

APPROVED BY
BUREAU OF EXPLOSIVES

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DATE 5/5/93

LOADING AND BRACING (CL & LCL) IN BOXCARS OF INJECTOR ASSEMBLY CONTAINERS (IAC) FOR THE MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) BINARY CHEMICAL WARHEAD

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● THIS OUTLOADING DRAWING INCLUDES PROCEDURES FOR CONVENTIONAL TYPE BOXCARS ONLY.

U.S. ARMY MATERIEL COMMAND DRAWING			
APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND <i>Timothy R. Fore</i>	DRAFTSMAN	TECHNICIAN	ENGINEER L. FIEFFER
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APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND <i>William J. Ernst</i>	JULY 1993		
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL	CLASS	DIVISION	DRAWING
	19	48	4564
			FILE CB5J3

DO NOT SCALE

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 HEREIN ARE APPLICABLE TO THE MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) BINARY CHEMICAL WARHEAD (BCW) INJECTOR ASSEMBLY (IA) WHEN PACKED IN THE INJECTOR ASSEMBLY CONTAINER (IAC). SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE IAC WITH INJECTOR ASSEMBLY.

C. FOR DETAIL OF THE IAC SEE PAGE 3.

CONTAINER DIMENSIONS - - 91" LONG X 34" WIDE X 37" HIGH

GROSS WEIGHT - - - - - 1,053 POUNDS (APPROX)

D. THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINERS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED WITHIN THE DRAWING TITLE.

E. THE OUTLOADING PROCEDURES DEPICTED WITHIN THIS DOCUMENT ARE APPLICABLE FOR SHIPMENTS IN CONVENTIONAL TYPE BOXCARS. SHIPMENT OF THE SPECIFIED ITEM IN BOXCARS EQUIPPED WITH LOAD DIVIDER BULKHEADS OR ANY OTHER MECHANICAL LOAD BRACING DEVICE IS NOT APPROVED.

F. DUNNAGE LUMBER SPECIFIED IS OF A NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" 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".

G. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHENEVER 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 ENDWALL 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.

H. PORTIONS OF THE BOXCARS DEPICTED WITHIN THIS PROCEDURAL DRAWING, SUCH AS SIDEWALLS, ENDWALLS, AND ROOFS, AND PORTIONS OF THE BLOCKING AND BRACING COMPONENTS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.

J. BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS HAVE BEEN SHOWN. HOWEVER, THE DEPICTED OUTLOADING PROCEDURES ARE ALSO APPLICABLE FOR CARS EQUIPPED WITH PLUG DOORS. CAUTION: DUNNAGE MATERIAL MUST NOT BE NAILED TO ANY PLUG DOOR, WHETHER MAIN OR AUXILIARY. 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.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

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

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

STRAPPING, STEEL - - : ASTM D3953; FLAT STRAPPING, TYPE 1 OR 2, HEAVY DUTY, COATED FINISH (ORGANIC), ZINC-COATED (GRADE 2), OR UNCOATED.

SEAL, STRAP - - - - : ASTM D3953; CLASS H, FINISH A, B (GRADE 2), OR C, TYPE D, STYLE I, II, OR IV.

STAPLE, STRAP - - - : COMMERCIAL GRADE.

WIRE, CARBON STEEL - : ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, .0800" DIA, GRADE 1006 OR BETTER.

K. THE SELECTION OF RAILCARS FOR THE TRANSPORT OF THE DESIGNATED ITEM 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 DOCUMENT, WILL BE SELECTED. WHEN SELECTING RAILCARS, EVERY EFFORT SHOULD BE MADE TO OBTAIN BOXCARS THAT DO NOT HAVE BOWED ENDWALLS. CARS WITH 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, FILL MATERIAL MUST BE NAILED TO THE BACK SIDE OF THE END FILL ASSEMBLY FOR CROSSWISE LOADED CONTAINERS OR A END-OF-CAR BULKHEAD MUST BE INSTALLED FOR LENGTHWISE LOADED CONTAINERS TO PROVIDE A "SQUARED OFF" SURFACE FOR THE LOAD AT THE END OF THE CAR. REFER TO PAGES 8 AND 21 FOR GUIDANCE.

L. THE NUMBER OF LADING ASSEMBLIES 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 CONTAINERS. NOTICE: A SHIPMENT WILL BE POSITIONED IN THE RAILCAR IN COMPLIANCE WITH THE WEIGHT DISTRIBUTION REQUIREMENTS OF THE AAR.

M. OTHER TYPES OF LADING ITEMS MAY BE LOADED IN CARS WHICH ARE PARTIALLY LOADED WITH THE DESIGNATED ITEMS, 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.

N. 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 ALL FLOORLINE BLOCKING PIECES TO THE CAR FLOOR. 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. SEE GENERAL NOTE "G" ON THIS PAGE.

O. LOADS SHOWN WITHIN THIS DOCUMENT ARE TYPICAL. SINCE THE ACTUAL QUANTITY TO BE SHIPPED MAY NOT BE DEPICTED IN ANY OF THE LOAD VIEWS SHOWN HEREIN, A LOAD PLAN SHOULD BE DEVELOPED WHICH WILL BE THE MOST EFFICIENT AS TO THE AMOUNT OF DUNNAGE REQUIRED AND THE EASE OF LOADING FOR THE QUANTITY TO BE SHIPPED.

P. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "SPECIAL NOTES" SECTIONS WHICH ARE IMMEDIATELY ADJACENT TO THE DEPICTED OUTLOADING METHODS.

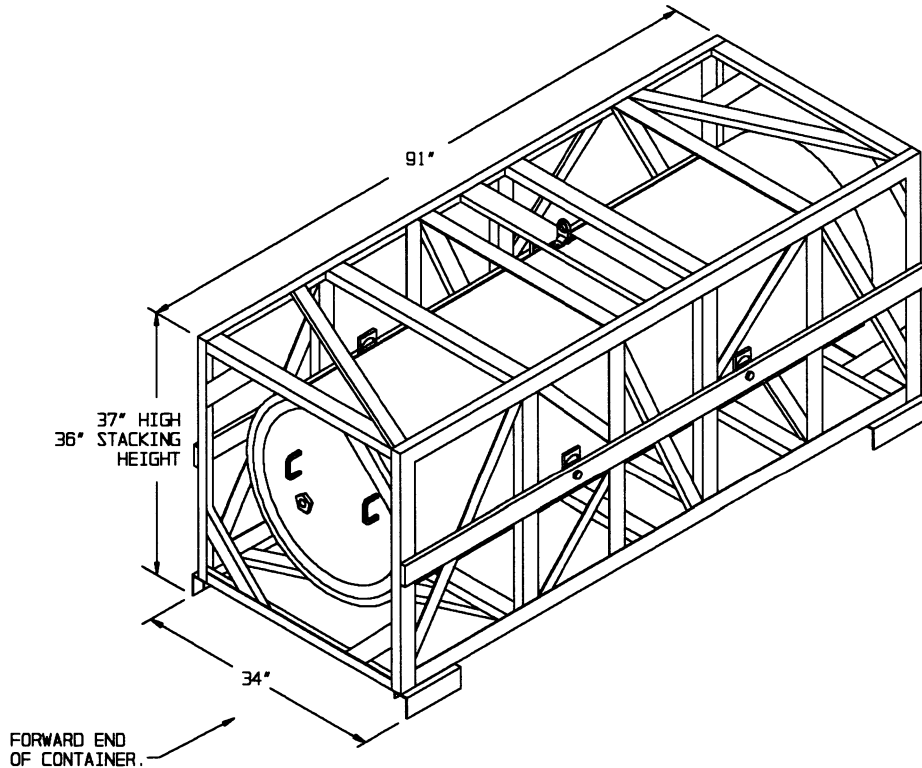
Q. NOTICE: ALL LOADS SHOWN WITHIN THIS DRAWING ARE FOR USE WITH 50'-6" LONG BOXCARS. LONGER CARS CAN ALSO BE USED BY INCREASING THE LENGTH OF THE STRUTS AND APPLYING VERTICAL AND HORIZONTAL STRUT BRACING. SEE GENERAL NOTE "R" BELOW.

R. LOAD BLOCKING STRUTS WHICH ARE 48" OR LONGER MUST BE STIFFENED BY THE APPLICATION OF HORIZONTAL AND VERTICAL STRUT BRACING. THESE PIECES ARE 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. HOWEVER, IF A LOAD REQUIRES 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. VERTICAL STRUT BRACING PIECES ARE TO BE 2" X 4" MATERIAL CUT TO A LENGTH TO EXTEND 2" ABOVE THE TOP STRUT. HORIZONTAL STRUT BRACING PIECES ARE TO BE 2" X 4" MATERIAL BY CAR WIDTH MINUS 1/2". HORIZONTAL PIECES WILL BE APPLIED ON EACH LAYER OF STRUTS. BOTH VERTICAL AND HORIZONTAL STRUT BRACING PIECES WILL BE NAILED TO THE STRUTS WITH 3-10d NAILS AT EACH JOINT.

(CONTINUED ON PAGE 3)

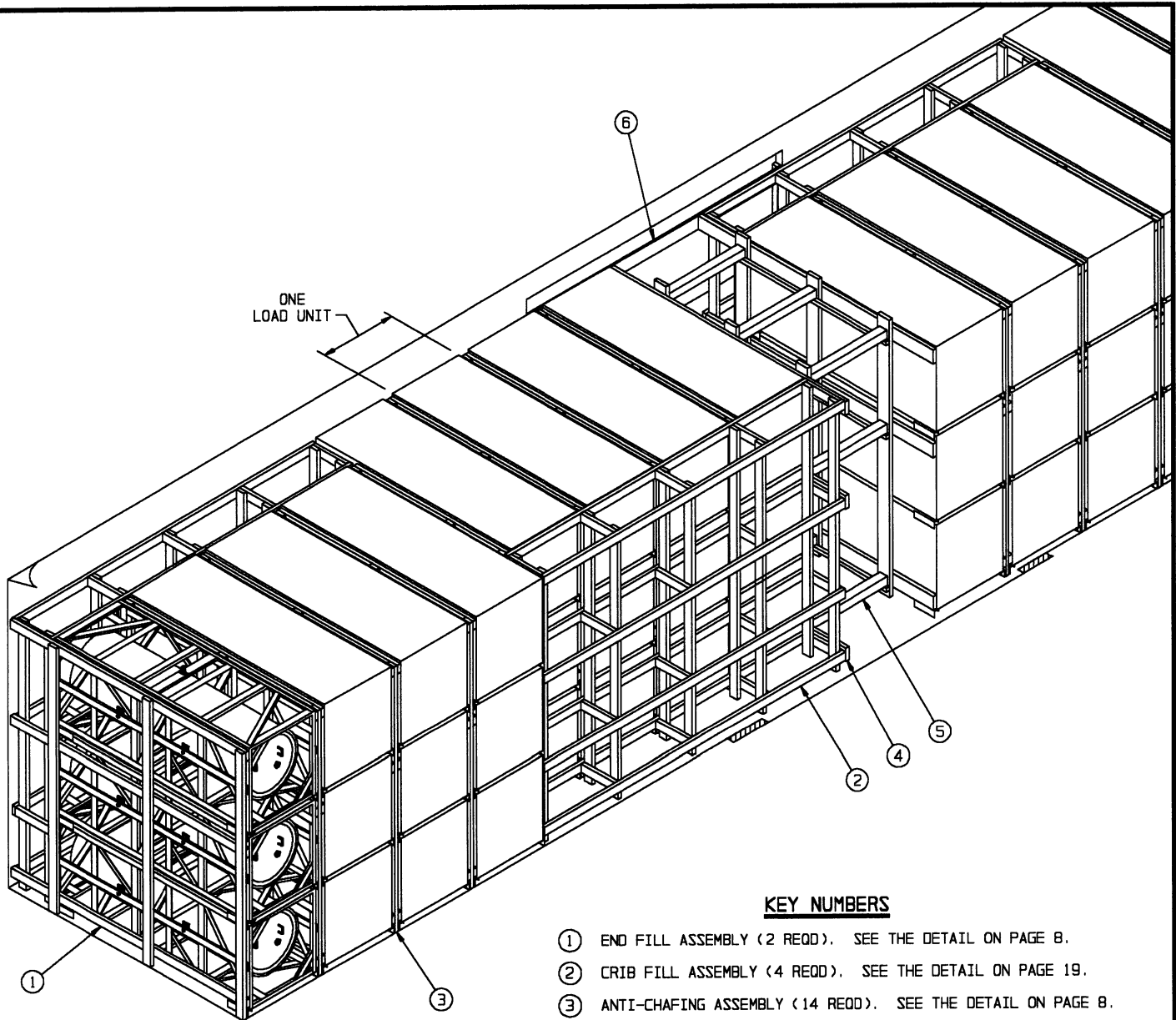
(GENERAL NOTES CONTINUED)

- S. TO ACHIEVE A TIGHTLY BLOCKED LOAD, A STRUT WILL BE CUT SLIGHTLY LONGER THAN THE MEASURED DISTANCE BETWEEN THE STRUT BEARING AREAS ON THE TWO CENTER GATES. ONE END OF THE STRUT WILL BE POSITIONED AT ITS BEARING AREA JUST ABOVE THE STRUT LEDGER ON ONE GATE, THEN THE OTHER END, WHICH CAN BE BEVELED ON THE LOWER CORNER IF DESIRED, WILL 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 11 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 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.



INJECTOR ASSEMBLY CONTAINER (IAC)

WEIGHT ----- 1,053 LBS (APPROX)
CUBE ----- 66.3 CU FT (APPROX)



ISOMETRIC VIEW

KEY NUMBERS

- ① END FILL ASSEMBLY (2 REQD). SEE THE DETAIL ON PAGE 8.
- ② CRIB FILL ASSEMBLY (4 REQD). SEE THE DETAIL ON PAGE 19.
- ③ ANTI-CHAFING ASSEMBLY (14 REQD). SEE THE DETAIL ON PAGE 8.
- ④ CENTER-GATE A (2 REQD). SEE THE DETAIL ON PAGE 9.
- ⑤ STRUT, 4" X 4" BY A LENGTH TO SUIT (REF: 35") (9 REQD). TOENAIL TO PIECES MARKED ④ W/2-16d NAILS AT EACH END.
- ⑥ DOORWAY PROTECTION (2 REQD). SEE THE DETAIL ON PAGE 10 AND SPECIAL NOTE 3 ON PAGE 5.

SPECIAL NOTES:

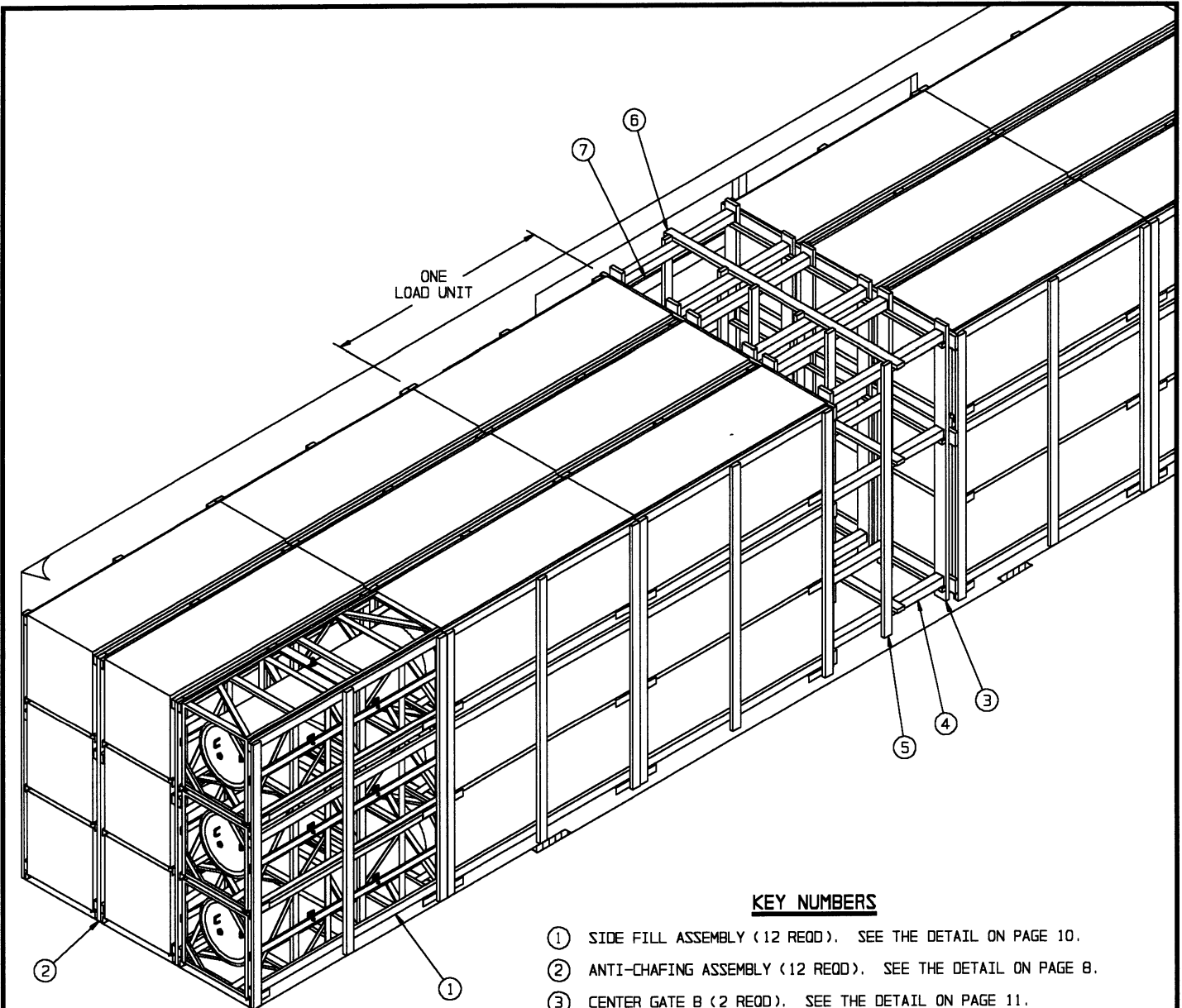
1. A 50'-6" LONG BY 9'-2" WIDE WOOD-LINED CONVENTIONAL TYPE BOXCAR EQUIPPED WITH 10'-0" WIDE DOOR OPENINGS IS SHOWN. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.
2. A MAXIMUM OF 36 IAC CONTAINERS, FOR A LADING WEIGHT OF APPROXIMATELY 37,908 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR BY USING THE DEPICTED PROCEDURES, AND A MAXIMUM OF 57 IAC CONTAINERS, FOR A LADING WEIGHT OF APPROXIMATELY 60,021 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.
3. DOORWAY PROTECTION IS REQUIRED FOR ALL CONTAINER STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY 1/2 OR MORE OF THE CONTAINER WIDTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION, SHOWN AS PIECE MARKED ⑥ IN THE LOAD ON PAGE 4, IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND NAILABLE DOOR POSTS. REFER TO PAGES 20 AND 21 FOR ALTERNATIVE DOORWAY PROTECTION.
4. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. A 3-TIER, 2-TIER, OR 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF 3, 2 OR 1 UNITS, RESPECTIVELY, BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD. ALSO, THE ENTIRE TOP TIER OR TIERS CAN BE OMITTED. FOR OTHER METHODS OF REDUCING A LOAD, AND FOR TYPICAL LCL PROCEDURES, REFER TO PAGES 12 THRU 19 FOR GUIDANCE.

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BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	80	40
2" X 2"	36	12
2" X 3"	32	16
2" X 4"	1966	1311
2" X 6"	111	111
4" X 4"	27	36
NAILS	NO. REQD	POUNDS
6d (2")	48	1/2
10d (3")	1270	19-3/4
12d (3-1/4")	32	3/4
16d (3-1/2")	36	1

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
IAC	48	50,544 LBS
DUNNAGE		3,074 LBS
TOTAL WEIGHT		53,618 LBS (APPROX)



ISOMETRIC VIEW

KEY NUMBERS

- ① SIDE FILL ASSEMBLY (12 REQD). SEE THE DETAIL ON PAGE 10.
- ② ANTI-CHAFING ASSEMBLY (12 REQD). SEE THE DETAIL ON PAGE 8.
- ③ CENTER GATE B (2 REQD). SEE THE DETAIL ON PAGE 11.
- ④ STRUT, 4" X 4" BY A LENGTH TO SUIT (REF: 54") (18 REQD). TOENAIL TO PIECES MARKED ③ W/2-16d NAILS AT EACH END.
- ⑤ VERTICAL STRUT BRACING, 2" X 4" X 9'-2" (6 REQD). NAIL TO THE STRUTS W/2-10d NAILS AT EACH JOINT.
- ⑥ HORIZONTAL STRUT BRACING, 2" X 4" BY CAR WIDTH MINUS 1/2" (3 REQD). NAIL TO THE STRUTS W/2-10d NAILS AT EACH JOINT.
- ⑦ DOORWAY PROTECTION (4 REQD). SEE THE DETAIL ON PAGE 10 AND SPECIAL NOTE 3 ON PAGE 7.

SPECIAL NOTES:

1. A 50'-6" LONG BY 9'-2" WIDE WOOD-LINED CONVENTIONAL TYPE BOXCAR EQUIPPED WITH 15'-0" WIDE STAGGERED DOOR OPENINGS IS SHOWN. CARS OF OTHER DIMENSIONS AND CARS HAVING WIDER OR NARROWER DOOR OPENINGS CAN BE USED.
2. A MAXIMUM OF 36 IAC CONTAINERS, FOR A LADING WEIGHT OF APPROXIMATELY 37,908 POUNDS, CAN BE LOADED IN A 40'-6" LONG CAR BY USING THE DEPICTED PROCEDURES, AND A MAXIMUM OF 63 IAC CONTAINERS, FOR A LADING WEIGHT OF APPROXIMATELY 66,339 POUNDS, CAN BE LOADED IN A 60'-8" LONG CAR BY USING THE DEPICTED PROCEDURES.
3. DOORWAY PROTECTION IS REQUIRED FOR ALL CONTAINER STACKS WHICH ARE COMPLETELY WITHIN THE DOORWAY AREA OR WHICH EXTEND INTO THE DOORWAY AREA BY 1/2 OR MORE OF THE CONTAINER WIDTH. THE WOODEN GATE TYPE OF DOORWAY PROTECTION, SHOWN AS PIECE MARKED (7) IN THE LOAD ON PAGE 6, IS APPLICABLE FOR BOXCARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS AND AVAILABLE DOOR POSTS. REFER TO PAGES 20 AND 21 FOR ALTERNATIVE DOORWAY PROTECTION.
4. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. A 3-TIER, 2-TIER, OR 1-TIER LOAD CAN BE REDUCED BY A MULTIPLE OF 9, 6 OR 3 UNITS, RESPECTIVELY, BY OMITTING ONE OR MORE LOAD UNITS FROM THE CENTER PORTION OF THE LOAD. ALSO, THE ENTIRE TOP TIER OR TIERS CAN BE OMITTED. FOR OTHER METHODS OF REDUCING A LOAD, AND FOR TYPICAL LCL PROCEDURES, REFER TO PAGES 12 THRU 18 FOR GUIDANCE.

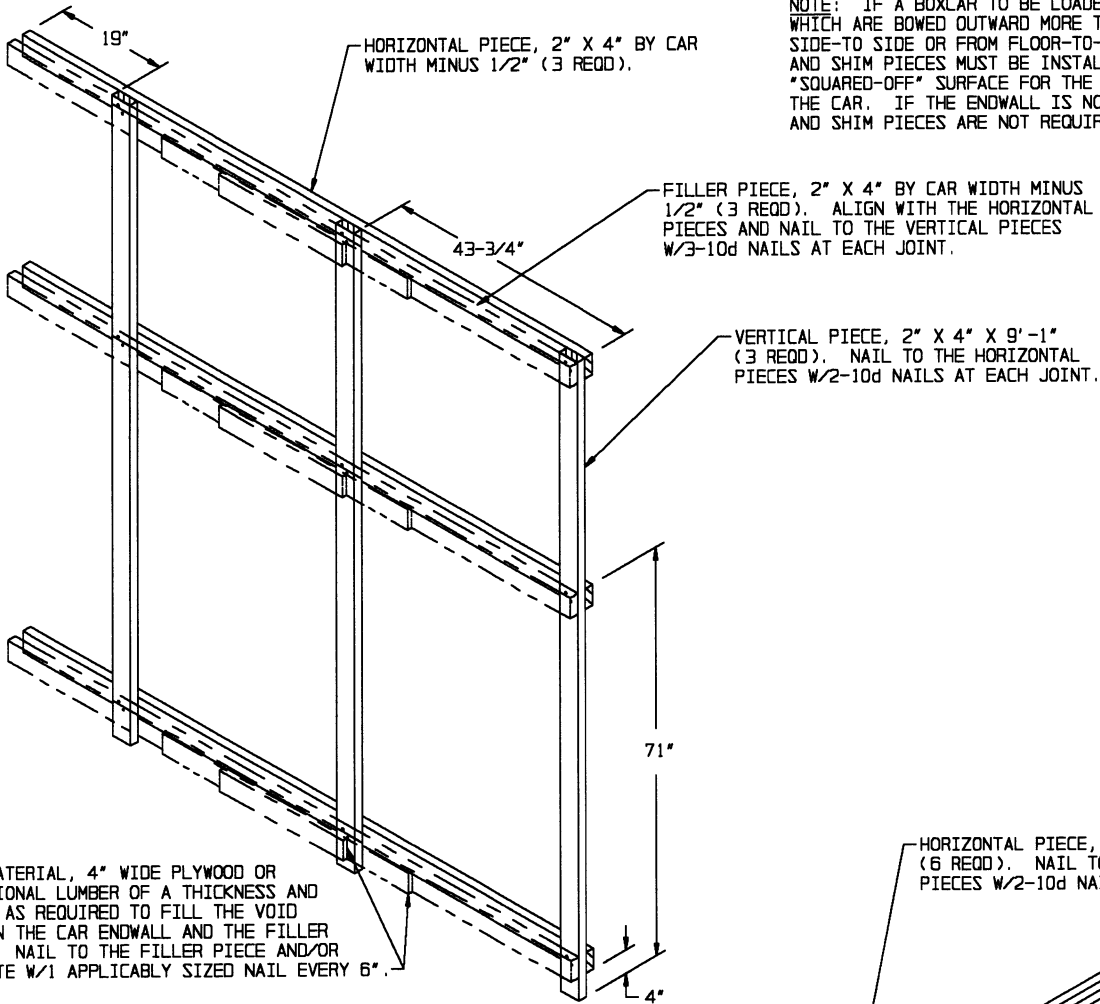
BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
1" X 6"	89	45
2" X 2"	52	18
2" X 3"	64	32
2" X 4"	1575	1050
2" X 6"	167	167
4" X 4"	81	108
NAILS	NO. REQD	POUNDS
6d (2")	72	1/2
10d (3")	936	14-1/2
12d (3-1/4")	64	1-1/4
16d (3-1/2")	72	1-3/4

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
IAC	54	56,862 LBS
DUNNAGE		2,858 LBS

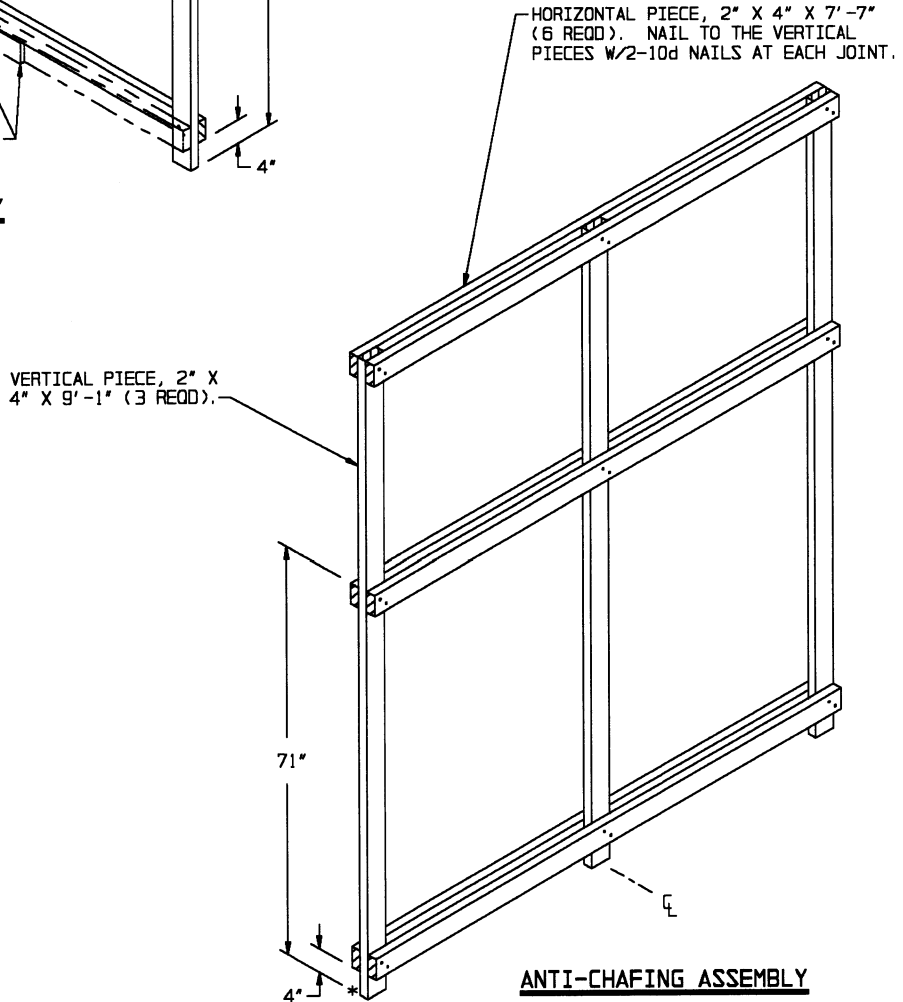
TOTAL WEIGHT - - - - - 59,720 LBS (APPROX)

NOTE: IF A BOXCAR TO BE LOADED HAS BOWED ENDWALLS WHICH ARE BOWED OUTWARD MORE THAN 2", EITHER FROM SIDE-TO-SIDE OR FROM FLOOR-TO-ROOF, FILLER PIECES AND SHIM PIECES MUST BE INSTALLED TO PROVIDE A "SQUARED-OFF" SURFACE FOR THE LOAD AT THE END OF THE CAR. IF THE ENDWALL IS NOT BOWED, THE FILLER AND SHIM PIECES ARE NOT REQUIRED.

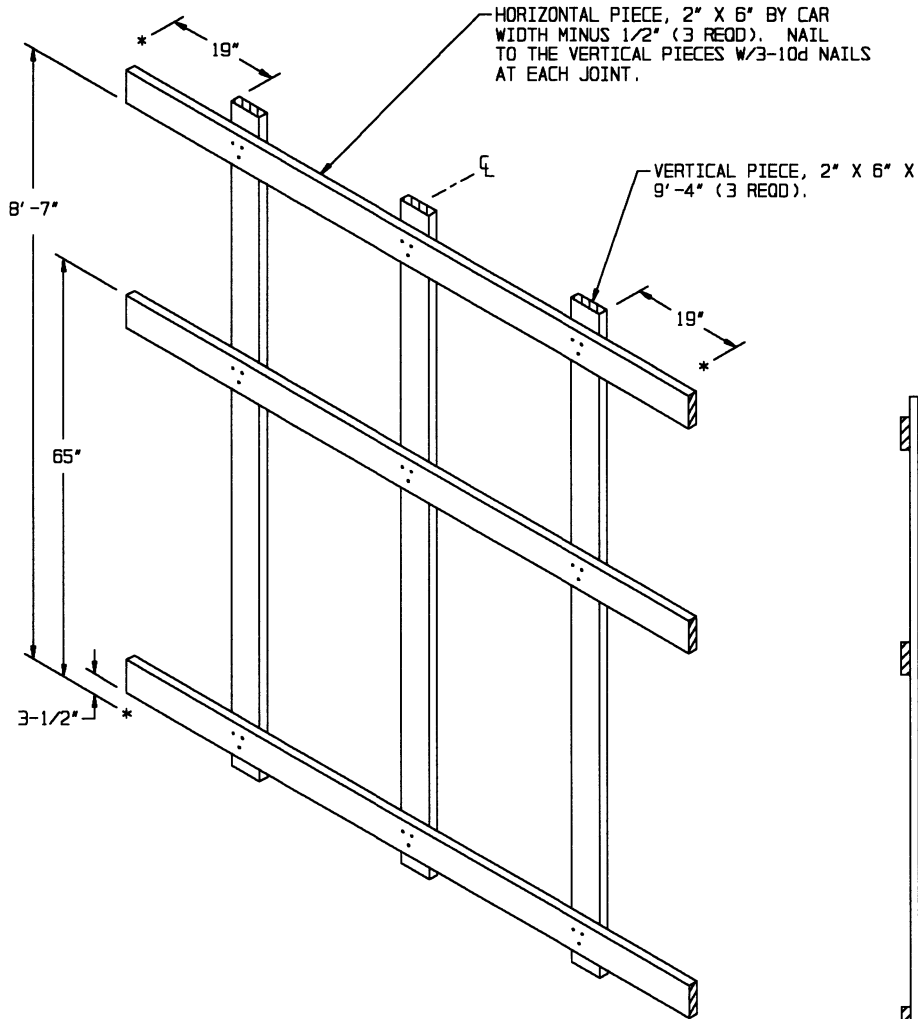


END FILL ASSEMBLY

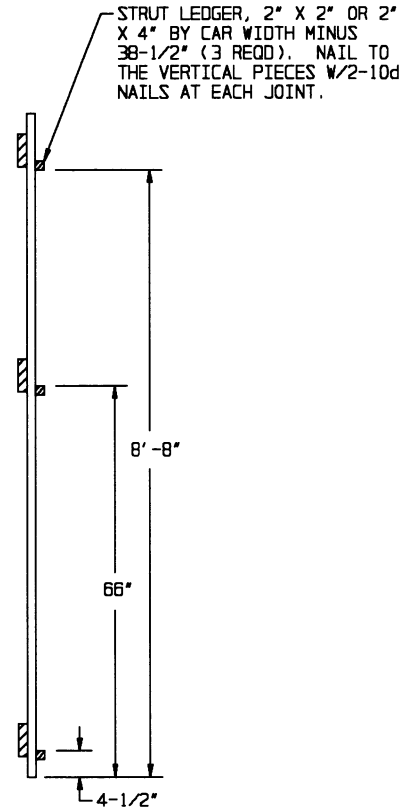
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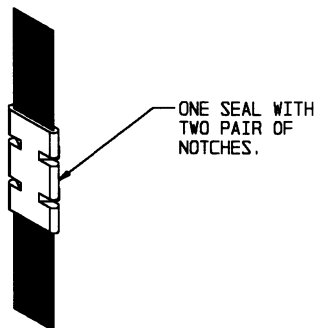
ANTI-CHAFING ASSEMBLY



CENTER GATE A

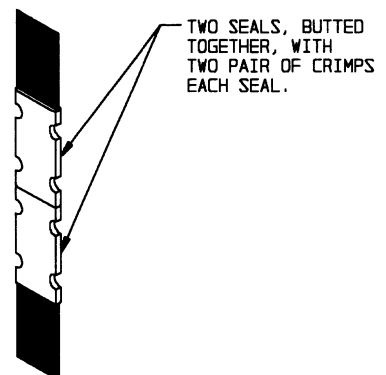


END VIEW



STRAP JOINT A

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



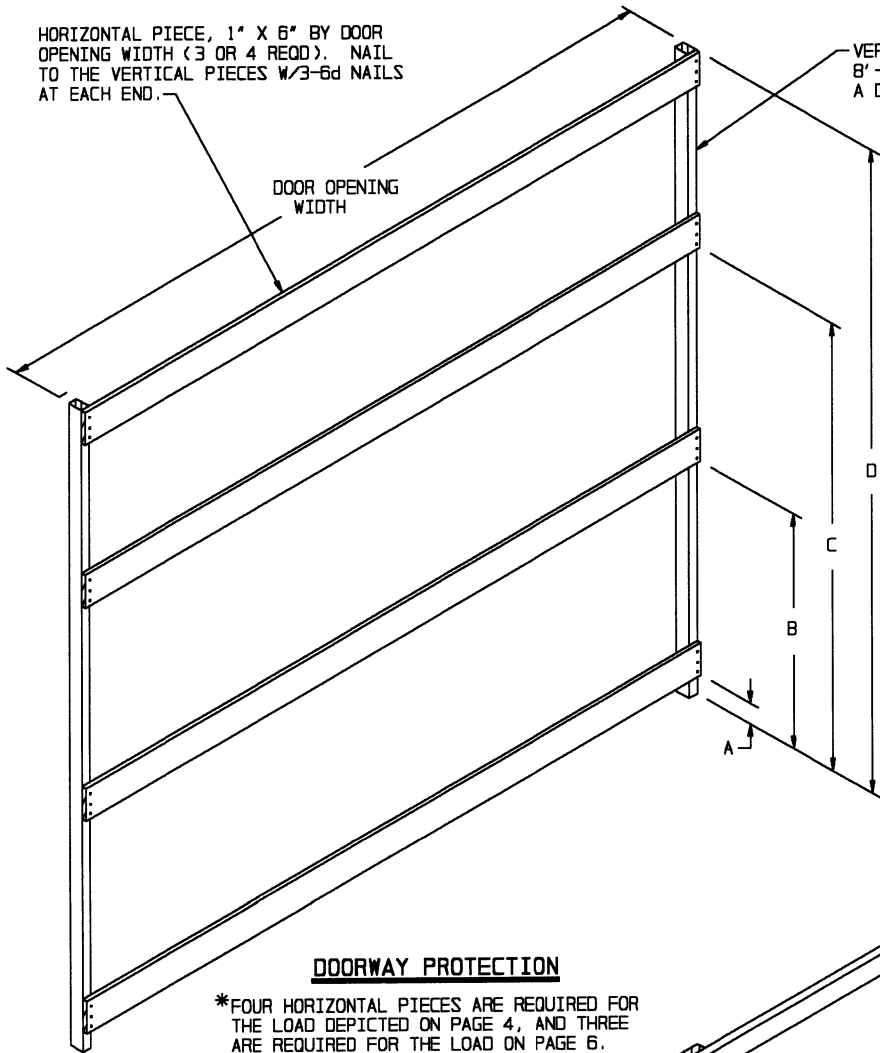
STRAP JOINT B

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

END-OVER-END LAP JOINT DETAILS

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

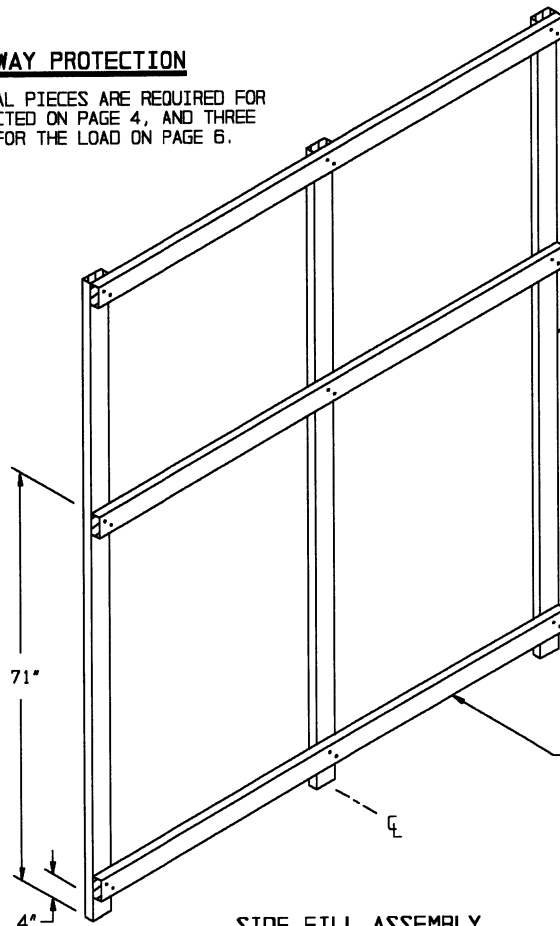
VERTICAL PIECE, 2" X 3" X
8'-0" (2 REQD). NAIL TO
A DOOR POST W/12d NAILS.



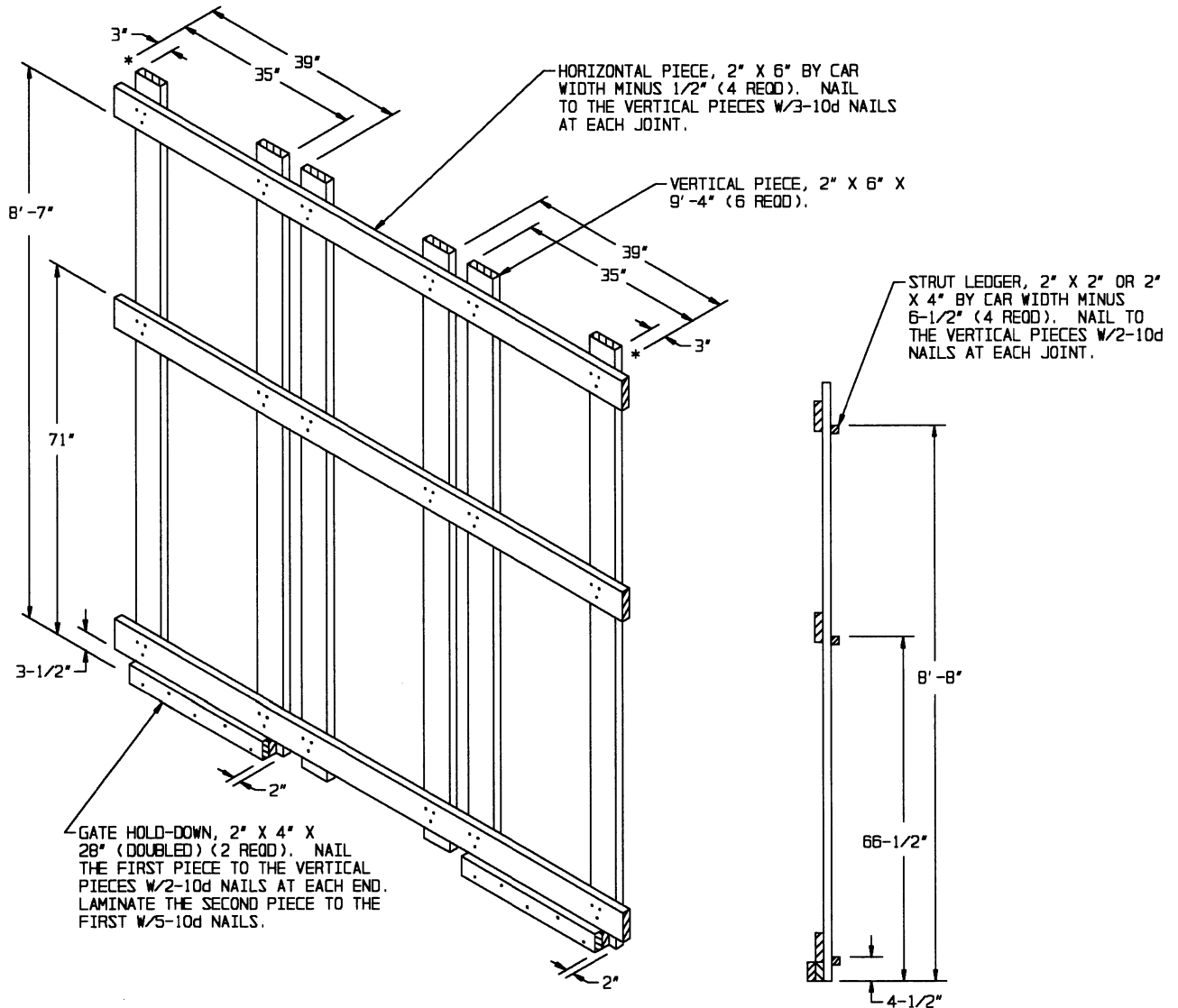
CONTAINER LOADING DIRECTION		
DIM	CROSSWISE (PAGE 4)	LENGTHWISE (PAGE 6)
A	3-1/2"	*
B	39-1/2"	18"
C	6' -3-1/2"	54"
D	9'-1"	8'-0"

DOORWAY PROTECTION

*FOUR HORIZONTAL PIECES ARE REQUIRED FOR
THE LOAD DEPICTED ON PAGE 4, AND THREE
ARE REQUIRED FOR THE LOAD ON PAGE 6.

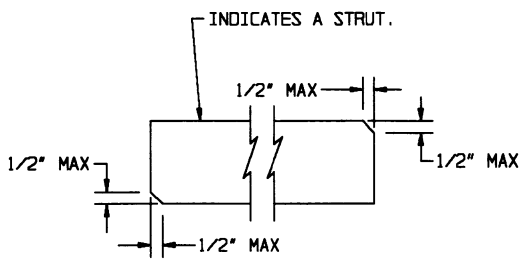


SIDE FILL ASSEMBLY



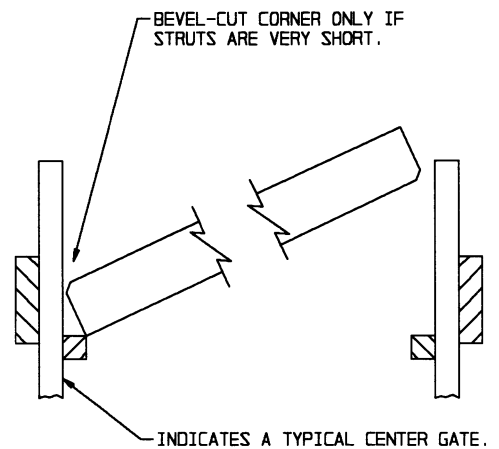
CENTER GATE B

END VIEW



BEVEL-CUT

BEVEL CUTTING THE STRUTS AS SPECIFIED WILL FACILITATE INSTALLING THE STRUTS WITH A "DRIVE FIT". CAUTION: DO NOT BEVEL A CORNER MORE THAN 1/2".

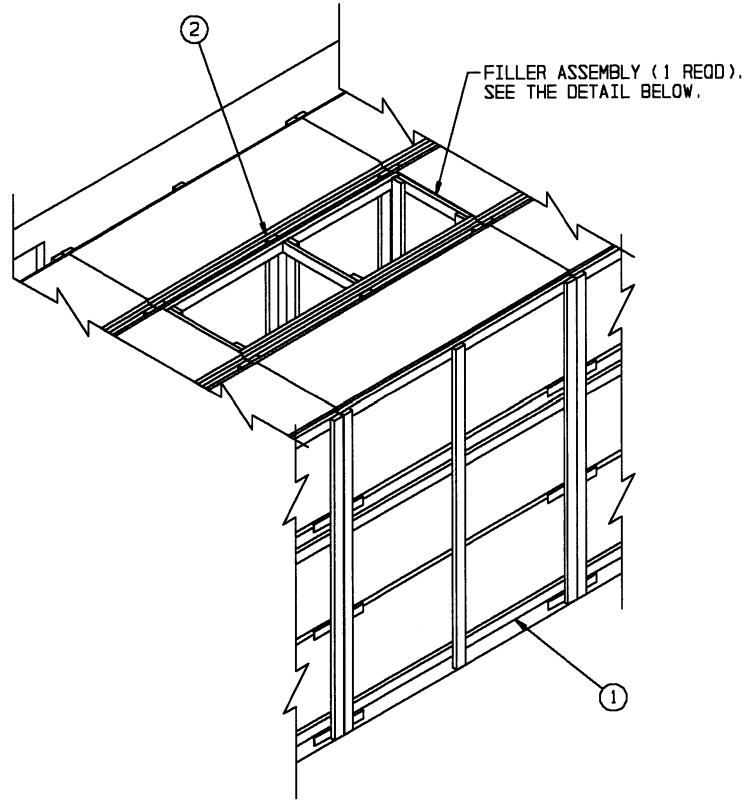


STRUT INSTALLATION

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

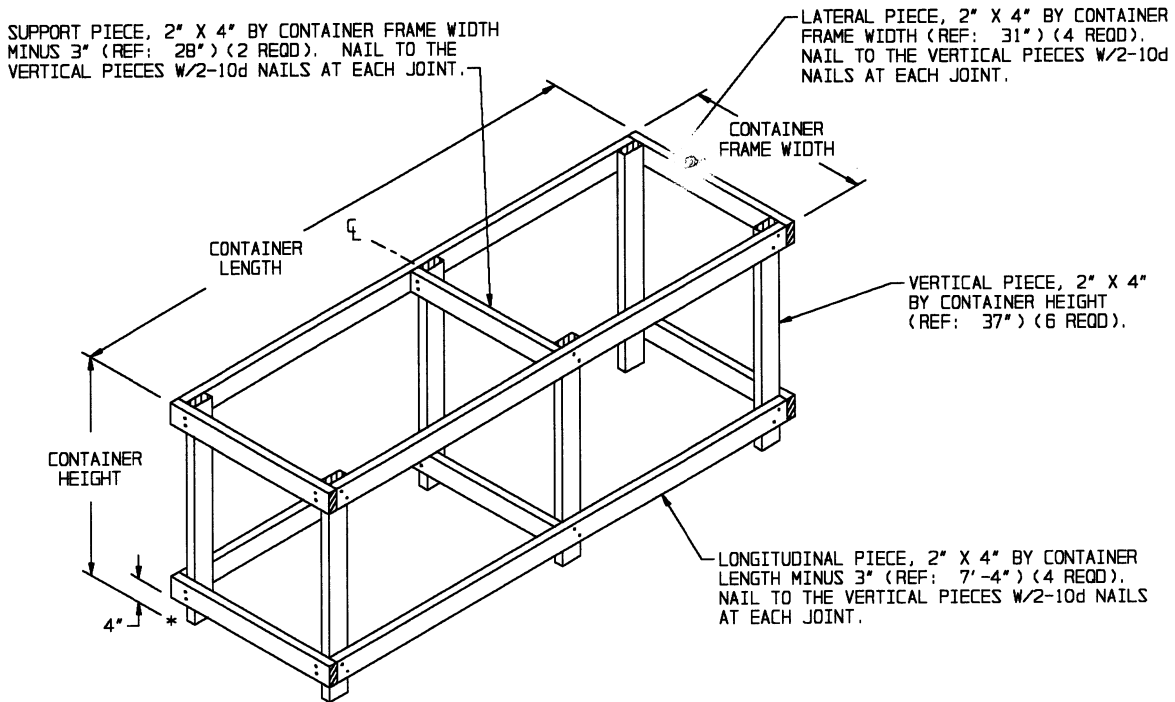
SPECIAL NOTES:

1. A PARTIAL VIEW OF A 9'-2" WIDE CONVENTIONAL TYPE BOXCAR IS SHOWN. WIDER CARS CAN ALSO BE USED.
2. A UNIT OMITTED FROM THE TOP LAYER OF A 3-LAYER LOAD IS SHOWN AS TYPICAL. THE PROCEDURES ARE ALSO APPLICABLE FOR THE OMISSION OF A TOP-LAYER CONTAINER FROM A 2-LAYER OR 1-LAYER LOAD.
3. THE OMITTED UNIT PROCEDURES 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 THE CENTER GATE.
4. ONLY THE BLOCKING AND BRACING FOR THE OMITTED UNITS IS SHOWN; REFER TO THE LOAD ON PAGE 6 FOR THE BLOCKING AND BRACING REQUIREMENTS FOR THE BALANCE OF THE LOAD.



ISOMETRIC VIEW

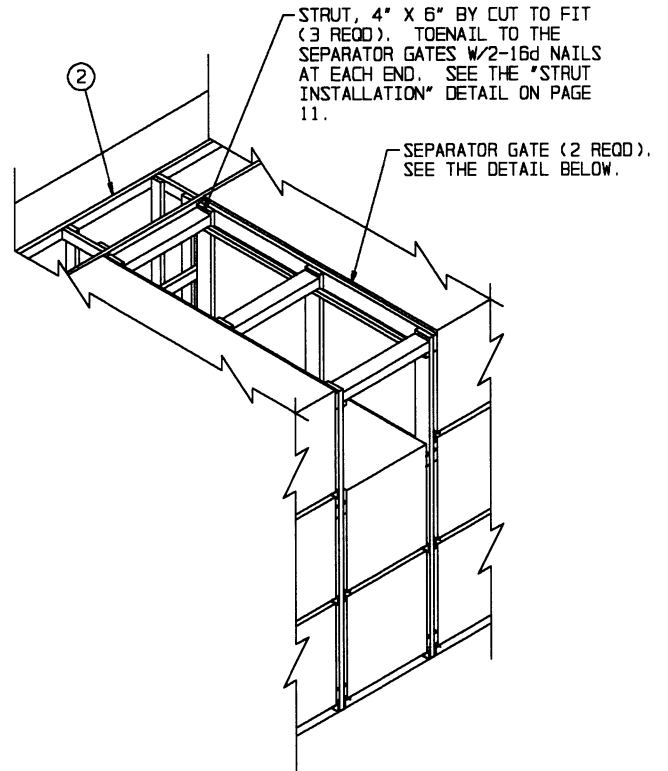
(KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 6.)



FILLER ASSEMBLY

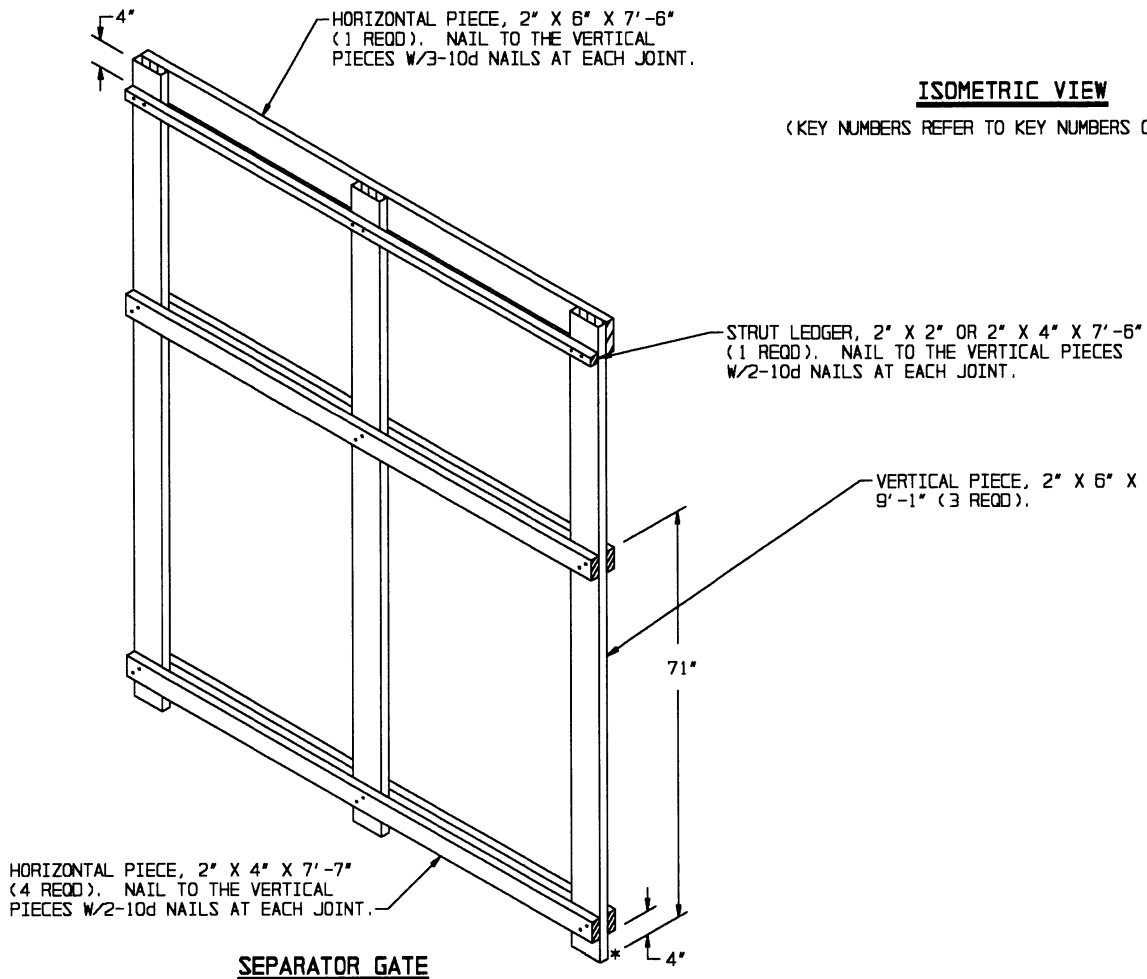
SPECIAL NOTES:

1. A PARTIAL VIEW OF A 9'-2" WIDE CONVENTIONAL TYPE BOXCAR IS SHOWN. WIDER CARS CAN ALSO BE USED.
2. A UNIT OMITTED FROM THE TOP LAYER OF A 3-LAYER LOAD IS SHOWN AS TYPICAL. THE PROCEDURES ARE ALSO APPLICABLE FOR THE OMISSION OF A TOP-LAYER CONTAINER FROM A 2-LAYER OR 1-LAYER LOAD.
3. THE OMITTED UNIT PROCEDURES 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 THE CENTER GATE.
4. ONLY THE BLOCKING AND BRACING FOR THE OMITTED UNITS IS SHOWN; REFER TO THE LOAD ON PAGE 4 FOR THE BLOCKING AND BRACING REQUIREMENTS FOR THE BALANCE OF THE LOAD.



ISOMETRIC VIEW

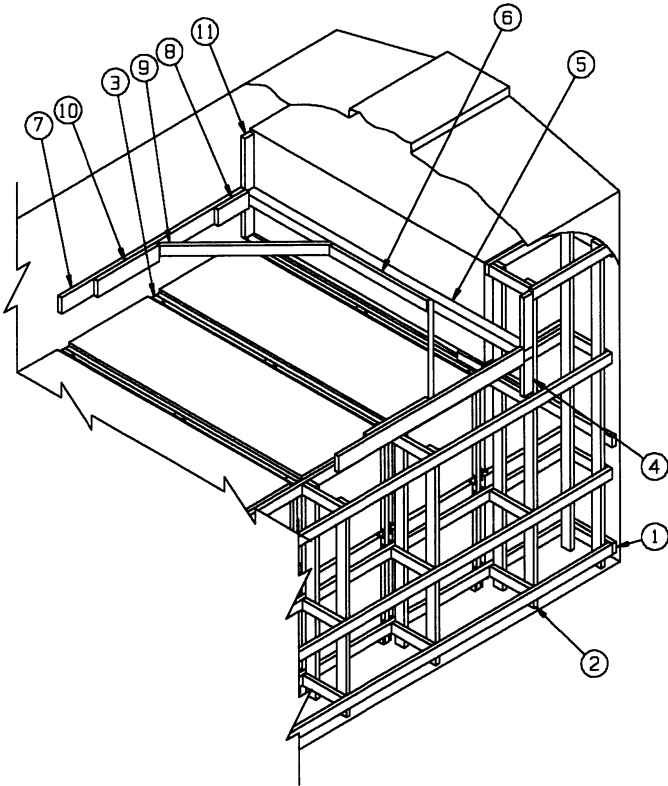
(KEY NUMBERS REFER TO KEY NUMBERS ON PAGE 4.)



SEPARATOR GATE

KEY NUMBERS

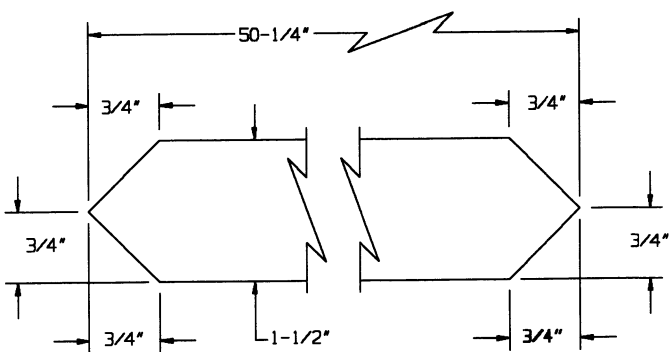
- ① END FILL ASSEMBLY (AS REQD). SEE THE DETAIL ON PAGE 8.
- ② MODIFIED CRIB FILL ASSEMBLY (AS REQD). SEE THE DETAIL ON PAGE 19.
- ③ ANTI-CHAFING ASSEMBLY (AS REQD). SEE THE DETAIL ON PAGE 8.
- ④ SUPPORT CLEAT, 2" X 4" X 12" (2 REQD). POSITION VERTICALLY AS SHOWN SO AS TO CENTER PIECE MARKED ⑤ ON THE CONTAINER LOAD BEARING SURFACE. NAIL TO THE CAR SIDEWALL W/3-10d NAILS.
- ⑤ CROSS CAR BRACE, 4" X 4" BY CAR WIDTH IN LENGTH (CUT TO FIT) (1 REQD).
- ⑥ CENTER CLEAT, 2" X 4" X 36" (1 REQD). NAIL TO THE CROSS CAR BRACE, PIECE MARKED ⑤, W/7-16d NAILS.
- ⑦ HORIZONTAL WALL CLEAT, 2" X 6" X 72" (2 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, PIECE MARKED ⑦, W/4-16d NAILS.
- ⑨ DIAGONAL BRACE, 2" X 4" X 50-1/4" (2 REQD). SEE THE DETAIL BELOW FOR BEVEL-CUTS REQUIRED. TOENAIL TO THE CROSS CAR BRACE, PIECE MARKED ⑤, AND TO THE HORIZONTAL WALL CLEAT, PIECE MARKED ⑦, W/2-16d NAILS AT EACH END.
- ⑩ BACK-UP CLEAT, 2" X 6" X 24" (2 REQD). NAIL TO THE HORIZONTAL WALL CLEAT, PIECE MARKED ⑦, W/8-16d NAILS.
- ⑪ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REQD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.



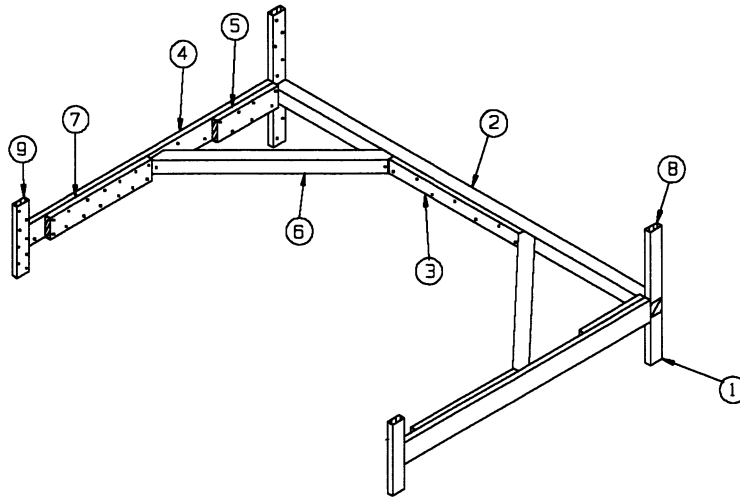
ISOMETRIC VIEW

SPECIAL NOTES:

1. A 9'-2" WIDE CONVENTIONAL WOOD-LINED (ENDWALLS AND SIDEWALLS) BOXCAR IS SHOWN WITH A TYPICAL K-BRACE. WOOD-LINED CARS OF OTHER WIDTHS CAN BE USED.
2. THE K-BRACE METHOD OF PARTIAL-LAYER BRACING MAY BE USED IN A WOOD-LINED CAR FOR THE SECUREMENT OF A PARTIAL TOP TIER, BE IT A FIRST, SECOND OR THIRD TIER. THE TYPE "A" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL TIER OF NOT MORE THAN 4,000 POUNDS. IF IT IS NECESSARY TO BLOCK A HEAVIER LOAD, REFER TO THE DETAIL ON PAGE 15.
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 K-BRACE. DUNNAGE PIECES MARKED ④, ⑤, ⑧, 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, PIECE MARKED ⑨, TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT PIECE MARKED ⑦ MUST BE DOUBLED WITH THE DELETION OF THE POCKET CLEATS, PIECE MARKED ⑧, AND EXTENDED FROM THE CROSS CAR BRACE, PIECE MARKED ⑤, ACROSS THE DOORWAY AREA FOR ENOUGH TO ALLOW A MINIMUM OF 60" OF NAILABLE SURFACE AREA. NAIL WITH 16d NAILS EVERY 6", CLINCHING NAILS WHICH ARE EXPOSED IN THE DOORWAY AREA. NOTE THAT THE DIAGONAL BRACE WILL BE 49-1/8" IN LIEU OF 50-1/4" WHEN PIECE MARKED ⑦ IS DOUBLED.



DIAGONAL BRACE



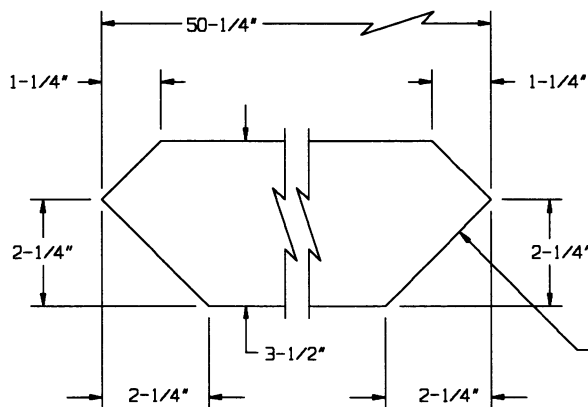
ISOMETRIC VIEW

SPECIAL NOTES:

1. THE TYPE "B" K-BRACE SHOWN IS ADEQUATE FOR RETAINING A PARTIAL-LAYER (TIER) OF NOT MORE THAN 7,000 POUNDS. IF THE PARTIAL TIER TO BE BRACED WEIGHS 4,000 POUNDS OR LESS, THE TYPE "A" K-BRACE DEPICTED ON PAGE 14 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 K-BRACE. DUNNAGE PIECES MARKED ①, ②, ⑤, ⑧, AND ⑨ MUST BE SUPPORTED AT THE SIDES OF A CAR BY A CAR SIDEWALL. IT IS ALRIGHT FOR THE ENDS OF THE DIAGONAL BRACES, PIECE MARKED ⑥, TO BEAR IN FRONT OF A DOOR OPENING, HOWEVER, THE ADJACENT PIECE MARKED ④ MUST BE DOUBLED AND EXTENDED ACROSS AND FAR ENOUGH PAST THE DOOR OPENING (REF: 54") TO PROVIDE FOR THE SPECIFIED NAILING OF EACH PIECE, WITH THE DELETION OF PIECE MARKED ⑤. NAIL THE FIRST PIECE TO THE SECOND W/16-16d NAILS. CLINCH THOSE NAILS WHICH PROTRUDE THRU THE HORIZONTAL WALL CLEAT WITHIN THE DOORWAY AREA. NOTE THAT THE DIAGONAL BRACE WILL BE 49-1/8" LONG IN LIEU OF 50-1/4" WHEN PIECE MARKED ④ IS DOUBLED.
3. THE CENTER CLEAT SHOWN AS PIECE MARKED ③ WILL BE 38" LONG FOR A 9'-4" WIDE CAR AND 40" LONG FOR A 9'-6" WIDE CAR. ADJUST THE LENGTH PROPORTIONATELY FOR CARS OF OTHER WIDTHS.
4. REFER TO PAGE 14 FOR A TYPICAL INSTALLATION OF THE K-BRACE.

KEY NUMBERS

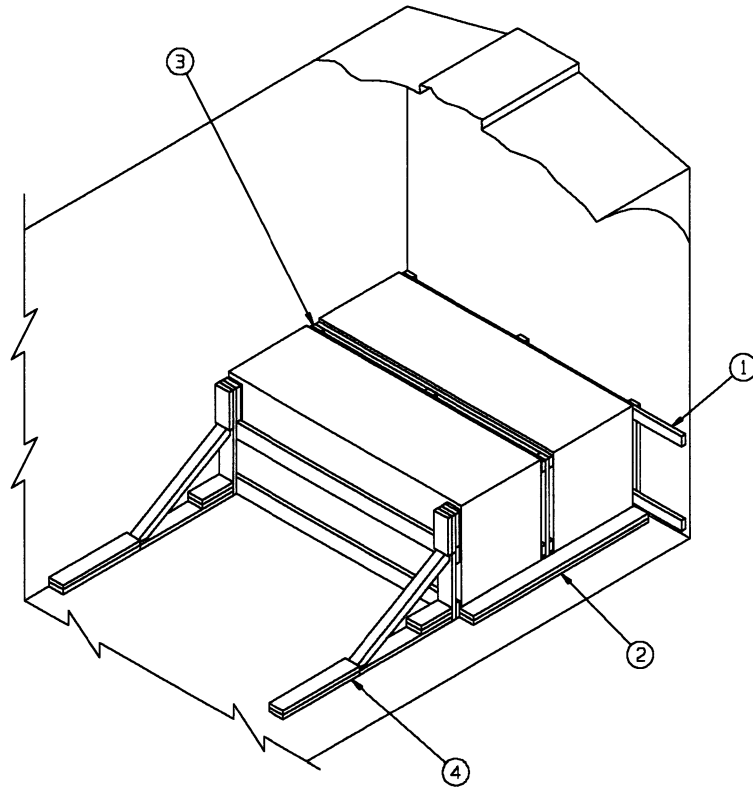
- ① SUPPORT CLEAT, 2" X 4" X 12" (2 REOD). NAIL TO THE CAR SIDEWALL W/3-10d NAILS. POSITION SO AS TO CENTER PIECE MARKED ② ON THE CONTAINER LOAD BEARING SURFACE.
- ② CROSS CAR BRACE, 4" X 4" X CAR WIDTH (CUT-TO-FIT) (1 REOD).
- ③ CENTER CLEAT, 2" X 4" X 38" (1 REOD). CENTER ON THE CROSS CAR BRACE, PIECE MARKED ②, AND NAIL W/7-16d NAILS. SEE SPECIAL NOTE 3 AT LEFT.
- ④ HORIZONTAL WALL CLEAT, 2" X 6" X 72" (2 REOD). NAIL TO THE CAR SIDE WALL W/16-12d NAILS.
- ⑤ POCKET CLEAT, 2" X 6" X 18" (2 REOD). NAIL TO THE HORIZONTAL WALL CLEAT, PIECE MARKED ④, W/7-16d NAILS.
- ⑥ DIAGONAL BRACE, 2" X 4" X 50-1/4" (2 REOD). SEE THE DETAIL BELOW FOR BEVEL CUTS REQUIRED. TOENAIL TO THE CROSS CAR BRACE, PIECE MARKED ②, AND TO THE HORIZONTAL WALL CLEAT, PIECE MARKED ④, W/1-60d NAIL AT EACH END.
- ⑦ BACK-UP CLEAT, 2" X 6" X 30" (2 REOD). NAIL TO THE HORIZONTAL WALL CLEAT, PIECE MARKED ④, W/14-16d NAILS.
- ⑧ HOLD-DOWN CLEAT, 2" X 4" X 18" (2 REOD). NAIL TO THE CAR SIDEWALL W/5-12d NAILS.
- ⑨ VERTICAL BACK-UP CLEAT, 2" X 6" X 18" (2 REOD). CENTER ON PIECE MARKED ④ AND NAIL W/8-12d NAILS.



DIAGONAL BRACE

SEE SPECIAL NOTE 2 ABOVE.

TYPE "B" K-BRACE DETAILS



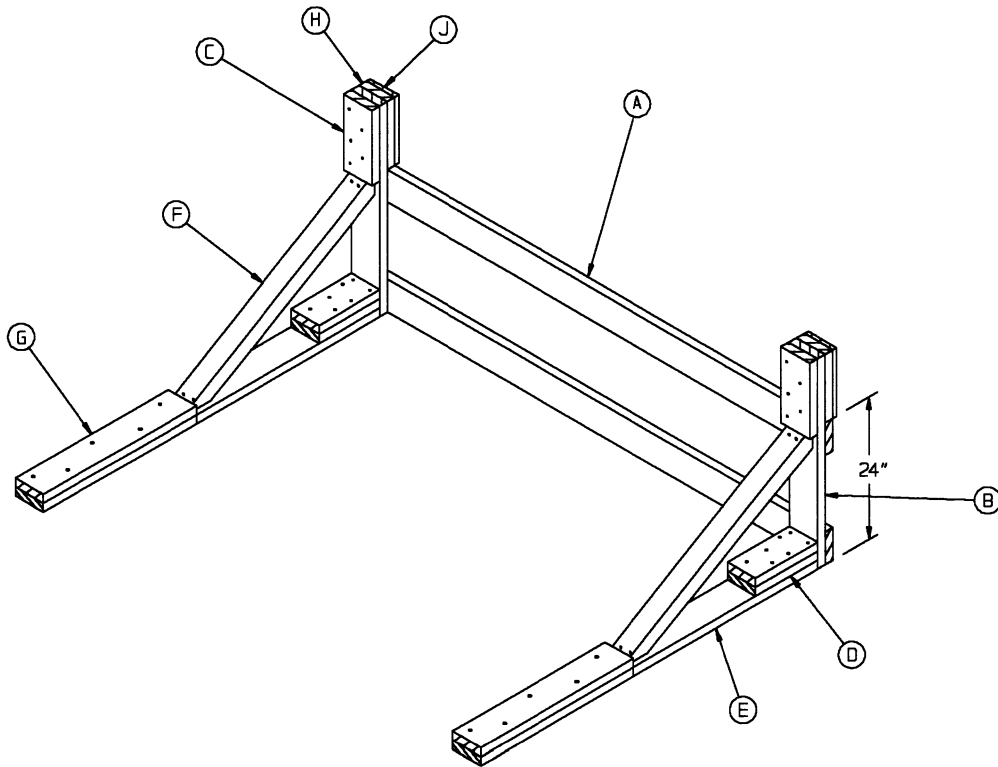
ISOMETRIC VIEW

SPECIAL NOTES:

1. A TWO CONTAINER LOAD IS SHOWN IN A 9'-2" WIDE CONVENTIONAL BOXCAR. CARS OF OTHER WIDTHS CAN ALSO BE USED.
2. THE TOTAL KNEE BRACE ASSEMBLY IS ADEQUATE FOR RETAINING A MAXIMUM LCL LOAD OF NOT MORE THAN 8,500 POUNDS.

KEY NUMBERS

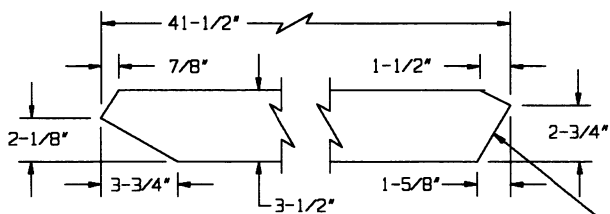
- ① END FILL ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 8.
- ② SIDE BLOCKING, 2" X 6" BY LOAD LENGTH (DOUBLED) (1 REQD). PRE-POSITION. NAIL THE FIRST PIECE TO THE CAR FLOOR W/1-16d NAIL EVERY 8". LAMINATE THE SECOND PIECE IN A LIKE MANNER.
- ③ ANTI-CHAFING ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 8.
- ④ KNEE BRACE ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 17 AND SPECIAL NOTE 2 AT LEFT.



ISOMETRIC VIEW

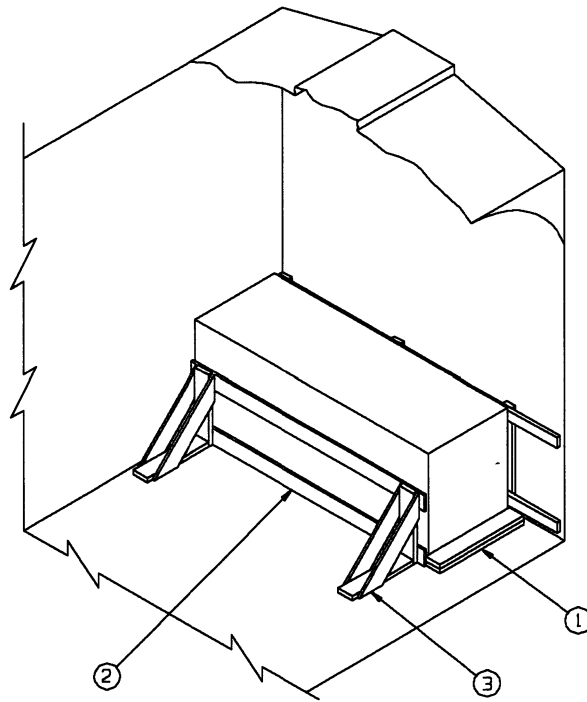
KEY LETTERS

- (A) LOAD BEARING PIECE, 2" X 6" X 7'-7" (2 REOD). NAIL TO THE VERTICAL PIECES, PIECES MARKED (B), W/3-10d NAILS AT EACH JOINT.
- (B) VERTICAL PIECE, 2" X 6" X 36" (2 REOD).
- (C) HOLD-DOWN CLEAT, 2" X 6" X 13" (2 REOD). NAIL TO THE VERTICAL PIECE, PIECE MARKED (B), W/5-10d NAILS.
- (D) POCKET CLEAT, 2" X 6" X 12" (DOUBLED) (2 REOD). NAIL THE FIRST PIECE TO THE FLOOR CLEAT, PIECE MARKED (E), W/5-16d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER. TOENAIL TO THE VERTICAL PIECE W/2-10d NAILS.
- (E) FLOOR CLEAT, 2" X 6" X 67-1/4" (2 REOD). NAIL TO THE CAR FLOOR W/1-16d NAIL EVERY 8".
- (F) BRACE, 4" X 4" X 41-1/2" (2 REOD). SEE THE DETAIL AT BELOW FOR BEVEL CUTS REQUIRED. TOENAIL TO THE VERTICAL PIECE AND FLOOR CLEAT, PIECES MARKED (B) AND (E), W/2-16d NAILS AT EACH JOINT.
- (G) BACK-UP CLEAT, 2" X 6" X 30" (2 REOD). NAIL TO THE FLOOR CLEAT, PIECE MARKED (E), W/6-40d NAILS.
- (H) FILL PIECE, 2" X 6" X 12" (2 REOD). NAIL TO THE VERTICAL PIECE, PIECE MARKED (B), W/3-10d NAILS.
- (J) FILL PIECE, 1" X 6" X 12" (2 REOD). NAIL TO THE FILL PIECE, PIECE MARKED (H), W/3-6d NAILS.



BRACE
4" X 4" MATERIAL

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



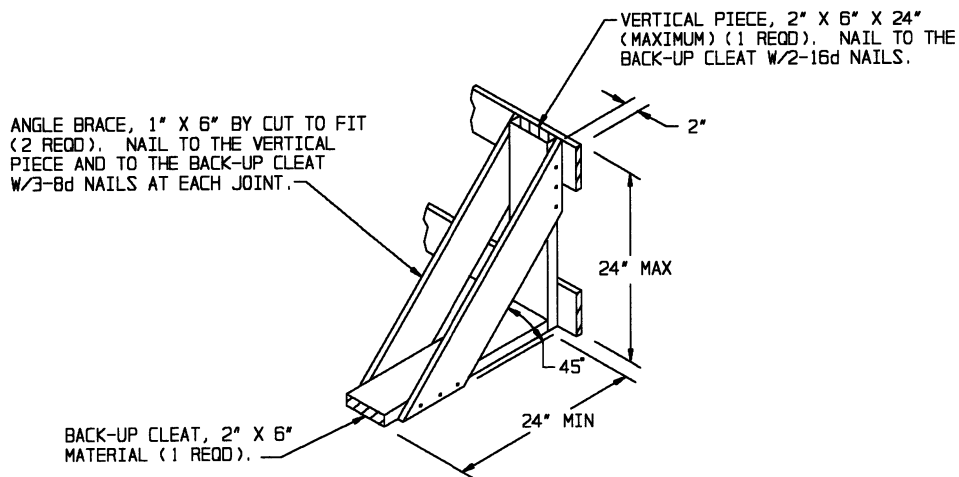
ISOMETRIC VIEW

SPECIAL NOTES:

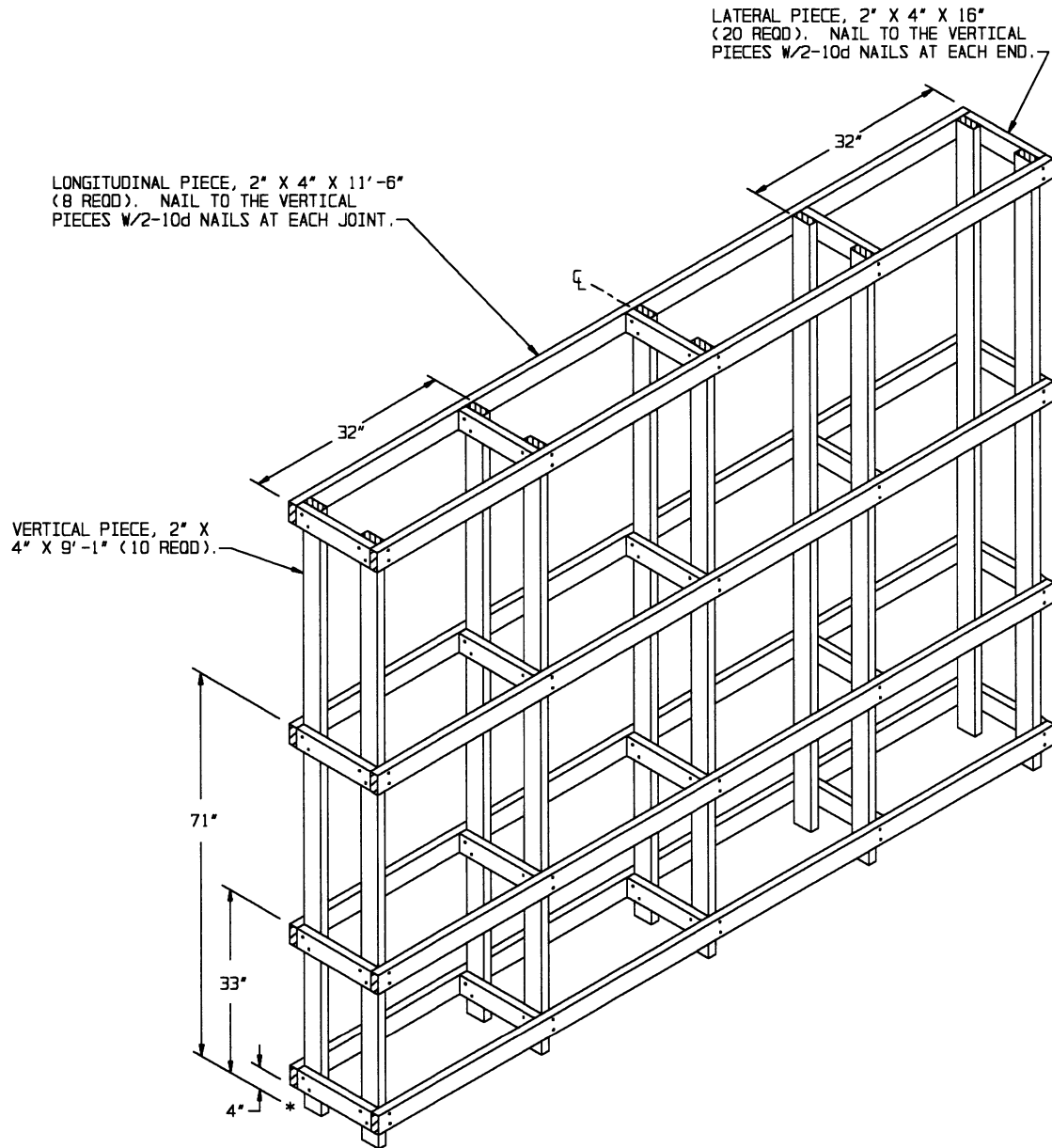
1. A 9'-2" WIDE CONVENTIONAL BOXCAR HAVING A WOOD OR NAILABLE METAL FLOOR IS SHOWN. CARS OF OTHER WIDTHS CAN ALSO BE USED.
2. EACH LCL BRACE AS APPLIED FOR LONGITUDINAL BRACING WILL RETAIN 2,000 POUNDS OF LADING. EACH LCL BRACE AS APPLIED FOR LATERAL BRACING WILL SUPPORT 8,000 POUNDS OF LADING. A MINIMUM OF TWO BRACES MUST BE USED FOR LONGITUDINAL BRACING.

KEY NUMBERS

- ① SIDE BLOCKING, 2" X 6" BY LOAD LENGTH (DOUBLED) (1 REQD). PRE-POSITION. NAIL THE FIRST PIECE TO THE CAR FLOOR W/1-16d NAIL EVERY 8". LAMINATE THE SECOND PIECE IN A LIKE MANNER.
- ② HORIZONTAL PIECE, 1" X 6" X 7'-7" (2 REQD). NAIL TO THE LCL BRACE W/3-8d NAILS AT EACH JOINT.
- ③ LCL BRACE (2 REQD). SEE THE DETAIL BELOW. NAIL TO THE CAR FLOOR W/7-10d NAILS. SEE SPECIAL NOTE 2 AT LEFT.



LCL BRACE



CRIB FILL ASSEMBLY

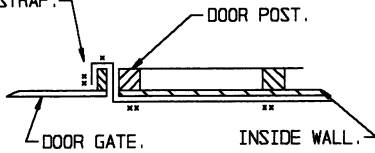
CRIB FILL ASSEMBLY MODIFICATION INSTRUCTIONS: THE UNMODIFIED ASSEMBLY DEPICTED ABOVE IS SUITABLE FOR LATERALLY BRACING 12 CONTAINERS. TO FABRICATE AN ASSEMBLY TO BRACE FEWER CONTAINERS, FOLLOW THESE RULES. FOR A THREE CONTAINER LONG ASSEMBLY, REDUCE THE OVERALL LENGTH TO 8'-6", FOR A TWO CONTAINER LONG ASSEMBLY, REDUCE THE OVERALL LENGTH TO 67", AND FOR A ONE CONTAINER LONG ASSEMBLY, REDUCE THE OVERALL LENGTH TO 31". TO REDUCE THE HEIGHT OF THE ASSEMBLY, ELIMINATE ONE LAYER OF LONGITUDINAL AND LATERAL PIECES FOR EACH LAYER OF CONTAINERS ELIMINATED, I.E., FOR A TWO CONTAINER HIGH ASSEMBLY, THERE WOULD BE THREE LAYERS OF LONGITUDINAL AND LATERAL PIECES, AND FOR A ONE CONTAINER HIGH ASSEMBLY, THERE WOULD BE TWO LAYERS OF PIECES. ASSEMBLIES MAY ALSO BE CONSTRUCTED FOR LOADS THAT VARY IN HEIGHT, SUCH AS THAT SHOWN ON PAGE PAGE 14.

*ONE HORIZONTAL PIECE OR STRAP IS REQUIRED PER LAYER FOR LENGTHWISE LOADED CONTAINERS. TWO HORIZONTALS OR STRAPS PER LAYER ARE REQUIRED FOR CROSSWISE LOADED CONTAINERS.

*HORIZONTAL PIECE, 1" X 6" BY DOOR OPENING WIDTH (1 OR 2 REQD PER LAYER). NAIL TO THE VERTICAL PIECES W/3-6d NAILS AT EACH END. SEE THE "DOORWAY PROTECTION" DETAIL ON PAGE 10 FOR HEIGHT LOCATIONS.

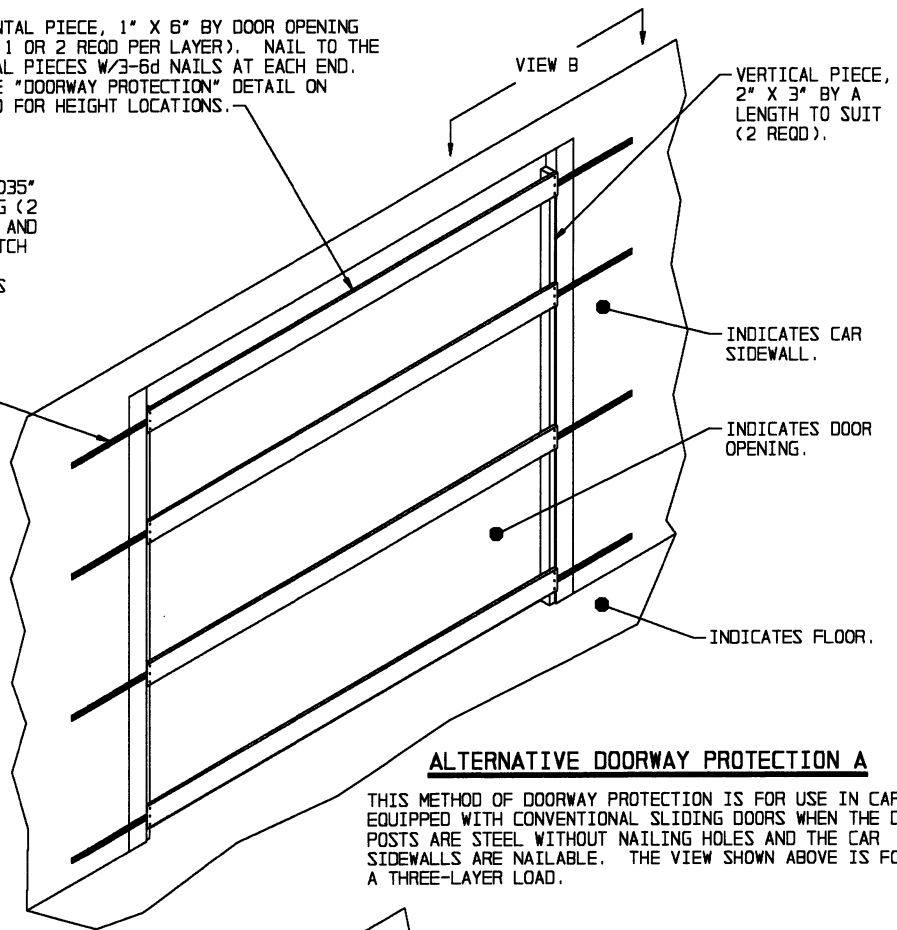
DOORWAY PROTECTION-GATE STRAP, 1-1/4" X .035" X 3'-0" (REF) NAIL-ON TYPE STEEL STRAPPING (2 REQD PER HORIZONTAL PIECE). NAIL TO GATE AND CAR SIDEWALL AS SHOWN BY THE "VIEW B" SKETCH BELOW. NOTE THAT TYPE I STRAPPING MAY BE PUNCHED FOR NAILING IF TYPE 3 STRAPPING IS NOT AVAILABLE.

INDICATES LOCATION OF 7 (MIN) 4d NAILS PER STRAP.



VIEW B

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



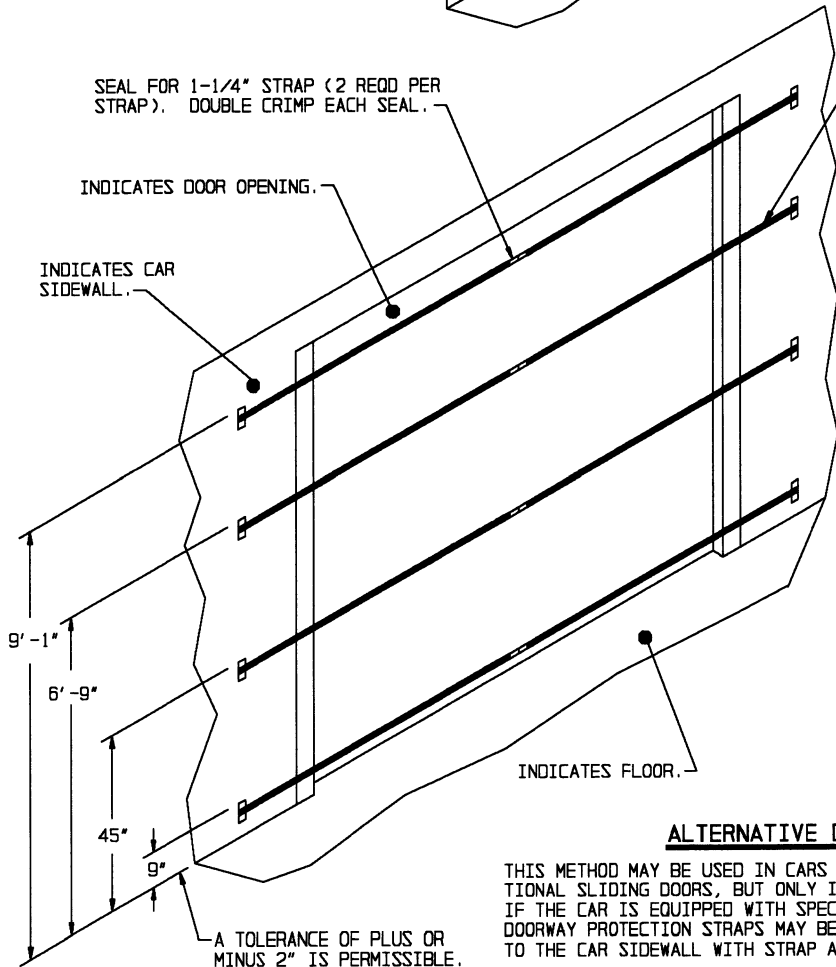
ALTERNATIVE DOORWAY PROTECTION A

THIS METHOD OF DOORWAY PROTECTION IS FOR USE IN CARS EQUIPPED WITH CONVENTIONAL SLIDING DOORS WHEN THE DOOR POSTS ARE STEEL WITHOUT NAILING HOLES AND THE CAR SIDEWALLS ARE AVAILABLE. THE VIEW SHOWN ABOVE IS FOR A THREE-LAYER LOAD.

SEAL FOR 1-1/4" STRAP (2 REQD PER STRAP). DOUBLE CRIMP EACH SEAL.

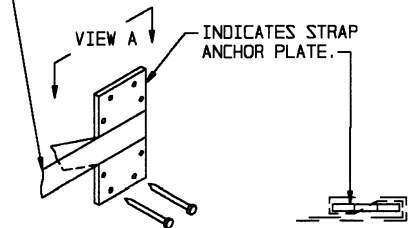
INDICATES DOOR OPENING.

INDICATES CAR SIDEWALL.



*DOORWAY PROTECTION STRAP, 1-1/4" X .035" OR .031" STEEL STRAPPING BY DOOR OPENING WIDTH PLUS 8'-0" IN LENGTH (1 OR 2 REQD PER LAYER). INSTALL FROM TWO PIECES. THREAD ONE END THRU A STRAP ANCHOR PLATE AS SHOWN BY THE "APPLICATION OF STRAPPING TO STRAP ANCHOR PLATE" DETAILS BELOW. NAIL STRAP ANCHOR PLATE TO CAR SIDEWALL W/4 SIGNODE MICROLOCK NAILS.

DOOR SPANNER END OF STRAP.



ISOMETRIC VIEW

VIEW A

APPLICATION OF STRAPPING TO STRAP ANCHOR PLATE

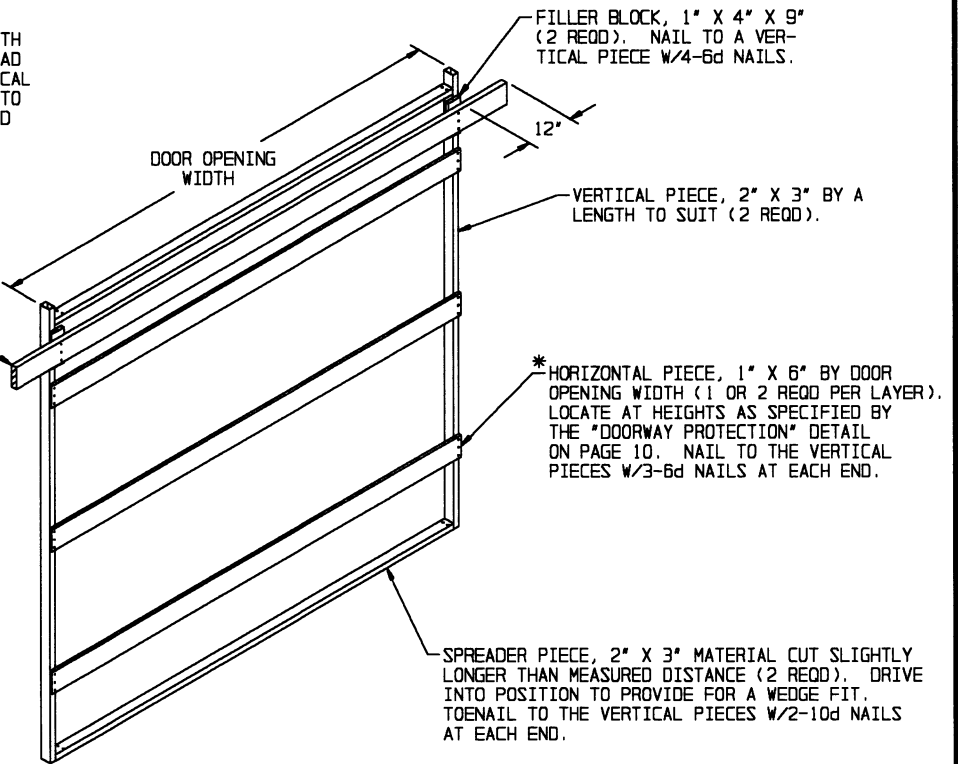
THESE VIEWS DEPICT THE PROPER THREADING OF A DOORWAY PROTECTION STRAP THRU AN ANCHOR PLATE.

ALTERNATIVE DOORWAY PROTECTION B

THIS METHOD MAY BE USED 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.

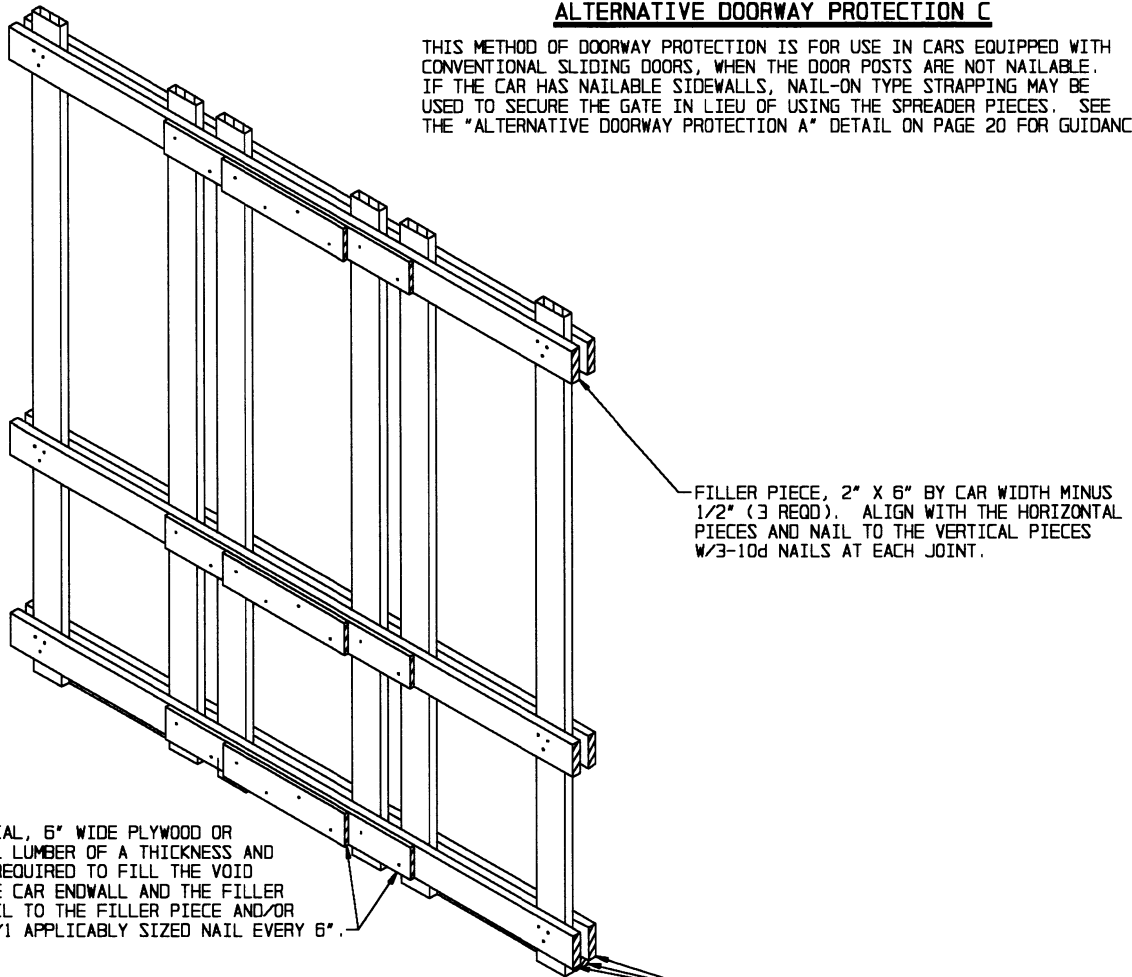
DOOR SPANNER, 2" X 6" BY DOOR OPENING WIDTH PLUS 24" (1 REQD). POSITION ABOVE THE LOAD AND NAIL THRU A FILLER BLOCK INTO A VERTICAL PIECE W/3-12d NAILS AT EACH JOINT. NAIL TO THE CAR SIDEWALL W/2-12d NAILS AT EACH END (OPTIONAL).

*ONE HORIZONTAL PIECE IS REQUIRED PER LAYER FOR LENGTHWISE LOADED CONTAINERS. TWO HORIZONTALS PER LAYER ARE REQUIRED FOR CROSSWISE LOADED CONTAINERS.



ALTERNATIVE DOORWAY PROTECTION C

THIS METHOD OF DOORWAY PROTECTION 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 "ALTERNATIVE DOORWAY PROTECTION A" DETAIL ON PAGE 20 FOR GUIDANCE.



END-OF-CAR BULKHEAD

(FOR LENGTHWISE LOADED CONTAINERS)

THESE PIECES ARE PART OF A MODIFIED "CENTER GATE B". TO MODIFY THE CENTER GATE, ELIMINATE THE STRUT LEDGERS.

