

APPROVED BY
 MECH DIV AAR, THEIR LETTER
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 SIGNED Charles S. Ellis
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 MTMCTEA, FT EUSTIS, VA.

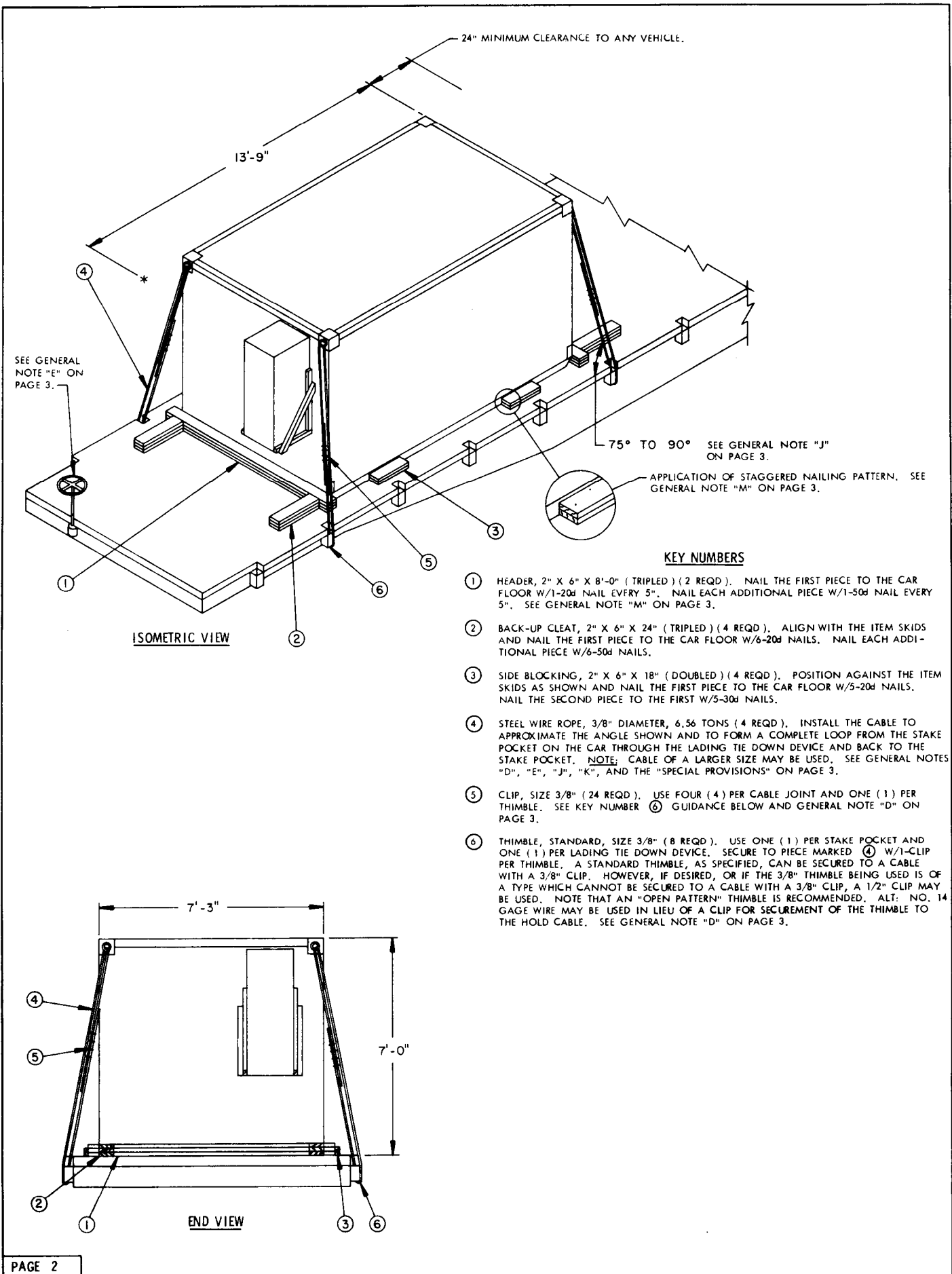
TOW

LOADING AND BRACING ON FLAT CAR OF IMPROVED CONTACT SUPPORT SET

THIS OUTLOADING PROCEDURAL DRAWING INCLUDES PROCEDURES FOR GENERAL SERVICE FLAT CARS (FM) AND FOR CUSHIONED FLAT CARS (FMS) EQUIPPED WITH SPECIAL CHAIN TIE-DOWN DEVICES OF VARIOUS DESIGN AND MANUFACTURE.

DO NOT SCALE

REVISIONS				DESIGNER	PROJ ENG	APPROV
				DS	RSK/WRF	LC-107
				DSM	W. G. G. G.	
APPROVED, U.S. ARMY SIGNAL COMMAND						
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SPECIAL PROVISIONS:

THE UNCRATED SHELTER MAY BE SECURED ON A CUSHIONED FMS TYPE FLAT CAR WITH CHAIN TIEDOWN ASSEMBLIES IN LIEU OF USING THE DEPICTED GENERAL SERVICE FM TYPE CAR AND THE SPECIFIED TIEDOWN MATERIALS, PROVIDING THE FOLLOWING CONDITIONS ARE MET:

1. THE CAR MUST HAVE A NAILABLE FLOOR AREA AT LEAST 8'-2" WIDE BETWEEN THE OUTER CHANNELS FOR THE SECUREMENT OF PIECES MARKED ① THRU ③ ON PAGE 2.
2. ONE (1) MOVABLE ANCHOR WITH CHAIN ASSEMBLY TIE DOWN DEVICE MUST BE SUBSTITUTED FOR EACH WIRE ROPE CABLE TIE DOWN MARKED ④ ON PAGE 2. CHAINS WILL BE ATTACHED TO THE LADING AT THE SAME LOCATIONS SHOWN FOR THE WIRE ROPE. NOTE THAT IF THE LADING TIE DOWN DEVICE IS NOT LARGE ENOUGH TO PERMIT PASSAGE OF THE HOOK ON THE CHAIN ASSEMBLY, A 5/8" (OR LARGER) SHACKLE MAY BE USED FOR ATTACHMENT OF THE CHAIN. ANCHOR DEVICES WILL BE LOCATED SO AS TO POSITION THE CHAINS WITHIN THE ANGULAR TOLERANCES SPECIFIED ON THE LOAD VIEW.
3. BEFORE AND DURING INSTALLATION, THE ANCHOR DEVICES SHALL BE INSPECTED FOR BENT HOOKS, STRETCH, GOUGES, BENT LINKS, AND WEAR IN THE CHAINS, AND FOR DAMAGED LOAD BINDERS OR WINCHES, OR ANY OTHER NOTICEABLE DEFECTS. ANY DEFICIENCY SHALL BE CAUSE FOR NOT USING AN ANCHOR AND CHAIN ASSEMBLY.
4. CHAINS MUST NOT BE TWISTED DURING INSTALLATION. CHAINS ARE TO BE STRUCK WITH A HAMMER OR BAR AFTER TIGHTENING TO ELIMINATE ANY POSSIBLE MISALIGNMENT OF LINKS. FURTHER TIGHTENING MAY BE REQUIRED TO TAKE UP ANY SLACK THAT DEVELOPS DUE TO LINK ALIGNMENT.
5. TURNBUCKLES OR OTHER TENSIONING DEVICES NOT EQUIPPED WITH SELF-LOCKING DEVICES MUST BE WIRED OR PINNED TO PREVENT THEM FROM TURNING OR LOOSENING DURING TRANSIT.
6. OPEN HOOKS MUST BE SECURED WITH A WIRE AS REQUIRED TO PREVENT THE HOOK FROM BECOMING DISENGAGED FROM THE CHAIN LINK TO WHICH IT IS ATTACHED.
7. ANTI-CHAFING MATERIAL MUST BE PLACED AND SECURED BETWEEN THE CHAINS AND THE LADING AT ALL POINTS OF CONTACT EXCEPT AT DEFINITIVE TIE-DOWN POINTS.

(GENERAL NOTES CONTINUED)

- O. IF THE LADING ITEM IS TO BE LOADED ONTO OR OFF OF THE TRANSPORTING VEHICLE BY OVERHEAD SLINGING, CARE MUST BE EXERCISED SO THAT THE ITEM IS NOT DAMAGED DURING THE HANDLING OPERATION BY THE USE OF IMPROPER EQUIPMENT. ONE RECOMMENDED PROCEDURE IS DELINEATED IN THE "SLINGING PROVISIONS" DETAIL ON PAGE 6. TO PREVENT DAMAGE TO THE BOTTOM OF THE SUPPORT SET, DO NOT LIFT THE UNCRATED SUPPORT SET WITH A FORKLIFT TRUCK. HOWEVER, THE CRATED SUPPORT SET MAY BE LIFTED WITH A FORKLIFT TRUCK WITH ADEQUATE CAPACITY.

(GENERAL NOTES CONTINUED)

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 6"	84	84
NAILS	NO. REQD	POUNDS
20d (4")	80	2-3/4
30d (4-1/2")	20	1
50d (5-1/2")	120	9-1/4
ROPE, STEEL WIRE, 3/8" DIA	80' REQD	20 LBS
CLIP, 3/8"	24 REQD	8 LBS
THIMBLE, STANDARD, 3/8"	8 REQD	2 LBS
CLIP, 1/2" (ALT FOR 3/8", 8 REQD)		4 LBS

MATERIAL SPECIFICATIONS

- LUMBER** ----- : DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN AND FREE OF MATERIAL DEFECTS. REF: FED SPEC MM-L-751.
- NAILS** ----- : COMMON, REF: FED SPEC FF-N-105.
- ROPE** ----- : STEEL WIRE, PLAIN, PREFORMED, REGULAR LAY, 6.56 TONS, 6 X 19, FLEXIBLE IWRC MACWHYTE WIRE ROPE CO (OR EQUAL). REF: FED SPEC RR-W-410.
- CLIPS** ----- : "U" BOLT, CROSBY, HEAVY DUTY (OR EQUAL). REF: FED SPEC FF-C-450, TYPE I, CLASS 1.
- STRAPPING, STEEL** ----- : CLASS 1, TYPE I, HEAVY DUTY, FINISH A,B (GRADE 2) OR C. FED SPEC QQ-5-781.
- STRAP SEAL** ----- : TYPE D, STYLE I, II OR IV, CLASS H. REF: FED SPEC QQ-5-781.
- STRAP STAPLE; STAKE POCKET PROTECTOR** ----- : COMMERCIAL GRADE.
- THIMBLE** ----- : TYPE II, FED SPEC FF-T-276.

GENERAL NOTES

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1.
- B. THE LOADS AS SHOWN ARE BASED ON FLAT CARS 9'-6" WIDE (PLATFORM). CARS 9'-0" WIDE OR WIDER CAN BE USED. ONLY ONE UNIT OF LADING IS SHOWN IN EACH LOAD VIEW; HOWEVER, MULTIPLES OF UNITS, AS SHOWN OR DISSIMILAR IN NATURE, MAY BE LOADED ON A CAR. THE NUMBER OF UNITS TO BE LOADED ON A CAR WILL BE DEPENDENT ON THE SIZE OF THE CAR USED OR THE QUANTITIES OF UNITS TO BE SHIPPED, WITH THE VIEW OF FULL UTILIZATION OF CARRIER EQUIPMENT.

NOTICE TO TRANSPORTATION OFFICER:

WHEN SHIPPING UNCRATED SHELTER, IN LIEU OF REQUISITIONING A GENERAL SERVICE FM* FLAT CAR AS DEPICTED HEREIN, EVERY EFFORT SHOULD BE MADE TO ACQUIRE AN FMS* TYPE CAR. THIS IS A CUSHIONED CAR EQUIPPED WITH SPECIAL TIEDOWN CHANNELS AND MOVABLE ANCHOR AND CHAIN ASSEMBLY TIEDOWN DEVICES**, SUCH AS IS USED FOR TRANSPORTING AGRICULTURAL MACHINERY AND HEAVY, EARTH MOVING EQUIPMENT. SEE THE "SPECIAL PROVISIONS" AT LEFT FOR GUIDANCE.

* ASSOCIATION OF AMERICAN RAILROADS (AAR) MECHANICAL DESIGNATION FOR CAR TYPE. REFERENCE IS MADE TO THE "OFFICIAL RAILWAY EQUIPMENT REGISTER".

** A TYPICAL CAR OF THIS TYPE IS SHOWN BY FIGURE 88-B OF SECTION 6 IN PUBLICATION OF AAR TITLED: "GENERAL RULES GOVERNING THE LOADING OF COMMODITIES ON OPEN TOP CARS". CHAINS MUST PROOF TEST AT LEAST 18,000 POUNDS.

C. LADING DATA:

SUPPORT SET (UNCRATED)
DIMENSIONS ---- 13'-9" LONG BY 7'-3" WIDE BY 7'-0" HIGH.
GROSS WEIGHT -- 3,920 POUNDS (APPROX).

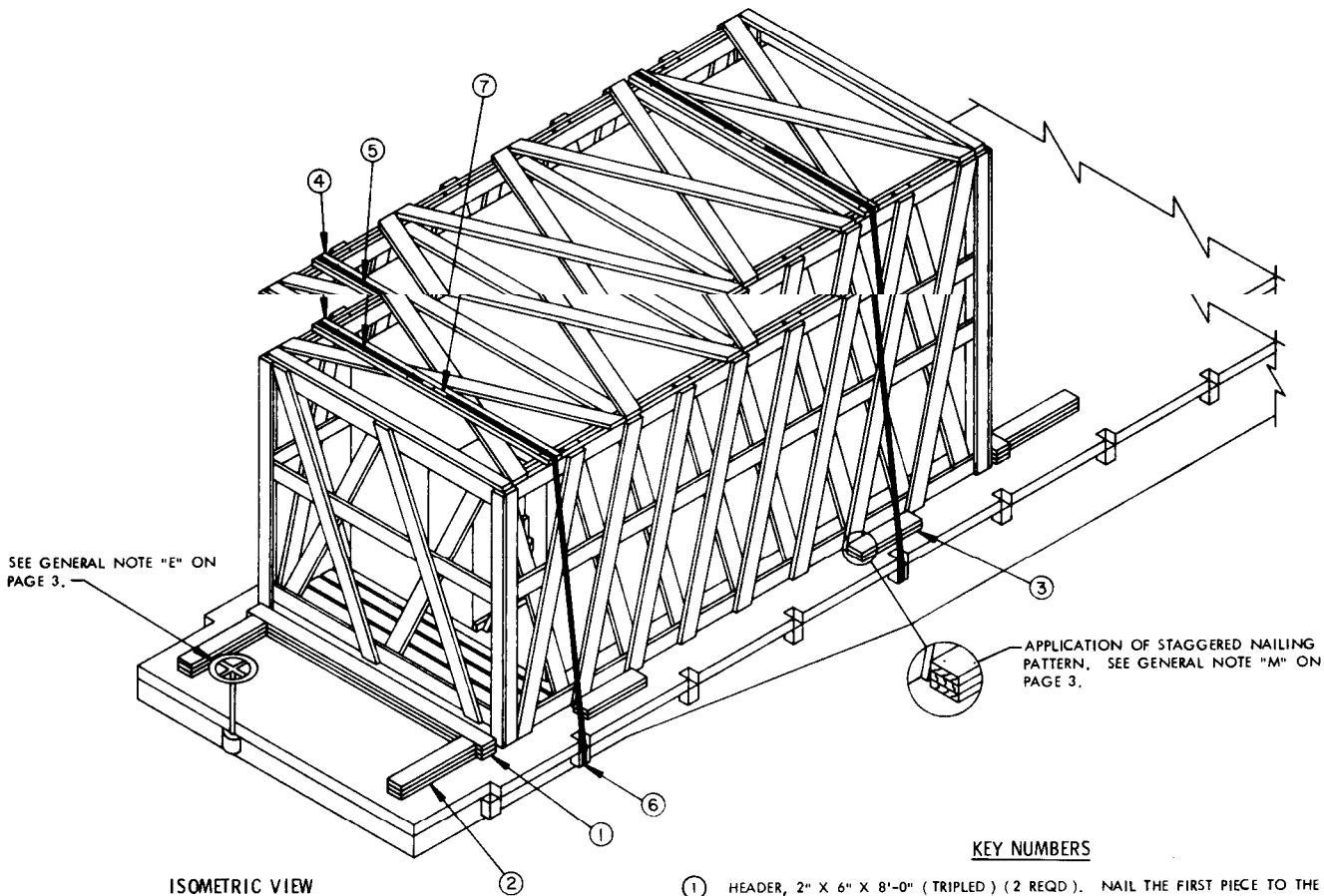
SUPPORT SET (CRATED)
DIMENSIONS ---- 15'-0" LONG BY 8'-0" WIDE BY 7'-8" HIGH.
GROSS WEIGHT -- 5,945 POUNDS (APPROX).

- D. REFER TO ORD DWG 19-48-C-ORDJU-588, "WIRE ROPE AND ANNEALED WIRE APPLICATION METHODS FOR SECURING LADING ON RAIL & MOTOR CARRIER EQUIP", FOR PROPER TIEDOWN APPLICATION, EXCEPT THAT THE NUTS ON 3/8" CLIPS WILL BE TIGHTENED TO A TORQUE OF 35 TO 40 FOOT POUNDS.
- E. REFER TO ASSOCIATION OF AMERICAN RAILROADS MANUAL, "GENERAL RULES GOVERNING THE LOADING OF COMMODITIES ON OPEN TOP CARS AND TRAILERS, FOR APPLICABLE LOADING RULES. PREFACE, 1-A, 2, 3, 4, 5, 9, 14, AND 15.
- F. ONLY CARS WITH "SOUND" FLOORS WILL BE USED. CARS WITH STEEL FLOOR ENDS AND/OR EXPOSED STEEL BOLSTERS WHICH INTERFERE WITH PROPER POSITIONING OR NAILING OF THE DUNNAGE WILL NOT BE USED. SEE THE "TYPICAL END BLOCKING FOR CARS WITH EXPOSED STEEL BOLSTERS" DETAIL ON PAGE 5 FOR APPLICATION OF DUNNAGE METHODS WHICH PERMIT THE USE OF SOME CARS THAT HAVE EXPOSED STEEL COMPONENTS.
- G. WHEN ANY STRAP IS SEALED AT AN END-OVER-END LAP JOINT, OR AS SHOWN IN DETAILS "A" AND "B" ON PAGE 5, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED.
- H. CAUTION: STAKE POCKETS WILL BE USED FOR ANCHORING THE STRAPPING WHENEVER POSSIBLE. DO NOT USE SWIVEL RING TYPE ANCHOR DEVICES. IF OTHER TYPES ARE USED, THEY MUST BE OF SUFFICIENT WIDTH TO RECEIVE 2" STRAPPING, AND ALSO BE OF A DESIGN WHICH WILL PROVIDE A BEARING SURFACE ACROSS THE FULL WIDTH OF THE STRAPPING SO IT WILL NOT DEFORM A STRAP, ESPECIALLY AT THE EDGES, WHEN IT IS TENSIONED.
- J. CAUTION: IT IS RECOMMENDED THAT STEEL WIRE ROPE BE INSTALLED TO APPROXIMATE THE ANGLE SHOWN; HOWEVER, IF PLACEMENT OF THE CAR STAKE POCKETS PREVENT THIS, CARE MUST BE EXERCISED TO INSURE THAT CABLES ON THE SAME SIDE OF THE LADING ARE INSTALLED SO THEIR RETENTION FORCES ACT IN OPPOSITE LONGITUDINAL DIRECTIONS. CONTACT OF CABLE WITH THE EDGE OF THE LADING IS PROHIBITED.
- K. TO ACHIEVE PROPER CABLE TENSION, EMPLOY TWO (2) CABLE "GRIPPERS" AND AN APPLICABLY SIZED "COME-A-LONG" TYPE MECHANICAL HOIST.
- L. DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE. FOR EXAMPLE, 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE.
- M. NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEN DUNNAGE IS NAILED TO THE FLOOR OF THE TRANSPORTING VEHICLE, OR WHEN LAMINATING DUNNAGE. 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.
- N. 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 25.4 MM, AND ONE POUND EQUALS 0.454 KG.
(CONTINUED AT LEFT)

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
IMPROVED CONTACT		
SUPPORT SET (UNCRATED)	1	3,920 LBS
DUNNAGE		211 LBS

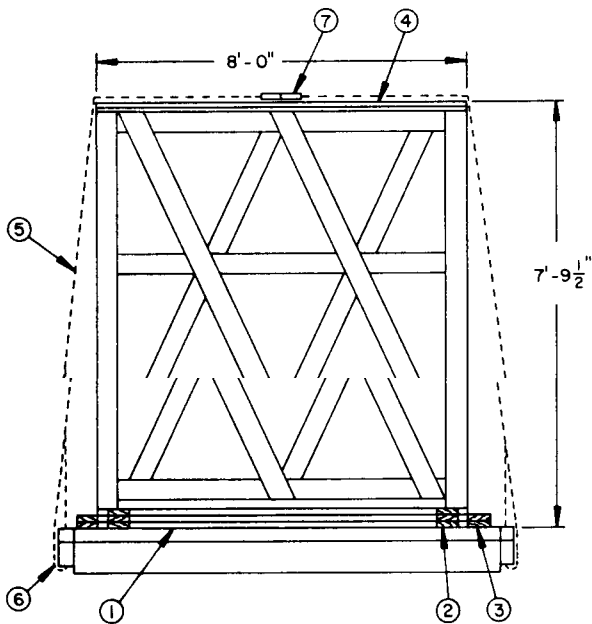
TOTAL WEIGHT ----- 4,131 LBS



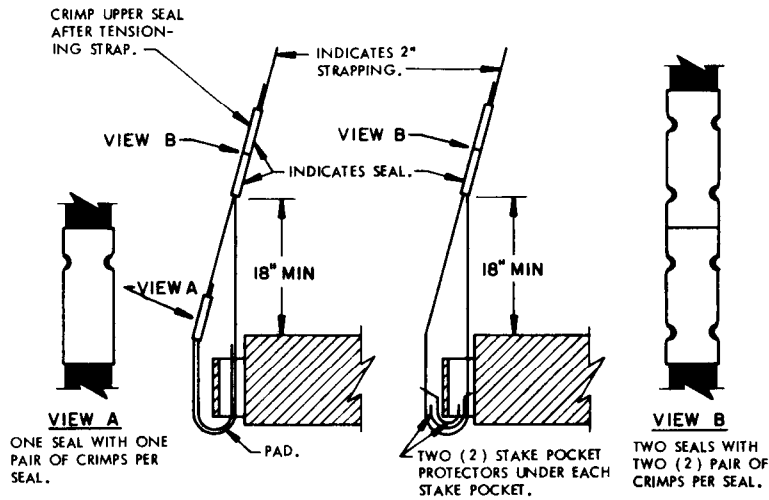
ISOMETRIC VIEW

KEY NUMBERS

- ① HEADER, 2" X 6" X 8'-0" (TRIPLED) (2 REQD). NAIL THE FIRST PIECE TO THE CAR FLOOR W/1-20d NAIL EVERY 5". NAIL EACH ADDITIONAL PIECE W/1-50d NAIL EVERY 5". SEE GENERAL NOTE "M" ON PAGE 3.
- ② BACK-UP CLEAT, 2" X 6" X 30" (TRIPLED) (4 REQD). ALIGN WITH THE CRATE SKIDS AND NAIL THE FIRST PIECE TO THE CAR FLOOR W/8-20d NAILS. NAIL EACH ADDITIONAL PIECE W/8-50d NAILS.
- ② BACK-UP CLEAT, 2" X 6" X 30" (TRIPLED) (4 REQD). ALIGN WITH THE CRATE SKIDS AND NAIL THE FIRST PIECE TO THE CAR FLOOR W/8-20d NAILS. NAIL EACH ADDITIONAL PIECE W/8-50d NAILS.
- ③ SIDE BLOCKING, 2" X 6" X 24" (DOUBLED) (4 REQD). NAIL THE FIRST PIECE TO THE CAR FLOOR W/6-20d NAILS. NAIL THE SECOND PIECE TO THE FIRST W/6-30d NAILS.
- ④ STRAPPING BOARD, 2" X 6" X 8'-0" (2 REQD).
- ⑤ HOLD-DOWN STRAP, 2" X .050" X 36'-0" LONG STEEL STRAPPING (2 REQD). INSTALL EACH STRAP FROM TWO (2) 18'-0" LONG PIECES. STAPLE TO THE STRAPPING BOARD, PIECE MARKED ④, W/4-STAPLES. SEE GENERAL NOTE "G" ON PAGE 3.
- ⑥ PAD, 2" X .050" X 24" LONG STEEL STRAPPING (4 REQD). POSITION UNDER STAKE POCKET AND SEAL TO A PIECE MARKED ⑤. SEE "DETAIL A" ON PAGE 5. ALT: STAKE POCKET PROTECTOR (8 REQD). USE TWO (2) UNDER EACH STAKE POCKET WITH A PIECE MARKED ⑤. SEE "DETAIL B" ON PAGE 5.
- ⑦ SEAL FOR 2" STRAPPING (16 REQD, 8 PER STRAP). SEE GENERAL NOTE "G" ON PAGE 3.



END VIEW



DETAIL A
METHOD OF INSTALLING 2" STRAPPING AND PAD AT STAKE POCKET.

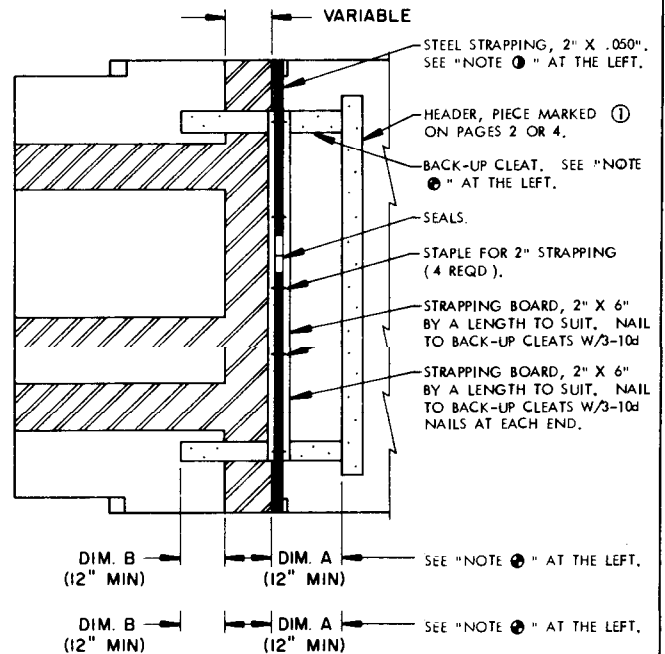
DETAIL B
METHOD OF INSTALLING 2" STRAPPING AND STAKE POCKET PROTECTORS (ALT PAD).

NOTE 1:
WHEN LOADING CARS WHICH HAVE EXPOSED STEEL BOLSTERS, DIMENSION "B" MUST BE AT LEAST 12", AND THE TOTAL OF DIMENSIONS "A" AND "B" MUST BE EQUAL TO OR GREATER THAN THE LENGTH OF A BACK-UP CLEAT (PIECE MARKED ② ON PAGES 2 AND 4) TO PROVIDE FOR PROPER NAILING TO THE CAR FLOOR. SEE PIECE MARKED ② ON PAGE 2 OR 4 FOR DIMENSIONS. "A" AND "B" MUST BE EQUAL TO OR GREATER THAN THE LENGTH OF A BACK-UP CLEAT (PIECE MARKED ② ON PAGES 2 AND 4) TO PROVIDE FOR PROPER NAILING TO THE CAR FLOOR. SEE PIECE MARKED ② ON PAGE 2 OR 4 FOR PROPER NAILING.

NOTE 2:
PROPER NAILING.

NOTE 3:
THE STRAP HOLD DOWN FOR END BLOCKING AS SHOWN AT THE RIGHT IS OPTIONAL; IT MAY BE USED FOR CARS WITH EXPOSED STEEL BOLSTERS AS SHOWN, OR IT MAY BE USED FOR CARS WHICH DO NOT HAVE EXPOSED STEEL BOLSTERS.

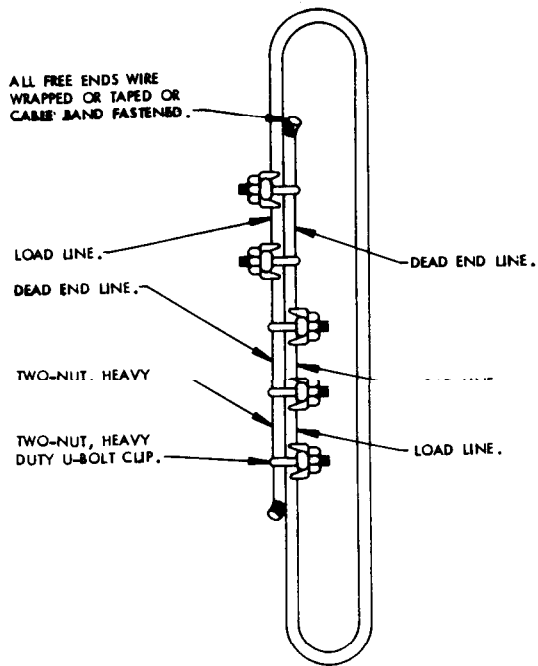
BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 6"	110	110
NAILS	NO. REQD	POUNDS
20d (4")	92	3-1/4
30d (4-1/2")	24	1-1/2
50d (5-1/2")	136	10-1/2
20d (4")	92	3-1/4
30d (4-1/2")	24	1-1/2
50d (5-1/2")	136	10-1/2
STEEL STRAPPING, 2" X .050"	80' REQD	26-1/2 LBS
SEAL FOR 2" STRAPPING	16 REQD	4 LBS
STAPLE FOR 2" STRAPPING	8 REQD	NIL



TYPICAL END BLOCKING FOR CARS WITH EXPOSED STEEL BOLSTERS (TOP VIEW)

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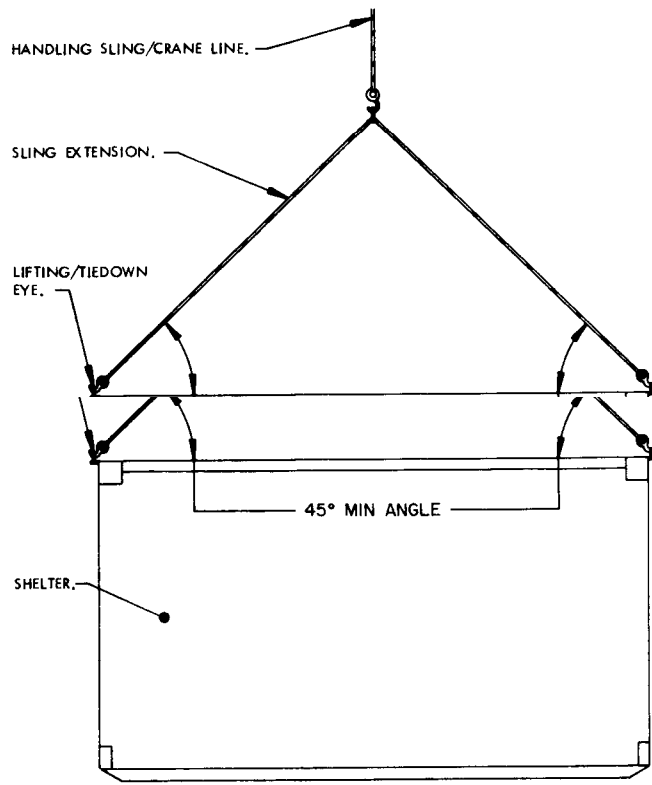
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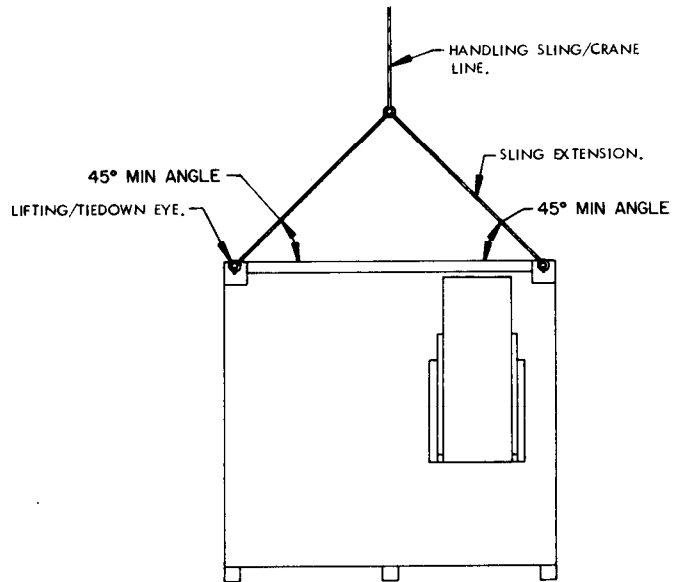
CABLE JOINT

PROPER TIGHTENING OF THE WIRE ROPE CLIP NUTS CAN BE ACCOMPLISHED BY UTILIZING A PROPER SIZED TORQUE WRENCH. AFTER THE NUTS HAVE BEEN INITIALLY TIGHTENED, THE "U" SIDE OF EACH CLIP MUST BE STRUCK SEVERAL TIMES WITH A HAMMER TO INSURE PROPER SEATING INTO THE DEAD END LINE. FINAL TORQUE WILL BE ACQUIRED BY REPEATEDLY AND ALTERNATELY TIGHTENING EACH CLIP NUT. SEE GENERAL NOTE "D" ON PAGE 3.

GENERAL NOTE "D" ON PAGE 3.



SIDE ELEVATION VIEW



END VIEW

END VIEW

SLINGING PROVISIONS

SEE GENERAL NOTE "O" ON PAGE 3.