

APPROVED BY
BUREAU OF EXPLOSIVES

[Signature]

DATE 4/05/2006

LOADING AND BRACING (CL & LCL) IN BOXCARS* OF PALLETIZED MODULAR ARTILLERY CHARGE SYSTEM (MACS) PACKED IN CYLINDRICAL METAL CONTAINERS

PA103A2 CONTAINER

INDEX

ITEM	PAGE(S)
GENERAL NOTES AND MATERIAL SPECIFICATIONS - - - - -	2-3
PALLET UNIT DETAIL - - - - -	4
DETAILS - - - - -	5
60 PALLET UNIT LOAD IN A 50'-6" LONG BY 9'-6" WIDE CONVENTIONAL BOXCAR - - - - -	6-7
52 PALLET UNIT LOAD IN A 50'-6" LONG BY 8'-6" WIDE BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS - - - - -	8-9
62 PALLET UNIT LOAD IN A 60'-8" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR - - - - -	10-11
TYPICAL LCL USING K-BRACE - - - - -	12-14
TYPICAL LCL USING RISERS - - - - -	15
TYPICAL LCL USING BULKHEAD GATE - - - - -	16-17
TYPICAL LCL USING KNEE BRACES - - - - -	18-19
SHIPMENT OF PARTIAL PALLET UNIT - - - - -	20-22
OMITTED PALLET UNIT PROCEDURES - - - - -	23
TYPICAL LCL USING LCL BRACES - - - - -	24
DETAILS - - - - -	25-32

*THIS OUTLOADING DRAWING INCLUDES PROCEDURES FOR CONVENTIONAL TYPE BOXCARS AND CUSHIONED BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS.

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY FIELD SUPPORT COMMAND <i>[Signature]</i>	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 32.				FEBRUARY 2006			
	DO NOT SCALE							
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND <i>[Signature]</i> U.S. ARMY DEFENSE AMMUNITION CENTER	ENGINEER OR TECHNICIAN	BASIC REV.	MELVIN SIX					
	TRANSPORTATION ENGINEERING DIVISION	<i>[Signature]</i>		TESTED	CLASS	DIVISION	DRAWING	FILE
	VALIDATION ENGINEERING DIVISION	<i>[Signature]</i>			19	48	4330/50A	5PM1007
ENGINEERING DIRECTORATE	<i>[Signature]</i>							

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 PALLETIZED M232 MODULAR ARTILLERY CHARGE SYSTEM (MACS) PACKED IN PA103A2 CONTAINERS. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS PALLET UNIT WITH CONTAINERS. SEE PAGE 4 FOR DETAILS OF THE PALLET UNITS. SEE U. S. ARMY MATERIEL COMMAND DRAWING 19-48-4326/50A-20PM1012 FOR UNITIZATION PROCEDURES FOR THE MACS PACKAGED IN PA103A2 CONTAINERS. **CAUTION:** REGARDLESS OF THE QUANTITY OF UNITS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE BOXCAR MUST NOT BE EXCEEDED.
- C. THE OUTLOADING PROCEDURES DEPICTED WITHIN THIS DOCUMENT ARE APPLICABLE FOR SHIPMENTS IN CONVENTIONAL TYPE BOXCARS AND FOR SHIPMENTS IN CUSHIONED BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS.
- D. THE SELECTION OF RAILCARS FOR THE TRANSPORT OF PALLET UNITS OF MACS IS THE RESPONSIBILITY OF THE ORIGINATING CARRIER AND THE SHIPPER. ONLY CARS WHICH HAVE "SOUND" FLOORS AND ARE IN OTHERWISE PROPER CONDITION, IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE REGULATORY DOCUMENTS, WILL BE SELECTED.
- E. WHEN SELECTING RAILCARS, EVERY EFFORT SHOULD BE MADE TO OBTAIN BOXCARS THAT DO NOT HAVE BOWED ENDWALLS. CARS HAVING BOWED ENDS CAN BE USED, HOWEVER, IF AN ENDWALL IS BOWED OUTWARD MORE THAN 2" EITHER FROM SIDE TO SIDE OR FROM FLOOR TO ROOF, AN END-OF-CAR BULKHEAD MUST BE INSTALLED TO PROVIDE A "SQUARED OFF" SURFACE FOR THE LOAD AT THE END OF THE CAR. REFER TO PAGE 28 FOR GUIDANCE.
- F. CONVENTIONAL BOXCARS EQUIPPED WITH SLIDING DOORS HAVE BEEN SHOWN, HOWEVER, THE DEPICTED OUTLOADING PROCEDURES ARE ALSO APPLICABLE FOR CONVENTIONAL CARS EQUIPPED WITH PLUG DOORS. **CAUTION:** DUNNAGE MATERIAL MUST NOT BE NAILED TO ANY PLUG DOOR, WHETHER AUXILIARY OR MAIN. ALSO, AFTER THE PLUG DOORS ON A CAR ARE CLOSED AND READY FOR THE INSTALLATION OF CAR SEALS, A PIECE OF WIRE OF SUITABLE SIZE WILL BE USED IN ADDITION TO AND IN CONJUNCTION WITH EACH CAR SEAL USED TO SEAL THE CAR. THE WIRE WILL BE THREADED THRU THE HOLES IN THE DOOR LATCH ASSEMBLY ONE OR MORE TIMES, AND THE WIRE ENDS WILL BE TWISTED TOGETHER.
- G. OTHER TYPES OF LADING ITEMS MAY BE LOADED IN CARS WHICH ARE PARTIALLY LOADED WITH PALLET UNITS OF MACS, PROVIDING THE TOTAL LOAD IS COMPATIBLE, EXISTING DIRECTIVES ARE NOT VIOLATED, AND THE OTHER LADING ITEMS ARE BLOCKED AND BRACED TO EQUAL THE BLOCKING AND BRACING CRITERIA SPECIFIED HEREIN.
- H. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 4" MATERIAL IS ACTUALLY 1-1/2" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE. IF THOSE MEMBERS SPECIFICALLY IDENTIFIED AS "STRUTS" WITHIN THE KEY NUMBERS OF A DEPICTED LOAD ARE SPECIFIED TO BE 4" X 4" MATERIAL, IT IS PERMISSIBLE TO USE TWO LAMINATED PIECES OF 2" X 6" MATERIAL IN LIEU OF EACH 4" X 4" STRUT. DOUBLED 2" X 6" STRUTS WILL BE LAMINATED W/1-10d NAIL EVERY 6".
- J. THE USE OF AN OFFSET LOADING PATTERN WILL FACILITATE LOADING AND UNLOADING OPERATIONS IN THE DOORWAY AREA OF THE CAR. UNLESS PROHIBITED WITHIN THE SPECIAL NOTES, A FULL LOAD SHOULD BE BUILT USING AN OFFSET LOADING PATTERN. FOR INSTANCE, A LOAD CONSISTING OF AN EVEN NUMBER OF LOAD UNITS AND HAVING TWO MORE LOAD UNITS IN ONE END OF THE CAR THAN IN THE OPPOSITE END, OR A LOAD CONSISTING OF AN ODD NUMBER OF LOAD UNITS AND HAVING ONE MORE LOAD UNIT IN ONE END THAN IN THE OTHER IS CONSIDERED TO BE AN OFFSET LOAD.

(CONTINUED AT RIGHT)

- K. **NOTICE:** A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES. ALSO, A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OR SIDEWALL OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. THE NAILING PATTERN WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL DOES NOT PENETRATE INTO OR NEAR A CRACK BETWEEN FLOOR BOARDS OR SIDEWALL BOARDS. 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.
- L. POWER DRIVEN STAPLES MAY BE USED AS ALTERNATIVE FASTENERS FOR NAILS WHEN CONSTRUCTING DUNNAGE ASSEMBLIES THAT ARE TO BE USED IN THE DELINEATED BOXCAR LOADS SHOWN THROUGHOUT THIS DRAWING. THE STAPLES TO BE USED MUST BE EQUAL IN LENGTH TO THE SPECIFIED NAIL SIZE AND MUST BE SUBSTITUTED ON A ONE STAPLE FOR ONE NAIL BASIS. STAPLES WHICH ARE 2-1/2" OR LESS IN LENGTH SHOULD BE IN ACCORDANCE WITH ASTM F1667 AS NEARLY AS PRACTICABLE. STAPLES THAT ARE LONGER THAN 2-1/2" WILL BE A COMMERCIAL GRADE, OF A QUALITY EQUIVALENT TO THOSE MANUFACTURED BY SENCO PRODUCTS INCORPORATED. **NOTE:** STAPLES WILL NOT BE SUBSTITUTED FOR NAILS IN ANY LOAD RESTRAINING FLOOR DUNNAGE APPLICATION.
- M. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF ONE SEAL WITH TWO PAIR OF NOTCHES WILL BE USED TO SEAL THE JOINT WHEN A NOTCH-TYPE SEALER IS BEING USED. A MINIMUM OF TWO SEALS, BUTTED TOGETHER, WITH TWO PAIR OF CRIMPS PER SEAL WILL BE USED TO SEAL THE JOINT WHEN A CRIMP-TYPE SEALER IS BEING USED. REFER TO THE "STRAP JOINT A" AND "STRAP JOINT B" DETAILS ON PAGE 4 FOR GUIDANCE.
- N. THROUGHOUT THIS PROCEDURAL DRAWING, PORTIONS OF THE BLOCKING COMPONENTS AND OF THE DEPICTED CARS, SUCH AS A CAR SIDEWALL, HAVE BEEN OMITTED FROM THE LOAD VIEW FOR CLARITY PURPOSES.
- O. THE NUMBER OF LADING UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE BOXCAR BEING LOADED OR THE QUANTITY TO BE SHIPPED, HOWEVER, THE APPROVED METHODS SPECIFIED HEREIN MUST BE FOLLOWED AS CLOSELY AS POSSIBLE FOR BLOCKING, BRACING, AND STAYING OF THE UNITS. **NOTE:** A SHIPMENT WILL BE POSITIONED IN THE RAILCAR IN COMPLIANCE WITH THE WEIGHT DISTRIBUTION REQUIREMENTS OF THE AAR.
- P. **CAUTION:** WHEN POWER OR PNEUMATIC NAILERS ARE BEING USED IN THE APPLICATION OF NAILED FLOORLINE BLOCKING OR BRACING, PALLET UNITS BEING LOADED INTO THE CONVEYANCE MUST BE POSITIONED TO ALLOW A CLEAR PATH OF EXIT FOR THE OPERATOR AT ALL TIMES, SHOULD AN EMERGENCY EXIT BECOME NECESSARY.
- Q. 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.
- 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.

(CONTINUED ON PAGE 3)

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

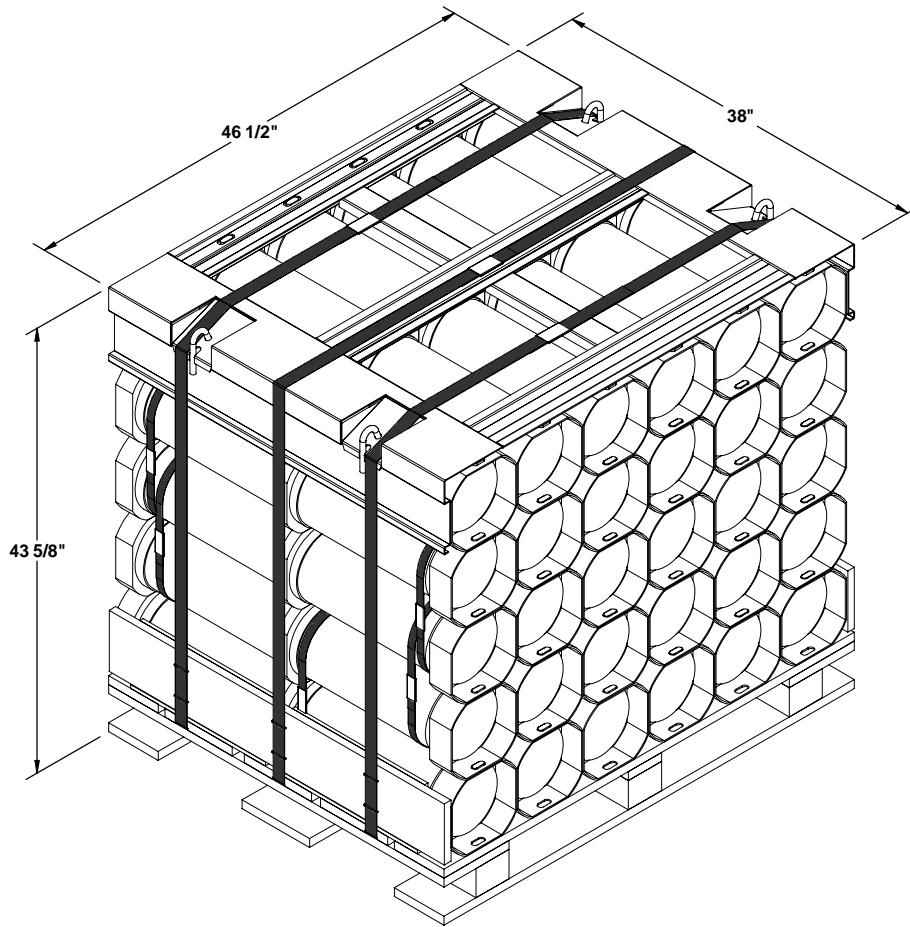
S. FOR CONVENTIONAL TYPE BOXCARS:

1. IF THE CAR BEING USED FOR A SHIPMENT IS EQUIPPED WITH A NAILABLE METAL FLOOR AND A NAIL SIZE FOR FLOOR NAILING IS MARKED ON THE SIDEWALL OF THE CAR, THAT GUIDANCE SHOULD BE APPLIED TO THE NAILING OF THE "DOORWAY BLOCKING" PIECES IN THE FULL LOADS AND TO THE NAILING TO THE CAR FLOOR OF THE LCL BRACES AND KNEE BRACE ASSEMBLIES IN THE LESS-THAN-FULL LOADS. IF A NAIL SIZE IS NOT SPECIFIED IN THE CAR, 30d NAILS SHOULD BE USED IN LIEU OF THOSE SPECIFIED IN THE APPLICABLE KEY NUMBERS.
2. **NOTICE:** WHEN POSITIONING PALLET UNITS IN A CAR, THEY SHOULD BE PLACED TIGHTLY AGAINST A CAR SIDEWALL AND ARE TO BE PRESSED TIGHTLY TOGETHER LENGTHWISE SO AS TO ACHIEVE A TIGHT LOAD. TO AID IN ACHIEVING TIGHTNESS LENGTHWISE IN A FULL LOAD, A LOAD-COMPRESSING JACK MAY BE EMPLOYED IN THE AREA OF THE CENTER GATES TO MOVE THE PALLET UNITS INTO THEIR FINAL SHIPPING POSITION. A HYDRAULIC JACK IS RECOMMENDED FOR THIS OPERATION. **CAUTION:** WHEN USING A JACK TO COMPACT A LOAD, THE JACK MUST BE USED AGAINST STRONG POINTS OF THE PALLET UNITS, SUCH AS THE JOINTS BETWEEN THE LAYERS OF CONTAINERS ON THE PALLET UNIT. PADDING, OF 2" THICK LUMBER OR ANY OTHER MATERIAL OF SIMILAR CONSISTENCY, SHOULD BE PLACED BETWEEN THE JACK AND THE LADING.
3. LOAD-BLOCKING STRUTS WHICH ARE 48" OR LONGER MUST BE STIFFENED BY THE APPLICATION OF HORIZONTAL AND VERTICAL STRUT BRACING AS SHOWN ON PAGE 10. BRACING IS NOT REQUIRED IF THE STRUTS FOR THE LOAD BEING SHIPPED ARE SHORTER THAN 48". THE LENGTH OF THE LOAD-BLOCKING STRUTS SHOULD BE KEPT AS SHORT AS POSSIBLE (APPROX 18" MINIMUM), BUT IN THE EVENT IT IS NECESSARY TO USE STRUTS WHICH ARE 8'-0" OR MORE IN LENGTH, IT WILL BE NECESSARY TO APPLY AN ADDITIONAL SET OF HORIZONTAL AND VERTICAL STRUT BRACING PIECES. STRUT BRACING SHOULD BE APPLIED SO AS TO PROVIDE NEARLY EQUAL SPACES BETWEEN THE BRACING PIECES AND THE CENTER GATES AND/OR BETWEEN ADJACENT STRUT BRACING PIECES. NOTE THAT HORIZONTAL STRUT BRACING PIECES FOR THE UPPER LEVEL OF STRUTS FOR ALL BUT THE UPPERMOST TIER OF A LOAD MAY BE DIFFICULT TO APPLY TO THE TOP SURFACES OF THE STRUT AS DEPICTED. STRUT BRACING WILL BE EQUALLY EFFECTIVE IF APPLIED TO THE UNDER SIDE OF THOSE STRUTS.
4. TO ACHIEVE A TIGHTLY BLOCKED LOAD, A STRUT WILL BE CUT APPROXIMATELY 1/4" TO 3/8" LONGER THAN THE MEASURED DISTANCE BETWEEN THE STRUT BEARING AREAS ON THE TWO CENTER GATES. MEASUREMENTS FOR STRUT LENGTHS NEEDS TO BE ACCOMPLISHED AT SEVERAL PLACES DURING THE BLOCKING AND BRACING PROCESS. CARE MUST BE EXERCISED WHEN MEASURING FOR AND INSTALLING STRUTS. THE SPECIFIED APPROXIMATE DIMENSION FOR A STRUT LENGTH MAY BE ADJUSTED, AS NECESSARY, TO PROVIDE FOR A TIGHTLY BLOCKED LOAD WITHOUT DISTORTING, DENTING OR OTHERWISE DAMAGING THE PALLET UNITS. ONE END OF THE STRUT WILL BE POSITIONED AT ITS BEARING AREA JUST ABOVE THE STRUT LEDGER ON ONE GATE. THE OTHER END, WHICH CAN BE BEVELED ON THE LOWER CORNER IF DESIRED, WILL THEN BE DRIVEN DOWNWARD UNTIL IT CONTACTS THE STRUT LEDGER ON THE OTHER GATE. EACH END OF THE STRUT WILL BE TOENAILED TO THE ADJACENT CENTER GATE, AS SPECIFIED WITHIN THE KEY NUMBERS FOR A LOAD, IN SUCH A MANNER SO THAT AS NEARLY AS PRACTICAL EQUAL LENGTHS OF A NAIL ARE EMBEDDED IN THE STRUT AND IN THE VERTICAL PIECE OF THE CENTER GATE. NOTE THAT THE UPPER CORNER NEEDS TO BE BEVELED ONLY IF THE STRUTS ARE VERY SHORT. IF ONLY ONE END IS BEVEL CUT, THE BEVELED EDGE WILL BE PLACED IN THE DOWNWARD POSITION SO THAT IT WILL ALLOW THE STRUT END TO SLIDE MORE FREELY DOWN THE FACE OF THE VERTICAL PIECE ON THE ADJACENT CENTER GATE AS THE STRUT IS DRIVEN DOWN INTO ITS FINAL BLOCKING POSITION.
5. WHERE 2" X 4" PIECES ARE SPECIFIED FOR STRUT LEDGERS, 2" X 2" MATERIAL MAY BE SUBSTITUTED, IF DESIRED.

(CONTINUED AT RIGHT)

T. FOR CARS EQUIPPED WITH LOAD DIVIDER BULKHEADS:

1. **CAUTION:** FOR CUSHIONED BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS, ONLY CARS EQUIPPED WITH LOAD DIVIDERS MANUFACTURED BY EVANS, EQUIPCO, OR PRECO MAY BE USED. LOAD DIVIDERS MANUFACTURED BY TRANSCO ARE NOT ACCEPTABLE WHETHER OF ALUMINUM OR STEEL CONSTRUCTION. THE DEPICTED PROCEDURES ARE APPLICABLE FOR CARS OF VARIOUS LENGTHS AND WIDTHS. THE AAR MECHANICAL DESIGNATION CLASS FOR THESE CARS, AS IDENTIFIED IN "THE OFFICIAL RAILWAY EQUIPMENT REGISTER", WILL BE RBL, XL, OR XLI.
2. THE USE OF LOAD DIVIDER EQUIPPED CARS WILL ELIMINATE THE NEED FOR CENTER GATES AND STRUTS, AND GATE HOLD DOWNS (WHEN APPLICABLE) WHICH ARE REQUIRED IN CONVENTIONAL BOXCAR LOADS. THIS WILL ACCOUNT FOR A CONSIDERABLE SAVING IN MATERIAL AND LABOR COSTS. THEREFORE, EVERY EFFORT SHOULD BE MADE TO ACQUIRE CUSHIONED CARS EQUIPPED WITH LOAD DIVIDERS FOR SHIPMENT OF SMALL DIAMETER BOMBS. **NOTICE:** ONLY CUSHIONED CARS THAT HAVE SLIDING CENTER SILL TYPE CUSHIONED DEVICES OR END-OF-CAR TYPE DEVICES WHICH HAVE AT LEAST 15" OF TRAVEL ARE ACCEPTABLE.
3. IF NAILING TO A CAR SIDEWALL IS NOT REQUIRED, BOXCARS EQUIPPED WITH ADJUSTABLE SIDE FILLERS THAT HAVE 3/8" OR THICKER PANELS MAY BE USED, HOWEVER, THESE SIDE FILLERS MUST NOT BE USED FOR LATERAL BLOCKING; THEY MUST BE RETRACTED AND LOCKED AGAINST THE CAR SIDEWALL. A "FILL PIECE" MUST BE INSTALLED IN THE VOID BETWEEN THE CAR SIDEWALL AND THE SIDE FILLER PANEL. SEE THE "SIDE FILLER TYPICAL TYPE A" VIEW ON PAGE 31 FOR GUIDANCE. IF THE BACK OF THE SIDE FILLER PANELS ARE REINFORCED WITH VERTICAL AND HORIZONTAL STEEL MEMBERS AS SHOWN IN THE "SIDE FILLER TYPICAL TYPE B" VIEW ON PAGE 31, THE "FILL PIECE" MATERIAL IS NOT REQUIRED.
4. **NOTICE:** AFTER THE LOAD DIVIDER BULKHEADS ARE POSITIONED AGAINST THE LADING, AND THE LOCKING PINS ARE ENGAGED IN THE HOLES OF THE RAILS, THE LOWER LOCKING PINS MUST BE INSPECTED TO ENSURE THAT THE PINS ARE FULLY ENGAGED IN THE LOCKING HOLES. IF THE PINS ARE NOT FULLY SEATED IN THE LOCKING HOLES, THE LINKAGE MECHANISM WILL BE ADJUSTED AS REQUIRED SO THAT THE PINS WILL BE FULLY SEATED INTO THE LOCKING HOLES OF THE LOWER RAILS. IF PRESENT, DEBRIS MUST BE REMOVED FROM BENEATH THE LOCKING HOLES WHICH HAVE BEEN SELECTED FOR SECURING A LOAD DIVIDER BULKHEAD.
5. A "STRUT ASSEMBLY" MUST BE INSTALLED BETWEEN THE LOAD DIVIDER BULKHEADS IF THE CAR CONTAINS HAZARD CLASS AND DIVISION 1.1, 1.2, OR 1.3 EXPLOSIVES AND THE LOAD IN EITHER END OF THE CAR WEIGHS 50,000 POUNDS OR MORE. A STRUT ASSEMBLY IS NOT REQUIRED FOR LOADS OF HAZARD CLASS AND DIVISION 1.4 EXPLOSIVES. NOTE THAT THE STRUT ASSEMBLY MAY BE OMITTED FROM LOADS OF HAZARD CLASS AND DIVISION 1.1, 1.2, OR 1.3 EXPLOSIVES WEIGHING 50,000 POUNDS WHEN THE LADING AND ADEQUATE BLOCKING AND BRACING ARE POSITIONED TO COMPLETELY FILL THE SPACE BETWEEN THE INSTALLED BULKHEADS AS SPECIFIED IN GENERAL NOTE "T-6" BELOW. DETAILS OF STRUT ASSEMBLIES FOR USE BETWEEN 2-PIECE BULKHEADS AND BETWEEN 1-PIECE BULKHEADS ARE SHOWN ON PAGE 32.
6. THE NORMAL LOADING PATTERN IN CARS EQUIPPED WITH LOAD DIVIDER BULKHEADS IS TO POSITION THE LADING BETWEEN A CAR ENDWALL AND A LOAD DIVIDER BULKHEAD IN FULL LAYERS. OBVIOUSLY, A LOAD QUANTITY MUST THEN BE A MULTIPLE OF THE NUMBER OF PALLET UNITS THAT ARE IN ONE LOAD UNIT. A LOAD UNIT IS DEFINED AS A STACK OF PALLET UNITS THAT IS FULL CAR WIDTH BY FULL LOAD HEIGHT BY ONE UNIT IN LENGTH. IF THE QUANTITY TO BE SHIPPED CANNOT BE ATTAINED BY ADJUSTING THE NUMBER OF TIERS IN ONE OR BOTH ENDS OF A CAR, OR BY ADJUSTING THE NUMBER OF LOAD UNITS IN EITHER END OF THE CAR, ONE OF THE FOLLOWING PROCEDURES MUST BE USED IN ORDER TO OBTAIN THE DESIRED QUANTITY.
 - I. ONE OR MORE RISERS CAN BE POSITIONED WITHIN A LOAD TO INCREASE A LOAD QUANTITY. SEE THE RISER PROCEDURES AND DETAILS ON PAGE 15.
 - II. AT LOCATION(S) WHERE K-BRACES MIGHT NORMALLY BE USED IN A LOAD IN A CONVENTIONAL CAR, LOAD DIVIDER BULKHEADS CAN BE POSITIONED. LOADING CAN THEN CONTINUE TOWARD THE CENTER OF THE CAR FROM EACH INSTALLED LOAD DIVIDER BULKHEAD IN A ONE-HIGH LOADING PATTERN. INSTALL CENTER GATES AND STRUTS AS SHOWN ON PAGE 6 OR 10 OF THE CONVENTIONAL BOXCAR DRAWING HEREIN TO PROVIDE FOR A TIGHT LOAD BETWEEN THE BULKHEADS.
 - III. ONE OR MORE UNITS CAN BE POSITIONED IN CONTACT WITH A LOAD DIVIDER BULKHEAD ON THE CENTER-OF-CAR SIDE. BLOCK AND BRACE WITH LCL BRACES, AS SHOWN ON PAGE 24 OR WITH KNEE BRACE ASSEMBLIES, AS SHOWN ON PAGE 18.



PALLET UNIT DATA

GROSS WEIGHT - - - - - 1,835 LBS
 CUBE - - - - - 44.6 CU FT



ONE SEAL WITH
TWO PAIR OF
NOTCHES.

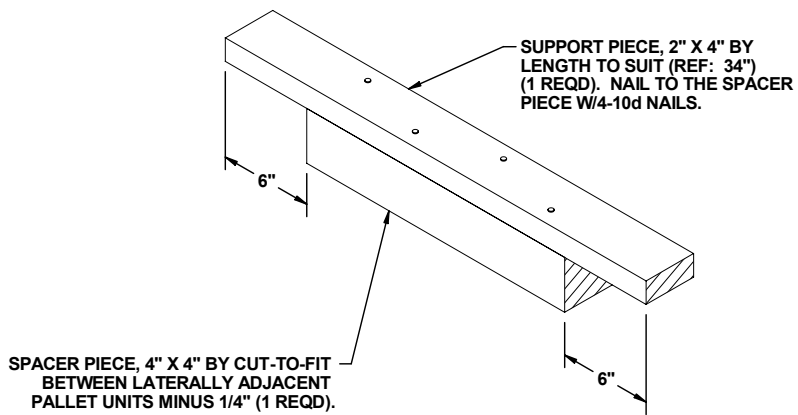
STRAP JOINT A
 METHOD OF SECURING A
 STRAP JOINT WHEN USING
 A NOTCH-TYPE SEALER.



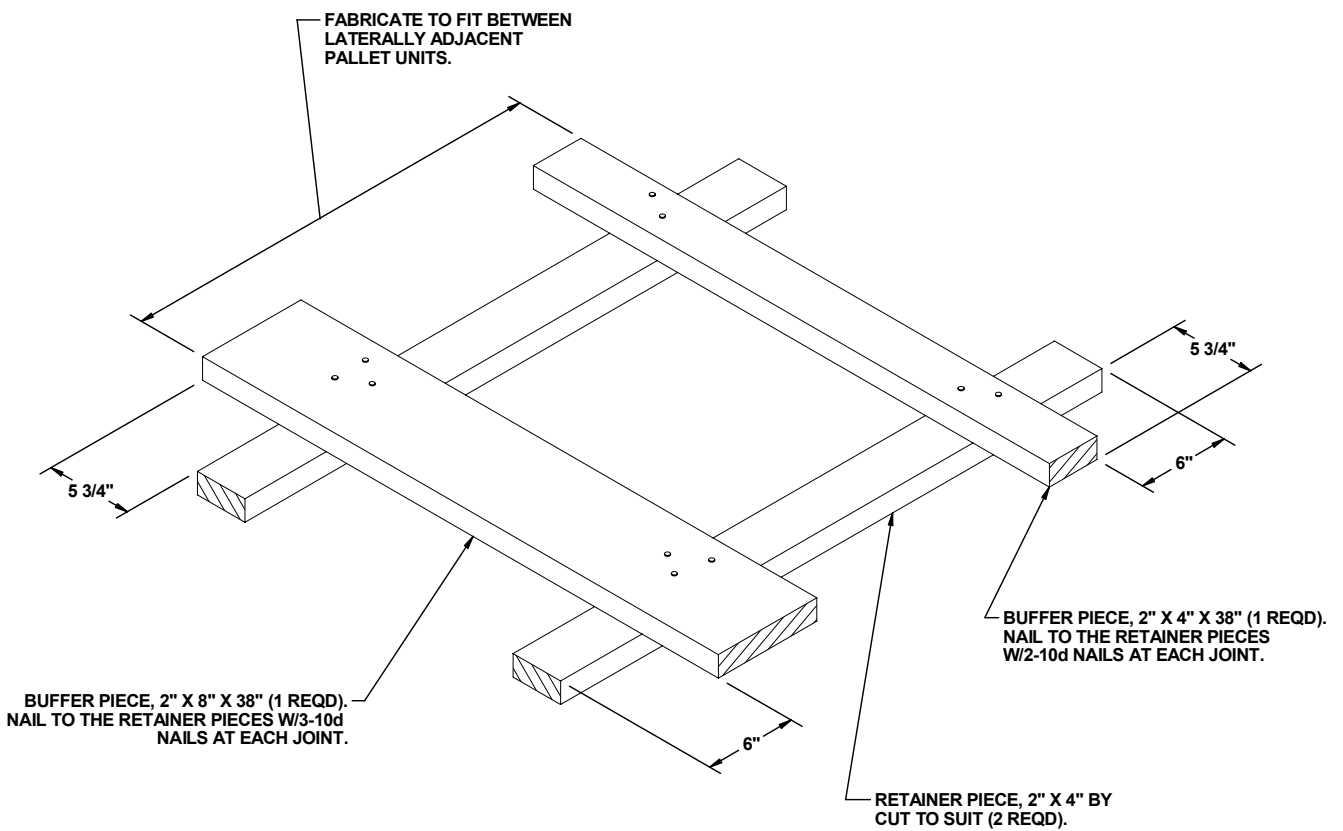
TWO SEALS, BUTTED
TOGETHER, WITH
TWO PAIR OF CRIMPS
EACH SEAL.

STRAP JOINT B
 METHOD OF SECURING A
 STRAP JOINT WHEN USING
 A CRIMP-TYPE SEALER.

END-OVER-END LAP JOINT DETAILS

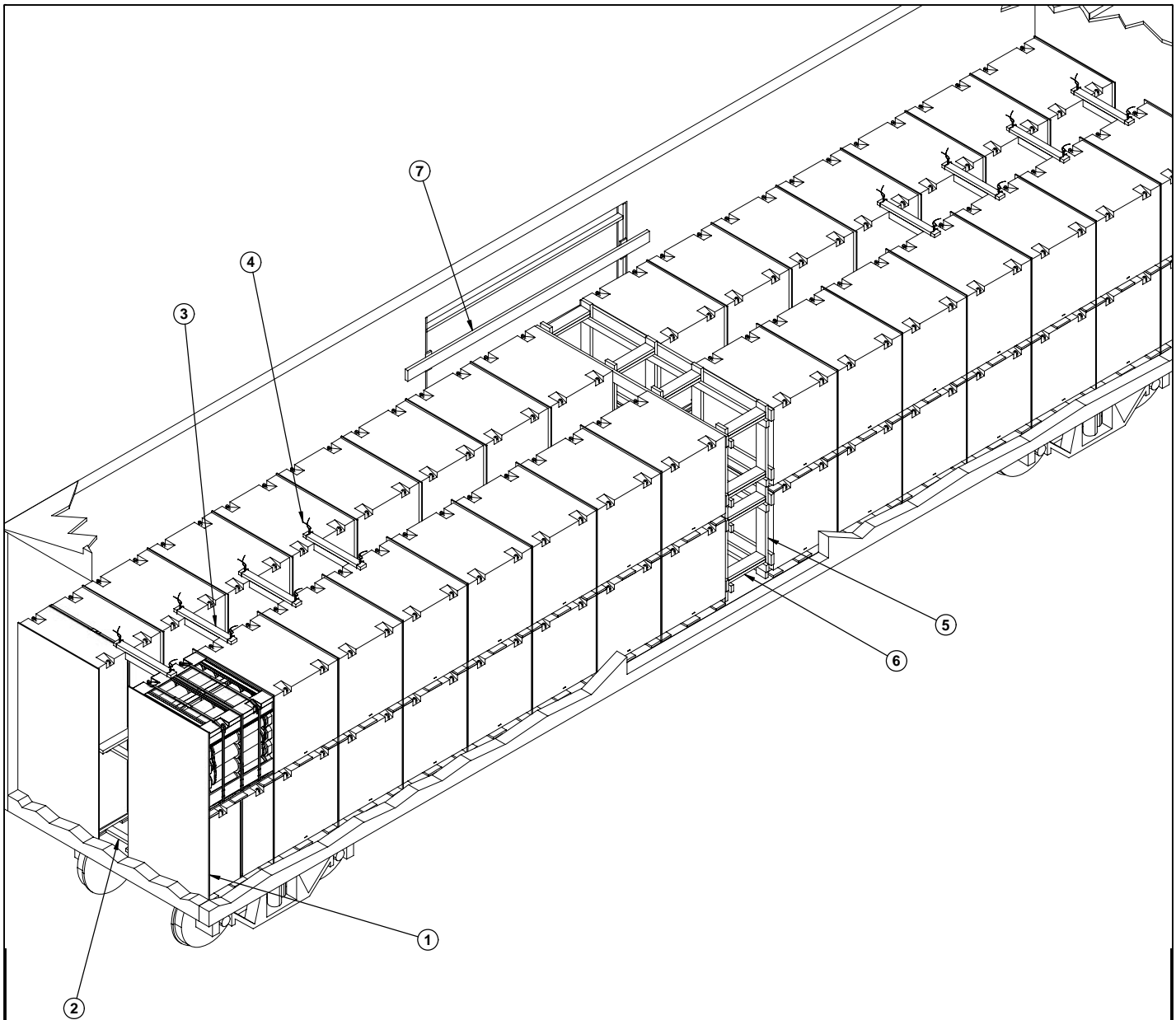


TOP OF LOAD ANTI-SWAY BRACE



ANTI-SWAY BRACE

NOTE: THE ANTI-SWAY BRACE CAN BE PARTIALLY ASSEMBLED, ONE BUFFER PIECE CAN BE NAILED TO BOTH RETAINER PIECES. THE LONG ENDS OF THE ASSEMBLY CAN THEN BE INSTALLED INTO THE FORKLIFT OPENING OF A LOADED PALLET UNIT PRIOR TO POSITIONING OF THE LATERALLY ADJACENT PALLET UNIT.



ISOMETRIC VIEW

KEY NUMBERS

- ① SEPARATOR GATE B (30 REQD). SEE THE DETAIL ON PAGE 30. INSTALL WITH THE HOLD-DOWN PIECES TOWARD THE PALLET UNITS.
- ② ANTI-SWAY BRACE (30 REQD). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
- ③ TOP-OF-LOAD ANTI-SWAY BRACE (8 REQD). SEE THE DETAIL ON PAGE 5.
- ④ TIE WIRE, .0800" DIA 24" LONG (16 REQD). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET UNIT. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑤ CENTER GATE (2 REQD). SEE THE DETAIL ON PAGE 25.
- ⑥ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 23") (16 REQD). TOENAIL TO THE CENTER GATES W/2-16d NAILS AT EACH END. SEE THE "BEVEL CUT" DETAIL ON PAGE 5.
- ⑦ DOORWAY PROTECTION D (2 REQD). SEE THE DETAIL ON PAGE 27 AND SPECIAL NOTE 3 ON PAGE 7.

SPECIAL NOTES:

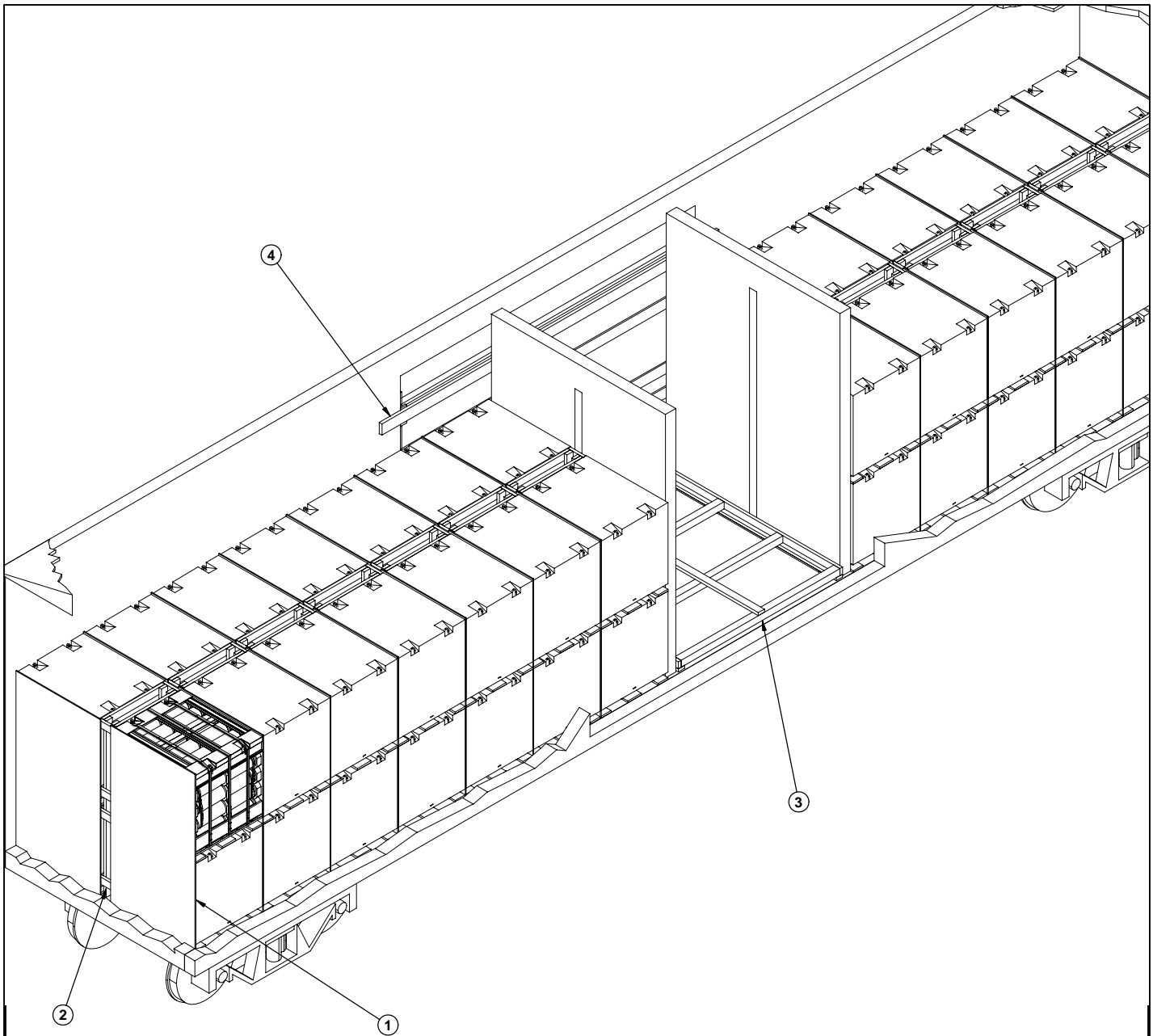
1. A 60 PALLET UNIT LOAD IS SHOWN IN A 50'-6" LONG BY 9'-6" WIDE CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING OTHER DOOR OPENINGS CAN BE USED.
2. THE TOTAL ACCUMULATED SPACE ACROSS A BOXCAR MUST NOT BE MORE THAN 6". ANTI-SWAY BRACES OR CRIB FILL ASSEMBLIES ARE REQUIRED WHEN THE LATERAL SPACE BETWEEN THE PALLET UNITS EXCEEDS 6", AS MEASURED FROM PALLET UNIT TO PALLET UNIT.
3. DOORWAY PROTECTION IS REQUIRED FOR ALL PALLET UNIT STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION IN THE LOAD ON PAGE 6 IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NON-MAILABLE DOOR POSTS. REFER TO PAGES 26 AND 27 FOR ALTERNATIVE DOORWAY PROTECTION FOR CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS. IF THE CAR BEING LOADED IS EQUIPPED WITH PLUG TYPE DOORS OR COMBINATION PLUG AND SLIDING DOORS, NAILED FLOORLINE BLOCKING AND DOORWAY PROTECTION STRAPS MUST BE USED. SEE THE LOAD ON PAGE 10 FOR GUIDANCE.
4. FOR SHIPMENT OF A LOAD WHICH CONTAINS MORE OR FEWER PALLET UNITS THAN WHAT IS SHOWN, SEE THE PROCEDURES CONTAINED ON PAGES 8 THRU 24.

BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	3	1
1" X 6"	40	20
2" X 3"	128	64
2" X 4"	407	272
2" X 6"	220	220
2" X 8"	95	127
4" X 4"	14	19
NAILS	NO. REQD	POUNDS
6d (2")	330	2
10d (3")	604	9-1/2
12d (3-1/4")	6	NIL
16d (3-1/2")	64	1-1/2
WIRE, .008" DIA - - - - 32' REQD - - - -		3/4 LB
PLYWOOD, 1/2" - - 900 SQ FT REQD - - - -		1238 LBS

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT - - - - -	60 - - - - -	110,100 LBS
DUNNAGE - - - - -	- - - - -	2,692 LBS
TOTAL WEIGHT - - - - -		112,792 LBS (APPROX)



ISOMETRIC VIEW

KEY NUMBERS

- ① SEPARATOR GATE B (26 REQD). SEE THE DETAIL ON PAGE 30. INSTALL WITH THE HOLD-DOWN PIECES TOWARD THE PALLET UNITS.
- ② CRIB FILL ASSEMBLY (13 REQD). SEE THE DETAIL ON PAGE 25.
- ③ STRUT ASSEMBLY (1 REQD). SEE DETAIL ON PAGE 32.
- ④ DOORWAY PROTECTION D (2 REQD). SEE THE DETAIL ON PAGE 27 AND SPECIAL NOTE 3 ON PAGE 7.

SPECIAL NOTES:

1. A 52 PALLET UNIT LOAD IS SHOWN IN A 50'-6" LONG BY 8'-6" WIDE CUSHIONED TYPE BOXCAR EQUIPPED WITH LOAD DIVIDERS AND 14'-0" WIDE THRU DOOR OPENINGS IS SHOWN. BOXCARS OF OTHER DIMENSIONS OR HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.
2. THE TOTAL ACCUMULATED SPACE ACROSS A BOXCAR MUST NOT BE MORE THAN 6". CRIB FILL ASSEMBLIES ARE REQUIRED WHEN THE TOTAL SPACE BETWEEN THE PALLET UNITS EXCEEDS 6", AS MEASURED FROM PALLET UNIT TO PALLET UNIT.
3. DOORWAY PROTECTION IS REQUIRED FOR ALL PALLET UNIT STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION IN THE LOAD ON PAGE 8 IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NON-NAILED DOOR POSTS. REFER TO PAGES 26 AND 27 FOR ALTERNATIVE DOORWAY PROTECTION FOR CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS. IF THE CAR BEING LOADED IS EQUIPPED WITH PLUG TYPE DOORS OR COMBINATION PLUG AND SLIDING DOORS, NAILED FLOORLINE BLOCKING AND DOORWAY PROTECTION STRAPS MUST BE USED. SEE THE LOAD ON PAGE 10 FOR GUIDANCE.
4. STRUT ASSEMBLIES ARE REQUIRED WHEN THE LOAD IN EITHER END OF A CAR IS 50,000 POUNDS OR MORE. FOR THE LOAD SHOWN ON PAGE 8, THE STRUT ASSEMBLY WOULD NOT BE REQUIRED IF THE LOAD CONSISTED OF 26 PALLET UNITS OR LESS ON EACH END OF THE BOXCAR.
5. FOR SHIPMENTS OF A LOAD WHICH CONTAINS MORE OR FEWER PALLET UNITS THAN WHAT IS SHOWN SEE THE PROCEDURES ON PAGES 6 AND 10 THRU 24.

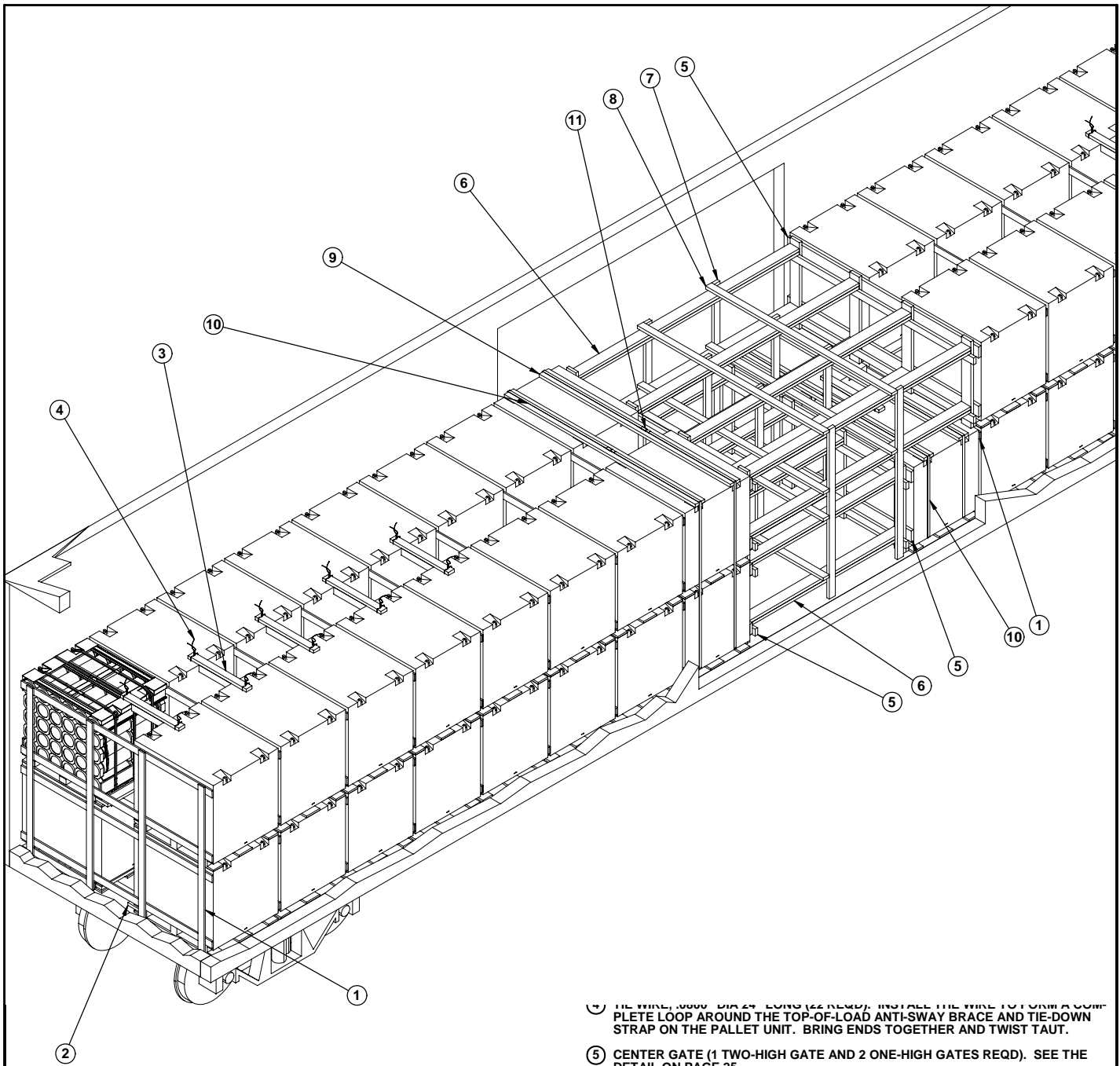
BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	3	1
1" X 6"	56	28
1" X 8"	14	10
2" X 3"	133	67
2" X 4"	739	493
2" X 6"	32	41
NAI LS	NO. REQD	POUNDS
6d (2")	304	1-3/4
10d (3")	814	12-3/4
12d (3-1/4")	22	1/2
PLYWOOD, 1/2" - - - 900 SQ FT REQD - 1,238 LBS		

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT - - - - -	52 - - - - -	95,420 LBS
DUNNAGE - - - - -	- - - - -	2,590 LBS
TOTAL WEIGHT - - - - -		98,010 LBS (APPROX)

**52 PALLET UNIT LOAD IN A 50'-6" LONG BY 8'-6" WIDE
BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS**



ISOMETRIC VIEW

- ④ THE WIRE, 300W DIA 29 LONG (22 REQD). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET UNIT. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑤ CENTER GATE (1 TWO-HIGH GATE AND 2 ONE-HIGH GATES REQD). SEE THE DETAIL ON PAGE 25.
- ⑥ STRUT, 2" X 6" BY CUT-TO-FIT (REF: 8 STRUTS 7'-6" LONG AND 8 STRUTS 10'-10" LONG) (DOUBLED) (16 REQD). TOENAIL TO THE CENTER GATES W/2-16d NAILS AT EACH END. LAMINATE FIRST PIECE TO SECOND PIECE W/1-10d NAILS EVERY 12".
- ⑦ VERTICAL STRUT BRACING, 2" X 4" X 7'-2" (8 REQD). NAIL TO THE STRUTS W/2-10d NAILS AT EACH JOINT.
- ⑧ HORIZONTAL STRUT BRACING, 2" X 4" BY CAR WIDTH MINUS 2" (6 REQD). NAIL TO THE STRUTS W/2-10d NAILS AT EACH JOINT.
- ⑨ STRAPPING BOARD, 2" X 6" X 9'-4" (4 REQD).
- ⑩ DOORWAY PROTECTION STRAP, 1-1/4" X .035" OR .031" X 33'-8" LONG STEEL STRAPPING FOR TWO-HIGH STACKS AND 26'-5" FOR ONE-HIGH STACKS (4 REQD). INSTALL AS TO ENCIRCLE THE LOAD UNITS IN THE DOORWAY AREA. STAPLE TO THE STRAPPING BOARD W/2 STAPLES. SEE SPECIAL NOTE 3 ON PAGE 11.
- ⑪ SEAL FOR 1-1/4" STEEL STRAPPING (4 REQD, 1 PER STRAP). DOUBLE NOTCH EACH SEAL. SEE THE "END-OVER-END LAP JOINT DETAILS" ON PAGE 4.

SPECIAL NOTES:

1. A 62 PALLET UNIT LOAD IS SHOWN IN A 60'-8" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR EQUIPPED WITH 14'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.
2. THE TOTAL ACCUMULATED SPACE ACROSS A BOXCAR MUST NOT BE MORE THAN 6". ANTI-SWAY BRACES OR CRIB FILL ASSEMBLIES ARE REQUIRED WHEN THE LATERAL SPACE BETWEEN THE PALLET UNITS EXCEEDS 6", AS MEASURED FROM PALLET UNIT TO PALLET UNIT.
3. DOORWAY PROTECTION IS REQUIRED FOR ALL PALLET UNIT STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH. THE NAILED TO BOXCAR FLOOR ANTI-SWAY BRACE (AS FLOORLINE BLOCKING) AND DOORWAY PROTECTION STRAPS ARE USED IN THE LOAD ON PAGE 10. TWO DOORWAY PROTECTION STRAPS ARE REQUIRED FOR EACH GROUP OF PALLET UNIT ROWS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH ARE NOT RETAINED BY AT LEAST 6" OF THE SIDEWALL ON BOTH SIDES OF THE CAR. ONE DOORWAY PROTECTION STRAP IS REQUIRED FOR EACH PALLET UNIT ROW WHICH IS RETAINED BY FROM 6" TO ONE-HALF THE PALLET/LOAD UNIT LENGTH OR WIDTH. IF THE CAR BEING LOADED IS EQUIPPED WITH SLIDING DOORS, A WOODEN GATE TYPE OF DOORWAY PROTECTION SUCH AS SHOWN IN THE LOAD ON PAGE 6, OR ANY OF THE ALTERNATIVES ON PAGES 26 AND 27 MAY BE USED.
4. FOR SHIPMENTS OF A LOAD WHICH CONTAINS MORE OR FEWER PALLET UNITS THAN WHAT IS SHOWN, SEE THE PROCEDURES ON PAGES 6, 8 AND 12 THRU 24.

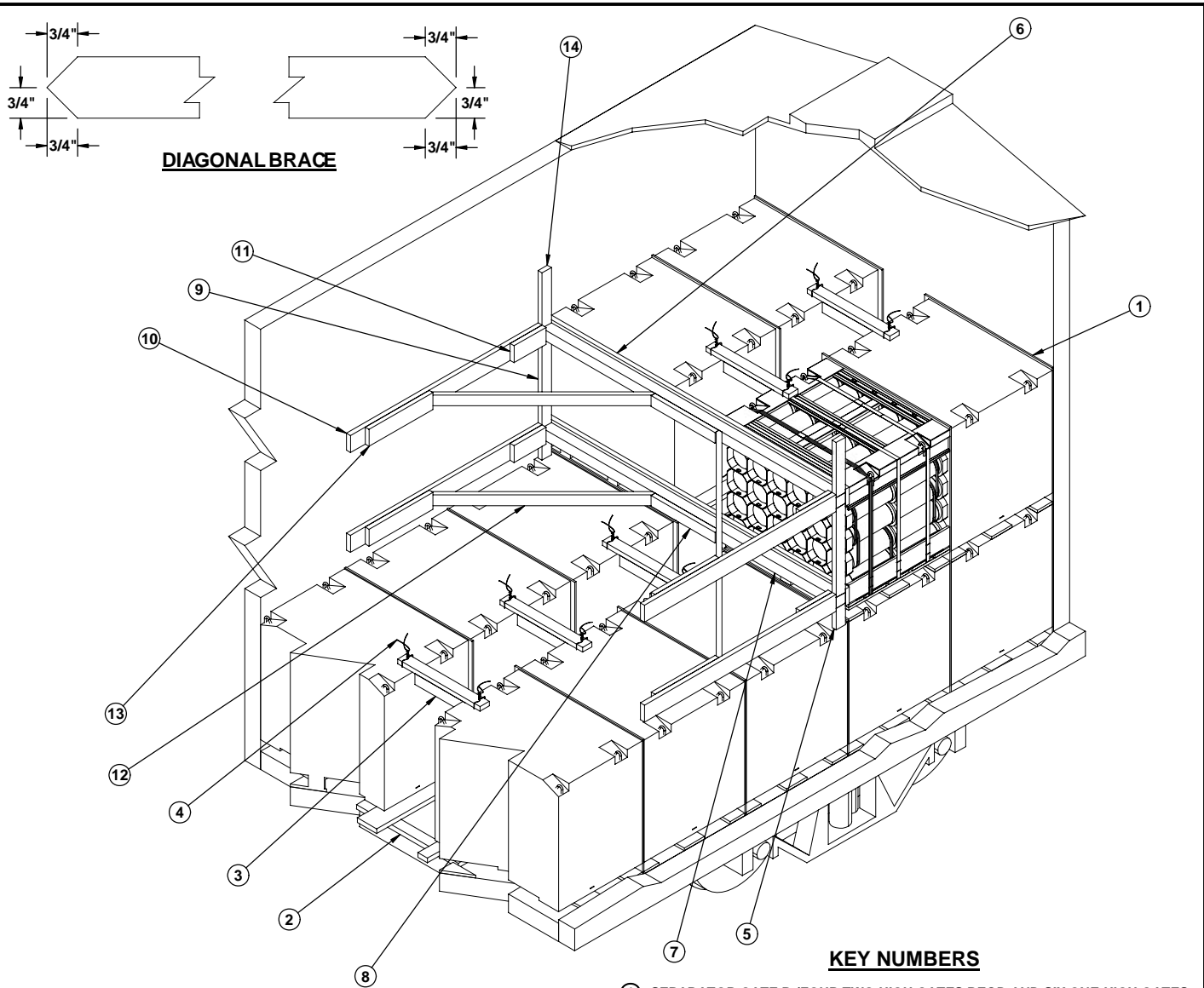
BILL OF MATERIAL

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	985	329
2" X 3"	15	8
2" X 4"	504	336
2" X 6"	331	331
2" X 8"	99	131
4" X 4"	18	24
NAILS	NO. REQD	POUNDS
6d (2")	480	3
10d (3")	730	11-1/4
12d(3-1/4")	64	1-1/4
STEEL STRAPPING, 1-1/4" - - 121' REQD - 18 LBS		
SEAL FOR 1-1/4" STRAPPING - - - 4 REQD - - NIL		
STAPLE, 1-1/4" - - - - - 8 REQD - - NIL		
WIRE, .080" DIA - - - - - 44' REQD - 3/4 LBS		

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT - - - - -	62 - - - - -	113,770 LBS
DUNNAGE - - - - -	- - - - -	2,346 LBS

TOTAL WEIGHT - - - - - 116,116 LBS (APPROX)



DIAGONAL BRACE

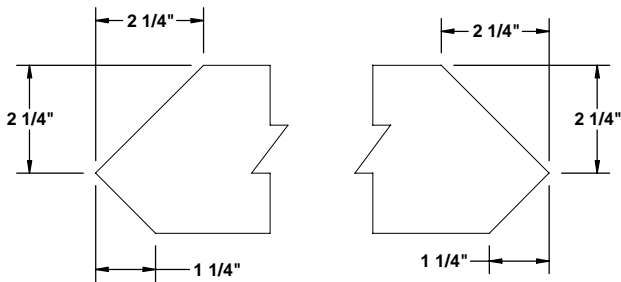
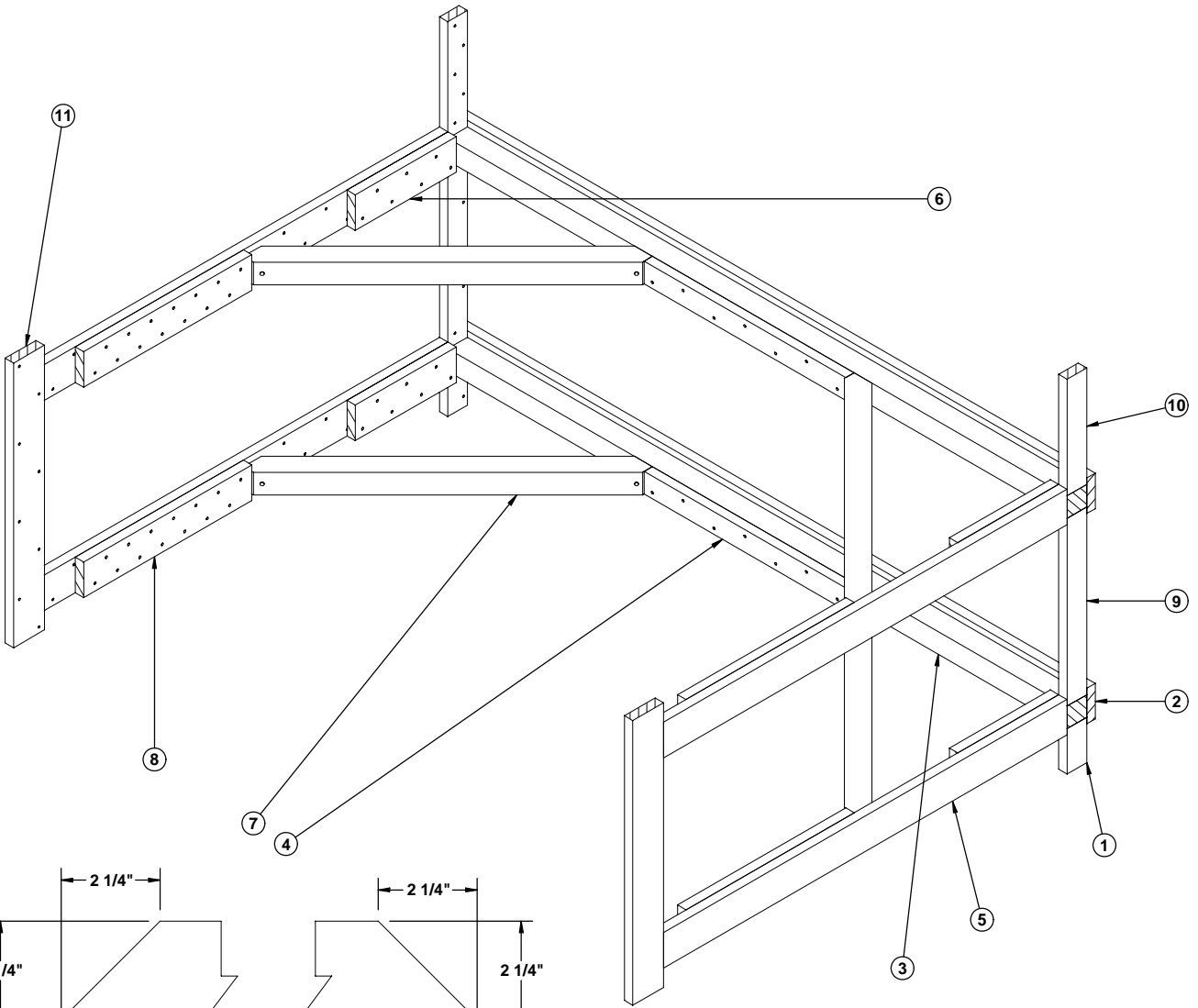
ISOMETRIC VIEW

KEY NUMBERS

- ① SEPARATOR GATE B (FOUR TWO-HIGH GATES REQD AND SIX ONE-HIGH GATES SHOWN). SEE THE DETAIL ON PAGE 30. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
- ② ANTI-SWAY BRACE (7 SHOWN). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF CONTAINERS.
- ③ TOP-OF-LOAD ANTI-SWAY BRACE (5 SHOWN). SEE THE DETAIL ON PAGE 5.
- ④ TIE WIRE .0800" DIA 24" LONG (10 REQD). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET UNIT. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑤ SUPPORT CLEAT, 2" X 4" X 6" (2 REQD). NAIL TO THE SIDEWALL W/3-12d NAILS. POSITION AS TO CENTER LOAD BEARING PIECE AND CROSS CAR BRACE ACROSS CONTAINER ANGLE SUPPORT PIECES. SEE SPECIAL NOTE 3 AT LEFT.
- ⑥ LOAD BEARING PIECE, 2" X 6" BY CAR WIDTH (CUT-TO-FIT) (2 REQD). NAIL TO THE CROSS CAR BRACE W/1-12d NAIL EVERY 6".
- ⑦ CROSS CAR BRACE, 4" X 4" BY CAR WIDTH (CUT-TO-FIT) (2 REQD).
- ⑧ CENTER CLEAT, 2" X 4" X 14" (2 REQD). NAIL TO THE CROSS CAR BRACE W/4-16d NAILS. SEE SPECIAL NOTE 4 AT LEFT.
- ⑨ SPACER CLEAT, 2" X 4" X 30-1/2" (2 REQD). NAIL TO THE CAR SIDEWALL W/4-12d NAILS.
- ⑩ HORIZONTAL WALL CLEAT, 2" X 4" X 72" (4 REQD). NAIL TO THE CAR SIDEWALL W/6-12d NAILS.
- ⑪ POCKET CLEAT, 2" X 4" X 12" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/4-16d NAILS.
- ⑫ DIAGONAL BRACE, 2" X 4" X 60" (4 REQD). SEE THE DETAIL ABOVE FOR BEVEL CUTS REQUIRED. TOENAIL TO THE HORIZONTAL WALL CLEAT AND TO THE CROSS CAR BRACE W/2-16d NAILS AT EACH END.
- ⑬ BACK-UP CLEAT, 2" X 6" X 24" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/8-16d NAILS.
- ⑭ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.

SPECIAL NOTES:

1. A 9'-4" WIDE CONVENTIONAL WOOD-LINED BOXCAR IS SHOWN. CARS OF OTHER WIDTHS MAY BE USED.
2. THE K-BRACE METHOD OF PARTIAL-LAYER (TIER) BRACING SHOWN MAY BE USED IN WOOD-LINED CARS FOR THE SECUREMENT OF A PARTIAL SECOND TIER OR FIRST TIER. THE TYPE "A" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 8,000 LBS OR NOT MORE THAN FOUR PALLET UNITS. IF THE PARTIAL TIER IS NOT MORE THAN 14,000 POUNDS, SEVEN PALLET UNITS, THE TYPE "B" K-BRACE SHOWN ON PAGE 13 WILL BE REQUIRED. IF THE PARTIAL TIER TO BE BRACED IS GREATER THAN SEVEN PALLET UNITS, THE TYPE "C" K-BRACE DEPICTED ON PAGE 14 MAY BE USED.
3. **CAUTION:** SOME CARS ARE NOT SUITED FOR THE APPLICATION OF "PARTIAL-LAYER BRACING" BECAUSE THE LENGTH OF THE PARTIAL TIER TO BE SHIPPED AND/OR THE SIZE OR CONFIGURATION OF THE CAR DOORS WILL NOT PERMIT PROPER INSTALLATION OF THE SPECIFIED K-BRACE DUNNAGE. SUPPORT CLEAT, LOAD BEARING PIECE, CROSS CAR BRACE, POCKET CLEAT, SPACER CLEAT AND THE HOLD DOWN CLEAT MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDEWALL. IT IS ALRIGHT FOR THE ENDS OF THE DIAGONAL BRACES TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT HORIZONTAL WALL CLEAT MUST BE DOUBLED AND EXTENDED ACROSS AND FAR ENOUGH PAST THE DOOR OPENING (REF: 54") TO PROVIDE FOR THE SPECIFIED NAILING OF EACH PIECE. LAMINATE THE SECOND PIECE OF THE DOUBLED HORIZONTAL WALL CLEAT TO THE FIRST W/16-16d NAILS. CLINCH THOSE NAILS WHICH PROTRUDE THRU THE HORIZONTAL WALL CLEAT WITHIN THE DOOR OPENING. NOTE THAT THE DIAGONAL BRACE WILL BE 58-7/8" LONG IN LIEU OF 60" WHEN THE HORIZONTAL WALL CLEAT IS DOUBLED.
4. THE CENTER CLEAT WILL BE 14" LONG FOR AN 8'-6" WIDE CAR, 22" LONG FOR A 9'-2", AND 24" LONG FOR A 9'-4" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.



DIAGONAL BRACE

ISOMETRIC VIEW

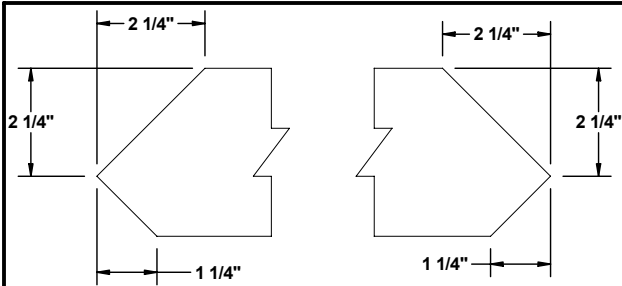
KEY NUMBERS

- ① SUPPORT CLEAT, 2" X 4" X 9" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO CENTER THE LOAD BEARING PIECE AND THE CROSS CAR BRACE ON THE JOINT BETWEEN THE BOTTOM TWO LAYERS OF CONTAINERS ON THE UNITS. NAIL TO THE CAR SIDEWALL W/3-12d NAILS.
- ② LOAD BEARING PIECE, 2" X 6" BY CAR WIDTH (CUT TO FIT) (2 REQD). NAIL TO THE CROSS CAR BRACE W/1-12d NAIL EVERY 6".
- ③ CROSS CAR BRACE, 4" X 4" BY CAR WIDTH (CUT TO FIT) (2 REQD).
- ④ CENTER CLEAT, 2" X 4" X 36" (2 REQD). NAIL TO THE CROSS CAR BRACE W/7-16d NAILS. SEE SPECIAL NOTE 3 AT LEFT.
- ⑤ HORIZONTAL WALL CLEAT, 2" X 6" X 72" (4 REQD). NAIL TO THE CAR SIDEWALL W/16-12d NAILS.
- ⑥ POCKET CLEAT, 2" X 6" X 18" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/7-16d NAILS.
- ⑦ DIAGONAL BRACE, 4" X 4" X 51-1/2" (4 REQD). SEE THE DETAIL AT LEFT FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE CROSS CAR BRACE AND TO THE HORIZONTAL WALL CLEAT W/1-60d NAIL AT EACH END.
- ⑧ BACK-UP CLEAT, 2" X 6" X 30" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/14-16d NAILS.
- ⑨ SPACER CLEAT, 2" X 4" X 29" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.
- ⑩ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.
- ⑪ VERTICAL BACK-UP CLEAT, 2" X 6" X 43" (2 REQD). NAIL TO THE CAR SIDEWALL W/8-12d NAILS.

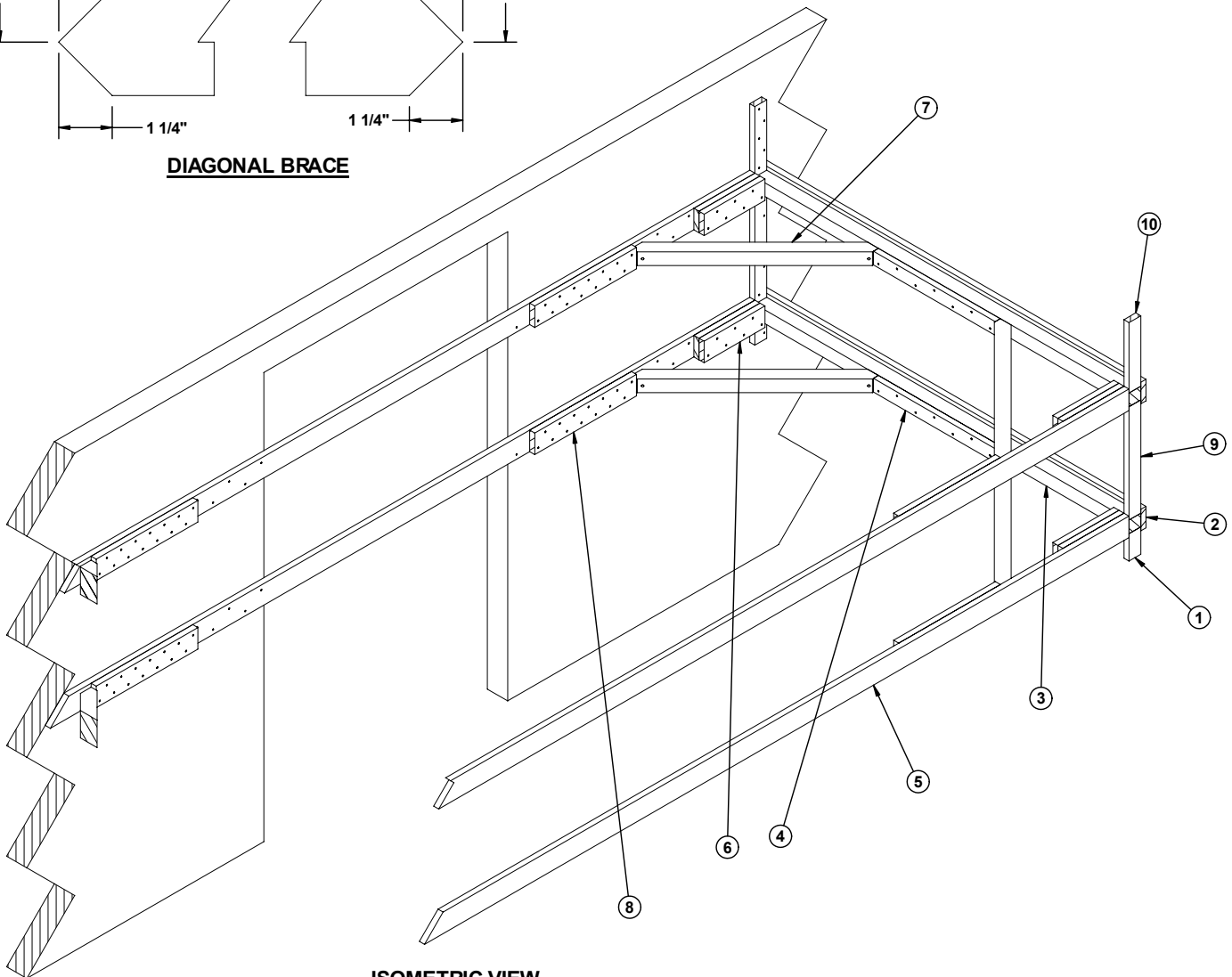
SPECIAL NOTES:

- 1. THE TYPE "B" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 14,000 POUNDS, OR SEVEN PALLET UNITS. IF THE PARTIAL TIER TO BE BRACED IS GREATER THAN SEVEN PALLET UNITS, THE TYPE "C" K-BRACE DEPICTED ON PAGE 14 MAY BE USED. IF THE PARTIAL TIER IS LESS THAN FIVE PALLET UNITS, THE TYPE "A" K-BRACE DEPICTED ON PAGE 12 WILL BE ADEQUATE.
- 2. **CAUTION:** SOME CARS ARE NOT SUITED FOR THE APPLICATION OF "PARTIAL-LAYER BRACING" BECAUSE THE LENGTH OF THE PARTIAL TIER TO BE SHIPPED AND/OR THE SIZE OR CONFIGURATION OF THE CAR DOORS WILL NOT PERMIT PROPER INSTALLATION OF THE SPECIFIED K-BRACE DUNNAGE. SUPPORT CLEAT, LOAD BEARING PIECE, CROSS CAR BRACE, POCKET CLEAT, SPACER CLEAT AND THE HOLD DOWN CLEAT MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDEWALL. IT IS ALRIGHT FOR THE ENDS OF THE DIAGONAL BRACES TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT HORIZONTAL WALL CLEAT MUST BE DOUBLED. LAMINATE THE SECOND PIECE TO THE FIRST W/40-16d NAILS. CLINCH THOSE NAILS WHICH PROTRUDE THRU THE HORIZONTAL WALL CLEAT WITHIN THE DOOR OPENING. NOTE THAT THE DIAGONAL BRACE WILL BE 50-3/8" LONG IN LIEU OF 51-1/2" WHEN THE HORIZONTAL WALL CLEAT IS DOUBLED.
- 3. THE CENTER CLEAT, WILL BE 28" LONG FOR AN 8'-6" WIDE CAR, 36" LONG FOR A 9'-2", AND 38" LONG FOR A 9'-4" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.
- 4. REFER TO PAGE 12 FOR A TYPICAL INSTALLATION OF A K-BRACE.

TYPE "B" K BRACE



DIAGONAL BRACE



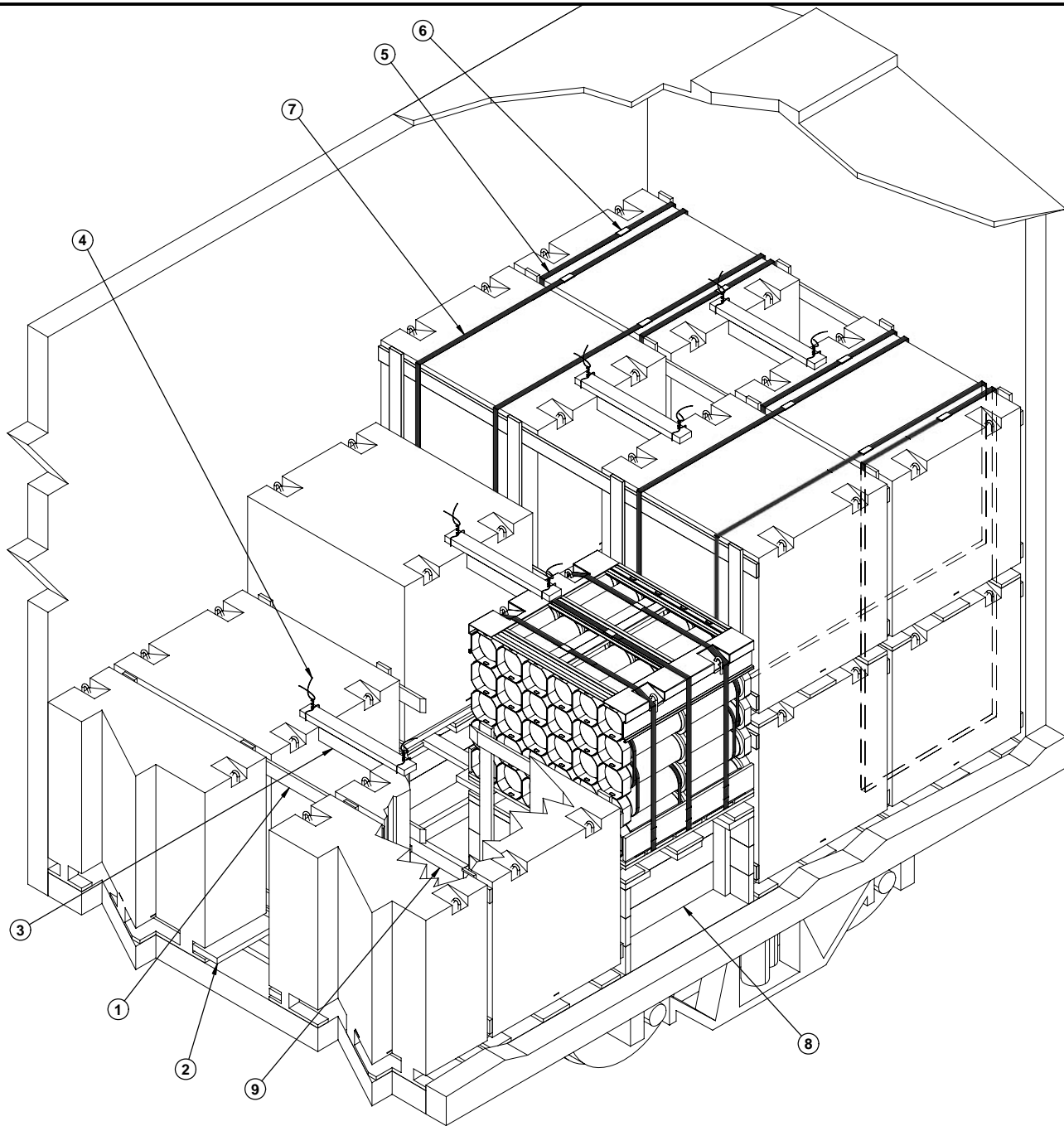
ISOMETRIC VIEW

SPECIAL NOTES:

1. THE TYPE "C" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 20,000 POUNDS, OR 10 PALLET UNITS. IF THE PARTIAL TIER TO BE BRACED IS BETWEEN FIVE AND SEVEN PALLET UNITS, THE TYPE "B" K-BRACE DEPICTED ON PAGE 13 MAY BE USED. IF THE PARTIAL TIER IS LESS THAN FIVE PALLET UNITS, THE TYPE "A" K-BRACE DEPICTED ON PAGE 12 WILL BE ADEQUATE.
2. **CAUTION:** SOME CARS ARE NOT SUITED FOR THE APPLICATION OF "PARTIAL-LAYER BRACING" BECAUSE THE LENGTH OF THE PARTIAL TIER TO BE SHIPPED AND/OR THE SIZE OR CONFIGURATION OF THE CAR DOORS WILL NOT PERMIT PROPER INSTALLATION OF THE SPECIFIED K-BRACE DUNNAGE. SUPPORT CLEAT, LOAD BEARING PIECE, CROSS CAR BRACE, POCKET CLEAT, SPACER CLEAT AND THE HOLD DOWN CLEAT MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDEWALL. IT IS ALRIGHT FOR THE ENDS OF THE DIAGONAL BRACES TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT HORIZONTAL WALL CLEAT MUST BE DOUBLED. LAMINATE THE SECOND PIECE TO THE FIRST W/40-16d NAILS. CLINCH THOSE NAILS WHICH PROTRUDE THRU THE HORIZONTAL WALL CLEAT WITHIN THE DOOR OPENING. NOTE THAT THE DIAGONAL BRACE WILL BE 50-3/8" LONG IN LIEU OF 51-1/2" WHEN THE HORIZONTAL WALL CLEAT IS DOUBLED.
3. THE CENTER CLEAT, WILL BE 28" LONG FOR AN 8'-6" WIDE CAR, 36" LONG FOR A 9'-2", AND 38" LONG FOR A 9'-4" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.
4. **CAUTION:** A TYPE "C" K-BRACE MUST BE USED IN BOTH ENDS OF THE CAR; THE BRACE IS NOT DESIGNED FOR USE IN ONLY ONE END. NOTE THAT EXCEPT FOR THE HORIZONTAL WALL CLEAT, THE QUANTITIES SPECIFIED ARE APPLICABLE ONLY FOR THE BRACE IN ONE END.

KEY NUMBERS

- ① SUPPORT CLEAT, 2" X 4" X 9" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO CENTER LOAD BEARING PIECE AND CROSS CAR BRACE ON THE JOINT BETWEEN THE BOTTOM TWO LAYERS OF CONTAINERS ON THE PALLET UNITS. NAIL TO THE CAR SIDEWALL W/3-12d NAILS.
- ② LOAD BEARING PIECE, 2" X 6" BY CAR WIDTH (CUT TO FIT) (2 REQD). NAIL TO THE CROSS CAR BRACE W/1-12d NAIL EVERY 6".
- ③ CROSS CAR BRACE, 4" X 4" BY CAR WIDTH (CUT TO FIT) (2 REQD).
- ④ CENTER CLEAT, 2" X 4" X 36" (2 REQD). NAIL TO THE CROSS CAR BRACE W/7-16d NAILS. SEE SPECIAL NOTE 3 AT LEFT.
- ⑤ HORIZONTAL WALL CLEAT, 2" X 6" BY CUT TO FIT (4 REQD). A CLEAT WILL BE OF A LENGTH AS NECESSARY TO EXTEND ACROSS AND FAR ENOUGH PAST THE DOOR OPENINGS TO CONTACT CROSS CAR BRACE IN THE OPPOSITE END OF THE CAR. NAIL TO THE CAR SIDEWALL W/40-12d NAILS.
- ⑥ POCKET CLEAT, 2" X 6" X 18" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE HORIZONTAL WALL CLEAT W/7-16d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
- ⑦ DIAGONAL BRACE, 4" X 4" X 51-1/2" (4 REQD). SEE THE DETAIL ABOVE FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE CROSS CAR BRACE AND TO THE HORIZONTAL WALL CLEAT W/1-60d NAIL AT EACH END.
- ⑧ BACK-UP CLEAT, 2" X 6" X 30" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/14-16d NAILS.
- ⑨ SPACER CLEAT, 2" X 4" X 29" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.
- ⑩ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.

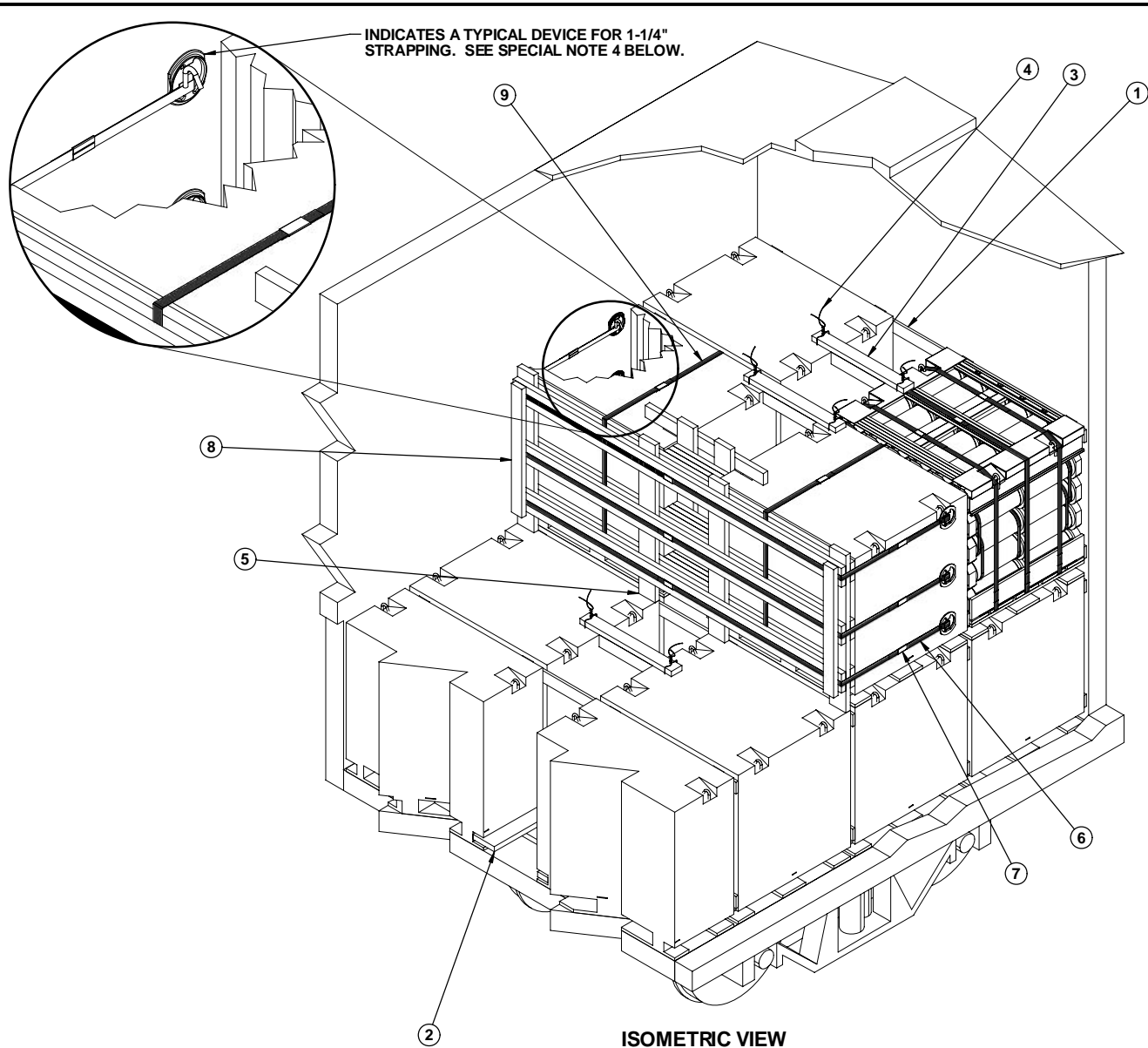


ISOMETRIC VIEW

SPECIAL NOTES:

1. A 9'-4" WIDE CONVENTIONAL TYPE BOXCAR IS SHOWN. CARS OF OTHER WIDTHS MAY BE USED.
2. THE LOAD SHOWN DEPICTING THE RISER METHOD OF PARTIAL-LAYER BRACING IS TYPICAL. THE QUANTITY MAY BE ADJUSTED TO SUIT.

- END
- WALL, BETWEEN THE TWO-HIGH STACKS OF PALLET UNITS AND BETWEEN THE RISERED ONE-HIGH AND TWO-HIGH PALLET UNITS, TWO ONE-HIGH GATES BETWEEN THE RISERED ONE-HIGH PALLET UNITS AND THE ONE-HIGH STACKS OF PALLET UNITS AND BETWEEN THE ONE-HIGH STACKS OF PALLET UNITS). SEE THE DETAIL ON PAGE 30.
- 2 ANTI-SWAY BRACE (7 SHOWN). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
 - 3 TOP-OF-LOAD ANTI-SWAY BRACE (4 SHOWN). SEE THE DETAIL ON PAGE 5.
 - 4 TIE WIRE, .0800" DIA 24" LONG (8 SHOWN, 2 PER TOP-OF-LOAD ANTI-SWAY BRACE). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIEDOWN STRAP ON THE PALLET UNIT. BRING ENDS TOGETHER AND TWIST TAUT.
 - 5 STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" X 21'-3" LONG STEEL STRAPPING (4 REQD). INSTALL THE STRAPS THROUGH THE OF THE LOWER PALLET UNIT AND OVER THE TOP OF THE UPPER PALLET UNIT TO ENCIRCLE BOTH PALLET UNITS.
 - 6 SEAL FOR 1-1/4" STEEL STRAPPING (8 REQD). DOUBLE CRIMP EACH SEAL.
 - 7 BUNDLING UNITIZING STRAP, 1-1/4" X .035" OR .031" X 20'-8" LONG STEEL STRAPPING (4 REQD). INSTALL THE STRAPS TO ENCIRCLE THE LONGITUDINALLY ADJACENT PALLET UNITS IN THE TOP LAYER.
 - 8 RISER ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 29.
 - 9 RISER RETAINER ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 29.



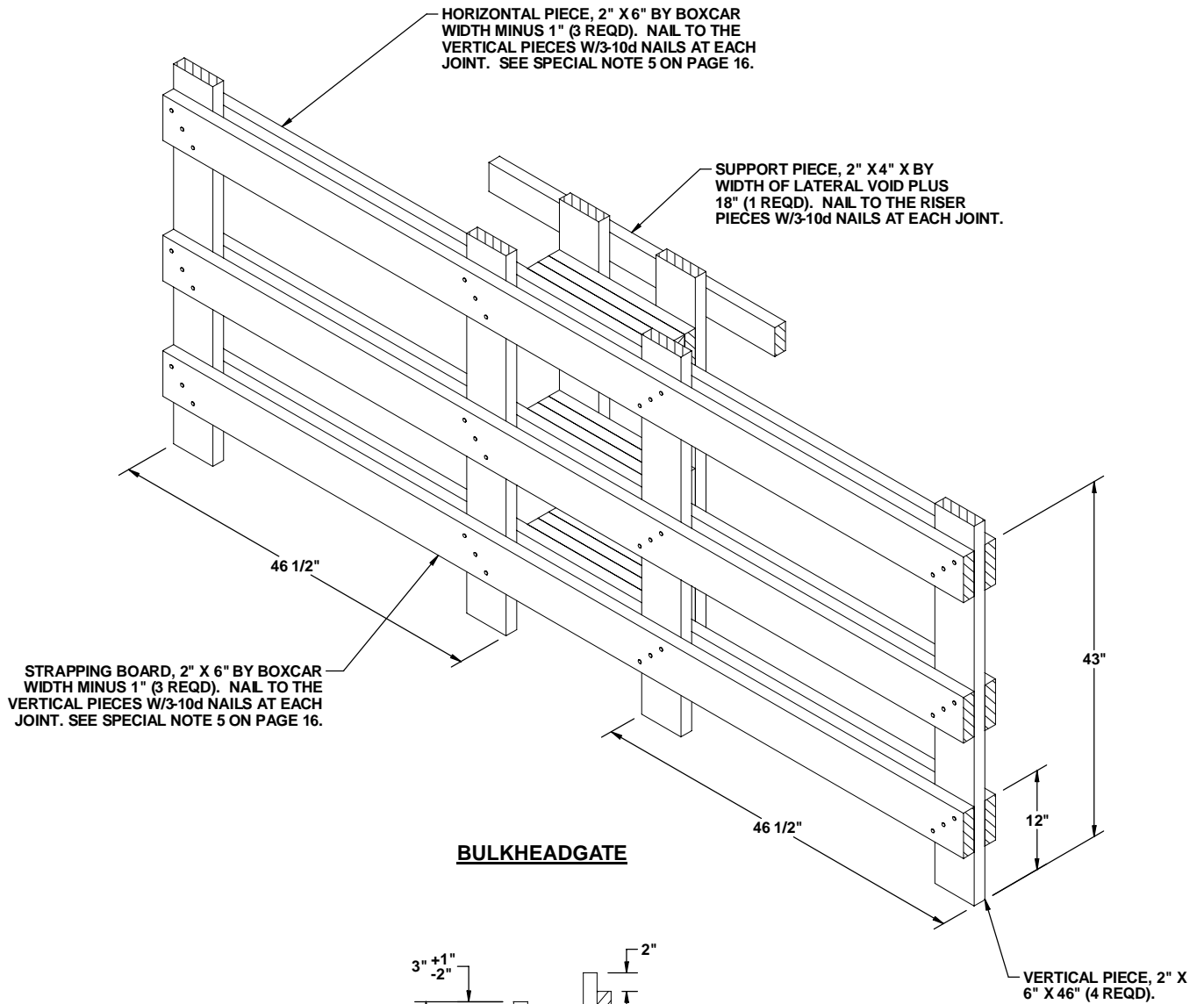
INDICATES A TYPICAL DEVICE FOR 1-1/4" STRAPPING. SEE SPECIAL NOTE 4 BELOW.

SPECIAL NOTES:

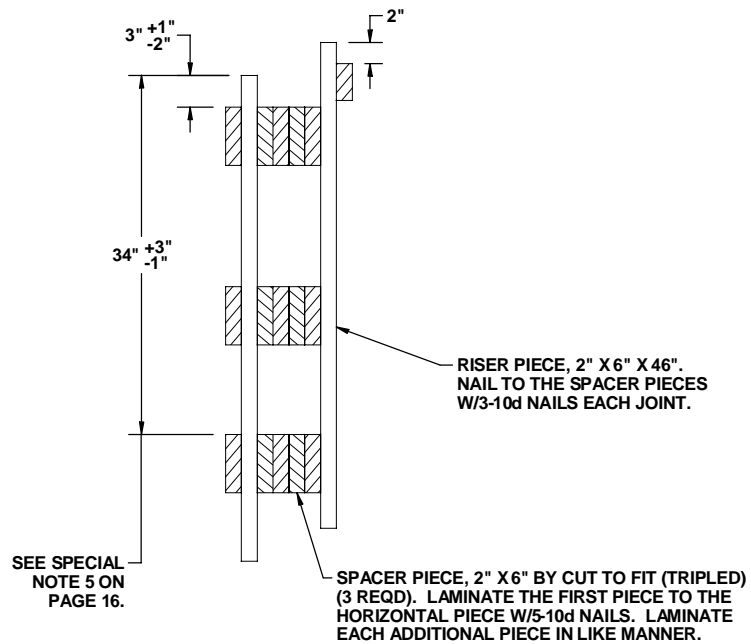
1. A 9'-4" WIDE ALL METAL BOXCAR WITH STRAP ANCHOR DEVICES AND HAVING AN AAR MECHANICAL DESIGNATION CLASS OF XL IS SHOWN. CARS OF OTHER WIDTHS MAY BE USED.
2. THE BULKHEAD GATE METHOD OF PARTIAL-LAYER BRACING IS ONLY APPLICABLE FOR USE IN LOADS OF PALLET UNITS WITH CONTAINERS POSITIONED LENGTHWISE AS SHOWN IN THE VIEW ABOVE. PALLET UNITS WITH CONTAINERS POSITIONED CROSSWISE WILL NOT BE RETAINED BY THE BULKHEAD GATE METHOD.
3. A BULKHEAD GATE USED IN CONJUNCTION WITH THREE BULKHEAD STRAPS WILL RETAIN UP TO 7,500 POUNDS OF LADING, FOUR PALLET UNITS; A BULKHEAD GATE WITH TWO STRAPS WILL RETAIN NOT MORE THAN 5,000 POUNDS OF LADING, TWO PALLET UNITS.
4. THE ANCHOR DEVICES TO BE USED FOR ATTACHMENT OF THE BULKHEAD STRAPS MUST BE LOCATED AT LEAST 36" TOWARD THE CAR END WALL FROM THE OPPOSITE-THE-LOAD SIDE OF THE BULKHEAD GATE.
5. THE STRAPPING BOARDS ON A BULKHEAD GATE ARE TO BE ALIGNED AS NEARLY AS POSSIBLE WITH THE ANCHOR DEVICES IN THE CAR TO WHICH THE BULKHEAD STRAPS ARE ATTACHED. TOLERANCES ARE SPECIFIED ON THE END VIEW OF THE BULKHEAD GATE DETAIL ON PAGE 17 FOR THE LOCATION OF THE HORIZONTAL PIECES IN RELATION TO THE LOCATION OF THE STRAPPING BOARDS. THE STRAPPING BOARDS/HORIZONTAL PIECES SHOULD BE LOCATED WITHIN THESE TOLERANCES. IF THIS IS NOT POSSIBLE, ADDITIONAL HORIZONTAL PIECES MUST BE APPLIED, AS NECESSARY TO PROVIDE PROPER BEARING AGAINST THE PALLET UNIT.

KEY NUMBERS

- ① SEPARATOR GATE A (TWO TWO-HIGH GATES REQD AND TWO ONE-HIGH GATES SHOWN). SEE THE DETAIL ON PAGE 30.
- ② ANTI-SWAY BRACE (6 SHOWN). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
- ③ TOP-OF-LOAD ANTI-SWAY BRACE (3 SHOWN). SEE THE DETAIL ON PAGE 5.
- ④ TIE WIRE, .0800" DIA 24" LONG (6 SHOWN). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑤ BULKHEAD GATE (1 REQD). SEE THE DETAIL ON PAGE 17. SEE SPECIAL NOTE 3 AT LEFT.
- ⑥ BULKHEAD STRAP, 1-1/4" X .031" OR .035" BY LENGTH TO SUIT STEEL STRAPPING (3 REQD). INSTALL FROM TWO EQUAL LENGTH PIECES. ATTACH TO AN ANCHOR WITH ONE SEAL. SEE SPECIAL NOTES 3 AND 4 AT LEFT.
- ⑦ SEAL FOR 1-1/4" STEEL STRAPPING (11 REQD). DOUBLE CRIMP EACH SEAL.
- ⑧ STRAP RETAINER, 2" X 4" X 43" (2 REQD). NAIL TO THE BULKHEAD GATE W/2-12d NAILS ABOVE AND BELOW EACH BULKHEAD STRAP.
- ⑨ BUNDLING STRAP, 1-1/4" X .031" OR .035" X 14'-6" (2 REQD). ENCIRCLE THE PALLET UNIT AND THE HORIZONTAL PIECES OF THE BULKHEAD GATE. TENSION AND SEAL AFTER TENSIONING THE BULKHEAD STRAPS.

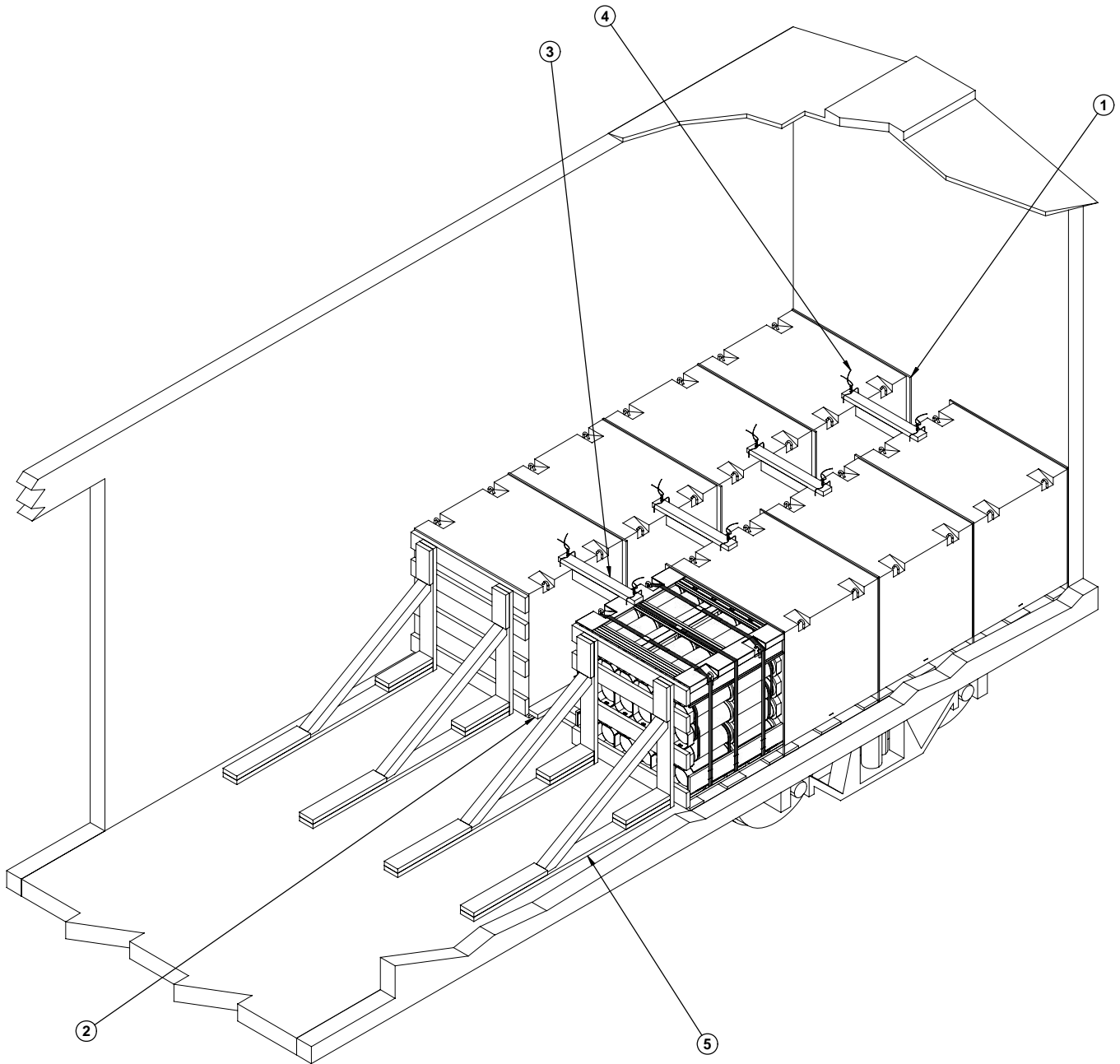


BULKHEADGATE



END VIEW

TYPICAL LCL USING BULKHEAD GATE

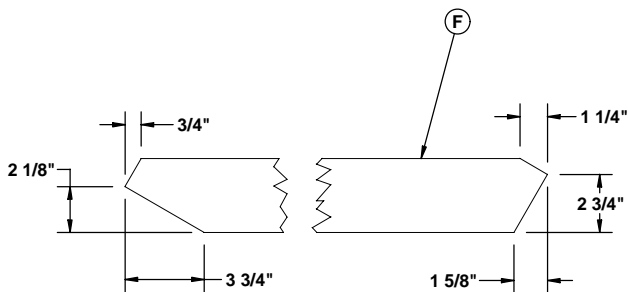
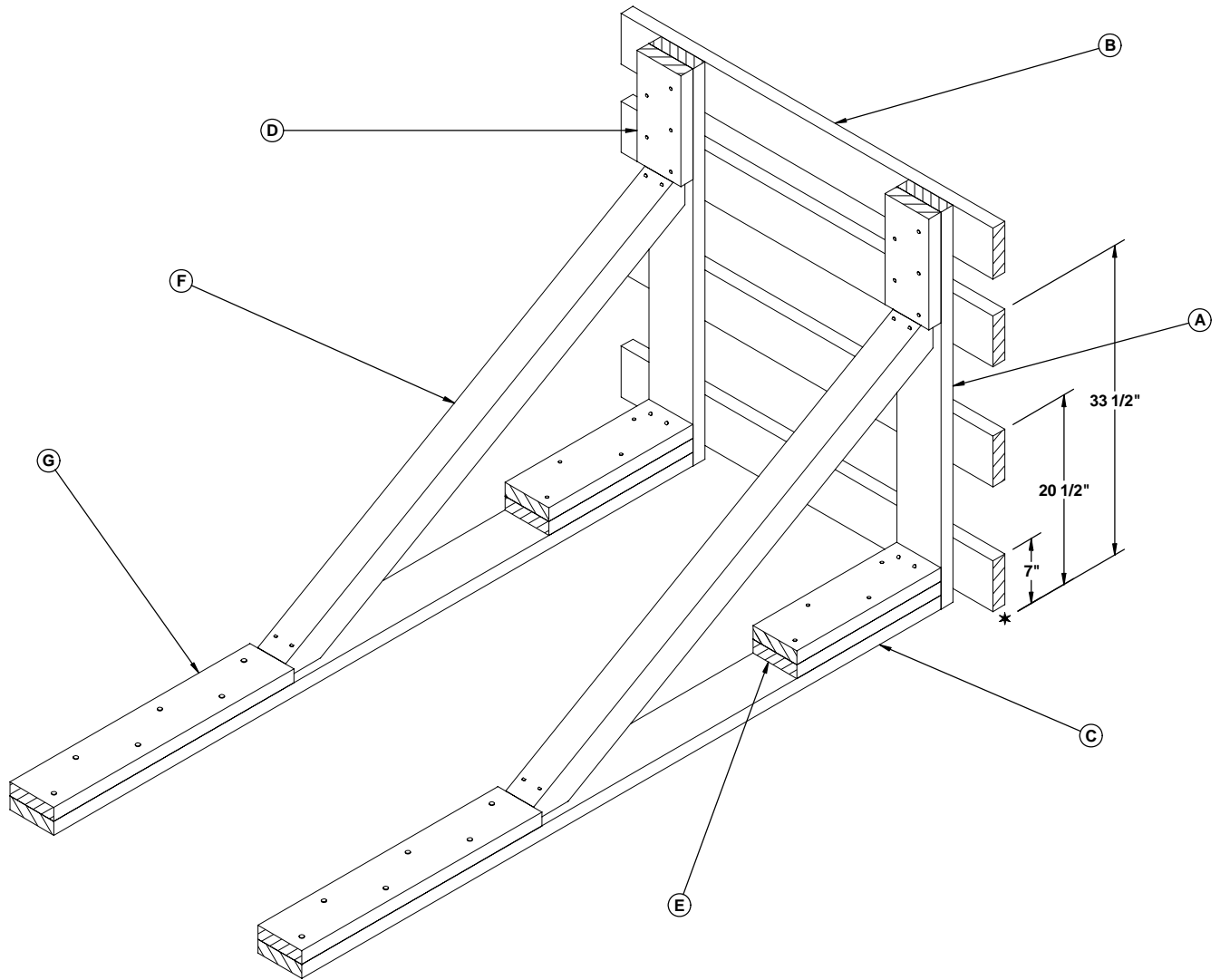


SPECIAL NOTES:

1. A 9'-4" WIDE CONVENTIONAL TYPE BOXCAR HAVING A WOOD OR NAILABLE METAL FLOOR IS SHOWN. CARS OF OTHER MAY BE USED.
2. THE LOAD SHOWN DEPICTING THE KNEE BRACE METHOD OF PARTIAL-LAYER BRACING IS TYPICAL. THE QUANTITY MAY BE ADJUSTED TO SUIT, PROVIDED THE LIMITATIONS OF THE KNEE BRACE AS SET FORTH IN SPECIAL NOTE 3 ARE NOT EXCEEDED.
3. A KNEE BRACE ASSEMBLY WILL BE USED FOR EACH ROW OF CONTAINERS. ONE KNEE BRACE ASSEMBLY IS ADEQUATE FOR RETAINING A MAXIMUM LCL LOAD OF NOT MORE THAN 8,500 POUNDS OR FOUR PALLET UNITS.
4. WHEN USING CRIB FILL OR SIDE FILL ASSEMBLIES WITH KNEE BRACE ASSEMBLIES, PROVISIONS MUST BE MADE TO PREVENT LONGITUDINAL MOVEMENT OF THE CRIB FILL OR SIDE FILL ASSEMBLIES.

KEY NUMBERS

- ① SEPARATOR GATE B (8 REQD). SEE DETAIL ON PAGE 30.
- ② ANTI-SWAY BRACE (4 REQD). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
- ③ TOP-OF-LOAD ANTI-SWAY BRACE (4 REQD). SEE THE DETAIL ON PAGE 5.
- ④ TIE WIRE, .0800" DIA 60" LONG (8 REQD). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND A TIEDOWN STRAP. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑤ KNEE BRACE ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 19.

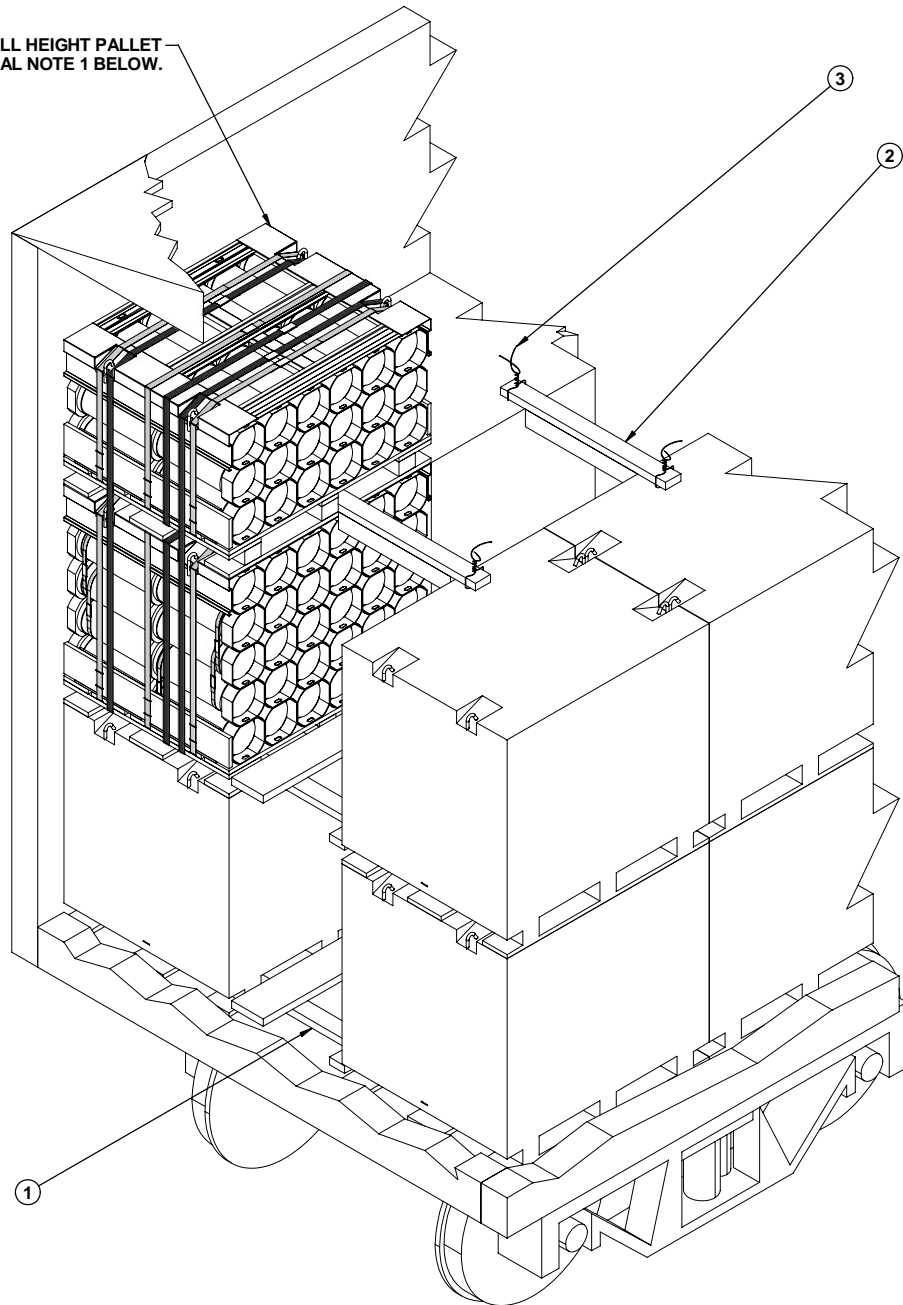


BRACE

KEY LETTERS

- (A) VERTICAL PIECE, 2" X 6" X 43" (2 REQD). NAIL TO A FLOOR CLEAT W/3-16d NAILS.
- (B) HORIZONTAL PIECE, 2" X 6" X 46-1/2" (3 REQD). NAIL TO THE VERTICAL PIECES W/3-10d NAILS AT EACH JOINT.
- (C) FLOOR CLEAT, 2" X 6" X 6'-8" (2 REQD). NAIL TO THE CAR FLOOR W/1-16d NAIL EVERY 8".
- (D) HOLD-DOWN CLEAT, 2" X 6" X 12" (2 REQD). NAIL TO A VERTICAL PIECE W/5-10d NAILS.
- (E) POCKET CLEAT, 2" X 6" X 18" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE FLOOR CLEAT W/5-16d NAILS. NAIL THE SECOND PIECE IN A LIKE MANNER AND TOENAIL THE SECOND PIECE TO THE FIRST TO THE VERTICAL PIECE W/2-16d NAILS.
- (F) BRACE, 4" X 4" X 58" (2 REQD). SEE THE DETAIL AT LEFT FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE VERTICAL PIECE AND TO THE FLOOR CLEAT W/2-16d NAIL.
- (G) BACK-UP CLEAT, 2" X 6" X 30" (2 REQD). NAIL TO THE FLOOR CLEAT W/6-40d NAILS.

INDICATES LESS-THAN-FULL HEIGHT PALLET UNIT. SEE SPECIAL NOTE 1 BELOW.



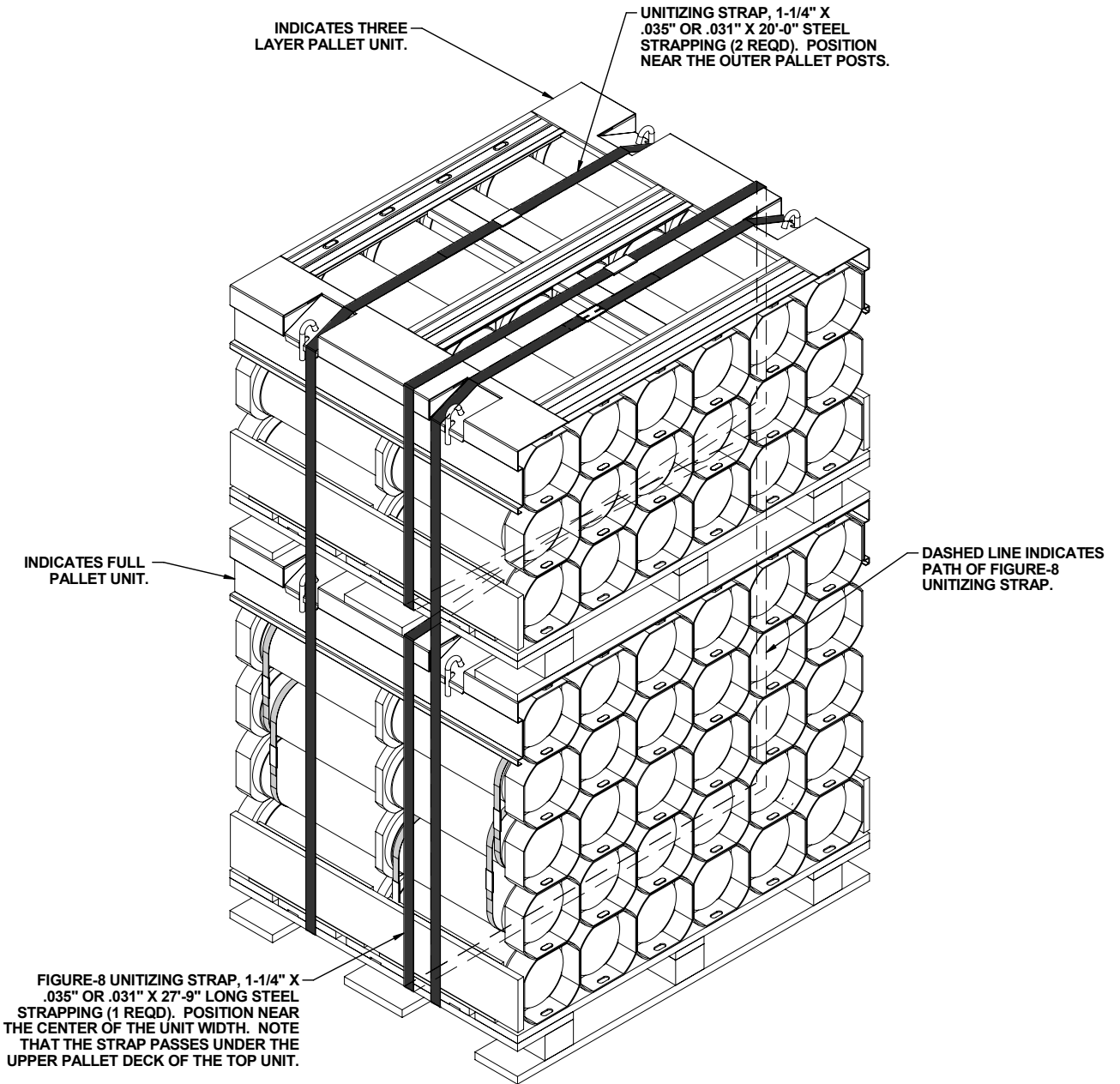
ISOMETRIC VIEW

SPECIAL NOTES:

1. FOR SECUREMENT OF PARTIAL PALLET UNIT ON TOP OF A FULL-HEIGHT PALLET UNIT, SEE PAGE 21.
2. SHIPMENTS OF MODULAR ARTILLERY CHARGE SYSTEMS SHOULD CONSIST OF FULL-HEIGHT AND FULL-LAYER PALLET UNITS TO THE MAXIMUM EXTENT POSSIBLE. HOWEVER, THE END OF A LOT OR THE QUANTITY OF ITEMS NEEDED TO FILL A REQUISITION, MAY NECESSITATE THE SHIPMENT OF ONE OR MORE LESS THAN FULL PALLET WITHIN A UNITS PER LOAD. THE PROCEDURES ON THIS PAGE AND ON PAGE 21 ARE PRESENTED AS GUIDANCE IN THE SHIPMENT OF PARTIAL UNITS.
3. THE PARTIAL PALLET UNIT IS SHOWN IN THE END OF THE CAR ONLY AS A TYPICAL LOCATION. THE PARTIAL PALLET UNIT MAY BE POSITIONED ANYWHERE IN THE LENGTH OF THE LOAD EXCEPT WITHIN THE DOORWAY AREA.
4. THE PROCEDURES SHOWN ON THIS PAGE ARE ONLY APPLICABLE TO PARTIAL PALLET UNITS CONSISTING OF TWO, THREE OR FOUR LAYERS OF CONTAINERS.
5. THE SHIPMENT OF A PARTIAL PALLET UNIT AS SHOWN ABOVE IS APPLICABLE FOR LOADS IN CONVENTIONAL BOXCARS AND BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS.

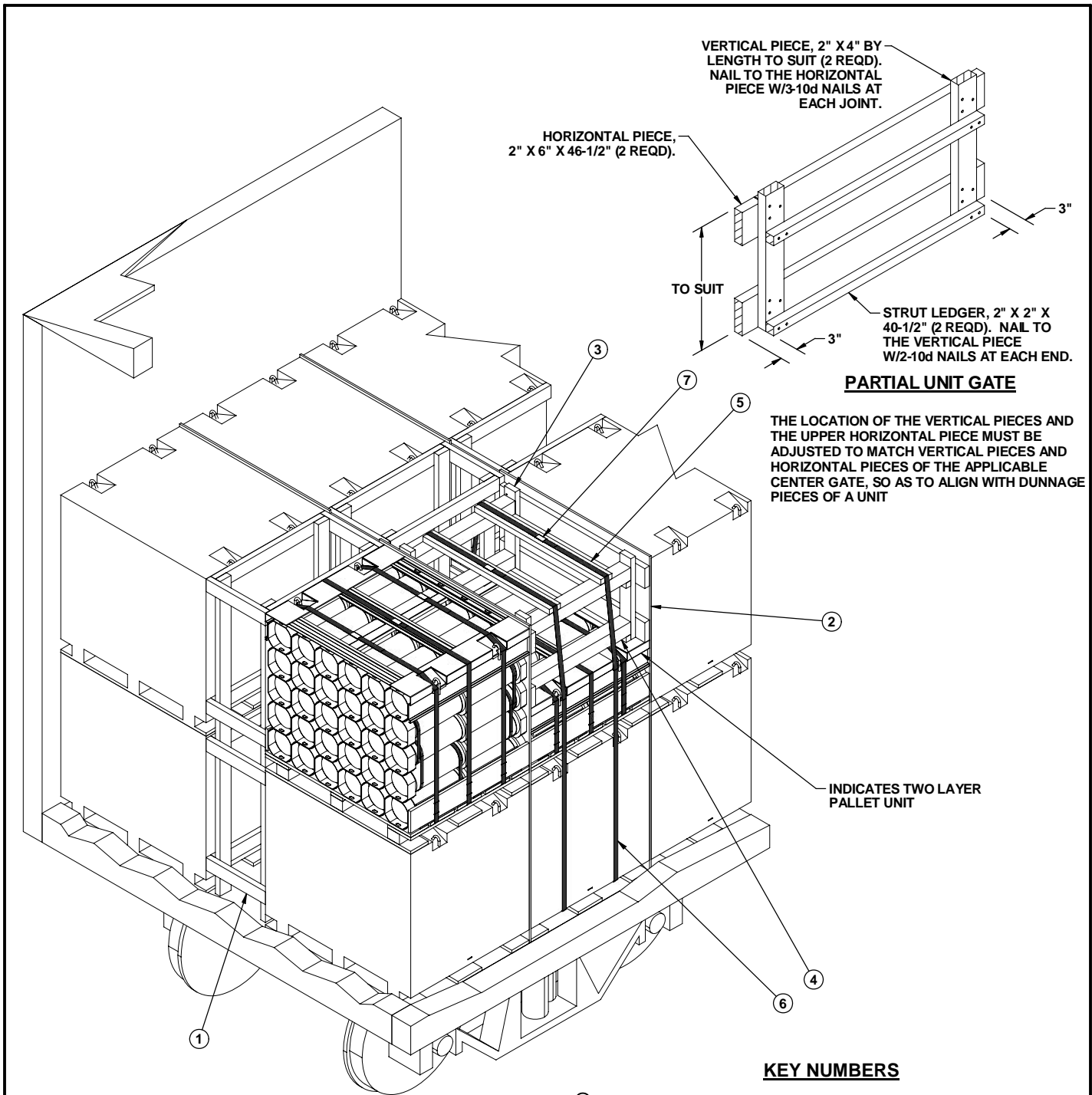
KEY NUMBERS

- ① ANTI-SWAY BRACE (4 SHOWN). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN LATERALLY ADJACENT ROWS OF PALLET UNITS.
- ② TOP-OF-LOAD ANTI-SWAY BRACE (2 SHOWN). SEE THE DETAIL ON PAGE 5.
- ③ TIE WIRE, .0800" DIA 24" LONG (4 SHOWN). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET UNITS. BRING ENDS TOGETHER AND TWIST TAUT.



SECUREMENT OF A PARTIAL PALLET UNIT ON TOP OF A FULL PALLET UNIT

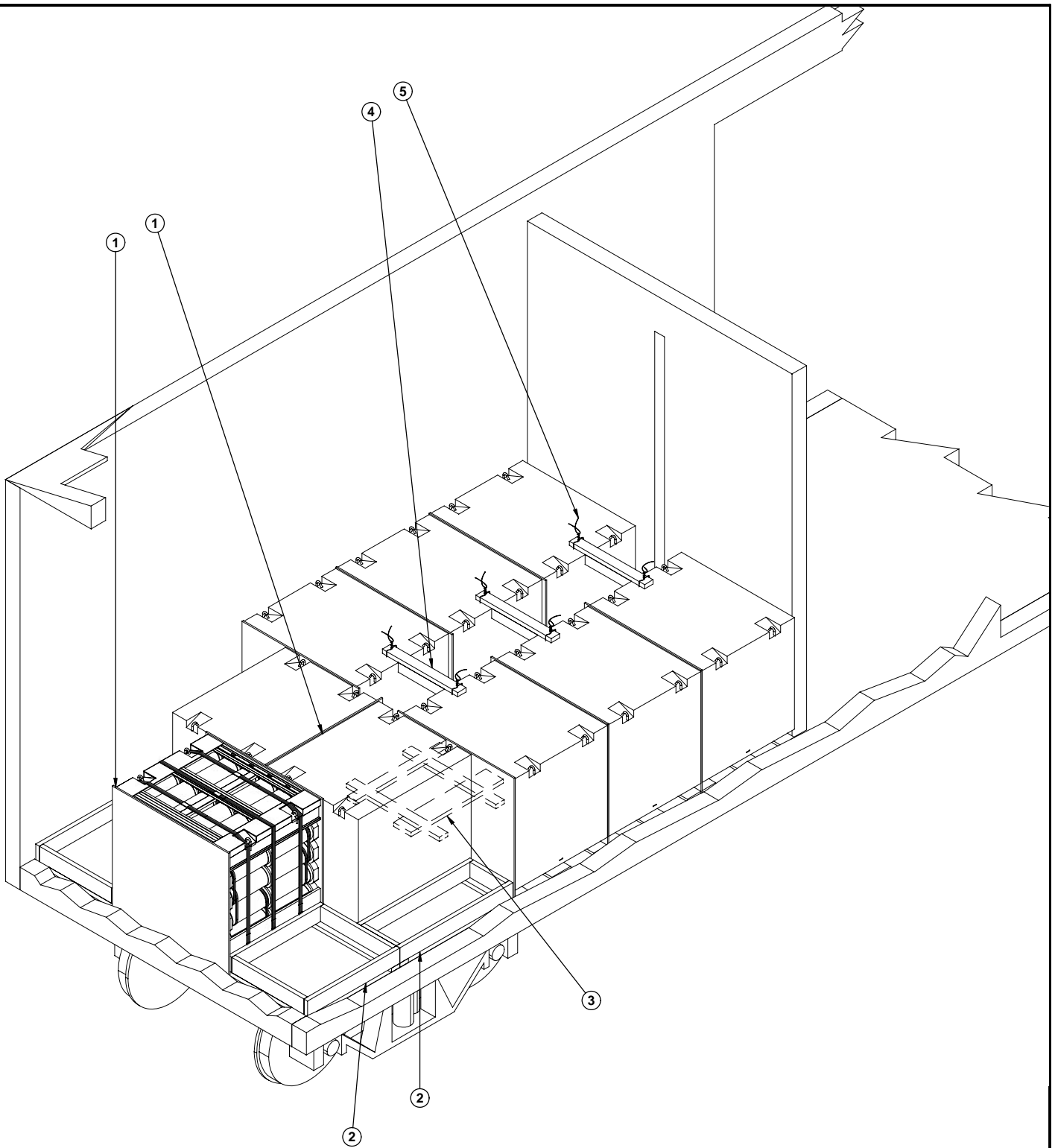
PALLET UNIT TIEDOWN STRAPS OMITTED FOR CLARITY PURPOSES. THIS PROCEDURE IS APPLICABLE ONLY FOR USE IN A CROSSWISE LOAD. CAUTION: THE PARTIAL PALLET UNIT ON TOP IS LIMITED TO TWO, THREE OR FOUR LAYERS OF CONTAINERS.



SPECIAL NOTES:

1. SHIPMENTS OF MODULAR ARTILLERY CHARGE SYSTEMS SHOULD CONSIST OF FULL-HEIGHT AND FULL-LAYER PALLET UNITS TO THE MAXIMUM EXTENT POSSIBLE. HOWEVER, THE END OF A LOT OR THE QUANTITY OF ITEMS NEEDED TO FILL A REQUISITION, MAY NECESSITATE THE SHIPMENT OF ONE OR MORE LESS THAN FULL PALLET WITHIN A UNITS PER LOAD. THE PROCEDURES ON THIS PAGE IS PRESENTED AS GUIDANCE IN THE SHIPMENT OF PARTIAL UNITS.
2. THE PARTIAL PALLET UNIT IS SHOWN AS A TYPICAL LOCATION. THE PARTIAL PALLET UNIT MAY BE POSITIONED ANYWHERE IN THE LENGTH OF THE LOAD EXCEPT WITHIN THE DOORWAY AREA.
3. THE PROCEDURES SHOWN ON THIS PAGE ARE ONLY APPLICABLE TO PARTIAL PALLET UNITS CONSISTING OF TWO, THREE OR FOUR LAYERS OF CONTAINERS.
4. THE SHIPMENT OF A PARTIAL PALLET UNIT AS SHOWN ABOVE IS APPLICABLE FOR LOADS IN CONVENTIONAL BOXCARS AND BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS.

- ① CRIB FILL ASSEMBLY (3 SHOWN). SEE THE DETAIL ON PAGE 25.
- ② SEPARATOR GATE B (3 SHOWN). SEE THE DETAIL ON PAGE 30. INSTALL WITH THE HOLD-DOWN PIECES TOWARD THE PALLET UNITS.
- ③ PARTIAL UNIT GATE (2 REQD). SEE DETAIL ABOVE.
- ④ STRUT 4" X 4" BY CUT-TO-FIT (REF: 32") (4 REQD). TOENAIL TO THE VERTICAL PIECES OF THE PARTIAL UNIT GATE W/2-16d NAILS.
- ⑤ STRAPPING BOARD, 2" X 4" X 40-1/2" (2 REQD). NAIL TO THE STRUTS W/2-10d NAILS AT EACH END.
- ⑥ UNITIZING STRAP, 1-1/4" X .035" OR .031" LENGTH-TO-SUIT STEEL STRAPPING (2 REQD). PRE-POSITION THE STRAPS UNDER THE DECK OF THE BOTTOM PALLET UNIT.
- ⑦ SEAL FOR 1-1/4" STEEL STRAPPING (2 REQD). DOUBLE CRIMP EACH SEAL.



ISOMETRIC VIEW

KEY NUMBERS

SPECIAL NOTES:

1. THESE PROCEDURES SPECIFY REQUIREMENTS FOR OMITTING A PALLET UNIT FROM A 1-LAYER LOAD. THESE PROCEDURES MAY NOT BE APPLIED TO A 2-LAYER LOAD AS SEEN ON PAGES 6 - 11.
2. EXERCISE CARE WHEN POSITIONING THE PALLET UNIT AGAINST THE END WALL OF THE BOXCAR TO ASSURE THAT IT IS CENTERED Laterally IN THE CAR.

- ① SEPARATOR GATE B (9 SHOWN). SEE THE DETAIL ON PAGE 30. INSTALL AS SHOWN. INSTALL WITH HOLD-DOWN PIECES TOWARD PALLET UNITS.
- ② SIDE BLOCKING ASSEMBLY, (4 REQD, 2 FOR THE LENGTHWISE PALLET UNIT AND 2 FOR THE Laterally ADJACENT PALLET UNITS). SEE DETAIL ON PAGE 28.
- ③ ANTI-SWAY BRACE (3 SHOWN). SEE THE DETAIL ON PAGE 5. INSTALL BETWEEN Laterally ADJACENT ROWS OF PALLET UNITS.
- ④ TOP-OF-LOAD ANTI-SWAY BRACE (3 SHOWN). SEE THE DETAIL ON PAGE 5.
- ⑤ TIE WIRE, .0800" DIA 24" LONG (6 REQD). INSTALL THE WIRE TO FORM A COMPLETE LOOP AROUND THE TOP-OF-LOAD ANTI-SWAY BRACE AND TIE-DOWN STRAP ON THE PALLET. BRING ENDS TOGETHER AND TWIST TAUT.

OMITTED PALLET UNIT PROCEDURES

END HORIZONTAL PIECE, 2" X 6" X 46-1/2" (2 REQD). NAIL TO LCL BRACES W/3-6d NAILS AT EACH JOINT PRIOR TO PLACING AGAINST PALLET UNIT.

SIDE HORIZONTAL PIECE, 2" X 6" X 38" (2 REQD). NAIL TO LCL BRACES W/3-6d NAILS AT EACH JOINT PRIOR TO PLACING AGAINST PALLET UNIT.

LCL BRACE (4 REQD). SEE THE DETAIL BELOW. LOCATE AS SHOWN. NAIL TO THE FLOOR W/7-16d NAILS.

ISOMETRIC VIEW

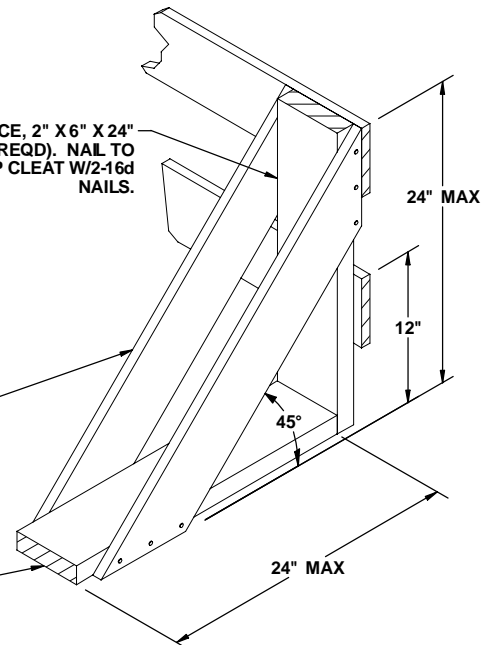
SPECIAL NOTES:

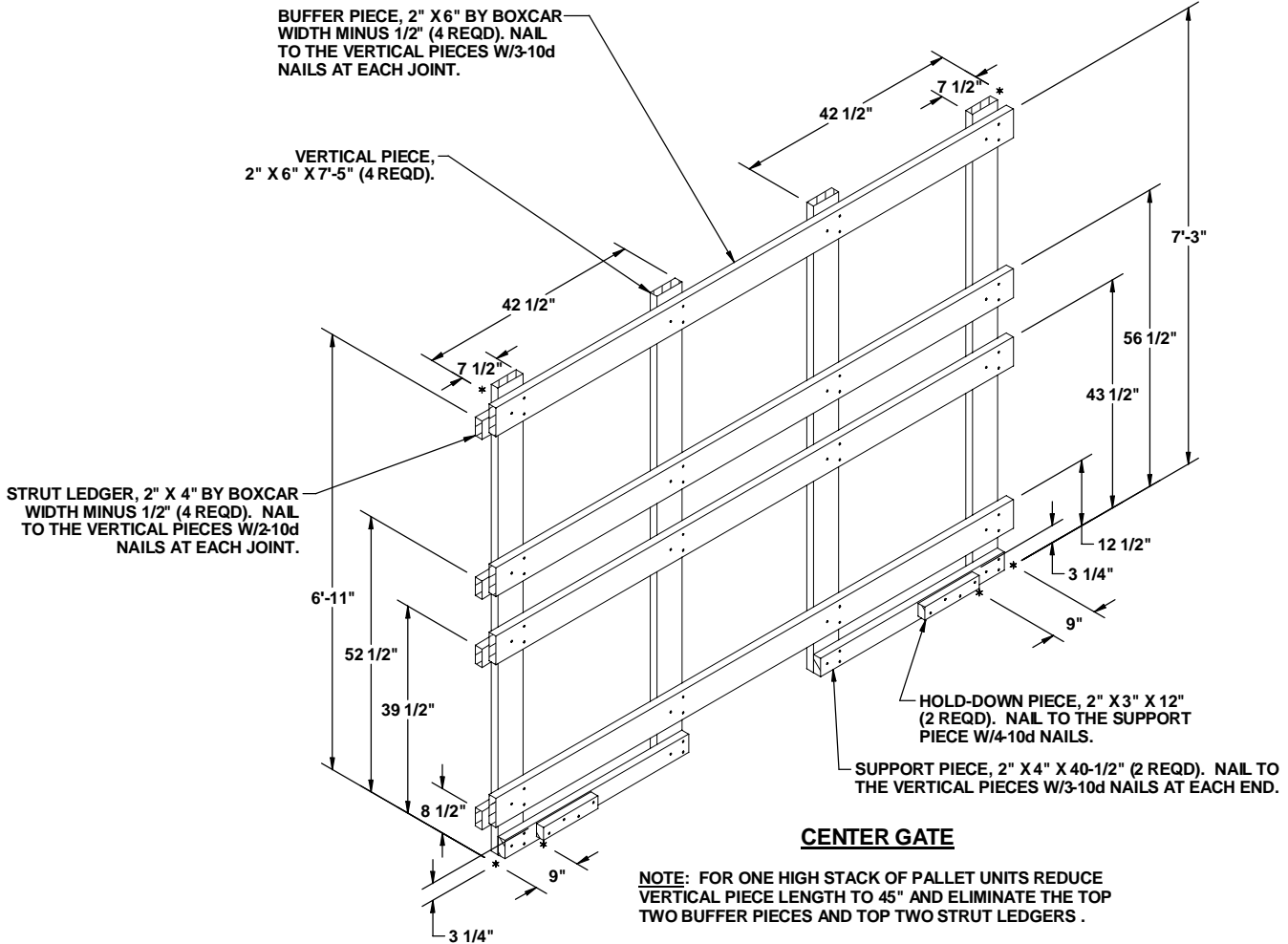
1. A 9'-4" WIDE CONVENTIONAL TYPE BOXCAR HAVING A WOOD OR NAILABLE METAL FLOOR IS SHOWN. CARS OF OTHER WIDTHS CAN BE USED.
2. THE LOAD SHOWN DEPICTING THE LCL BRACE METHOD OF PARTIAL-LAYER BRACING IS TYPICAL. THE PROCEDURES ARE ALSO APPLICABLE FOR OTHER QUANTITIES AS LONG AS THE CAPACITY OF THE BRACES IS NOT EXCEEDED. SEE SPECIAL NOTE 3.
3. EACH LCL BRACE AS APPLIED FOR LONGITUDINAL BRACING WILL RETAIN 2,000 POUNDS OF LADING. EACH LCL BRACE AS APPLIED FOR LATERAL BRACING WILL SUPPORT 8,000 POUNDS OF LADING. A MINIMUM OF TWO BRACES MUST BE USED FOR LONGITUDINAL BRACING. BRACES MAY BE ADDED FOR LONGITUDINAL BRACING AS NECESSARY.

VERTICAL PIECE, 2" X 6" X 24" (MAXIMUM) (1 REQD). NAIL TO THE BACK-UP CLEAT W/2-16d NAILS.

ANGLE BRACE, 1" X 6" BY CUT-TO-FIT (2 REQD). NAIL TO THE VERTICAL PIECE AND THE BACK-UP CLEAT W/3-8d NAILS AT EACH END.

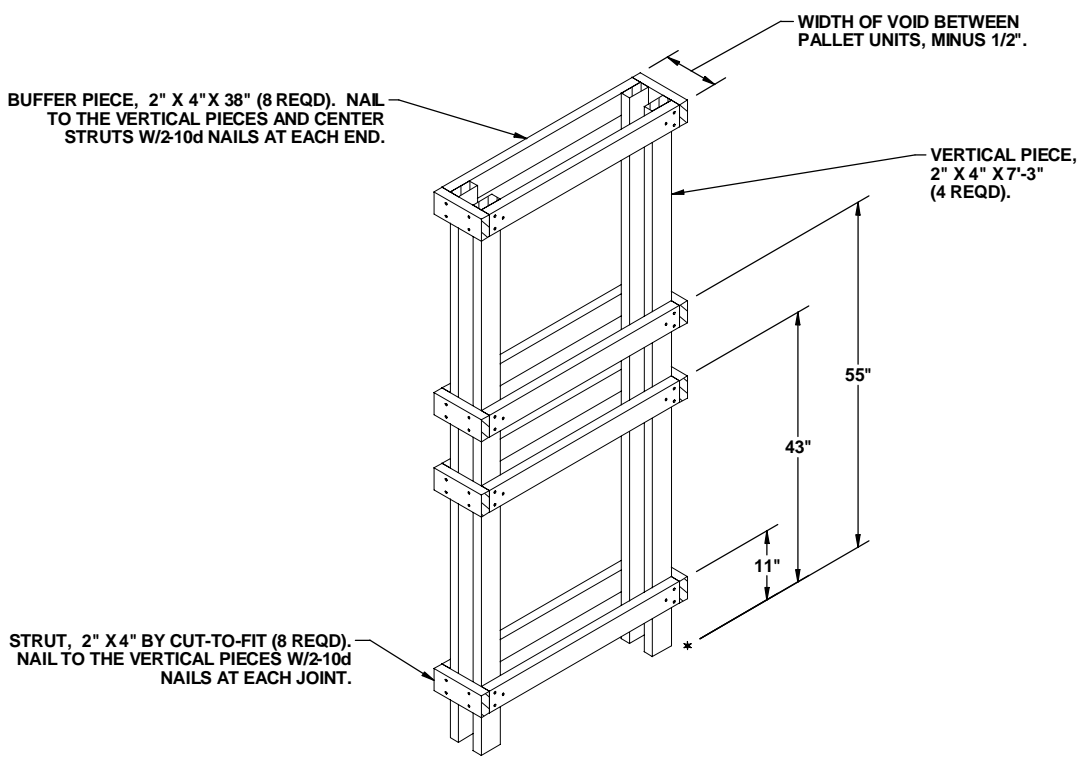
BACK-UP CLEAT, 2" X 6" MATERIAL (1 REQD).





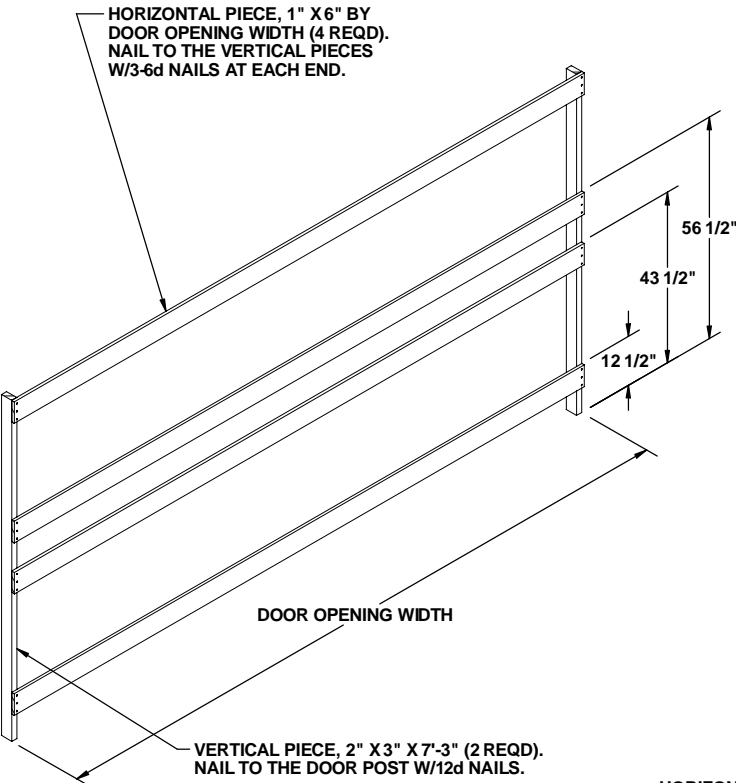
CENTER GATE

NOTE: FOR ONE HIGH STACK OF PALLET UNITS REDUCE VERTICAL PIECE LENGTH TO 45" AND ELIMINATE THE TOP TWO BUFFER PIECES AND TOP TWO STRUT LEDGERS .



CRIB FILL ASSEMBLY

NOTE: MAY BE USED AS SIDE FILL ASSEMBLY. FOR ONE HIGH STACKS OF PALLET UNITS REDUCE THE VERTICAL PIECES TO 43" AND REMOVE THE TOP TWO LAYERS OF BUFFER PIECES AND STRUTS.



HORIZONTAL PIECE, 1" X 6" BY DOOR OPENING WIDTH (4 REQD). NAIL TO THE VERTICAL PIECES W/3-6d NAILS AT EACH END.

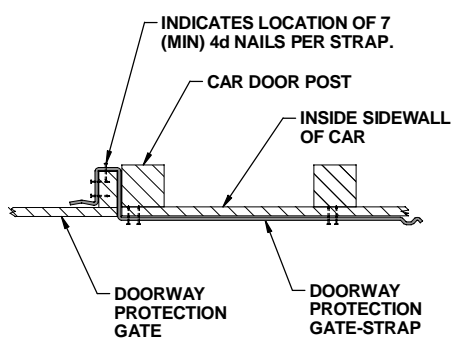
DOOR OPENING WIDTH

VERTICAL PIECE, 2" X 3" X 7'-3" (2 REQD). NAIL TO THE DOOR POST W/12d NAILS.

DOORWAY PROTECTION A

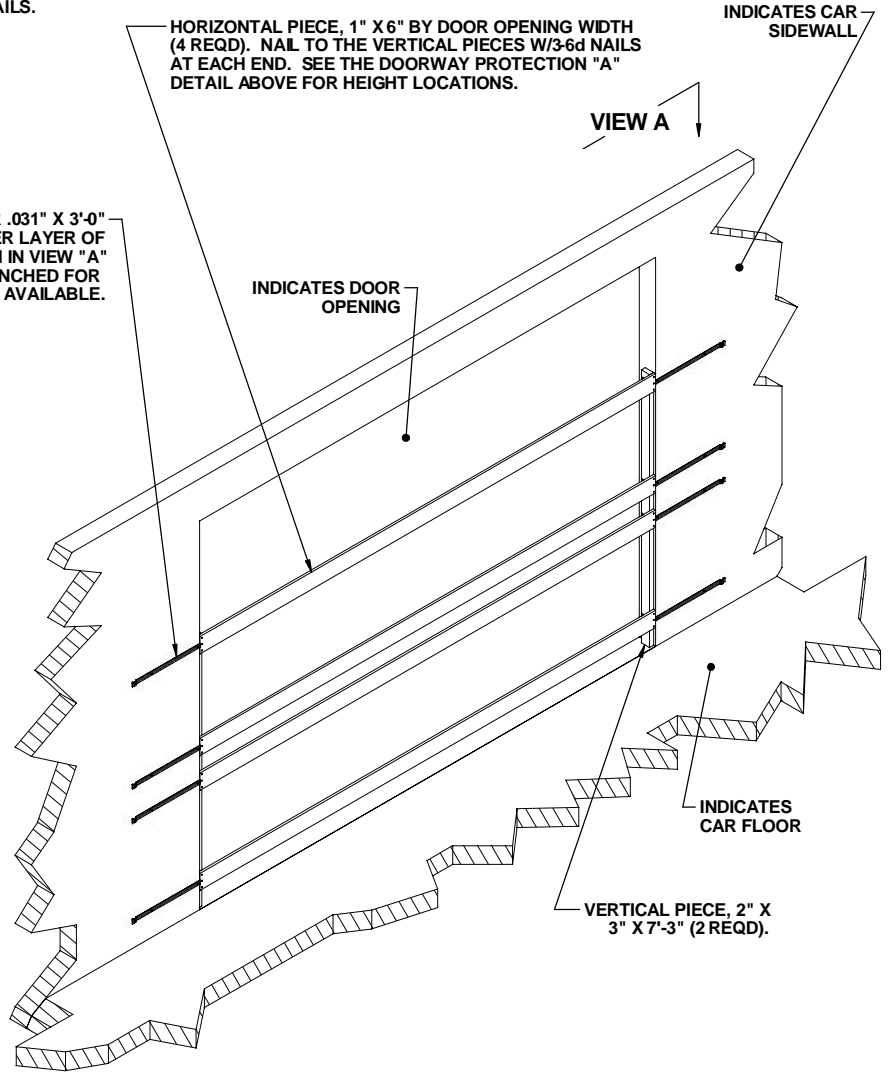
SEE SPECIAL NOTES 1 AND 6 AT RIGHT.

DOORWAY PROTECTION-GATE STRAP, 1-1/4" X .035" OR .031" X 3'-0" (REF) NAIL-ON TYPE STEEL STRAPPING (2 REQD PER LAYER OF LOAD). NAIL TO GATE AND CAR SIDEWALL AS SHOWN IN VIEW "A" BELOW. NOTE: TYPE 1 STRAPPING MAY BE PUNCHED FOR NAILING IF TYPE 2 STRAPPING IS NOT AVAILABLE.



VIEW A

THIS DEPICTS THE LOCATION OF THE NAILS FOR SECURING THE DOORWAY PROTECTION GATE STRAP. NOTE THAT THE STRAPS MUST BE APPLIED TO THE CAR SIDE WALL PRIOR TO POSITIONING THE ADJACENT CONTAINERS.



HORIZONTAL PIECE, 1" X 6" BY DOOR OPENING WIDTH (4 REQD). NAIL TO THE VERTICAL PIECES W/3-6d NAILS AT EACH END. SEE THE DOORWAY PROTECTION "A" DETAIL ABOVE FOR HEIGHT LOCATIONS.

VIEW A

INDICATES CAR SIDEWALL

INDICATES DOOR OPENING

INDICATES CAR FLOOR

VERTICAL PIECE, 2" X 3" X 7'-3" (2 REQD).

SPECIAL NOTES:

1. DOORWAY PROTECTION "A" IS FOR USE IN CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NAILABLE DOOR POSTS.
2. DOORWAY PROTECTION "B" IS FOR USE IN CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS WHEN THE DOOR POSTS ARE STEEL WITHOUT NAILING HOLES AND THE CAR SIDEWALLS ARE NAILABLE.
3. DOORWAY PROTECTION "C" IS FOR USE IN CARS EQUIPPED WITH EITHER PLUG TYPE DOORS OR CONVENTIONAL SLIDING DOORS, BUT ONLY IF THE CAR IS EQUIPPED WITH NAILABLE SIDEWALLS. IF THE CAR IS EQUIPPED WITH SPECIAL ANCHOR RODS IN THE CAR DOOR POSTS, THE DOORWAY PROTECTION STRAPS MAY BE SECURED TO THESE RODS IN LIEU OF ATTACHING TO THE CAR SIDEWALL WITH STRAP ANCHOR PLATES.
4. DOORWAY PROTECTION "D" IS FOR USE IN CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS, WHEN THE DOOR POSTS ARE NOT NAILABLE. IF THE CAR HAS NAILABLE SIDEWALLS, NAIL-ON TYPE STRAPPING MAY BE USED TO SECURE THE GATE IN LIEU OF USING THE SPREADER PIECES. SEE THE DOORWAY PROTECTION "B" DETAIL FOR GUIDANCE.
5. NAILED FLOORLINE BLOCKING AND BUNDLING STRAPS ARE REQUIRED FOR DOORWAY PROTECTION IF NONE OF THE ABOVE METHODS CAN BE USED. SEE THE LOAD ON PAGE 10 FOR GUIDANCE.
6. THE VIEWS ON PAGES 26 AND 27 DEPICT DOORWAY PROTECTION FOR A TWO-LAYER LOAD. FOR A ONE-LAYER LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND/OR STRAPS AND REDUCE THE HEIGHT OF THE VERTICAL PIECES TO 43". FOR DOORWAY PROTECTION "D", MOVE THE SPANNER BY AN APPROPRIATE DISTANCE.

SEAL FOR 1-1/4" STEEL STRAP (4 REQD). NOTCH EACH SEAL WITH TWO NOTCHES. SEE THE "END-OVER-END LAP JOINT DETAILS" ON PAGE 4.

INDICATES CAR SIDEWALL

SEE THE "ANCHOR PLATE DETAIL" BELOW.

INDICATES DOOR OPENING

INDICATES STRAP ANCHOR PLATE

VIEW C

INDICATES CAR FLOOR

DOORWAY PROTECTION STRAP, 1-1/4" X .035" OR .031" STEEL STRAPPING BY DOOR OPENING WIDTH PLUS 6'-0" IN LENGTH (2 REQD PER LAYER OF LOAD). INSTALL FROM TWO PIECES. THREAD ONE END THRU STRAP ANCHOR PLATE AS SHOWN BY THE "ANCHOR PLATE DETAIL" BELOW. NAIL STRAP ANCHOR PLATE TO CAR SIDEWALL W/4 SIGNODE MICROLOCK NAILS.

ONC

PAGE 26.

MATERIAL CUT INTO POSITIVE WEDGE FIT. CUT EACH END.

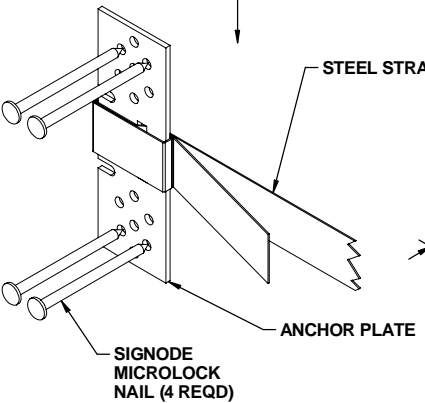
FILLER BLOCK, 1" X 4" X 9" (2 REQD). NAIL TO THE VERTICAL PIECE W/4-6d NAILS.

DOOR SPANNER, 2" X 6" BY DOOR OPENING WIDTH PLUS 24" (1 REQD). POSITION ABOVE THE LOAD AND NAIL THRU A FILLER BLOCK INTO A VERTICAL PIECE W/3-12d NAILS AT EACH JOINT. NAIL TO THE CAR SIDEWALL W/2-12d NAILS AT EACH END (OPTIONAL).

VERTICAL PIECE, 2" X 3" BY DOOR OPENING HEIGHT MINUS 1" (2 REQD).

VIEW B

STEEL STRAP



ANCHOR PLATE DETAIL

THIS VIEW "B" BELOW DEPICTS THE PROPER THREADING OF A DOORWAY PROTECTION STRAP THRU AN ANCHOR PLATE.

STEEL STRAP



VIEW B

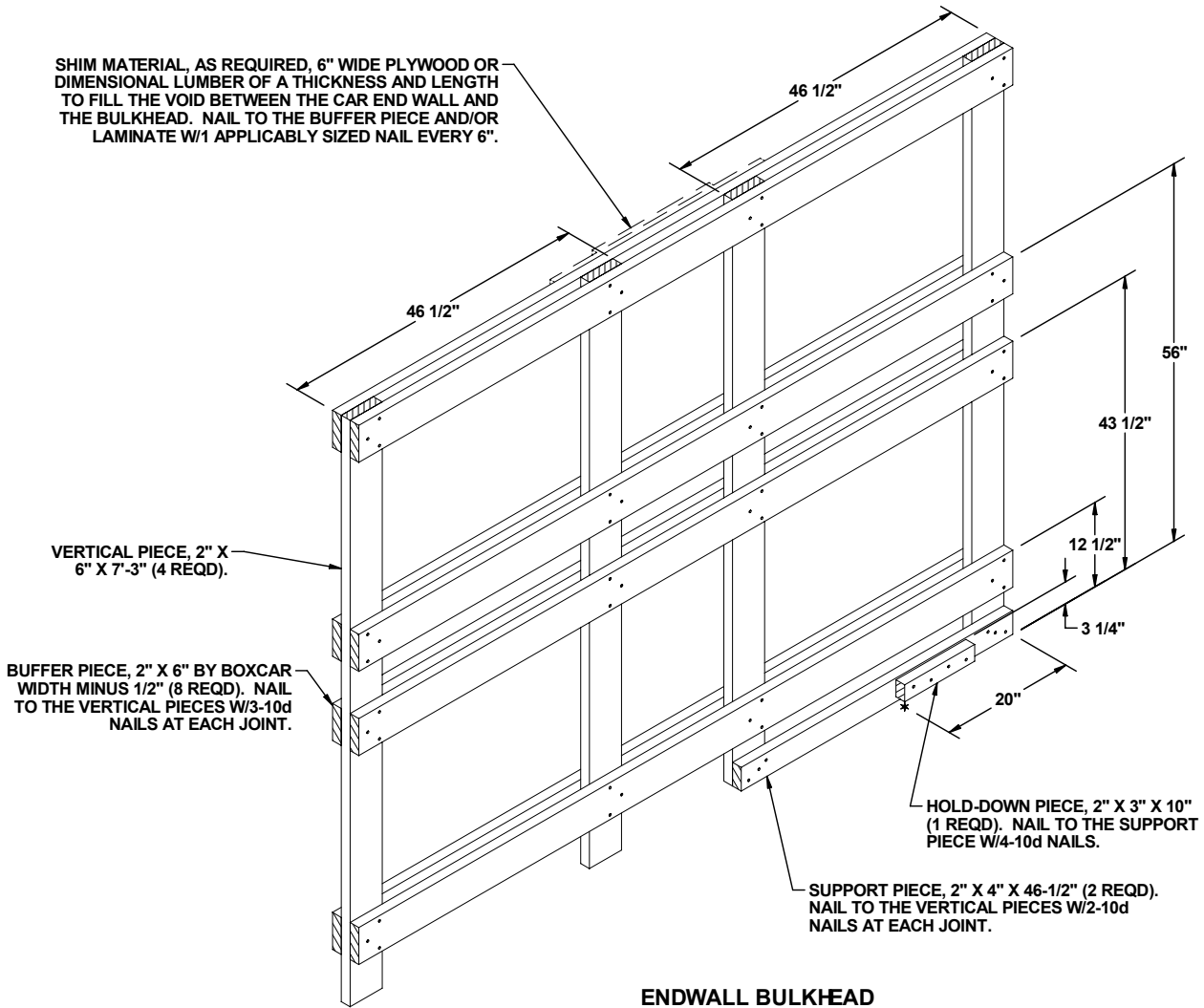
DOOR OPENING WIDTH

HORIZONTAL PIECE, 1" X 6" BY DOOR OPENING WIDTH (4 REQD). NAIL TO THE VERTICAL PIECES W/3-6d NAILS AT EACH END. SEE THE DOORWAY PROTECTION "A" DETAIL ON PAGE 26 FOR HEIGHT LOCATIONS.

DOORWAY PROTECTION D

SEE SPECIAL NOTES 4 AND 6 ON PAGE 26.

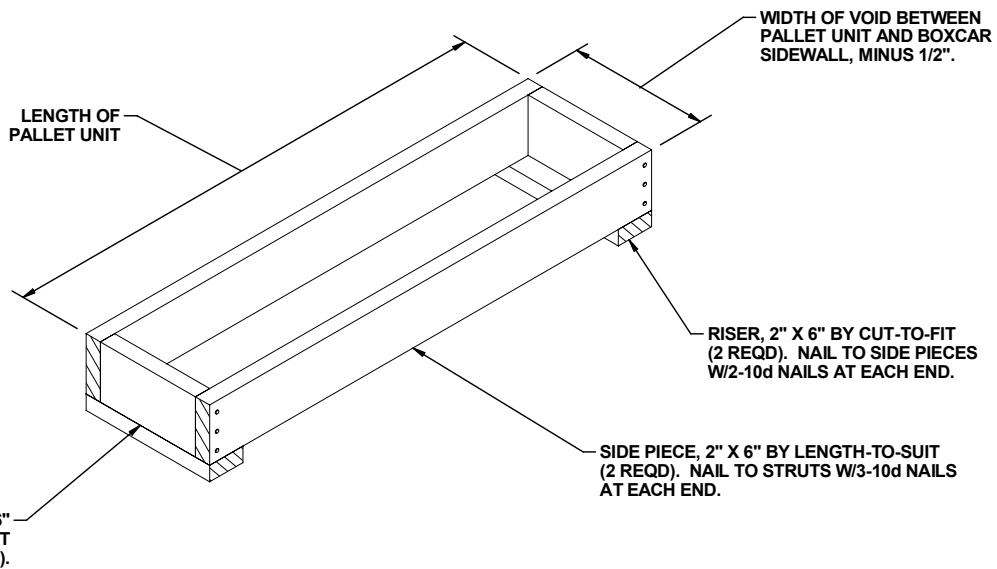
SHIM MATERIAL, AS REQUIRED, 6" WIDE PLYWOOD OR DIMENSIONAL LUMBER OF A THICKNESS AND LENGTH TO FILL THE VOID BETWEEN THE CAR END WALL AND THE BULKHEAD. NAIL TO THE BUFFER PIECE AND/OR LAMINATE W/1 APPLICABLY SIZED NAIL EVERY 6".



ENDWALL BULKHEAD

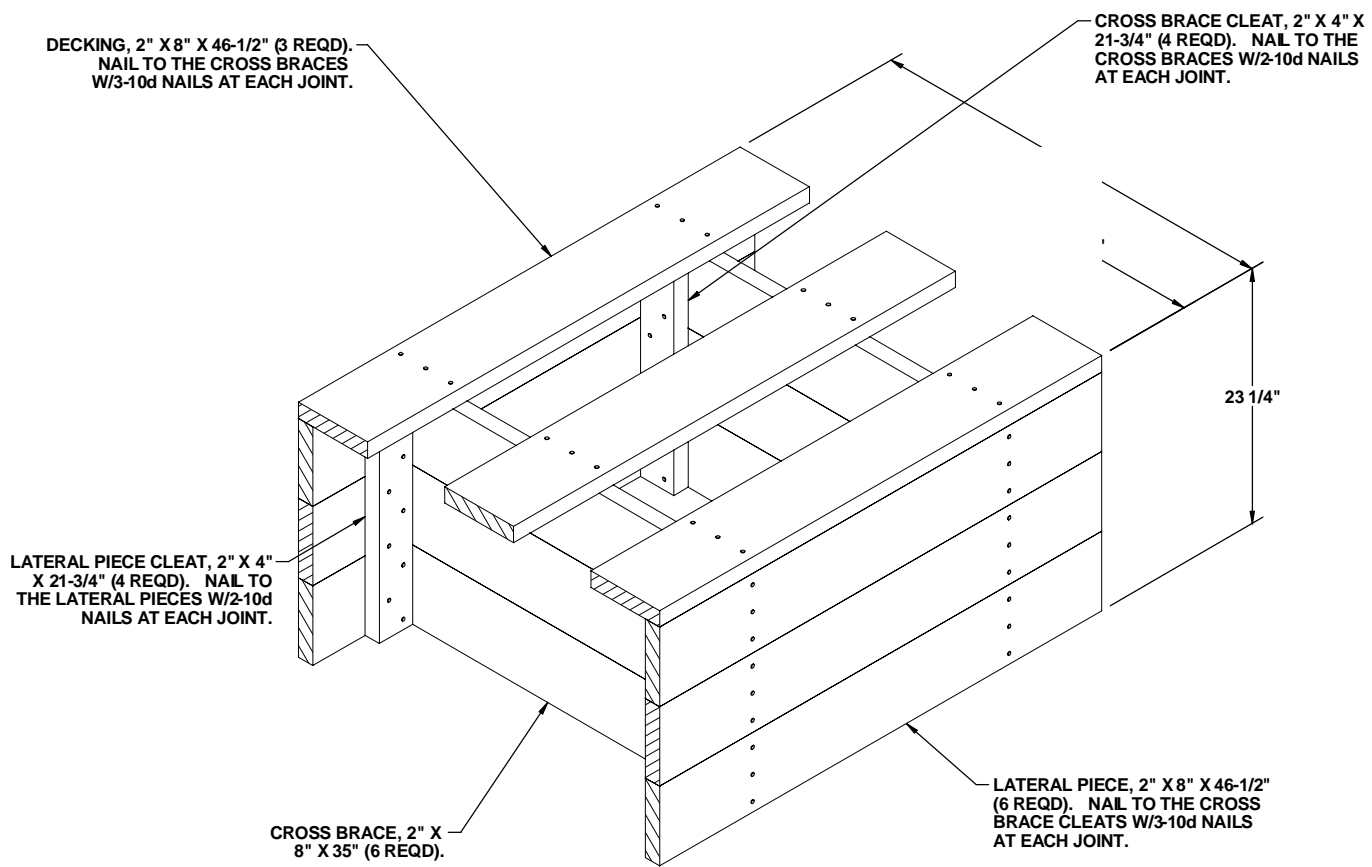
(OPTIONAL: USE IF BOXCAR ENDWALL IS BOWED OUTWARD MORE THAN 2")

NOTE: FOR ONE HIGH STACK OF PALLET UNITS REDUCE VERTICAL BOARD LENGTH TO 44" AND ELIMINATE THE TOP FOUR BUFFER PIECES.

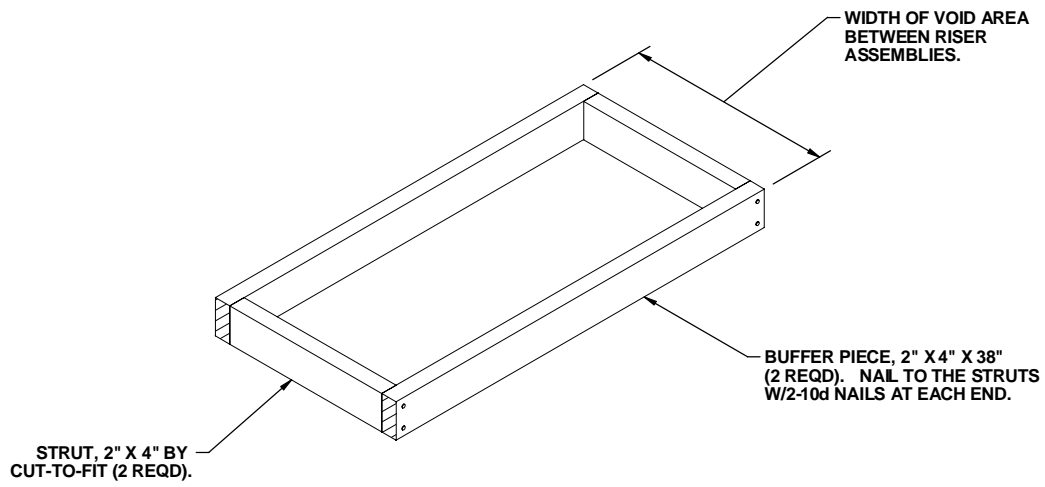


SIDE BLOCKING ASSEMBLY

(FOR USE WITH SINGLE STACKED PALLET UNITS.)



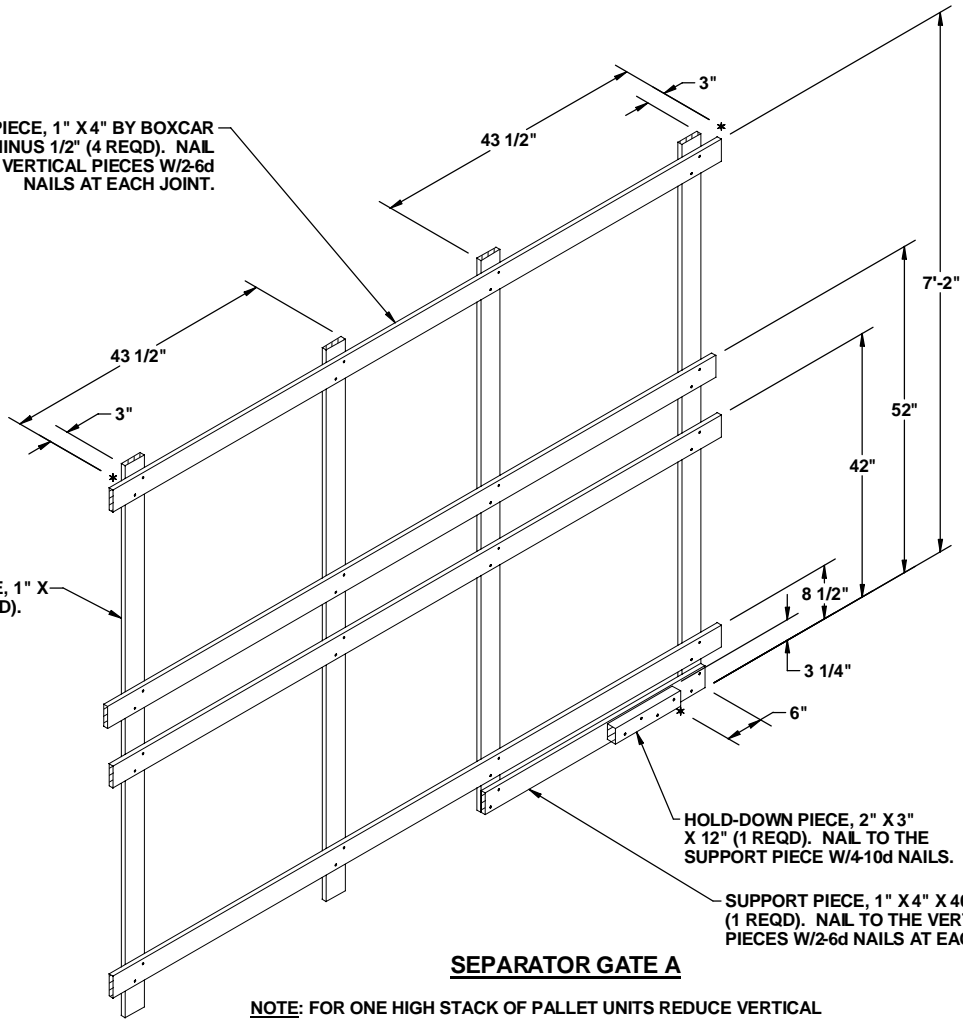
RISER ASSEMBLY



RISER RETAINER ASSEMBLY

BUFFER PIECE, 1" X 4" BY BOXCAR WIDTH MINUS 1/2" (4 REQD). NAIL TO THE VERTICAL PIECES W/2-6d NAILS AT EACH JOINT.

VERTICAL PIECE, 1" X 4" X 7'-4" (4 REQD).

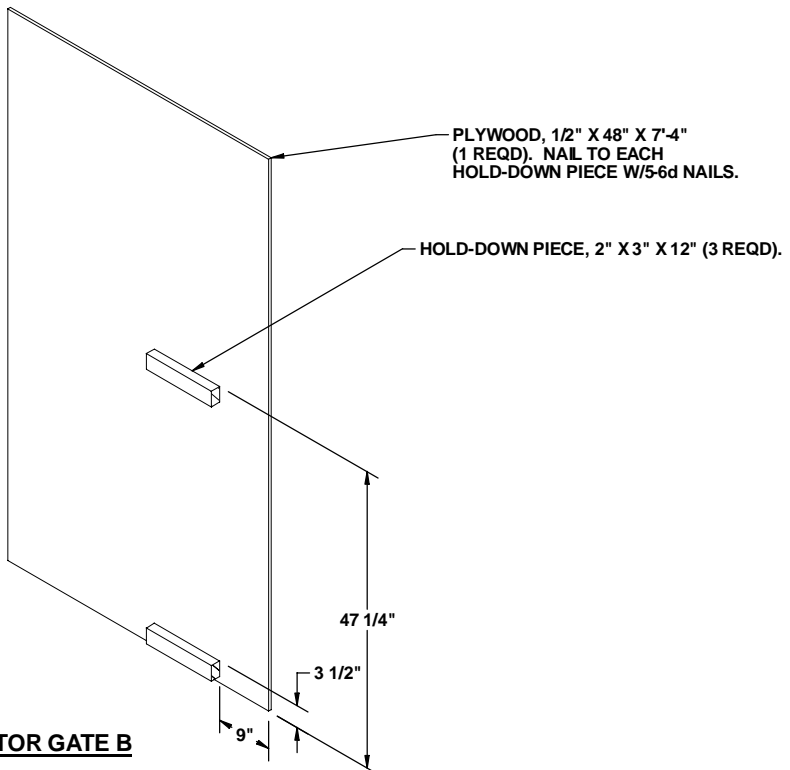


HOLD-DOWN PIECE, 2" X 3" X 12" (1 REQD). NAIL TO THE SUPPORT PIECE W/4-10d NAILS.

SUPPORT PIECE, 1" X 4" X 40-1/2" (1 REQD). NAIL TO THE VERTICAL PIECES W/2-6d NAILS AT EACH JOINT.

SEPARATOR GATE A

NOTE: FOR ONE HIGH STACK OF PALLET UNITS REDUCE VERTICAL BOARD LENGTH TO 44" AND ELIMINATE THE TOP TWO BUFFER PIECES.

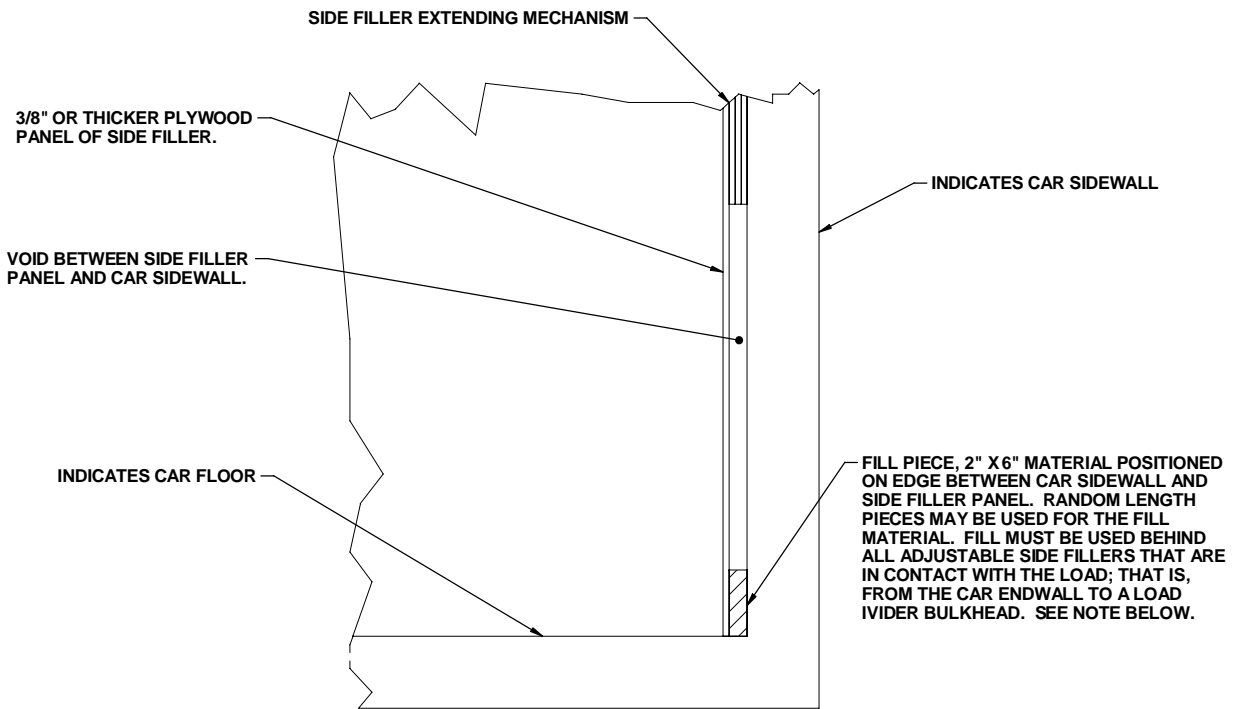


PLYWOOD, 1/2" X 48" X 7'-4" (1 REQD). NAIL TO EACH HOLD-DOWN PIECE W/5-6d NAILS.

HOLD-DOWN PIECE, 2" X 3" X 12" (3 REQD).

SEPARATOR GATE B

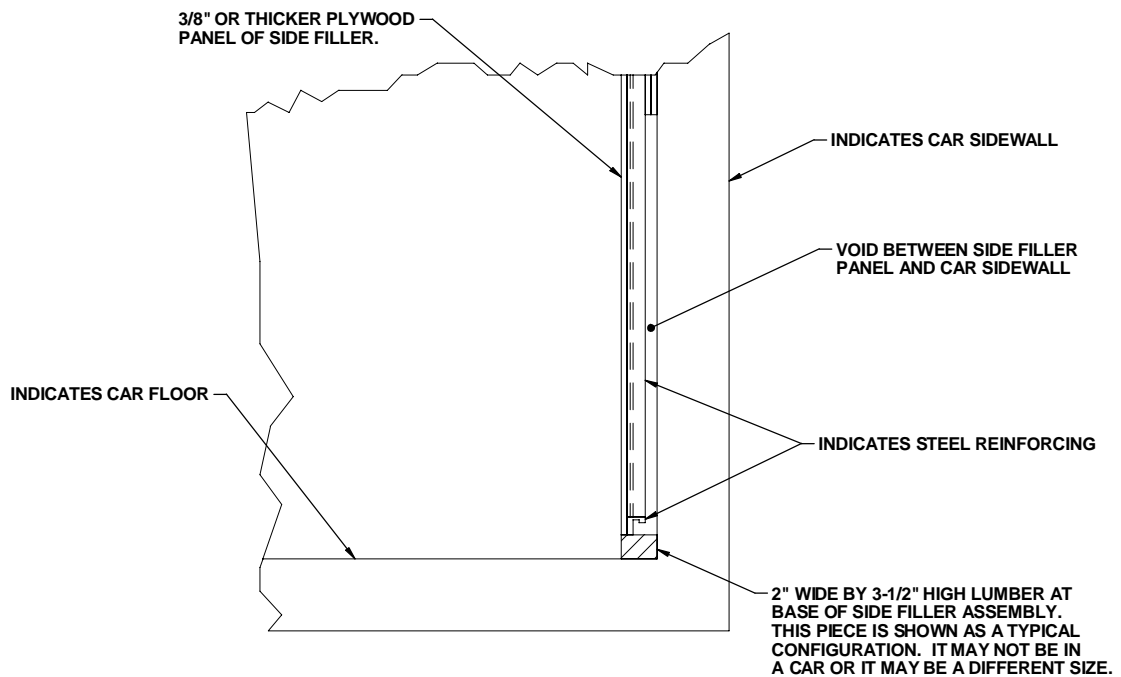
NOTE: FOR ONE HIGH STACK OF PALLET UNITS REDUCE PLYWOOD HEIGHT TO 44" AND ELIMINATE THE TOP HOLD-DOWN PIECE.



SIDE FILLER TYPICAL TYPE A

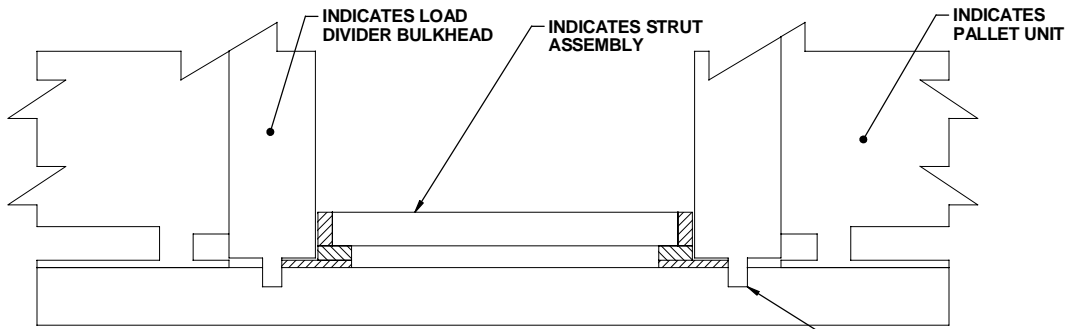
THIS VIEW SHOWS THE INSTALLATION OF A "FILL PIECE" IN A CAR EQUIPPED WITH A STANDARD ADJUSTABLE SIDE FILLER

NOTE:
 NAILING OF "FILL PIECES" IS NOT REQUIRED EXCEPT THAT EACH "FILL PIECE" LOCATED NEAREST THE DOOR OPENINGS OF THE CAR WILL BE SECURED AGAINST LONGITUDINAL MOVEMENT W/1-6d NAIL DRIVEN THROUGH THE SIDE FILLER PANEL AND INTO THE "FILL PIECE".



SIDE FILLER TYPICAL TYPE B

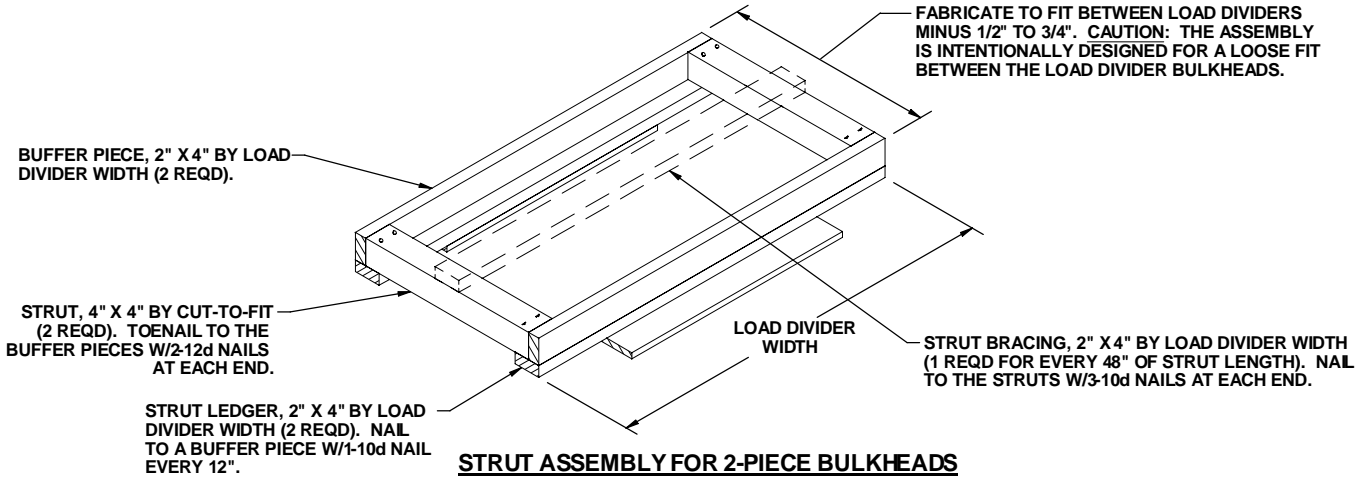
THIS VIEW SHOWS A TYPICAL SECTION OF A CAR EQUIPPED WITH HEAVY DUTY, STEEL REINFORCED, ADJUSTABLE SIDE FILLERS. A "FILL PIECE", AS SHOWN IN THE "TYPICAL TYPE A" DETAIL ABOVE, IS NOT REQUIRED IN CARS SO EQUIPPED.



INSTALLATION OF STRUT ASSEMBLY

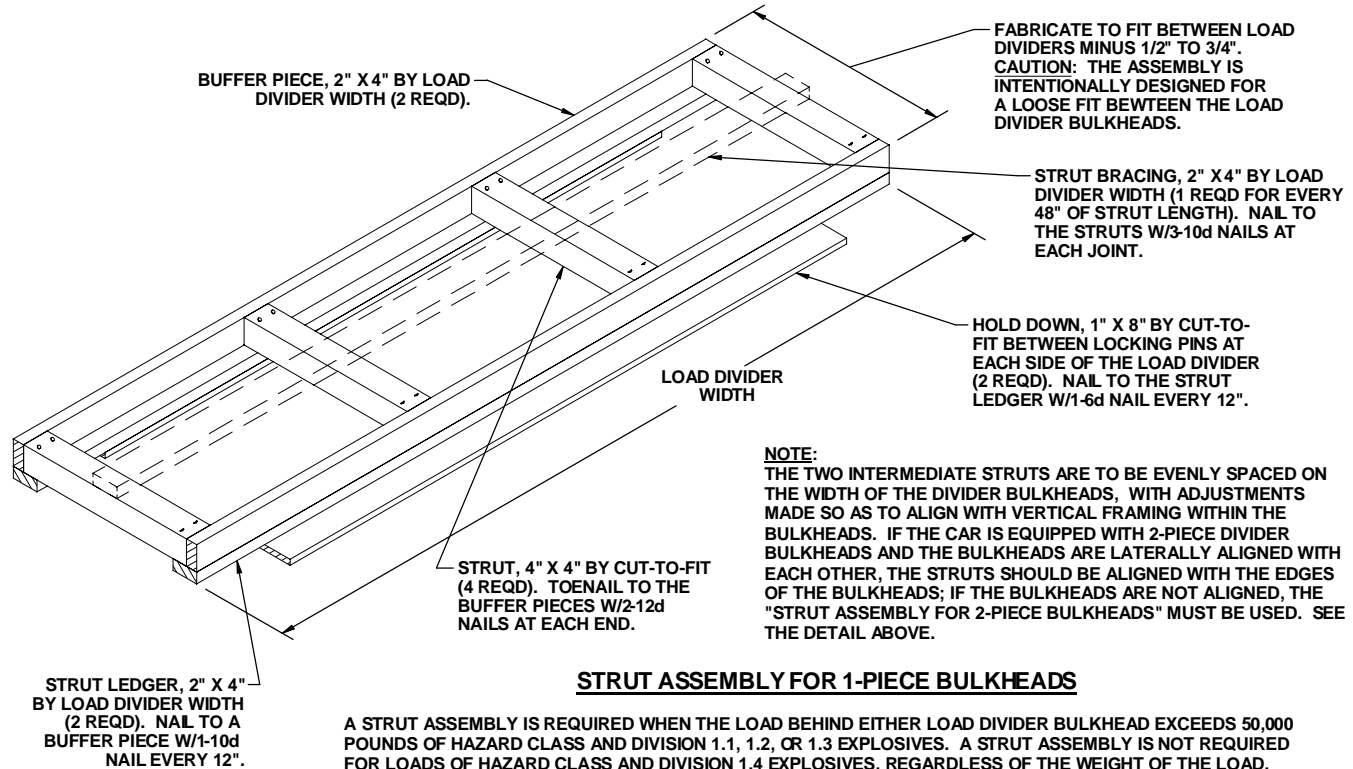
THIS SIDE ELEVATION VIEW SHOWS THE STRUT ASSEMBLY INSTALLED BETWEEN THE LOAD DIVIDER BULKHEADS. NOTE THE 1/2" TO 3/4" (TOTAL) SPACE INTENTIONALLY PROVIDED BETWEEN THE ASSEMBLY AND THE BULKHEADS.

LOCKING PIN OF LOAD DIVIDER BULKHEAD.



STRUT ASSEMBLY FOR 2-PIECE BULKHEADS

A STRUT ASSEMBLY IS REQUIRED WHEN THE LOAD BEHIND EITHER LOAD DIVIDER BULKHEAD EXCEEDS 50,000 POUNDS OF HAZARD CLASS AND DIVISION 1.1, 1.2, OR 1.3 EXPLOSIVES. A STRUT ASSEMBLY IS NOT REQUIRED FOR LOADS OF HAZARD CLASS AND DIVISION 1.4 EXPLOSIVES, REGARDLESS OF THE WEIGHT OF THE LOAD. NOTE: TWO ASSEMBLIES AS SHOWN ARE REQUIRED FOR A 2-PIECE BULKHEAD IF NOT LATERALLY ALIGNED. SEE "NOTE" BELOW.



NOTE:
THE TWO INTERMEDIATE STRUTS ARE TO BE EVENLY SPACED ON THE WIDTH OF THE DIVIDER BULKHEADS, WITH ADJUSTMENTS MADE SO AS TO ALIGN WITH VERTICAL FRAMING WITHIN THE BULKHEADS. IF THE CAR IS EQUIPPED WITH 2-PIECE DIVIDER BULKHEADS AND THE BULKHEADS ARE LATERALLY ALIGNED WITH EACH OTHER, THE STRUTS SHOULD BE ALIGNED WITH THE EDGES OF THE BULKHEADS; IF THE BULKHEADS ARE NOT ALIGNED, THE "STRUT ASSEMBLY FOR 2-PIECE BULKHEADS" MUST BE USED. SEE THE DETAIL ABOVE.

STRUT ASSEMBLY FOR 1-PIECE BULKHEADS

A STRUT ASSEMBLY IS REQUIRED WHEN THE LOAD BEHIND EITHER LOAD DIVIDER BULKHEAD EXCEEDS 50,000 POUNDS OF HAZARD CLASS AND DIVISION 1.1, 1.2, OR 1.3 EXPLOSIVES. A STRUT ASSEMBLY IS NOT REQUIRED FOR LOADS OF HAZARD CLASS AND DIVISION 1.4 EXPLOSIVES, REGARDLESS OF THE WEIGHT OF THE LOAD.