# LOADING AND BRACING (CL & LCL) IN BOXCARS⊕ OF THE MODULAR PACK MINE SYSTEM (MOPMS), M131, AND PRACTICE, M136, PALLETIZED

INDEX





**⊕ 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 JOINT MUNITIONS COMMAND**

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**DO NOT SCALE**

**MARCH 1995**

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| TEST REPORT | NA | |
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**REVISION NO. 1** — **FEBRUARY 2016**

**SEE THE REVISION LISTING ON PAGE 2**

| CLASS | DIVISION | DRAWING | FILE |
|---|---|---|---|
| 19 | 48 | 4281 | 5PK1000 |

**PROJECT** CA 298-93

## GENERAL NOTES

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).

B. THE SPECIFIED OUTLOADING PROCEDURES ARE APPLICABLE TO LOADS OF MODULAR PACK MINE SYSTEM (MOPMS) PALLET UNITS. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE PALLET UNITS WITH MOPMS ITEMS. SEE PAGE 4 AND ARDEC DRAWING 9349988 FOR DETAILS OF THE PALLET UNITS.

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 MOPMS 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 31 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 MOPMS, 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. 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)

**(GENERAL NOTES CONTINUED)**

J. 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".

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 5 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. **NOTICE:** 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.

(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. |

## REVISION:

REVISION NO. 1, DATED FEBRUARY 2016, CONSISTS OF:

ADDING A NEW PALLET UNIT SIZE (PALLET UNIT “B”).

**(GENERAL NOTES CONTINUED FROM PAGE 2)**

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 OR DUNNAGE ASSEMBLY 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 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 17. 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 NEED 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. SEE THE "BEVEL CUT" DETAIL ON PAGE 5 FOR BEVELING INSTRUCTIONS AND THE "STRUT INSTALLATION" DETAIL ON THAT PAGE FOR A PICTORIAL VIEW SHOWING THE PROPER POSITIONING OF A BEVELED STRUT FOR INSTALLATION. 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 2" PIECES ARE SPECIFIED FOR STRUT LEDGERS, 2" X 4" MATERIAL MAY BE SUBSTITUTED, IF DESIRED.

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**(GENERAL NOTES CONTINUED)**

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 COMPLETE ROUNDS. 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 "TYPICAL TYPE A" VIEW ON PAGE 35 FOR GUIDANCE. IF THE BACK OF THE SIDE FILLER PANELS ARE REINFORCED WITH VERTICAL AND HORIZONTAL STEEL MEMBERS AS SHOWN IN THE "TYPICAL TYPE B" VIEW ON PAGE 35, THE "FILL PIECE" MATERIAL IS NOT REQUIRED.

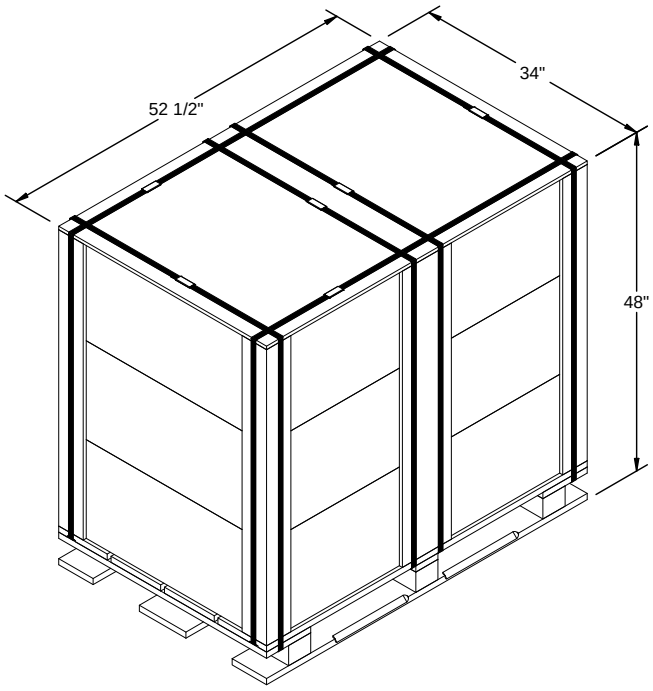
4. **NOTICE:** AFTER THE LOAD DIVIDER BULKHEADS ARE POSITIONED AGAINST THE LADING, AND THE LOCKING PINS ARE ENGAGED IN THE HOLES OF THE RAILS, THE LOWER LOCKING PINS MUST BE INSPECTED TO ENSURE THAT THE PINS ARE FULLY ENGAGED IN THE LOCKING HOLES. IF THE PINS ARE NOT FULLY SEATED IN THE LOCKING HOLES, 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. 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. THE "OMITTED PALLET UNIT" METHOD MAY BE USED TO ADJUST A LOAD QUANTITY DOWNWARD BY OTHER THAN A MULTIPLE OF A LOAD UNIT. SEE THE PROCEDURES ON PAGE 16 FOR GUIDANCE.

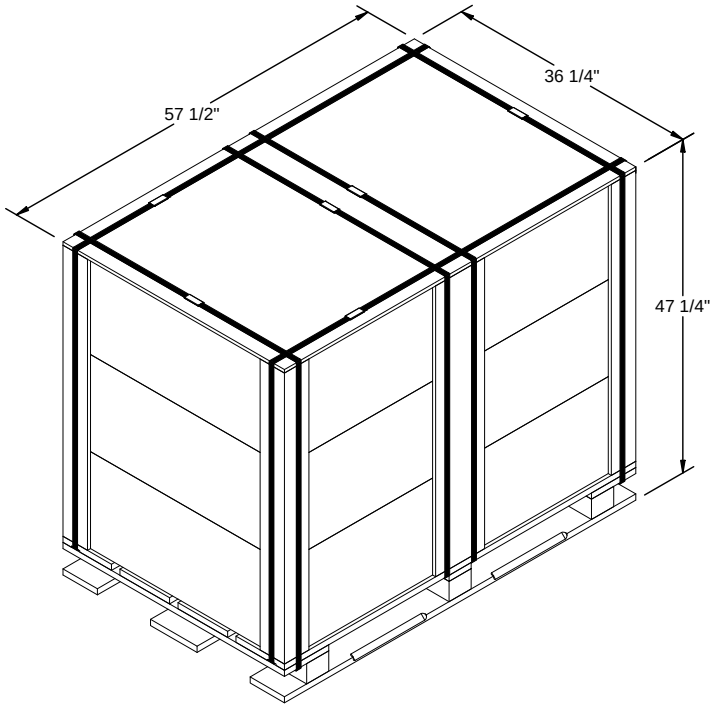
   II. AT LOCATION(S) WHERE K-BRACES MIGHT NORMALLY BE USED IN A LOAD IN A CONVENTIONAL CAR, LOAD DIVIDER BULKHEADS CAN BE POSITIONED. LOADING CAN THEN CONTINUE TOWARD THE CENTER OF THE CAR FROM EACH INSTALLED LOAD DIVIDER BULKHEAD IN A ONE-HIGH LOADING PATTERN. INSTALL CENTER GATES AND STRUTS AS SHOWN ON PAGE 6 OR 8 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 21 OR WITH KNEE BRACE ASSEMBLIES, AS SHOWN ON PAGE 26.




**PALLET UNIT A**

| | |
|---|---|
| UNIT WEIGHT (M131) - - - - - - - - - - | 1,100 LBS (APPROX) |
| UNIT WEIGHT (M136) - - - - - - - - - - | 1,130 LBS (APPROX) |
| CUBE - - - - - - - - - - - - - - - - - | 49.6 CU FEET (APPROX) |

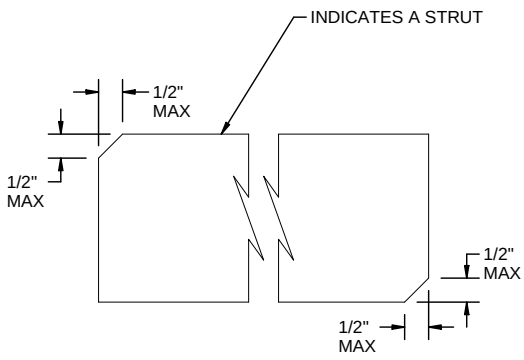



**PALLET UNIT B**

| | |
|---|---|
| UNIT WEIGHT (M131) - - - - - - - - - - | 1,100 LBS (APPROX) |
| UNIT WEIGHT (M136) - - - - - - - - - - | 1,130 LBS (APPROX) |
| CUBE - - - - - - - - - - - - - - - - - | 57.0 CU FEET (APPROX) |

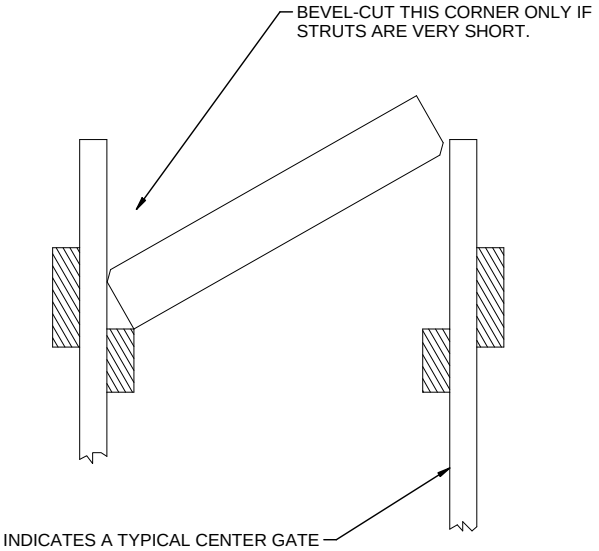


**PROJECT CA 298-93**



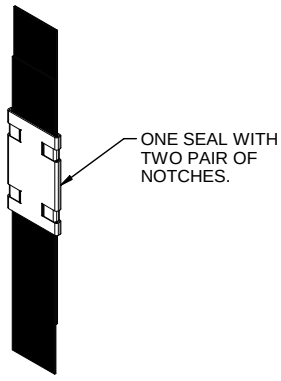

**BEVEL CUT**

IF DESIRED, EACH END OF A STRUT MAY BE BEVEL-CUT AS SHOWN ABOVE TO FACILITATE INSTALLING THE STRUTS WITH A "DRIVE" FIT.



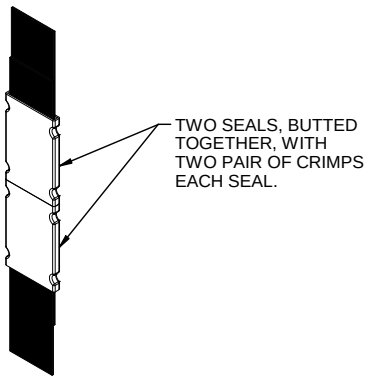

**STRUT INSTALLATION**

SEE GENERAL NOTE "S.3" ON PAGE 3 FOR ADDITIONAL STRUT INSTALLATION GUIDANCE.




**STRAP JOINT A**

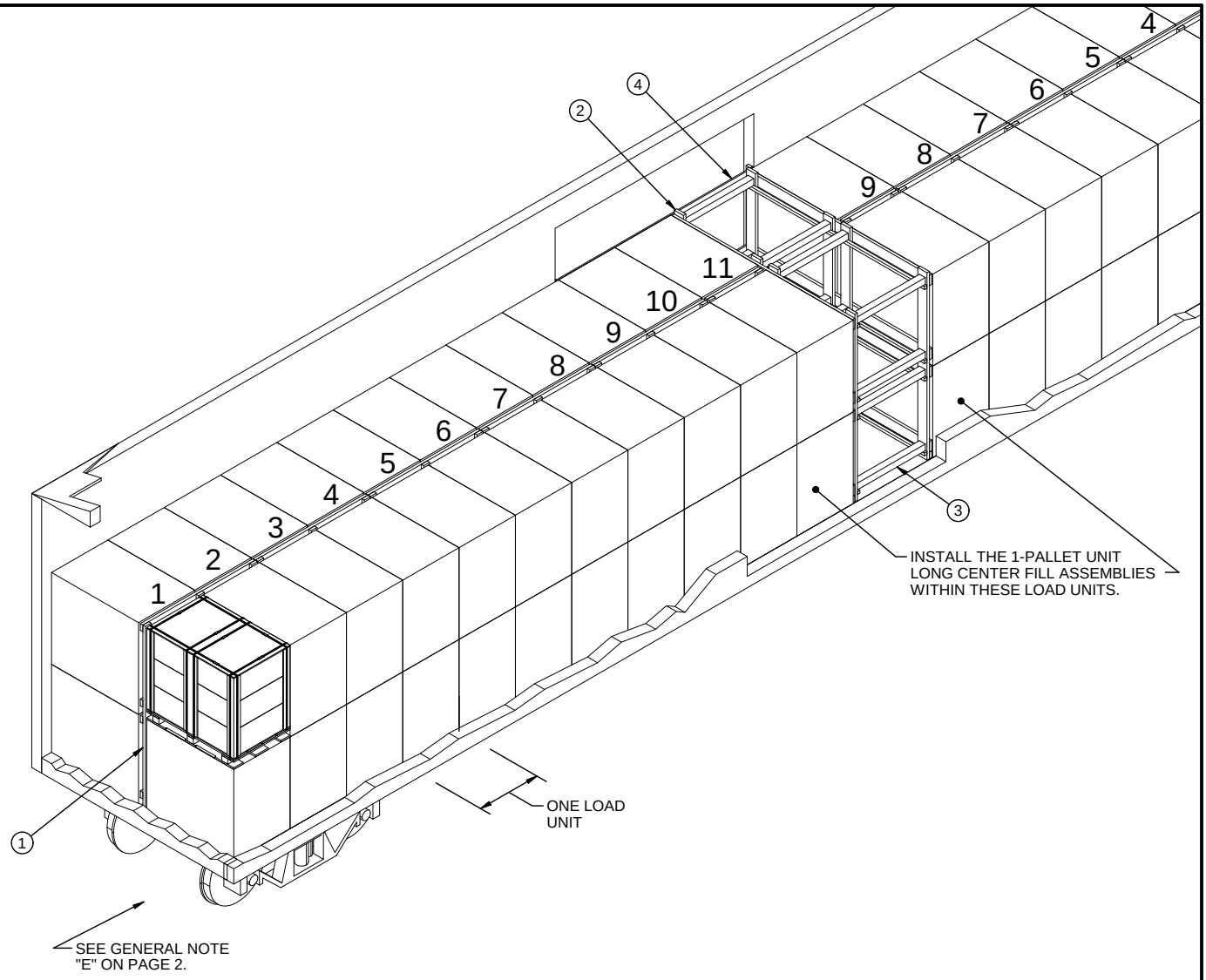
METHOD OF SECURING A STRAP JOINT WHEN USING A NOTCH-TYPE SEALER.




**STRAP JOINT B**

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

**END-OVER-END LAP JOINT DETAILS**




**ISOMETRIC VIEW**

## KEY NUMBERS

① CENTER FILL ASSEMBLY (11 REQD, NINE 2-PALLET UNIT LONG ASSEMBLIES, TWO 1-PALLET UNIT ALONG ASSEMBLIES). SEE THE DETAIL ON PAGE 28. INSTALL THE 1-PALLET UNIT LONG ASSEMBLIES ADJACENT TO THE CENTER GATE. NOTE THAT 1-PALLET UNIT LONG CENTER FILL ASSEMBLIES ARE NOT REQUIRED WHEN AN EVEN NUMBER OF LOAD UNITS IS LOCATED IN EACH END OF THE CAR.

② CENTER GATE A (2 REQD). SEE THE DETAIL ON PAGE 28 AND SPECIAL NOTES 2 AND 3 ON PAGE 7.

③ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 42") (16 REQD). TOENAIL TO CENTER GATE "A" W/2-16d NAILS AT EACH END. SEE "BEVEL CUT" DETAIL ON PAGE 5.

④ DOORWAY PROTECTION (2 REQD). SEE THE DETAIL ON PAGE 30. NAIL TO THE DOOR POSTS W/12d NAILS. SEE SPECIAL NOTE 5 ON PAGE 7.

**80 UNIT LOAD IN A 60'-8" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR**



**PROJECT CA 298-93**

**SPECIAL NOTES:**

1. AN 80 UNIT LOAD IS SHOWN IN A 60'-8" LONG BY 9'-4" WIDE WOOD-LINED CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.

2. PALLET UNIT "A" IS SHOWN IN THE LOAD DEPICTED ON PAGE 6. PALLET UNIT "B" CANNOT BE LOADED IN THIS CONFIGURATION

3. CENTER GATE "A" MAY BE PARTIALLY FORMED FROM 1/2" OR THICKER PLYWOOD, IF DESIRED. PLYWOOD MAY BE USED IN LIEU OF THE 2" X 6" HORIZONTAL PIECES. SEE THE "PLYWOOD CENTER GATE ALTERNATIVE" DETAIL ON PAGE 31.

4. FOR EASE OF HANDLING, SPLIT CENTER GATES, WHICH ARE NOT DEPENDENT UPON THE WIDTH OF THE CAR, MAY BE USED AS AN ALTERNATIVE TO THE CAR WIDTH GATES. IN LIEU OF EACH "CENTER GATE A", INSTALL TWO "CENTER GATES D" AS SHOWN ON PAGE 32. AFTER INSTALLATION, THE SPLIT GATES MUST BE TIED TOGETHER AS DEPICTED BY THE "TIE PIECE APPLICATION" DETAIL ON PAGE 32.

5. IF NAILED BLOCKING AND DOORWAY PROTECTION STRAPS, AS DEPICTED ON PAGE 8, ARE USED IN LIEU OF ONE OF THE FOUR METHODS OF DOORWAY PROTECTION SHOWN ON PAGES 33 AND 34, NAILED FLOORLINE BLOCKING MUST BE USED IN LIEU OF EACH CENTER FILL ASSEMBLY IN THE DOORWAY AREA. NAILED BLOCKING IS REQUIRED FOR ALL PALLET STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH ON EITHER SIDE OF THE CAR.

6. 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 WIDTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION DEPICTED IN THE LOAD ON PAGE 6 IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NAILABLE DOOR POSTS. REFER TO PAGES 33 AND 34 FOR ALTERNATIVE DOORWAY PROTECTION FOR CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS. IF THE CAR BEING LOADED IS EQUIPPED WITH PLUG TYPE DOORS BUT DOES NOT HAVE NAILABLE SIDEWALLS, NAILED FLOORLINE BLOCKING AND LOAD BUNDLING STRAPS MUST BE USED, AS DEPICTED IN THE LOAD ON PAGE 8.

7. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. THE LOAD CAN BE REDUCED BY ONE CONTAINER USING THE "OMITTED PALLET UNIT" ASSEMBLY ON PAGE 16. A 2-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF FOUR UNITS, OR A 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF TWO UNITS BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD, OR, THE ENTIRE TOP TIER CAN BE OMITTED. SEE THE LCL DETAILS ON PAGES 14 THROUGH 27 FOR ADDITIONAL METHODS OF REDUCING THE LOAD.

8. A MAXIMUM OF 52 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 58,760 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR, AND A MAXIMUM OF 68 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 76,840 POUNDS, CAN BE LOADED IN A 50'-6" LONG CAR BY USING THE DEPICTED PROCDURES.

**BILL OF MATERIAL**

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 1″ X 6″ | 80 | 40 |
| 2″ X 2″ | 68 | 23 |
| 2″ x 3″ | 12 | 45 |
| 2″ x 4″ | 587 | 392 |
| 2″ X 6″ | 139 | 139 |
| 4″ x 4″ | 56 | 75 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2″) | 24 | 1/4 |
| 10d (3″) | 432 | 6-3/4 |
| 12d (3-1/4″) | 32 | 1/2 |
| 16d (3-1/2″) | 64 | 1-1/2 |

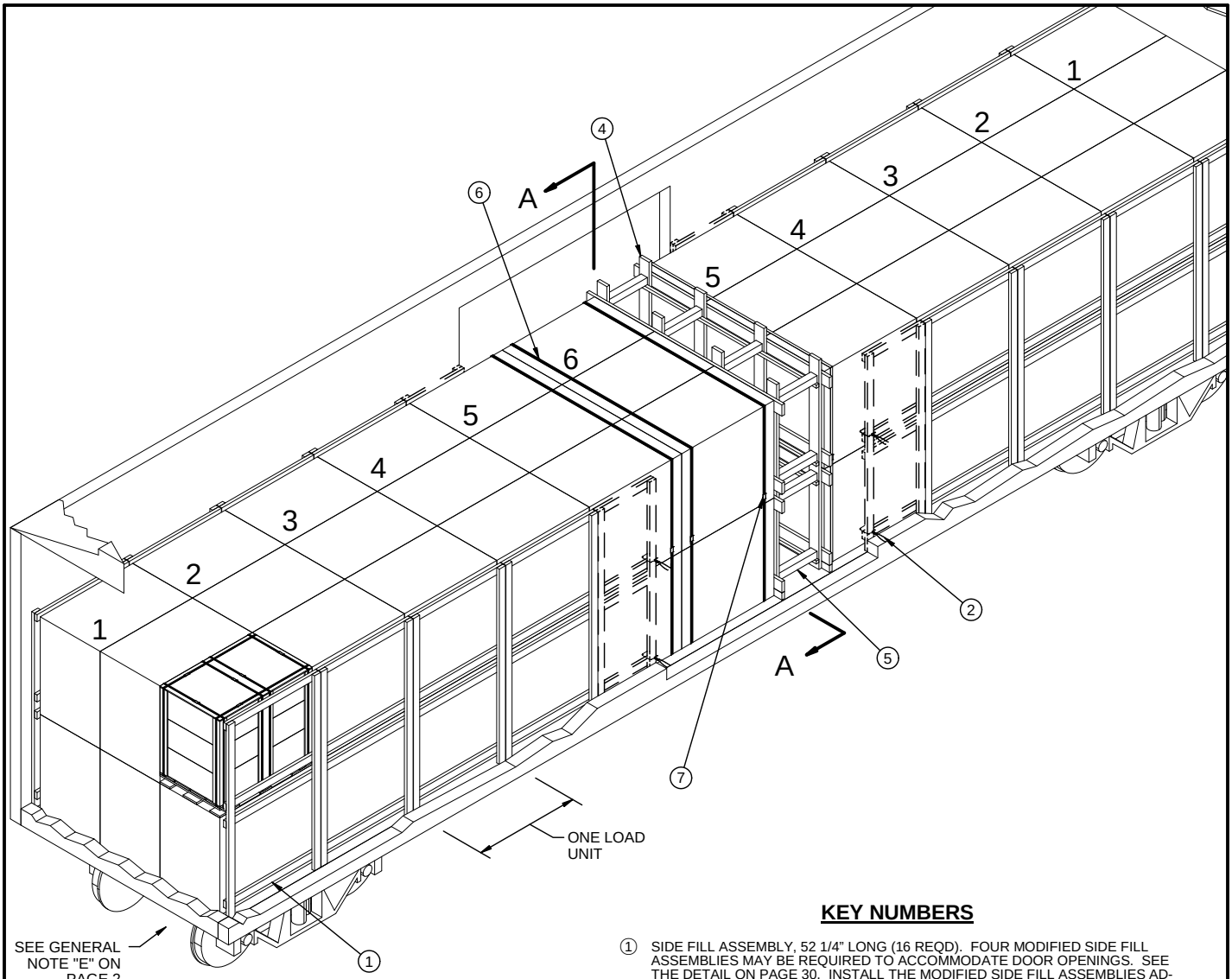
**LOAD AS SHOWN**

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| PALLET UNIT | 80 | 90,400 LBS |
| DUNNAGE | | 1,345 LBS |
| TOTAL WEIGHT | | 91,745 LBS (APPROX) |

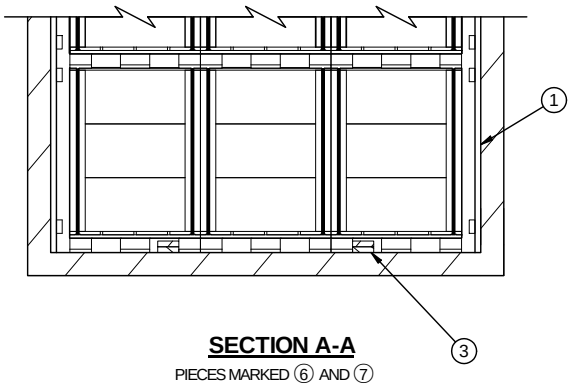
**80 UNIT LOAD IN A 60'-8" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR**



**PROJECT CA 298-93**




**ISOMETRIC VIEW**




**SECTION A-A**

PIECES MARKED ⑥ AND ⑦ OMITTED FOR CLARITY PURPOSES.

## KEY NUMBERS

① SIDE FILL ASSEMBLY, 52 1/4" LONG (16 REQD). FOUR MODIFIED SIDE FILL ASSEMBLIES MAY BE REQUIRED TO ACCOMMODATE DOOR OPENINGS. SEE THE DETAIL ON PAGE 30. INSTALL THE MODIFIED SIDE FILL ASSEMBLIES ADJACENT TO THE DOORWAY OF THE CAR. NOTE THAT SIDE FILL ASSEMBLIES ARE NOT REQUIRED IN A PALLET UNIT B LOAD. NOTE THAT THE MODIFIED SIDE FILL ASSEMBLIES ARE NOT REQUIRED WHEN WOODEN DOORWAY PROTECTION IS USED.

② TIE WIRE, .0800" DIA, 24" LONG (8 REQD). INSTALL TO FORM A COMPLETE LOOP AROUND THE MODIFIED SIDE FILL ASSEBMLY AND THE PALLET UNITIZING STRAP. BRING ENDS TOGETHER AND TWIST TAUT. SECURE TO THE MODIFIED SIDE FILL ASSEMBLY WITH A PARTIALLY DRIVEN 10d NAIL BENT OVER THE WIRE OR WITH A STRAP STAPLE. NOTE THAT TIE WIRE IS ONLY REQUIRED WHEN MODIFIED SIDE FILL ASSEMBLIES ARE USED.

③ DOORWAY BLOCKING, 2" X 6" X 48" (DOUBLED) (2 REQD). PREPOSITION TO BE LOCATED CENTERED AGAINST THE PALLETS IN THE DOORWAY AREA AS SHOWN IN THE "SECTION A-A" VIEW BELOW. NAIL THE FIRST PIECE TO THE CAR FLOOR W/5-16d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER. SEE SPECIAL NOTE 4 ON PAGE 9.

④ CENTER GATE B (2 REQD). SEE THE DETAIL ON PAGE 29 AND SPECIAL NOTE 3 ON PAGE 9.

⑤ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 22-1/2") (16 REQD). TOENAIL TO PIECES MARKED ④ W/2-16d NAILS AT EACH END. SEE GENERAL NOTES "S.3" AND "S.4" ON PAGE 3 AND THE "BEVEL-CUT" DETAIL ON PAGE 5.

⑥ DOORWAY PROTECTION STRAP, 1-1/4" X .035" OR .031" X 33'-6" LONG STEEL STRAPPING (4 REQD). INSTALL TO ENCIRCLE THE LOAD UNIT IN THE DOORWAY AREA. ALIGN WITH THE STRONG POINTS OF THE PALLET UNITS.

⑦ SEAL FOR 1-1/4" STRAPPING (2 OR 4 REQD). CRIMP SINGLE SEALS WITH TWO PAIR OF NOTCHES OR CRIMP DOUBLE SEALS WITH TWO PAIR OF CRIMPS EACH.



**66-UNIT LOAD IN A 50'-6" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR**

**SPECIAL NOTES:**

1. A 66 UNIT LOAD IS SHOWN IN A 50'-6" LONG BY 9'-4" WIDE WOOD-LINED CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.

2. PALLET UNIT "A" IS SHOWN IN THE LOAD DEPICTED ON PAGE 8. PALLET UNIT "B" CAN ALSO BE LOADED IN THIS CONFIGURATION. WHEN LOADING PALLET UNIT "B" IN THE CONFIGURATION DEPICTED ON PAGE 8, THE LOAD WILL CONSIST OF 60 PALLET UNITS AND WILL WEIGH 68,127 POUNDS. THE SIDE FILL ASSEMBLIES AND TIE WIRE WILL BE ELIMINATED, AND CENTER GATE "C" WILL BE UTILIZED IN LIEU OF CENTER GATE "B".

3. CENTER GATE "B" MAY BE PARTIALLY FORMED FROM 1/2" OR THICKER PLYWOOD, IF DESIRED. PLYWOOD MAY BE USED IN LIEU OF THE 2" X 6" HORIZONTAL PIECES. SEE THE "PLYWOOD CENTER GATE ALTERNATIVE" DETAIL ON PAGE 31.

4. 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 WIDTH. THE DEPICTED DOORWAY PROTECTION IS APPLICABLE FOR BOXCARS EQUIPPED WITH EITHER SLIDING TYPE OR PLUG DOORS, OR A COMBINATION THEREOF. ONE DOORWAY PROTECTION STRAP IS REQUIRED FOR PALLET STACKS WHICH EXTEND INTO THE DOORWAY AREA BY MORE THAN HALF THE STACK LENGTH, BUT ARE RETAINED BY 6" OF CAR SIDEWALL. TWO STRAPS ARE REQUIRED FOR PALLET STACKS THAT ARE RETAINED BY LESS THAN 6" OF CAR SIDEWALL. REFER TO PAGES 33 AND 34 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 LOAD BUNDLING STRAPS MUST BE USED.

5. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. THE LOAD CAN BE REDUCED BY ONE CONTAINER USING THE "OMITTED PALLET UNIT" ASSEMBLY ON PAGE 16. A 2-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF FOUR UNITS, OR A 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF TWO UNITS BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD, OR, THE ENTIRE TOP TIER CAN BE OMITTED. SEE THE LCL DETAILS ON PAGES 14 THROUGH 27 FOR ADDITIONAL METHODS OF REDUCING THE LOAD.

6. FOR A PALLET UNIT "A" LOAD, A MAXIMUM OF 48 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 54,240 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR, AND A MAXIMUM OF 78 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 88,140 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.

7. FOR A PALLET UNIT "B" LOAD, A MAXIMUM OF 48 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 54,240 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR, AND A MAXIMUM OF 72 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 81,360 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.

## BILL OF MATERIAL

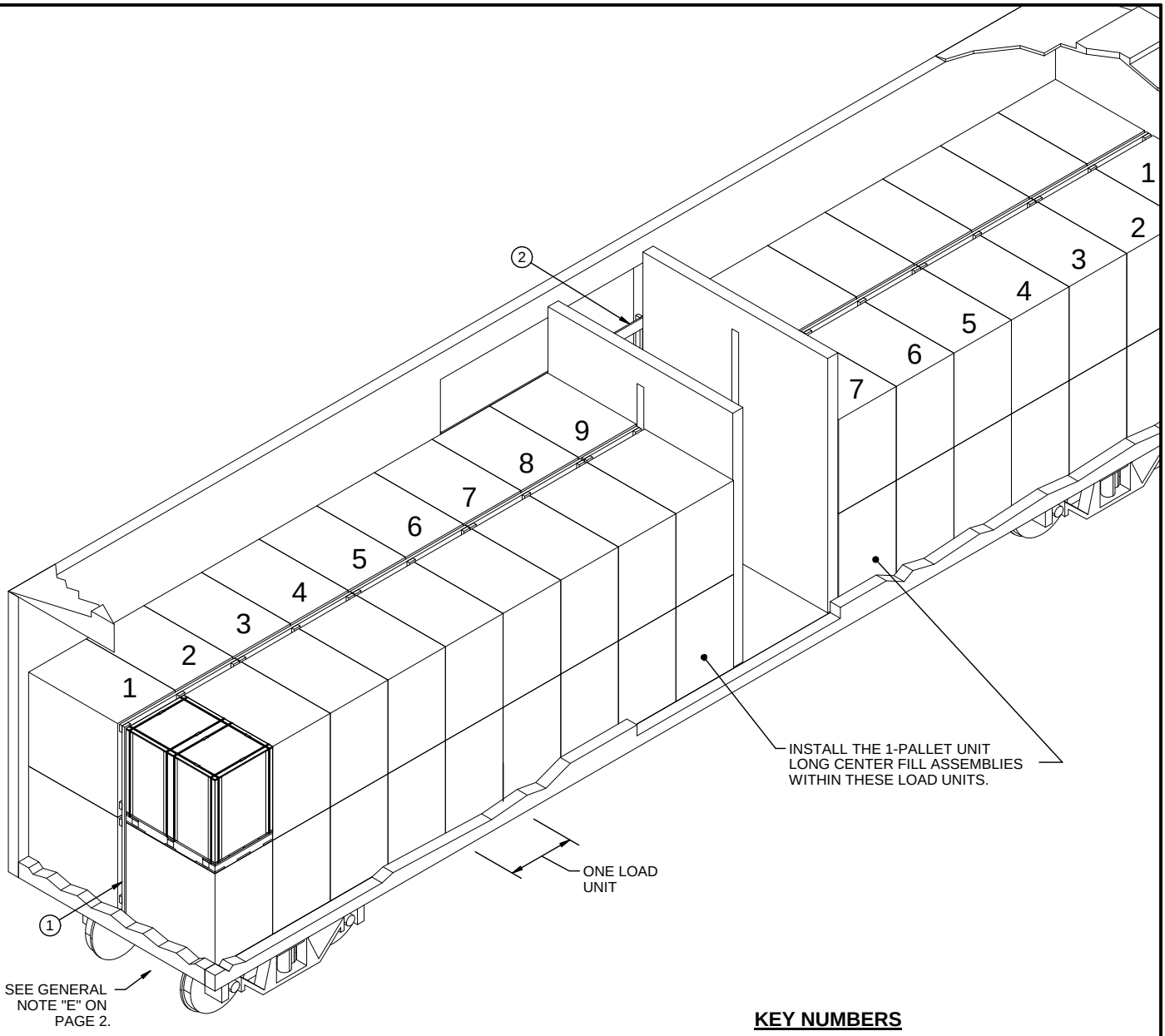
| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 2″ X 2″ | 68 | 23 |
| 2″ X 4″ | 669 | 446 |
| 2″ X 6″ | 159 | 159 |
| 4″ X 4″ | 30 | 40 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 10d (3″) | 544 | 8-1/2 |
| 16d (3-1/2″) | 84 | 2 |

STEEL STRAPPING, 1-1/4″ – 134′ REQD - - 19 LBS
SEAL FOR 1-1/4″ STRAPPING - 4 REQD - - 1/4 LBS
WIRE, .0800″ DIA - - - - - - - - - - - - 1/4 LBS

## LOAD AS SHOWN

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| PALLET UNIT | 66 | 74,580 LBS |
| DUNNAGE | | 1,364 LBS |
| TOTAL WEIGHT | | 75,944 LBS (APPROX) |

**66-UNIT LOAD IN A 50'-6" LONG BY 9'-4" WIDE CONVENTIONAL BOXCAR**




**ISOMETRIC VIEW**

## KEY NUMBERS

① CENTER FILL ASSEMBLY (9 REQD, SEVEN 2-PALLET UNIT LONG ASSEMBLIES, TWO 1-PALLET UNIT LONG ASSEMBLIES). SEE THE DETAIL ON PAGE 28. INSTALL THE 1-PALLET UNIT LONG ASSEMBLIES ADJACENT TO THE LOAD DIVIDER BULKHEADS. NOTE THAT 1-PALLET UNIT LONG CENTER FILL ASSEMBLIES ARE NOT REQUIRED WHEN AN EVEN NUMBER OF LOAD UNITS IS LOCATED IN EACH END OF THE CAR.

② DOORWAY PROTECTION (2 REQD). SEE THE DETAIL ON PAGE 30. NAIL TO THE DOOR POSTS W/12d NAILS. SEE SPECIAL NOTE 3 ON PAGE 11.

**64-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS**

**SPECIAL NOTES:**

1. A 64 UNIT LOAD IS SHOWN IN A 50'-6" LONG BY 9'-2" WIDE WOOD-LINED CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.

2. PALLET UNIT "A" IS SHOWN IN THE LOAD DEPICTED ON PAGE 10. PALLET UNIT "B" CANNOT BE LOADED IN THIS CONFIGURATION.

3. IF NAILED BLOCKING AND DOORWAY PROTECTION STRAPS, AS DEPICTED ON PAGE 8, ARE USED IN LIEU OF ONE OF THE FOUR METHODS OF DOORWAY PROTECTION SHOWN ON PAGES 33 AND 34, NAILED FLOORLINE BLOCKING MUST BE USED IN LIEU OF EACH CENTER FILL ASSEMBLY IN THE DOORWAY AREA. NAILED BLOCKING IS REQUIRED FOR ALL PALLET STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH ON EITHER SIDE OF THE CAR.

4. 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 WIDTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION DEPICTED IN THE LOAD ON PAGE 8 IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NAILABLE DOOR POSTS. REFER TO PAGES 33 AND 34 FOR ALTERNATIVE DOORWAY PROTECTION FOR CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS. IF THE CAR BEING LOADED IS EQUIPPED WITH PLUG TYPE DOORS BUT DOES NOT HAVE NAILABLE SIDEWALLS, NAILED FLOORLINE BLOCKING AND LOAD BUNDLING STRAPS MUST BE USED, AS DEPICTED IN THE LOAD ON PAGE 8.

5. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. THE LOAD CAN BE REDUCED BY ONE CONTAINER USING THE "OMITTED PALLET UNIT" ASSEMBLY ON PAGE 16. A 2-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF FOUR UNITS, OR A 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF TWO UNITS BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD, OR, THE ENTIRE TOP TIER CAN BE OMITTED. SEE THE LCL DETAILS ON PAGES 14 THROUGH 27 FOR ADDITIONAL METHODS OF REDUCING THE LOAD.

6. A MAXIMUM OF 52 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 58,760 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR, AND A MAXIMUM OF 80 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 90,400 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.

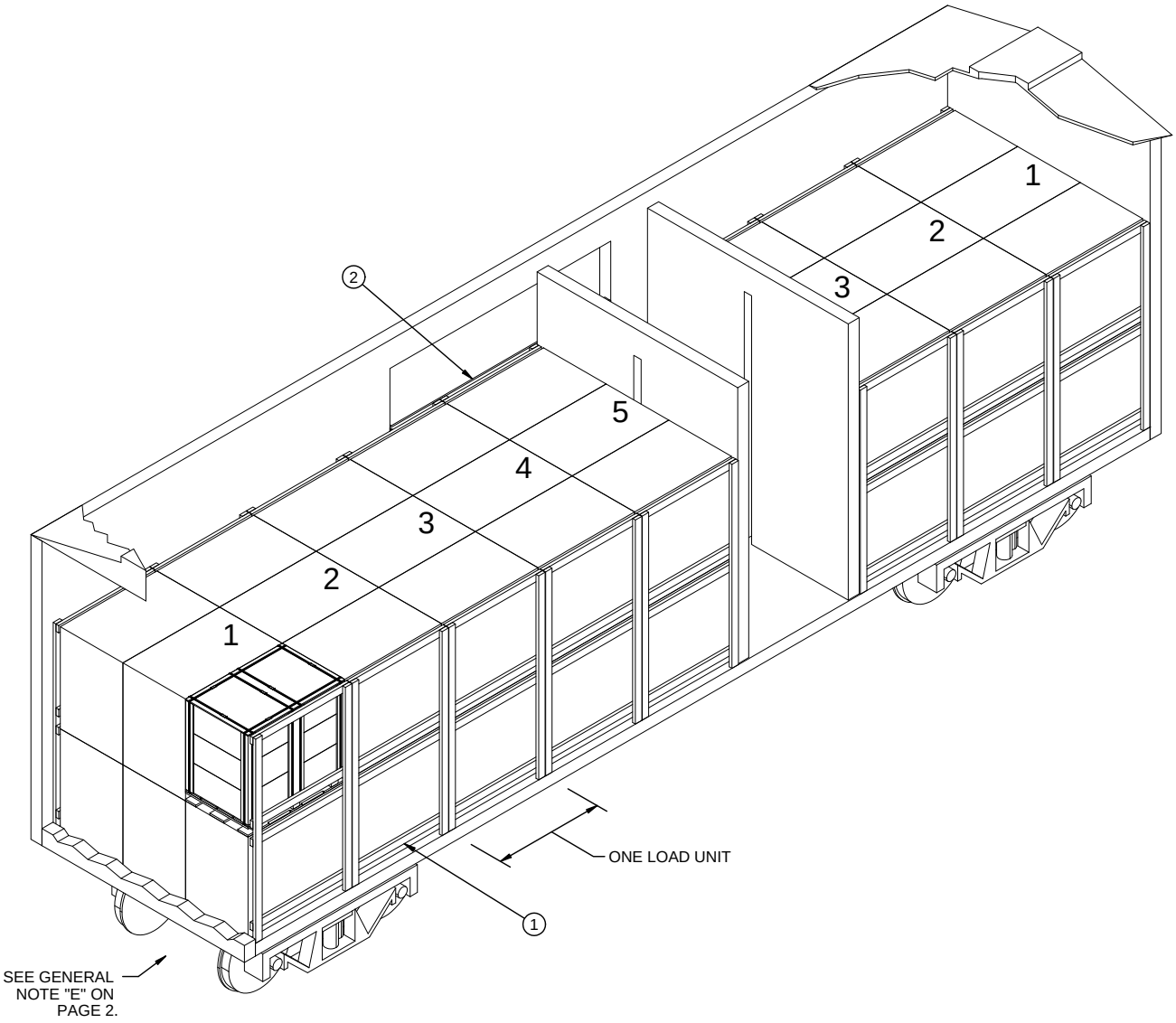
**BILL OF MATERIAL**

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 1″ X 6″ | 80 | 40 |
| 2″ X 3″ | 16 | 8 |
| 2″ X 4″ | 383 | 255 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2″) | 24 | 1/4 |
| 10d (3″) | 248 | 4 |

**LOAD AS SHOWN**

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| PALLET UNIT | 64 | 72,320 LBS |
| DUNNAGE | | 594 LBS |
| TOTAL WEIGHT | | 72,914 LBS (APPROX) |

**64-UNIT LOAD IN A 50'-6" LONG BY 9'-2" WIDE BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS**




**ISOMETRIC VIEW**

**KEY NUMBERS**

① SIDE FILL ASSEMBLY (16 REQD). SEE THE DETAIL ON PAGE 30. NOTE THAT SIDE FILL ASSEMBLIES ARE NOT REQUIRED IN A PALLET UNIT "B" LOAD.

② DOORWAY PROTECTION (2 REQD). SEE THE DETAIL ON PAGE 30. NAIL TO THE DOOR POSTS W/12d NAILS. SEE SPECIAL NOTE 3 ON PAGE 13.

**48-UNIT LOAD IN A 40'-6" LONG BY 9'-2" WIDE BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS**

**SPECIAL NOTES:**

1. A 48 UNIT LOAD IS SHOWN IN A 40'-6" LONG BY 9'-2" WIDE WOOD-LINED CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.

2. PALLET UNIT "A" IS SHOWN IN THE LOAD DEPICTED ON PAGE 12. PALLET UNIT "B" CAN ALSO BE LOADED IN THIS CONFIGURATION. WHEN LOADING PALLET UNIT "B" IN THE CONFIGURATION DEPICTED ON PAGE 12, THE LOAD WILL CONSIST OF 42 PALLET UNITS, WILL WEIGH 47,460 POUNDS, AND THE SIDE FILL ASSEMBLIES WILL BE ELIMINATED.

3. IF NAILED BLOCKING AND DOORWAY PROTECTION STRAPS, AS DEPICTED ON PAGE 8, ARE USED IN LIEU OF ONE OF THE FOUR METHODS OF DOORWAY PROTECTION SHOWN ON PAGES 33 AND 34, NAILED FLOORLINE BLOCKING MUST BE USED IN LIEU OF EACH CENTER FILL ASSEMBLY IN THE DOORWAY AREA. NAILED BLOCKING IS REQUIRED FOR ALL PALLET STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY ONE-HALF OR MORE OF THE STACK LENGTH ON EITHER SIDE OF THE CAR.

4. 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 WIDTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION DEPICTED IN THE LOAD ON PAGE 8 IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NAILABLE DOOR POSTS. REFER TO PAGES 33 AND 34 FOR ALTERNATIVE DOORWAY PROTECTION FOR CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS. IF THE CAR BEING LOADED IS EQUIPPED WITH PLUG TYPE DOORS BUT DOES NOT HAVE NAILABLE SIDEWALLS, NAILED FLOORLINE BLOCKING AND LOAD BUNDLING STRAPS MUST BE USED, AS DEPICTED IN THE LOAD ON PAGE 8.

5. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. THE LOAD CAN BE REDUCED BY ONE CONTAINER USING THE "OMITTED PALLET UNIT" ASSEMBLY ON PAGE 16. A 2-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF FOUR UNITS, OR A 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF TWO UNITS BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD, OR, THE ENTIRE TOP TIER CAN BE OMITTED. SEE THE LCL DETAILS ON PAGES 14 THROUGH 27 FOR ADDITIONAL METHODS OF REDUCING THE LOAD.

6. A MAXIMUM OF 66 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 74,580 POUNDS, CAN BE LOADED IN A 50'-6" LONG CAR, AND A MAXIMUM OF 72 PALLET UNITS, FOR A LADING WEIGHT OF APPROXIMATELY 81,360 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.

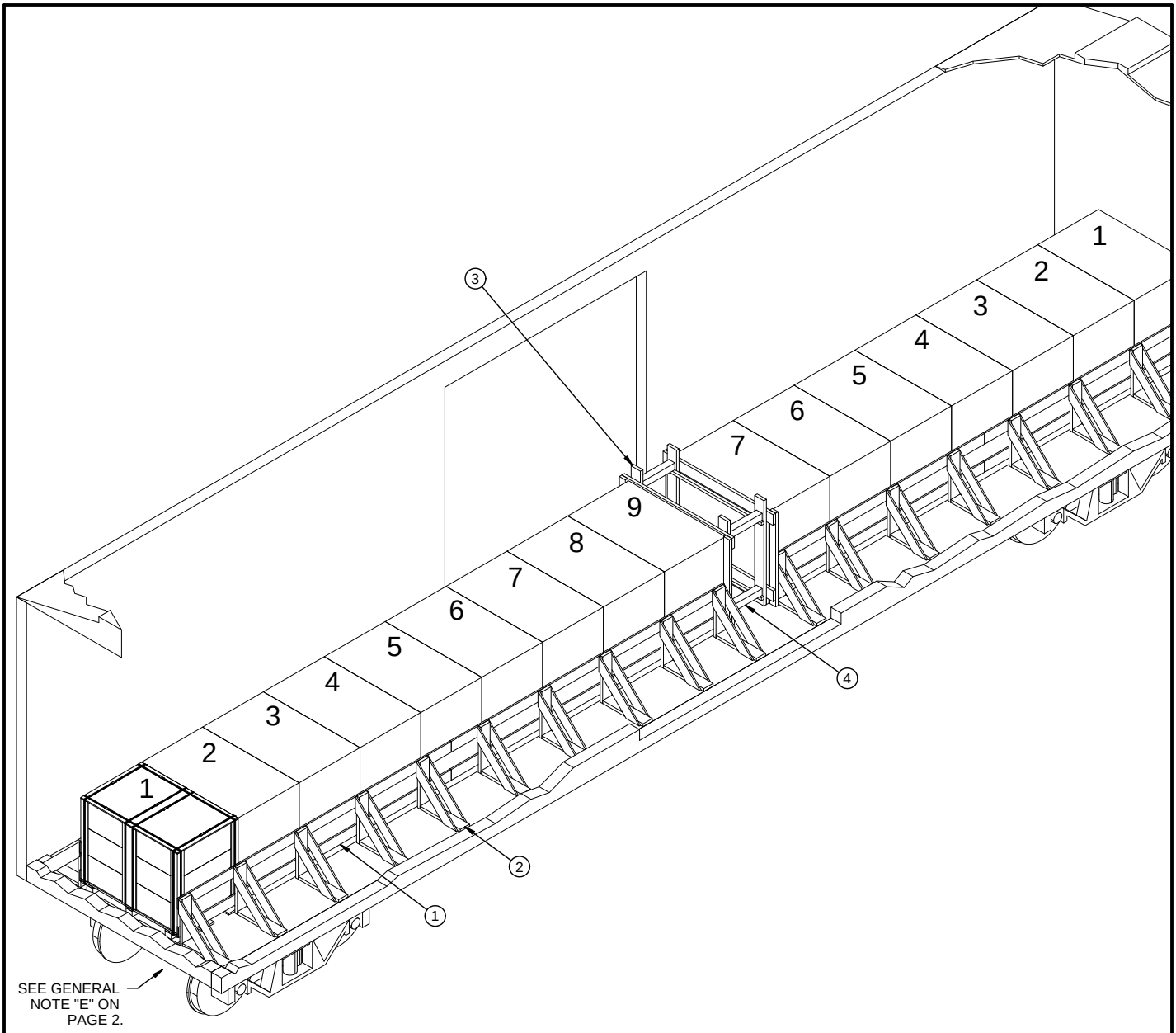
**BILL OF MATERIAL**

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 1″ X 6″ | 80 | 40 |
| 2″ X 3″ | 16 | 8 |
| 2″ X 4″ | 535 | 356 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2″) | 24 | 1/4 |
| 10d (3″) | 256 | 4 |

**LOAD AS SHOWN**

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| PALLET UNIT | 48 | 54.240 LBS |
| DUNNAGE | | 813 LBS |
| TOTAL WEIGHT | | 55,053 LBS (APPROX) |

**48-UNIT LOAD IN A 40'-6" LONG BY 9'-2" WIDE BOXCAR EQUIPPED WITH LOAD DIVIDER BULKHEADS**




**ISOMETRIC VIEW**

## KEY NUMBERS

① HORIZONTAL PIECE, 1" X 6" BY A LENGTH TO SUIT (8 REQD). NAIL TO THE VERTICAL PIECES OF THE LCL BRACES W/3-6d NAILS AT EACH JOINT PRIOR TO PLACEMENT AGAINST THE LADING. SEE THE "LCL BRACE" DETAIL ON PAGE 15 FOR HEIGHT LOCATION GUIDANCE.

② LCL BRACE (36 REQD). SEE THE DETAIL ON PAGE 15. NAIL TO THE CAR FLOOR W/7-16d NAILS. INSTALL AS DEPICTED, AT THE STRONG POINTS OF THE PALLET UNITS. SEE GENERAL NOTE "S.1" ON PAGE 3 AND SPECIAL NOTE 3 ON PAGE 15.

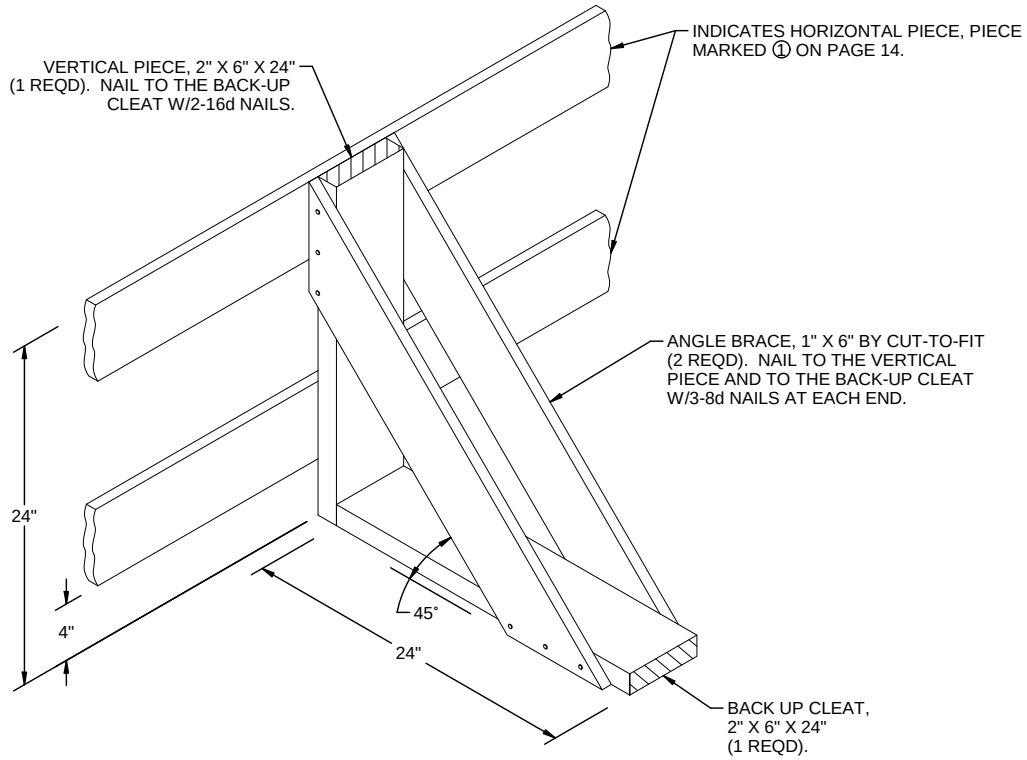
③ CENTER GATE D (2 REQD). SEE THE DETAIL ON PAGE 30.

④ STRUT, 4" X 4" BY CUT-TO-FIT (REF: 20") (4 REQD). TOENAIL TO THE CENTER GATES W/2-16d NAILS AT EACH END. SEE GENERAL NOTES "S.3" AND "S.4" ON PAGE 3 AND THE "BEVEL-CUT" DETAIL ON PAGE 5.

**TYPICAL LCL USING A 1-WIDE LOADING METHOD**

**SPECIAL NOTES:**

1. A 16 PALLET UNIT "B" LOAD IS SHOWN IN A 50'-6" LONG BY 9'-2" WIDE WOOD-LINED CONVENTIONAL BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS. A 17 PALLET UNIT "A" LOAD IS ALSO POSSIBLE IN AN IDENTICAL SIZED BOXCAR. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.
2. A 1-WIDE CROSSWISE LOAD IN A 50'-6" LONG CAR IS SHOWN AS TYPICAL. THE DEPICTED PROCEDURES ARE ALSO APPLICABLE FOR A LENTHWISE LOAD IN A 50'-6" LONG CAR, OR CROSSWISE OR LENGTHWISE LOADS IN A 40'-6" OR 60'-8" LONG CARS.
3. TWO LCL BRACES WILL BE USED AT EACH SIDE OF EACH PALLET UNIT. THE BRACES WILL BE LOCATED AT THE EDGES OF THE PALLET UNITS. ONE LCL BRACE WILL SUPPORT TWO PALLET UNITS, EXCEPT AT THE ENDS OF THE CAR.
4. THE BILL OF MATERIAL AND LOAD AS SHOWN ARE BASED ON THE DEPICTED UNIT POSITIONING AND THEREFORE ARE ONLY TYPICAL.




**LCL BRACE**

| BILL OF MATERIAL | | |
|---|---|---|
| **LUMBER** | **LINEAR FEET** | **BOARD FEET** |
| 1″ X 6″ | 397 | 199 |
| 2″ X 2″ | 19 | 6 |
| 2″ x 3″ | 4 | 2 |
| 2″ X 4″ | 26 | 17 |
| 2″ X 6″ | 184 | 184 |
| 4″ X 4″ | 7 | 9 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2″) | 216 | 1-1/2 |
| 8d (2-1/2″) | 432 | 4-1/2 |
| 10d (3″) | 84 | 1-1/2 |
| 16d (3-1/2″) | 356 | 7-3/4 |

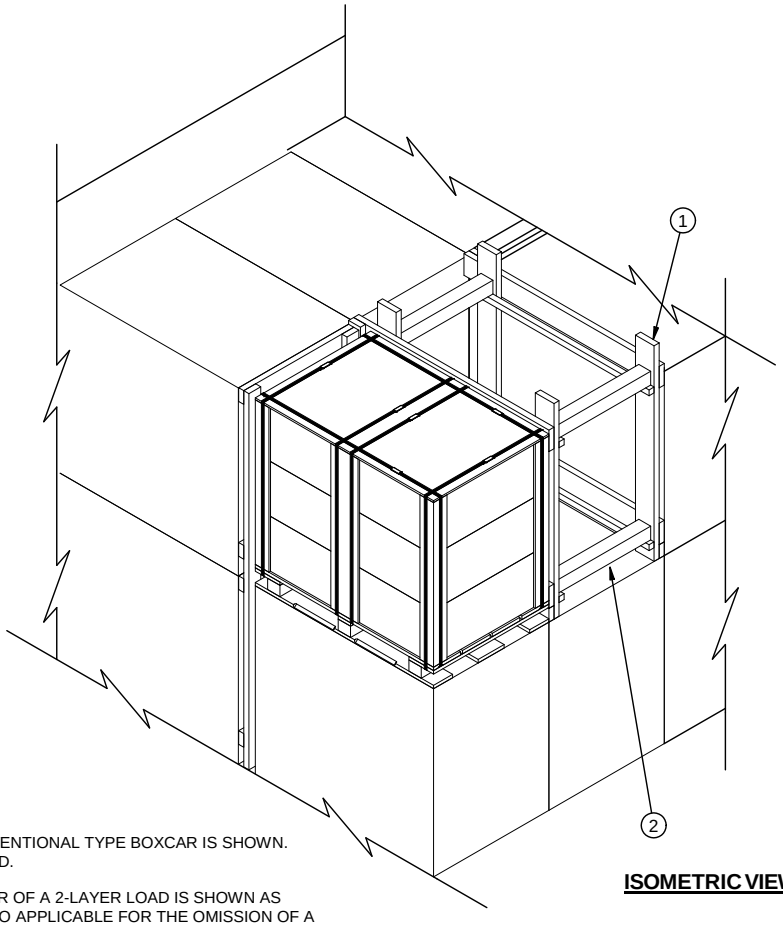
**LOAD AS SHOWN**

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| PALLET UNIT | 16 | 18,080 LBS |
| DUNNAGE | | 849 LBS |
| TOTAL WEIGHT | | 18,929 LBS (APPROX) |

**TYPICAL LCL USING A 1-WIDE LOADING METHOD**



**PROJECT CA 298-93**




**ISOMETRIC VIEW**

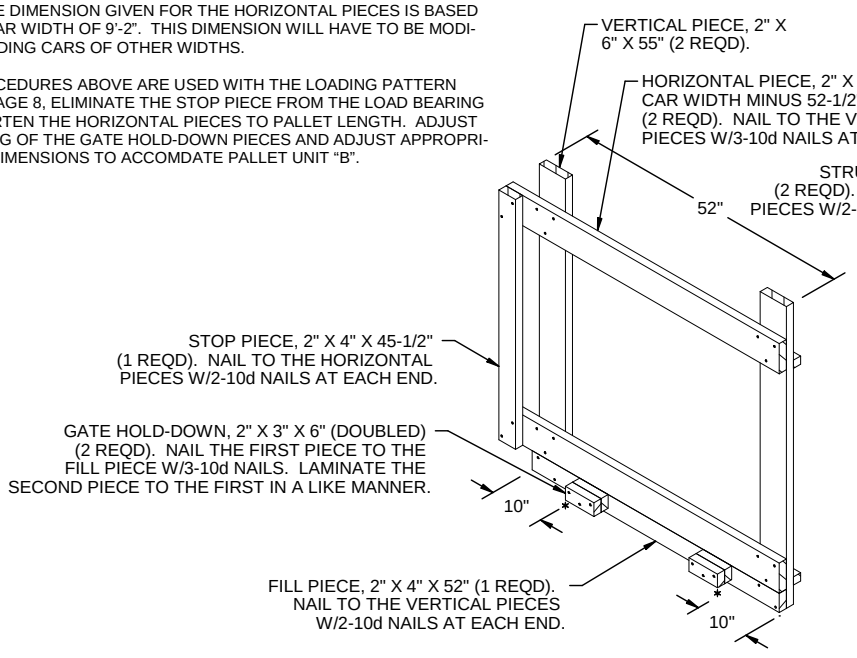
**SPECIAL NOTES:**

1. A PARTIAL VIEW OF A 9'-2" WIDE CONVENTIONAL TYPE BOXCAR IS SHOWN. CARS OF OTHER WIDTHS CAN BE USED.
2. A UNIT OMITTED FROM THE TOP LAYER OF A 2-LAYER LOAD IS SHOWN AS TYPICAL. THE PROCEDURES ARE ALSO APPLICABLE FOR THE OMISSION OF A PALLET UNIT FROM A 1-LAYER LOAD.
3. THE OMITTED-UNIT PROCEDURE SHOULD BE APPLIED NEAR THE CENTER OF THE CAR LENGTH, BUT NOT IN THE DOORWAY AREA. ALSO, THERE SHOULD BE AT LEAST ONE LOAD UNIT BETWEEN THE OMITTED UNIT AND A CENTER GATE.
4. ONLY BLOCKING AND BRACING FOR THE OMITTED UNIT IS SHOWN; REFER TO PAGE 6 FOR THE BLOCKING AND BRACING REQUIREMENTS FOR THE BALANCE OF THE LOAD.
5. THE REFERENCE DIMENSION GIVEN FOR THE HORIZONTAL PIECES IS BASED ON AN INSIDE CAR WIDTH OF 9'-2". THIS DIMENSION WILL HAVE TO BE MODIFIED WHEN LOADING CARS OF OTHER WIDTHS.
6. WHEN THE PROCEDURES ABOVE ARE USED WITH THE LOADING PATTERN DEPICTED ON PAGE 8, ELIMINATE THE STOP PIECE FROM THE LOAD BEARING GATE AND SHORTEN THE HORIZONTAL PIECES TO PALLET LENGTH. ADJUST THE POSITIONING OF THE GATE HOLD-DOWN PIECES AND ADJUST APPROPRIATE VERTICAL DIMENSIONS TO ACCOMDATE PALLET UNIT "B".

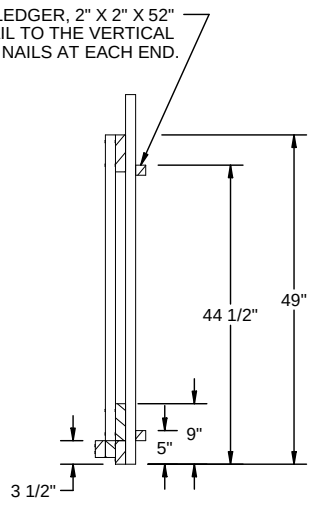
## KEY NUMBERS

① LOAD BEARING GATE (2 REQD, ONE RIGHT HAND AND ONE LEFT HAND). SEE THE DETAIL BELOW AND SPECIAL NOTES 5 AND 6 AT LEFT.

② STRUT, 4" X 4" X 28" (4 REQD). TOENAIL TO VERTICAL PIECES OF LOAD BEARING GATE W/2-16d NAILS AT EACH END.




**LOAD BEARING GATE**



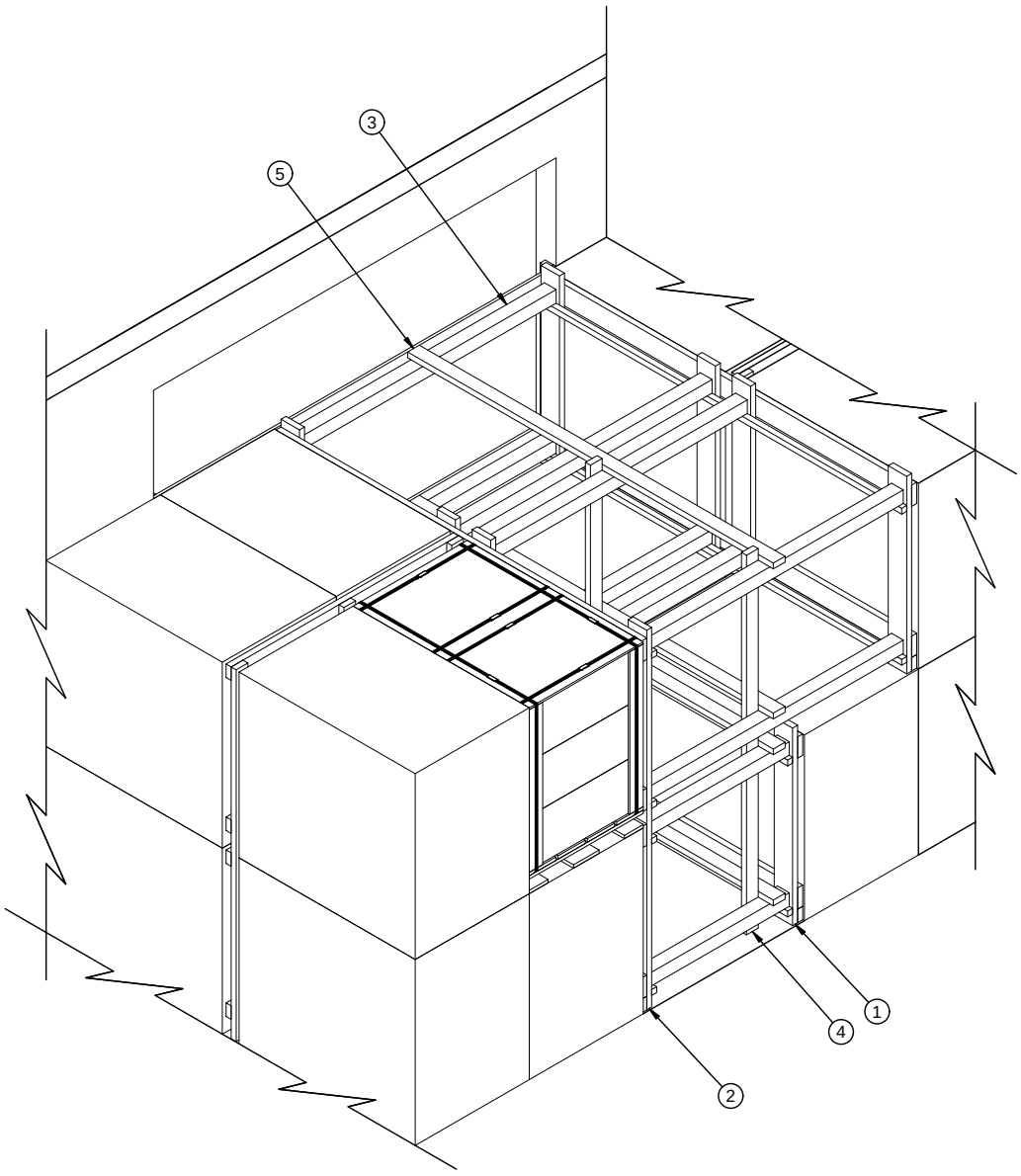

**END VIEW**

SEE SPECIAL NOTES 5 AND 6 ABOVE.

**TYPICAL LCL- ONE PALLET UNIT OMITTED FROM THE TOP LAYER OF A LOAD**



**PROJECT CA 298-93**




**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. ONLY THE CENTER PORTION OF A 50'-6" LONG BY 9'-2" WIDE CONVENTIONAL TYPE BOXCAR IS SHOWN TO PORTRAY THE STRUTTED GATE METHOD OF PARTIAL-LAYER BRACING. CARS OF OTHER WIDTHS AND CARS OF OTHER LENGTHS CAN ALSO BE USED.
2. ONLY THE BLOCKING AND BRACING PIECES WHICH ARE NECESSARY TO PERMIT THE OMISSION OF THE UNITS FROM THE TOP LAYER ARE SHOWN. REFER TO PAGE 6 FOR LATERAL BRACING AND DOORWAY PROTECTION REQUIREMENTS.
3. STRUT BRACING SHOULD BE LOCATED AS NEAR AS POSSIBLE TO THE CENTER OF THE STRUTS, BUT SHOULD NOT BE LOCATED SUCH THAT ANY UNBRACED SPAN OF STRUT LENGTH EXCEEDS 48".

## KEY NUMBERS

① CENTER GATE FOR 1-HIGH (2 REQD). SEE THE "CENTER GATE A" DETAIL ON PAGE 28.

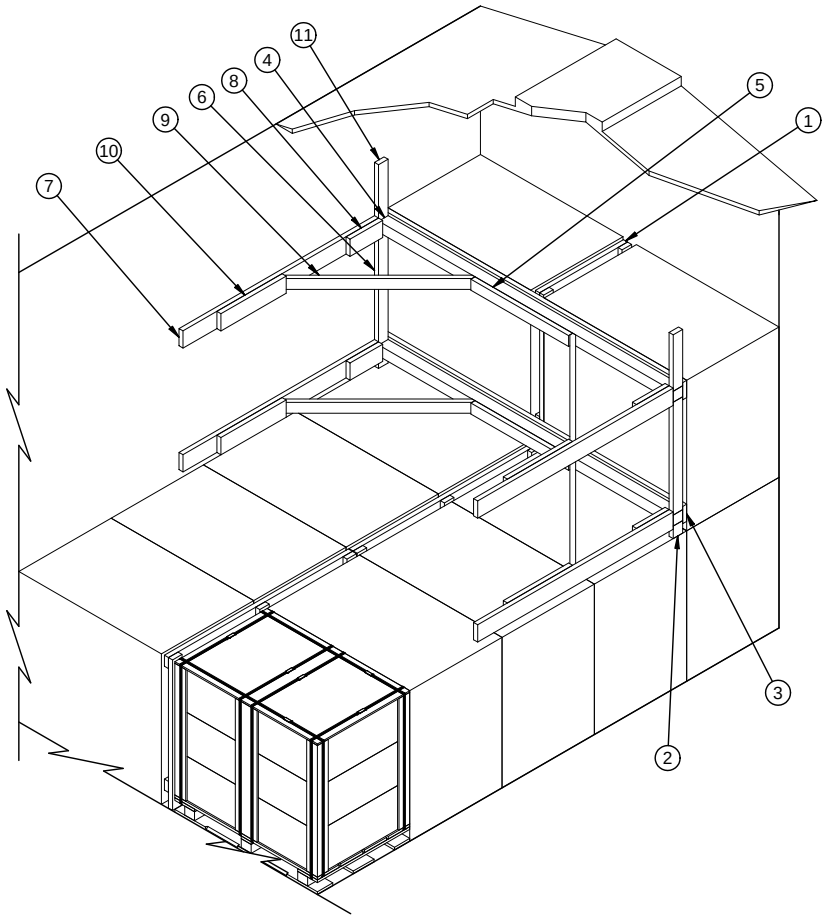
② CENTER GATE FOR 2-HIGH (1 REQD). SEE THE "CENTER GATE A" DETAIL ON PAGE 28.

③ STRUT, 4" X 4" BY CUT-TO-FIT (16 REQD). POSITION BETWEEN CENTER GATES IN THE FIRST AND SECOND LAYERS AND TOENAIL W/2-16d NAILS AT EACH JOINT. SEE GENERAL NOTES "S.3" AND "S.4" ON PAGE 3 AND THE "BEVEL-CUT" DETAIL ON PAGE 5.

④ VERTICAL STRUT BRACING, 2" X 4" X 8'-2" (4 REQD). NAIL TO THE STRUTS W/3-10d NAILS AT EACH JOINT. SEE SPECIAL NOTE 3 AT LEFT AND GENERAL NOTE "S.3" ON PAGE 3.

⑤ HORIZONTAL STRUT BRACING, 2" X 4" BY CAR WIDTH MINUS 1" IN LENGTH (4 REQD). NAIL TO THE STRUTS W/3-10d NAILS AT EACH JOINT. SEE SPECIAL NOTE 3 AT LEFT AND GENERAL NOTE "S.3" ON PAGE 3.

**TYPICAL LCL USING STRUTTED-GATE METHOD OF PARTIAL-LAYER BRACING**




**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A 9'-2" WIDE CONVENTIONAL WOOD-LINED BOXCAR IS SHOWN. WOOD-LINED CARS OF OTHER WIDTHS CAN BE USED.
2. PARTIAL-LAYER BRACING MAY BE APPLIED FOR ANY OF THE CONVENTIONAL CARLOADS DEPICTED HEREIN. IF ONLY ONE PALLET UNIT IS TO BE SHIPPED IN A PARTIAL SECOND LAYER, IT WILL BE POSITIONED DIRECTLY ABOVE THE LOWER PALLET UNIT. FOR A PARTIAL FIRST LAYER, POSITION THE PALLET UNIT IN ONE CORNER. PROVIDE LATERAL BRACING BY APPLYING VERTICALLY POSITIONED DOUBLED 2" X 4" X 48" LONG PIECES TO THE CAR ENDWALL AND TO THE K-BRACE. NAIL TO THE CAR ENDWALL W6/12d NAILS ON EACH LAYER. THE FIRST PIECE APPLIED TO THE K-BRACE WILL BE NAILED TO THE HORIZONTAL PIECE W/6-12d NAILS AT EACH JOINT. LAMINATE THE SECOND PIECE W/6-12d NAILS.
3. THE K-BRACE METHOD OF PARTIAL-LAYER (TIER) BRACING SHOWN MAY BE USED IN WOOD-LINED CARS FOR THE SECUREMENT OF A PARTIAL SECOND OR FIRST TIER. THE TYPE "A" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 8,000 LBS (SEVEN PALLET UNITS). IF IT IS NECESSARY TO BRACE MORE THAN SEVEN PALLET UNITS, REFER TO THE DETAILS ON PAGES 19 OR 20 FOR SELECTION OF THE APPLICABLY SIZED K-BRACE TO USE AND THE DESIGN SPECIFICATIONS FOR THE BRACE.
4. THE CENTER CLEAT WILL BE 28" LONG FOR AN 8'-6" WIDE CAR, 36" LONG FOR A 9'-2" WIDE CAR, AND 38" LONG FOR A 9'-4" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.

## KEY NUMBERS

① CENTER FILL ASSEMBLY (1 REQD, 1-PALLET UNIT LONG AND 2 PALLET UNITS HIGH). SEE THE DETAIL ON PAGE 28. NOTE THAT THE QUANTITY IS ONLY FOR THE PARTIAL-TIER UNITS.

② SUPPORT CLEAT, 2" X 4" X 4" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO ALIGN THE HORIZONTAL PIECE AND CROSS CAR BRACE WITH THE BOTTOM OF THE LOWEST CONTAINERS IN THE PALLET UNITS. NAIL TO THE CAR SIDEWALL W/2-12d NAILS.

③ HORIZONTAL PIECE, 2" X 6" BY CAR WIDTH IN LENGTH (CUT TO FIT) (2 REQD). NAIL TO THE CROSS CAR BRACE W/1-12d NAIL EVERY 6".

④ CROSS CAR BRACE, 4" X 4" BY CAR WIDTH IN LENGTH (CUT TO FIT) (2 REQD).

⑤ CENTER CLEAT, 2" X 4" X 36" (2 REQD). NAIL TO THE CROSS CAR BRACE W/7-16d NAILS. SEE SPECIAL NOTE 4 AT LEFT.

⑥ SPACER CLEAT, 2" X 4" X 36" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS. ADJUST TO 2" X 4" X 35-1/4" FOR PALLET UNIT "B".

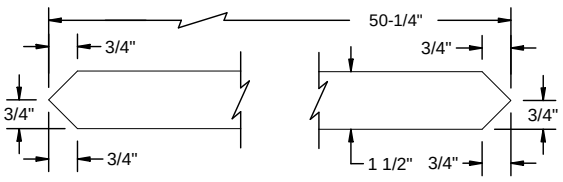
⑦ HORIZONTAL WALL CLEAT, 2" X 6" X 72" (4 REQD). NAIL TO THE CAR SIDEWALL W/16-12d NAILS.

⑧ POCKET CLEAT, 2" X 6" X 12" (2 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/4-16d NAILS.

⑨ DIAGONAL BRACE, 2" X 4" X 50-1/4" (4 REQD). SEE THE DETAIL AT LEFT FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE CROSS CAR BRACE AND TO THE HORIZONTAL WALL CLEAT W/2-16d NAILS AT EACH END.

⑩ BACK-UP CLEAT, 2" X 6" X 24" (4 REQD). NAIL TO THE HORIZONTAL WALL CLEAT W/8-16d NAILS.

⑪ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.




**DIAGONAL BRACE**

**TYPICAL LCL USING K-BRACE METHOD OF PARTIAL-LAYER BRACING**



**PROJECT CA 298-93**

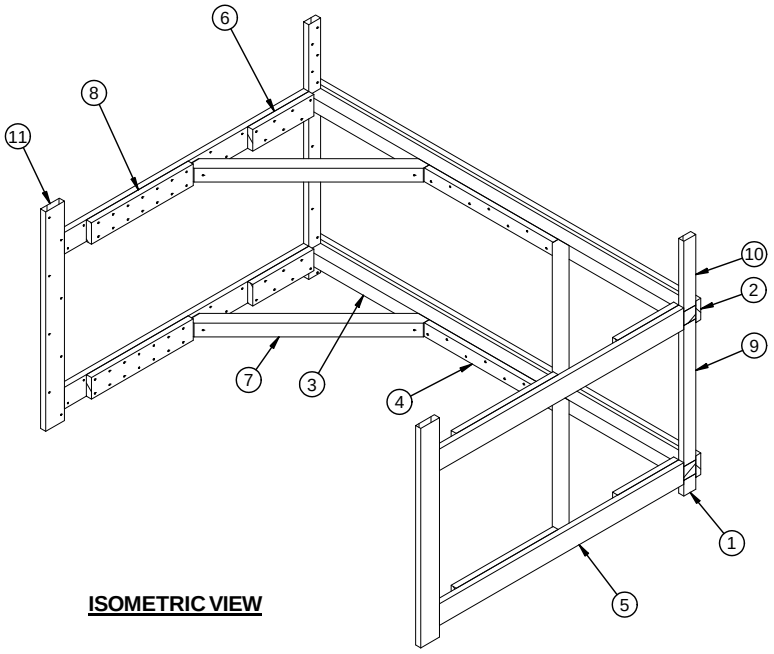
**SPECIAL NOTES:**

1. THE TYPE "B" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 14,000 POUNDS (12 PALLET UNITS). IF IT IS NECESSARY TO BLOCK MORE THAN 12 PALLET UNITS, THE TYPE "C" K-BRACE DEPICTED ON PAGE 20 MAY BE USED. IF LESS THAN EIGHT PALLET UNITS ARE TO BE SHIPPED IN THE PARTIAL LAYER, THE TYPE "A" K-BRACE DEPICTED ON PAGE 18 MAY BE USED.

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. PIECES MARKED ①, ②, ③, ⑥, ⑨, ⑩ AND ⑪ 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 49-1/8" LONG IN LIEU OF 50-1/4" 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" WIDE CAR, AND 38" LONG FOR A 9'-4" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.

4. REFER TO PAGE 18 FOR A TYPICAL INSTALLATION OF A K-BRACE.




**ISOMETRIC VIEW**

## KEY NUMBERS

① SUPPORT CLEAT, 2" X 4" X 4" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO ALIGN WITH THE BOTTOM OF THE LOWEST CONTAINERS IN THE PALLET UNITS. NAIL TO THE CAR SIDEWALL W/2-12d NAILS.

② LOAD BEARING PIECE, 2" X 6" BY CAR WIDTH IN LENGTH (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.

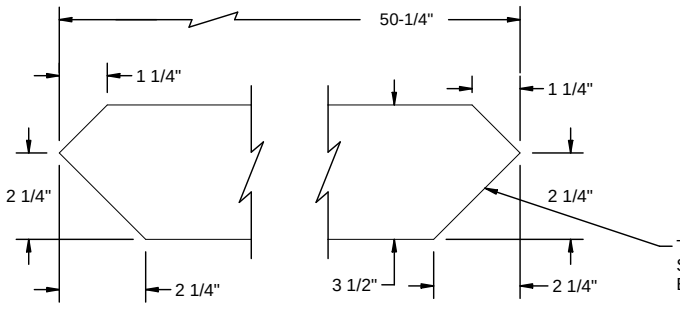
⑦ DIAGONAL BRACE, 4" X 4" X 50-1/4" (4 REQD). SEE THE DETAIL BELOW FOR BEVEL CUTS REQURED. TOENAIL TO THE CROSS CAR BRACE AND TO THE HORIZONTAL WALL CLEAT W/1-60d NAIL AT EACH END.

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 36" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS. ADJUST TO 2" X 4" X 35-1/4" FOR PALLET UNIT "B".

⑩ HOLD-DOWN CLEAT, 2" X 6" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.

⑪ VERTICAL BACK-UP CLEAT, 2" X 6" X 56" (2 REQD). NAIL TO THE CAR SIDEWALL W/8-12d NAILS.



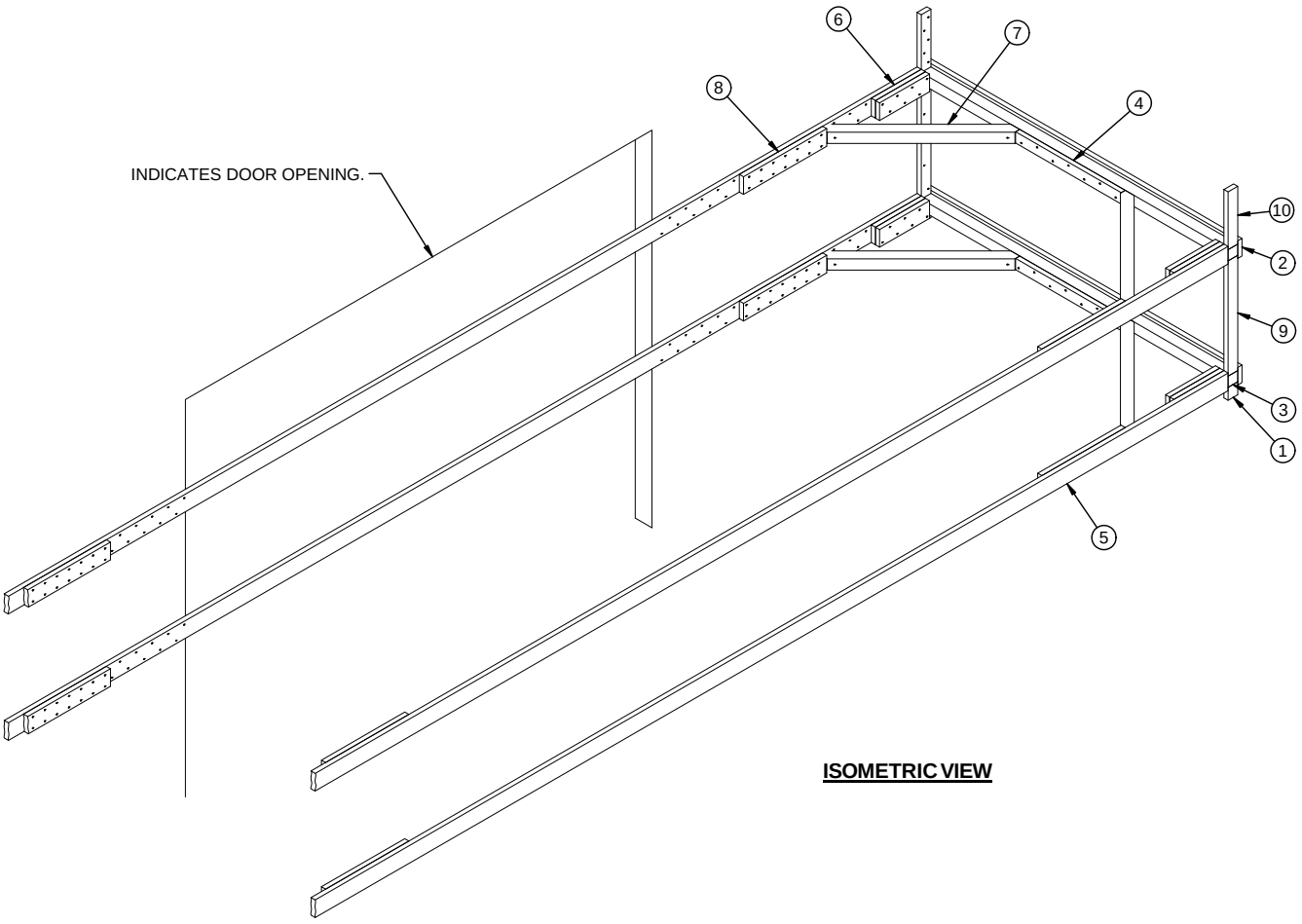

**DIAGONAL BRACE**

SEE SPECIAL NOTE 2 ABOVE.

**TYPE "B" K-BRACE**



**PROJECT CA 298-93**




**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 (18 PALLET UNITS). IF IT IS NECESSARY TO BRACE FEWER THAN 18 PALLET UNITS, REFER TO THE DETAILS ON PAGES 18 AND 19 FOR SELECTION OF THE APPLICABLEY SIZED K-BRACE TO USE AND THE DESIGN SPECIFICATIONS FOR THE BRACE.

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. PIECES MARKED ①, ②, ③, ⑥, ⑨, AND ⑩ MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDEWALL. IT IS ALRIGHT FOR THE ENDS OF THE DIAGONAL BRACES MARKED ⑦ TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT PIECE MARKED ⑤ 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 49-1/8" LONG IN LIEU OF 50-1/4" WHEN PIECE MARKED ⑤ IS DOUBLED.

3. THE CENTER CLEAT WILL BE 28" LONG FOR AN 8'-6" WIDE CAR, 36" LONG FOR A 9'-2" WIDE CAR, 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 HORIZONTAL WALL CLEATS, THE QUANTITIES SPECIFIED ARE APPLICABLE ONLY FOR THE BRACE IN ONE END.

## KEY NUMBERS

① SUPPORT CLEAT, 2" X 4" X 4" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO ALIGN THE LOAD BEARING PIECE AND CROSS CAR BRACE WITH THE BOTTOM OF THE LOWEST CONTAINERS IN THE PALLET UNITS. NAIL TO THE CAR SIDEWALL W/2-12d 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 IN LENGTH (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 OPENING TO CONTACT THE CROSS CAR BRACE OF THE K-BRACE IN THE OPPOSITE END OF THE CAR. NAIL TO THE CAR SIDEWALL W/40-12d NAILS.

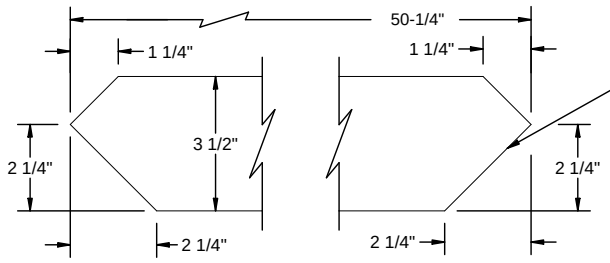
⑥ POCKET CLEAT, 2" X 6" X 18" (4 REQD). NAIL THE FIRST PIECE TO THE HORIZONTAL WALL CLEAT W/7-16d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.

⑦ DIAGONAL BRACE, 4" X 4" X 50-1/4" (4 REQD). SEE THE DETAIL BELOW FOR BEVEL CUTS REQURED. 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 36" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS. ADJUST TO 2" X 4" X 35-1/4" FOR PALLET UNIT "B".

⑩ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.



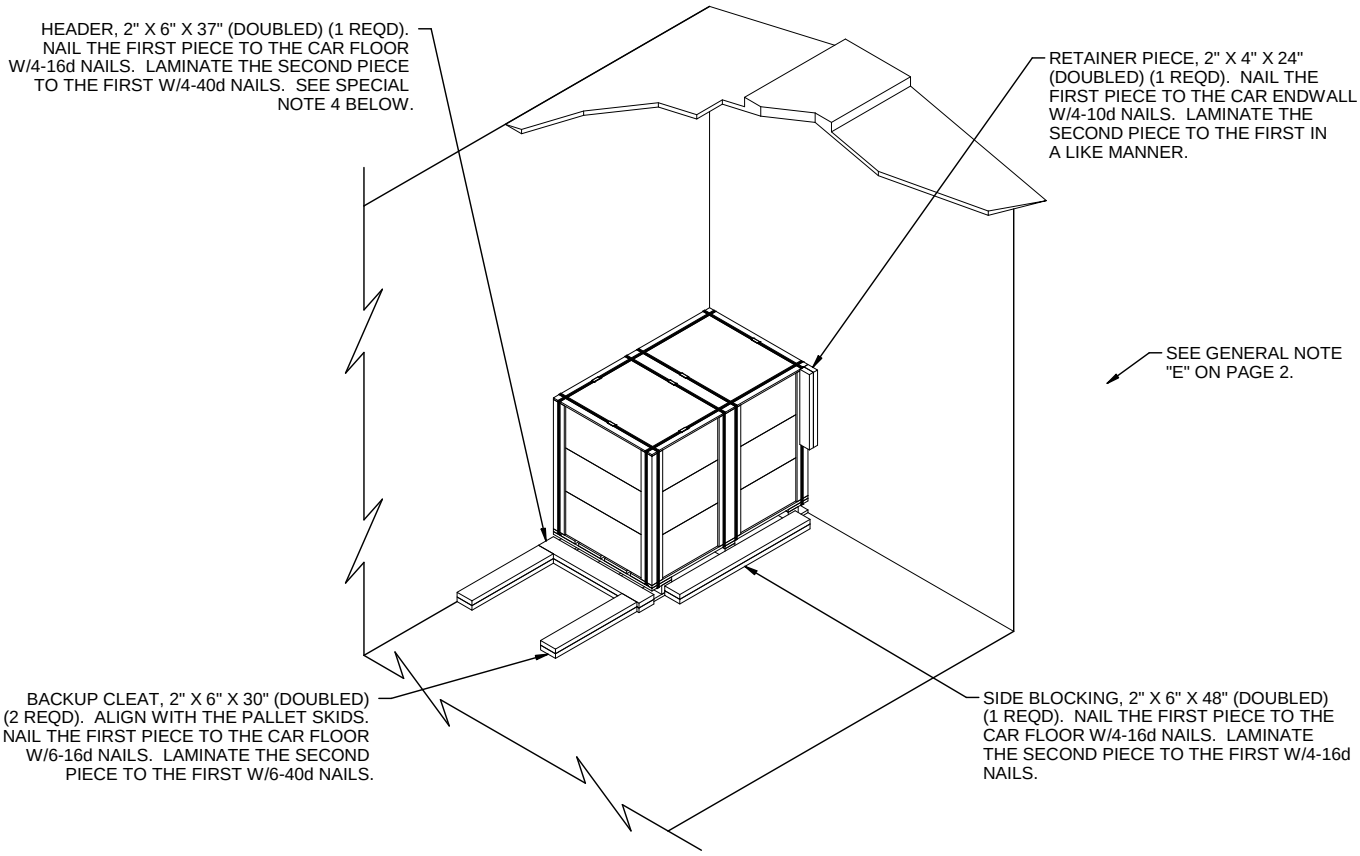

**DIAGONAL BRACE**

SEE SPECIAL NOTE 2 ABOVE.

**TYPE "C" K-BRACE**



**PROJECT CA 298-93**

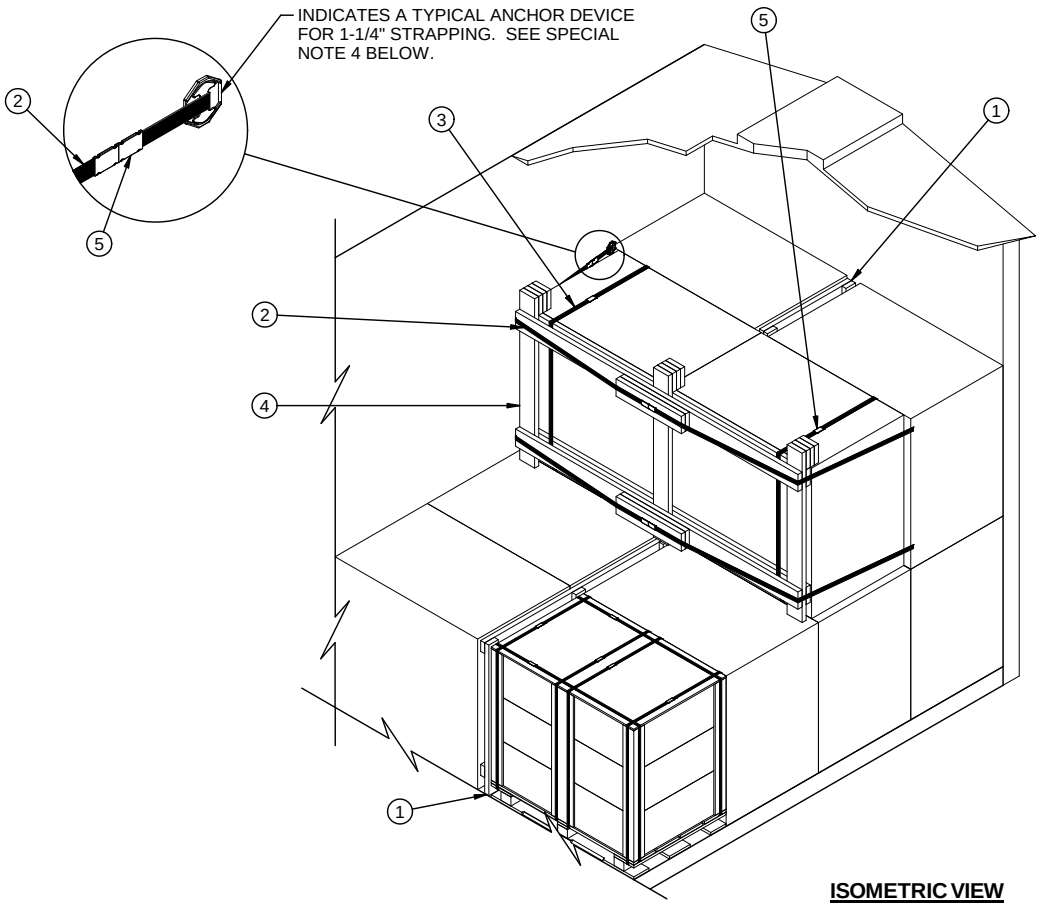



**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A WOOD-LINED CONVENTIONAL TYPE BOXCAR HAVING A WOOD OR NAILABLE METAL FLOOR IS SHOWN. CARS OF OTHER WIDTHS CAN BE USED. SEE GENERAL NOTE "S.1" ON PAGE 3.
2. THE LOAD SHOWN DEPICTING THE FLOORLINE BLOCKING METHOD OF PARTIAL-LAYER BRACING IS TYPICAL. THE PROCEDURES ARE ALSO APPLICABLE FOR OTHER QUANTITIES AS LONG AS THE CAPACITY OF THE BACKUP CLEATS IS NOT EXCEEDED. SEE SPECIAL NOTE 3.
3. EACH SET OF TWO BACKUP CLEATS APPLIED FOR LONGITUDINAL BRACING WILL RETAIN 9,000 POUNDS OF LADING. THE DEPICTED PROCEDURE MAY NOT BE APPLIED FOR PALLET UNITS ROTATED 90° FROM WHAT IS DEPICTED ABOVE, I.E., DO NOT USE THESE PROCEDURES TO LOAD PALLET UNITS WITH THE 52-1/2" OR 57-1/2" DIMENSION ACROSS THE WIDTH OF THE BOXCAR.
4. THE POSITIONING OF A UNIT IS OPTIONAL. UNITS MAY BE LOCATED IN THE CENTER OF THE BOXCAR, ALTHOUGH THIS WILL REQUIRE THE INSTALLATION OF ADDITIONAL SIDE BLOCKING AND RETAINER PIECES. WHEN LOADING A PALLET UNIT AWAY FROM THE SIDEWALL OF THE BOXCAR, LENGTHEN THE HEADER TO 40" AND CENTER ON THE PALLET UNIT LENGTH.
5. MORE THAN ONE PALLET UNIT CAN BE SHIPPED, PROVIDING THE CAPACITY OF THE BACKUP CLEATS IS NOT EXCEEDED. THE LOAD SHOULD BE FORMED IN ROWS, WITH THE UNITS POSITIONED AGAINST OPPOSITE SIDEWALLS. THE SIDE FILL ASSEMBLY, AS DEPICTED ON PAGE 30, OR NAILED SIDE BLOCKING, WILL BE INSTALLED BETWEEN THE LATERALLY ADJACENT UNITS, DEPENDING ON THE SIZE OF THE VOID.

**TYPICAL LCL USING FLOORLINE BLOCKING METHOD OF PARTIAL-LAYER BRACING**




**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A 9'-2" WIDE ALL-METAL BOXCAR EQUIPPED WITH STRAP ANCHOR DEVICES AND HAVING AN AAR MECHANICAL DESIGNATION CLASS OF XL IS SHOWN. CARS OF OTHER WIDTHS CAN BE USED.

2. PALLET UNIT "A" IS SHOWN IN THE LOAD ABOVE. PALLET UNIT "B" CANNOT BE LOADED IN THIS CONFIGURATION.

3. THE PALLET UNITS THAT ARE IMMEDIATELY ADJACENT TO THE BULKHEAD GATE SHOULD BE LOADED SO AS TO BE LATERALLY ADJACENT TO EACH OTHER, WITH NO LATERAL SPACE BETWEEN PALLET UNITS. ALL OTHER PALLET UNITS DEPICTED IN THE LOAD ABOVE WILL BE LOADED IN ACCORDANCE WITH THE PROCEDURES DEPICTED ON PAGE 6, I.E., WITH LATERAL SPACE BETWEEN PALLET UNITS AND FILLER ASSEMBLIES INSTALLED IN THE SPACE. THIS WILL NECESSITATE THE USE OF VARIOUS COMBINATIONS OF 1 AND 2-PALLET UNIT HIGH AND 1 AND 2-PALLET UNIT LONG FILLER ASSEMBLIES, AS DESCRIBED AT RIGHT. FOR THE DUNNAGE REQUIREMENTS FOR THE REMAINDER OF THE LOAD, REFER TO PAGE 6.

4. A BULKHEAD GATE USED IN CONJUNCTION WITH TWO BULKHEAD STRAPS WILL RETAIN UP TO 5,000 POUNDS (FOUR PALLET UNITS).

5. THE ANCHOR DEVICES TO BE USED FOR THE ATTACHMENT OF THE BULKHEAD STRAPS MUST BE LOCATED AT LEAST 36" TOWARD THE CAR ENDWALL FROM THE OPPOSITE-THE-LOAD SIDE OF THE BULKHEAD GATE. IF THE ANCHOR DEVICES IN THE CAR BEING LOADED ARE NOT LOCATED NEAR ENOUGH TO THE END OF THE CAR SO THAT THE 36" REQUIREMENT CAN BE SATISFIED, IT WILL BE NECESSARY TO INSTALL GATES AND STRUTS AT THE END OF THE CAR. THESE GATES WILL BE 1-HIGH GATES FOR THE ITEM BEING LOADED AND WILL BE INSTALLED SIMILAR TO THE STRUTTED GATE METHOD SHOWN ON PAGE 17 FOR AN EVEN QUANTITY OF UNITS, OR THE OMITTED PALLET UNIT PROCEDURES ON PAGE 16 FOR A SINGLE UNIT.

6. 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 DETAIL OF THE BULKHEAD GATE ON PAGE 23 FOR THE LOCATION OF THE STRAPPING BOARDS IN RELATION TO THE LOCATION OF THE HORIZONTAL PIECES. THE STRAPPING BOARDS 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 CONTAINERS.

7. THE PROPER BULKHEAD GATE TO BE USED FOR A LOAD WILL BE DEPENDENT UPON THE CONFIGURATION OF THE LOAD. BULKHEAD GATE "A" IS FOR USE AGAINST A 2-WIDE PORTION OF A LOAD, AS DEPICTED ABOVE, AND BULKHEAD GATE "B" IS FOR USE AGAINST A 3-WIDE PORTION OF A LOAD, AS DEPICTED ON PAGE 24.

## KEY NUMBERS

① CENTER FILL ASSEMBLY (3 REQD, ONE 2-PALLET UNIT LONG AND 1-PALLET UNIT HIGH ASSEMBLY, ONE 1-PALLET UNIT LONG AND 1-PALLET UNIT HIGH ASSEMBLY, AND ONE 1-PALLET UNIT LONG AND 2-PALLET UNIT HIGH ASSEMBLY). SEE THE DETAIL ON PAGE 28. INSTALL THE 2-PALLET UNIT LONG AND 1-PALLET UNIT HIGH ASSEMBLY BETWEEN THE ONE HIGH PALLET UNITS LOCATED TOWARDS THE CENTER OF THE CAR. INSTALL THE 1-PALLET UNIT LONG AND 1-PALLET UNIT HIGH ASSEMBLY BETWEEN THE LOWER LAYER OF THE PALLET UNITS LOCATED UNDER THE PALLET UNITS IMMEDIATELY ADJACENT TO THE BULKHEAD GATE. INSTALL THE 1-PALLET UNIT LONG AND 2-PALLET UNIT HIGH ASSEMBLY BETWEEN THE TWO HIGH PALLET UNITS LOCATED AT THE END OF THE CAR. SEE SPECIAL NOTE 2 AT LEFT.

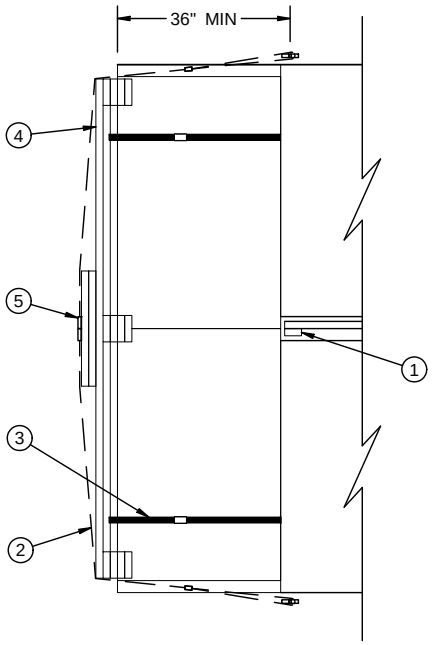
② BULKHEAD STRAP, 1-1/4" X .029" OR .031" OR .035" BY A LENGTH TO SUIT STEEL STRAPPING (2 REQD). INSTALL FROM TWO EQUAL LENGTH PIECES. SEE THE "STRAP APPLICATION PLAN VIEW" ON PAGE 23 FOR INSTALLATION GUIDANCE. SEE SPECIAL NOTES 3 AND 4 AT LEFT.

③ BUNDLING STRAP, 1-1/4" X .029" OR .031" OR .035" X 14'-0" LONG STEEL STRAPPING (2 REQD). ENCIRCLE THE PALLET UNIT AND THE HORIZONTAL PIECES OF THE BULKHEAD GATE. TENSION AND SEAL AFTER TENSIONING THE BULKHEAD STRAPS.

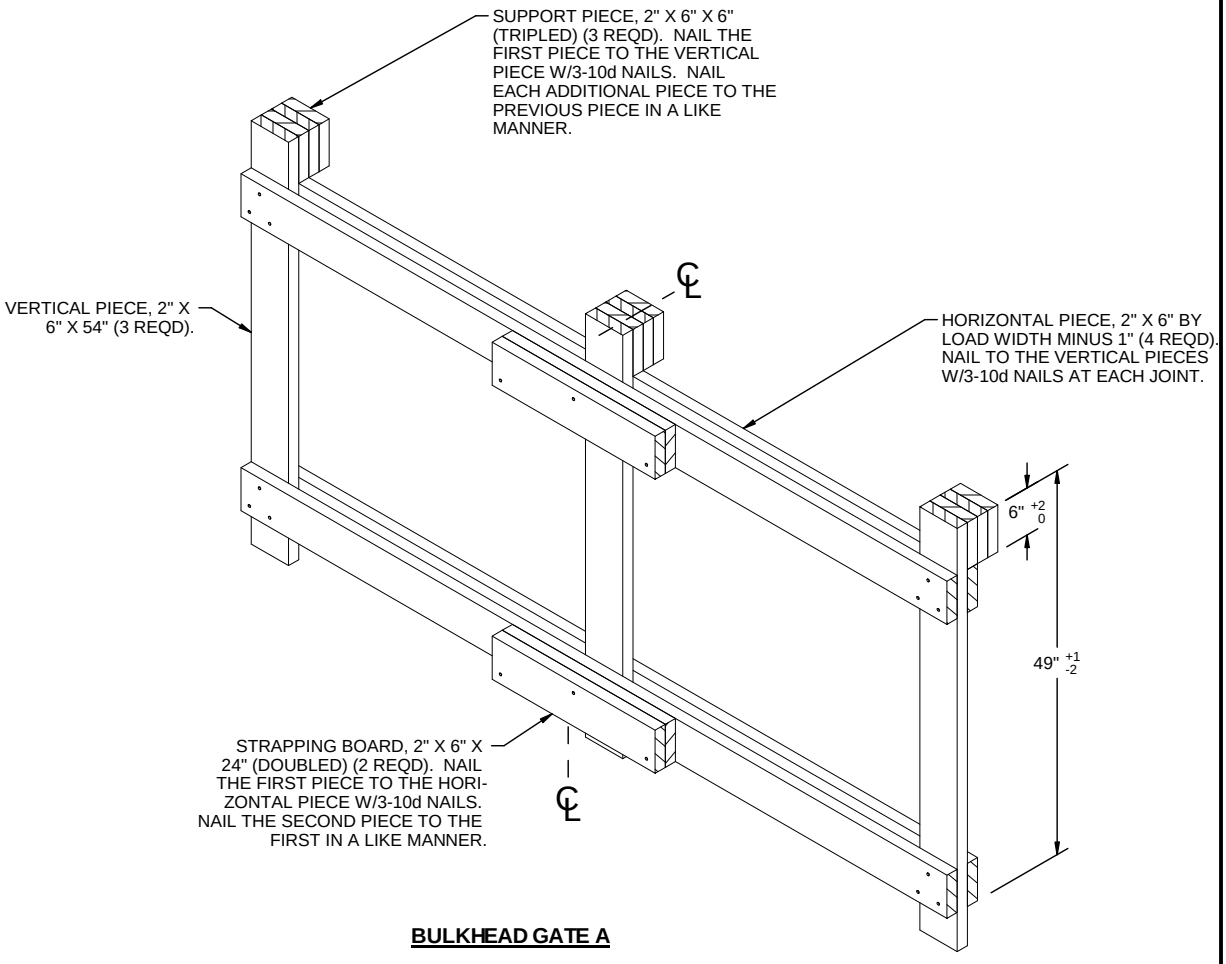
④ BULKHEAD GATE A (1 REQD). SEE THE DETAIL ON PAGE 23. SEE SPECIAL NOTES 3 AND 5 AT LEFT.

⑤ SEAL FOR 1-1/4" STEEL STRAPPING (10 REQD, 4 PER BULKHEAD STRAP AND 1 PER BUNDLING STRAP). DOUBLE CRIMP EACH SEAL.

**TYPICAL LCL USING BULKHEAD GATE METHOD OF PARTIAL-LAYER BRACING**



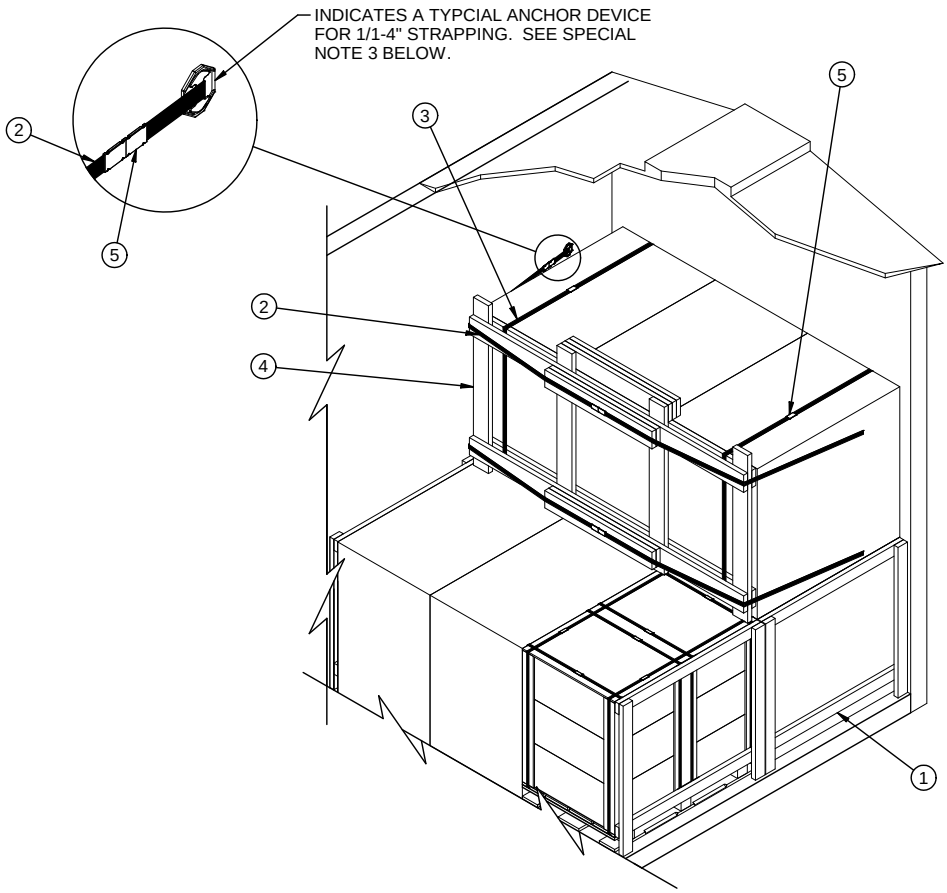

**STRAP APPLICATION PLAN VIEW**




**BULKHEAD GATE A**

(FOR USE IN RESTRAINING TWO ROWS OF PALLET UNITS)

**TYPICAL LCL USING BULKHEAD GATE METHOD OF PARTIAL-LAYER BRACING**




**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A 9'-2" WIDE ALL-METAL BOXCAR EQUIPPED WITH STRAP ANCHOR DEVICES AND HAVING AN AAR MECHANICAL DESIGNATION CLASS OF XL IS SHOWN. CARS OF OTHER WIDTHS CAN BE USED. PALLET UNIT "A" IS USED IN THE LOAD ABOVE. PALLET UNIT "B" CAN ALSO BE LOADED WITH THE SIDE FILL ASSEMBLIES ELIMINATED.

2. A BULKHEAD GATE USED IN CONJUNCTION WITH TWO BULKHEAD STRAPS WILL RETAIN UP TO 5,000 POUNDS (FOUR PALLET UNITS).

3. THE ANCHOR DEVICES TO BE USED FOR THE ATTACHMENT OF THE BULKHEAD STRAPS MUST BE LOCATED AT LEAST 36" TOWARD THE CAR ENDWALL FROM THE OPPOSITE-THE-LOAD SIDE OF THE BULKHEAD GATE. IF THE ANCHOR DEVICES IN THE CAR BEING LOADED ARE NOT LOCATED NEAR ENOUGH TO THE END OF THE CAR SO THAT THE 36" REQUIREMENT CAN BE SATISFIED, IT WILL BE NECESSARY TO INSTALL GATES AND STRUTS AT THE END OF THE CAR. THESE GATES WILL BE 1-HIGH GATES FOR THE ITEM BEING LOADED AND WILL BE INSTALLED SIMILAR TO THE STRUTTED GATE METHOD SHOWN ON PAGE 17 FOR AN EVEN QUANTITY OF UNITS, OR THE OMITTED PALLET UNIT PROCEDURES ON PAGE 16 FOR A SINGLE UNIT.

4. 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 DETAIL OF THE BULKHEAD GATE ON PAGE 25 FOR THE LOCATION OF THE STRAPPING BOARDS IN RELATION TO THE LOCATION OF THE HORIZONTAL PIECES. THE STRAPPING BOARDS 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 CONTAINERS.

5. THE PROPER BULKHEAD GATE TO BE USED FOR A LOAD WILL BE DEPENDENT UPON THE CONFIGURATION OF THE LOAD. BULKHEAD GATE "A" IS FOR USE AGAINST A 2-WIDE PORTION OF A LOAD, AS DEPICTED ON PAGE 22, AND BULKHEAD GATE "B" IS FOR USE AGAINST A 3-WIDE PORTION OF A LOAD, AS DEPICTED ABOVE.

## KEY NUMBERS

① SIDE FILL ASSEMBLY (4 REQD, ONE PALLET UNIT HIGH). SEE THE DETAIL ON PAGE 30. SEE SPECIAL NOTE 1.

② BULKHEAD STRAP, 1-1/4" X .031" OR .035" BY A LENGTH TO SUIT STEEL STRAPPING (2 REQD). INSTALL FROM TWO EQUAL LENGTH PIECES. SEE THE "STRAP APPLICATION PLAN VIEW" ON PAGE 25 FOR INSTALLATION GUIDANCE. SEE SPECIAL NOTES 2 AND 3 AT LEFT.

③ BUNDLING STRAP, 1-1/4" X .031" OR .035" X 17'-0" LONG STEEL STRAPPING (2 REQD). ENCIRCLE THE PALLET UNIT AND THE HORIZONTAL PIECES OF THE BULKHEAD GATE. TENSION AND SEAL AFTER TENSIONING THE BULKHEAD STRAPS.

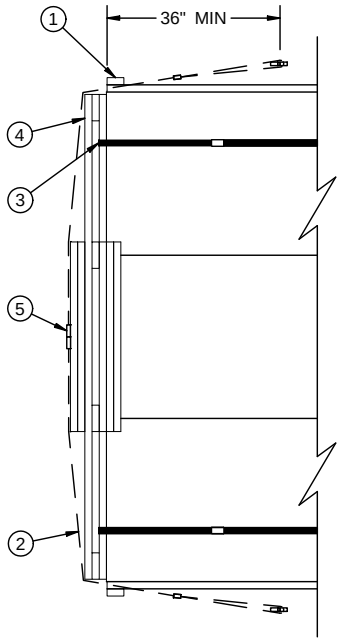
④ BULKHEAD GATE B (1 REQD). SEE THE DETAIL ON PAGE 25. SEE SPECIAL NOTES 2 AND 4 AT LEFT.

⑤ SEAL FOR 1-1/4" STEEL STRAPPING (10 REQD, 4 PER BULKHEAD STRAP AND 1 PER PUNDLING STRAP). DOUBLE CRIMP EACH SEAL.

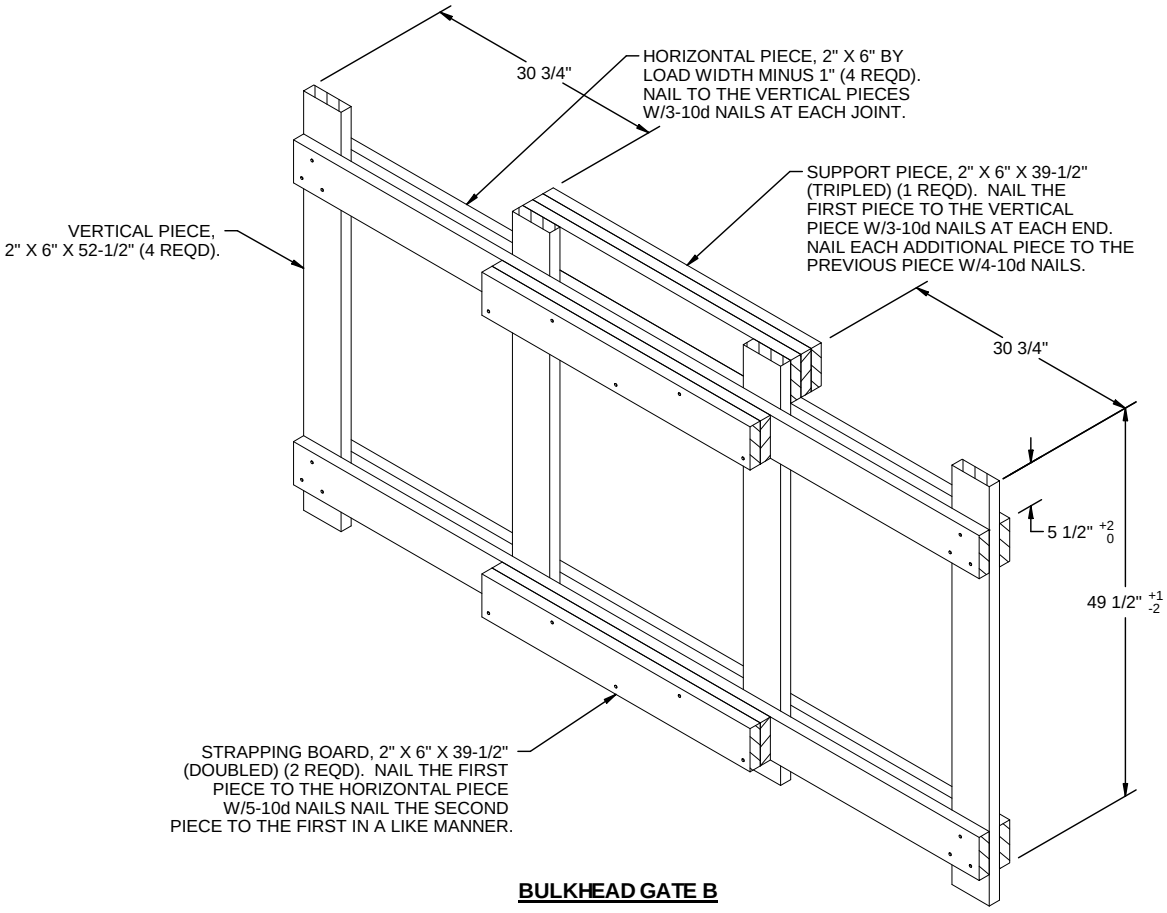
**TYPICAL LCL USING BULKHEAD GATE METHOD OF PARTIAL-LAYER BRACING**



**PROJECT CA 298-93**



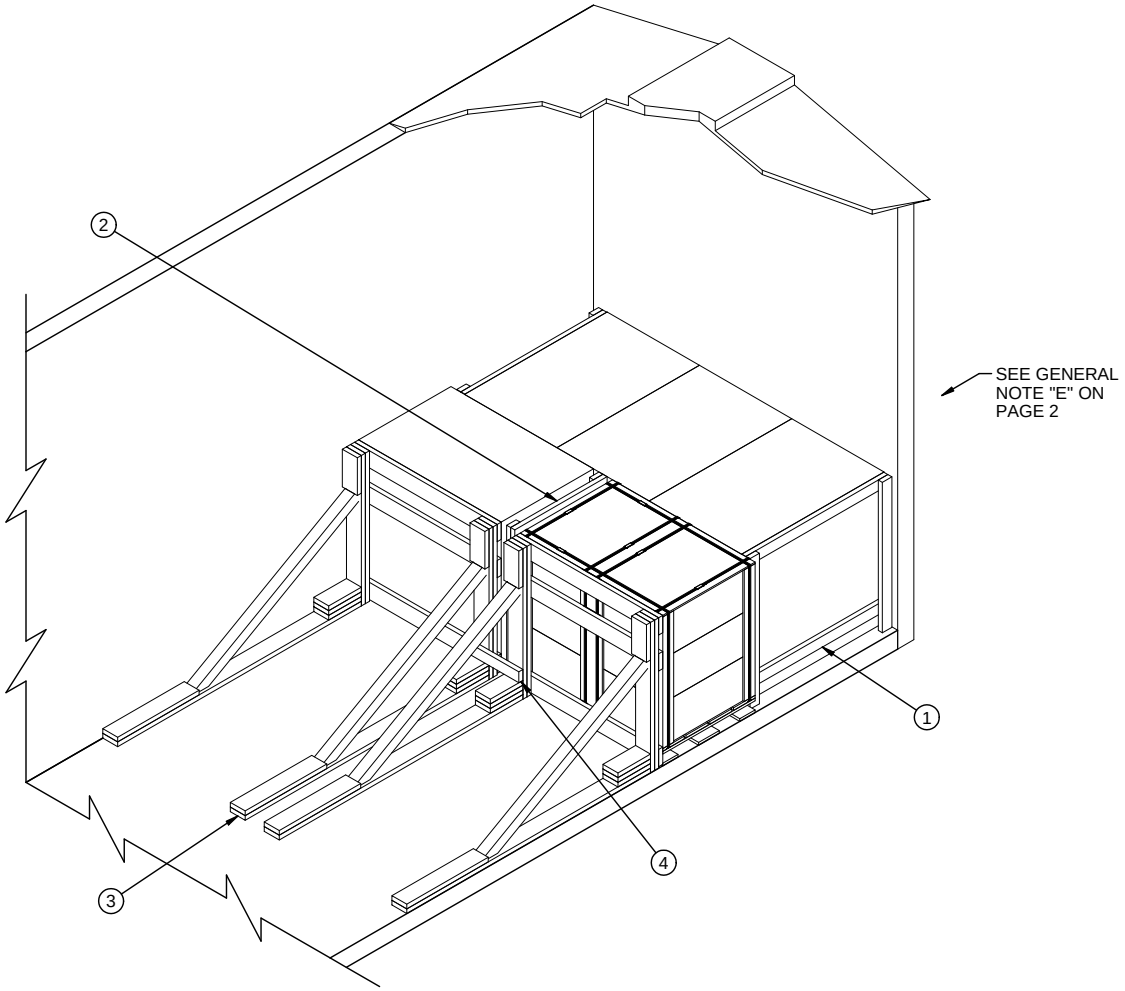

**STRAP APPLICATION PLAN VIEW**




**BULKHEAD GATE B**

(FOR USE IN RESTRAINING THREE ROWS OF PALLET UNITS)

**TYPICAL LCL USING BULKHEAD GATE METHOD OF PARTIAL-LAYER BRACING**




**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A 9'-2" WIDE WOOD-LINED CONVENTONAL TYPE BOXCAR HAVING A WOOD OR NAILABLE METAL FLOOR IS SHOWN. CARS OF OTHER WIDTHS AND CARS HAVING METAL LININGS CAN BE USED. PALLET UNIT "A" IS USED IN THE LOAD ABOVE. PALLET UNIT "B" CAN ALSO BE LOADED IF THE LENGTH OF THE UNIT IS PARALLEL WITH THE LONGITUDINAL SIDE OF THE BOXCAR AND THE SIDE FILL ASSEMBLIES ARE ELIMINATED. SEE SPECIAL NOTES 2 AND 3 FOR MORE DETAILS.

2. THE COMBINATION TWO-WIDE AND THREE-WIDE LOAD DEPICTED USING THE KNEE BRACE METHOD OF PARTIAL-LAYER BRACING IS TYPICAL. THE QUANTITY AND ORIENTATION MAY BE ADJUSTED TO SUIT, PROVIDED THE LIMITATIONS OF THE KNEE BRACE AS SET FORTH IN SPECIAL NOTE 3 ARE NOT EXCEEDED. DO NOT USE THIS METHOD WHEN LOADING ONE PALLET UNIT ALONE, REFER TO THE DETAILS ON PAGE 21 FOR GUIDANCE.

**3.** A KNEE BRACE ASSEMBLY WILL BE USED FOR EACH ROW OF PALLET UNITS. ONE KNEE BRACE ASSEMBLY IS ADEQUATE FOR RETAINING A MAXIMUM LCL LOAD OF NOT MORE THAN 8,500 POUNDS (SEVEN PALLET UNITS).

## KEY NUMBERS

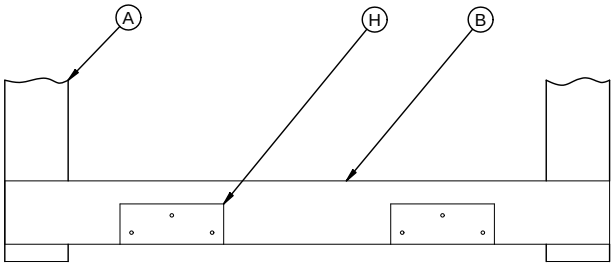
① SIDE FILL ASSEMBLY (2 REQD, ONE PALLET UNIT HIGH). SEE THE DETAIL ON PAGE 30.

② CENTER FILL ASSEMBLY (1 REQD, ONE PALLET UNIT LONG AND ONE PALLET UNIT HIGH). SEE THE DETAIL ON PAGE 28.

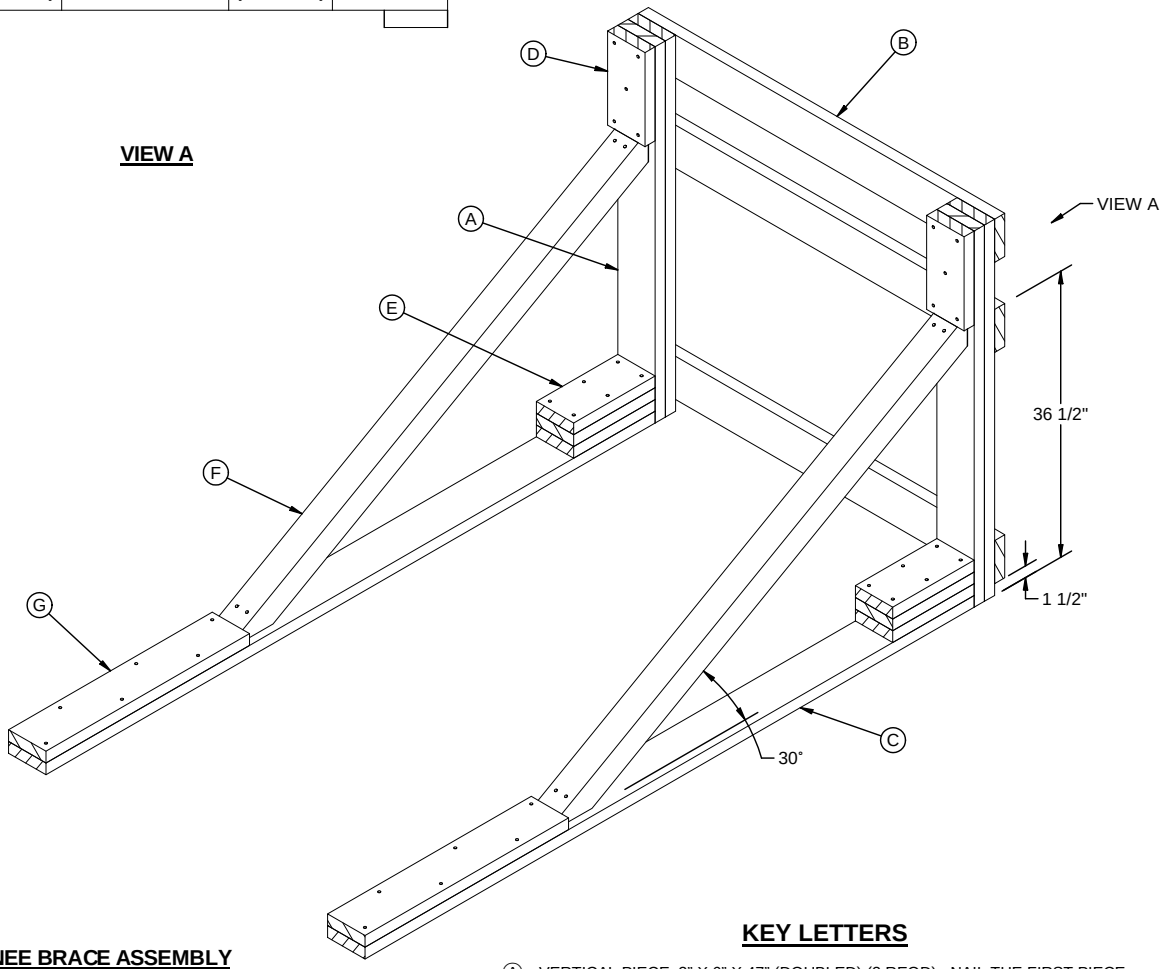
③ KNEE BRACE ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 27.

④ STOP PIECE, 2" X 4" BY LENGTH TO SUIT (1 REQD). NAIL TO ADJACENT KNEE BRACE VERTICAL PIECES W/2-10d NAILS AT EACH END TO RESTRAIN THE CENTER FILL ASSEMBLY.

**TYPICAL LCL USING KNEE BRACE METHOD OF PARTIAL-LAYER BRACING**




**VIEW A**




**KNEE BRACE ASSEMBLY**

## KEY LETTERS

Ⓐ VERTICAL PIECE, 2" X 6" X 47" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO A FLOOR CLEAT W/3-16d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/4-10d NAILS.

Ⓑ HORIZONTAL PIECE, 2" X 6" BY PALLET LENGTH OR WIDTH MINUS 1/2" (3 REQD). NAIL TO THE VERTICAL PIECES W/3-10d NAILS AT EACH JOINT.

Ⓒ FLOOR CLEAT, 2" X 6" X 7'-5-3/4" (2 REQD). NAIL TO THE CAR FLOOR W/1-16d NAIL EVERY 8". SEE GENERAL NOTE "S.1" ON PAGE 3.

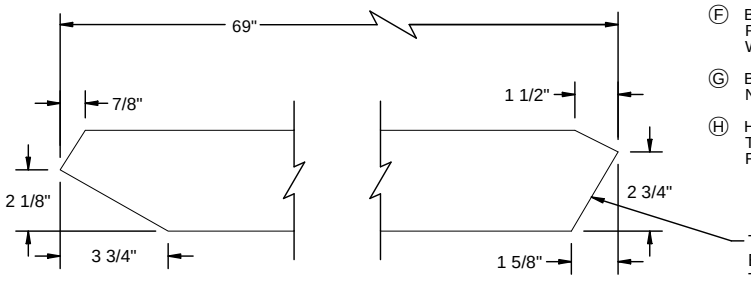
Ⓓ HOLD-DOWN CLEAT, 2" X 6" X 12" (2 REQD). NAIL TO A VERTICAL PIECE W/5-10d NAILS.

Ⓔ POCKET CLEAT, 2" X 6" X 12" (TRIPLED) (2 REQD). NAIL THE FIRST PIECE TO THE FLOOR CLEAT W/4-16d NAILS. NAIL THE SECOND AND THIRD PIECES IN A LIKE MANNER AND TOENAIL THE THIRD PIECE TO THE VERTICAL PIECE W/2-16d NAILS.

Ⓕ BRACE, 4" X 4" X 69" (2 REQD). SEE THE DETAIL AT LEFT FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE VERTICAL PIECE AND TO THE FLOOR CLEAT W/2-16d NAILS.

Ⓖ BACK-UP CLEAT, 2" X 6" X 30" (2 REQD). NAIL TO THE FLOOR CLEAT W/6-40d NAILS.

Ⓗ HOLD-DOWN CLEAT, 2" X 4" X 9" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO A HORIZONTAL PIECE W/3-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER. SEE "VIEW A" ABOVE FOR LOCATION DIMENSIONS.

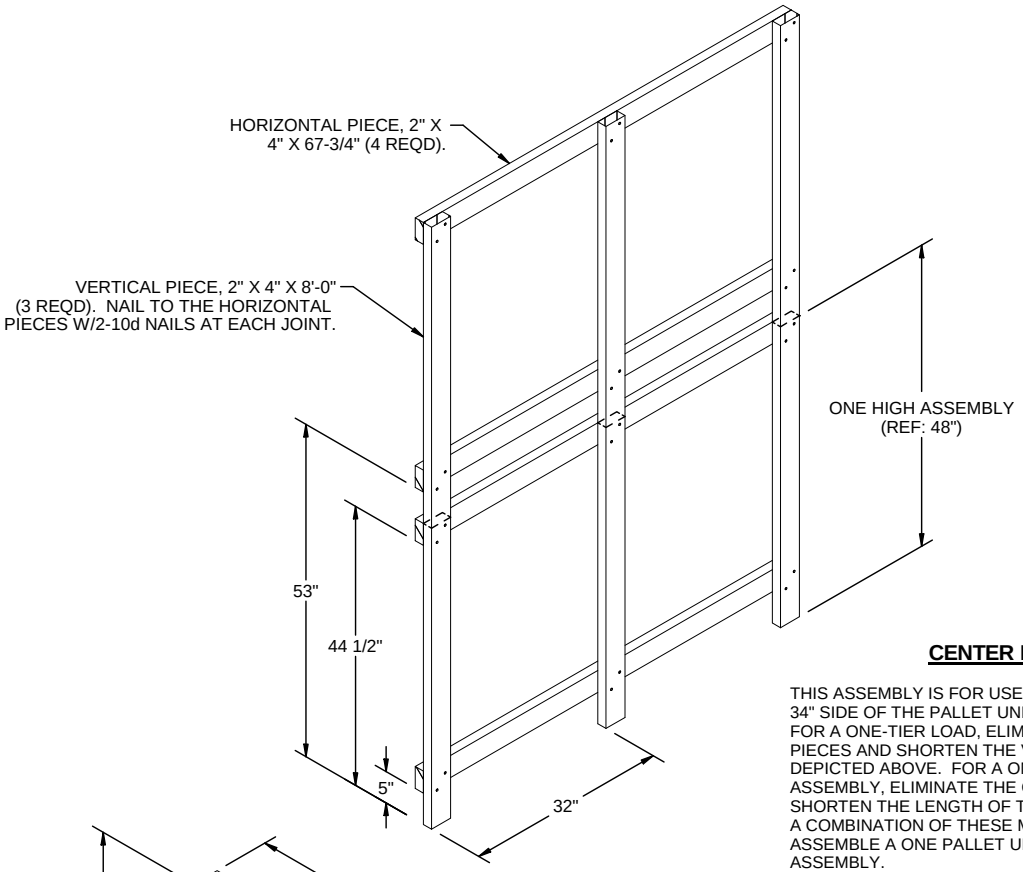



THE BRACE MUST BE INSTALLED SO THAT THIS BEARING SURFACE WILL BE IN CONTACT WITH THE VERTICAL PIECE.

**BRACE**

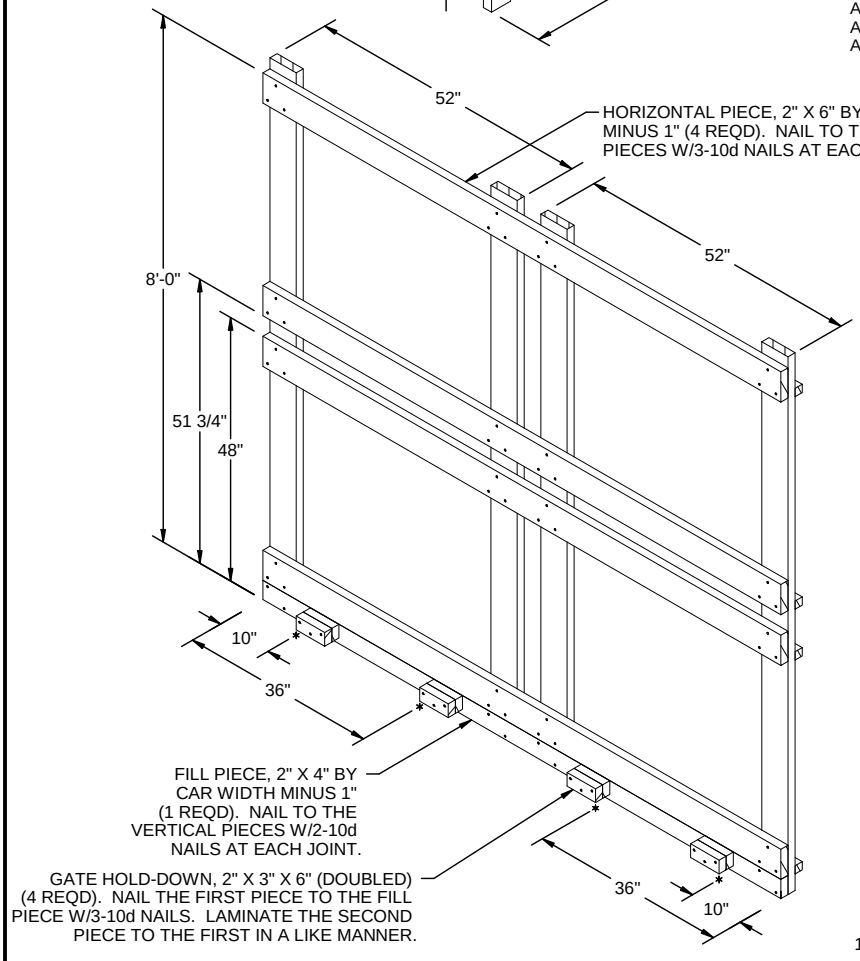
4" x 4" MATERIAL

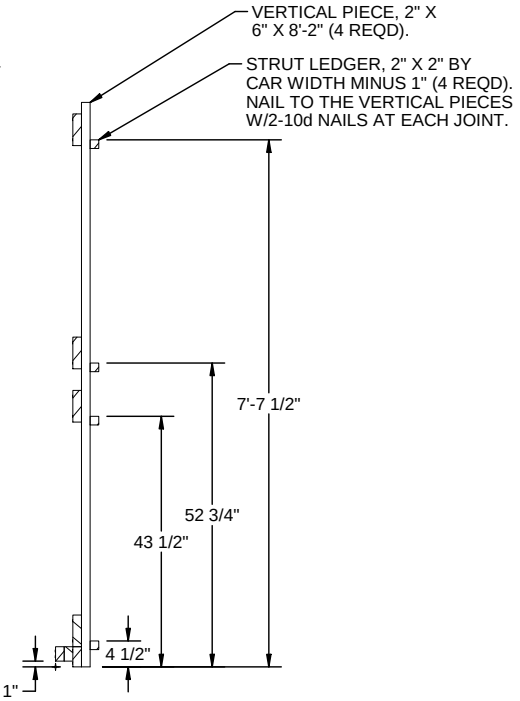
**TYPICAL LCL USING KNEE BRACE METHOD OF PARTIAL-LAYER BRACING**




## CENTER FILL ASSEMBLY

THIS ASSEMBLY IS FOR USE IN TWO-TIER LOADS WHERE THE 34" SIDE OF THE PALLET UNIT "A" IS LENGTHWISE IN THE CAR. FOR A ONE-TIER LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND SHORTEN THE VERTICAL PIECES TO 48", AS DEPICTED ABOVE. FOR A ONE PALLET WIDE, TWO PALLET TIER ASSEMBLY, ELIMINATE THE CENTER VERTICAL PIECE AND SHORTEN THE LENGTH OF THE HORIZONTAL PIECES TO 33-3/4". A COMBINATION OF THESE MODIFICATIONS CAN BE USED TO ASSEMBLE A ONE PALLET UNIT WIDE/ONE PALLET UNIT TIER ASSEMBLY.




## CENTER GATE A

THIS ASSEMBLY IS FOR USE IN LOADS WHERE THE 34" SIDE OF THE PALLET UNIT "A" IS LENGTHWISE IN THE CAR. FOR A ONE TIER LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND THE TOP TWO LEDGERS. SHORTEN THE VERTICAL PIECES APPROPRIATELY.



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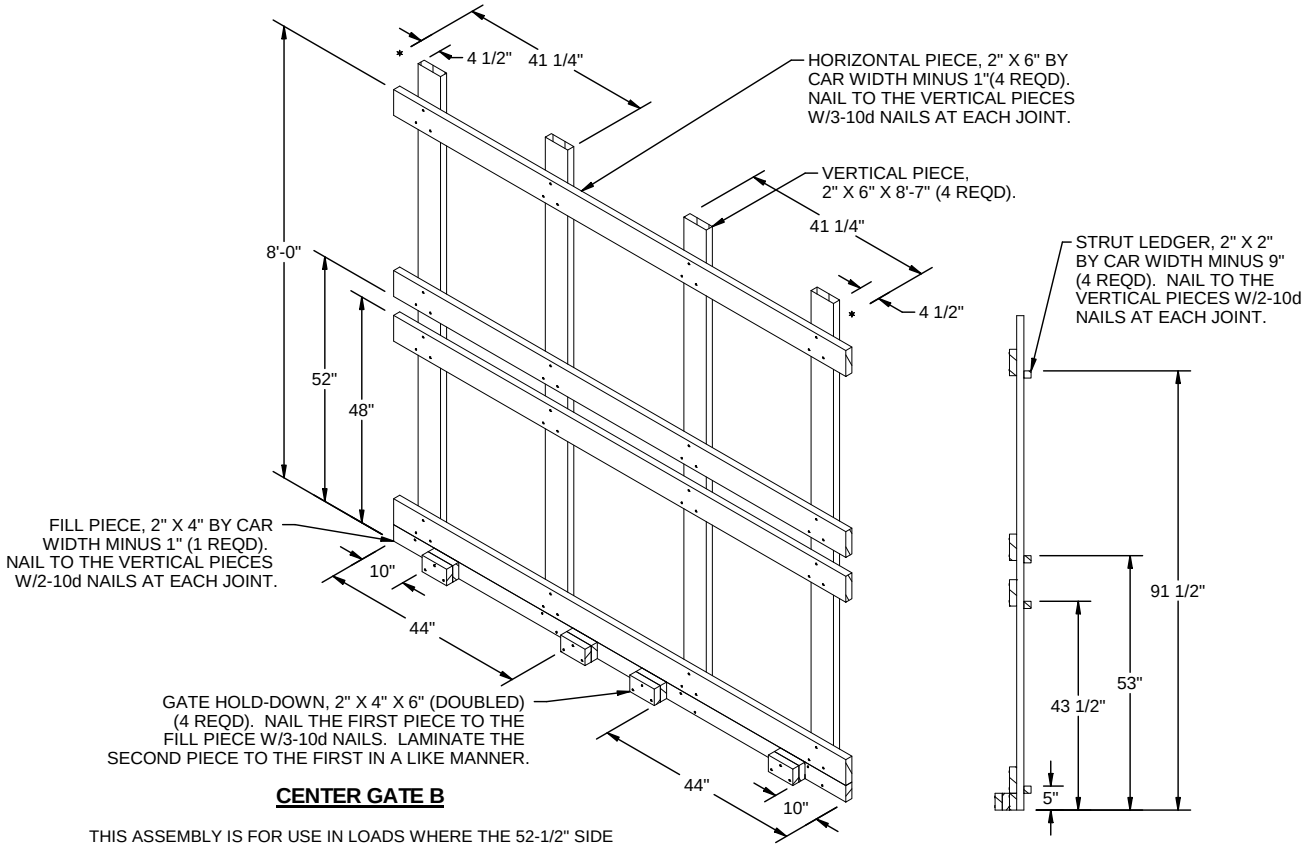
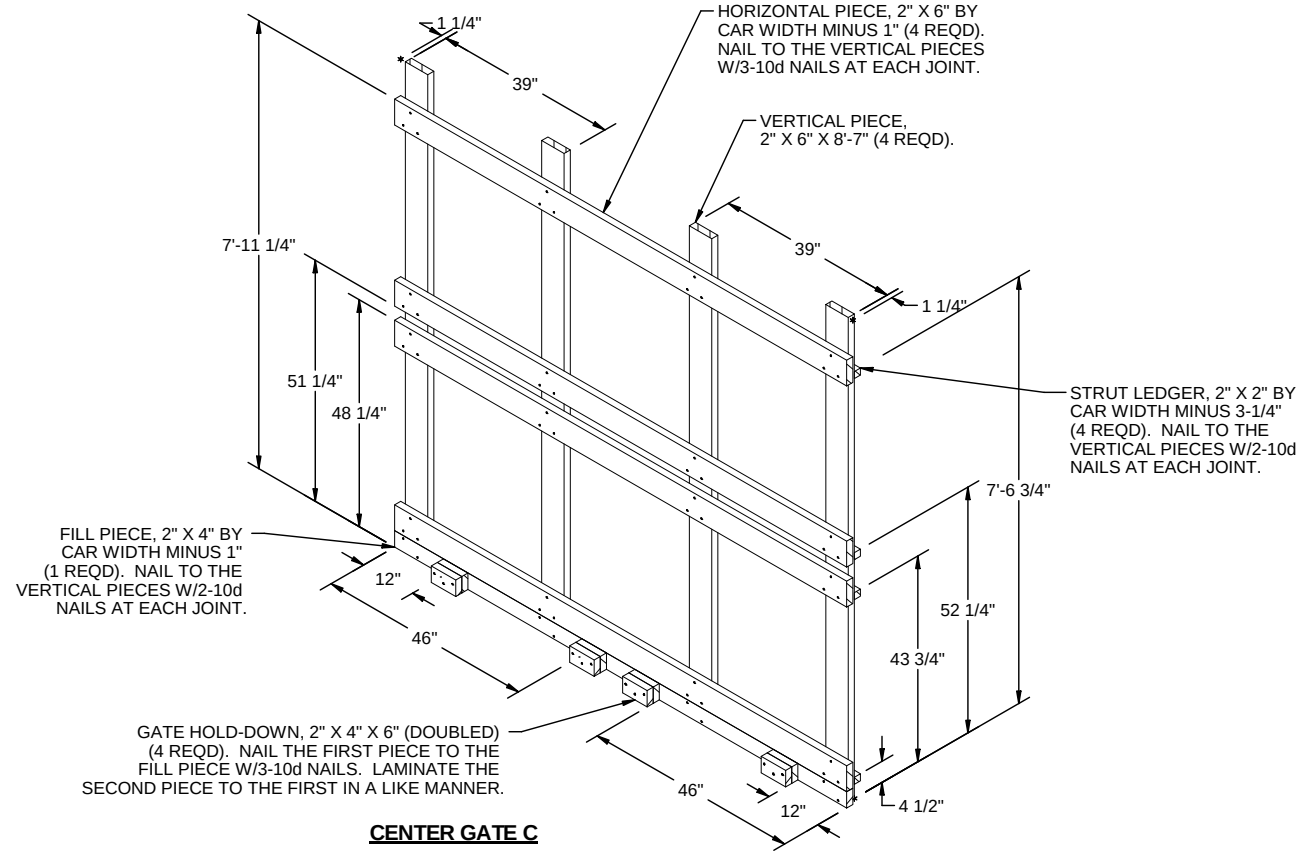



**CENTER GATE B**

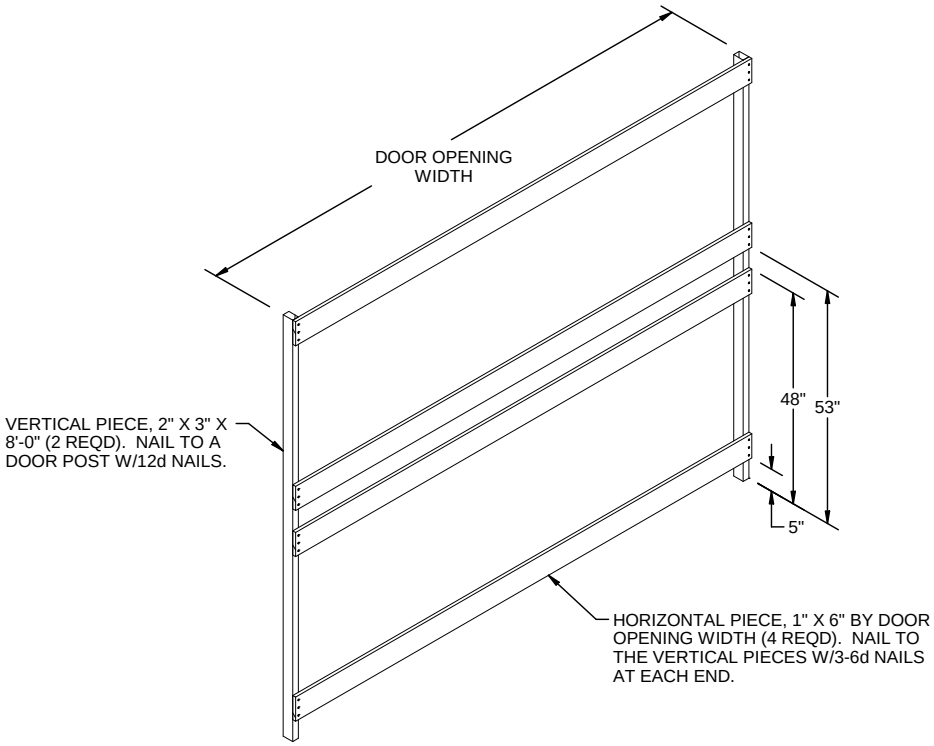
THIS ASSEMBLY IS FOR USE IN LOADS WHERE THE 52-1/2" SIDE OF THE PALLET UNIT "A" IS LENGTHWISE IN THE CAR. FOR A ONE TIER LOAD, ELIMINATE THE TOP HORIZONTAL PIECES AND THE TOP TWO STRUT LEDGERS. SHORTEN THE VERTICAL PIECES APPROPRIATELY.

**END VIEW**



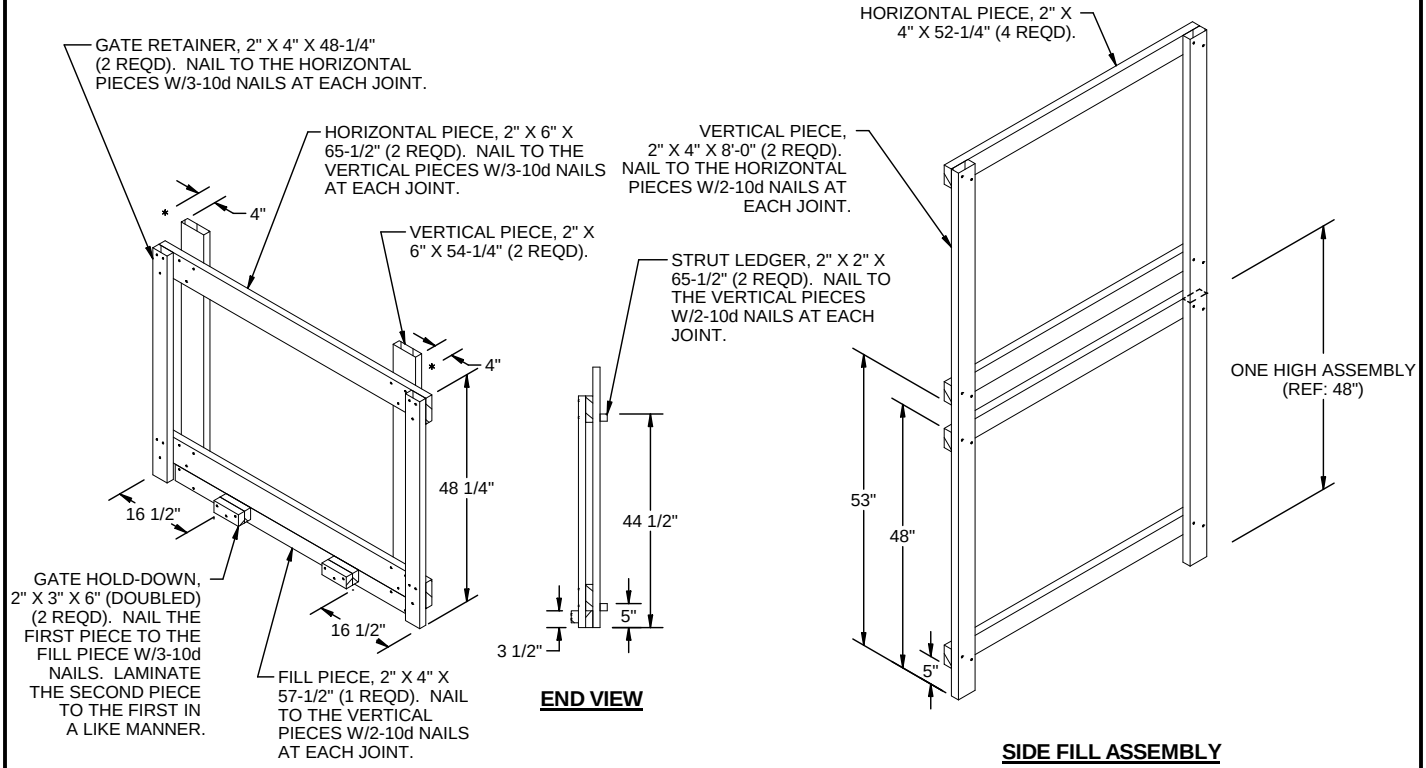

**CENTER GATE C**

THIS ASSEMBLY IS FOR USE IN LOADS WHERE THE 57-1/2" SIDE OF THE PALLET UNIT "B" IS LENGTHWISE IN THE CAR. FOR A ONE TIER LOAD, ELIMINATE THE TOP HORIZONTAL PIECES AND THE TOP TWO STRUT LEDGERS. SHORTEN THE VERTICAL PIECES APPROPRIATELY.




**DOORWAY PROTECTION**

FOR A ONE HIGH LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND SHORTEN THE VERTICAL PIECES APPROPRIATELY.




**END VIEW**

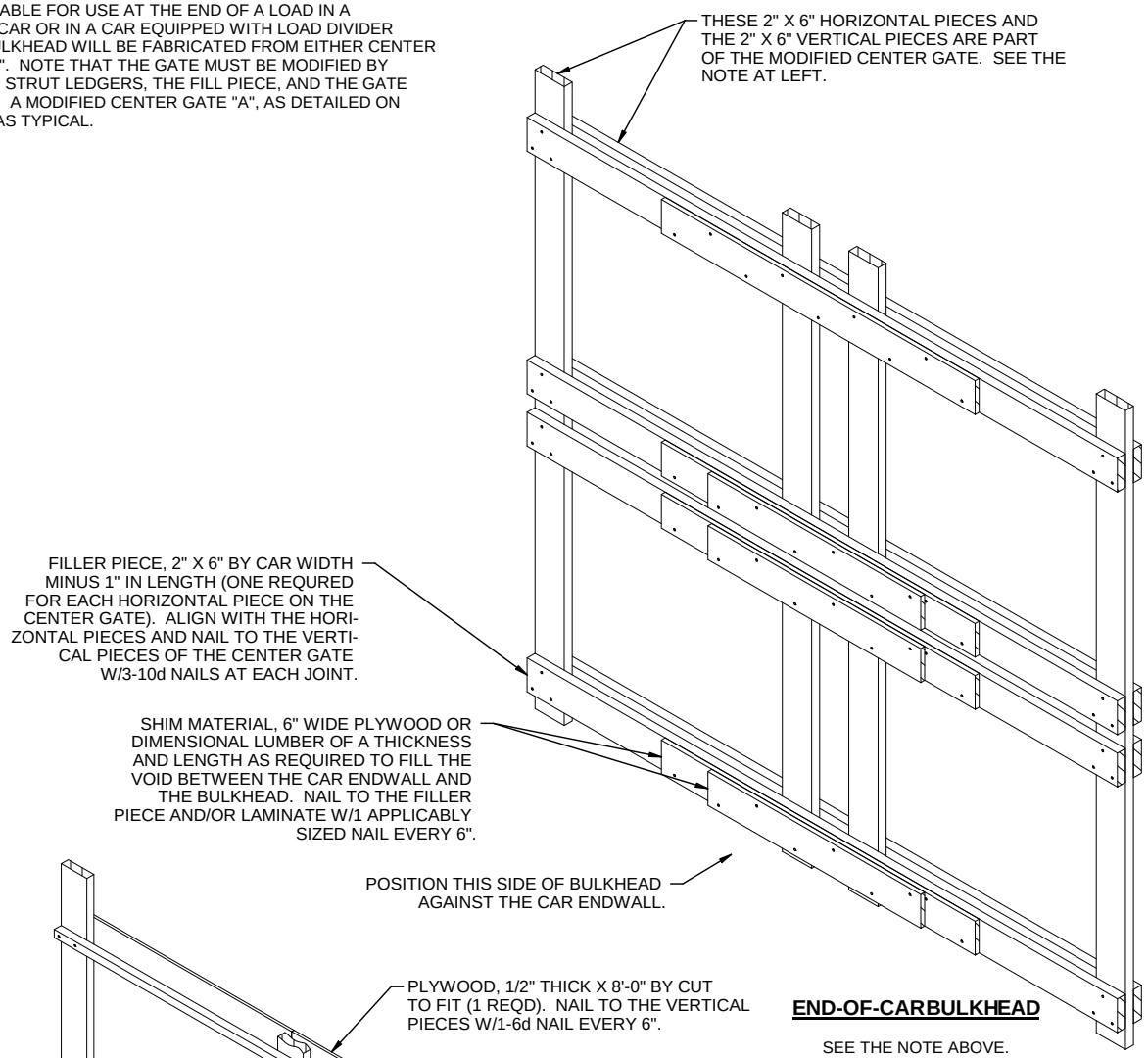
**CENTER GATE D**

THIS ASSEMBLY IS FOR USE IN 1-WIDE LOADS. THE DIMENSIONS DETAILED ABOVE ARE APPLICALBE TO A CROSSWISE LOAD OF PALLET UNIT"B". THE ASSEMBLY CAN BE USED FOR LENGTHWISE LOADS OF UNIT "B" AS WELL AS BOTH CROSSWISE AND LEGTHWISE LOADS OF UNIT "A", IF DESIRED. INCREASE OR DECREASE THE OVERALL WIDTH OF THE ASSEMBLY TO ACCOMODATE THE LATERAL DIMENSION OF THE APPRORIATE PALLET UNIT.

**SIDE FILL ASSEMBLY**

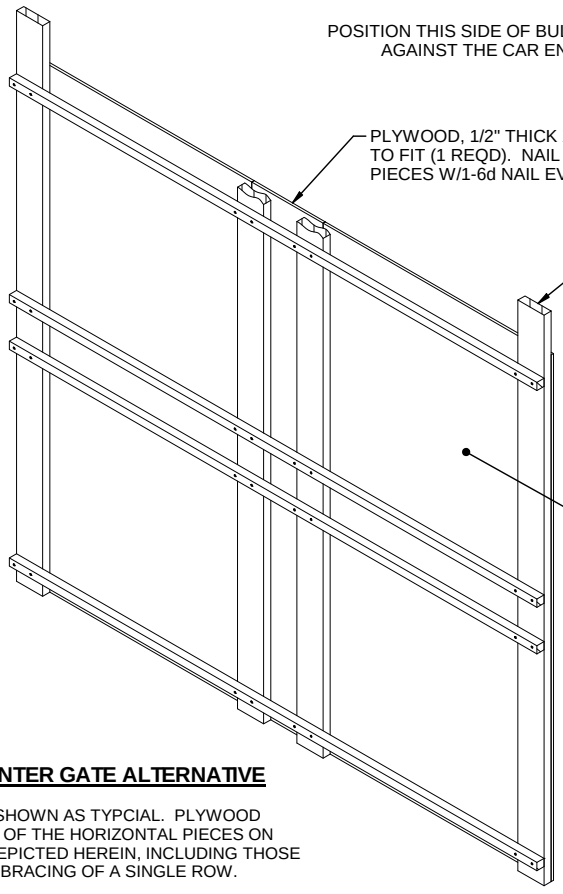
THIS ASSEMBLY IS FOR USE IN LOADS WITH PALLET UNIT "A". IF THE ABOVE ASSEMBLY IS USED WITH PALLET UNIT "B", INCREASE THE LENGTH OF THE HORIZONTAL PIECES TO 57-1/4". FOR A ONE-TIER LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND SHORTEN THE VERTICAL PIECES TO 48", AS DEPICTED ABOVE. NOTE: THE HORIZONTAL PIECES IN THE ASSEMBLIES THAT ARE POSITIONED ADJACENT TO THE DOORWAY AREA OF THE CAR IN LOADS USING THE FLOORLINE BLOCKING/STRAPPING METHOD OF DOORWAY PROTECTION MUST BE SHORTENED SO AS NOT TO EXTEND INTO THE DOORWAY AREA AND WIRE TIED TO AN ADJACENT PALLET UNIT TO PREVENT MOVEMENT.

**NOTE:** IF A BOXCAR TO BE LOADED HAS BOWED ENDWALLS WHICH ARE BOWED OUTWARD MORE THAN 2" 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. THE BULKHEAD IS APPLICABLE FOR USE AT THE END OF A LOAD IN A CONVENTIONAL BOXCAR OR IN A CAR EQUIPPED WITH LOAD DIVIDER BULKHEADS. THE BULKHEAD WILL BE FABRICATED FROM EITHER CENTER GATES "A", "B", OR "C". NOTE THAT THE GATE MUST BE MODIFIED BY OMITTING THE 2" X 2" STRUT LEDGERS, THE FILL PIECE, AND THE GATE HOLD-DOWN PIECES. A MODIFIED CENTER GATE "A", AS DETAILED ON PAGE 28, IS SHOWN AS TYPICAL.



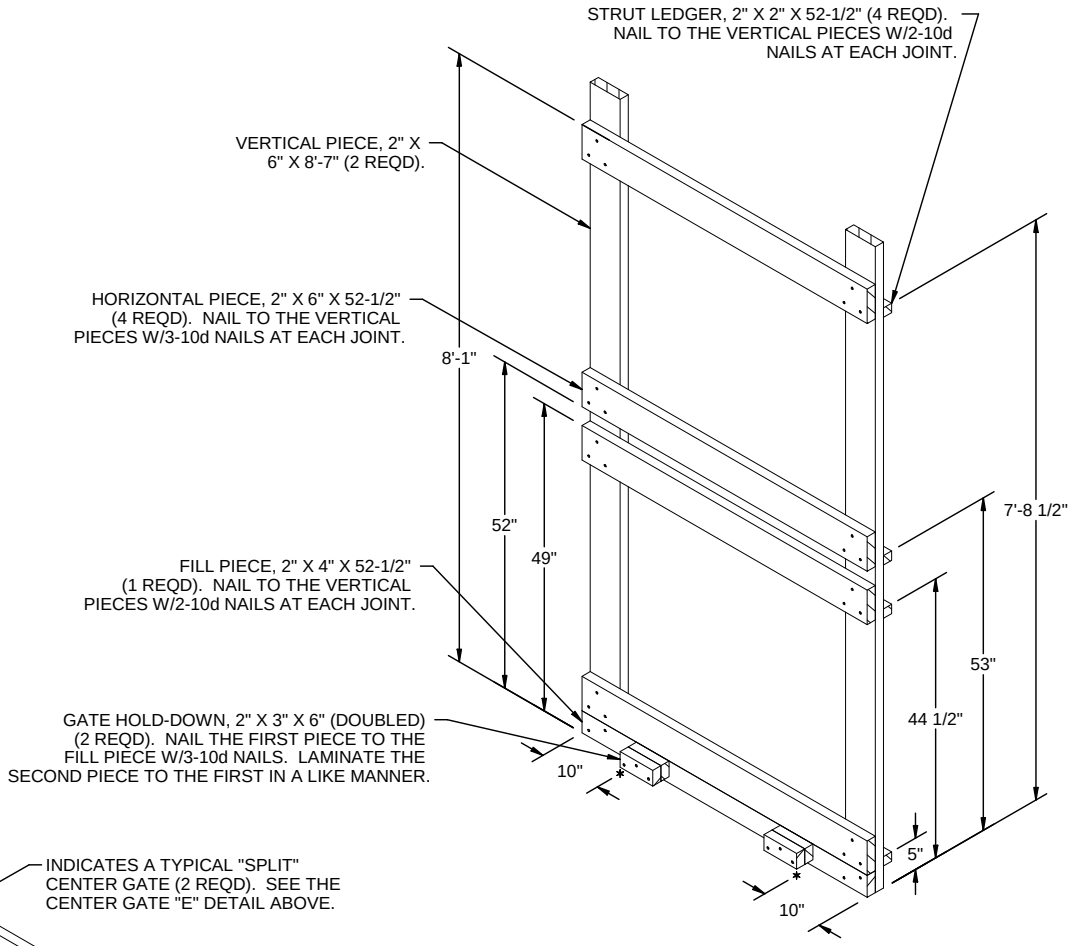

**END-OF-CARBULKHEAD**

SEE THE NOTE ABOVE.



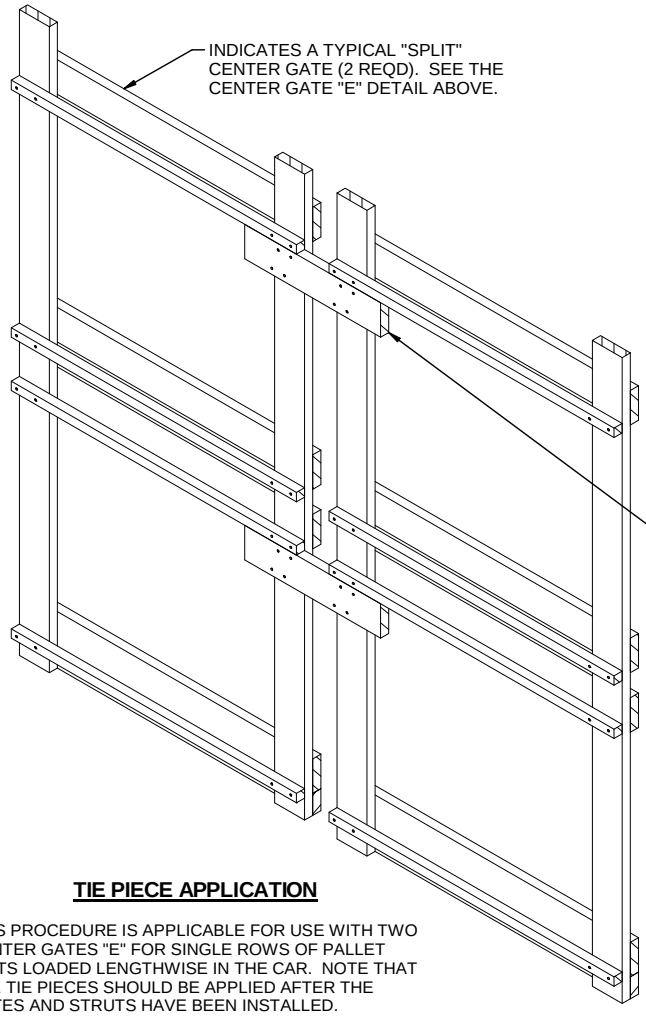

**PLYWOOD CENTER GATE ALTERNATIVE**

CENTER GATE "A" IS SHOWN AS TYPCIAL. PLYWOOD MAY BE USED IN LIEU OF THE HORIZONTAL PIECES ON ANY CENTER GATE DEPICTED HEREIN, INCLUDING THOSE WHICH ARE FOR THE BRACING OF A SINGLE ROW.



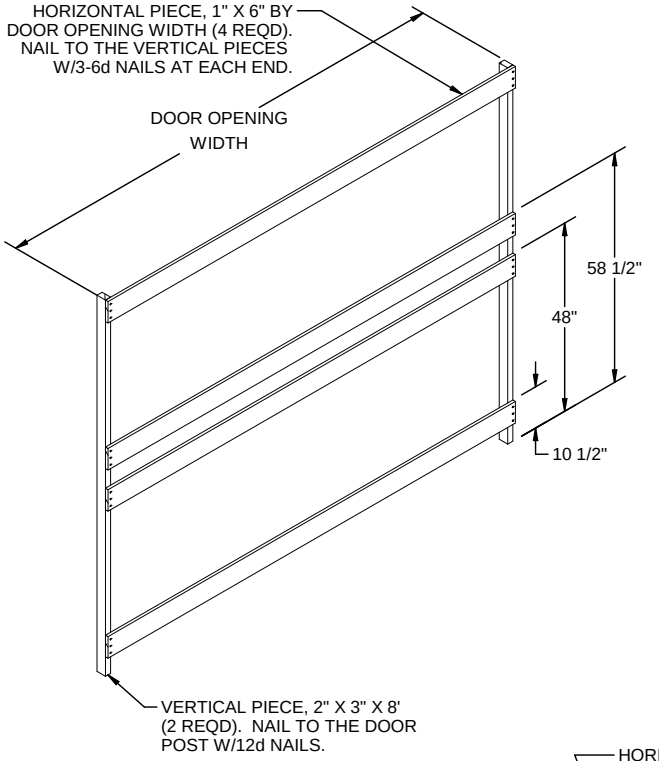

**CENTER GATE E**

NOTE: THIS ASSEMBLY IS FOR USE IN LOADS WHERE THE 34" SIDE OF PALLET UNIT "A" IS LENGTHWISE IN THE CAR. FOR A ONE TIER LOAD, ELIMINATE THE TOP TWO HORIZONTAL PIECES AND THE TOP TWO STRUT LEDGERS. SHORTEN THE VERTICAL PIECES APPROPRIATELY. FOR LOADS WHERE THE 52-1/2" SIDE OF PALLET UNIT "A" IS LENGTHWISE IN THE CAR, REDUCE THE LENGTH OF THE HORIZONTAL PIECES TO 34". WHEN PALLET UNIT "B" IS USED, AND THE 57-1/2" SIDE OF THE PALLET UNIT IS LENGTHWISE IN THE CAR, REDUCE THE LENGTH OF THE HORIZONTAL PIECES TO 39" AND REDUCE ALL HEIGHT DIMENSIONS BY 2" EXCEPT FOR THE 5" DIMENSION.




**TIE PIECE APPLICATION**

THIS PROCEDURE IS APPLICABLE FOR USE WITH TWO CENTER GATES "E" FOR SINGLE ROWS OF PALLET UNITS LOADED LENGTHWISE IN THE CAR. NOTE THAT THE TIE PIECES SHOULD BE APPLIED AFTER THE GATES AND STRUTS HAVE BEEN INSTALLED.

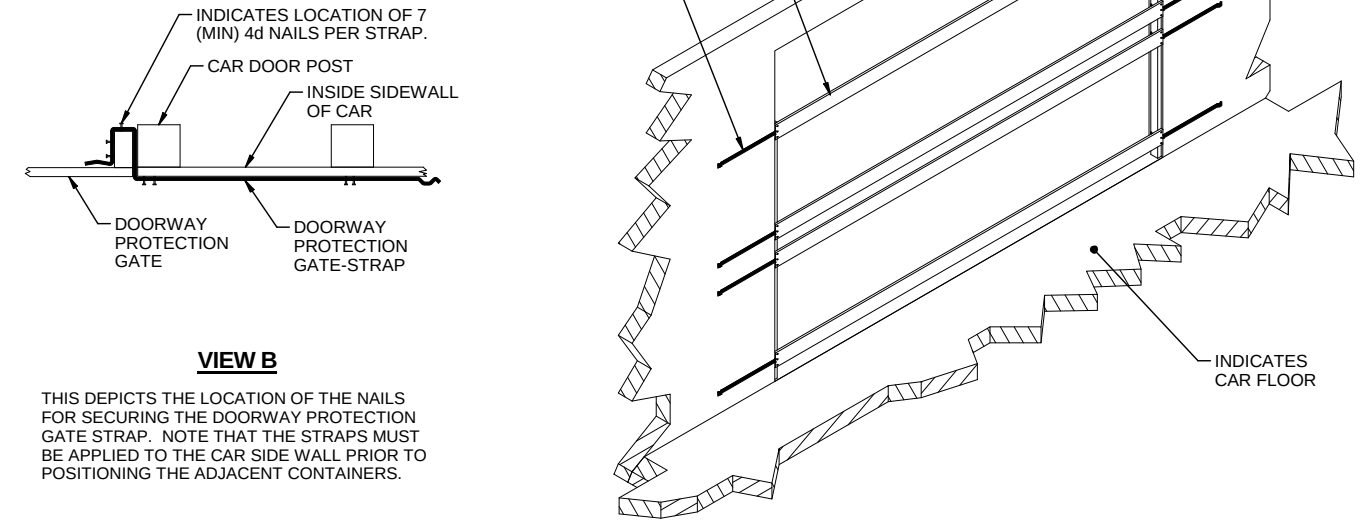



## DOORWAY PROTECTION A

SEE SPECIAL NOTES 1 AND 6 AT RIGHT.

**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 8 FOR GUIDANCE.
6. THE VIEWS ON PAGES 6, 10 AND 12 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 48". FOR DOORWAY PROTECTION "D", MOVE THE SPANNER BY AN APPROPRIATE DISTANCE.

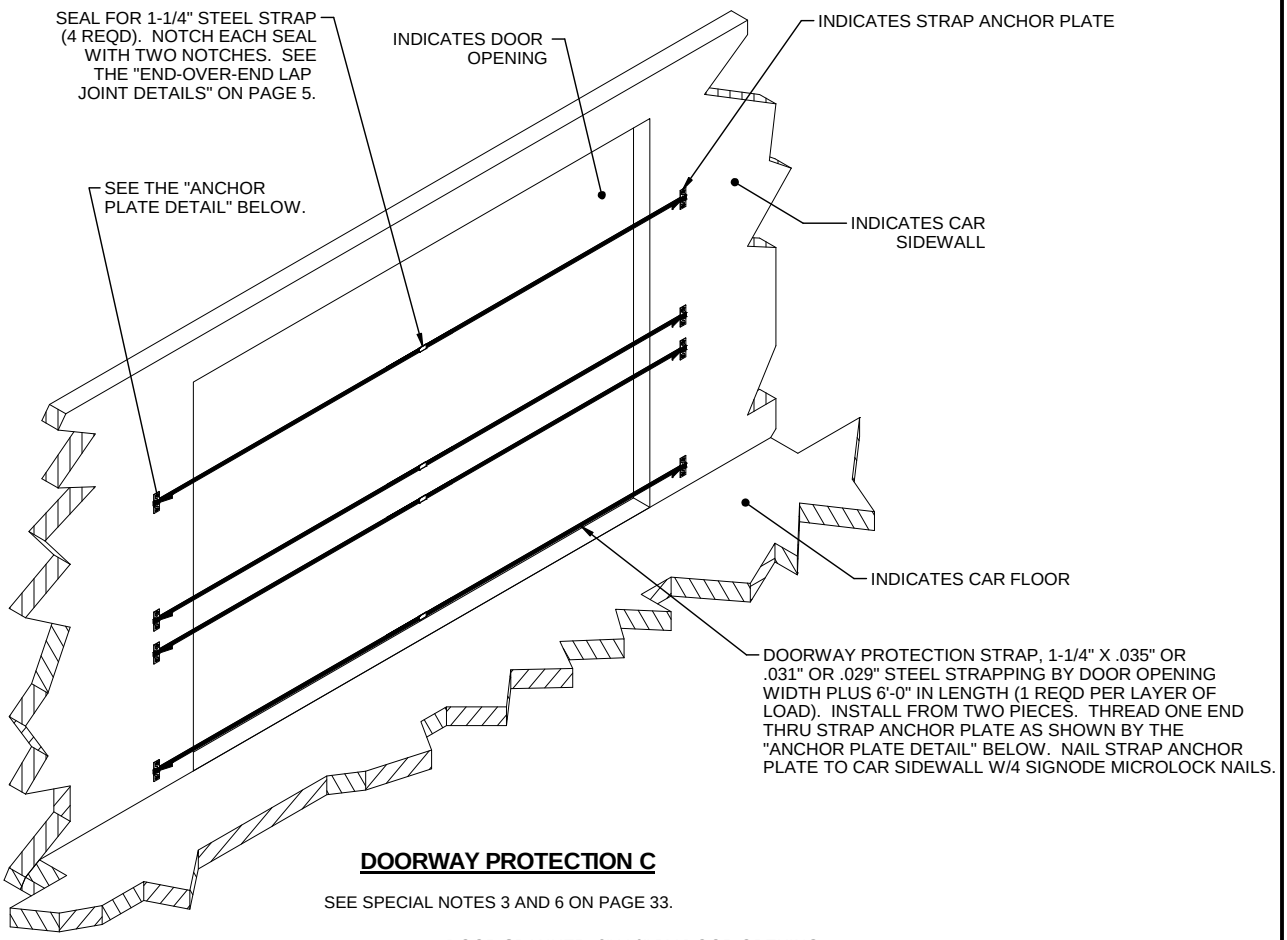



## VIEW B

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.

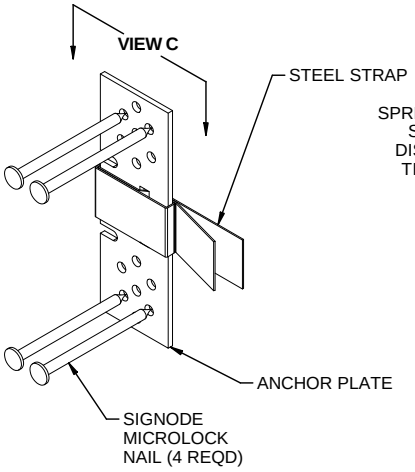
## DOORWAY PROTECTION B

SEE SPECIAL NOTES 2 AND 6 ABOVE.



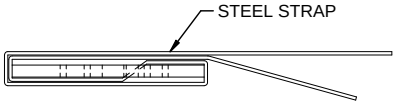

## DOORWAY PROTECTION C

SEE SPECIAL NOTES 3 AND 6 ON PAGE 33.

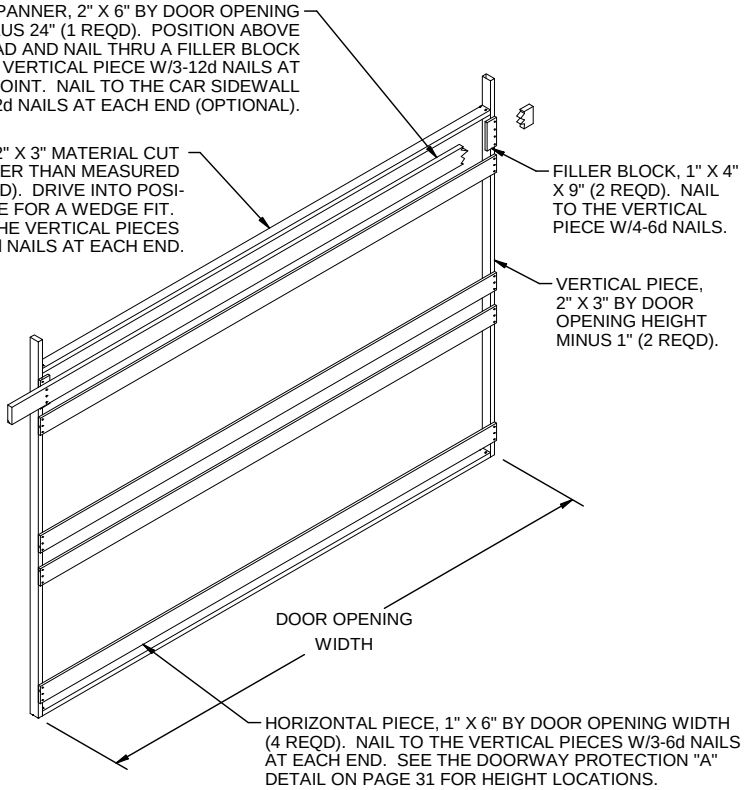



## ANCHOR PLATE DETAIL

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

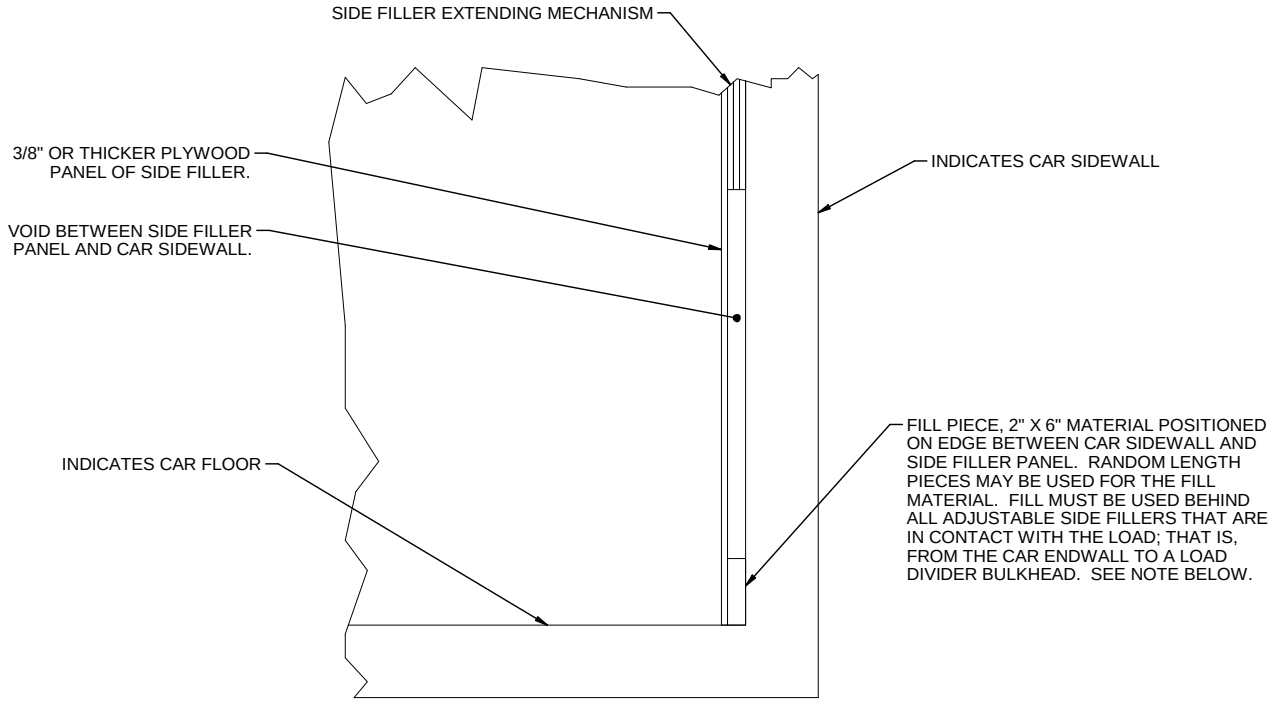



## VIEW C




## DOORWAY PROTECTION D

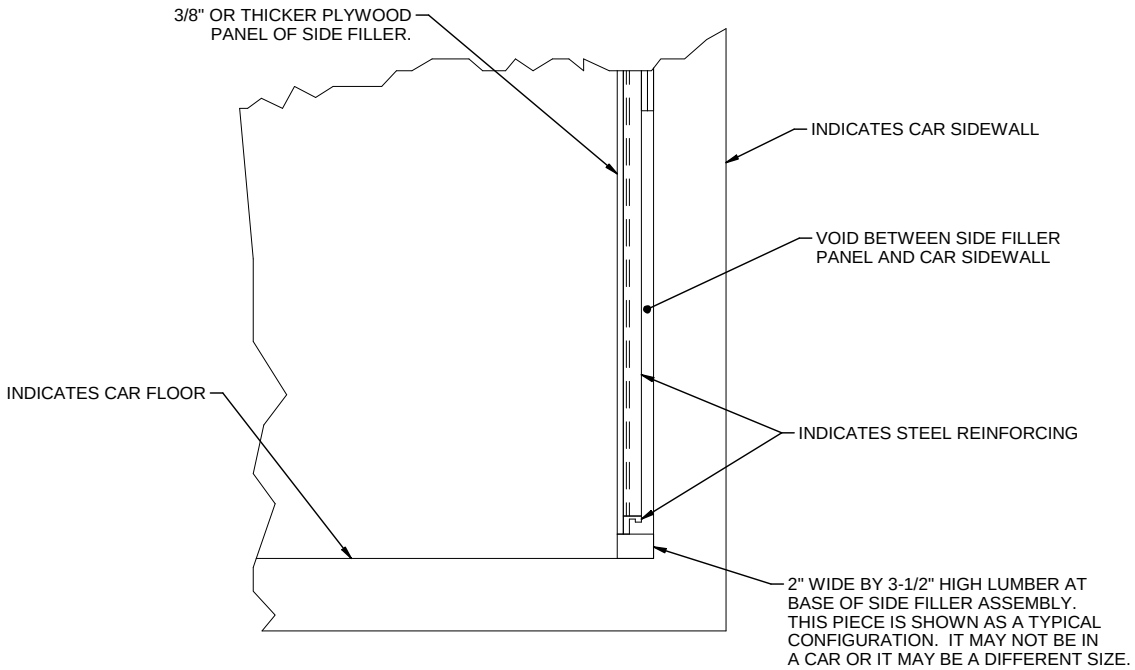
SEE SPECIAL NOTES 4 AND 6 ON PAGE 33.




**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.