# LOADING AND BRACING (TL & LTL) IN FLATBED TRAILERS ⬢ OF BSU-84, BSU-88 OR BSG-92 AIRFOIL GROUP PACKED IN CNU-373/E SHIPPING AND STORAGE CONTAINERS

**INDEX**



⬢ **CAUTION: THE PROCEDURES SHOWN HEREIN ARE ONLY APPLICABLE FOR HIGHWAY MOVEMENTS, NOT FOR TRAILER-ON-FLATCAR (TOFC) MOVEMENTS.**

## U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND

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

U.S. ARMY DEFENSE AMMUNITION CENTER

**CAUTION: VERIFY PRIOR TO USE AT WWW.DAC.ARMY.MIL/DET THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 16.**

**DO NOT SCALE**

**MAY 2004**

| | | |
|---|---|---|
| ENGINEER OR TECHNICIAN | BASIC | MELVIN SIX |
| | REV. | MELVIN SIX |
| TRANSPORTATION ENGINEERING DIVISION | | |
| VALIDATION ENGINEERING DIVISION | | TESTED |
| ENGINEERING DIRECTORATE | | |

| REVISION NO. 1 | NOVEMBER 2006 |
|---|---|

SEE THE REVISION LISTING ON PAGE 3

| CLASS | DIVISION | DRAWING | FILE |
|---|---|---|---|
| 19 | 48 | 8687 | SP11J117 |

PROJECT SP 386-00

## 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 BSU-84, BSU-88 OR BSG-92 AIRFOIL GROUP PACKED IN THE CNU-373/E CONTAINER. SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE CONTAINER WITH MISSILE INSTALLED. SEE PAGE 3 AND AIR FORCE DRAWING NUMBER 817218-30 FOR DETAILS OF THE CONTAINER.

C. THE LOADS AS SHOWN HEREIN ARE BASED ON 48'-0" LONG BY 8'-0" WIDE OR 45'-0" LONG BY 8'-6" WIDE FLATBED TRAILERS. TRAILERS OF OTHER LENGTHS AND WIDTHS MAY BE USED. TRAILERS MUST HAVE WOOD OR WOOD AND 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 FOR THE TRANSPORT OF THE DESIGNATED ITEM IS THE RESPONSIBILITY OF THE ORIGINATING CARRIER AND THE SHIPPER. ONLY VEHICLES IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE REGULATORY DOCUMENTS WILL BE SELECTED FOR USE.

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.

H. IF THE CAPACITY OF THE MATERIALS HANDLING EQUIPMENT PERMITS, IT IS RECOMMENDED THAT CONTAINERS BE UNITIZED PRIOR TO PLACEMENT ABOARD THE TRAILER.

(CONTINUED AT RIGHT)

## 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). |
| STRAP, WEB, COMMERCIAL - - - - -: | WEB SLING AND TIEDOWN ASSOCIATION RECOMMENDED STANDARD SPECIFICATION FOR SYNTHETIC WEB TIEDOWNS, REVISED 1998. |
| 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. |
| ANTI-CHAFING MATERIAL - - - - - -: | MIL-PRF-121 (OR EQUAL); NEUTRAL BARRIER MATERIAL. |
| CHAIN - - - - - - - -: | NATIONAL ASSOCIATION OF CHAIN MANUFACTURER'S WELDED CHAIN SPECIFICATION ADOPTED NOVEMBER 1999. |
| LOAD BINDER - - - -: | FED SPEC GGG-B-325. |

(GENERAL NOTES CONTINUED)

J. 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.

K. 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.

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 13 FOR GUIDANCE.

M. THE TRANSPORTING VEHICLE OPERATOR SHOULD BE INSTRUCTED TO PERIODICALLY INSPECT THE TIEDOWN CHAINS AND LOAD BINDERS 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.

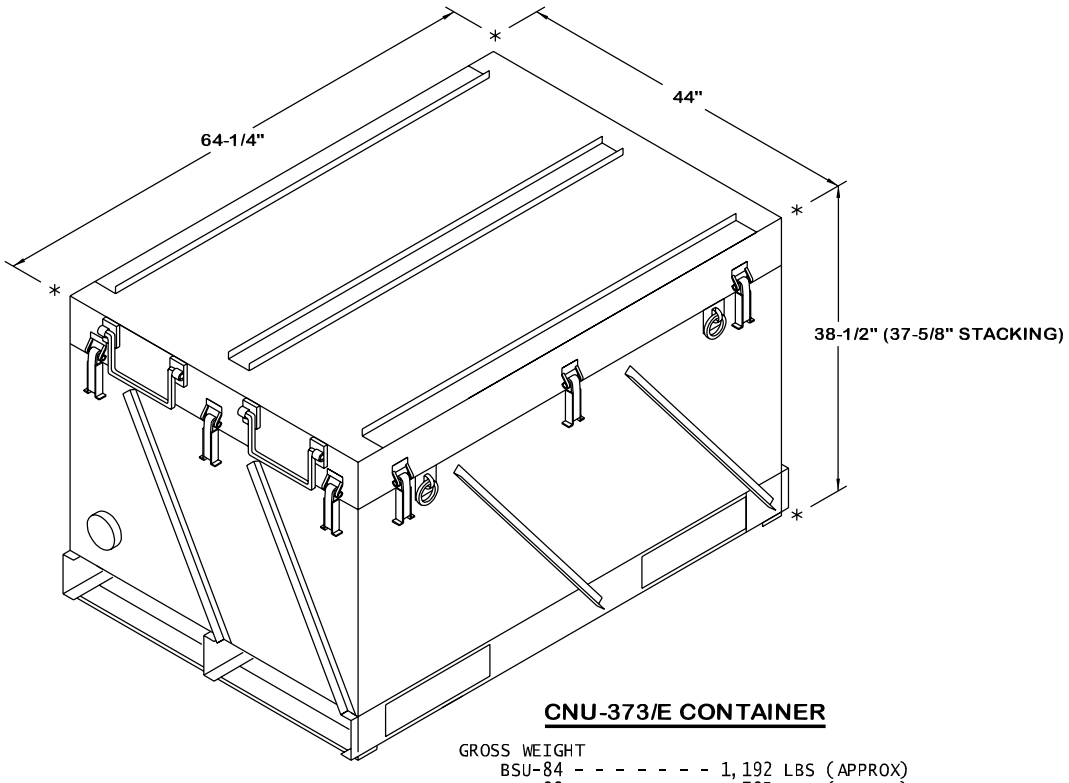
O. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE.

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.

## REVISION

REVISION NO. 1, DATED NOVEMBER 2006, CONSISTS OF:

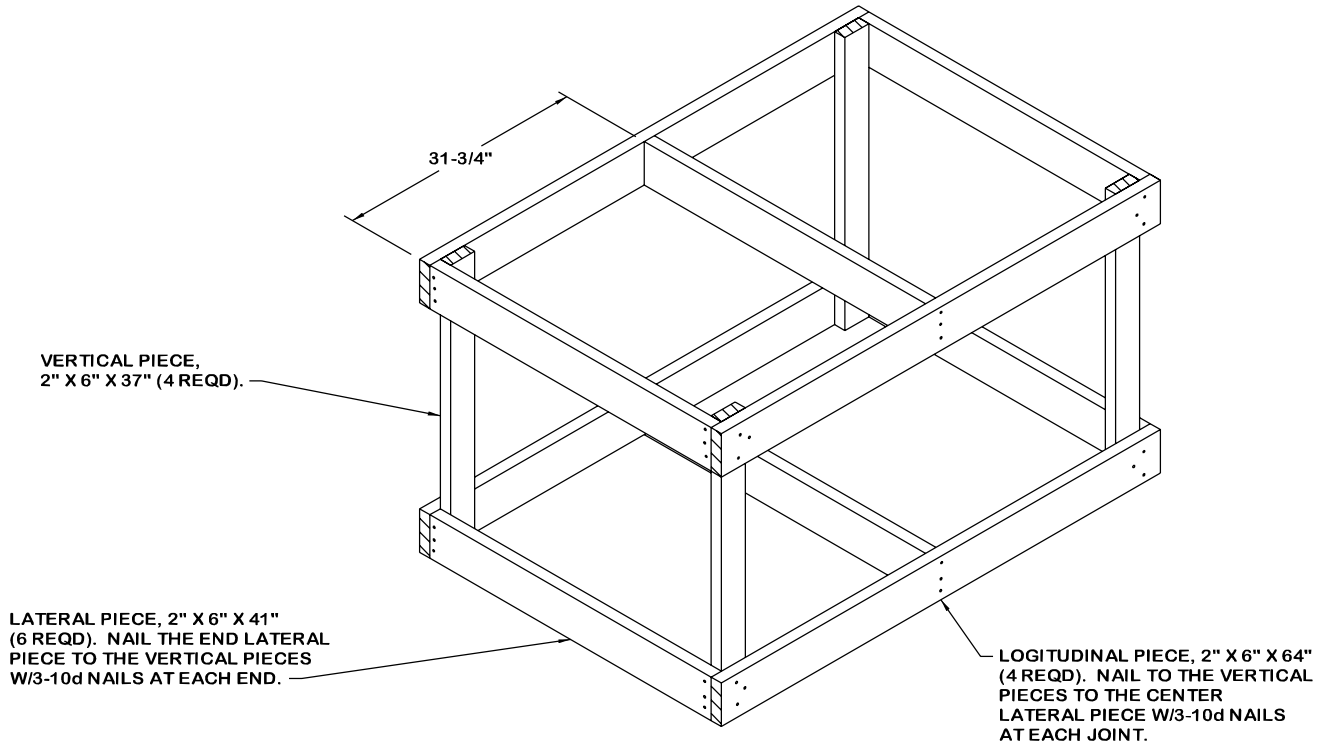
ADDING REFERENCE TO BSU-88 AND BSG-92 TO THE DRAWING.




## CNU-373/E CONTAINER

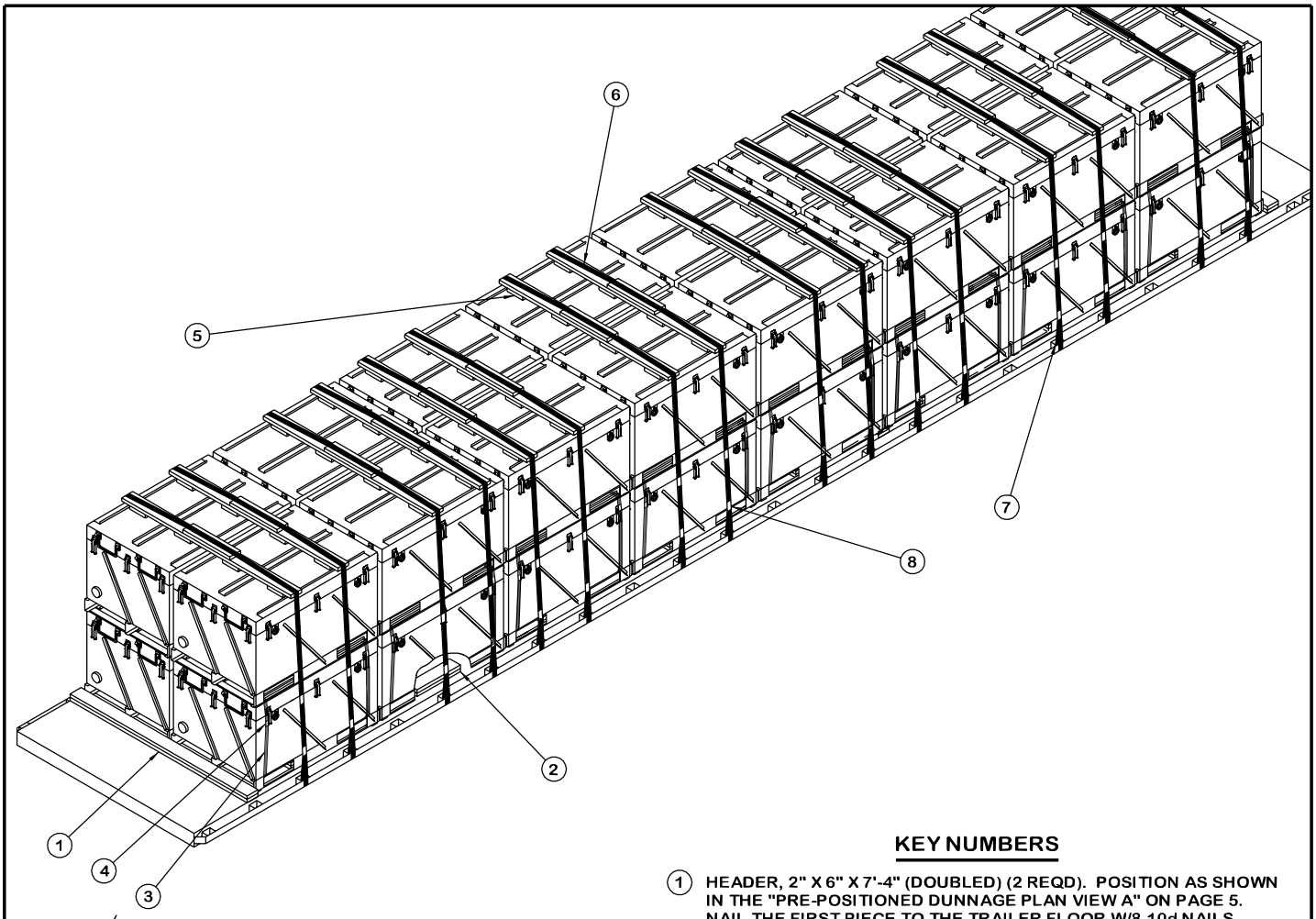
GROSS WEIGHT
- BSU-84 - - - - - - - - 1,192 LBS (APPROX)
- BSU-88 - - - - - - - - 785 LBS (APPROX)
- BSG-92 - - - - - - - - 836 LBS (APPROX)

CUBE - - - - - - - - - - 63.0 CU FT (APPROX)




## FILLER ASSEMBLY

(FOR MINUS ONE UNIT)




**ISOMETRIC VIEW**

## KEY NUMBERS

1. HEADER, 2" X 6" X 7'-4" (DOUBLED) (2 REQD). POSITION AS SHOWN IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW A" ON PAGE 5. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/8-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/8-20d NAILS. SEE SPECIAL NOTES 2 AND 3 ON PAGE 5.

2. SIDE BLOCKING, 2" X 6" X 12" (DOUBLED) (16 REQD). PRE-POSITION AS SHOWN IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW A" ON PAGE 5. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.

3. STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" X 14'-4" LONG STEEL STRAPPING (32 REQD).

4. SEAL FOR 1-1/4" STEEL STRAPPING (32 REQD). DOUBLE CRIMP EACH SEAL.

5. HOLD-DOWN BOARD ASSEMBLY A (16 REQD). SEE DETAIL ON PAGE 12.

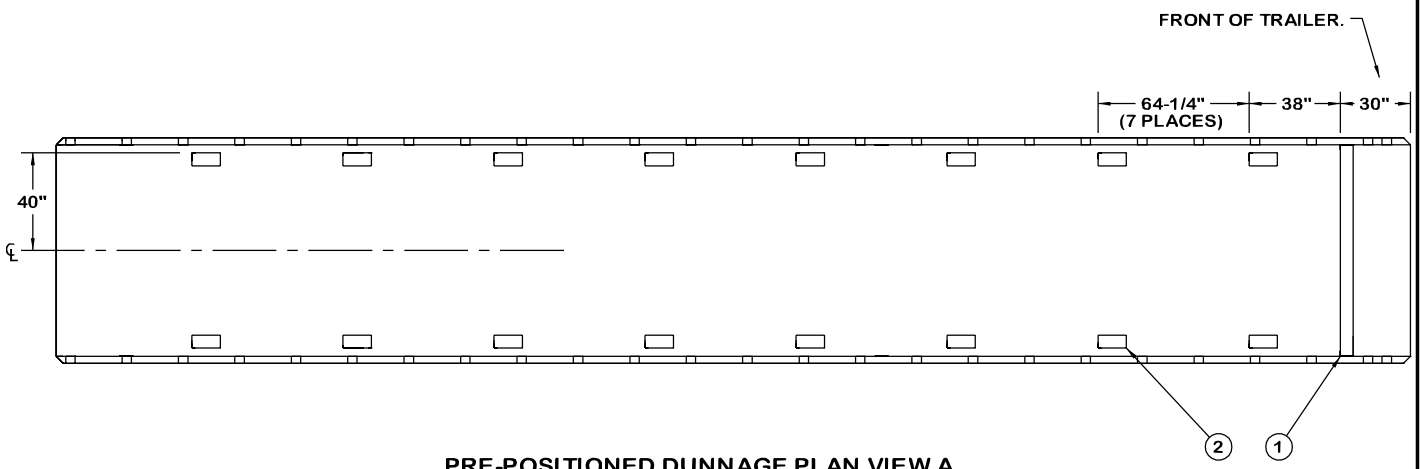
6. HOLD-DOWN STRAP, 2" X .050" OR .044" X 25'-7" LONG STEEL STRAPPING (16 REQD). INSTALL EACH STRAP FROM ONE PIECE OF STRAPPING. ANCHOR A STRAP TO A TIEDOWN FACILITY ON ONE SIDE OF THE TRAILER, RUN IT OVER THE LOAD, PASS IT THROUGH A TIEDOWN FACILITY ON THE OPPOSITE SIDE OF THE TRAILER, AND BRING IT BACK UP ABOVE THE TRAILER FLOOR WHERE IT CAN BE TENSIONED AND SEALED.

7. PAD, 2" X .050" OR .044" X 18" LONG STEEL STRAPPING (32 REQD). POSITION BETWEEN THE HOLD-DOWN STRAP AND THE STAKE POCKET AND SEAL TO HOLD-DOWN STRAP, PIECE MARKED ④. SEE "DETAIL A" ON PAGE 13. ALT: STAKE POCKET PROTECTOR (64 REQD). USE TWO UNDER EACH STAKE POCKET WITH A HOLD-DOWN STRAP. SEE "DETAIL B" ON PAGE 13.

8. SEAL FOR 2" STEEL STRAPPING (64 REQD, 4 PER STRAP). DOUBLE CRIMP EACH SEAL, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ⑦.



32-UNIT LOAD ON A 48'-0" LONG BY 8'-0" WIDE FLATBED TRAILER (STEEL STRAPPING METHOD)




## PRE-POSITIONED DUNNAGE PLAN VIEW A

KEY NUMBER REFER TO KEY NUMBERS ON PAGE 4. KEY NUMBERS ③ THROUGH ⑧ OMITTED FOR CLARITY PURPOSES.

SPECIAL NOTES:

1. A 32-UNIT LOAD IS SHOWN ON A 48'-0" LONG BY 8'-0" WIDE FLAT-BED TRAILER. OTHER LENGTH AND WIDTH TRAILERS MAY BE USED.
2. THE LOCATIONS FOR THE PRE-POSITIONED DUNNAGE PIECES ARE SPECIFIED IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW A" ABOVE. ONE HEADER, PIECE MARKED ①, IS SHOWN IN THE VIEW AND ALL THE PRE-POSITIONED PIECES ARE TO BE LOCATED FROM THAT PIECE.
3. THE HEADER AS APPLIED ABOVE FOR LONGITUDINAL BRACING WILL SUPPORT 40,000 POUNDS OF LADING.
4. THE LOCATION DIMENSION FOR THE FIRST PIECE MARKED ① TO BE INSTALLED IS BASED ON THE USE OF A 48'-0" LONG TRAILER WHICH HAS THE REAR TANDEMS LOCATED AT THE EXTREME REAR OF THE TRAILER. THESE LOCATION DIMENSIONS ARE NOT MANDATORY FOR USE AND MAY BE ADJUSTED TO SUIT.
5. IF CHAINS AND LOAD BINDERS ARE TO BE USED FOR LOAD SECUREMENT IN LIEU OF THE STEEL STRAPPING, REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE. IF WEB STRAPS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 6 AND 7 FOR GUIDANCE.
6. THE DEPICTED LOAD CAN BE REDUCED TO SUIT THE QUANTITY TO BE SHIPPED. SEE THE DETAILS ON PAGES 6, 8, 10 AND 11 FOR OTHER QUANTITIES.

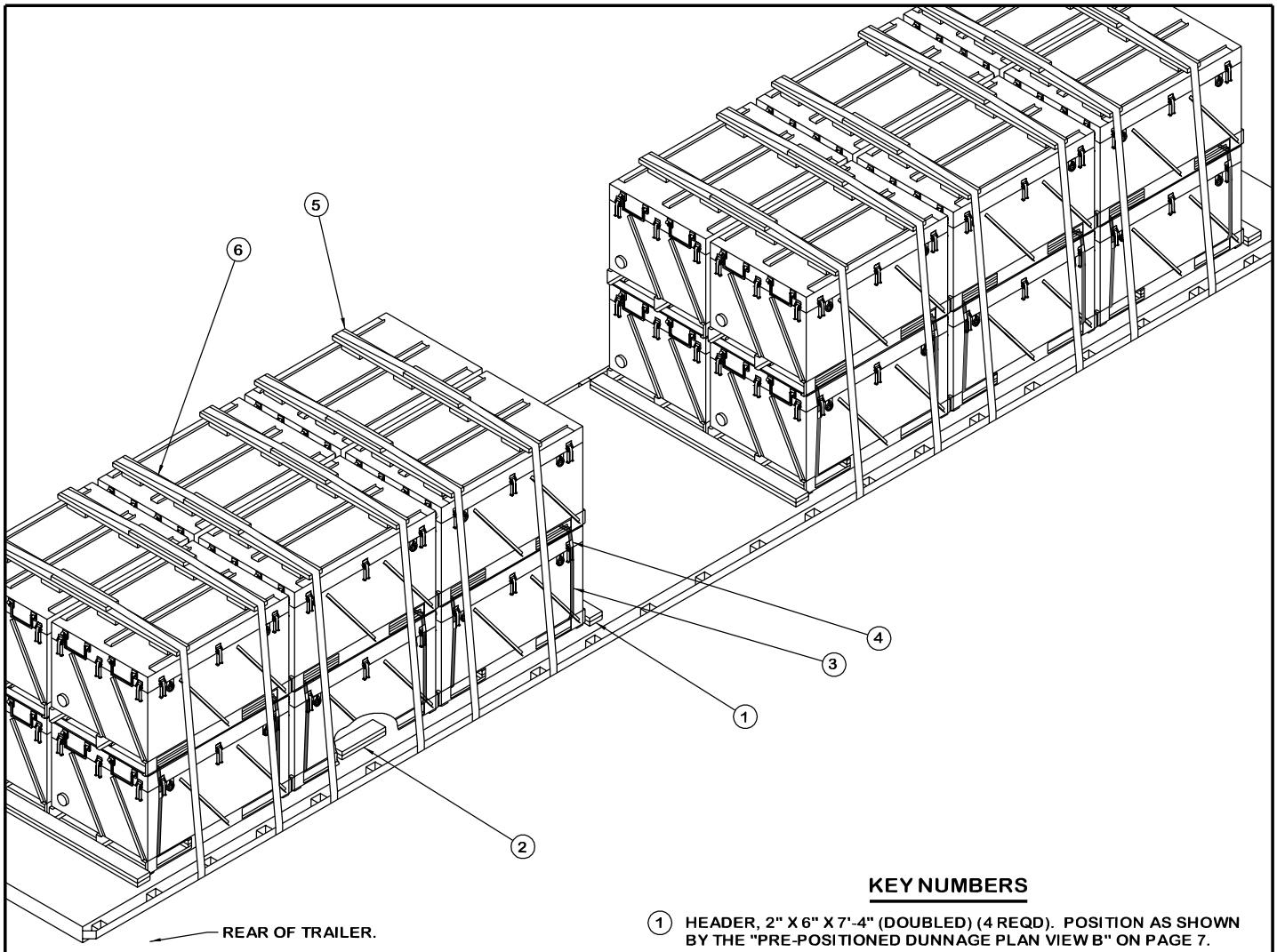
| BILL OF MATERIAL | | |
|---|---|---|
| LUMBER | LINEAR FEET | BOARD FEET |
| 2" X 6" | 254 | 254 |
| NAILS | NO. REQD | POUNDS |
| 10d (3")<br>20d (4") | 400<br>16 | 6-1/4<br>1-1/4 |

STEEL STRAPPING, 1-1/4" - - 459' REQD - - - - 66 LBS
SEAL FOR 1-1/4" STRAPPING - 32 REQD - - - - - 2 LBS
STEEL STRAPPING, 2" - - - - 458' REQD - - - - 153 LBS
SEAL FOR 2" STRAPPING - - - 64 REQD - - - - - 3 LBS
ANTI-CHAFING MATERIAL - - - - AS REQD - - - - - - NIL

### LOAD AS SHOWN

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| CONTAINERS | 32 | 38,144 LBS |
| DUNNAGE | | 747 LBS |
| | TOTAL WEIGHT | 38,891 LBS (APPROX) |

## 32-UNIT LOAD ON A 48'-0" LONG BY 8'-0" WIDE FLATBED TRAILER (STEEL STRAPPING METHOD)



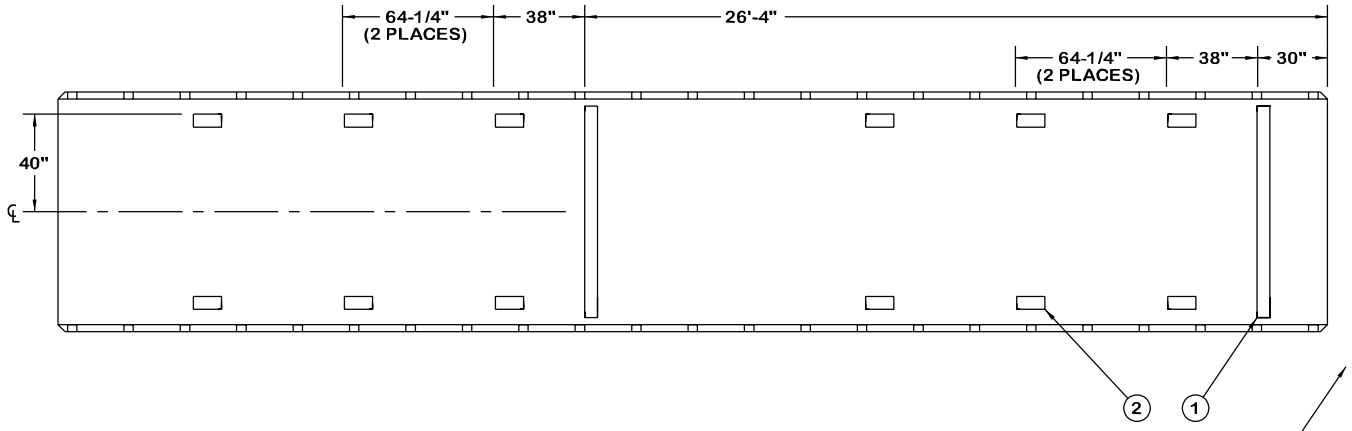

ISOMETRIC VIEW

## KEY NUMBERS

1. HEADER, 2" X 6" X 7'-4" (DOUBLED) (4 REQD). POSITION AS SHOWN BY THE "PRE-POSITIONED DUNNAGE PLAN VIEW B" ON PAGE 7. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/6-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/6-20d NAILS. SEE SPECIAL NOTE 2 ON PAGE 7.
2. SIDE BLOCKING, 2" X 6" X 12" (DOUBLED) (12 REQD). PRE-POSITION AS SHOWN IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW B" ON PAGE 7. LAMINATE THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
3. STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" X 14'-4" LONG STEEL STRAPPING (24 REQD).
4. SEAL FOR 1-1/4" STEEL STRAPPING (24 REQD). DOUBLE CRIMP EACH SEAL.
5. HOLD-DOWN BOARD ASSEMBLY A (12 REQD). SEE DETAIL ON PAGE 12.
6. WEB STRAP ASSEMBLY (12 REQD). POSITION TO EXTEND FROM A WINCH ON ONE SIDE OF THE TRAILER, OVER THE TOP OF THE CONTAINERS, TO AN ATTACHMENT POINT ON THE OPPOSITE SIDE. SEE THE "SPECIAL PROVISIONS FOR WEB STRAP TIEDOWN" ON PAGE 15.



24-UNIT LOAD ON A 45'-0" LONG BY 8'-6" WIDE FLATBED TRAILER (WEB STRAP TIEDOWN METHOD)




## PRE-POSITIONED DUNNAGE PLAN VIEW B

KEY NUMBER REFER TO KEY NUMBERS ON PAGE 6. KEY NUMBERS ③ THROUGH ⑥ OMITTED FOR CLARITY PURPOSES.

SPECIAL NOTES:

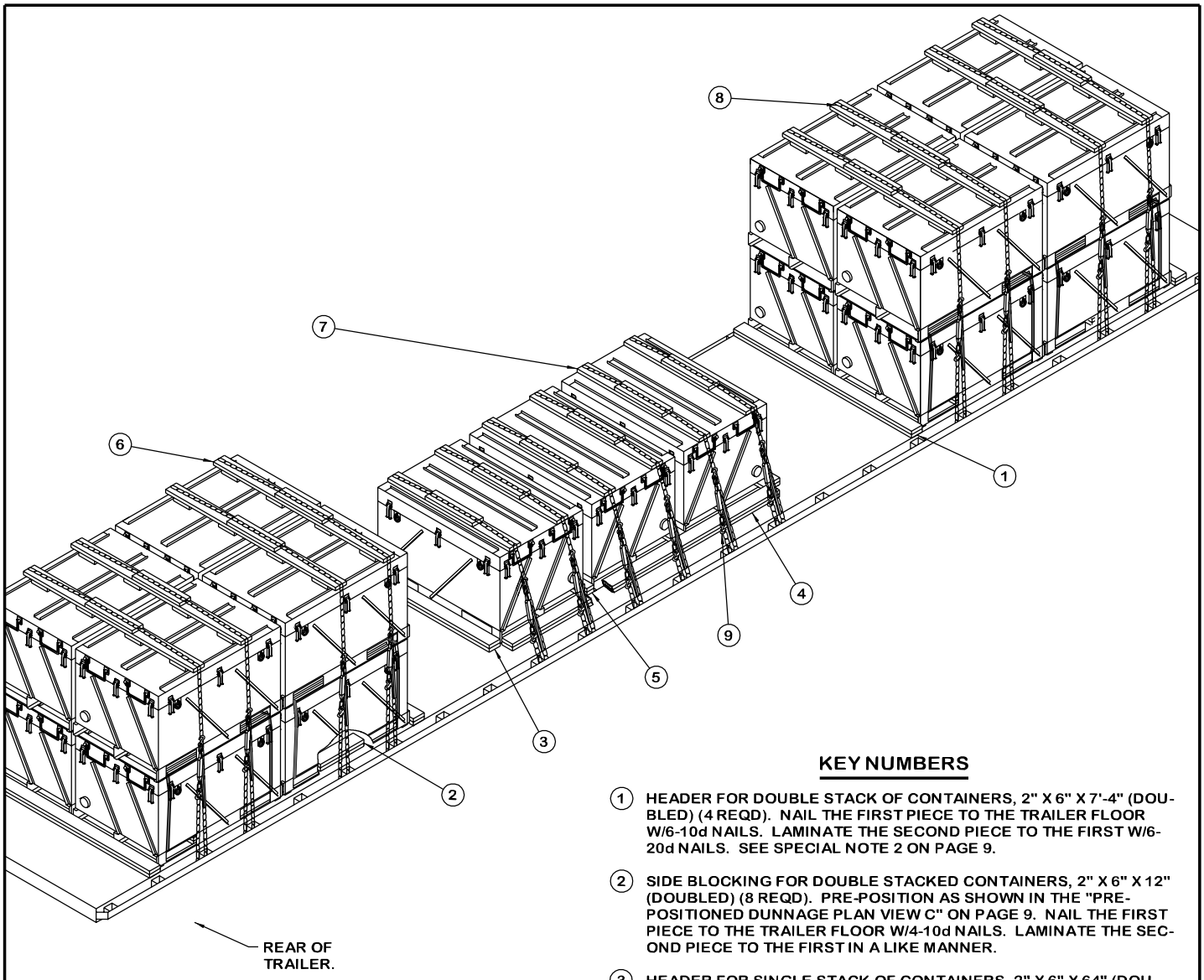
1. A 24-UNIT LOAD IS SHOWN ON A 45'-0" LONG BY 8'-6" WIDE FLATBED TRAILER. OTHER LENGTH AND WIDTH TRAILERS MAY BE USED.
2. THE HEADER AS APPLIED ABOVE FOR LONGITUDINAL BRACING WILL SUPPORT 30,000 POUNDS OF LADING; FOLLOW NAILING INSTRUCTIONS FOR KEY NUMBER ① ON PAGE 4 FOR HEADERS REQUIRING 40,000 POUNDS OF SUPPORT.
3. THE LOCATION DIMENSION FOR THE DUNNAGE TO BE INSTALLED IS BASED ON THE USE OF A 45'-0" LONG TRAILER OF THE "WESTERN" TYPE, WHICH HAS THE REAR TANDEMS LOCATED AT THE EXTREME REAR OF THE TRAILER. THESE LOCATION DIMENSIONS ARE NOT MANDATORY FOR USE AND MAY BE ADJUSTED TO SUIT.
4. IF THE CAPACITY OF MATERIALS HANDLING EQUIPMENT (MHE) IS ADEQUATE, TWO CONTAINERS MAY BE UNITIZED PRIOR TO LOADING ON THE FLATBED TRAILER. IF THIS IS NOT POSSIBLE, THEN THE STACK UNITIZING STRAPS MUST BE POSITIONED AS THE LOADING PROGRESSES.
5. IF CHAINS AND LOAD BINDERS ARE TO BE USED FOR LOAD SECUREMENT IN LIEU OF THE WEB STRAPPING, REFER TO THE PROCEDURES ON PAGES 8 AND 9 FOR GUIDANCE. IF STEEL STRAPS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 4 AND 5 FOR GUIDANCE.

| BILL OF MATERIAL | | |
|---|---|---|
| LUMBER | LINEAR FEET | BOARD FEET |
| 2" x 6" | 215 | 215 |
| NAILS | NO. REQD | POUNDS |
| 10d (3")<br>20d (4") | 276<br>48 | 5<br>2 |
| STEEL STRAPPING, 1-1/4" - 344' REQD - - - - -50 LBS<br>SEAL FOR 1-1/4" STRAPPING - 24 REQD - - - - - 1 LB<br>WEB STRAP ASSEMBLY - - - - - - - - - - - - - - - 12 REQD<br>ANTI-CHAFING MATERIAL - - - AS REQD - - - - - - NIL | | |

### LOAD AS SHOWN

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| CONTAINERS | 24 | 28,608 LBS |
| DUNNAGE | | 486 LBS |
| TOTAL WEIGHT | | 29,094 LBS (APPROX) |

## 24-UNIT LOAD ON A 45'-0" LONG BY 8'-6" WIDE FLATBED TRAILER (WEB STRAP TIEDOWN METHOD)




ISOMETRIC VIEW

## KEY NUMBERS

1. HEADER FOR DOUBLE STACK OF CONTAINERS, 2" X 6" X 7'-4" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/6-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/6-20d NAILS. SEE SPECIAL NOTE 2 ON PAGE 9.

2. SIDE BLOCKING FOR DOUBLE STACKED CONTAINERS, 2" X 6" X 12" (DOUBLED) (8 REQD). PRE-POSITION AS SHOWN IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW C" ON PAGE 9. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.

3. HEADER FOR SINGLE STACK OF CONTAINERS, 2" X 6" X 64" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/4-20d NAILS.

4. SIDE BLOCKING FOR SINGLE STACKED CONTAINERS, 2" X 6" X 11'-0" (DOUBLED) (2 REQD). PRE-POSITION AS SHOWN IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW C" ON PAGE 9. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.

5. FILL PIECE, 2" X 4" X 64" (DOUBLED) (AS REQD, 2 SHOWN). LOCATE BETWEEN CONTAINERS TO ADJUST CONTAINER ALIGNMENT WITH THE TRAILER POCKETS. NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/3-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/3-20d NAILS.

6. HOLD-DOWN BOARD ASSEMBLY A (8 REQD). SEE DETAIL ON PAGE 12.

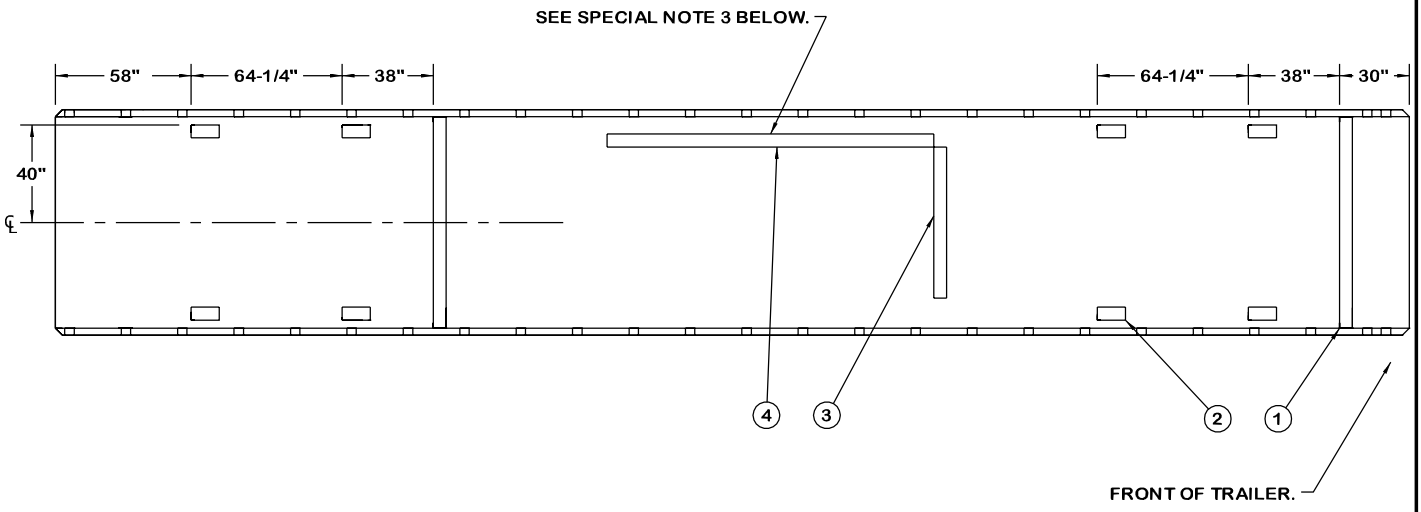
7. HOLD-DOWN BOARD ASSEMBLY B (6 REQD). SEE DETAIL ON PAGE 12.

8. CHAIN, BINDING, 5/16", GRADE 70 BY A LENGTH TO SUIT (REF: 14'-6") (6 REQD) FOR SINGLE STACK CONTAINERS, (REF: 24'-0") (8 REQD) FOR DOUBLE STACK CONTAINERS. POSITION AS SHOWN. ATTACH TO A TRAILER STAKE POCKET, NOT A RUB RAIL. SEE THE "SPECIAL PROVISIONS FOR CHAIN TIEDOWN" ON PAGE 14.

9. 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 ⑧, TO THE HOLD-DOWN BOARD ASSEMBLY, PIECES MARKED ⑥ AND ⑦, W/1-20d NAIL AT EACH END BY DRIVING EACH NAIL INTO THE PIECES THRU AN OPENING IN A CHAIN LINK AND BENDING IT OVER THE LINK.



19-UNIT LOAD ON A 48'-0" LONG BY 8'-0" WIDE FLATBED TRAILER (CHAIN TIEDOWN METHOD)




## PRE-POSITIONED DUNNAGE PLAN VIEW C

KEY NUMBER REFER TO KEY NUMBERS ON PAGE 8. KEY NUMBERS ⑤ THROUGH ⑨ OMITTED FOR CLARITY PURPOSES.

SPECIAL NOTES:

1. A 19-UNIT LOAD IS SHOWN ON A 48'-0" LONG BY 8'-0" WIDE FLATBED TRAILER. TRAILERS OF OTHER DIMENSIONS CAN BE USED.
2. THE HEADER AS APPLIED ABOVE FOR LONGITUDINAL BRACING WILL SUPPORT 30,000 POUNDS OF LADING; FOLLOW NAILING INSTRUCTIONS FOR KEY NUMBER ① ON PAGE 4 FOR HEADERS REQUIRING 40,000 POUNDS OF SUPPORT.
3. THE LOCATION OF PIECES MARKED ③ AND ④ IN THE "PRE-POSITIONED DUNNAGE PLAN VIEW C" ABOVE ARE TO BE CENTERED BETWEEN THE FRONT AND REAR LOADS. THE LOCATION MAY BE ADJUSTED TO ALLOW THE CONTAINERS TO ALIGN WITH THE FLATBED STAKE POCKETS.
4. IF THE CAPACITY OF MATERIALS HANDLING EQUIPMENT (MHE) IS ADEQUATE, TWO CONTAINERS MAY BE UNITIZED PRIOR TO LOADING ON THE FLATBED TRAILER. IF THIS IS NOT POSSIBLE, THEN THE STACK UNITIZING STRAPS MUST BE POSITIONED AS THE LOADING PROGRESSES.
5. IF WEB STRAPPING IS TO BE USED FOR LOAD SECUREMENT IN LIEU OF THE CHAINS AND LOAD BINDERS, REFER TO THE PROCEDURES ON PAGES 6 AND 7 FOR GUIDANCE. IF STEEL STRAPS ARE TO BE USED FOR LOAD SECUREMENT, REFER TO THE PROCEDURES ON PAGES 4 AND 5 FOR GUIDANCE.

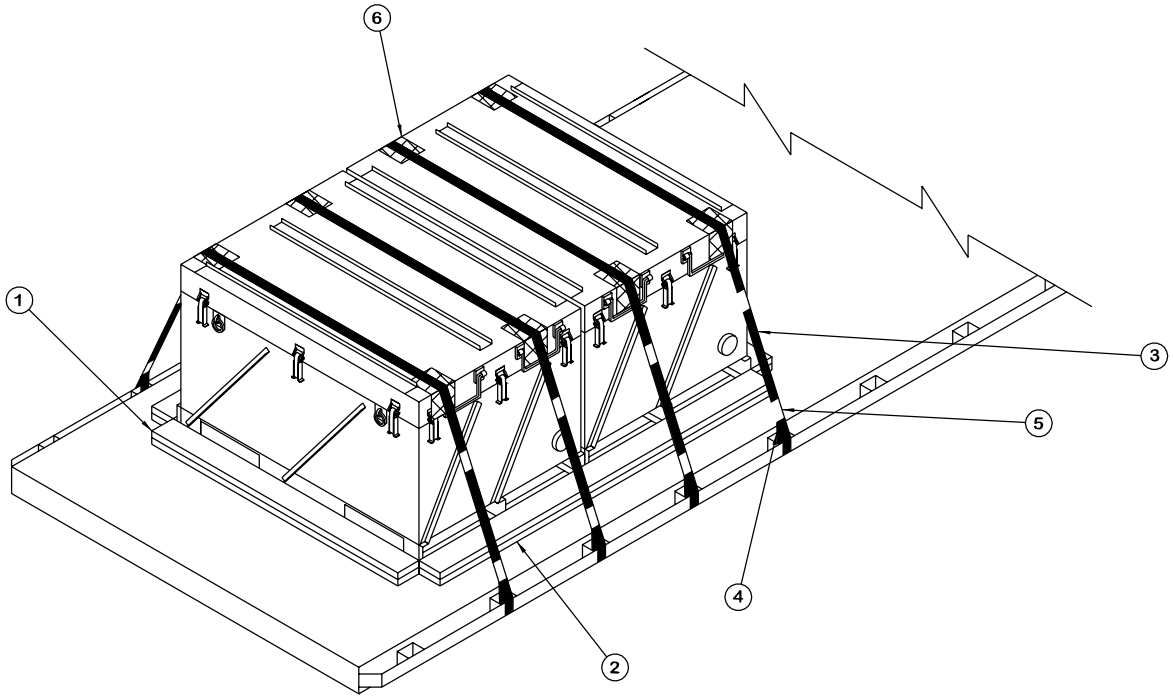
### BILL OF MATERIAL

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 2" X 4"<br>2" X 6" | 64<br>267 | 43<br>267 |
| NAILS | NO. REQD | POUNDS |
| 10d (3")<br>20d (4") | 408<br>48 | 7<br>2 |
| CHAIN, BINDING, 5/16" - - - - 276' REQD - - - 331 LBS<br>BINDER, LOAD - - - - - - - - - 14 REQD - - - -84 LBS<br>ANTI-CHAFING MATERIAL - - - - - AS REQD - - - - - NIL | | |

### LOAD AS SHOWN

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| CONTAINERS | 19 | 22,648 LBS |
| DUNNAGE | | 1,092 LBS |
| TOTAL WEIGHT | | 23,740 LBS (APPROX) |

## 19-UNIT LOAD ON A 48'-0" LONG BY 8'-0" WIDE FLATBED TRAILER (CHAIN TIEDOWN METHOD)




**ISOMETRIC VIEW**

SPECIAL NOTES:

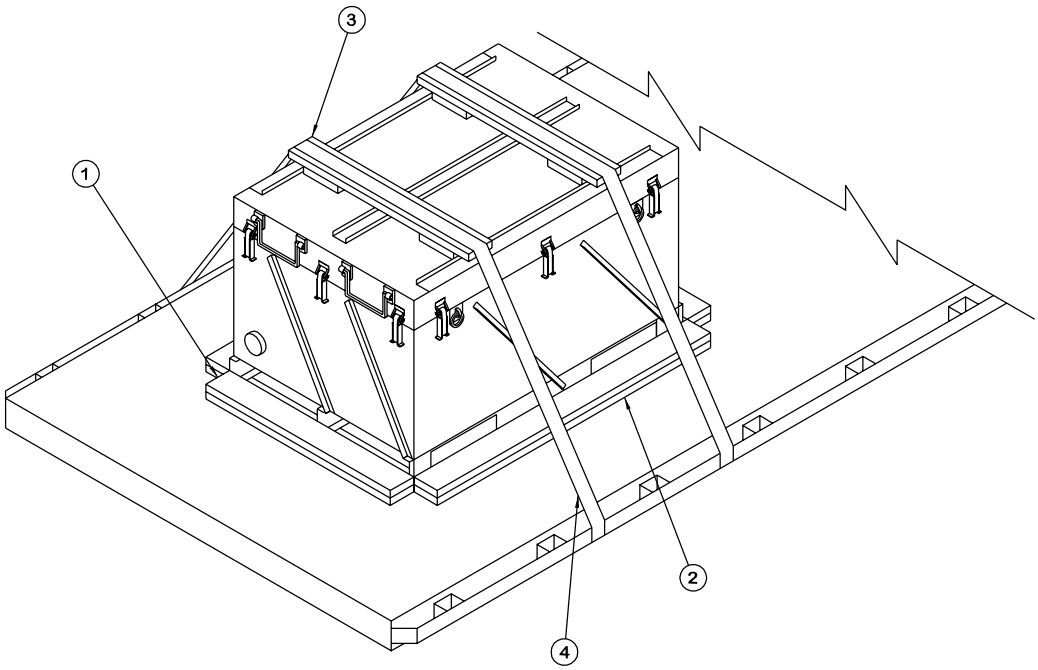
A 2-UNIT LOAD IS SHOWN ON AN 8'-0" WIDE TRAILER. WIDER TRAILERS CAN BE USED.

## KEY NUMBERS

1. HEADER, 2" X 6" X 64" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. NAIL THE SECOND PIECE TO THE FIRST W/4-20d NAILS.
2. SIDE BLOCKING, 2" X 6" X 7'-4" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
3. HOLD-DOWN STRAP, 2" X .050" OR .044" X 17'-0" LONG STEEL STRAPPING (4 REQD). INSTALL EACH STRAP FROM ONE PIECE OF STRAPPING. ANCHOR A STRAP TO A TIE-DOWN FACILITY ON ONE SIDE OF THE TRAILER, RUN IT OVER THE LOAD, PASS IT THROUGH A TIE-DOWN FACILITY ON THE OPPOSITE SIDE OF THE TRAILER, AND BRING IT BACK UP ABOVE THE TRAILER FLOOR WHERE IT CAN BE TENSIONED AND SEALED.
4. PAD, 2" X .050" OR .044" X 18" LONG STEEL STRAPPING (8 REQD). POSITION BETWEEN THE HOLD-DOWN STRAP AND THE STAKE POCKET AND SEAL TO HOLD-DOWN STRAP, PIECE MARKED ③. SEE "DETAIL A" ON PAGE 13. ALT: STAKE POCKET PROTECTOR (8 REQD). USE TWO UNDER EACH STAKE POCKET WITH A HOLD-DOWN STRAP. SEE "DETAIL B" ON PAGE 13.
5. SEAL FOR 2" STEEL STRAPPING (16 REQD, 4 PER STRAP). DOUBLE CRIMP EACH SEAL, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ④.
6. ANTI-CHAFING NEUTRAL BARRIER MATERIAL (AS REQD). POSITION UNDER ALL STRAPS AT POINTS OF CONTACT WITH THE ASSEMBLY.



**TYPICAL LTL (2-UNIT LOAD) (STEEL STRAP TIEDOWN METHOD)**




**ISOMETRIC VIEW**

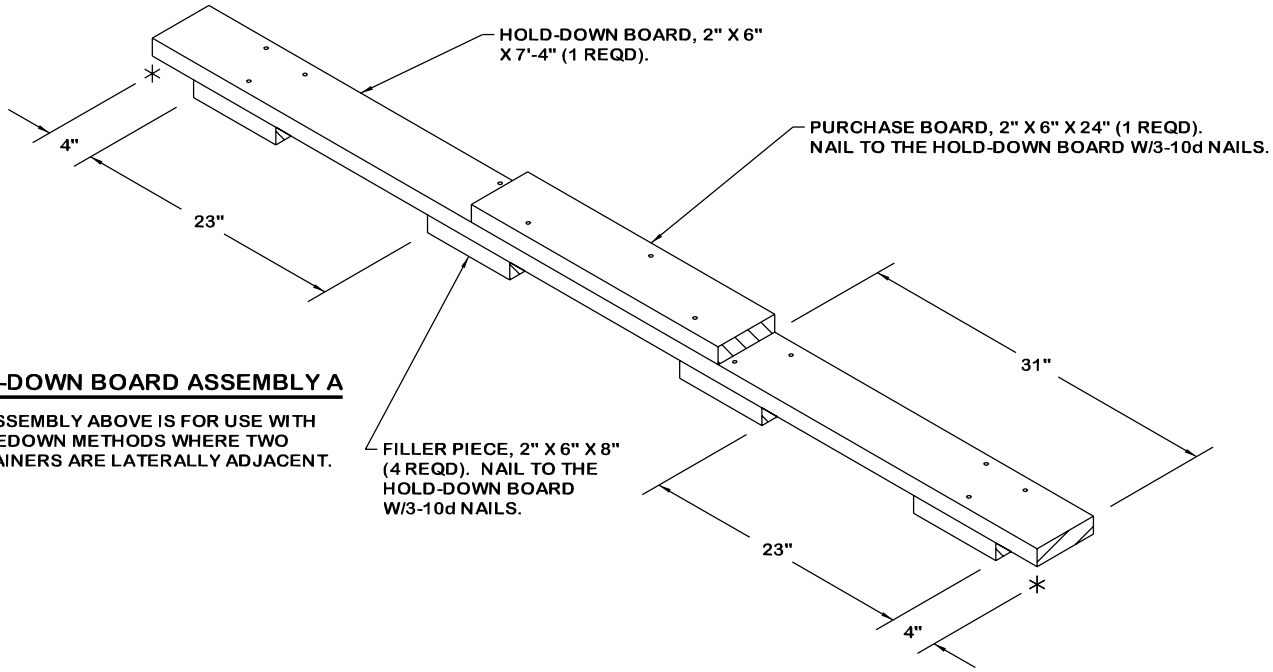
**KEY NUMBERS**

1. HEADER, 2" X 6" X 44" (DOUBLED) (2 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST W/4-20d NAILS.
2. SIDE BLOCKING, 2" X 6" X 64" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE TRAILER FLOOR W/4-10d NAILS. LAMINATE THE SECOND PIECE TO THE FIRST IN A LIKE MANNER.
3. HOLD-DOWN BOARD ASSEMBLY C (2 REQD). SEE DETAIL ON PAGE 12.
4. WEB STRAP ASSEMBLY (2 REQD). POSITION TO EXTEND FROM A WINCH ON ONE SIDE OF THE TRAILER, OVER THE CONTAINER, TO AN ATTACHMENT POINT ON THE OPPOSITE SIDE. SEE THE "SPECIAL PROVISIONS FOR WEB STRAP TIEDOWN" ON PAGE 15.

SPECIAL NOTES:

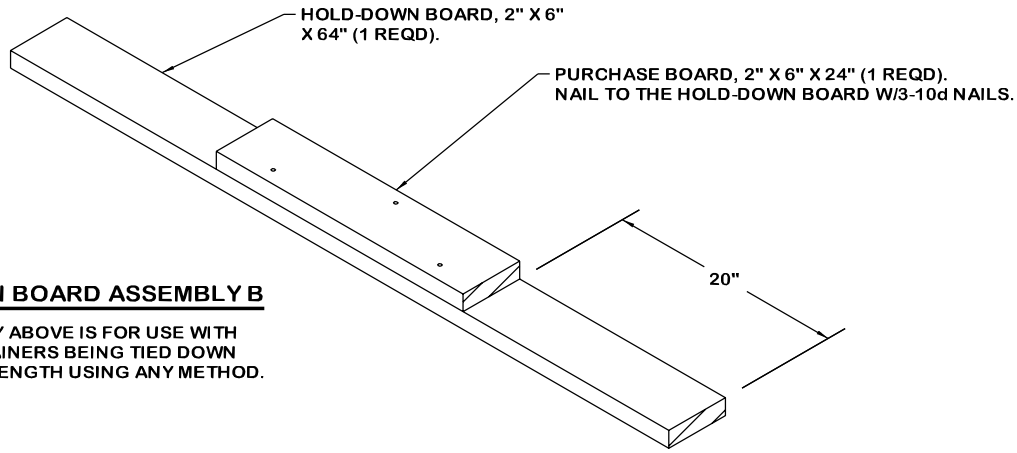
A 1-UNIT LOAD IS SHOWN ON AN 8'-0" WIDE TRAILER. WIDER TRAILERS CAN BE USED.

**TYPICAL LTL (1-UNIT LOAD) (WEB STRAP TIEDOWN METHOD)**



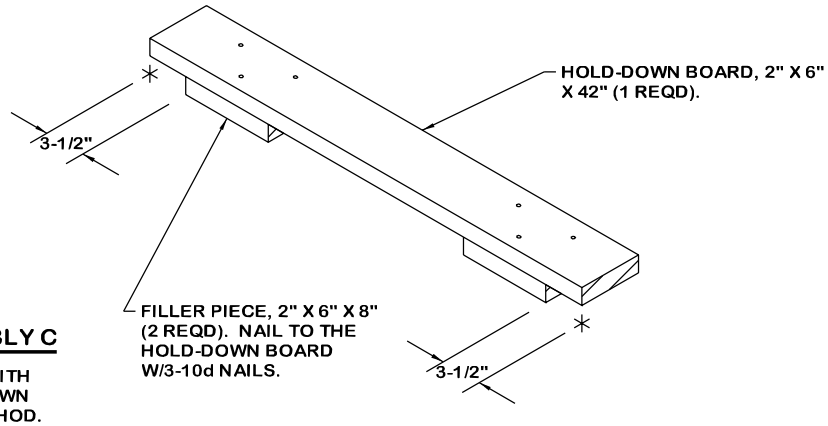

## HOLD-DOWN BOARD ASSEMBLY A

THE ASSEMBLY ABOVE IS FOR USE WITH ALL TIEDOWN METHODS WHERE TWO CONTAINERS ARE LATERALLY ADJACENT.



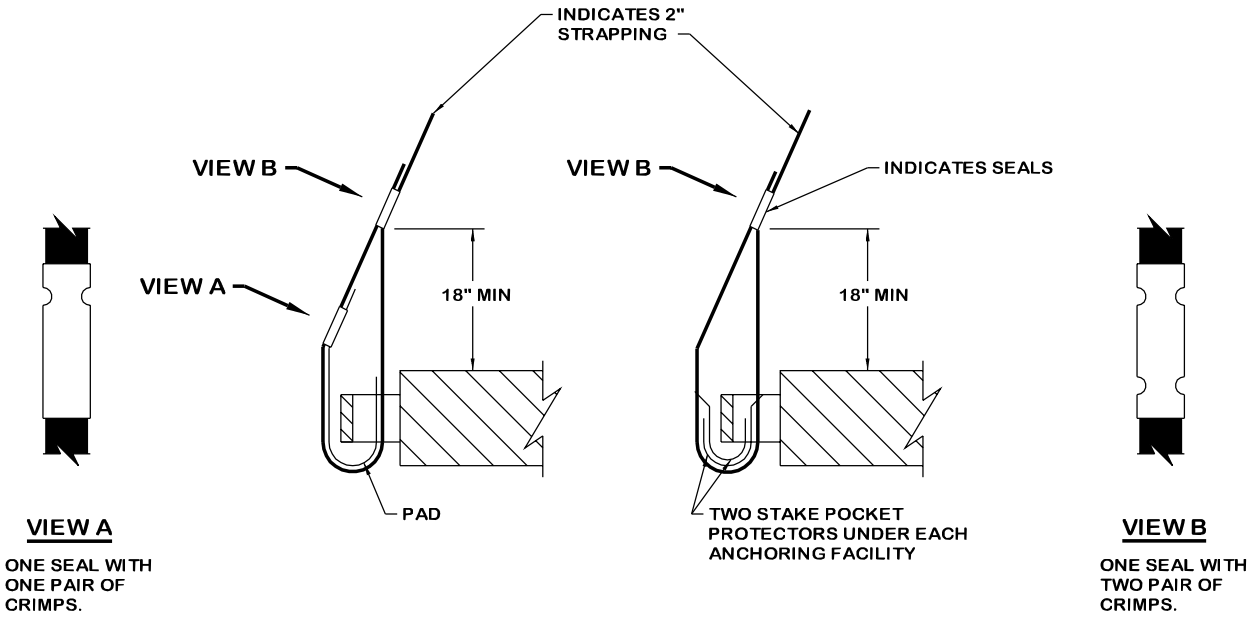

## HOLD-DOWN BOARD ASSEMBLY B

THE ASSEMBLY ABOVE IS FOR USE WITH SINGLE CONTAINERS BEING TIED DOWN ACROSS THE LENGTH USING ANY METHOD.




## HOLD-DOWN BOARD ASSEMBLY C

THE ASSEMBLY ABOVE IS FOR USE WITH SINGLE CONTAINERS BEING TIED DOWN ACROSS THE WIDTH USING ANY METHOD.




**VIEW A**

ONE SEAL WITH ONE PAIR OF CRIMPS.

**VIEW B**

ONE SEAL WITH TWO PAIR OF CRIMPS.

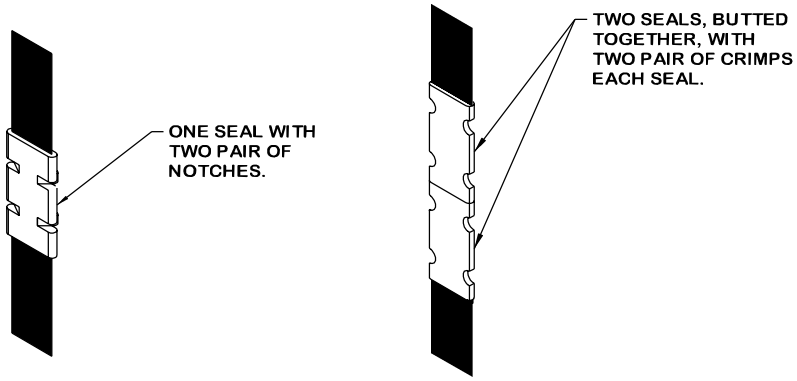
**DETAIL A**

METHOD OF INSTALLING 2" STRAPPING AND PAD AT ANCHORING FACILITY.

**DETAIL B**

METHOD OF INSTALLING 2" STRAPPING AND STAKE POCKET PROTECTORS (ALT PAD).

## HOLD-DOWN STRAP ANCHORING DETAILS




**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

## 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 12 AND 13 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 CHAIN BEING USED.

## PROVISIONS FOR THE USE OF FIRE HOSE IN LIEU OF HOLD-DOWN BOARDS

FIRE HOSE THAT IS NO LONGER SUITABLE FOR USE IN FIRE FIGHTING APPLICATIONS CAN BE SUBSTITUTED FOR THE HOLD-DOWN BOARDS, AS SPECIFIED HEREIN, PROVIDED THE FOLLOWING CONDITIONS ARE MET.

1. SUBSTITUTION AND APPLICATION GUIDANCE

   A. FIRE HOSE MAY BE USED WHEREVER A HOLD-DOWN BOARD CONTACTS A RIGID SURFACE OF THE LOAD PROVIDED GOUGING, SCRATCHING, CRACKING, BENDING, CRUSHING OR OTHER VISIBLE DAMAGE DOES NOT OCCUR TO THE LOAD.

   B. ONE OR MORE SEGMENTS OF FIRE HOSE MAY BE USED TO REPLACE EACH HOLD-DOWN BOARD PROVIDING LOAD PROTECTION DURING TENSIONING OF TIEDOWNS AND LOAD SHIPMENT; I.E., A HOLD-DOWN BOARD NEED NOT BE REPLACED BY A SINGLE SEGMENT OF HOSE, MULTIPLE SEGMENTS MAY BE USED INSTEAD, AS LONG AS THEY ARE SECURELY FASTENED TO THE TIEDOWN. REGARDLESS OF THE NUMBER OF SEGMENTS USED, THE HOSE LENGTH WILL BE SUCH THAT IT EXTENDS AT LEAST 6" BEYOND THE EDGE OF THE LOAD.

   C. FIRE HOSE CANNOT BE USED IN PLACE OF A PURCHASE BOARD ON A LOAD CONSISTING OF MORE THAN TWO PALLETS OR CONTAINERS ACROSS THE WIDTH OF THE TRAILER. THE FIRE HOSE CAN BE APPLIED TO THE OUTER STACKS, HOWEVER, A PURCHASE BOARD ASSEMBLY WILL STILL BE REQUIRED TO PROVIDE VERTICAL HOLD-DOWN ON THE CENTER STACK(S).

2. ACCEPTABLE FIRE HOSE

   A. FIRE HOSE TO BE USED WILL BE A RUBBER LINED SINGLE OR DOUBLE JACKETED TYPE; I.E., IT MUST HAVE A RUBBER LINING INSIDE A SINGLE OR DOUBLED FABRIC (COTTON, LINEN, ETC.) JACKET.

   B. THE COLLAPSED WIDTH OF THE HOSE MUST BE A MINIMUM OF 2-1/2".

   C. THE HOSE SEGMENTS USED MUST NOT CONTAIN DEFECTS THAT WILL ALLOW DIRECT CONTACT OF THE CHAIN OR LOAD BINDER WITH THE LOAD. THE HOSE THICKNESS MUST ALSO BE OF SUCH A THICKNESS THAT DENTING OR DAMAGE TO THE LOAD DOES NOT OCCUR DURING CHAIN OR STRAP TENSIONING.

3. SECUREMENT TO CHAINS OR STRAPS

   A. THE SEGMENTS OF HOSE USED UNDER EACH CHAIN OR STRAP WILL BE SECURED TO THE CHAIN OR STRAP WITH ONE FASTENER EVERY 12", WITH A MINIMUM OF TWO FASTENERS REQUIRED PER HOSE SEGMENT.

   B. FASTENERS CAN CONSIST OF PLASTIC ELECTRICAL TIES, WIRE, OR TAPE. REGARDLESS OF THE TYPE OF FASTENING USED, IT MUST PROVIDE A POSITIVE MEANS OF SECUREMENT OF THE HOSE TO THE CHAIN OR STRAP AND MUST NOT DAMAGE THE SURFACE OF THE CONTAINER, PALLET, OR ITEM IT CONTACTS.

## SPECIAL PROVISIONS FOR WEB STRAP TIEDOWN

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. MUST BE FASTENED TO THE TRAILER WITH A MINIMUM OF TWO BOLTS.

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.