

# LOADING AND BRACING ( TL & LTL ) ON FLATBED TRAILERS<sup>⊕</sup> OF MK82 ( 500 POUND ) BOMBS ON MHU-149/E METAL PALLETS

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⊕ CAUTION: THE OUTLOADING PROCEDURES SHOWN HEREIN ARE ONLY APPLICABLE TO HIGHWAY MOVEMENTS, NOT TRAILER-ON-FLATCAR MOVEMENTS.

U.S. ARMY MATERIEL COMMAND DRAWING			
APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND  <i>Smithy Fore</i>	DRAFTSMAN	TECHNICIAN	ENGINEER
	S. WILSON	R. ARNOLD	
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  <i>Williams &amp; Ernst</i>	VALIDATION ENGINEERING DIVISION	TRANSPORTATION ENGINEERING DIVISION	LOGISTICS ENGINEERING OFFICE
	<i>[Signatures]</i>		
MAY 1996			
CLASS	DIVISION	DRAWING	FILE
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DO NOT SCALE

**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 OUTLOADING PROCEDURES SPECIFIED IN THIS DRAWING ARE APPLICABLE TO LOADS OF MK-82 (500 LB) BOMBS ON MHU-149/E METAL PALLET. SUBSEQUENT REFERENCE TO PALLET UNIT HEREIN MEANS THE MHU-149/E METAL PALLET WITH MK-82 BOMBS INSTALLED. SEE PAGE 3 FOR DETAILS OF THE PALLET UNIT.
- C. THE LOADS AS SHOWN HEREIN ARE BASED ON 48'-0" LONG BY 8'-6" WIDE, AND 45'-0" LONG BY 8'-0" WIDE, AND 40'-0" LONG FLATBED TRAILERS. TRAILERS OF OTHER LENGTHS AND WIDTHS MAY BE USED. TRAILERS MUST HAVE WOOD OR METAL FLOORS. TRAILERS HAVING ALL-METAL FLOORS CANNOT BE USED. CAUTION: IF THE TRAILER FLOOR IS EQUIPPED WITH EXPOSED METAL DECKING ABOVE THE BOGIE ASSEMBLY, OR ELSEWHERE, FIELD MEASUREMENTS SHOULD BE MADE TO ENSURE THAT THE METAL DECKING DOES NOT INTERFERE WITH THE PROPER POSITIONING AND NAILING OF THE DUNNAGE AS SPECIFIED BY THE PROCEDURES SHOWN HEREIN.
- D. SELECTION OF A VEHICLE USED TO TRANSPORT THE DESIGNATED ITEM MUST COMPLY WITH AR 55-355, CHAPTER 29, FOR EXPLOSIVES AND OTHER DANGEROUS ARTICLES, IN FULL.
- E. GROSS WEIGHT AND AXLE DISTRIBUTION OF WEIGHT FOR A LOAD WILL BE THE RESPONSIBILITY OF THE CARRIER. THE CARRIER WILL ADVISE THE SHIPPER OF APPLICABLE LOADING REQUIREMENTS, AND THE SHIPPER WILL LOAD ACCORDINGLY.
- F. NOTICE: A SHIPMENT WILL BE POSITIONED ON A TRAILER CONSISTENT WITH STATE WEIGHT LAWS.
- G. OTHER TYPES OF LADING ITEMS MAY BE LOADED ON A TRAILER WHICH IS PARTIALLY LOADED WITH THE DESIGNATED ITEM, 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.

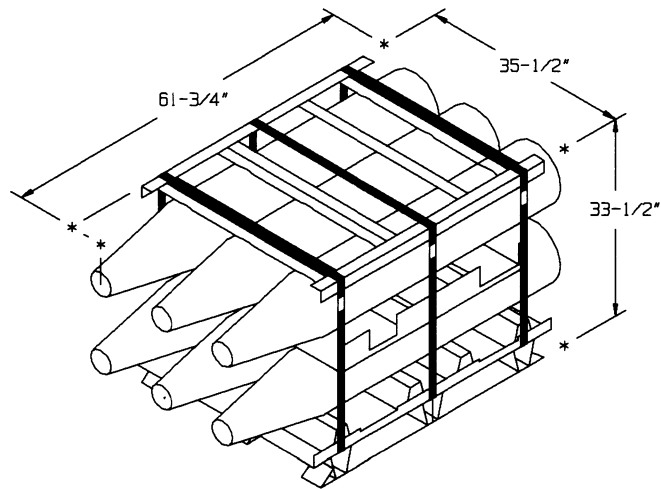
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**MATERIAL SPECIFICATIONS**

- LUMBER - - - - - : SEE TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-751.
- NAILS - - - - - : FED SPEC FF-N-105; COMMON.
- PLYWOOD - - - - - : COMMERCIAL ITEM DESCRIPTION A-A-55057, TYPE A, CONSTRUCTION AND INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED.
- STRAP - - - - - : WEB SLING AND TIEDOWN ASSOCIATION RECOMMENDED STANDARD SPECIFICATION FOR SYNTHETIC WEB TIEDOWNS, FIRST PUBLISHED IN 1991.
- 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.
- STAKE POCKET PROTECTOR - - : COMMERCIAL GRADE.
- CHAIN - - - - - : NATIONAL ASSOCIATION OF CHAIN MANUFACTURER'S WELDED CHAIN SPECIFICATION ADOPTED NOVEMBER 1975.
- LOAD BINDER - - - - - : FED SPEC GGG-B-325.

(GENERAL NOTES CONTINUED)

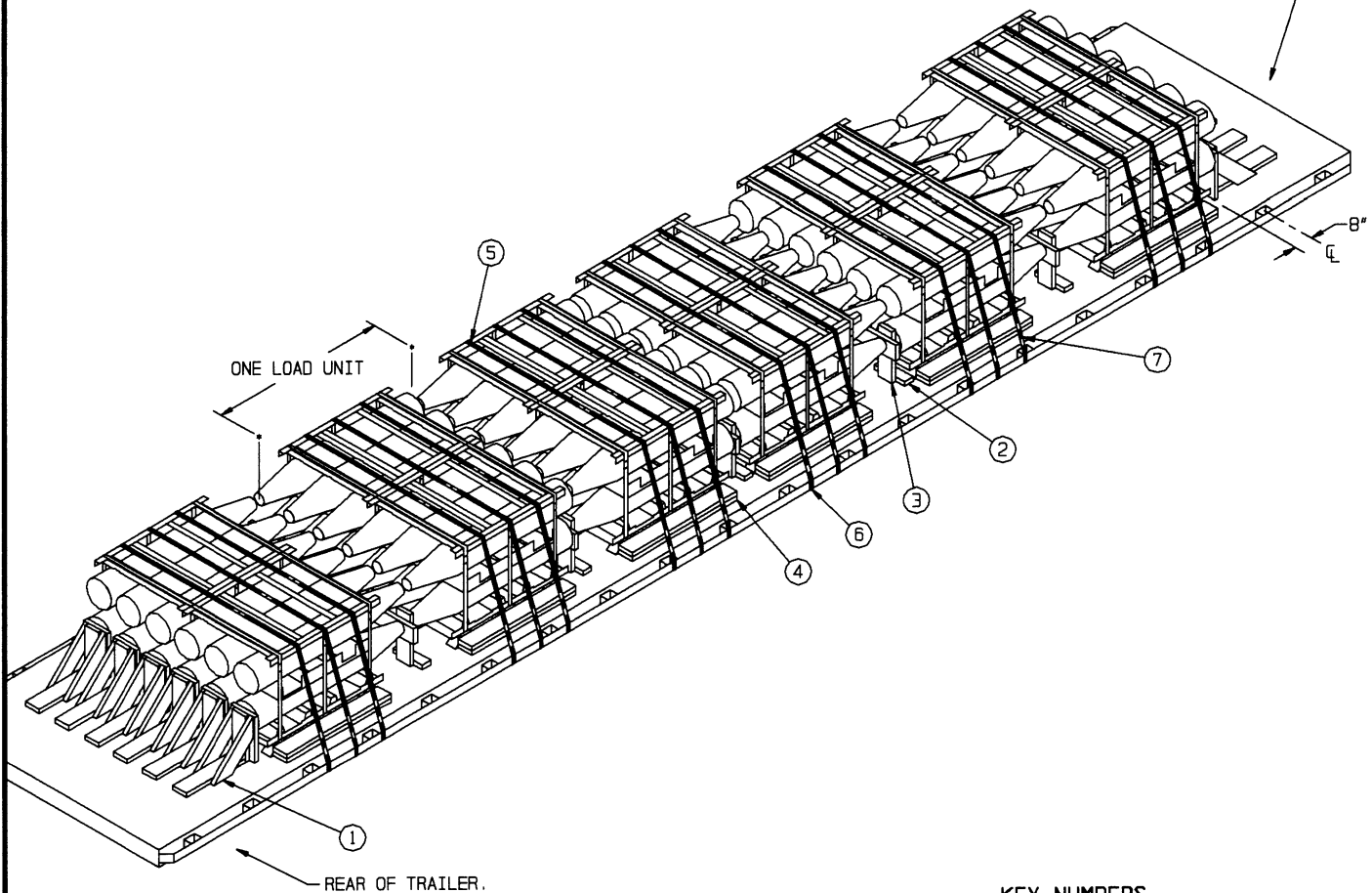
- H. CAUTION: REGARDLESS OF THE TYPE OF TRAILER INVOLVED, ONLY THOSE TRAILERS HAVING TIEDOWN ANCHORING FACILITIES WHICH PROVIDE HOLDING STRENGTH EQUAL TO OR GREATER THAN THE STRENGTH OF THE HOLD-DOWN STRAPS OR CHAINS AND WHICH ALIGN NEAR THE INDICATED LOCATIONS FOR THE HOLD-DOWN STRAPS OR CHAINS SHOULD BE USED. IF THE TRAILER ANCHOR DEVICES ARE NOT PROPERLY POSITIONED TO RECEIVE STRAPPING OR CHAINS, AS SHOWN, OR IF THE ANCHOR DEVICES ARE NOT EQUAL TO OR GREATER THAN THE STRENGTH OF THE TIEDOWN STRAPS OR CHAINS, STEEL STRAPS MAY BE APPLIED TO FORM A COMPLETE LOOP WHICH ENCOMPASSES BOTH THE LADING AND THE TRAILER FRAME AND/OR BED. CAUTION: AVOID TRAILER WHEELS, FIFTH WHEEL PLATE CONTROLS AND OTHER APPURTENANCES. USE EDGE PROTECTORS OR PADS ON ALL SHARP EDGES. NEITHER CHAINS NOR WEB STRAPS WILL BE APPLIED TO FORM A COMPLETE LOOP WHICH ENCOMPASSES BOTH THE LADING AND THE TRAILER FRAME AND/OR BED.
- J. 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 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. 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 THE PIECE ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.
- K. POWER DRIVEN STAPLES MAY BE USED AS ALTERNATIVE FASTENERS FOR NAILS WHEN CONSTRUCTING DUNNAGE ASSEMBLIES WHICH ARE TO BE USED IN THE TRAILER 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 FEDERAL SPECIFICATION FF-N-105 AS NEARLY AS PRACTICABLE. STAPLES WHICH 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.
- L. 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 12 FOR GUIDANCE.
- M. THE TRANSPORTING VEHICLE OPERATOR SHOULD BE INSTRUCTED TO PERIODICALLY INSPECT THE TIEDOWN CHAINS AND LOAD BINDERS AND/OR THE WEB STRAP TIEDOWNS DURING TRANSIT AND TIGHTEN IF NECESSARY.
- N. THE NUMBER OF LADING UNITS MAY BE ADJUSTED TO FIT THE SIZE OF THE TRAILER TO BE LOADED OR THE QUANTITY TO BE SHIPPED. THE APPROVED METHODS SHOWN HEREIN MUST BE FOLLOWED AS CLOSELY AS POSSIBLE FOR BLOCKING, BRACING AND STAYING OF THE DESIGNATED ITEM.
- O. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE.
- P. 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.
- Q. FOR ADDITIONAL GUIDANCE, ATTENTION IS DIRECTED TO THE "SPECIAL NOTES" SECTIONS WHICH ARE IMMEDIATELY ADJACENT TO THE DEPICTED OUTLOADING METHODS.



**PALLET UNIT**

GROSS WEIGHT - - 3,035 LBS (APPROX)

SEE SPECIAL NOTE  
4 ON PAGE 5.



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① END BRACE (12 REQD). SEE THE DETAIL ON PAGE 11. POSITION SO AS TO ALIGN WITH EACH BOMB ON THE PALLET. LOCATE THE FIRST END BRACES WITH THE LOAD SIDE 8" (REF) FROM THE CENTER OF THE SECOND STAKE POCKET FROM THE FRONT OF THE TRAILER. NAIL TO THE TRAILER FLOOR W/7-10d NAILS. SEE GENERAL NOTES "J" AND "K" ON PAGE 2.
- ② SEPARATOR GATE RETAINER PIECE, 2" X 4" X 12" (10 REQD). POSITION SO AS TO EXTEND OUTWARD FROM A POINT APPROXIMATELY 24" FROM THE CENTER OF THE TRAILER AND LOCATE LONGITUDINALLY UNDER THE PALLET UNIT AND FLUSH WITH THE END OF THE BOMBS. NAIL TO THE TRAILER FLOOR W/2-10d NAILS.
- ③ SEPARATOR GATE A (5 REQD). SEE THE DETAIL ON PAGE 11. NAIL TO SEPARATOR GATE RETAINER PIECE, PIECE MARKED ②, W/2-10d NAILS AT EACH JOINT. SEE SPECIAL NOTE 3 ON PAGE 5.
- ④ SIDE BLOCKING, 2" X 6" X 42" (DOUBLED) (12 REQD). POSITION TO CENTER ON THE PALLET. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/5-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
- ⑤ HOLD-DOWN STRAP, 1-1/4" X .035" OR .031" X 21'-0" LONG STEEL STRAPPING (18 REQD). INSTALL EACH STRAP FROM TWO 10'-6" LONG PIECES. POSITION THREE PER LOAD UNIT AS SHOWN. CAUTION: DO NOT POSITION NEARER THAN 3-1/2" FROM THE END OF THE PALLET FRAME. SEE SPECIAL NOTE 9 ON PAGE 5.
- ⑥ PAD, 1-1/4" X .035" OR .031" X 18" LONG STEEL STRAPPING (36 REQD). POSITION UNDER A STAKE POCKET OR THE RUB RAIL AND SEAL TO A HOLD-DOWN STRAP, PIECE MARKED ⑤, WITH ONE SEAL. ALT: STAKE POCKET PROTECTOR (72 REQD). USE TWO UNDER EACH STAKE POCKET WITH A HOLD-DOWN STRAP. SEE THE "HOLD-DOWN STRAP ANCHORING DETAILS" ON PAGE 12.
- ⑦ SEAL FOR 1-1/4" STEEL STRAPPING (108 REQD, 6 PER STRAP). CRIMP EACH SEAL WITH TWO PAIR OF CRIMPS, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ⑥. SEE GENERAL NOTE "L" ON PAGE 2.

SPECIAL NOTES:

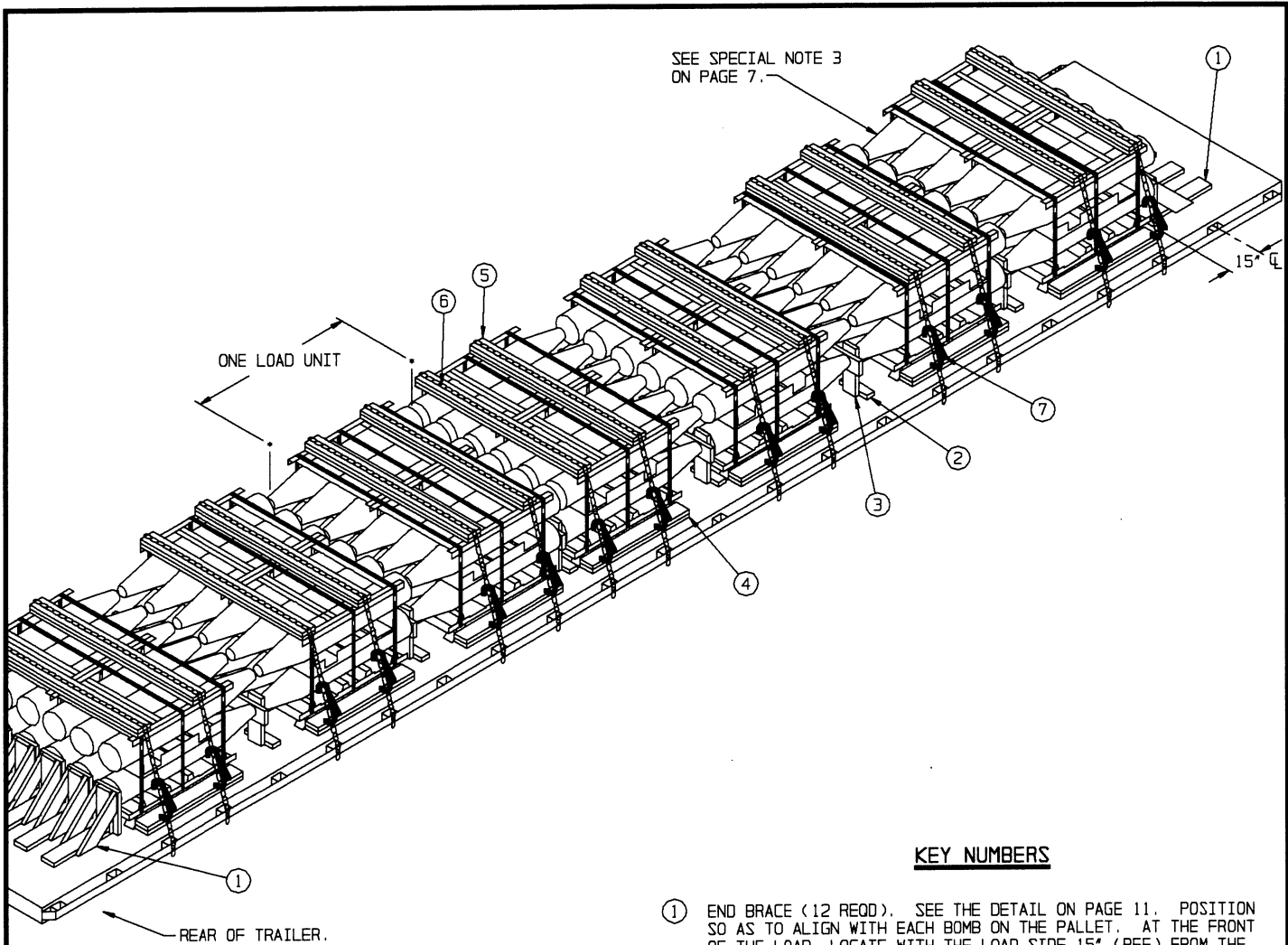
1. A 12-UNIT LOAD IS SHOWN ON A 40'-0" LONG BY 8'-0" WIDE FLATBED TRAILER. TRAILERS OF OTHER LENGTHS AND WIDTHS MAY BE USED.
2. THE 8" LOCATION DIMENSION IS FOR THE LONGITUDINAL PLACEMENT OF THE FIRST PALLET UNITS ON THE TRAILER. LOADING WILL PROGRESS FROM THE FRONT OF THE TRAILER TO THE REAR. THIS 8" DIMENSION SHOULD POSITION THE 12-UNIT LOAD SO AS TO PROVIDE PROPER WEIGHT DISTRIBUTION. THE LOCATION DIMENSION IS ADVISORY AND CAN BE ADJUSTED AS DESIRED.
3. IF DESIRED, A SEPARATOR GATE CONSTRUCTED OF PLYWOOD MAY BE USED IN LIEU OF THE DIMENSIONAL LUMBER SEPARATOR GATE SHOWN AS PIECE MARKED ③. SEE THE "SEPARATOR GATE B" DETAIL ON PAGE 11. WHEN USING A PLYWOOD SEPARATOR GATE, THE SEPARATOR GATE RETAINER PIECES, PIECES MARKED ②, ARE NOT REQUIRED. HOWEVER, THE PLYWOOD SEPARATOR GATE SHOULD BE INSTALLED WITH THE SUPPORT PIECES ON THE SIDE ADJACENT TO THE BOMB BASES, WHEN POSSIBLE.
4. THE PALLET UNITS AT EACH END OF THE LOAD ARE TO BE POSITIONED WITH THE BASE ENDS AGAINST THE END BRACES, PIECES MARKED ①. THE POSITIONING OF THE PALLET UNITS IN THE BALANCE OF THE LOAD IS OPTIONAL. SEE SPECIAL NOTE 7.
5. IF CHAINS AND LOAD BINDERS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 6 AND 7 FOR GUIDANCE. NOTE THAT STAKE POCKETS MUST BE USED FOR ATTACHMENT OF THE CHAINS. CHAINS WILL NOT BE ATTACHED TO A RUB RAIL ON THE TRAILER.
6. IF WEB STRAP TIEDOWNS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE.
7. IF THE DEPICTED LOAD IS TO BE REDUCED BY TWO PALLET UNITS, OMIT THE LATERALLY ADJACENT PALLET UNITS FROM THE FRONT OF THE LOAD IF THE TRAILER IS THE "WESTERN" TYPE WITH THE REAR TANDEMS AT THE EXTREME REAR OF THE TRAILER. IF THE TRAILER IS OTHER THAN A "WESTERN" TYPE, OMIT THE PALLET UNITS FROM THE REAR OF THE LOAD. THE PALLET UNITS WHICH ARE THEN AT THE FRONT AND/OR REAR MUST BE ROTATED SO THE BOMB BASES WILL FACE THE END BRACES, PIECES MARKED ①, TO PROVIDE BETTER CONTACT WITH THE BLOCKING AND BRACING.
8. IF THE DEPICTED LOAD IS TO BE REDUCED BY ONE PALLET UNIT, REFER TO THE PROCEDURES ON PAGE 10 FOR GUIDANCE.
9. IF DESIRED, TWO EACH 2" X .050" OR .044" X 21'-0" LONG STEEL STRAPS MAY BE USED TO RESTRAIN EACH LOAD UNIT IN LIEU OF THE THREE 1-1/4" X .035" OR .031" X 21'-0" LONG STEEL STRAPS SHOWN IN THE LOAD VIEW ON PAGE 4.

**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
1" X 4"	56	38
2" X 6"	199	199
2" X 10"	17	29
NAILS	NO. REQD	POUNDS
10d (3")	470	7-1/4
16d (3-1/2")	36	1
STEEL STRAPPING, 1-1/4" - - 432' REQD - - - -		62 LBS
SEAL FOR 1-1/4" STRAPPING - 108 REQD - - - -		5 LBS

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT - - - - -	12 - - - - -	36,420 LBS
DUNNAGE - - - - -	- - - - -	608 LBS
<hr/>		
TOTAL WEIGHT - - - - -	- - - - -	37,028 LBS (APPROX)



ISOMETRIC VIEW

KEY NUMBERS

- ① END BRACE (12 REQD.). SEE THE DETAIL ON PAGE 11. POSITION SO AS TO ALIGN WITH EACH BOMB ON THE PALLET. AT THE FRONT OF THE LOAD, LOCATE WITH THE LOAD SIDE 15" (REF) FROM THE CENTER OF THE SECOND STAKE POCKET FROM THE FRONT OF THE TRAILER. NAIL TO THE TRAILER FLOOR W/7-10d NAILS. SEE GENERAL NOTES "J" AND "K" ON PAGE 2. SEE SPECIAL NOTE 2 ON PAGE 7.
- ② SEPARATOR GATE RETAINER PIECE, 2" X 4" X 12" (14 REQD.). POSITION SO AS TO EXTEND OUTWARD FROM A POINT APPROXIMATELY 24" FROM THE CENTER OF THE TRAILER AND LOCATE LONGITUDINALLY UNDER THE PALLET UNIT AND FLUSH WITH THE END OF THE BOMBS. NAIL TO THE TRAILER FLOOR W/2-10d NAILS.
- ③ SEPARATOR GATE A (6 REQD.). SEE THE DETAIL ON PAGE 11. NAIL TO THE SEPARATOR GATE RETAINER PIECES, PIECES MARKED ②, W/2-10d NAILS AT EACH JOINT. SEE SPECIAL NOTE 4 ON PAGE 7.
- ④ SIDE BLOCKING, 2" X 6" X 42" (DOUBLED) (14 REQD.). POSITION TO CENTER ON THE PALLET. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/5-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
- ⑤ CHAIN BOARD, 2" X 6" X 71" (DOUBLED) (14 REQD.). LAMINATE W/6-10d NAILS.
- ⑥ CHAIN, BINDING, 5/16", GRADE 70 BY A LENGTH TO SUIT (14 REQD.). POSITION AS SHOWN. ATTACH TO A TRAILER STAKE POCKET. DO NOT ATTACH TO A RUB RAIL. SEE THE "SPECIAL PROVISIONS FOR CHAIN TIE DOWN" ON PAGE 7.
- ⑦ LOAD BINDER, 5/16", OVER-CENTER TYPE (14 REQD., 1 PER CHAIN). WIRE TIE HANDLE TO PREVENT OPENING DURING TRANSPORT. FASTEN THE TENSIONED CHAIN, PIECE MARKED ⑥, TO THE CHAIN BOARD, PIECE MARKED ⑤, W/1-20d NAIL AT EACH END BY DRIVING EACH NAIL INTO THE CHAIN BOARD THRU AN OPENING IN A CHAIN LINK AND BENDING IT OVER THE LINK.

**SPECIAL PROVISIONS FOR CHAIN TIEDOWN**

LADING MAY BE SECURED TO THE FLATBED TRAILER BY CARRIER-OWNED CHAINS AND LOAD BINDERS IN LIEU OF SPECIFIED STRAPPING, PROVIDED THE FOLLOWING CONDITIONS ARE MET AND THE PROCEDURES CONTAINED ON PAGES 6 AND 7 ARE FOLLOWED.

1. ONLY CHAINS AND LOAD BINDERS OF GOOD QUALITY WILL BE USED. ALL CHAINS AND LOAD BINDERS SHALL CONFORM TO THE NATIONAL ASSOCIATION OF CHAIN MANUFACTURER'S WELDED CHAIN SPECIFICATION ADOPTED NOVEMBER 1975.
2. ALL CHAINS SHALL BE MARKED AS PRESCRIBED BY THE NATIONAL ASSOCIATION OF CHAIN MANUFACTURER'S WELDED CHAIN SPECIFICATION ADOPTED NOVEMBER 1975. AT LEAST ONE LINK IN EVERY 36 LINKS SHALL CARRY THE MANUFACTURER'S PERMANENT AND DISTINCTIVE MARK IDENTIFYING THE GRADE OF CHAIN. CHAINS NOT MARKED IN THIS MANNER SHALL NOT BE USED. IN ADDITION TO THE GRADE MARKING, THE CHAIN MAY ALSO CARRY LETTER MARKINGS OR SYMBOLS IDENTIFYING THE CHAIN MANUFACTURER. THE PRESENCE OF THE MANUFACTURER'S IDENTIFICATION MARKING IS NOT MANDATORY.
3. BEFORE AND DURING INSTALLATION, THE CHAINS AND LOAD BINDERS SHALL BE INSPECTED FOR BENT HOOKS, STRETCH, GOUGES, BENT LINKS, WEAR, OR ANY OTHER NOTICEABLE DEFECTS. ANY DEFICIENCY SHALL BE CAUSE FOR REJECTION OF A CHAIN OR LOAD BINDER. CHAINS MUST NOT BE TWISTED DURING INSTALLATION. CAUTION: EXTREME CARE MUST BE EXERCISED WHEN TENSIONING CHAINS TO PREVENT DAMAGE OR PERMANENT DEFORMATION TO THE LADING.
4. CHAIN SIZES AND GRADES APPROVED FOR USE WITH FLATBED TRAILER LOADS ARE AS FOLLOWS:
  - A. 3/8", GRADE 43 HIGH TEST CHAIN
  - B. 5/16", GRADE 70 BINDING CHAIN
  - C. 3/8", GRADE 70 BINDING CHAIN
  - D. 5/16", GRADE 80 ALLOY STEEL CHAIN
  - E. 3/8", GRADE 80 ALLOY STEEL CHAIN
5. THE GRABHOOKS ON THE ENDS OF THE CHAIN MAY BE OF THE FOLLOWING TYPES WITH GRADE MARKINGS AS INDICATED.
  - A. CLEVIS GRABHOOKS, 3/8" SIZE, DO NOT REQUIRE GRADE MARKING. ALLOY GRABHOOKS, 5/16" SIZE, SHALL CARRY THE MANUFACTURER'S GRADE MARK OF 7, 70, OR 700. THE HOOKS SHALL BE USED ON THE APPROPRIATE SIZE CHAIN.
  - B. CLOSED EYE GRABHOOKS, 3/8" AND 5/16" SIZE, MAY BE USED ON THE APPROPRIATE SIZE CHAIN IF THEY ARE A PART OF A CHAIN ASSEMBLY WHICH WAS PROVIDED BY A CHAIN MANUFACTURER, AND THE CHAIN ASSEMBLY CARRIES THE CORRECT GRADE IDENTIFICATION MARKING AS PREVIOUSLY STATED. CLOSED EYE GRABHOOKS THAT FORM A PART OF THE CHAIN ASSEMBLY ARE EXEMPT FROM GRADE MARKINGS.
6. CONNECTING LINKS USED FOR CHAIN REPAIR MUST BE CORRECTLY MARKED AND BE EQUAL TO OR GREATER IN STRENGTH THAN THE CHAIN THEY ARE REPAIRING. CHAINS WITH UNMARKED CONNECTING LINKS SHALL NOT BE USED.
7. CHAIN AND FITTING OF A HIGHER GRADE MAY BE SUBSTITUTED FOR THE GRADES SPECIFIED IN NOTE 4 ABOVE.
8. LOAD BINDERS SHALL BE 5/16" TO 3/8" SIZE AND HAVE A MINIMUM BREAKING STRENGTH OF 16,200 POUNDS (WORKING LOAD LIMIT OF 5,400 POUNDS). OVERCENTER TYPE LOAD BINDERS SHALL BE SAFETY WIRED TO PREVENT ACCIDENTAL OPENING DURING TRANSPORT. LOAD BINDER SIZE SHALL BE COMPATIBLE WITH THE SIZE OF THE CHAIN BEING USED.

(CONTINUED AT RIGHT)

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	58	39
2" X 6"	394	394
2" X 10"	17	29
NAILS	NO. REQD	POUNDS
10d (3")	1596	24-3/4
16d (3-1/2")	36	1
CHAIN, BINDING, 5/16"	230' REQD	276 LBS
LOAD BINDER	14 REQD	84 LBS

**SPECIAL NOTES:**

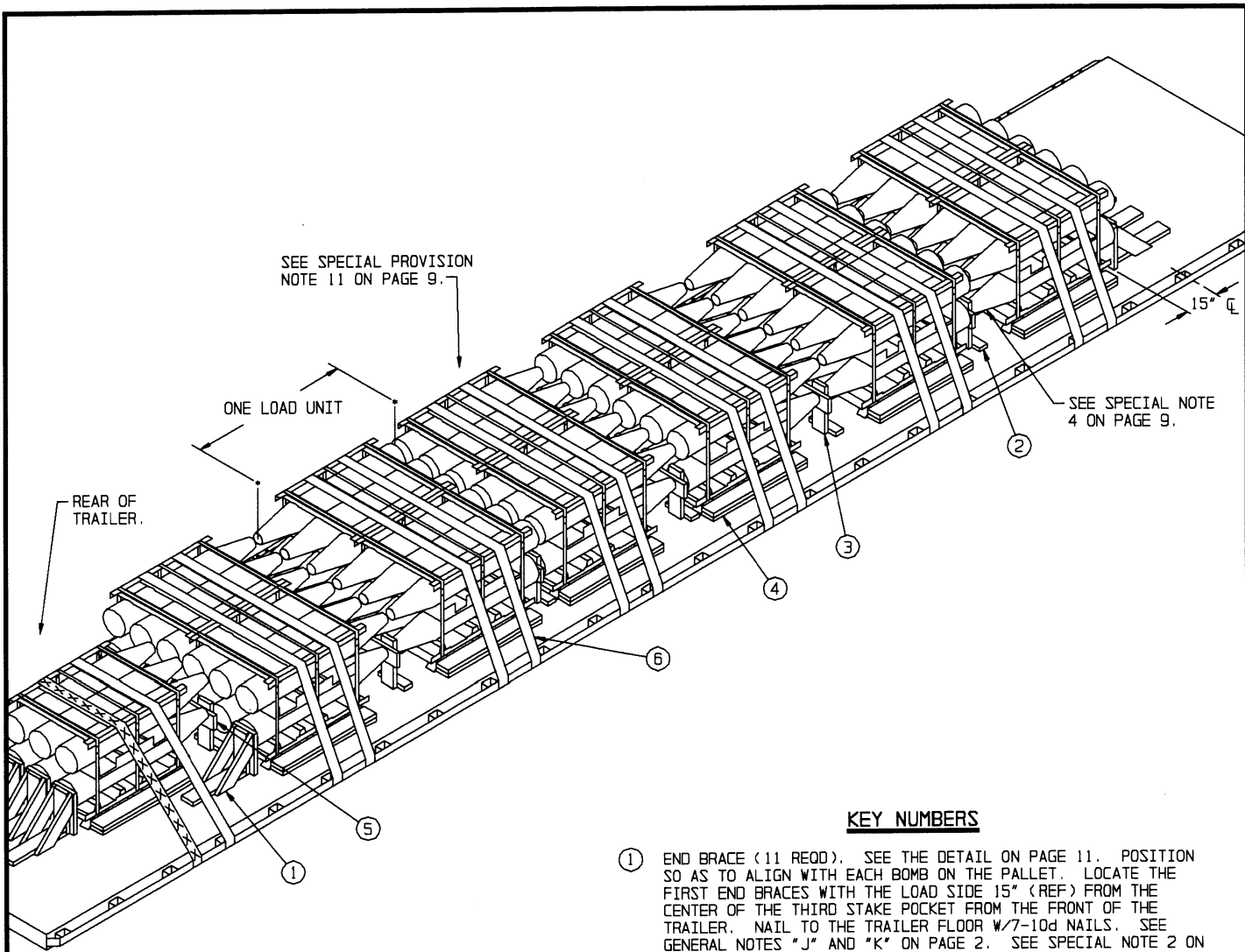
1. A 14-UNIT LOAD IS SHOWN ON A 45'-0" LONG BY 8'-0" WIDE FLATBED TRAILER. LONGER TRAILERS AND TRAILERS OF OTHER WIDTHS MAY BE USED.
2. THE 15" LOCATION DIMENSION IS FOR THE LONGITUDINAL PLACEMENT OF THE FIRST PALLET UNITS ON THE TRAILER. LOADING WILL PROGRESS FROM THE FRONT OF THE TRAILER TO THE REAR. THIS 15" DIMENSION SHOULD POSITION THE 14-UNIT LOAD SO AS TO PROVIDE PROPER WEIGHT DISTRIBUTION AND SHOULD ALSO PROPERLY POSITION THE PALLET UNITS IN ALIGNMENT WITH THE STAKE POCKETS FOR INSTALLATION OF THE CHAINS AND LOAD BINDERS. THE LOCATION DIMENSION IS ADVISORY AND CAN BE ADJUSTED AS DESIRED.
3. THE PALLET UNITS WILL BE POSITIONED WITH THE NOSE ENDS FACED IN THE DIRECTION SHOWN IN ORDER TO BEST ALIGN THE TOP FRAMES OF THE UNITS WITH THE STAKE POCKETS ON THE TRAILER.
4. THE PLYWOOD SEPARATOR GATE B SHOULD PROBABLY NOT BE USED IN LIEU OF THE SEPARATOR GATE A, PIECE MARKED (3). THE THINNER THICKNESS OF THE SEPARATOR GATE B WILL NOT PROPERLY ALIGN THE PALLET UNITS WITH THE STAKE POCKETS AS LOADING PROGRESSES REARWARD.
5. IF STEEL STRAPPING IS TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 4 AND 5 FOR GUIDANCE.
6. IF WEB STRAP TIEDOWNS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE.
7. IF A "WESTERN" TYPE TRAILER IS TO BE LOADED AND THE EMPTY WEIGHT OF THE TRACTOR DRIVE WHEELS IS MORE THAN APPROXIMATELY 14,400 POUNDS IT WILL BE NECESSARY TO OMIT ONE PALLET UNIT FROM THE FRONT OF THE LOAD. REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE IN BLOCKING AND BRACING THE REMAINING PALLET UNIT OF THE LOAD UNIT.
8. IF A TRAILER OTHER THAN A "WESTERN" TYPE IS TO BE LOADED AND THE EMPTY WEIGHT OF THE TRAILER TANDEMS IS MORE THAN APPROXIMATELY 8,900 POUNDS, IT WILL BE NECESSARY TO OMIT ONE PALLET UNIT FROM THE REAR OF THE LOAD. REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE IN BLOCKING AND BRACING THE REMAINING PALLET UNIT OF THE LOAD UNIT.
9. IF THE DEPICTED LOAD IS TO BE REDUCED BY TWO PALLET UNITS, OMIT THE LATERALLY ADJACENT PALLET UNITS FROM THE FRONT OF THE LOAD IF THE TRAILER IS THE "WESTERN" TYPE WITH THE REAR TANDEM AT THE EXTREME REAR OF THE TRAILER. IF THE TRAILER IS OTHER THAN A "WESTERN" TYPE, OMIT THE PALLET UNITS FROM THE REAR OF THE LOAD. THE PALLET UNITS WHICH ARE THEN AT THE REAR OF A TRAILER OTHER THAN A "WESTERN" TYPE MUST BE ROTATED SO THE BOMB BASES WILL FACE THE END BRACES, PIECES MARKED (4), TO PROVIDE BETTER CONTACT WITH THE BLOCKING AND BRACING.
10. IF THE DEPICTED LOAD IS TO BE REDUCED BY ONE PALLET UNIT, REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE.

(CHAIN TIEDOWN PROVISIONS CONTINUED)

9. WHEN TARPING IS REQUIRED, IT IS RECOMMENDED THAT THE LOAD-SECURING, CARRIER-OWNED, CHAINS BE APPLIED AFTER THE TARPULIN HAS BEEN PLACED OVER THE LOAD. APPLYING THE CHAINS ON TOP OF THE TARP WILL FACILITATE THE REQUIRED EXAMINING OF THE CHAINS AND LOAD BINDERS DURING TRANSIT, AND WILL ALLOW ADJUSTMENTS TO BE MADE TO CHAIN TAUTNESS, AS NECESSARY. PLACING THE CHAINS ON THE TOP WILL ALSO HELP SECURE THE TARP AGAINST THE EFFECTS OF THE WIND. PROTECTOR BOARDS SHOULD BE USED BETWEEN THE CHAINS AND THE TARPULIN. IT IS THE OPTION OF THE CARRIER WHETHER CHAINS WILL BE POSITIONED ON TOP OF OR UNDER THE TARPULIN.

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	14	42,490 LBS
DUNNAGE		1,310 LBS
TOTAL WEIGHT		43,800 LBS (APPROX)



**ISOMETRIC VIEW**

**KEY NUMBERS**

- ① END BRACE (11 REQD). SEE THE DETAIL ON PAGE 11. POSITION SO AS TO ALIGN WITH EACH BOMB ON THE PALLET. LOCATE THE FIRST END BRACES WITH THE LOAD SIDE 15" (REF) FROM THE CENTER OF THE THIRD STAKE POCKET FROM THE FRONT OF THE TRAILER. NAIL TO THE TRAILER FLOOR W/7-10d NAILS. SEE GENERAL NOTES "J" AND "K" ON PAGE 2. SEE SPECIAL NOTE 2 ON PAGE 9.
- ② SEPARATOR GATE RETAINER PIECE, 2" X 4" X 12" (12 REQD). POSITION SO AS TO EXTEND OUTWARD FROM A POINT APPROXIMATELY 24" FROM THE CENTER OF THE TRAILER FOR PIECES MARKED ③ AND APPROXIMATELY 6" FROM THE CENTER FOR PIECE MARKED ⑤. LOCATE LONGITUDINALLY UNDER THE PALLET UNIT AND FLUSH WITH THE END OF THE BOMBS. NAIL TO THE TRAILER FLOOR W/2-10d NAILS.
- ③ SEPARATOR GATE A FOR TWO UNITS WIDE (5 REQD). SEE THE DETAIL ON PAGE 11. NAIL TO THE SEPARATOR GATE RETAINER PIECES, PIECES MARKED ②, W/2-10d NAILS AT EACH JOINT. SEE SPECIAL NOTE 3 ON PAGE 7.
- ④ SIDE BLOCKING, 2" X 6" X 42" (DOUBLED) (14 REQD). POSITION TO CENTER ON THE PALLET. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/5-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
- ⑤ SEPARATOR GATE A FOR ONE UNIT WIDE (1 REQD). SEE THE DETAIL ON PAGE 11 AND THE NOTE UNDER THE DETAIL.
- ⑥ WEB STRAP ASSEMBLY (14 REQD, 2 PER LOAD UNIT). POSITION TO EXTEND FROM A WINCH ON ONE SIDE OF THE TRAILER, OVER THE BOMB PALLET UNITS, TO AN ATTACHMENT POINT ON THE OPPOSITE SIDE. SEE THE "SPECIAL PROVISIONS FOR WEB STRAP TIE DOWN" ON PAGE 9.



**SPECIAL PROVISIONS FOR WEB STRAP TIE DOWN**

LADING MAY BE SECURED TO A FLATBED TRAILER BY WEB STRAP ASSEMBLIES IN LIEU OF STEEL STRAPPING OR CHAINS AND LOAD BINDERS, PROVIDED THE FOLLOWING CONDITIONS ARE MET.

1. ONLY WEB STRAPS OF GOOD QUALITY WILL BE USED. ALL WEB STRAPS AND ASSOCIATED HARDWARE SHALL CONFORM TO THE WEB SLING & TIEDOWN ASSOCIATION RECOMMENDED STANDARD SPECIFICATION FOR SYNTHETIC WEB TIEDOWNS, FIRST PUBLISHED IN 1991.
2. ALL WEB STRAP TIEDOWN ASSEMBLIES SHALL BE PERMANENTLY LABELED WITHIN 18" OF ONE END TO SHOW:
  - A. NAME OR TRADEMARK OF MANUFACTURER
  - B. WORKING LOAD LIMIT (WLL)
  - C. DATE OF MANUFACTURE (MONTH AND YEAR)
3. WEB STRAP ASSEMBLY MINIMUM BREAKING STRENGTH WILL BE AT LEAST THREE TIMES THE WLL MARKED ON THE STRAP.
4. THE TOTAL MINIMUM BREAKING STRENGTH (MBS) OF THE STRAPS USED TO RESTRAIN AMMUNITION ITEMS WILL BE AT LEAST 1-1/2 TIMES THE TOTAL WEIGHT OF THE ITEMS, WITH A MINIMUM OF TWO STRAPS POSITIONED OVER EACH LOAD UNIT ON A TRAILER. WRITTEN PROOF OF THE MBS OF THE STRAPS SHALL BE PROVIDED BY THE CARRIER TO THE SHIPPING ACTIVITY IF REQUESTED.
5. CARRIERS MUST COMPLY WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS APPLICABLE TO CARGO RESTRAINT USING WEB STRAPS.
6. WHEN USING STRAPS AND WINCHES FOR CARGO RESTRAINT, THE STRAPS WILL BE TENSIONED UNTIL TIGHT WITHOUT CAUSING DAMAGE TO THE CARGO. ONLY WINCH BARS WILL BE USED FOR OPERATING THE STRAP WINCHES.
7. BEFORE AND DURING INSTALLATION, THE WEB STRAP ASSEMBLIES SHALL BE INSPECTED FOR DEFECTS. STRAPS HAVING ANY OF THE FOLLOWING DEFECTS WILL NOT BE USED FOR THE RESTRAINT OF ANY AMMUNITION LOAD, WITH THE EXCEPTION OF ONE WITH FRAYED ENDS. A STRAP HAVING FRAYED ENDS CAN BE USED IF THE FRAYED END IS TRIMMED AND MELTED WITH HEAT OR FLAME UNTIL ALL STRANDS ARE SEIZED.
  - A. STRAP ASSEMBLY HARDWARE: SHALL BE INSPECTED FOR BENT HOOKS, GOUGES, CORROSION, SIGNS OF REPAIR, BENT RATCHETS OR WINCHES, WEAR, OR ANY OTHER NOTICEABLE DEFECTS.
  - B. STRAP WEBBING: SHALL BE INSPECTED FOR KNOTS, EXCESSIVE ABRASIVE WEAR, TEARS, PUNCTURES, CUTS, ACID OR CAUSTIC BURNS, BROKEN STITCHES, FRAYED ENDS, OIL OR GREASE SPOTS EXCEEDING 6 SQUARE INCHES, BLEACHING OF COLOR, INCREASED STIFFNESS, SPLICES, VISIBLE WEAR INDICATOR THREADS, OR ANY OTHER NOTICEABLE DEFECTS.
8. RATCHET HANDLES MUST BE IN THE LOCKED POSITION AND/OR WINCH LOCKING DEVICES MUST BE FULLY SEATED IN THE TEETH OF THE WINCH.
9. IF THE WINCHES BEING USED ARE THE REMOVABLE TYPE HAVING BOLTS FOR ATTACHMENT TO THE TRAILER, CARE MUST BE EXERCISED WHEN ATTACHING THE WINCHES TO THE TRAILER. IF EXCESSIVE FORCE IS EXERTED ON THE BOLT DURING TENSIONING, DEFORMATION OF THE WINCH BRACKET MAY OCCUR, AND SUBSEQUENTLY CAUSE FAILURE OF THE WINCH BRACKET DURING TRANSPORT. WINCHES MUST BE FASTENED TO THE TRAILER WITH A MINIMUM OF TWO BOLTS.

(CONTINUED AT RIGHT)

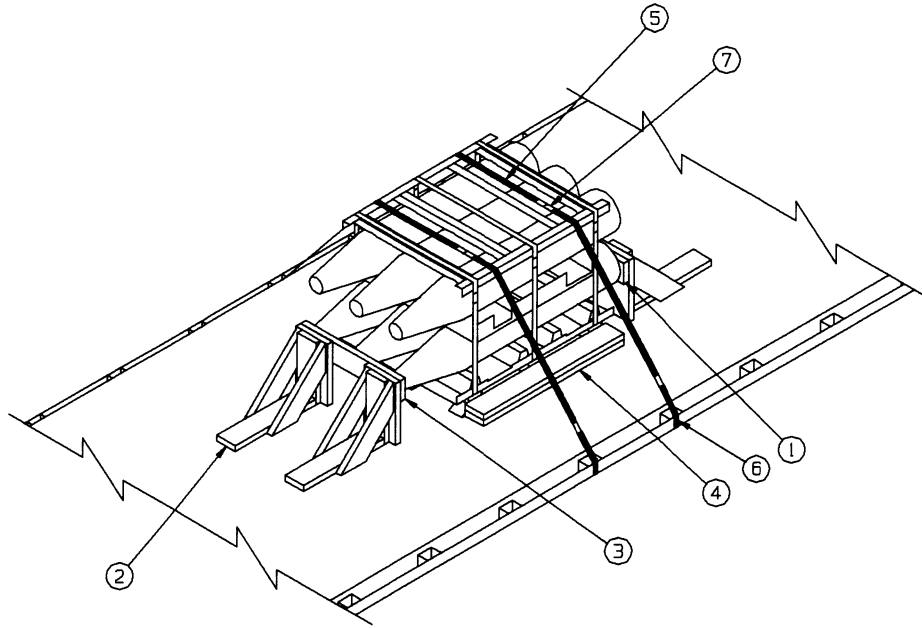
BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	58	39
2" X 6"	221	221
2" X 10"	17	29
NAILS	NO. REQD	POUNDS
10d (3")	503	7-3/4
16d (3-1/2")	36	1
WEB STRAP ASSEMBLIES	-----	14 REQD

**SPECIAL NOTES:**

1. A 13-UNIT LOAD IS SHOWN ON A 48'-0" LONG BY 8'-6" WIDE FLATBED TRAILER. TRAILERS OF OTHER LENGTHS AND WIDTHS MAY BE USED.
  2. THE 15" LOCATION DIMENSION IS FOR THE LONGITUDINAL PLACEMENT OF THE FIRST PALLET UNITS ON THE TRAILER. LOADING WILL PROGRESS FROM THE FRONT OF THE TRAILER TO THE REAR. THIS 15" DIMENSION SHOULD POSITION THE 13-UNIT LOAD SO AS TO PROVIDE PROPER WEIGHT DISTRIBUTION. THE LOCATION DIMENSION IS ADVISORY AND CAN BE ADJUSTED AS DESIRED.
  3. IF DESIRED, SEPARATOR GATES CONSTRUCTED OF PLYWOOD MAY BE USED IN LIEU OF THE DIMENSIONAL LUMBER SEPARATOR GATES SHOWN AS PIECES MARKED ③ AND ⑤. SEE THE "SEPARATOR GATE B" DETAIL ON PAGE 11. WHEN USING A PLYWOOD SEPARATOR GATE, THE SEPARATOR GATE RETAINER PIECES, PIECES MARKED ②, ARE NOT REQUIRED. HOWEVER, THE PLYWOOD SEPARATOR GATE SHOULD BE INSTALLED WITH THE SUPPORT PIECES ON THE SIDE ADJACENT TO THE BOMB BASES, WHEN POSSIBLE.
  4. THE PALLET UNITS AT EACH END OF THE LOAD ARE TO BE POSITIONED WITH THE BASE ENDS AGAINST THE END BRACES, PIECES MARKED ①. THE POSITIONING OF THE PALLET UNITS IN THE BALANCE OF THE LOAD IS OPTIONAL.
  5. IF STEEL STRAPPING IS TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 4 AND 5 FOR GUIDANCE.
  6. IF CHAINS AND LOAD BINDERS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 6 AND 7 FOR GUIDANCE.
  7. FOR THE DEPICTED LOAD PATTERN, WITH THE ODD UNIT AT THE REAR OF THE LOAD, THE TRACTOR DRIVE AXLES ARE LIMITED TO NOT MORE THAN 16,400 POUNDS. IF THE ODD UNIT IS POSITIONED AT THE FRONT OF THE LOAD, THE TANDEM AXLES OF THE TRAILER ARE LIMITED TO NOT MORE THAN 9,200 POUNDS.
  8. IF THE DEPICTED LOAD IS TO BE DECREASED BY ONE PALLET UNIT, OMIT THE ODD UNIT FROM THE REAR OF THE LOAD. IF THE LOAD IS TO BE DECREASED BY TWO PALLET UNITS, OMIT AN ENTIRE LOAD UNIT, EITHER FROM THE FRONT OF THE LOAD OR FROM THE REAR PORTION, AS DESIRED.
  9. THE DEPICTED LOAD CAN BE INCREASED BY ONE PALLET UNIT IF DESIRED AND IF THE TRACTOR DRIVE AXLES DO NOT WEIGH MORE THAN 16,400 POUNDS WITHOUT THE LADING, AND IF THE TRAILER TANDEM AXLES DO NOT WEIGH MORE THAN 8,900 POUNDS WITHOUT THE LADING. THESE WEIGHTS ARE APPROXIMATE. THE AXLE WEIGHTS SHOULD BE VERIFIED BY ACTUALLY WEIGHING THE LOADED TRAILER TO ENSURE THAT THE MAXIMUM TANDEM AXLE WEIGHT OF 34,000 POUNDS IS NOT EXCEED.
- (SPECIAL PROVISIONS FOR WEB STRAP TIE DOWN CONTINUED)
10. DRIVERS MUST BE INSTRUCTED TO PERIODICALLY CHECK THE TIGHTNESS OF THE WEB STRAP ASSEMBLIES AND RE-TIGHTEN, IF NECESSARY.
  11. IF PROVIDED ON OR WITH THE WEB STRAP ASSEMBLIES, SCUFF SLEEVES/WEB PROTECTORS WILL BE USED WHEREVER THE STRAP PASSES OVER A SHARP CORNER OR IRREGULAR SURFACE. IF NOT PROVIDED, ANTI-CHAFING MATERIAL OF A SUITABLE THICKNESS WILL BE USED TO INSURE THAT THE STRAP WEBBING IS NOT DAMAGED DURING TRANSPORT OF THE LOAD.
  12. THE HARDWARE FITTING OF THE TIEDOWN ASSEMBLIES MUST BE ATTACHED TO THE TRAILER IN SUCH A MANNER THAT THEY WILL REMAIN IN PLACE IF SLACK DEVELOPS IN THE STRAP DURING TRANSPORT.

**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
PALLET UNIT	----- 13	39,455 LBS
DUNNAGE	-----	587 LBS
TOTAL WEIGHT	-----	40,042 LBS (APPROX)



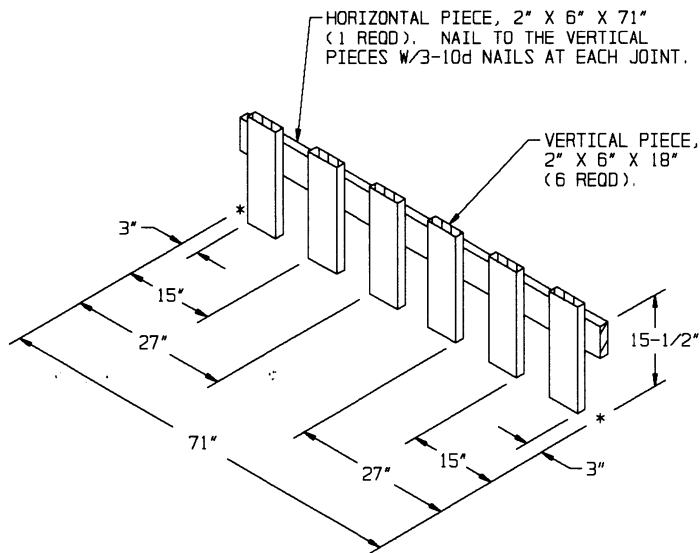
**ISOMETRIC VIEW**

**SPECIAL NOTES:**

1. A 1-UNIT LOAD IS SHOWN ON AN 8'-0" WIDE TRAILER. TRAILERS OF OTHER WIDTHS MAY BE USED.
2. STEEL STRAPPING IS SHOWN FOR ITEM SECUREMENT. CHAINS AND LOAD BINDERS OR WEB STRAPS MAY BE USED, IF DESIRED. IF CHAINS AND LOAD BINDERS ARE USED, CHAIN BOARDS MUST BE USED UNDER THE CHAINS, AND STAKE POCKETS MUST BE USED FOR ATTACHMENT OF THE CHAINS.

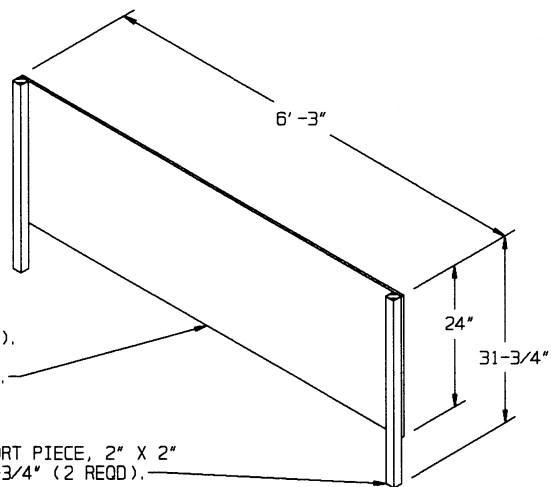
**KEY NUMBERS**

- ① LOAD BEARING PIECE, 2" X 6" X 36" (1 REQD). NAIL TO THE END BRACES, PIECES MARKED ②, W/3-10d NAILS AT EACH JOINT. SEE GENERAL NOTE "J" ON PAGE 2.
- ② END BRACE (4 REQD). SEE THE DETAIL ON PAGE 11. POSITION SO AS TO ALIGN WITH THE OUTER BOMBS ON THE PALLET. NAIL TO THE TRAILER FLOOR W/7-10d NAILS.
- ③ LOAD BEARING PIECE, 2" X 6" X 30" (1 REQD). NAIL TO THE END BRACES, PIECES MARKED ②, W/3-10d NAILS AT EACH JOINT.
- ④ SIDE BLOCKING, 2" X 6" X 42" (DOUBLED) (2 REQD). POSITION TO CENTER ON THE PALLET. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/5-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
- ⑤ HOLD-DOWN STRAP, 1-1/4" X .035" OR .031" X 19'-0" LONG STEEL STRAPPING (2 REQD). INSTALL FROM ONE PIECE. POSITION AS SHOWN. CAUTION: DO NOT POSITION NEARER THAN 3-1/2" FROM THE END OF THE PALLET FRAME.
- ⑥ PAD, 1-1/4" X .035" OR .031" X 18" LONG STEEL STRAPPING (4 REQD). POSITION UNDER A STAKE POCKET OR THE RUB RAIL AND SEAL TO A HOLD-DOWN STRAP, PIECE MARKED ⑤, WITH ONE SEAL. ALT: STAKE POCKET PROTECTOR (8 REQD). USE TWO UNDER EACH STAKE POCKET WITH A HOLD-DOWN STRAP. SEE THE "HOLD-DOWN STRAP ANCHORING DETAILS" ON PAGE 12.
- ⑦ SEAL FOR 1-1/4" STEEL STRAPPING (8 REQD, 4 PER STRAP). CRIMP EACH SEAL WITH TWO PAIR OF CRIMPS, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ⑥. SEE GENERAL NOTE "L" ON PAGE 2.



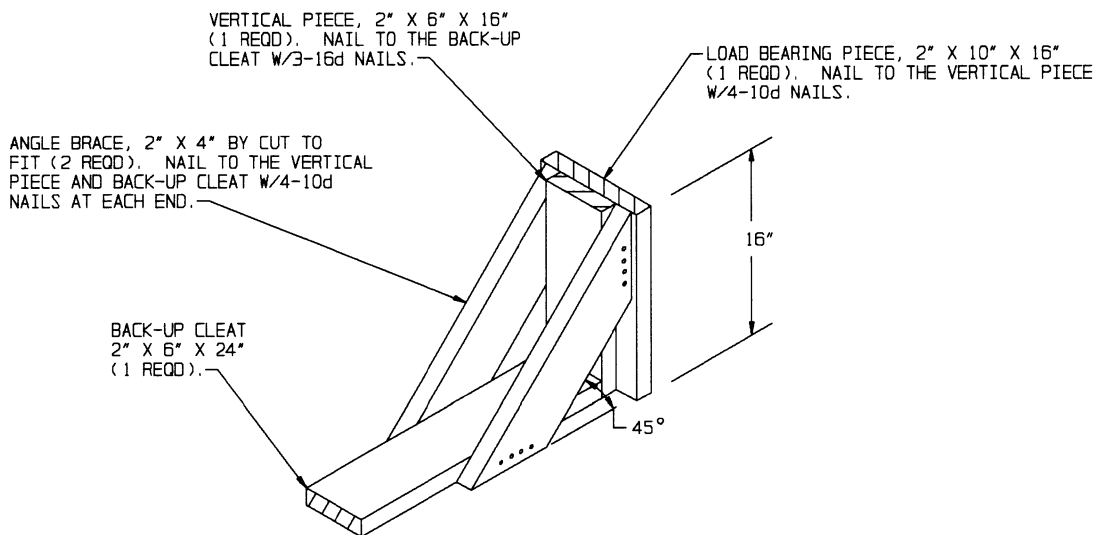
**SEPARATOR GATE A**

A SEPARATOR GATE FOR ONE PALLET WIDE WILL BE 35-1/2" LONG.



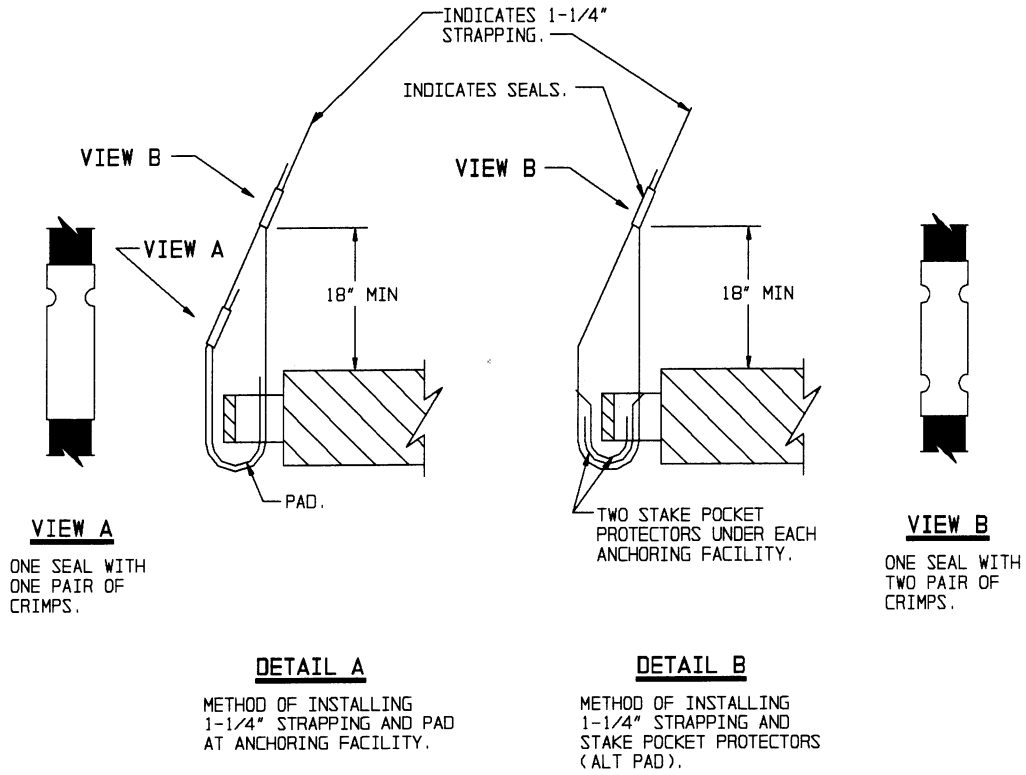
**SEPARATOR GATE B**

A SEPARATOR GATE FOR ONE PALLET WIDE WILL BE 40" LONG.

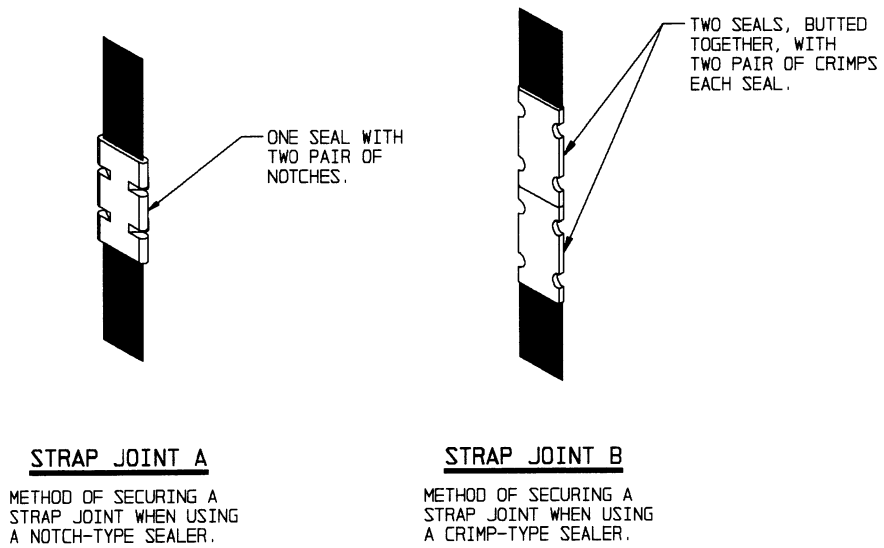


**END BRACE**

**DETAILS**



**HOLD-DOWN STRAP ANCHORING DETAILS**



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