

APPROVED BY  
BUREAU OF EXPLOSIVES

*Jan 12*  
DATE 8/8/2006

# PATRIOT

## LOADING AND BRACING\* IN MILVAN CONTAINERS<sup>⊗</sup> OF PATRIOT (PAC-3) PACKED IN SHIPPING AND STORAGE CANISTERS

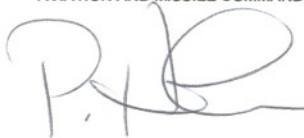

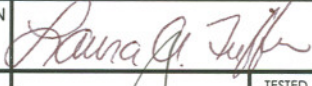

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<sup>⊗</sup>ONLY MILVAN CONTAINERS WHICH HAVE BEEN MODIFIED TO INCLUDE A MECHANICAL LOAD-BRACING SYSTEM THAT SATISFIES THE REQUIREMENTS OF THE BUREAU OF EXPLOSIVES PAMPHLET 6C WILL BE USED FOR THE MOVEMENT OF AMMUNITION BY T/COFC SERVICE. CAUTION: OTHER REQUIREMENTS OF PAMPHLET 6C ALSO APPLY.

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

### U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY AVIATION AND MISSILE 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 8.</b>					
	<b>DO NOT SCALE</b>		<b>AUGUST 2006</b>			
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  U.S. ARMY DEFENSE AMMUNITION CENTER	ENGINEER OR TECHNICIAN	BASIC REV.	MELVIN SIX			
	TRANSPORTATION ENGINEERING DIVISION					
	VALIDATION ENGINEERING DIVISION	TESTED	CLASS	DIVISION	DRAWING	
ENGINEERING DIRECTORATE			19	48	8223	GM15PA7

PROJECT GM 900-01

## 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 OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE APPLICABLE TO PATRIOT ADVANCED CAPABILITY-3 (PAC-3) COMPLETE ROUND, WHEN PACKED IN THE MISSILE CANISTER (SHIPPING, STORAGE AND LAUNCH CANISTER). SEE PAGE 3 AND LOCKHEED-MARTIN DRAWING 13506000 FOR DETAILS OF THE CANISTER. **CAUTION:** REGARDLESS OF THE QUANTITY OF CANISTERS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE MILVAN CONTAINER MUST NOT BE EXCEEDED.
- C. THE LOADS AS SHOWN ARE BASED ON A 20' LONG BY 8' WIDE BY 8' HIGH MILVAN CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 92" WIDE BY 87" HIGH. THE LOADS ARE DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (T/COFC) SHIPMENT.
- D. WHEN LOADING MISSILE CANISTERS, 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". THE LENGTH OF THE STRUTS IN THE CRIB FILL ASSEMBLY OR SIDE SPACER ASSEMBLY MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIATION IN THE SIZE OF THE CANISTER.
- E. THE SPECIFIED OUTLOADING PROCEDURES ARE FOR CONTAINERS EQUIPPED WITH SELF-CONTAINED MECHANICAL BRACING DEVICES AS DESCRIBED IN MIL-C-52661. CROSS MEMBER ATTACHMENT FACILITIES WITHIN THESE CONTAINERS MUST PROVIDE FOR THE INSTALLATION OF LOAD BLOCKING CROSS MEMBERS AT THE HEIGHTS SPECIFIED. VOIDS LENGTHWISE WITHIN THE LOAD MUST BE HELD TO A MINIMUM. EACH CROSS MEMBER WILL BE INSTALLED WITH THE ENDS ATTACHED AS NEARLY AS POSSIBLE IN "MATED" POSITIONS (AT EQUAL HEIGHTS, AND AT EQUAL DISTANCES FROM THE END OF THE CONTAINER). CROSS MEMBERS IN EMPTY CONTAINERS AND THOSE NOT USED IN LOADED CONTAINERS MUST BE FASTENED INTO BELT RAILS FOR SHIPMENT. COMPONENTS ASSIGNED TO EACH CONTAINER MUST REMAIN THEREWITH EVEN THOUGH UNUSED DURING SOME SHIPMENTS. THE LOAD BLOCKING COMPONENT DESIGNATED AS "CROSS MEMBER" HEREIN IS IDENTIFIED AS "BEAM ASSEMBLY" WITHIN TM 55-8115-200-23&P, DATED DECEMBER 1979. THE BEAM ASSEMBLY IS FURTHER IDENTIFIED AS NSN 8115-00-165-6623.
- F. 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.
- G. 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.
- H. **CAUTION:** DO NOT NAIL DUNNAGE MATERIAL TO THE MILVAN WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.
- J. PORTIONS OF THE MILVAN DEPICTED WITHIN THIS DRAWING, SUCH AS ONE OF THE SIDEWALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

(CONTINUED AT RIGHT)

## 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.

## 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. LOAD LIMITS OF T/COFC RAIL CARS 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.
3. CHASSIS/CONTAINERS COUPLED INTO A 40-FOOT TRAILER CONFIGURATION MUST BE PLACED AT THE B-END OF A TOFC RAILCAR. THE REAR END OF THE 40-FOOT UNIT WILL OVERHANG THE END OF THE CAR IF IT IS PLACED AT THE A-END. TWENTY-FOOT AND 40-FOOT UNITS CAN BE LOADED ON THE SAME CAR.

## M. 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.

## N. THE QUANTITY OF CANISTERS SHOWN IN THE LOAD ON PAGES 4 AND 5 MAY BE REDUCED FOR SHIPMENT, IF DESIRED.

## O. ANTI-CHAFING MATERIAL MAY BE INSTALLED AT POINTS OF CONTACT BETWEEN CANISTERS AND THE MILVAN.

## P. TO MAKE LOADING EASIER, TO HELP ACHIEVE A TIGHT LOAD ACROSS A CONTAINER, AND TO PREVENT UNACCEPTABLE DAMAGE TO LADING UNITS WHEN LOADING A MILVAN, A SLIP-SHEET CAN BE USED EFFECTIVELY AS A "SHOEHORN" TYPE DEVICE. THE SLIP-SHEET WILL PROVIDE A SMOOTH SURFACE THAT WILL PREVENT CANISTERS FROM INTERLOCKING OR CATCHING ON OTHER PROJECTIONS WHEN LATERALLY ADJACENT LADING UNITS ARE BEING LOADED. A SLIP-SHEET WILL BE USED AFTER ONE-HALF OF A STACK IS LOADED WITH ONE OF ITS SIDES IN TIGHT CONTACT AT ONE SIDE OF THE MILVAN. THE SLIP-SHEET IS TO BE PLACED AGAINST THE OTHER SIDE OF THE HALF-STACK BEFORE THE LAST HALF OF THE STACK IS LOADED. AFTER A STACK IS COMPLETED, THE SLIP-SHEET IS TO BE REMOVED FOR SUBSEQUENT USE WITH THE NEXT STACK. A SLIP-SHEET OF SUITABLE SIZE CAN BE MADE FROM A SHEET OF 1/8" TEMPERED HARDBOARD (MASONITE) OR FROM A SHEET OF ANY OTHER MATERIAL THAT WILL SATISFY THE REQUIREMENTS.

## MATERIAL SPECIFICATIONS

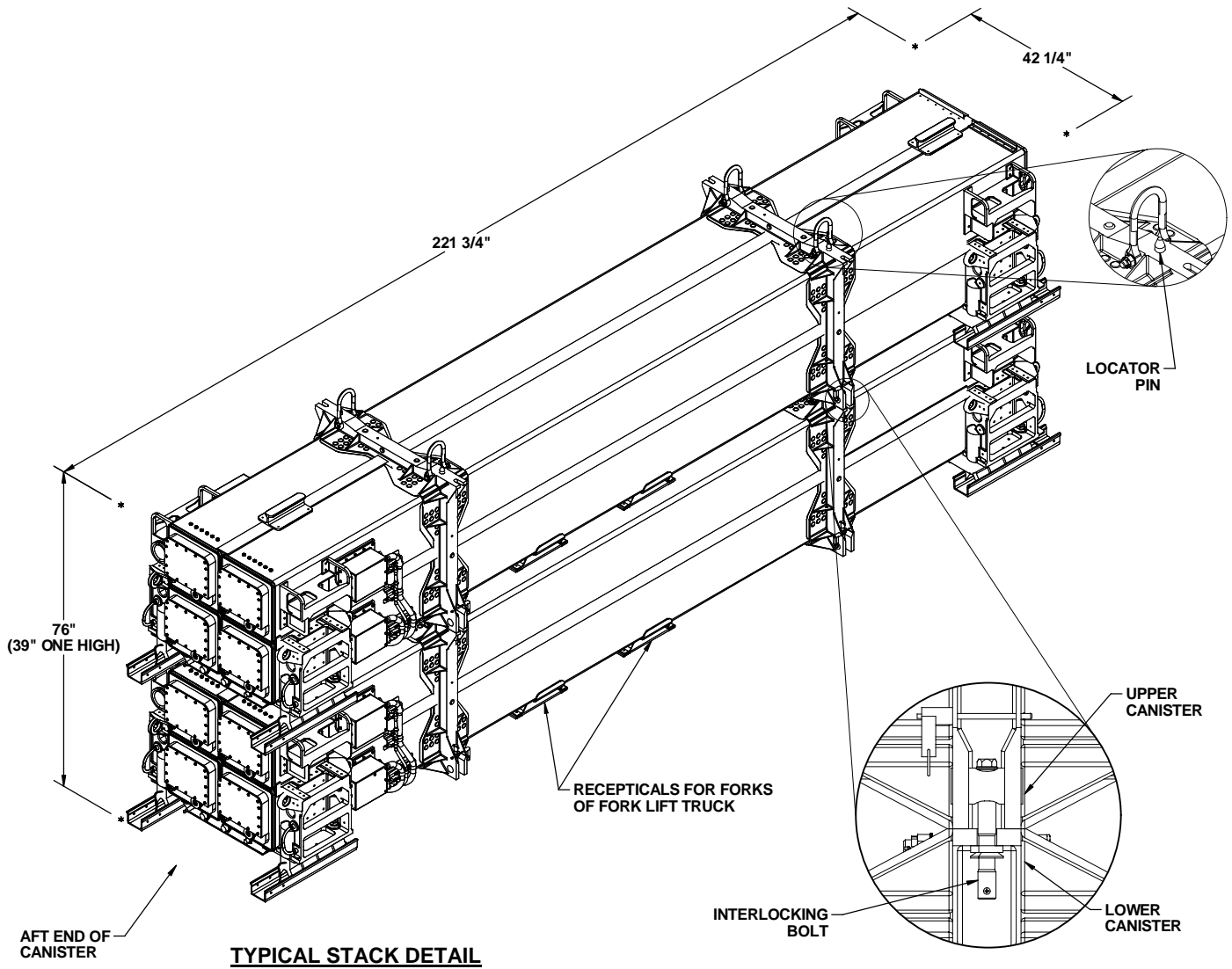
LUMBER - - - - - : SEE TM 743-200-1 (DUNNAGE LUMBER) AND VOLUNTARY PRODUCT STANDARD PS 20.

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.

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

WIRE, CARBON STEEL - : ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, 0.0800" DIA, GRADE 1006 OR BETTER.



**TYPICAL STACK DETAIL**

**SIDE VIEW DETAIL OF INTERLOCKING BOLT ASSEMBLY**

**PATRIOT PAC-3 DETAIL**

GROSS WEIGHT - - - - - 4,399 LBS (APPROX)  
 CUBE - - - - - 209.2 CU FT (APPROX)

**UNITIZATION AND HANDLING PROCEDURAL GUIDANCE**

(PROCEDURAL GUIDANCE CONTINUED)

1. STACKING CANISTER FOR UNITIZATION.
  - A. THE UPPER CANISTER STACK FRAME MUST BE FULLY SEATED UPON THE LOCATOR PINS OF THE LOWER CANISTER.
  - B. POSITION THE FORWARD END OF THE UPPER CANISTER ABOVE THE FORWARD END OF THE LOWER CANISTER.
  - C. CANISTER INTERLOCKING BOLTS MUST BE TIGHTENED AS SECURELY AS POSSIBLE WITH A NORMAL HAND TOOL WRENCH (REF: 60 FOOT POUNDS).

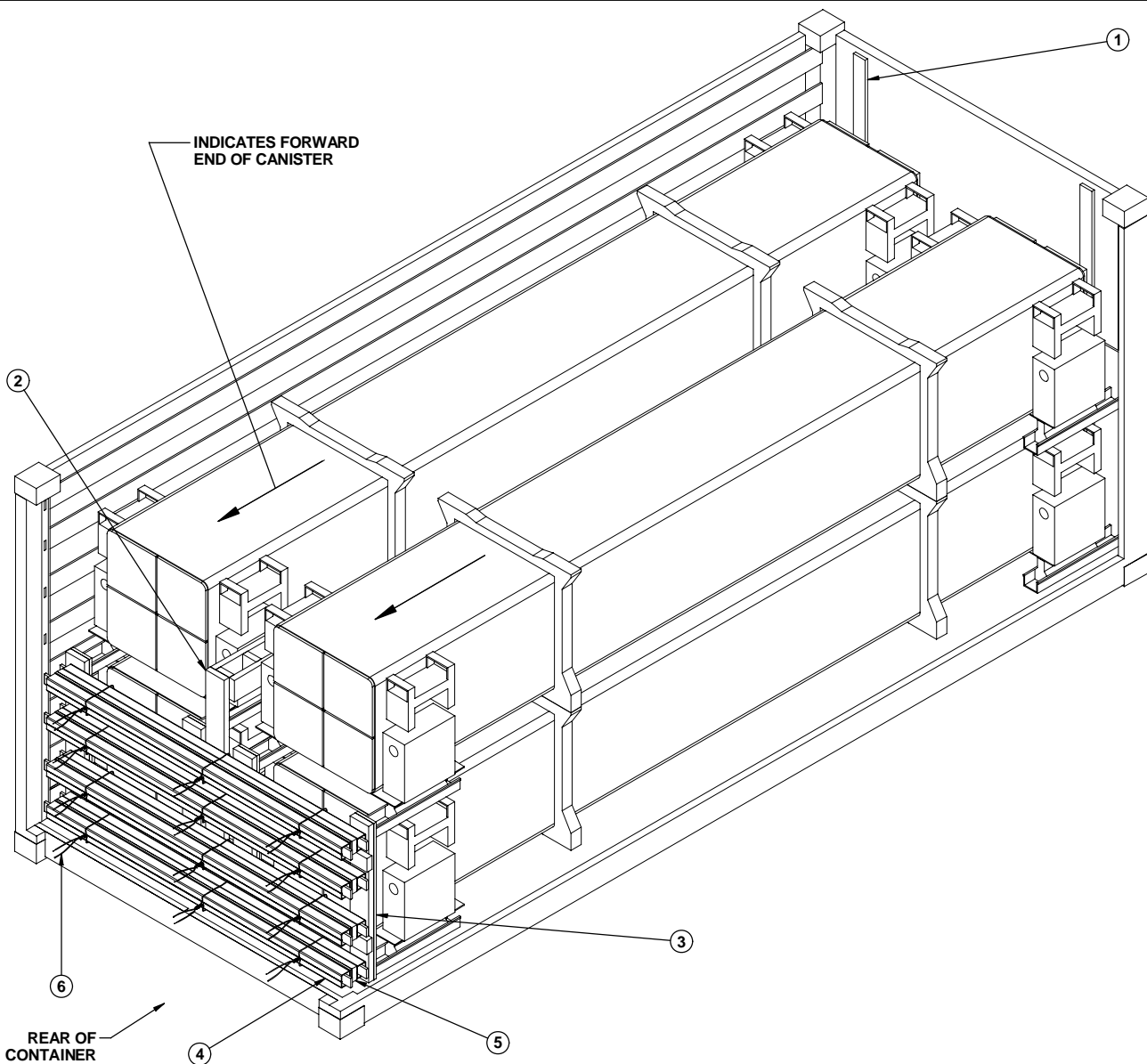
- A. ONLY APPROVED AND APPROPRIATELY SIZED MATERIALS HANDLING EQUIPMENT WILL BE USED FOR HANDLING THE DEPICTED CANISTERS.
- B. IF HANDLING IS ACCOMPLISHED WITH A FORK TRUCK, THE CANISTERS SHOULD BE HANDLED FROM A SIDE POSITION AS MUCH AS POSSIBLE. CARE MUST BE EXERCISED WHEN INSERTING FORKS UNDER A CANISTER, TO PREVENT DAMAGE TO THE CANISTER BY THE FORKLIFT TINES OR THE FORKLIFT PACKAGE GUARD. FOR VERY SHORT "INCHING" SPEED MOVEMENTS, SUCH AS WILL BE EXPERIENCED DURING CONTAINER LOADING, A TWO-HIGH CANISTER STACK MAY BE HANDLED BY INSERTING THE FORKS OF THE FORKLIFT TRUCK INTO THE FORK RECEPTACLES OF THE UPPER CANISTER.

NOTES: (1) APPROVED MATERIALS HANDLING EQUIPMENT (MHE) IS SPECIFIED IN OTHER DOCUMENTS. MHE IS INTENDED TO MEAN EQUIPMENT SUCH AS FORKLIFT TRUCKS, CRANES, HAND TRUCKS, DOLLIES, ROLLER ASSEMBLIES, SLINGS, AND SPREADER BARS.

- C. SLINGING OF A CANISTER OR A CANISTER STACK WILL BE IN ACCORDANCE WITH APPROVED PROCEDURES.

(2) PRECAUTIONARY HANDLING TECHNIQUES NORMALLY EMPLOYED OR AS SPECIFIED FOR THE TYPE OF COMMODITY INVOLVED WILL BE OBSERVED.

(CONTINUED AT RIGHT)



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① FORWARD BLOCKING ASSEMBLY A (1 REQD). SEE DETAIL ON PAGE 8.
- ② CRIB FILL ASSEMBLY A (2 REQD). SEE THE DETAIL ON PAGE 7. NAIL VERTICAL PIECE TO FORWARD BLOCKING ASSEMBLY "A" NAILING PIECE W/3-10d NAILS.
- ③ REAR BLOCKING ASSEMBLY A (1 REQD). SEE THE DETAIL ON PAGE 8. NAIL TIE PIECE TO CRIB FILL ASSEMBLY "A" VERTICAL PIECE W/3-10d NAILS AT EACH JOINT.
- ④ CROSS MEMBER (8 REQD). POSITION AS SHOWN IN THE DETAIL ABOVE AT THE 5", 16", 28", AND 38" HEIGHTS.
- ⑤ FILL MATERIAL, 2" X 4" AND 1/2" PLYWOOD X 3-1/2" BY INSIDE CONTAINER WIDTH MINUS 1" (4 REQD). SEE THE "FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.
- ⑥ TIE WIRE, 0.800" DIAMETER BY 24" LONG (12 REQD). SEE THE " FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.

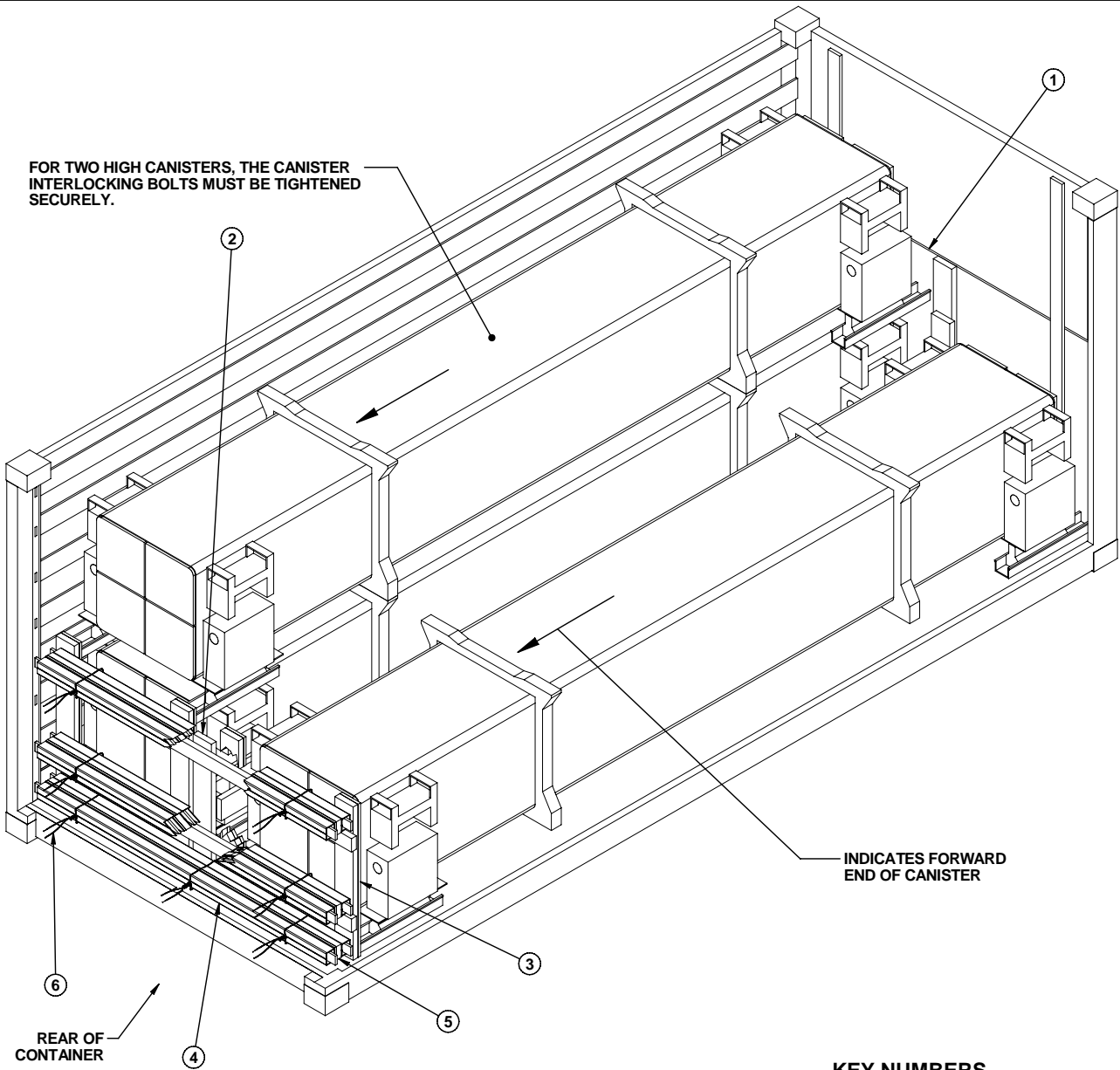
**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
CANISTER	4	17,356 LBS
DUNNAGE		242 LBS
CONTAINER		5,700 LBS

TOTAL WEIGHT - - - - - 23,298 LBS (APPROX)

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	15	5
1" X 6"	14	7
2" X 4"	31	21
2" X 6"	62	62
NAI LS	NO. REQD	POUNDS
6d (2")	35	1/4
10d (3")	117	2
PLYWOOD, 1/2"	38.97 SQ FT REQD	54 LBS
WI RE, 0.080" DIA	24' REQD	1/2 LB

FOR TWO HIGH CANISTERS, THE CANISTER INTERLOCKING BOLTS MUST BE TIGHTENED SECURELY.



**ISOMETRIC VIEW**

**KEY NUMBERS**

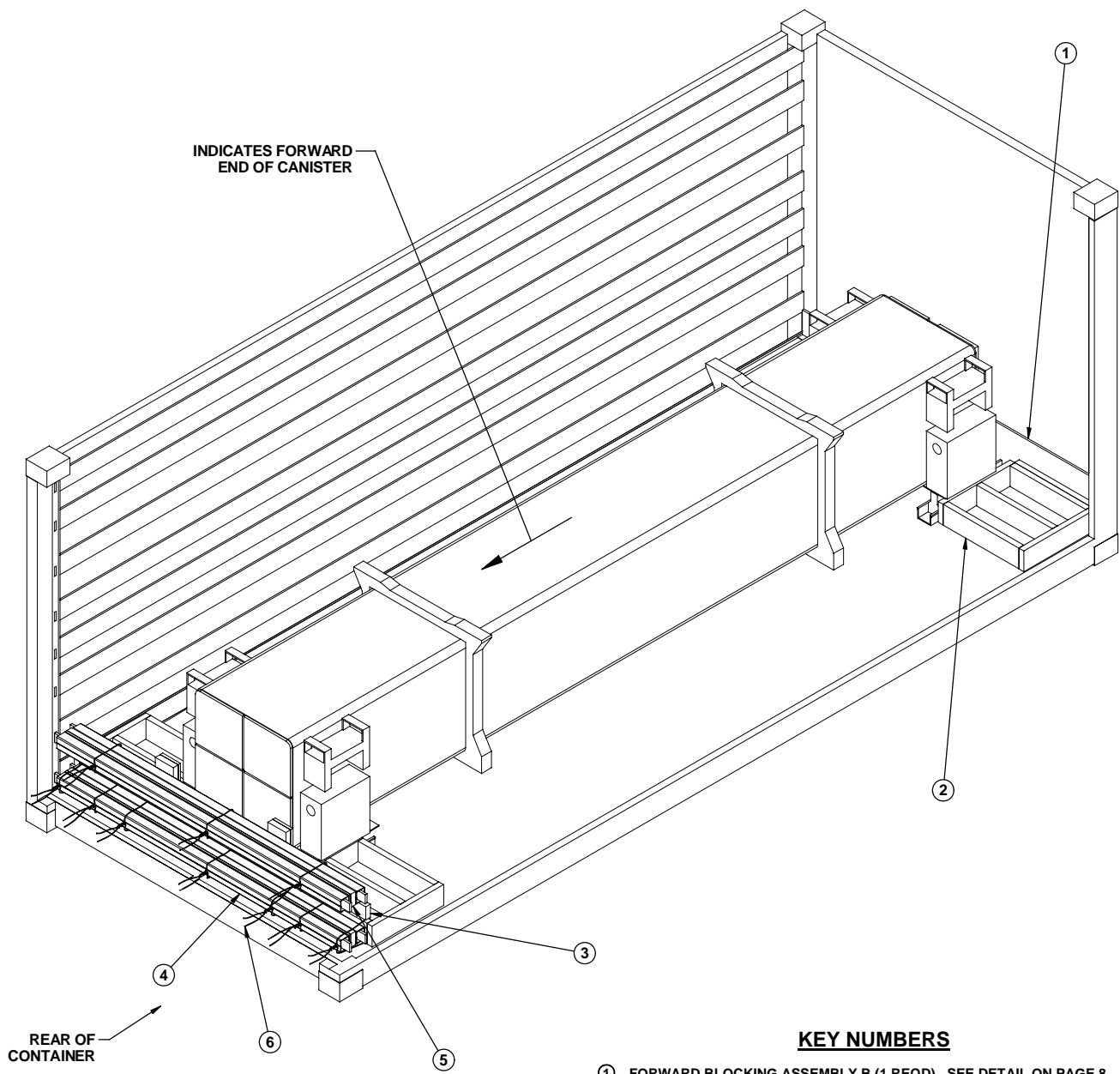
- ① FORWARD BLOCKING ASSEMBLY A (1 REQD). SEE DETAIL ON PAGE 8.
- ② CRIB FILL ASSEMBLY B (2 REQD). SEE THE DETAIL ON PAGE 7. NAIL VERTICAL PIECE TO FORWARD BLOCKING ASSEMBLY "A" NAILING PIECE W/3-10d NAILS.
- ③ REAR BLOCKING ASSEMBLY A (1 REQD). SEE THE DETAIL ON PAGE 8. NAIL TIE PIECE TO CRIB FILL ASSEMBLY VERTICAL PIECE W/3-10d NAILS AT EACH JOINT.
- ④ CROSS MEMBER (6 REQD). POSITION AS SHOWN IN THE DETAIL ABOVE AT THE 5", 16" AND 38" HEIGHTS.
- ⑤ FILL MATERIAL, 2" X 4" AND 1/2" PLYWOOD X 3-1/2" BY INSIDE CONTAINER WIDTH MINUS 1" (3 REQD). SEE THE "FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.
- ⑥ TIE WIRE, 0.800" DIAMETER BY 24" LONG (9 REQD). SEE THE "FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	15	5
1" X 6"	14	7
2" X 4"	23	16
2" X 6"	57	57
NAILS	NO. REQD	POUNDS
6d (2")	35	1/4
10d (3")	111	1-3/4
PLYWOOD, 1/2"	36.77 SQ FT REQD	51 LBS
WIRE, 0.080" DIA	18' REQD	1/2 LB

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
CANISTER	3	13,017 LBS
DUNNAGE		219 LBS
CONTAINER		5,700 LBS

TOTAL WEIGHT - - - - - 18,936 LBS (APPROX)



**ISOMETRIC VIEW**

**KEY NUMBERS**

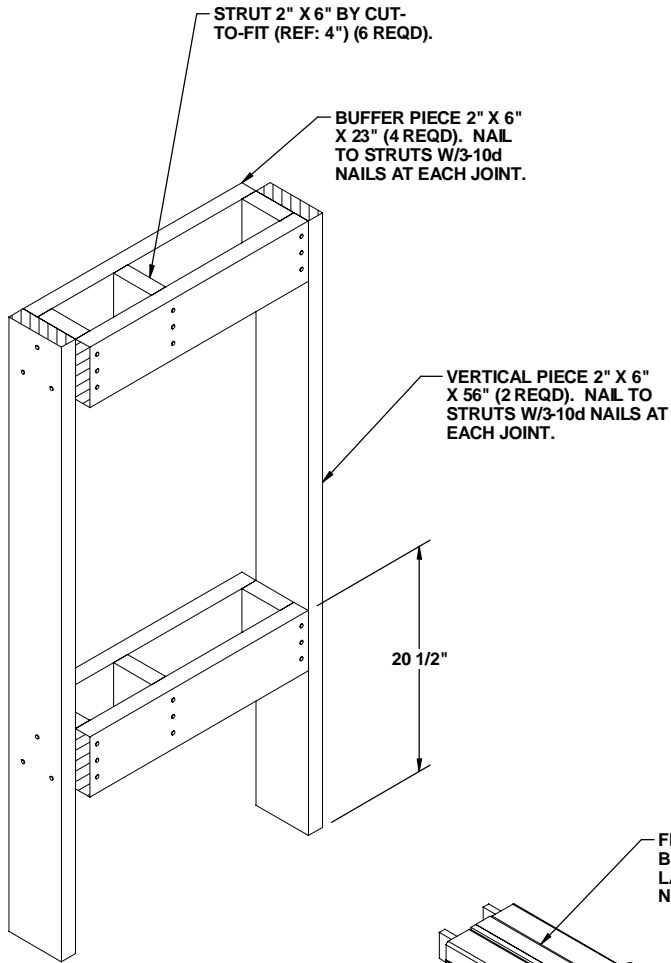
- ① FORWARD BLOCKING ASSEMBLY B (1 REQD). SEE DETAIL ON PAGE 8.
- ② SIDE SPACER ASSEMBLY (4 REQD). SEE DETAIL ON PAGE 7. NAIL TO FORWARD BLOCKING ASSEMBLY "B" NAILING PIECE W/3-10d NAILS.
- ③ REAR BLOCKING ASSEMBLY B (1 REQD). SEE DETAIL ON PAGE 8.
- ④ CROSS MEMBER (4 REQD). POSITION AS SHOWN IN THE DETAIL ABOVE AT THE 5" AND 16" HEIGHTS.
- ⑤ FILL MATERIAL, 2" X 4" AND 1/2" PLYWOOD X 3-1/2" BY INSIDE CONTAINER WIDTH MINUS 1" (2 REQD). SEE THE "FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.
- ⑥ TIE WIRE, .0800" DIA 24" LONG (10 REQD, 2 PER SIDE SPACER ASSEMBLY AND 3 PER CROSS MEMBER PAIR). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE SIDE SPACER ASSEMBLY AND CROSS MEMBER PAIR. BRING ENDS TOGETHER AND TWIST TAUT. ALSO SEE THE "FILL MATERIAL INSTALLATION DETAIL" ON PAGE 7.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	3	2
2" X 4"	16	11
2" X 6"	53	32
NAI LS	NO. REQD	POUNDS
6d (2")	14	NIL
10d (3")	84	1-1/2
PLYWOOD, 1/2"	11.94 SQ FT REQD	17 LBS
WI RE, 0.080" DIA	20' REQD	1/2 LB

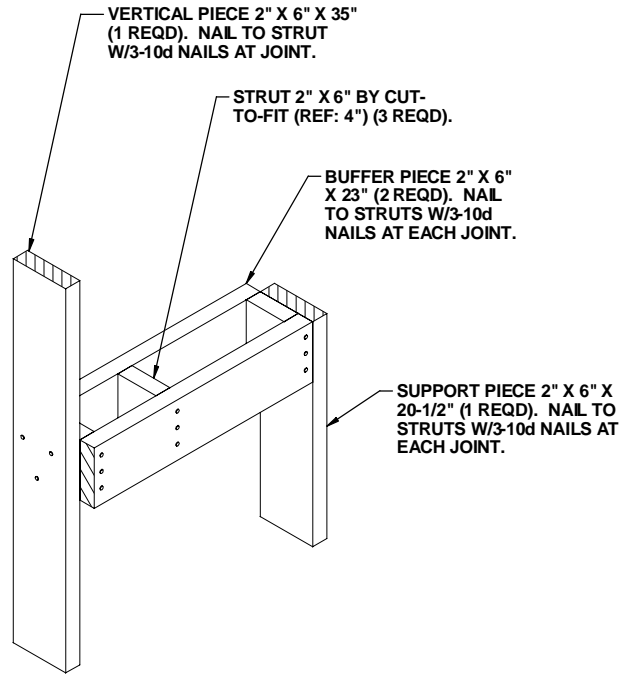
**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
CANISTER	1	4,339 LBS
DUNNAGE		146 LBS
CONTAINER		5,700 LBS

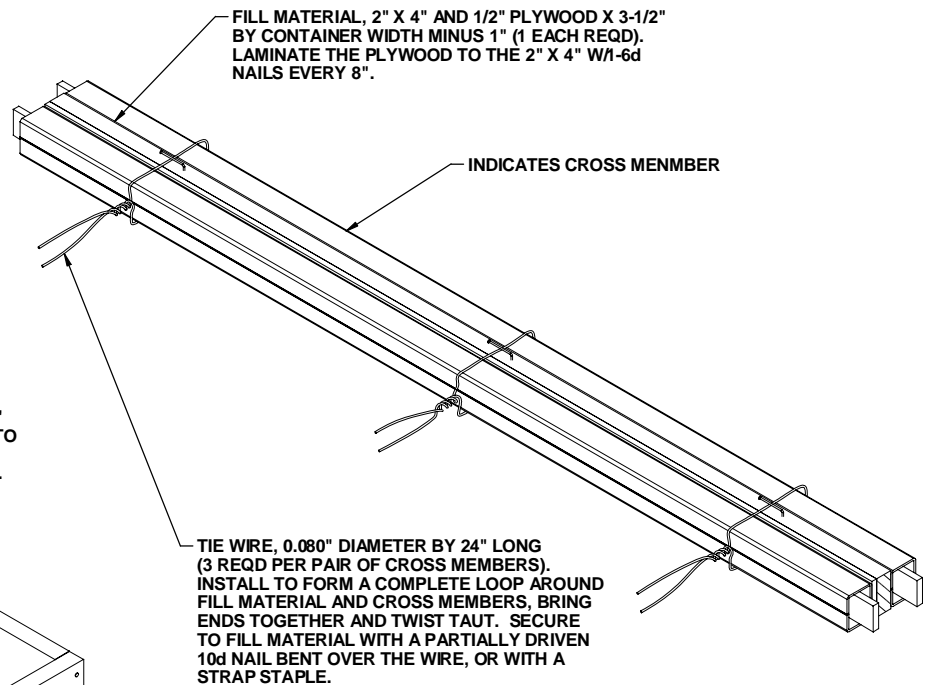
TOTAL WEIGHT - - - - - 10,185 LBS (APPROX)



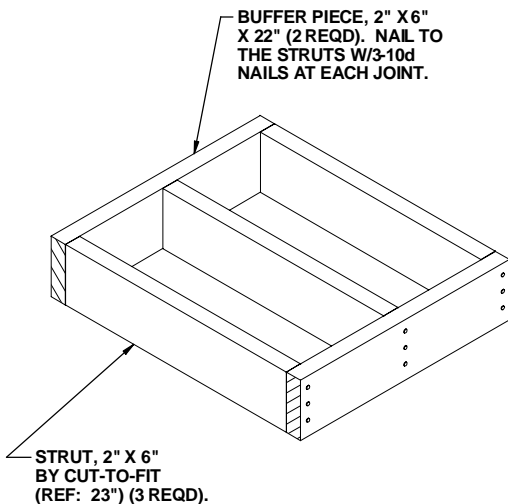
**CRIB FILL ASSEMBLY A**  
FOR A TWO HIGH CANISTER LOAD.



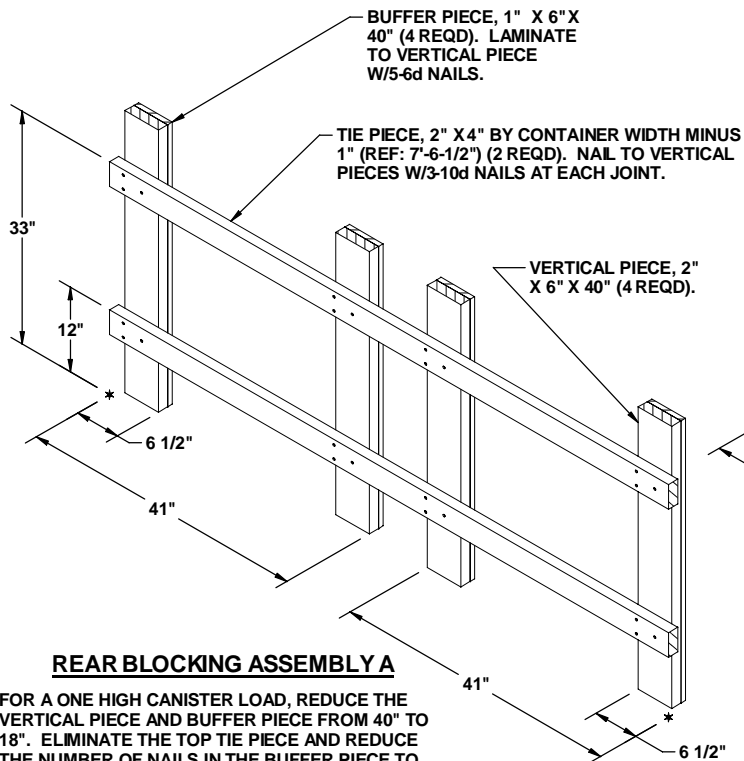
**CRIB FILL ASSEMBLY B**  
FOR A ONE HIGH CANISTER LOAD.



**FILL MATERIAL INSTALLATION DETAIL**

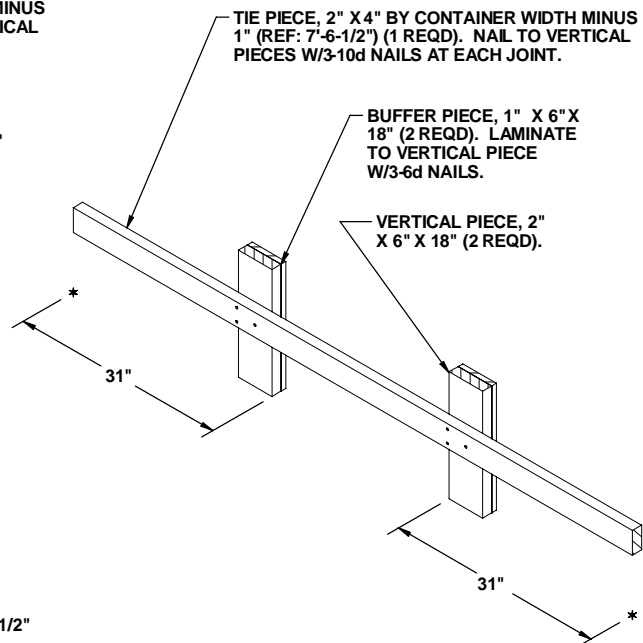


**SIDE SPACER ASSEMBLY**



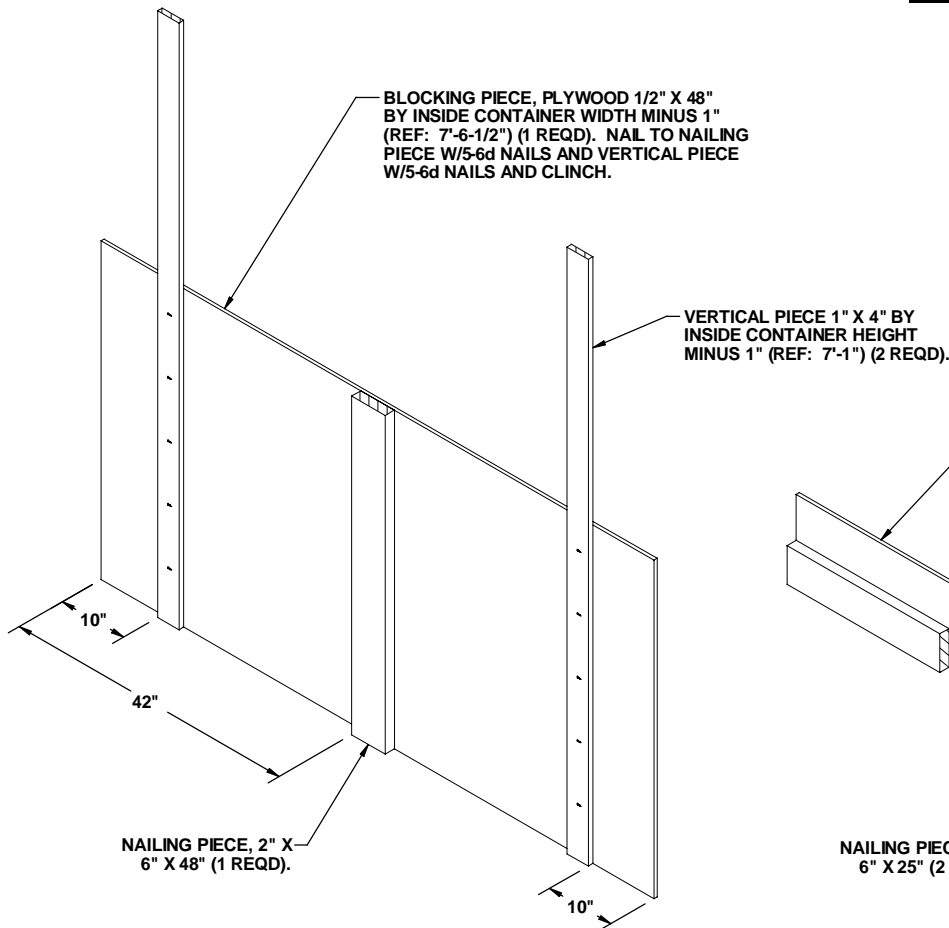
**REAR BLOCKING ASSEMBLY A**

FOR A ONE HIGH CANISTER LOAD, REDUCE THE VERTICAL PIECE AND BUFFER PIECE FROM 40" TO 18". ELIMINATE THE TOP TIE PIECE AND REDUCE THE NUMBER OF NAILS IN THE BUFFER PIECE TO 3-6d NAILS.



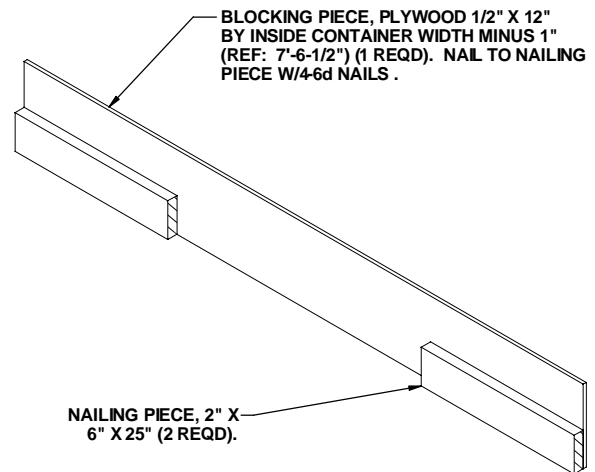
**REAR BLOCKING ASSEMBLY B**

FOR ONE CANISTER LOAD.



**FORWARD BLOCKING ASSEMBLY A**

FOR ONE HIGH CANISTER LOAD, REDUCE THE PLYWOOD AND NAILING PIECE FROM 48" HIGH TO 18" HIGH AND REDUCE THE NUMBER OF NAILS IN THE VERTICAL PIECES 3-6d NAILS AND NAILING PIECE TO 3-6d NAILS.



**FORWARD BLOCKING ASSEMBLY B**

FOR ONE CANISTER LOAD.