APPROVED BY
BUREAU OF EXPLOSIVES

DATE 11/14/91

LOADING AND BRACING● WITH WOODEN DUNNAGE IN COMMERCIAL CONTAINERS OF MIXED LOADS OF PALLETIZED 155MM SEPARATE LOADING PROJECTILES AND PROPELLING CHARGES

INDEX

● LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLAT CAR (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS. SEE GENERAL NOTE "L" ON PAGE 2.

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND

APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

DRAFTSMAN	TECHNICIAN	ENGINEER
G. GUAY	G. GUAY	M. DAELIMER

VALIDATION ENGINEERING DIVISION	TRANSPORTATION ENGINEERING DIVISION	LOGISTICS ENGINEERING OFFICE
	W. Trenchard	WJ Smith

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DO NOT SCALE

PROJECT CA 268-90

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 A MIXED LOAD OF 155MM SEPARATE LOADING PROJECTILES PACKED EIGHT PER PALLET AND 155MM PROPELLING CHARGES UNITIZED 24 PER PALLET UNIT. SUBSEQUENT REFERENCE TO PALLET UNIT MEANS THE PALLET WITH AMMUNITION ITEMS. SEE PAGE 3 FOR DETAILS OF THE SPECIFIC PALLET UNITS DEPICTED IN THE LOAD VIEWS.

C. THE LOAD AS SHOWN IS BASED ON A 20' LONG BY 8' WIDE BY 8'-6" HIGH INTERMODAL COMMERCIAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 92" WIDE BY 95" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLAT-CAR (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. CAUTION: INTERMODAL COMMERCIAL CONTAINERS VARY AS TO "MAXIMUM GROSS WEIGHT" CAPACITIES WHICH INCLUDE THE WEIGHT OF THE CONTAINER, THE LADING AND THE DUNNAGE. THE LOAD AS SHOWN IS BASED ON A CONTAINER WEIGHT OF 4,700 POUNDS WITH A GROSS WEIGHT CAPACITY OF NOT LESS THAN 45,750 POUNDS. THE "MAXIMUM GROSS WEIGHT" CAPACITY OF A CONTAINER MUST NOT BE EXCEEDED. THEREFORE, IT MAY BE NECESSARY TO REDUCE THE QUANTITY OF ITEMS TO BE SHIPPED. SEE THE SPECIAL NOTE ON PAGE 14 FOR GUIDANCE.

E. WHEN LOADING PALLET UNITS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE FORWARD AND SIDE DUNNAGE ASSEMBLIES). ALTHOUGH A TOTAL OF 1-1/2" OF UNBLOCKED SPACE ACROSS THE WIDTH OF A LOAD IS PERMITTED, LATERAL VOIDS WITHIN THE LOAD ARE TO BE HELD TO A MINIMUM. EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE SIDE WALL PANELS "A" ON ONE OR BOTH SIDES OF THE CONTAINER OR THE SEPARATOR PANELS "A". LAMINATE EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS OF THE PLYWOOD PIECES MAY BE ADJUSTED ON ONE OR BOTH SIDES OF THE CONTAINER AS REQUIRED TO FACILITATE VARIANCE IN THE PALLET UNIT SIZE. FOR RECOMMENDED SEQUENTIAL LOADING PROCEDURES, SEE PAGE 6.

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.

(CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

H. IN SOME CONTAINERS, SUCH AS SOME ALL STEEL CONTAINERS, THERE IS A SLOT AT THE FORWARD CORNERS OF THE FORWARD WALL. A PIECE OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE FORWARD BLOCKING ASSEMBLY TO PROVIDE A FLAT SURFACE FOR THE 2" X 6" 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". THIS PIECE IS NOT REQUIRED WHEN THE FRONT WALL OF THE CONTAINER IS SMOOTH AND FLAT.

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 SIDE WALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

L. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLAT-CAR (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 FLAT BED 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 0.454KG.

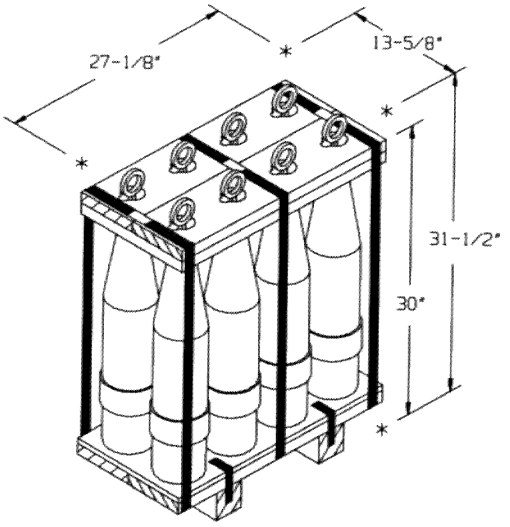
MATERIAL SPECIFICATIONS

LUMBER - - - - - - - -: SEE TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-751.

NAILS - - - - - - - -: FED SPEC FF-N-105; COMMON.

PLYWOOD - - - - - - -: FED SPEC NN-P-530; GROUP B, CONSTRUCTION AND 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.

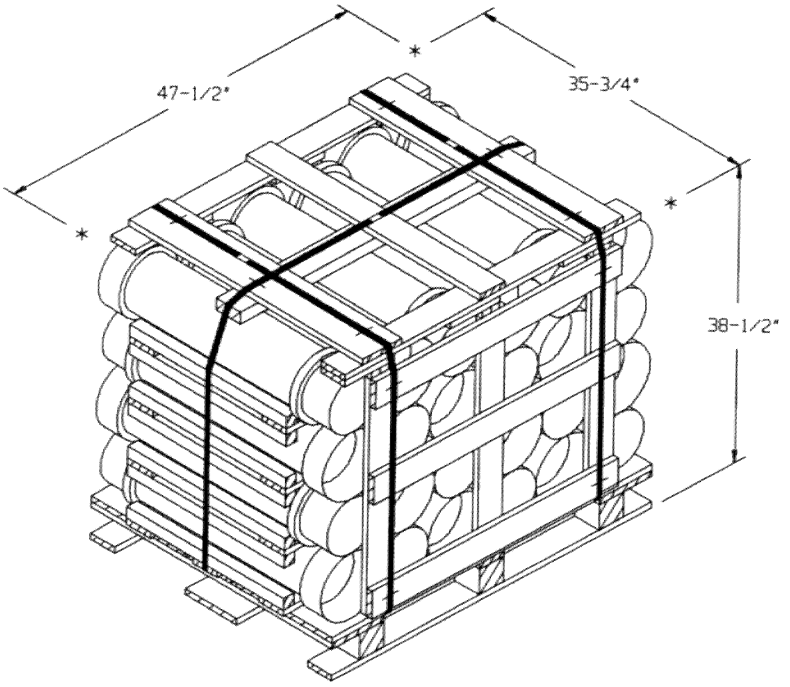
STEEL, STRUCTURAL -: FED SPEC QQ-S-741; SQUARE STRUCTURAL TUBING AND HOT-ROLLED STRIP.



PALLET UNIT

PROJECTILE, 155MM, HE, M107, 8 PER PALLET
DODAC 1320-0544
UNITIZATION DRAWINGS 7549275 AND 9362569

UNIT WEIGHT - - - - - - - - 797 LBS (APPROX)
UNIT CUBE - - - - - - - - - 6.7 CU FT (APPROX)

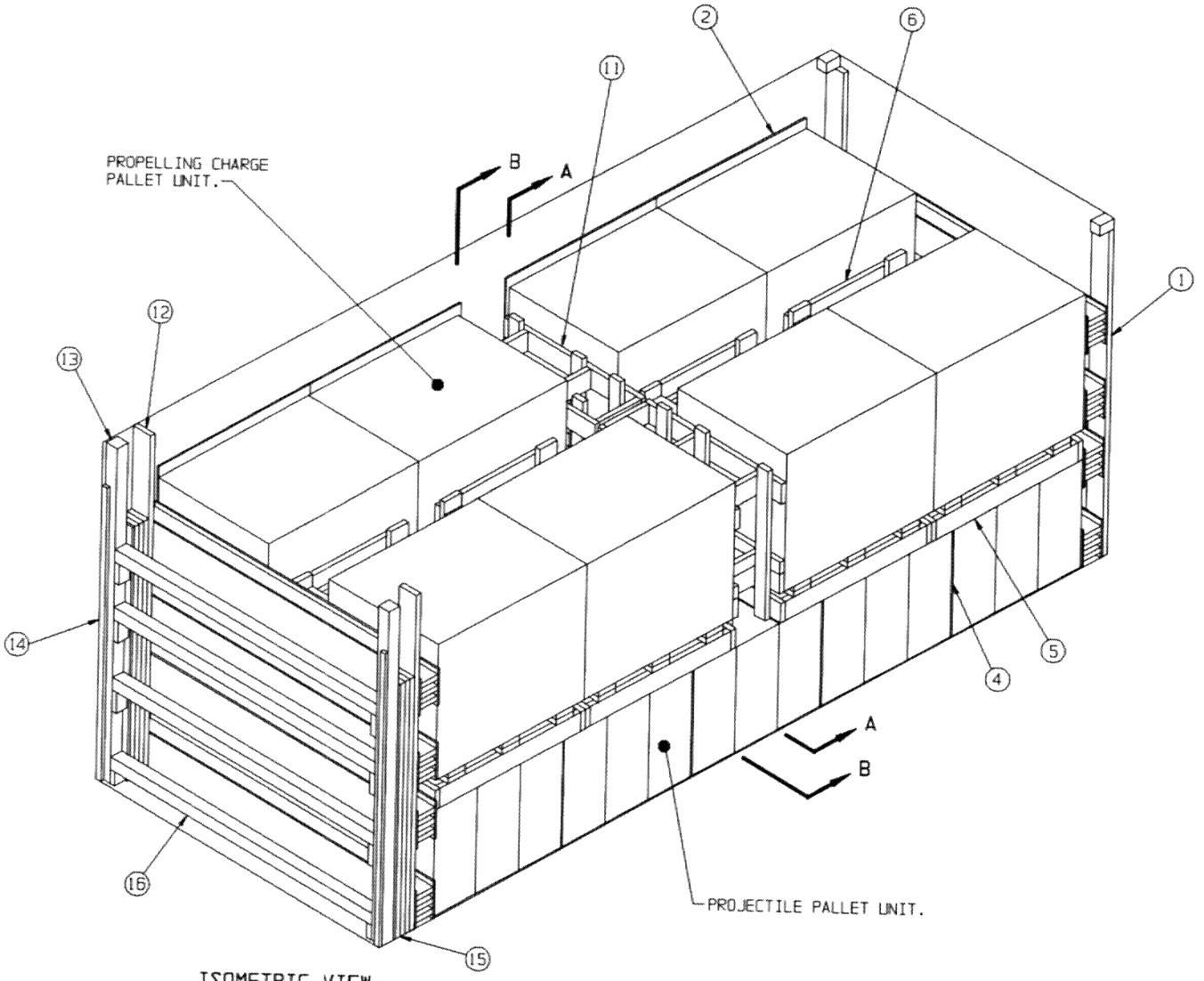


PALLET UNIT

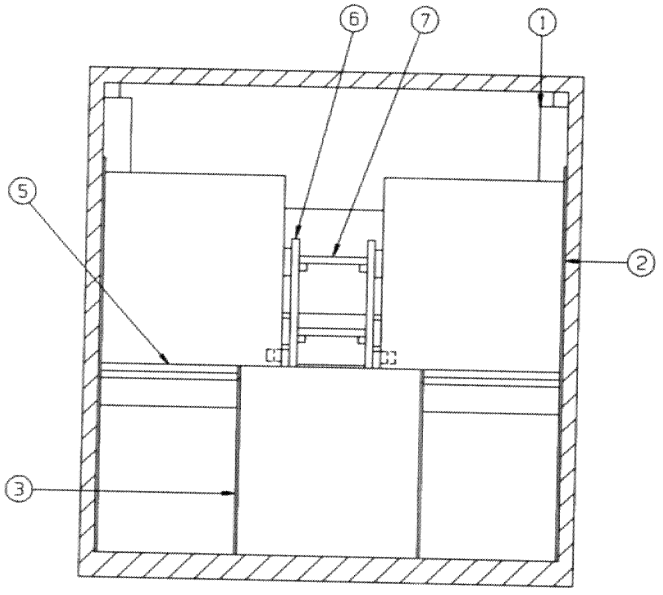
PROPELLING CHARGE, 155MM, M119, 24 PER PALLET
DODAC 1320-0533
UNITIZATION DRAWING 19-48-4042A/9-20PM1001

UNIT WEIGHT - - - - - - - 1,160 LBS (APPROX)
UNIT CUBE - - - - - - - - 37.8 CU FT (APPROX)

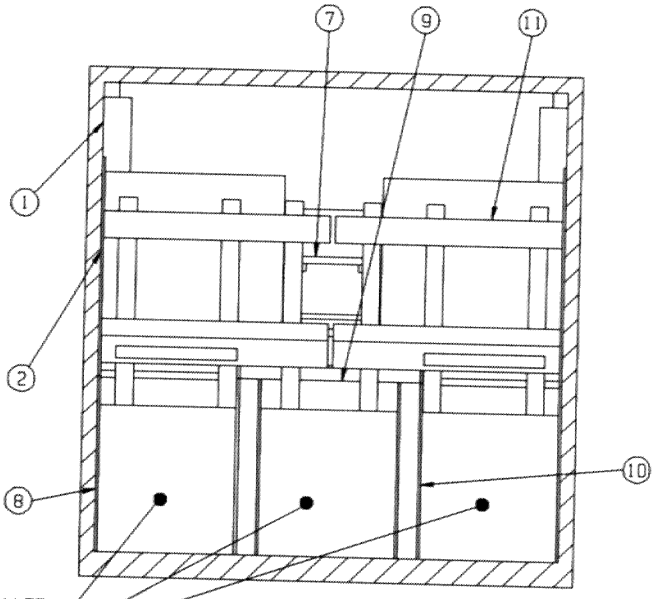
UNIT DETAILS



ISOMETRIC VIEW



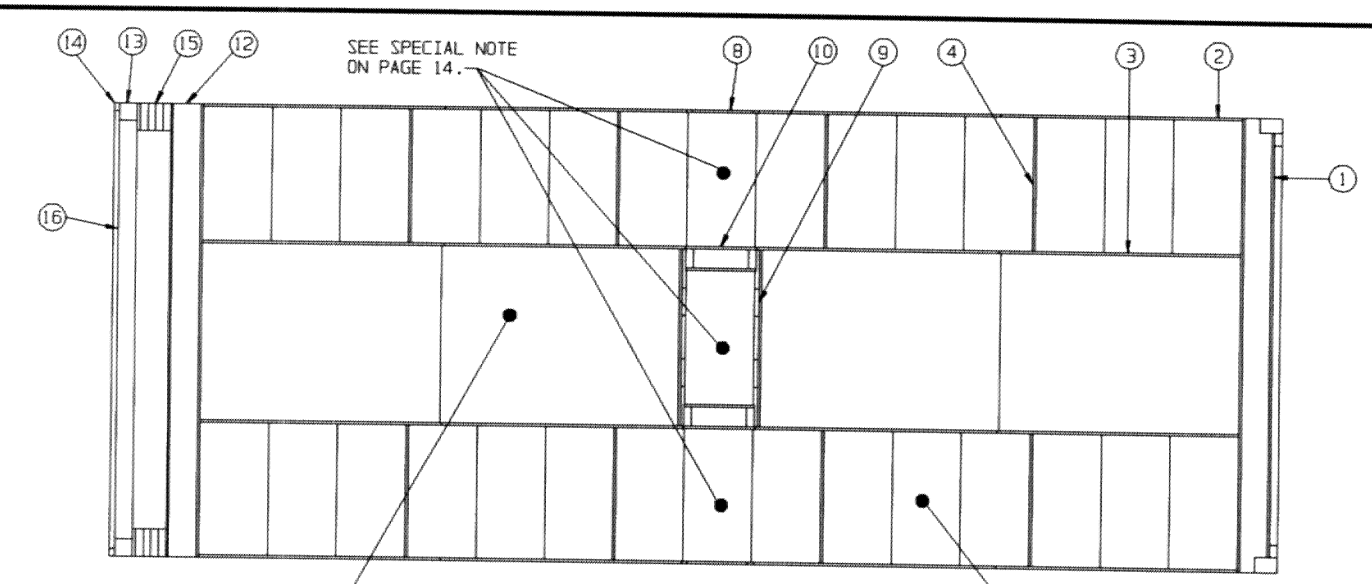
SECTION A-A



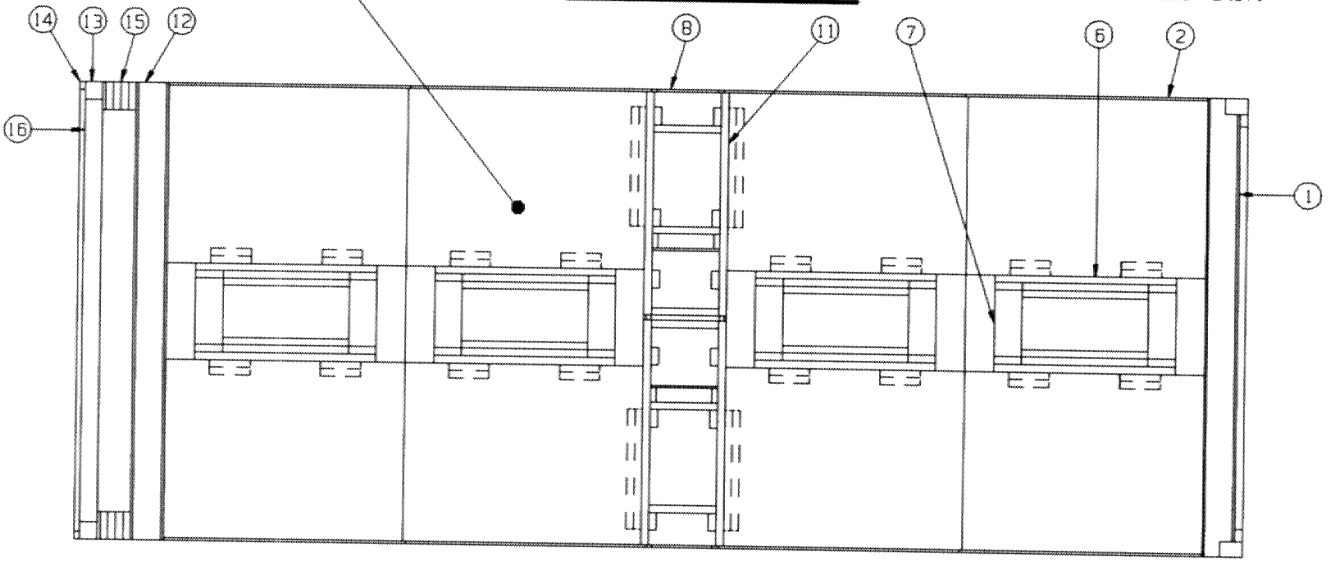
PROJECTILE PALLET UNIT. SEE NOTE ON PAGE 14.

SECTION B-B

PROJECT CA 268-90



FIRST LAYER PLAN VIEW



SECOND LAYER PLAN VIEW

KEY NUMBERS

(1) FORWARD BLOCKING ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 7.

(2) SIDE WALL PANEL A (8 REQD). SEE THE DETAIL ON PAGE 8.

(3) SEPARATOR PANEL A (8 REQD). SEE THE DETAIL ON PAGE 8.

(4) SEPARATOR PANEL B (8 REQD). SEE THE DETAIL ON PAGE 8.

(5) RISER ASSEMBLY (8 REQD). SEE THE DETAIL ON PAGE 9.

(6) LATERAL FILL GATE (8 REQD). SEE THE DETAIL ON PAGE 9.

(7) STRUT, 2" X 6" BY CUT-TO-FIT (16 REQD). TOENAIL TO VERTICALS OF LATERAL FILL GATES W/2-12d NAILS AT EACH END.

(8) SIDE WALL PANEL B (2 REQD). SEE THE DETAIL ON PAGE 8.

(9) CENTER FILL ASSEMBLY A (2 REQD). SEE THE DETAIL ON PAGE 10.

(10) CENTER FILL ASSEMBLY B (2 REQD). SEE THE DETAIL ON PAGE 10.

(CONTINUED AT RIGHT)

(KEY NUMBERS CONTINUED)

(11) CENTER BLOCKING ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 11.

(12) REAR BLOCKING ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 7.

(13) DOOR POST VERTICAL (2 REQD). SEE THE DETAIL ON PAGE PAGE 11 AND "DETAIL A" ON PAGE 12.

(14) DOOR POST VERTICAL RETAINER (2 REQD). SEE THE DETAIL ON PAGE 13 AND "DETAIL A" ON PAGE 12. NAIL THROUGH THE HOLES INTO THE DOOR POST VERTICAL W/4-10d NAILS.

(15) SOLID FILL, 6" WIDE MATERIAL BY 6'-6" LONG BY THICKNESS(ES) REQUIRED TO CONTACT THE DOOR POST VERTICAL (REQUIRED AT 2 PLACES). NAIL EACH PIECE TO THE REAR BLOCKING ASSEMBLY AND/OR LAMINATE TOGETHER W/6 NAILS OF A SUITABLE SIZE (10d NAILS FOR 2" MATERIAL, 6d NAILS FOR 1" MATERIAL). SEE THE DETAIL ON PAGE 12.

(16) DOOR SPANNER, 4" X 4" MATERIAL CUT TO A LENGTH THAT WILL PROVIDE FOR A DRIVE FIT (REF: 7'-1-3/8") (4 REQD). TOENAIL TO THE DOOR POST VERTICAL PIECES W/2-12d NAILS AT EACH END. SEE THE "BEVEL-CUT" DETAIL ON PAGE 12.

RECOMMENDED SEQUENTIAL LOADING PROCEDURES:

1. VERIFY THE "MAXIMUM GROSS WEIGHT" CAPACITY OF THE COMMERCIAL CONTAINER TO BE LOADED. SEE GENERAL NOTE "D" ON PAGE 2.

2. PREFABRICATE ONE FORWARD BLOCKING ASSEMBLY, EIGHT SIDE WALL PANEL "A" ASSEMBLIES, TWO SIDE WALL PANEL "B" ASSEMBLIES, EIGHT SEPARATOR PANEL "A", EIGHT SEPARATOR PANEL "B", EIGHT RISER ASSEMBLIES, EIGHT LATERAL FILL GATES, TWO CENTER FILL ASSEMBLIES "A", TWO CENTER FILL ASSEMBLIES "B", TWO CENTER BLOCKING ASSEMBLIES, ONE REAR BLOCKING ASSEMBLY, TWO DOOR POST VERTICALS AND TWO DOOR POST VERTICAL RETAINERS. NAIL EACH DOOR POST VERTICAL RETAINER TO A DOOR POST VERTICAL, ONE RIGHT HAND AND ONE LEFT HAND.

3. INSTALL FORWARD BLOCKING ASSEMBLY AND TWO SIDE WALL PANEL "A" ASSEMBLIES.

4. LOAD SIX PROJECTILE PALLET UNITS, INSTALL TWO SEPARATOR PANEL "A" AND TWO SEPARATOR PANEL "B". LOAD TWO PROJECTILE PALLET UNITS AND ONE PROPELLING CHARGE PALLET UNIT.

5. INSTALL TWO RISER ASSEMBLIES, LOAD TWO PROPELLING CHARGE PALLET UNITS, INSTALL TWO LATERAL FILL GATES AND FOUR STRUTS.

6. INSTALL TWO SIDE WALL PANEL "A" ASSEMBLIES.

7. LOAD FOUR PROJECTILE PALLET UNITS, INSTALL TWO SEPARATOR PANEL "B". LOAD TWO PROJECTILE PALLET UNITS.

8. INSTALL TWO SEPARATOR PANEL "A" AND LOAD ONE PROPELLING CHARGE PALLET UNIT.

9. REPEAT STEP 5.

10. INSTALL TWO SIDE WALL PANEL "B" ASSEMBLIES AND ONE CENTER FILL ASSEMBLY "A".

11. LOAD THREE PROJECTILE PALLET UNITS ACROSS THE WIDTH OF THE CONTAINER AND INSTALL TWO CENTER FILL ASSEMBLIES "B".

12. INSTALL ONE CENTER FILL ASSEMBLY "A" AND TWO CENTER BLOCKING ASSEMBLIES.

(CONTINUED AT RIGHT)

(RECOMMENDED SEQUENTIAL LOADING PROCEDURES CONTINUED)

13. INSTALL TWO SIDE WALL PANEL "A" ASSEMBLIES.

14. LOAD TWO PROJECTILE PALLET UNITS, INSTALL TWO SEPARATOR PANEL "B", LOAD SIX PROJECTILE PALLET UNITS, INSTALL TWO SEPARATOR PANEL "A" AND LOAD ONE PROPELLING CHARGE PALLET UNIT.

15. REPEAT STEP 5.

16. INSTALL TWO SEPARATOR PANEL "B", LOAD SIX PROJECTILE PALLET UNITS, INSTALL TWO SEPARATOR PANEL "A" AND LOAD ONE PROPELLING CHARGE PALLET UNIT.

17. REPEAT STEP 5.

18. INSTALL REAR BLOCKING ASSEMBLY.

19. INSTALL TWO DOOR POST VERTICAL RETAINERS NAILED TO VERTICAL DOOR POSTS (ONE RIGHT HAND AND ONE LEFT HAND).

20. INSTALL TWO DOOR SPANNER PIECES (ONE AT THE LOWEST POSITION AND ONE AT THE UPPERMOST POSITION).

21. INSTALL THE SOLID FILL TYPE LOAD-BLOCKING MATERIAL.

22. INSTALL THE REMAINING TWO DOOR SPANNER PIECES.

BILL OF MATERIAL

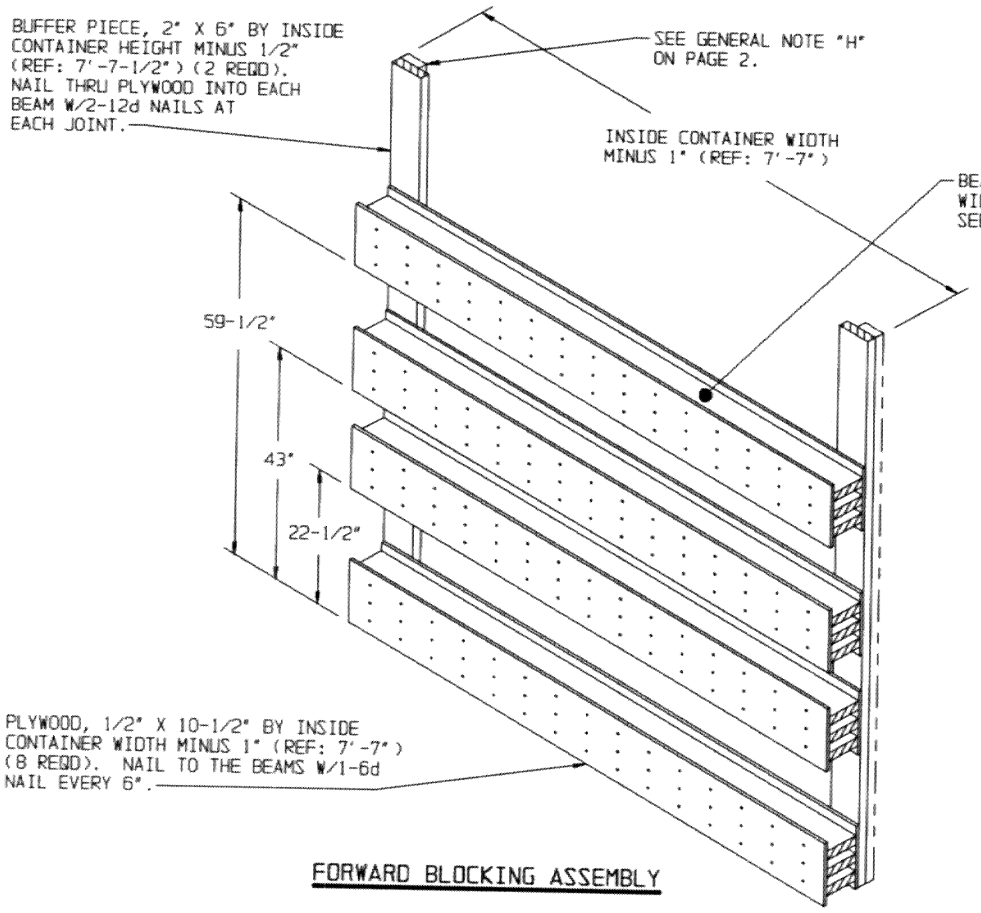
LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	12	6
2" x 2"	48	16
2" X 3"	48	24
2" X 4"	104	70
2" X 6"	628	628
4" X 4"	42	56
NAILS	**NO. REQD**	**POUNDS**
6d (2")	880	5-1/4
10d (3")	976	15
12d (3-1/4")	176	3
PLYWOOD, 1/2" - - - - 506 SQ FT REQD - - - 696 LBS		
DOOR POST VERTICAL RETAINER - 2 REQD - - - 64 LBS		

LOAD AS SHOWN

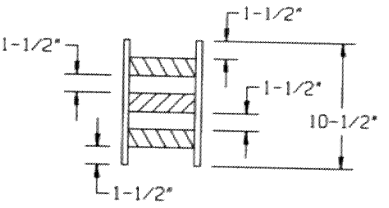
ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT		
PROJECTILE	31	24,707 LBS
PROPELLING CHARGE	12	13,920 LBS
DUNNAGE		2,383 LBS
CONTAINER		4,700 LBS

TOTAL WEIGHT - - - - - - - - 45,710 LBS (APPROX) *

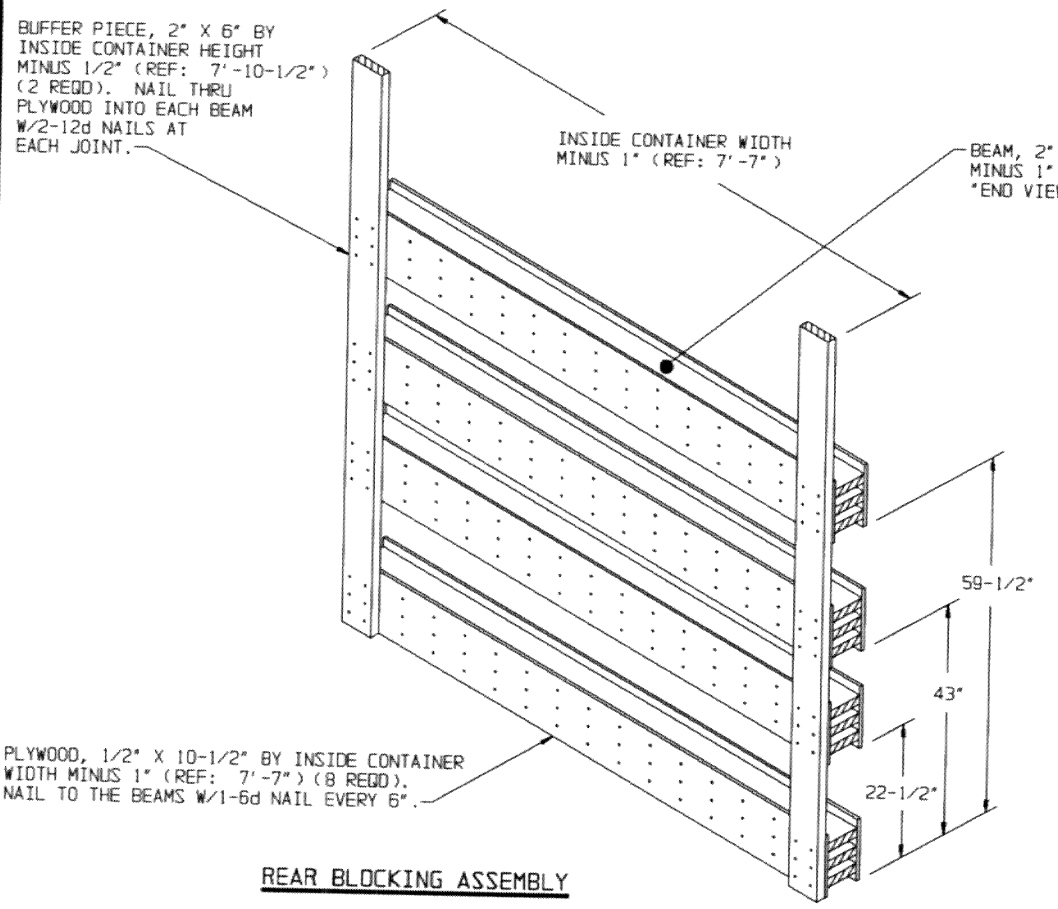
* SEE GENERAL NOTE "D" ON PAGE 2.



FORWARD BLOCKING ASSEMBLY



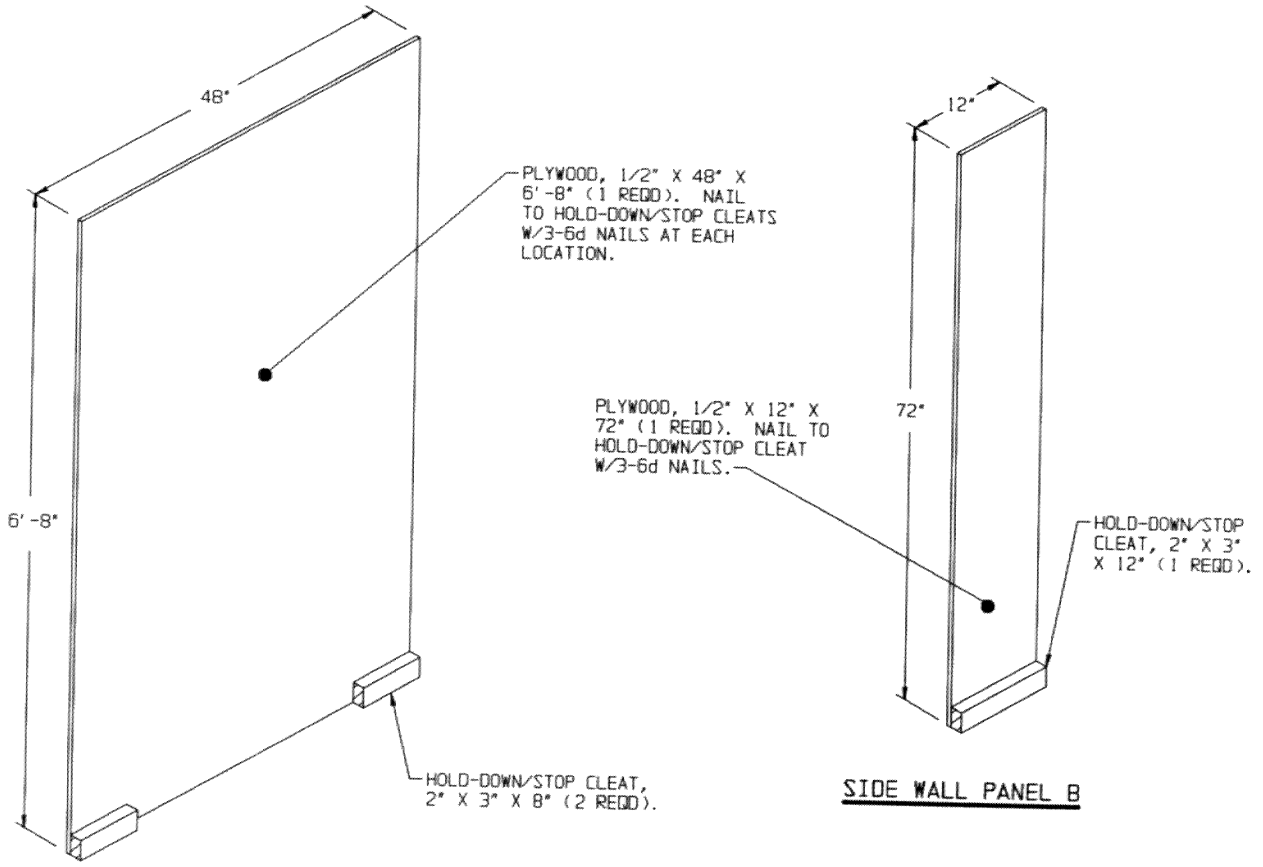
END VIEW OF BEAM ASSEMBLY



REAR BLOCKING ASSEMBLY

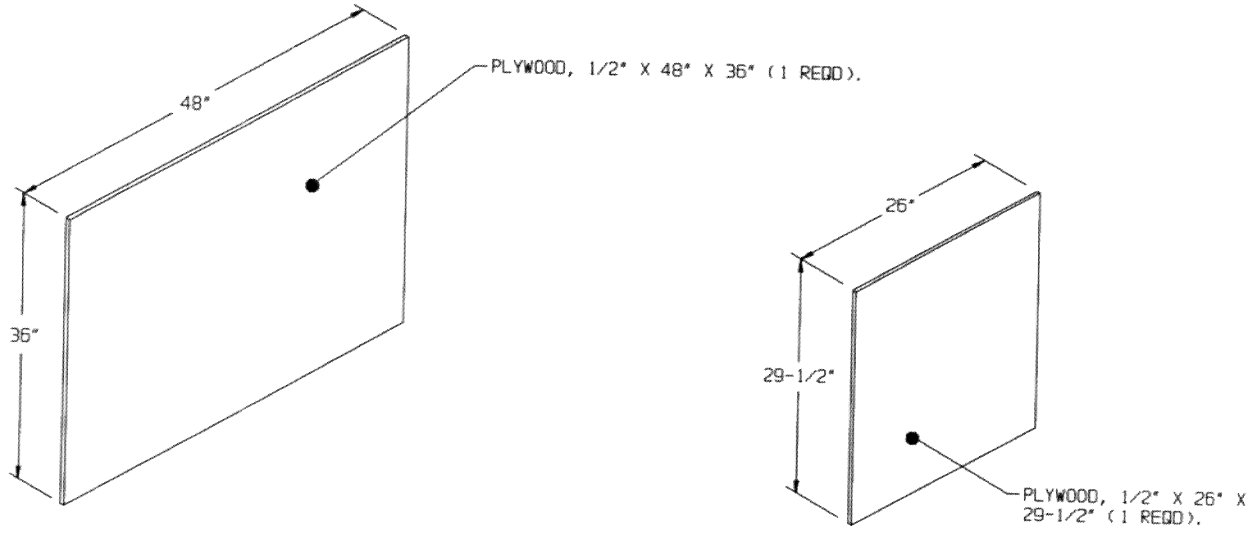
DETAILS

PROJECT CA 268-90



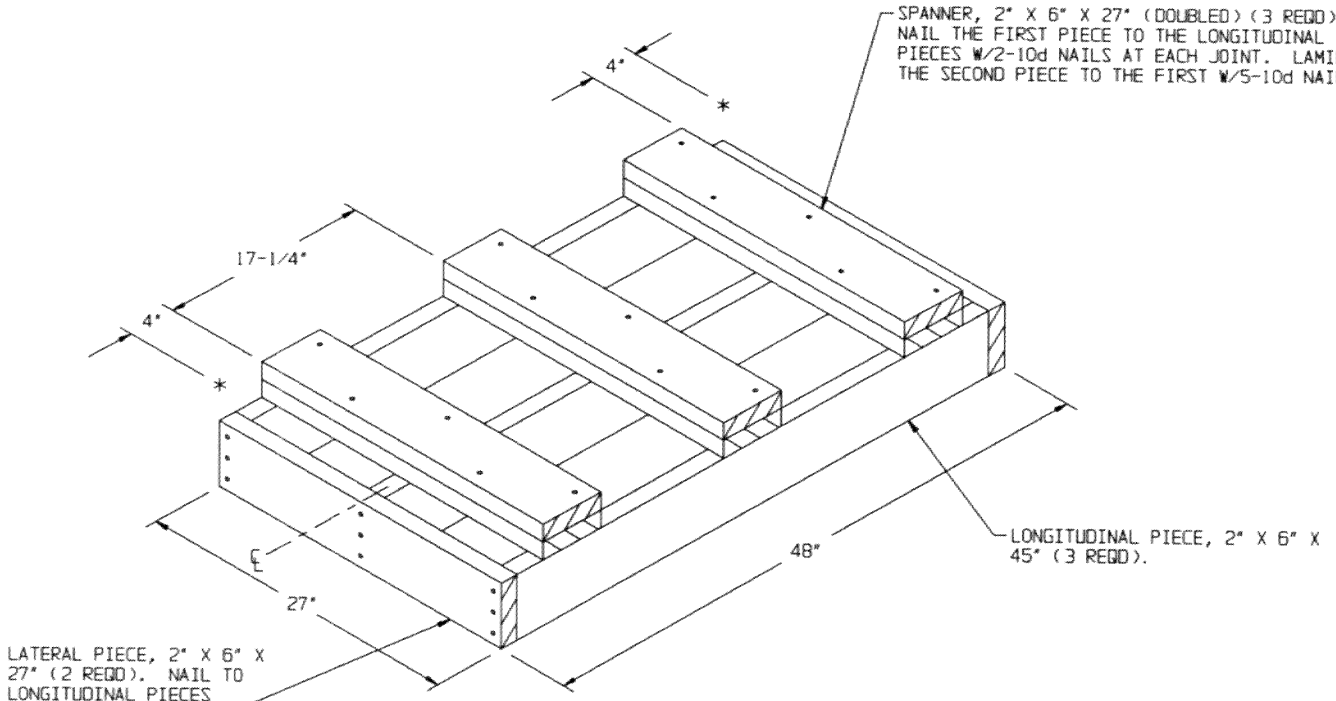
SIDE WALL PANEL A

SIDE WALL PANEL B

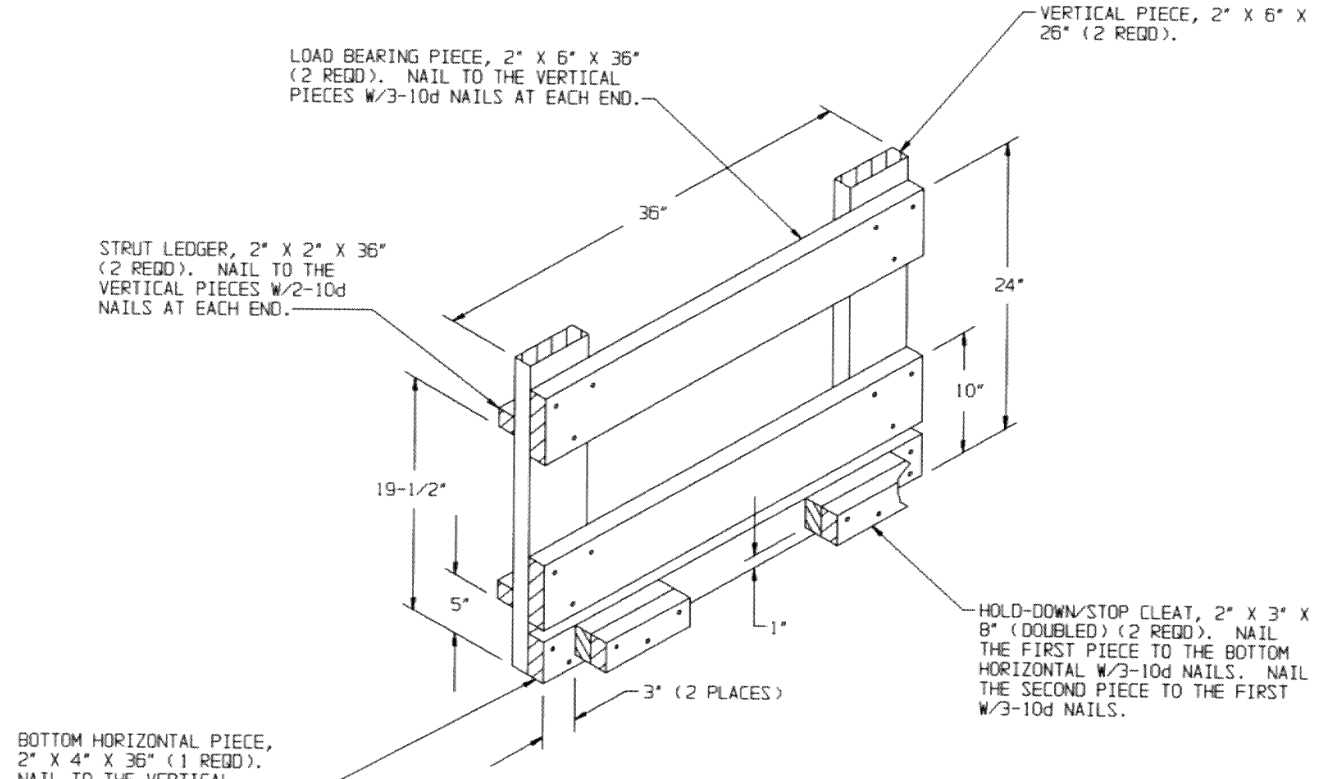


SEPARATOR PANEL A

SEPARATOR PANEL B

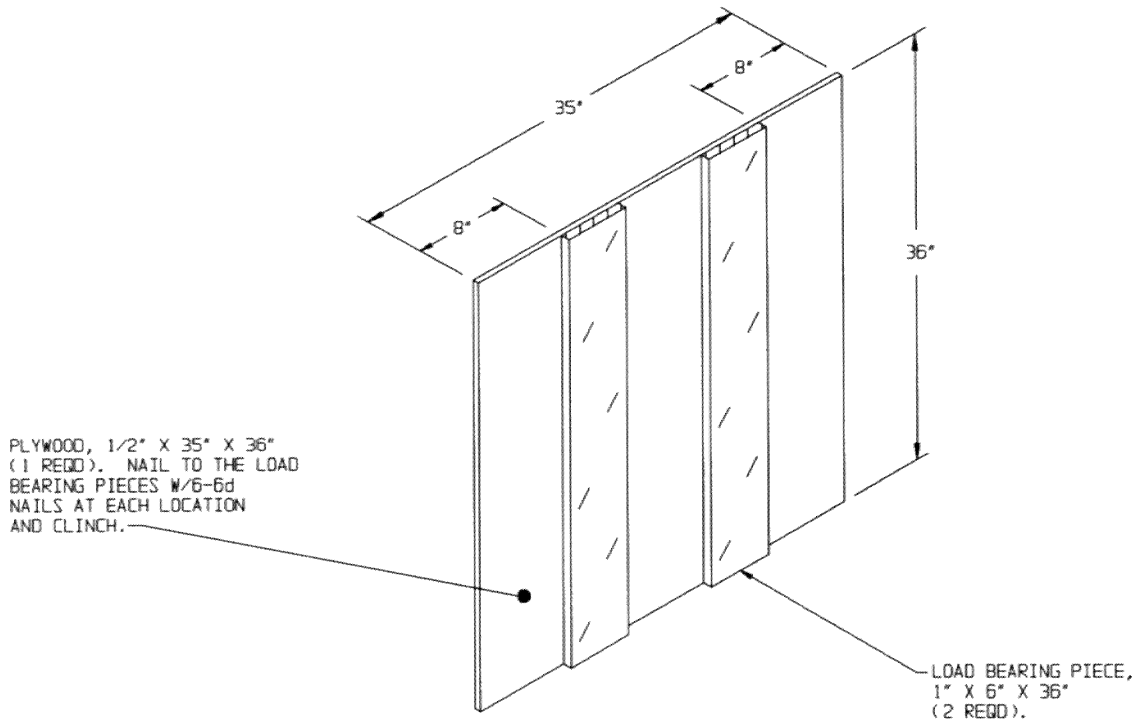


RISER ASSEMBLY

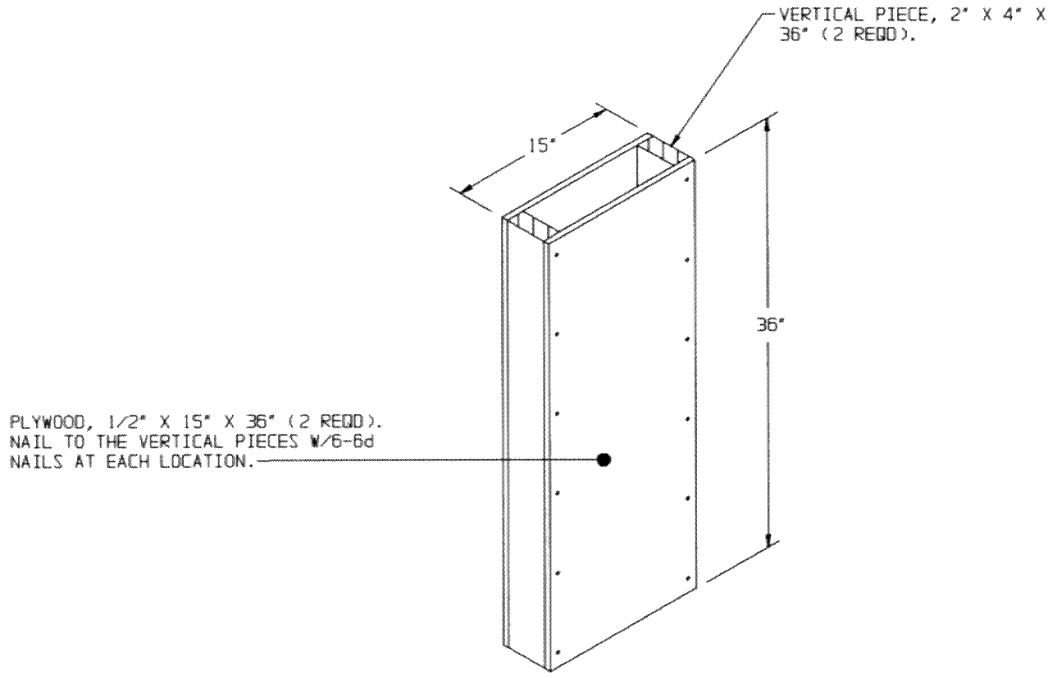


LATERAL FILL GATE

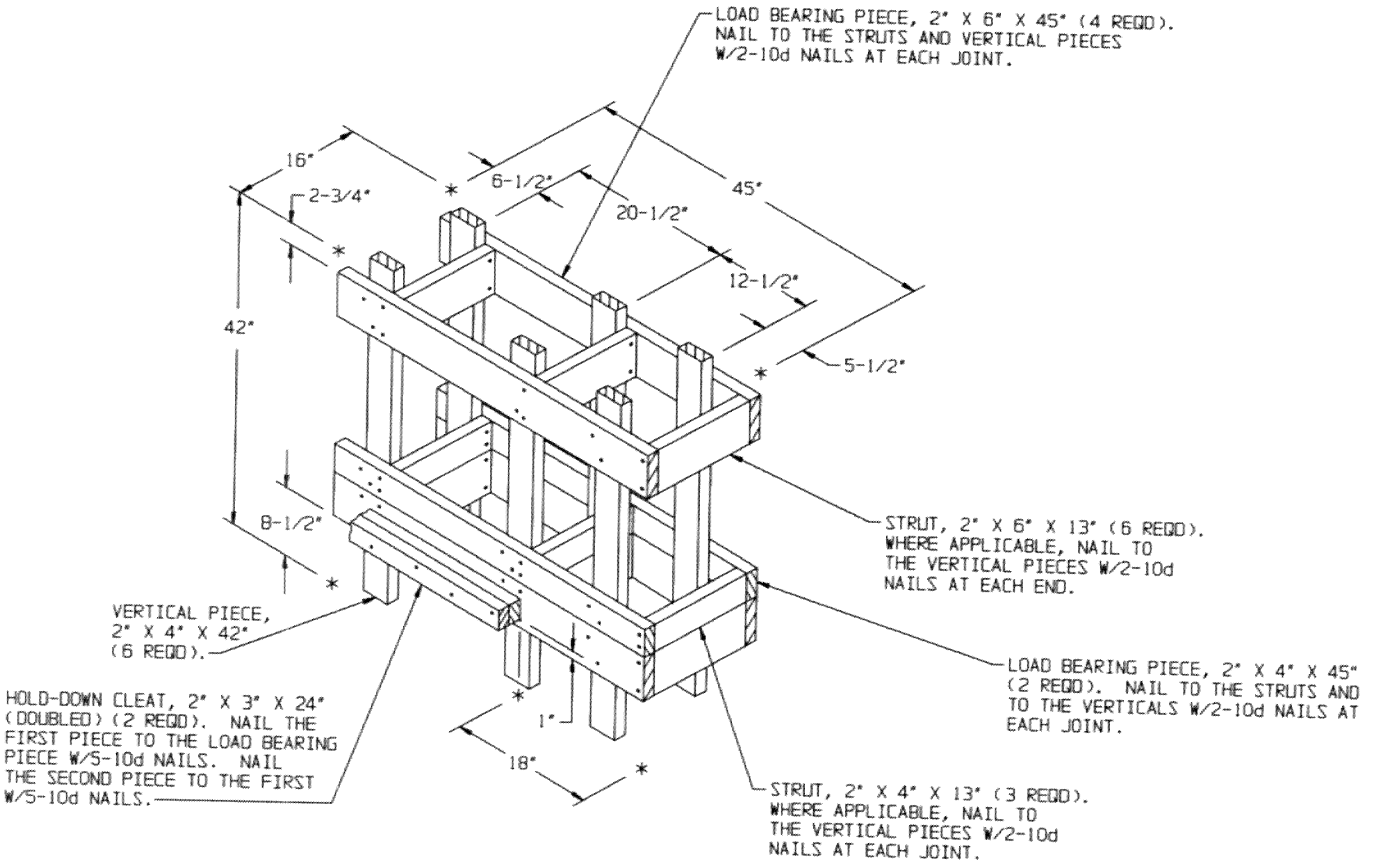
DETAILS



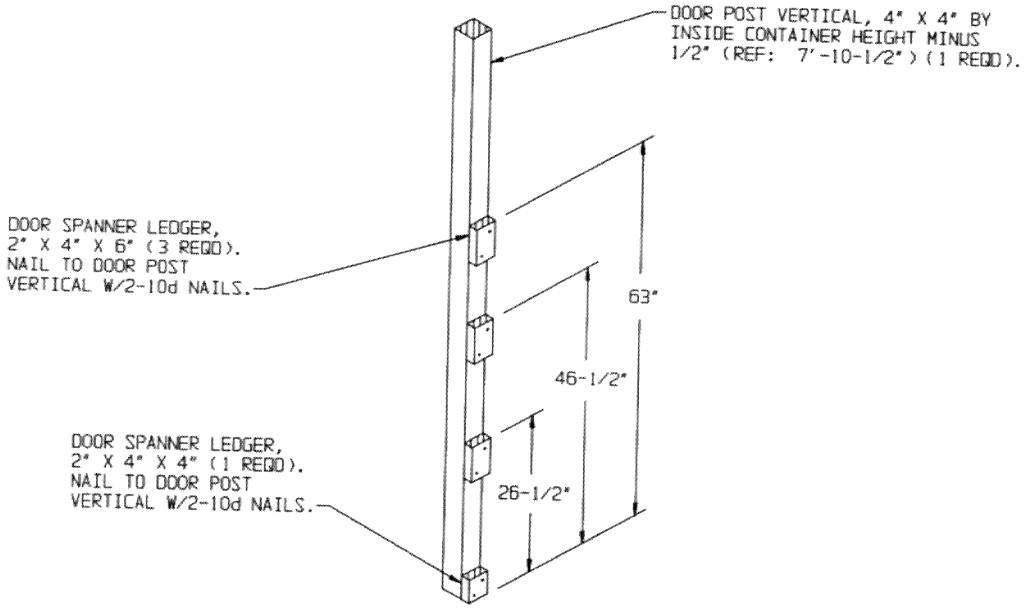
CENTER FILL ASSEMBLY A



CENTER FILL ASSEMBLY B



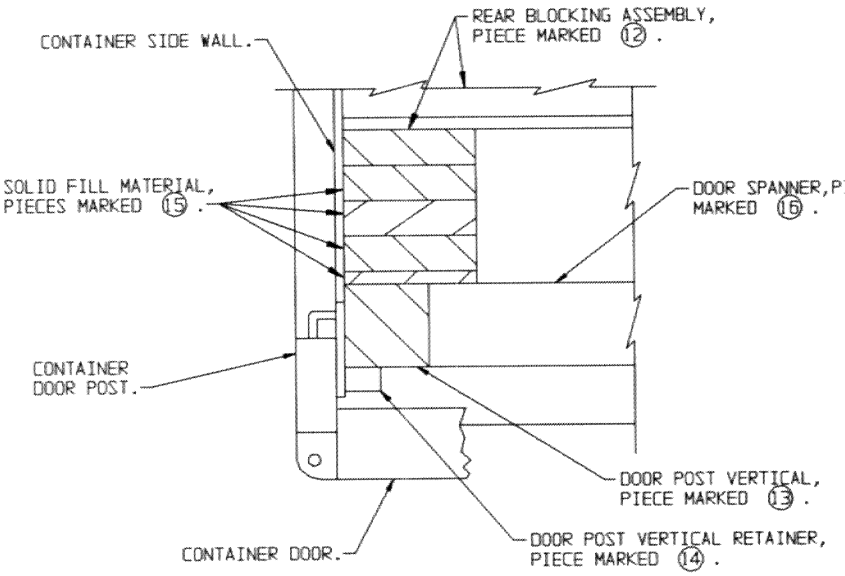
CENTER BLOCKING ASSEMBLY



DOOR POST VERTICAL

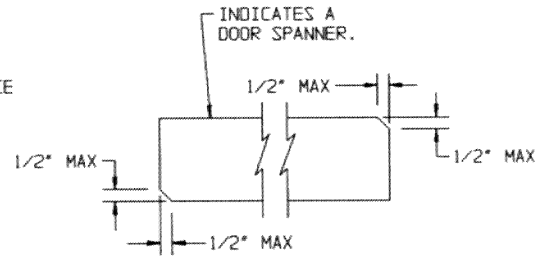
DETAILS

PROJECT CA 268-90



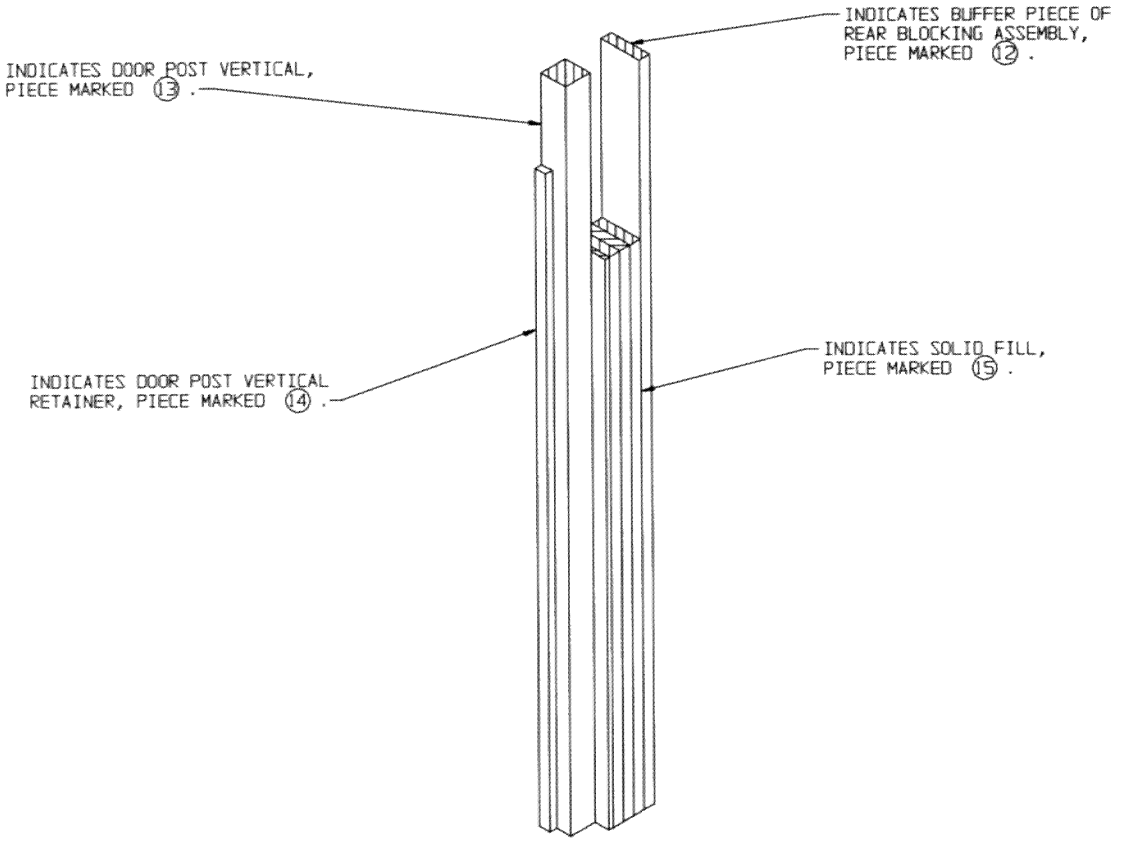
DETAIL A

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



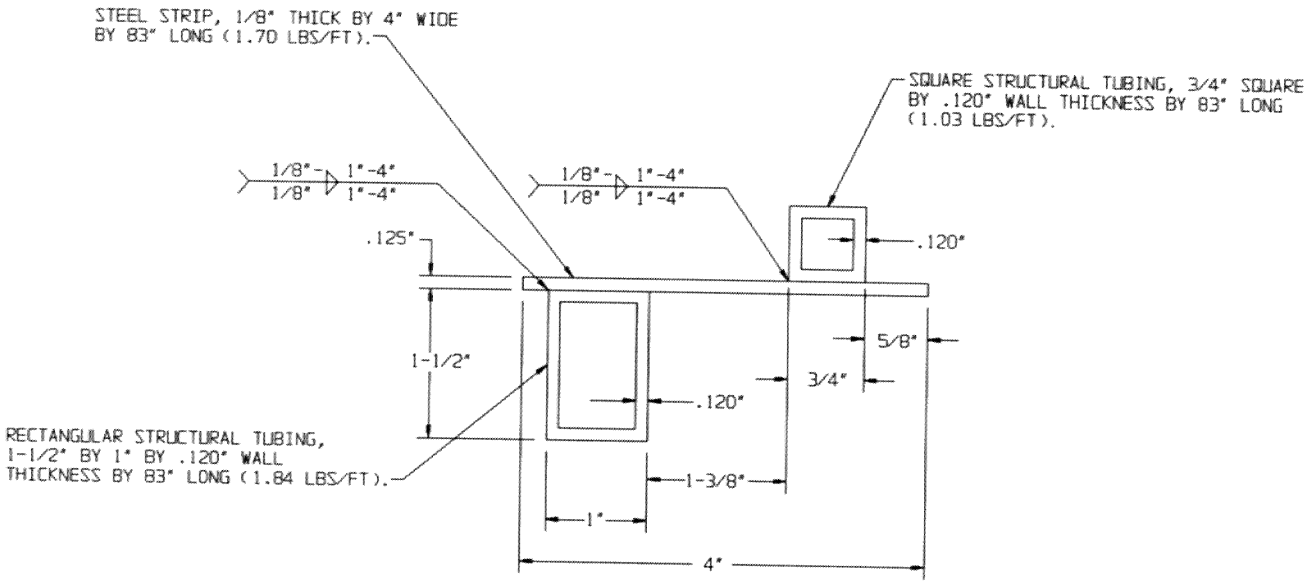
BEVEL-CUT

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

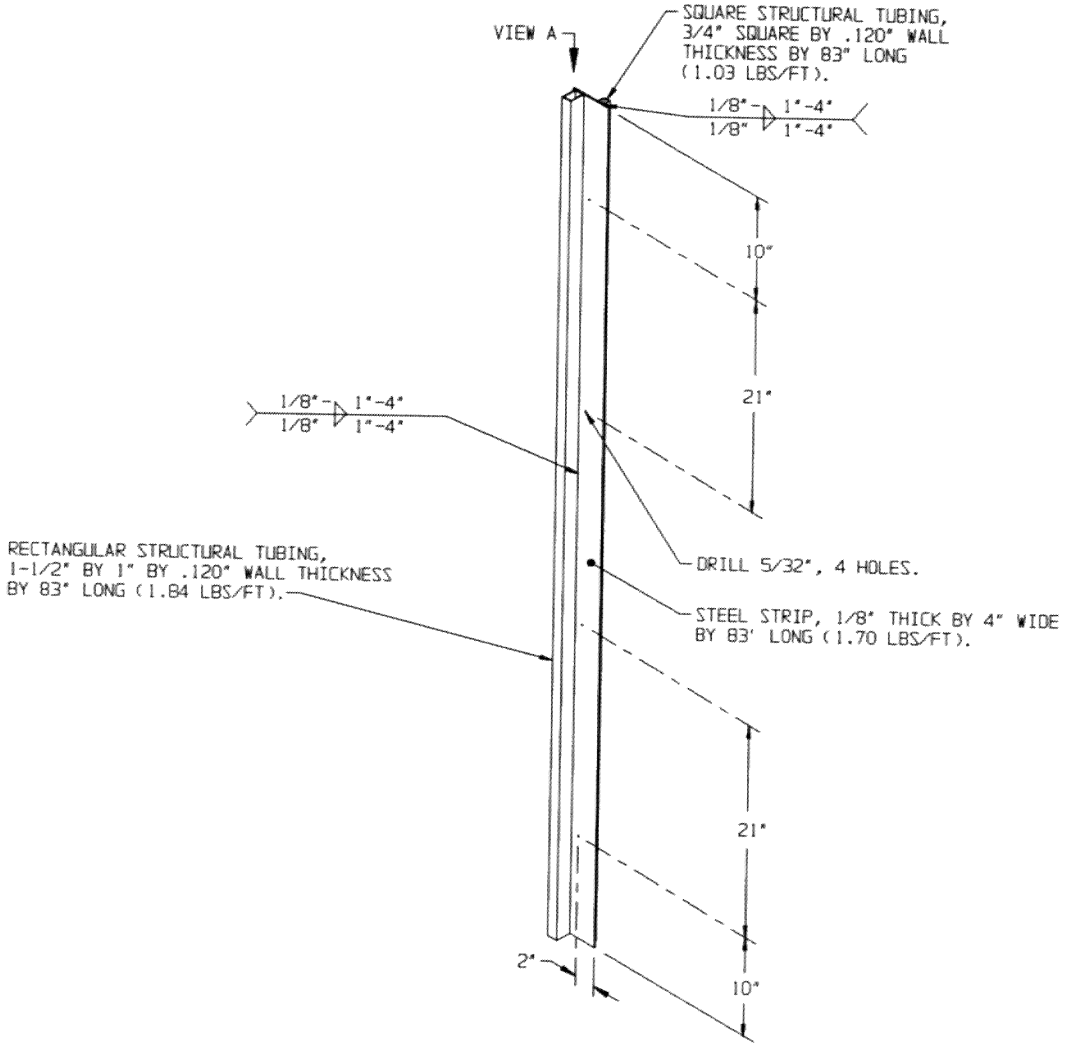


SOLID FILL DETAIL

DOOR SPANNERS AND DOOR SPANNER LEDGERS HAVE BEEN OMITTED FOR CLARITY PURPOSES.

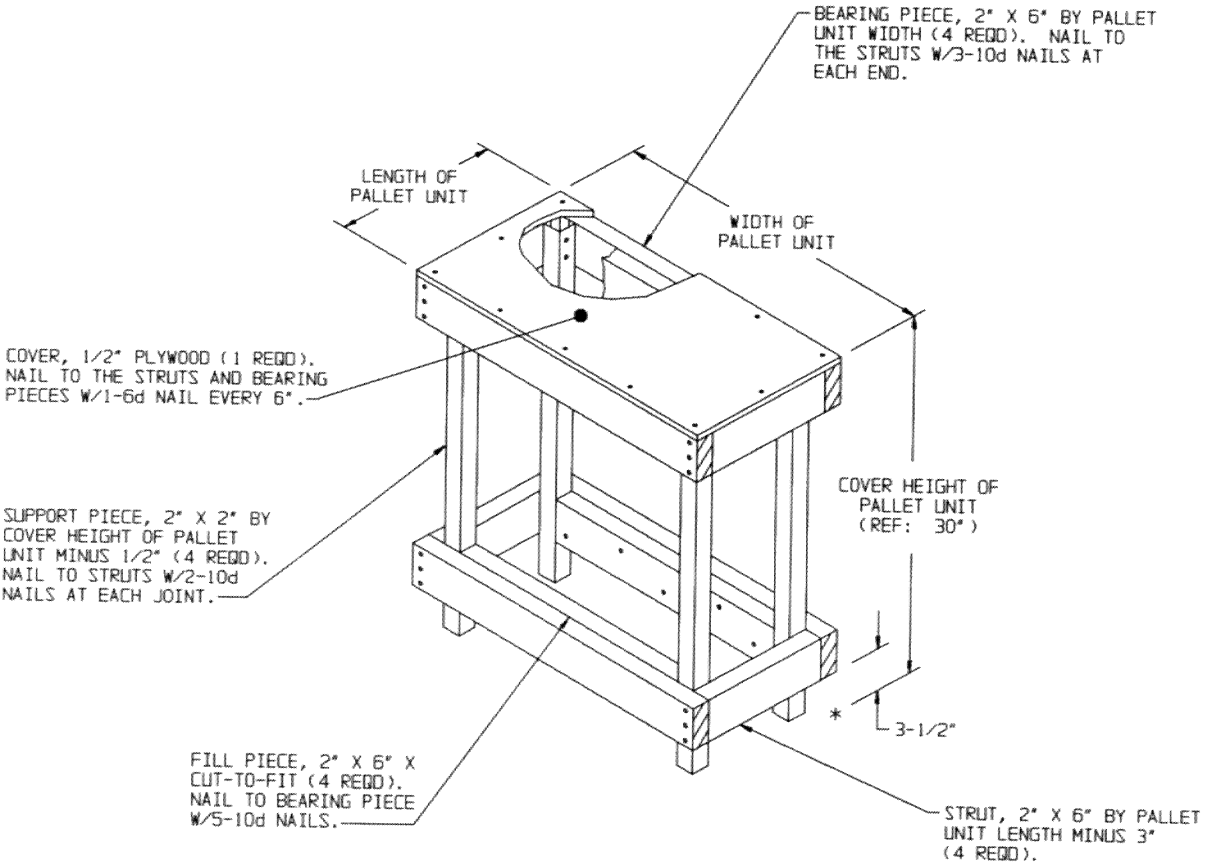


VIEW A



DOOR POST VERTICAL RETAINER

NOTE: THE ABOVE ASSEMBLY HAS BEEN SHOWN ROTATED 90° FROM THE ORIENTATION IN WHICH IT IS INSTALLED IN THE LEFT REAR CORNER OF THE CONTAINER. THE ASSEMBLY HAS BEEN ROTATED FOR HOLE LOCATION CLARITY.



OMITTED-UNIT ASSEMBLY

SPECIAL NOTE:

IF THE TOTAL WEIGHT OF THE CONTAINER, THE LADING AND THE DUNNAGE EXCEEDS THE "ALLOWABLE MAXIMUM GROSS WEIGHT" OF THE CONTAINER, ONE, TWO OR THREE PROJECTILE PALLET UNITS AT THE LONGITUDINAL CENTER OF THE LOAD SHOULD BE OMITTED AS REQUIRED TO REDUCE THE GROSS WEIGHT. AN OMITTED UNIT ASSEMBLY MUST BE SUBSTITUTED FOR EACH OMITTED PROJECTILE PALLET UNIT. FOR ONE OMITTED UNIT, OMIT THE CENTER UNIT; FOR TWO OMITTED UNITS, OMIT THE OUTER UNITS. OMIT ALL THREE UNITS IF NECESSARY.