MLRS

LOADING AND BRACING ON LOW-BOY
TRAILER OF THE MULTIPLE LAUNCH
ROCKET SYSTEM ARMORED VEHICLE
MULTIPLE ROCKET LAUNCHER

CAUTION:

LOAD AS SHOWN MAY REDUIRE CLEARANCE CONSIDERATION DUE TO EXCESSIVE LADING SIZE.

TRAILERS HAVING A MINIMUM WIDTH OF 10'-0" WITH OR WITHOUT LOAD-PLATFORMS SIDE EXTENSIONS, SHOULD BE USED.

U.S. ARMY	MATE	RI	EL COMMAND		RAWI	NG	
APPROVED, U.S. ARMY AVIATION AND MISSILE COMMAND	ENGINEER	BASIC			00	NOT SC	ALE
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APPROVED BY ORDER OF COMMANDING GENERAL,	TRANSPORTATION ENGINEERING DIVISION		REVISION NO. 2 White Revision Lister Revision		REVISION NO. 2 MAY 1997		MAY 1997
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GENERAL NOTES

- THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1.
- THE LOAD AS SHOWN IS BASED ON A "LOW-BOY" TRAILER 10'-O" WIDE WITH A WOOD OR A WOOD AND METAL FLOOR. TRAILERS WITH ALL METAL FLOORS WILL NOT BE USED. ONLY ONE ARMORED VEHICLE MULTIPLE ROCKET LAUNCHER CAN BE LOADED ON THE TRAILER. HOWEVER, OTHER ITEMS DISSIMILAR IN NATURE, MAY BE LOADED ON THE TRAILER, WITH THE VIEW OF FULL UTILIZATION OF CARRIER EQUIPMENT.
- ONLY TRAILERS CAPABLE OF SAFELY TRANSPORTING THE LADING TO DESTINATION WITHOUT DAMAGE WILL BE SELECTED. TRAILERS SELECTED MUST HAVE "SOUND" FLOORS WHICH PROVIDE NAIL RETENTION PROPERTIES EQUAL TO OR BETTER THAN THE SPECIFIED DUNNAGE LUMBER, AND A SUFFICIENT NUMBER OF TIEDOWN FACILITIES OF A STRENGTH EQUAL TO OR BETTER THAN SPECIFIED LADING TIEDOWN ASSEMBLIES.
- SHIPMENT GROSS WEIGHT, AXLE DISTRIBUTION OF THE LADING WEIGHT AND OVERALL DIMENSIONS MUST MEET STATE LAW REQUIREMENTS.
- E. LADING DATA:

DIMENSIONS - - 23'-9-1/4" LONG BY 9'-9" WIDE BY 8'-6" HIGH.

GROSS WEIGHT - 43,002 POUNDS (APPROX).

- REFER TO THE MILITARY TRAFFIC MANAGEMENT COMMAND. REFER TO THE MILITARY TRAFFIC MANAGEMENT COMMAND, TRANSPORTATION ENGINEERING AGENCY PUBLICATION, TIEDOWN HANDBOOK FOR TRUCK MOVEMENTS" FOR PROPER TIEDOWN APPLICATION. NOTE: IF A TORQUE WRENCH IS NOT AVAILABLE FOR TIGHTENING CLIP NUTS, THE PROPER TORQUE FOR CLIP NUTS CAN BE ACHIEVED BY USING BOX AND/OR OPEN-END OR SOCKET WRENCHES THAT HAVE 12" LONG HANDLES. CAUTION: DURING WIF ROPE INSTALLATION, AVOID CONTACT WITH ALL ELECTRICAL WIRING, VEHICLE CONTROLS AND OTHER APPURTENANCES. METAL FILLERS OR COMPARABLE CUSHIONING MATERIAL MUST BE USED BETWEEN TIEDOWN CABLES AND ALL SHARP EDGES
- SEE THE "SPECIAL PROVISIONS FOR CHAIN TIEDDWN" ON PAGE 3 FOR SPECIFICATIONS WHICH MUST BE APPLIED IF CHAINS AND LOAD BINDERS ARE TO BE USED.
- CABLES WILL BE TENSIONED SUFFICIENTLY TO CAUSE SLIGHT VEHICLE BODY DEPRESSION. TENSIONING CAN BE ACCOMPLISHED BY EMPLOYING TWO CABLE GRIPPERS AND AN APPLICABLY SIZED COME-A-LONG TYPE MECHANICAL HOIST.
- CAUTION: IT IS RECOMMENDED THAT STEEL WIRE ROPE TIEDOWNS BE INSTALLED TO APPROXIMATE THE ANGLE SHOWN; HOWEVER, IF PLACEMENT OF TRANSPORTER TIEDOWN FACILITIES PREVENTS THIS, CARE MUST BE EXERCISED TO ENSURE THAT TIEDOWNS ON THE SAME SIDE OF THE LADING ARE INSTALLED SO THEIR RETENTION FORCES ACT IN OPPOSITE LONGITUDINAL DIRECTIONS.

(CONTINUED AT RIGHT)

(GENERAL NOTES CONTINUED)

- NOTICE: A STAGGERED NAILING PATTERN WILL BE USED WHEREVER POSSIBLE WHEN NAILS ARE DRIVEN INTO 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 THE FLOOR BOARDS. ADDITIONALLY THE NAILING PATTERN FOR AN UPPER PARTY OF THE PROPERTY OF THE PARTY OF THE PART 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.
- DUNNAGE LUMBER SPECIFIED THROUGHOUT THIS PROCEDURAL DRAWING IS OF NOMINAL SIZE UNLESS OTHERWISE DIMENSIONED. FOR EXAMPLE, 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK BY 5-1/2" WIDE AND 2" X 8" MATERIAL IS ACTUALLY 1-1/2" THICK BY 7-1/4" WIDE.
- 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 0.454KG.
- IF THE LADING ITEM IS TO BE LOADED ONTO OR OFF OF THE TRANSPORTING TRAILER BY OVERHEAD SLINGING, CARE MUST BE EXERCISED SO THAT THE ITEM IS NOT DAMAGED DURING THE HANDLING OPERATION BY THE USE OF IMPROPER EQUIPMENT. ON RECOMMENDED PROCEDURE IS DELINEATED IN THE "PREFERRED SLINGING PROVISION" DETAIL ON PAGE 7.
- NOTICE: WHEN USING EITHER CHAIN TIEDOWN OR STEEL WIRE ROPE, IT MAY BE NECESSARY TO ATTACH SHACKLES TO THE TIEDOWN FITTINGS ON THE VEHICLE. SHACKLES SHOULD BE SIZE 7/8" OR LARGER. SEE THE "MATERIAL SPECIFICATIONS" ON THIS PAGE. MORE DISTANCE MAY BE REQUIRED BETWEEN THE DRILLED PADS AT THE OPEN END OF A SHACKLE SO THAT IT WILL FIT PROPERLY OVER THE THICKNESS OF THE TIEDOWN FITTINGS ON THE VEHICLE. TO PROVIDE THE NEEDED CLEARANCE, EQUAL AMOUNTS OF MATERIAL MAY BE REMOVED FROM THE SHACKLE PADS BY GRINDING OR MACHINING.

MATERIAL SPECIFICATIONS

FED SPEC MM-L-751; DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN LUMBER - - - - - - : AND FREE FROM MATERIAL DEFECTS. ----: FED SPEC FF-N-105: COMMON NAILS ASTM A853; ANNEALED AT FINISH, BLACK OXIDE FINISH, .0800" DIA, GRADE 1006 WIRE, CARBON STEEL -: OR BETTER. FED SPEC RR-W-410; IMPROVED PLOW STEEL WIRE, PREFORMED, REGULAR LAY, 6 X 19, FLEXIBLE IWRC, MACWHYTE WIRE ROPE CO. (OR EQUAL).

FED SPEC FF-C-450; TYPE I, CLASS I, "U" BOLT, CROSBY, HEAVY DUTY (OR CLIP - - - - - - - :

EQUAL).

THIMBLE - - - - - : FED SPEC FF-T-276; TYPE II.

SHACKLE - - - - - : FED SPEC RR-C-271; TYPE IV, CLASS 4.

NATIONAL ASSOCIATION OF CHAIN MANUFACTURER'S WELDED CHAIN SPECIFICATION ADOPTED NOVEMBER 1975.

LOAD BINDER - - - -: FED SPEC GGG-B-325.

REVISIONS

REVISION NO. 1, DATED DECEMBER 1988, CONSISTS OF:

- CHANGING FROM A U.S. ARMY DARCOM DRAWING TO A U.S. AMC DRAWING
- 2. CHANGING THE SPECIAL PROVISIONS FOR CHAIN TIE DOWN.
- REMOVING CABLE TIEDOWNS FROM THE LADING LIFTING POINT AT FRONT OF VEHICLE, AND INCREASING CABLE SIZE TO $5/8^{\circ}$.
- CHANGING NOMENCLATURE OF ITEM.
- ADDING BASIC ISSUE ITEM (BII) BOX ON FRONT OF ARMORED VEHICLE, AND CHANGING LENGTH AND WEIGHT.

REVISION NO. 2, DATED MAY 1997, CONSISTS OF:

- PROVIDING THE OPTION OF OMITTING THE SIDE BLOCKING AND LATERAL BRACING, PIECES MARKED (1) AND (2)
- 2. CHANGING DATE OF DRAWING TO THE ORIGINAL DRAWING DATE.

PAGE 2

(SPECIAL PROVISIONS CONTINUED)

- 10. LOAD BINDER SIZE SHALL BE COMPATIBLE WITH THE SIZE OF THE CHAIN BEING USED AND SHALL HAVE A MINIMUM BREAKING STRENGTH OF 16,200 POUNDS (WORKING LOAD LIMIT OF 5,400 POUNDS). OVER-CENTER TYPE LOAD BINDERS SHALL BE SAFETY WIRED TO PREVENT ACCIDENTAL OPENING DURING TRANSPORT.
- 11. 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.
- 12. THE TRANSPORTING VEHICLE OPERATOR SHOULD BE INSTRUCTED TO PERIODICALLY INSPECT THE TIEDOWN CHAINS AND LOAD BINDERS DURING TRANSIT AND RE-TIGHTEN, IF NECESSARY, TO ENSURE LOAD INTEGRITY.

CHART 1						
APPROVED CHAIN FOR EQUIPMENT TIE DOWN						
CHAIN TYPE	GRADE	SIZE	BREAKING STRENGTH	COMMON MARKINGS		
HIGH TEST HIGH TEST HIGH TEST BINDING BINDING BINDING ALLOY STEEL ALLOY STEEL ALLOY STEEL ALLOY STEEL	43 43 43 70 70 70 80 80 80 80 80	1/4" 5/16" 3/8" 1/4" 5/16" 3/8" 7/32" 9/32" 5/16" 3/8"	7,750 LBS 11,600 LBS 16,200 LBS 12,600 LBS 18,800 LBS 26,400 LBS 8,700 LBS 14,400 LBS 17,800 LBS 25,600 LBS	H:4:43:430: OR HT H:4:43:430: OR HT H:4:43:430: OR HT 7:70: OR 700 7:70: OR 700 7:70: OR 700 8:80: OR 800 8:80: OR 800 8:80: OR 800 8:80: OR 800 8:80: OR 800		

CHART 2						
CHAIN QUANTITIES FOR EQUIPMENT TIE DOWN						
CHAIN TYPE	GRADE	SIZE	EACH SIDE	NTITY TOTAL		
HIGH TEST HIGH TEST HIGH TEST BINDING BINDING BINDING ALLOY STEEL ALLOY STEEL ALLOY STEEL ALLOY STEEL	43 43 43 70 70 70 80 80 80 80	1/4" 5/16" 3/8" 1/4" 5/16" 3/8" 7/32" 9/32" 5/16" 3/8"	6 4 4 4 2 6 4 4 2	12 8 8 8 8 4 12 8 8		

NOTE: A CHAIN IS NORMALLY MARKED WITH ONLY ONE TYPE OF STRENGTH MARKING; I.E., A CHAIN MAY BE MARKED 70 OR MAY BE MARKED 70 OR MAY BE MARKED 700. THE CHAIN NEED NOT AND MOST LIKELY WILL NOT HAVE A COMBINATION OF STRENGTH MARKINGS.

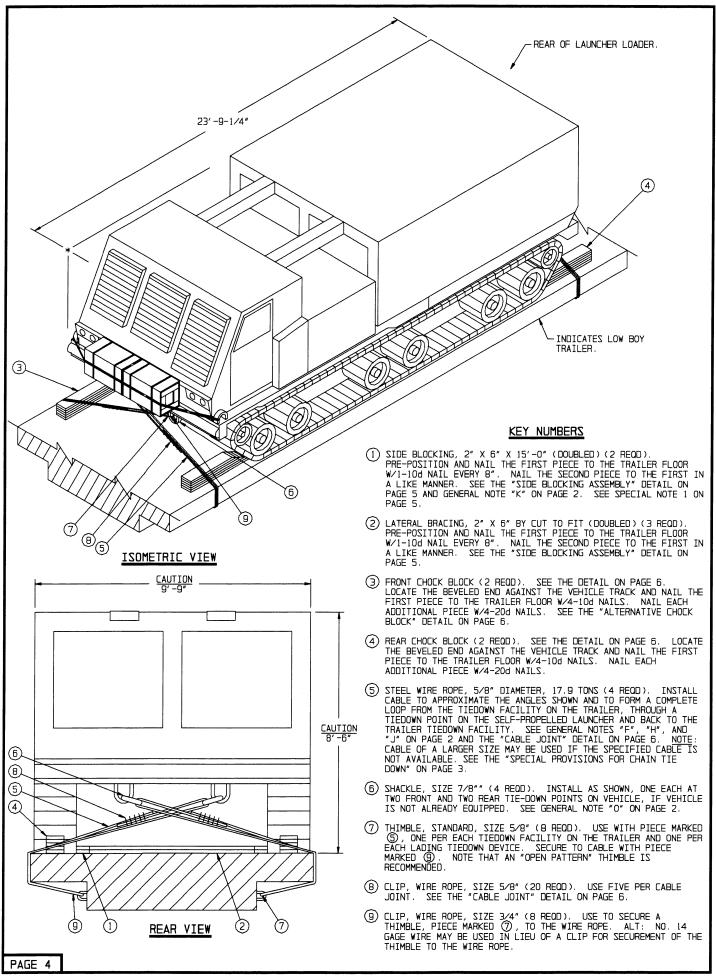
SPECIAL PROVISIONS FOR CHAIN TIE DOWN

LADING MAY BE SECURED TO THE "LOW-BDY" TRAILER BY CARRIED-OWNED CHAINS AND LOAD BINDERS IN LIEU OF THE SPECIFIED WIRE ROPE CABLE TIE DOWNS, PROVIDING THE FOLLOWING CONDITIONS ARE MET:

- 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.
- SIDE BLOCKING AND LATERAL BRACING, PIECES MARKED ① AND ②
 IN THE LOAD ON PAGE 4, WILL BE USED FOR LATERAL RESTRAINT, UNLESS RELEIVED BY SPECIAL NOTE 1 ON PAGE 5.
- 3. 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 IDENTIFYING MARKING IS NOT MANDATORY. SEE "CHART 1" FOR COMMON CHAIN GRADE MARKINGS
- 4. 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: CARE MUST BE EXERCISED WHEN TENSIONING CHAINS TO PREVENT DAMAGE OR PERMANENT DEFORMATION TO THE LADING OR TIFOOWN PROVISIONS.
- 5. ANTI-CHAFING MATERIAL MUST BE PLACED AND SECURED BETWEEN CHAINS AND LADING AT ALL POINTS OF CONTACT, EXCEPT AT DEFINITIVE TIE-DOWN POINTS.
- 6. CHAIN SIZES, GRADES, AND QUANTITIES APPROVED FOR USE IN LIEU OF WIRE ROPE CABLE ARE CONTAINED WITHIN "CHART 2".
- 7. WHENEVER POSSIBLE, CHAINS SHALL BE INSTALLED USING THE SAME TIEDOWN FACILITY ON THE LADING AS SHOWN FOR THE WIRE ROPE CABLES. IF 4 OR 6 CHAINS ARE REQUIRED ON EACH SIDE, SOME CHAINS SHOULD BE CROSSED AS SHOWN FOR THE CABLE IN THE LOAD ON PAGE 4 AND SOME SHOULD BE INSTALLED VERTICALLY. HOWEVER, IF ONLY 2 CHAINS ARE REQUIRED ON EACH SIDE, IN LIEU OF CROSSING THE CHAINS AS IS SHOWN FOR THE CABLE, CHAINS SHOULD BE ATTACHED TO A TIEDOWN FACILITY ON THE SAME SIDE OF THE TRAILER AS IS USED FOR ATTACHMENT TO THE LADING. CHAINS AND LOAD BINDERS SHOULD BE POSITIONED VERTICALLY SO THAT THEY APPEAR AS NEAR PERPENDICULAR AS POSSIBLE TO THE TRAILER BED WHEN VIEWED FROM THE SIDE OF THE TRAILER BED WHEN VIEWED FROM THE SIDE OF
- B. CHAIN AND FITTINGS OF A HIGHER GRADE (SAME SIZES) OR A LARGER SIZE (SAME GRADE) AS CONTAINED IN THE CHARTS ON THIS PAGE MAY BE SUBSTITUTED FOR THOSE SPECIFIED IN THE CHARTS.
- 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 MARKINGS. 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.

(CONTINUED AT LEFT)



SPECIAL NOTE:

1. THE SIDE BLOCKING AND LATERAL BRACING, PIECES MARKED ①
AND ②, MAY BE OMITTED IF THE TRAILER TO BE LOADED IS
EQUIPPED WITH OUTRIGGERS AND WITH 2" X 8" (MINIMUM) X
16'-0" PLANKING. PIECES MARKED ① AND ② MUST BE USED ON
8'-0" WIDE TRAILERS.

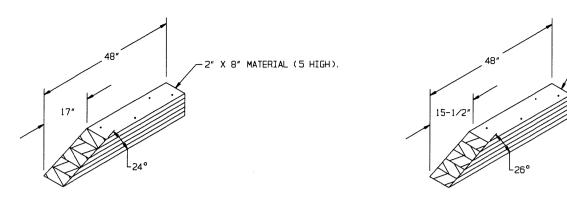
BILL OF MATERIAL					
LUMBER	LINEAR FEET	BOARD FEET			
2" X 6" 2" X 8"	91 68	91 91			
NAILS	NO. REOD	SQNNOS			
10d (3") 20d (4")	156 64	2-1/2 2-1/2			

ROPE, STEEL WIRE, 5/8" - - - 120' REOD - - - - 83 LBS CLIP, 5/8" - - - - - - - - 20 REOD - - - 13 LBS CLIP, 3/4" - - - - - - - 8 REOD - - - 12 LBS SHACKLE, 7/8" - - - - - 4 REOD - - - 16 LBS THIMBLE, STANDARD - - - - 8 REOD - - - 3 LBS

NWOHZ ZA DAOL

ITEM	QUANTITY	WEIGHT (API	PROX)
ARMORED VEHICLE, MULTIPLE ROCKET LAUN DUNNAGE			
TOTAL WEIG	iHT	43,498 LBS	(APPROX)

PAGE 5



REAR CHOCK BLOCK

REFER TO KEY NUMBER (4) ON PAGE 4 FOR MATERIAL AND NAILING SPECIFICATIONS.
SEE THE "ALTERNATIVE CHOCK BLOCK"
DETAIL BELOW.

FRONT CHOCK BLOCK

REFER TO KEY NUMBER ③ ON PAGE 4 FOR MATERIAL AND NAILING SPECIFICATIONS.
SEE THE 'ALTERNATIVE CHOCK BLOCK' DETAIL BELOW.

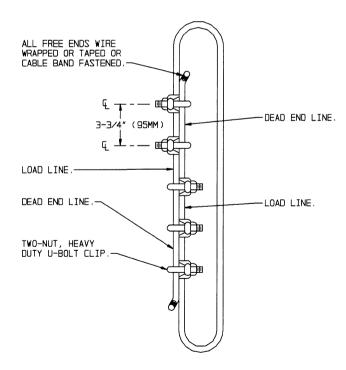
2" X B" MATERATI

(5 HIGH).

2" X 8" MATERIAL. LAMINATE W/11-10d NAILS. 1-1/2"

ALTERNATIVE CHOCK BLOCK

THIS BLOCK MAY BE USED IN LIEU OF THE FRONT AND/OR REAR CHOCK BLOCKS, IF DESIRED. NAIL TO THE TRAILER FLOOR W/2-12d NAILS THRU THE HEEL AND W/4-12d NAILS EACH SIDE.



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 PIECES MARKED (B) AND (B) ON PAGE 4.

DETAILS

PAGE 6

