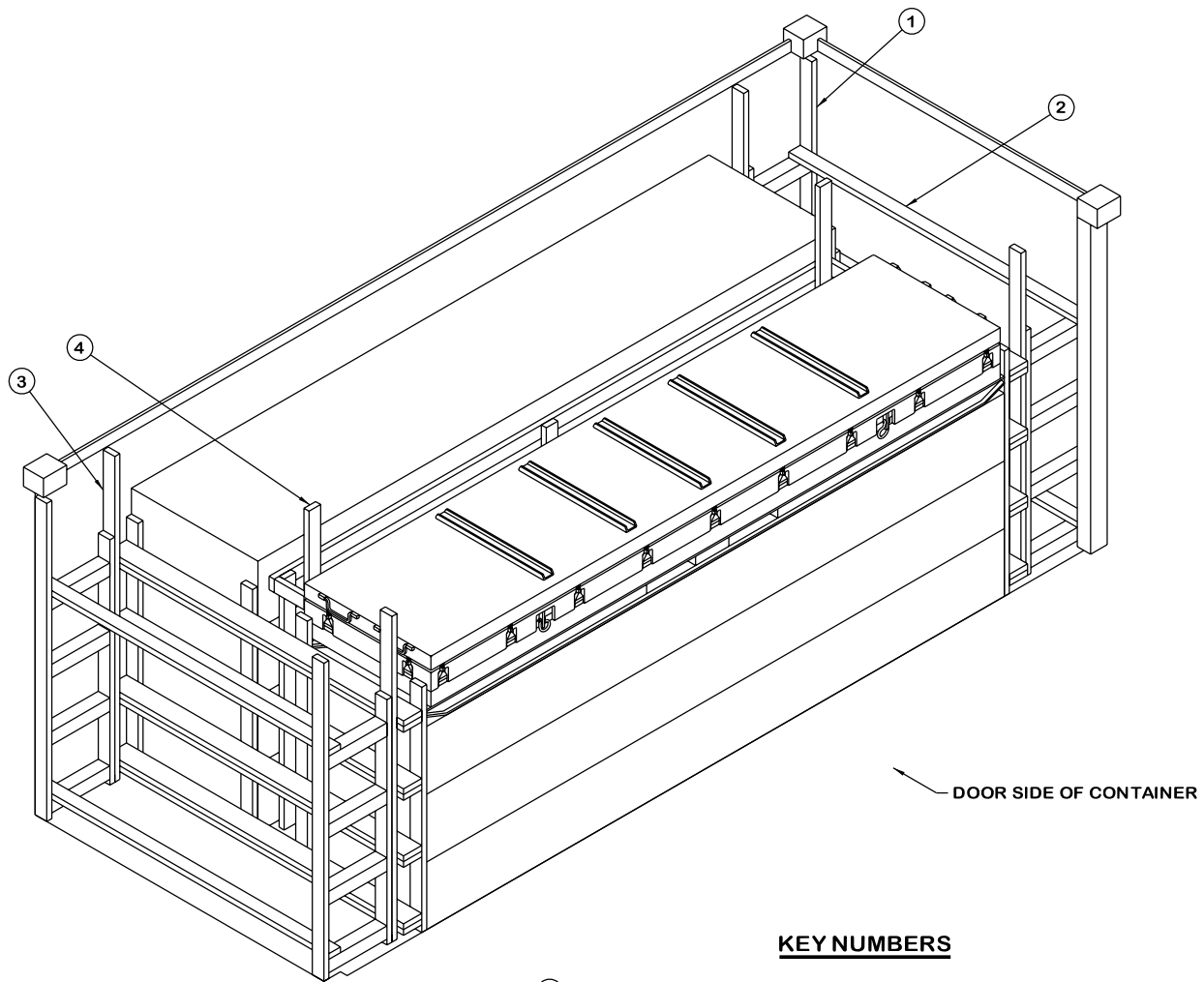
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- LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.

## U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY 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 6.</b>				
	<b>DO NOT SCALE</b>		<b>MARCH 2007</b>		
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND    U.S. ARMY DEFENSE AMMUNITION CENTER	ENGINEER OR TECHNICIAN	BASIC REV.	LAURA FIEFFER		
	TRANSPORTATION ENGINEERING DIVISION				
	VALIDATION ENGINEERING DIVISION	TESTED	CLASS	DIVISION	DRAWING
ENGINEERING DIRECTORATE			19	48	8653
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PROJECT SP 352-98



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① STRUT ASSEMBLY (4 REQD). SEE THE DETAIL ON PAGE 5.
- ② SPREADER PIECE, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-2-1/4") (4 REQD). NAIL TO THE STRUTS OF PIECE MARKED ① W/2-10d NAILS AT EACH END.
- ③ END BLOCKING ASSEMBLY (2 REQD, ONE LEFT HAND AND ONE RIGHT HAND). SEE THE DETAIL ON PAGE 5. NAIL THROUGH THE BUFFER PIECES INTO THE VERTICAL PIECES OF PIECE MARKED ① W/6-10d NAILS.
- ④ CENTER FILL ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 4.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	283	189
2" X 6"	119	119
4" X 4"	12	16
NAILS	NO. REQD	POUNDS
10d (3")	368	5-3/4
12d (3-1/4")	32	3/4

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
CNU-431/E	8	15,784 LBS
DUNNAGE		651 LBS
CONTAINER		6,050 LBS
TOTAL WEIGHT		22,485 LBS (APPROX)

(GENERAL NOTES CONTINUED)

K. 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.

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. 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.

P. THE QUANTITY OF CONTAINERS SHOWN IN THE LOAD ON PAGE 2 MAY BE REDUCED FOR SHIPMENT, IF DESIRED. SEE THE "LESS-THAN-FULL LOAD" DETAIL ON PAGE 6.

Q. ANTI-CHAFING MATERIAL MAY BE INSTALLED AT POINTS OF CONTACT BETWEEN CONTAINERS AND THE SIDE OPENING CONTAINER, AND BETWEEN CONTAINERS AND STEEL STRAPPING, IF DESIRED, TO PREVENT CHAFING DAMAGE TO CONTAINER PAINT AND MARKINGS.

R. AS REQUIRED BY THE ASSOCIATION OF AMERICAN RAILROADS (AAR), ALL 1-1/4" AND 2" STEEL STRAPPING USED FOR LOAD RESTRAINT MUST BE MARKED AS SPECIFIED WITHIN THE APPLICABLE AAR RULES GOVERNING LOADING, BLOCKING AND BRACING OF FREIGHT WITHIN THE CONVEYANCE. FOR THE SPECIFIC MARKING SIZE, FREQUENCY, ETC., REQUIRED, REFER TO THE APPROPRIATE AAR LOADING RULES.

S. RECOMMENDED SEQUENTIAL LOADING PROCEDURES:

1. PREFABRICATE FOUR STRUT ASSEMBLIES, TWO END BLOCKING ASSEMBLIES, AND ONE CENTER FILL ASSEMBLY.
2. INSTALL THE FOUR STRUT ASSEMBLIES AND FOUR SPREADER PIECES.
3. INSTALL THE END BLOCKING ASSEMBLIES.
4. LOAD FOUR CONTAINERS.
5. INSTALL THE CENTER FILL ASSEMBLY.
6. LOAD THE REMAINING FOUR CONTAINERS.

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 AMRAAM (AIM-120) MISSILES PACKED IN CNU-431/E METAL CONTAINERS. SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE CNU-431/E CONTAINER WITH CONTENTS. SEE PAGE 4 AND AIR FORCE DRAWING NO. 8644140 FOR DETAILS OF THE CNU-431/E CONTAINER. 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 LOADS AS SHOWN ARE BASED ON A 6,050 POUND 20' LONG BY 8' WIDE BY 8'-6" HIGH SIDE OPENING ISO CONTAINER WITH INSIDE DIMENSIONS OF 19'-5-1/4" LONG BY 89-3/4" WIDE BY 88" HIGH AND A MAXIMUM GROSS WEIGHT OF 52,910 POUNDS. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (T/COFC) SHIPMENT, HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY MOTOR OR WATER CARRIERS. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN ALSO BE USED.

D. WHEN LOADING CNU-431/E CONTAINERS, 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 ASSEMBLY. NAIL EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE LENGTH OF THE LATERAL PIECES IN THE CENTER FILL ASSEMBLY MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE CONTAINER SIZE.

E. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 6" MATERIAL IS ACTUALLY 3/4" THICK BY 5-1/2" 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 ENDWALLS. PIECES OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE STRUT ASSEMBLIES TO PROVIDE A FLAT SURFACE FOR THE STRUT ASSEMBLIES. 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 ENDWALLS 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 LONGITUDINAL BLOCKING.

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 SIDE DOORS, HAVE NOT BEEN SHOWN IN THE LOAD VIEW FOR CLARITY PURPOSES.

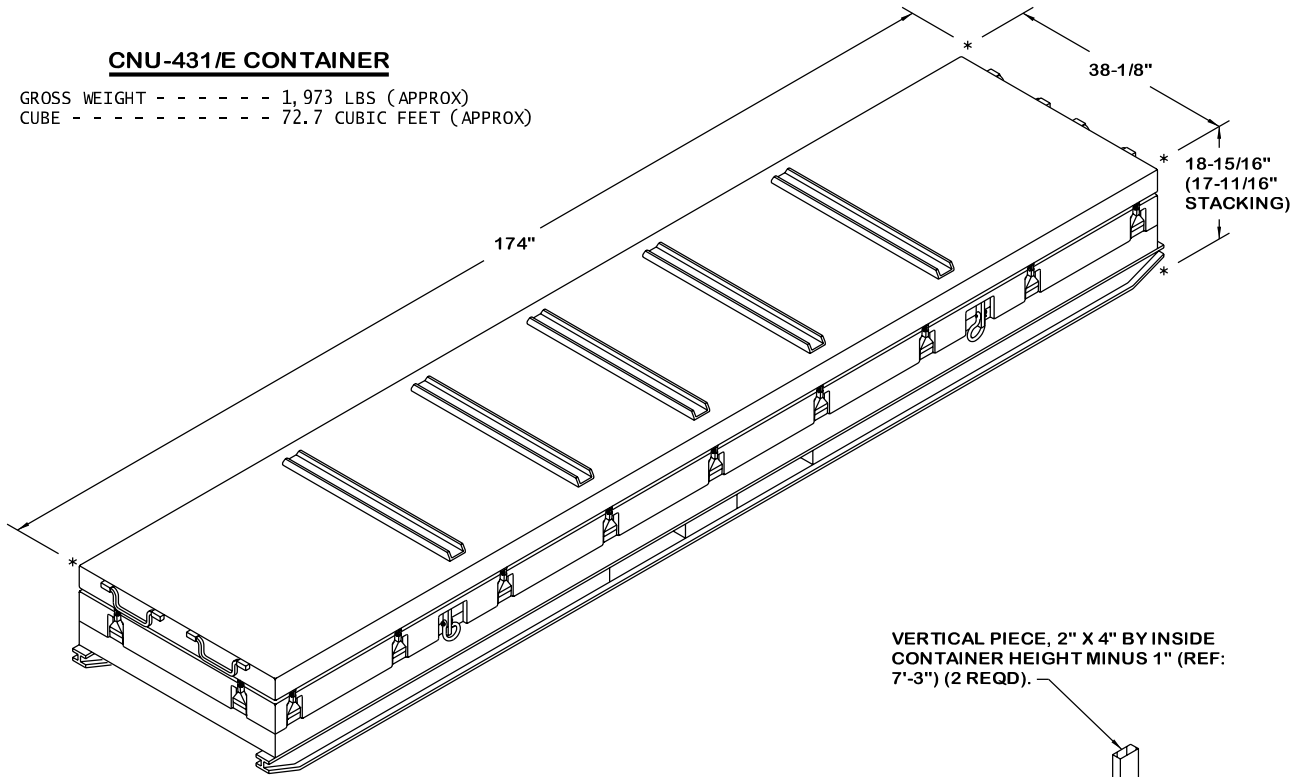
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MATERIAL SPECIFICATIONS

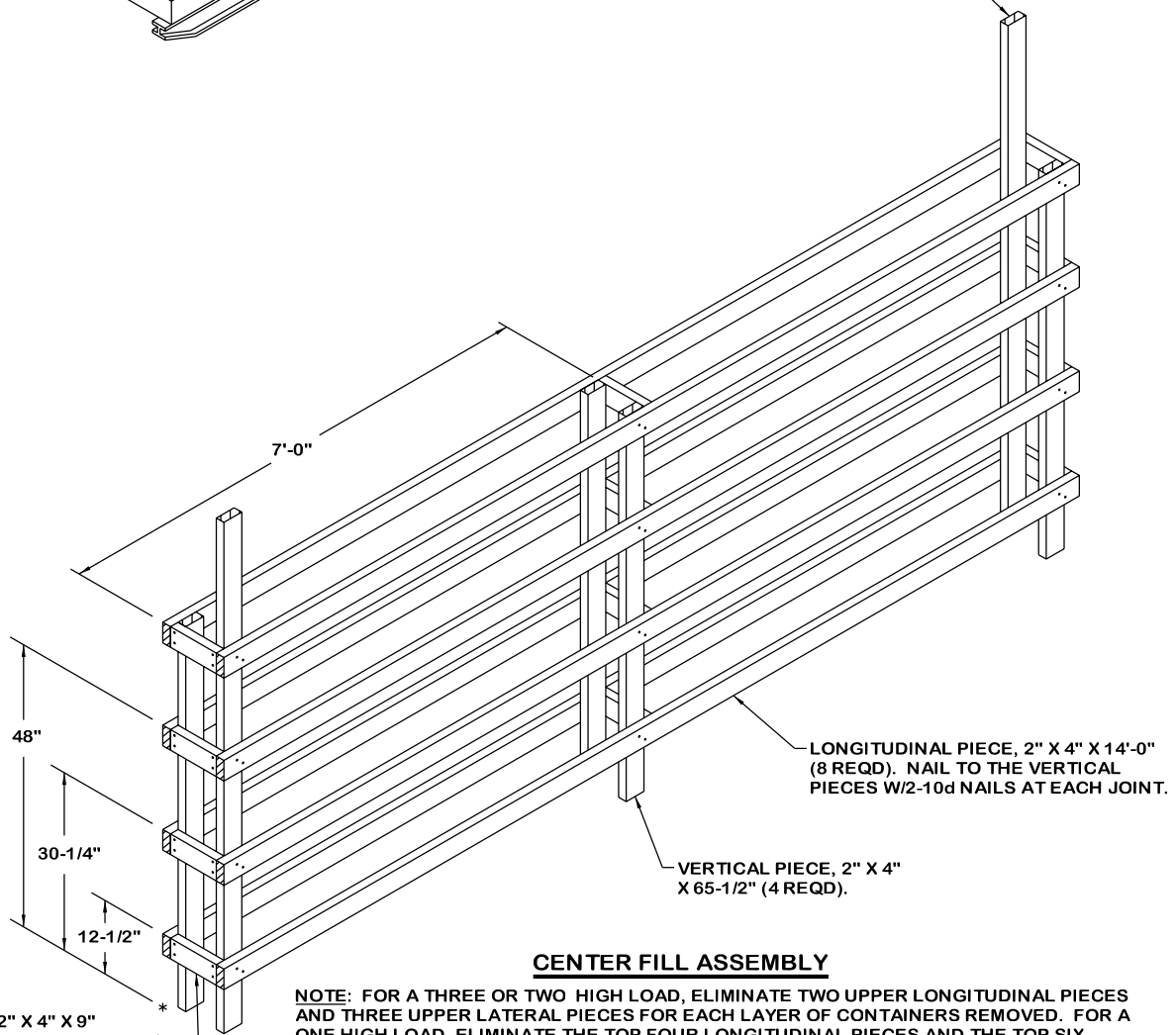
- LUMBER - - - - - -: SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.
- NAILS - - - - - -: ASTM F1667; COMMON STEEL NAIL (NLCMS OR NLCMS).
- STRAPPING, STEEL - - -: ASTM D3953; FLAT STRAPPING, TYPE 1, HEAVY DUTY, FINISH A, B (GRADE 2), OR C.
- SEAL, STRAP - - - -: ASTM D3953; CLASS H, FINISH A, B (GRADE 2), OR C, DOUBLE NOTCH TYPE, STYLE I, II, OR IV.
- ANTI-CHAFING MATERIAL - - - - - -: MIL-B-121 (OR EQUAL); NEUTRAL BARRIER MATERIAL.

**CNU-431/E CONTAINER**

GROSS WEIGHT - - - - - 1,973 LBS (APPROX)  
 CUBE - - - - - 72.7 CUBIC FEET (APPROX)



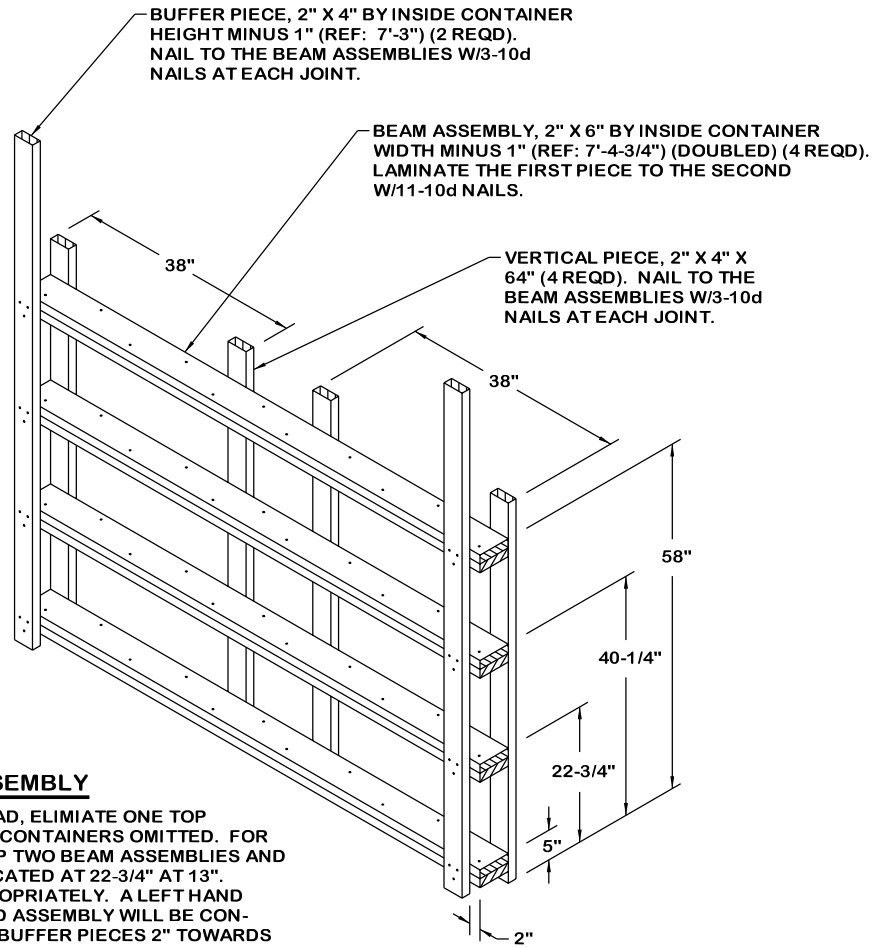
VERTICAL PIECE, 2" X 4" BY INSIDE  
 CONTAINER HEIGHT MINUS 1" (REF:  
 7'-3") (2 REQD).



**CENTER FILL ASSEMBLY**

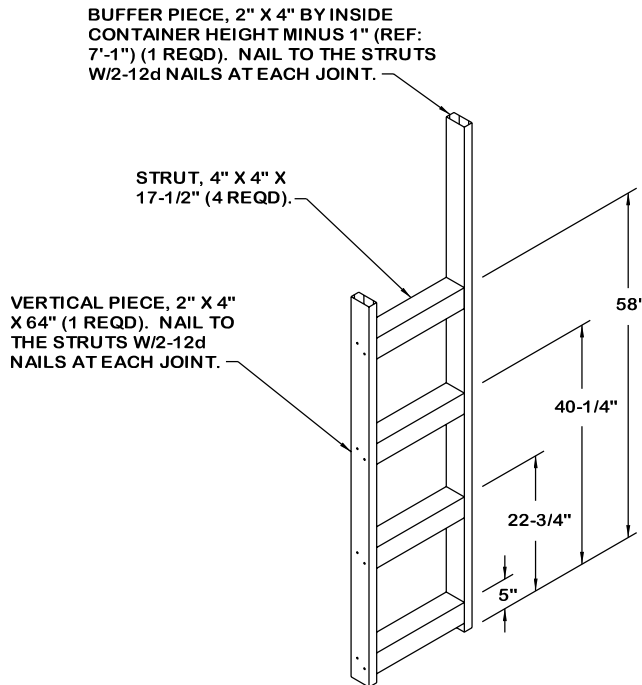
LATERAL PIECE, 2" X 4" X 9"  
 (12 REQD). NAIL TO THE VERTICAL  
 PIECES W/2-10d NAILS AT EACH END.

**NOTE:** FOR A THREE OR TWO HIGH LOAD, ELIMINATE TWO UPPER LONGITUDINAL PIECES AND THREE UPPER LATERAL PIECES FOR EACH LAYER OF CONTAINERS REMOVED. FOR A ONE HIGH LOAD, ELIMINATE THE TOP FOUR LONGITUDINAL PIECES AND THE TOP SIX LATERAL PIECES, REPOSITION ALL THE PIECES AT 30-1/4" AT 14-1/2", AND REPOSITION ALL THE PIECES AT 12-1/2" AT 11". SHORTEN THE 65-1/2" VERTICAL PIECES APPROPRIATELY. THE LENGTH OF THE LATERAL PIECES IS DEPENDENT ON THE VOID BETWEEN THE CONTAINERS.



**END BLOCKING ASSEMBLY**

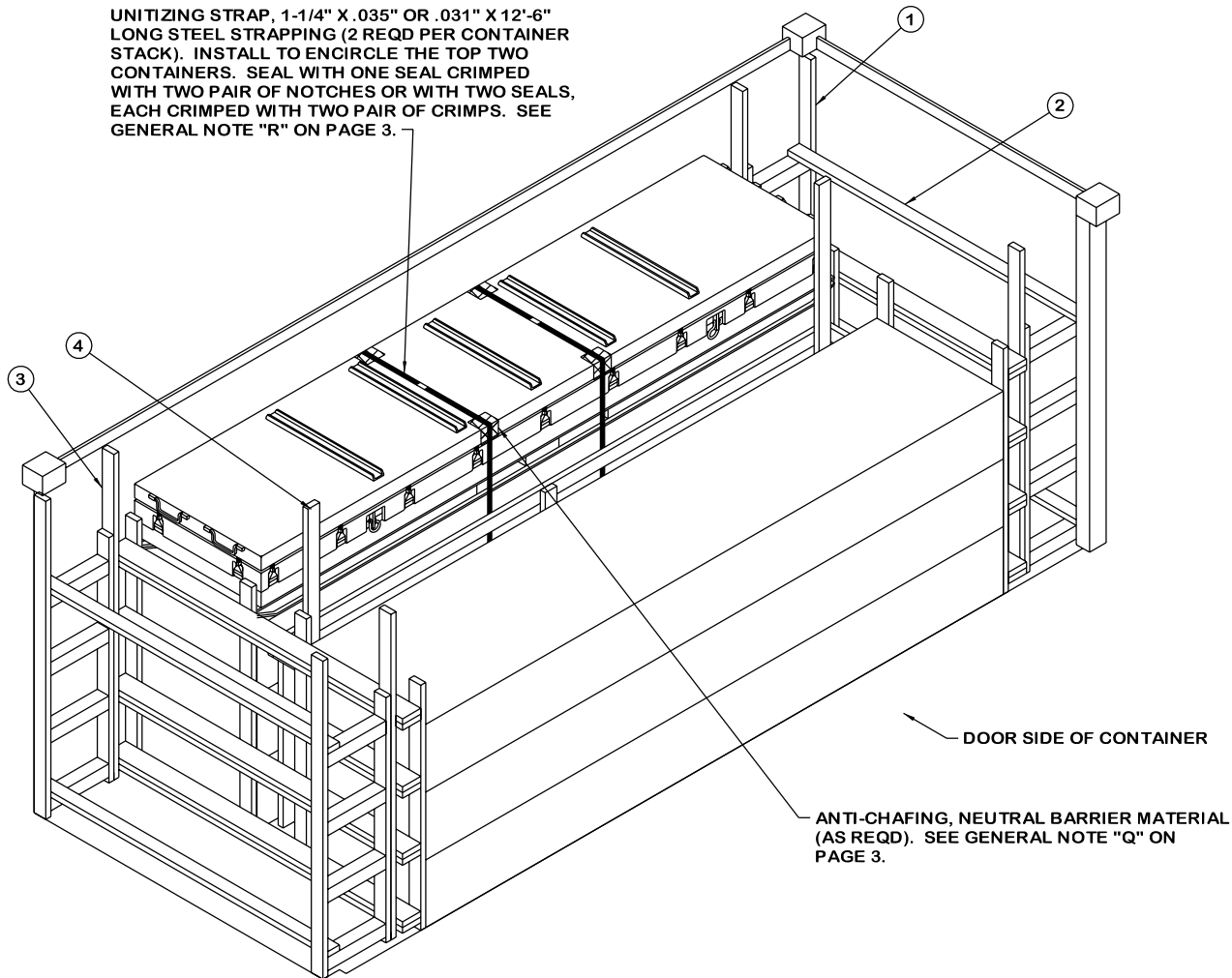
NOTE: FOR A THREE OR TWO HIGH LOAD, ELIMIATE ONE TOP BEAM ASSEMBLY FOR EACH LAYER OF CONTAINERS OMITTED. FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO BEAM ASSEMBLIES AND REPOSITION THE BEAM ASSEMBLY LOCATED AT 22-3/4" AT 13". SHORTEN THE VERTICAL PIECES APPROPRIATELY. A LEFT HAND ASSEMBLY IS DEPICTED, A RIGHT HAND ASSEMBLY WILL BE CONSTRUCTED BY SHIFTING BOTH OF THE BUFFER PIECES 2" TOWARDS THE RIGHT, AS ORIENTED ABOVE. BOTH A LEFT AND A RIGHT HAND ASSEMBLY ARE REQUIRED.



**STRUT ASSEMBLY**

NOTE: FOR A THREE OR TWO HIGH LOAD, ELIMIATE ONE UPPER STRUT FOR EACH LAYER OF CONTAINERS OMITTED. FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO STRUTS AND REPOSITION THE STRUT LOCATED AT 22-3/4" AT 13". SHORTEN THE VERTICAL PIECE APPROPRIATELY.

UNITIZING STRAP, 1-1/4" X .035" OR .031" X 12'-6"  
 LONG STEEL STRAPPING (2 REQD PER CONTAINER  
 STACK). INSTALL TO ENCIRCLE THE TOP TWO  
 CONTAINERS. SEAL WITH ONE SEAL CRIMPED  
 WITH TWO PAIR OF NOTCHES OR WITH TWO SEALS,  
 EACH CRIMPED WITH TWO PAIR OF CRIMPS. SEE  
 GENERAL NOTE "R" ON PAGE 3.



**ISOMETRIC VIEW**

**SPECIAL NOTE:**

WHEN REDUCING A LOAD BY ONE OR MORE CONTAINERS, IT WILL  
 BE NECESSARY TO UNITIZE THE CONTAINER STACK WHICH IS  
 LATERALLY ADJACENT TO THE OMITTED CONTAINER AS DEPICTED  
 IN THE LOAD VIEW ABOVE. SEE GENERAL NOTE "O" ON PAGE 3.

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

KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 2. NOTE THAT THE  
 CENTER FILL ASSEMBLY HAS BEEN MODIFIED AS DESCRIBED ON PAGE 4.