

# LOADING AND BRACING ON FLAT CAR OF 155MM HOWITZER, MI98

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PROCEDURES FOR TIEDOWN ARE ALSO SHOWN IN SECTION 6,  
FIGURE 7, OF THE ASSOCIATION OF AMERICAN RAILROADS  
PUBLICATION, "RULES GOVERNING THE LOADING OF  
COMMODITIES ON OPEN TOP CARS AND TRAILERS".

**DO NOT SCALE**

REVISIONS				DRAFTSMAN / CD	PROJ. ENG.
1	APR 93	WRE WSE	Joseph R. Fize William J. Ernst	JDS / <i>[Signature]</i>	<i>[Signature]</i>
				CHECKER	LOC ENGINE OFFICE
				APPROVED, U. S. ARMY ARMAMENT MATERIEL READINESS COMMAND	
				<i>David C. Feltner</i>	
				APPROVED BY ORDER OF COMMANDING GENERAL, U. S. ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND (DARCOM)	
				<i>A. E. Hanger</i>	
				DARCOM AMMO CENTER	
				U. S. ARMY DARCOM DRAWING	
				FEBRUARY 1978	
				CLASS	DIVISION
				19	48
				DRAWING	FILE
				8102	5WE2

GENERAL NOTES

(GENERAL NOTES CONTINUED)

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1.

B. THE LOADS SHOWN ARE BASED ON 40'-6" LONG BY 10'-6" WIDE (PLATFORM) FLAT CARS AND/OR 60'-0" LONG BY 10'-6" WIDE IMPLEMENT FLAT CARS WITH WOODEN DECKS. \* A MAXIMUM OF TWO HOWITZERS CAN BE LOADED ON A 40'-6" LONG BY 10'-6" WIDE FLAT CAR AND A MAXIMUM OF THREE HOWITZERS CAN BE LOADED ON A 60'-0" LONG BY 10'-6" WIDE IMPLEMENT FLAT CAR. OTHER ITEMS DISSIMILAR IN NATURE, MAY BE LOADED ON A CAR IF SPACE PERMITS. THE NUMBER OF HOWITZERS TO BE LOADED ON A CAR WILL BE DEPENDENT ON THE SIZE OF THE CAR OR THE QUANTITY OF HOWITZERS TO BE SHIPPED, WITH THE VIEW OF FULL UTILIZATION OF CARRIER EQUIPMENT. SEE GENERAL NOTE "L" ON THIS PAGE.

\* NOTICE TO TRANSPORTATION OFFICER:

THIS IS A CUSHIONED CAR EQUIPPED WITH SPECIAL TIEDOWN CHANNELS AND MOVEABLE ANCHOR AND CHAIN ASSEMBLY TIEDOWN DEVICES SUCH AS IS USED FOR TRANSPORTING AGRICULTURE MACHINERY AND HEAVY EARTH MOVING EQUIPMENT. SEE THE "SPECIAL PROVISIONS" ON THIS PAGE FOR GUIDANCE.

C. LADING DATA FOR THE 155MM M198 HOWITZER ( WIDE TIRES ).

TUBE ON  
ITEM DIMENSIONS ----24'-8" LONG BY 9'-2" WIDE BY 7'-0" HIGH.  
ITEM GROSS WEIGHT---15,760 POUNDS ( APPROX ).

TUBE OFF  
ITEM DIMENSIONS ----24'-5" LONG BY 9'-2" WIDE BY 7'-0" HIGH.  
ITEM GROSS WEIGHT---10,910 POUNDS ( APPROX ).

LADING DATA FOR THE 155MM M198 HOWITZER ( NARROW TIRES ).

TUBE ON  
ITEM DIMENSIONS ----24'-8" LONG BY 8'-2" WIDE BY 7'-0" HIGH.  
ITEM GROSS WEIGHT---15,678 POUNDS ( APPROX ).

TUBE OFF  
ITEM DIMENSIONS ----24'-5" LONG BY 8'-2" WIDE BY 7'-0" HIGH.  
ITEM GROSS WEIGHT---10,828 POUNDS ( APPROX ).

D. REFER TO ORD DWG 19-48-C-ORDJU-588, "WIRE ROPE AND ANNEALED WIRE APPLICATION METHODS FOR SECURING LADING ON RAIL AND MOTOR CARRIER EQUIPMENT", FOR PROPER TIE DOWN APPLICATION, EXCEPT THAT THE NUTS ON 1/2" CLIPS WILL BE TIGHTENED TO A TORQUE OF 75 TO 90 FOOT POUNDS AND THE NUTS ON 5/8" CLIPS WILL BE TIGHTENED TO A TORQUE OF 135 TO 150 FOOT POUNDS. 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 15" LONG HANDLES FOR 1/2" CLIP NUTS AND 24" LONG HANDLES FOR 5/8" CLIP NUTS. CAUTION: DURING WIRE ROPE INSTALLATION, AVOID CONTACT WITH ALL ELECTRICAL WIRING, VEHICLE CONTROLS, AND OTHER APPURTENANCES. METAL FILLERS OR COMPARABLE CUSHIONING MATERIAL MUST BE USED BETWEEN TIE DOWN CABLES AND ALL SHARP EDGES.

E. REFER TO ASSOCIATION OF AMERICAN RAILROADS MANUAL, "GENERAL RULES GOVERNING THE LOADING OF COMMODITIES ON OPEN TOP CARS", FOR APPLICABLE LOADING RULES: PREFACE, 1-A, 2, 3, 4, 5, 9, 14, 15, AND 19-B, ADDITIONALLY, LADING TIRES WILL BE INFLATED TO 45 PSI HIGHWAY OPERATING PRESSURE, AND ALL HAND BRAKES MUST BE "SET" WITH THE HAND LEVERS WIRE TIED.

F. WIRE ROPE CABLE MUST BE TENSIONED SUFFICIENTLY TO CAUSE MODERATE VEHICLE BODY DEPRESSION. TENSIONING CAN BE ACCOMPLISHED BY EMPLOYING TWO (2) CABLE "GRIPPERS" AND AN APPLICABLY SIZED "COME-A-LONG" TYPE MECHANICAL HOIST.

G. 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.

( CONTINUED AT RIGHT )

MATERIAL SPECIFICATIONS

- LUMBER -----: FED SPEC MM-L-751: DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN AND FREE FROM MATERIAL DEFECTS.
- NAILS -----: FED SPEC FF-N-105: COMMON
- ROPE -----: FED SPEC RR-W-410: STEEL WIRE, PLAIN, PREFORMED, REGULAR LAY, 17.9 TONS, 6 X 19, FLEXIBLE IWRC, MACWHYTE WIRE ROPE CO. ( OR EQUAL ).
- CLIP -----: FED SPEC FF-C-450: TYPE 1, CLASS 1, "U" BOLT, CROSBY HEAVY DUTY ( OR EQUAL ).
- THIMBLE -----: FED SPEC FF-T-276; TYPE II.
- STRAPPING, STEEL -----: ASTM D3953: FLAT STRAPPING, TYPE I OR 2, 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.
- STRAP STAPLE, STAKE  
POCKET PROTECTOR -----: COMMERCIAL GRADE.
- ANTI-CHAFING MATERIAL -: NEUTRAL BARRIER MATERIAL MIL-B-121 ( OR EQUAL ).
- WIRE, CARBON STEEL -----: ASTM A853: ANNEALED AT FINISH, BLACK OXIDE FINISH, .0900" DIA, GRADE 1006 OR BETTER.

H. WHEN ANY STRAP IS SEALED AT AN END-OVER-END LAP JOINT, AS SHOWN IN THE "CRADLE SECUREMENT DETAIL" ON PAGE 8, A MINIMUM OF TWO (2) SEALS, BUTTED TOGETHER, WITH TWO (2) PAIR OF CRIMPS PER SEAL MUST BE USED.

J. NOTICE: 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 THE 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 ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.

K. 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 4" X 4" MATERIAL IS ACTUALLY 3-1/2" THICK BY 3-1/2" WIDE.

L. WHEN SHIPPING ONE (1) HOWITZER A FLAT CAR WIDER THAN 9'-2" OR LONGER THAN 40'-6" SHOULD NOT BE ORDERED. WHEN SHIPPING TWO (2) HOWITZERS A FLAT CAR AT LEAST 10'-6" WIDE BY 40'-6" LONG MUST BE ORDERED. WHEN SHIPPING THREE (3) HOWITZERS AN IMPLEMENT FLAT CAR AT LEAST 10'-6" WIDE BY 60'-0" LONG AND HAVING A WOODEN DECK MUST BE ORDERED.

M. CONVERSION TO METRIC EQUIVALENTS:  
  
DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY, THE METRIC EQUIVALENT MAY BE COMPUTED ON THE BASIS OF ONE INCH EQUALS 25.4MM AND ONE POUND EQUALS 0.454KG.

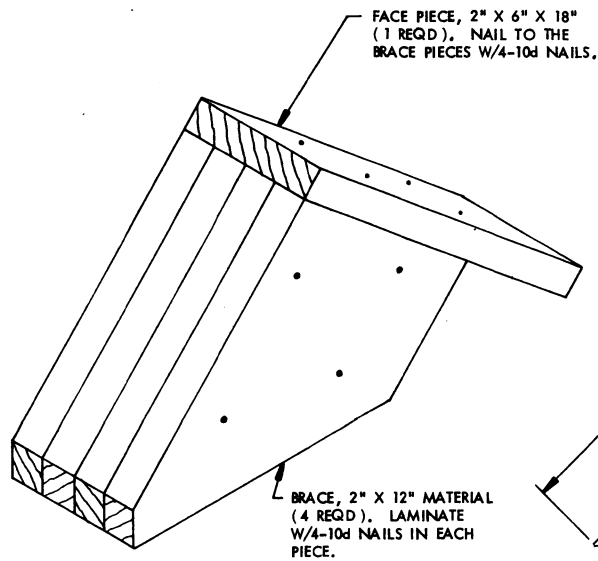
SPECIAL PROVISIONS: ( SEE GENERAL NOTE "B" ON THIS PAGE ).

A MAXIMUM OF THREE HOWITZERS MAY BE SECURED ON A CUSHIONED FMS TYPE FLAT CAR WITH CHAIN TIEDOWN ASSEMBLIES, AS SHOWN ON PAGE 10, PROVIDING THE FOLLOWING CONDITIONS ARE MET.

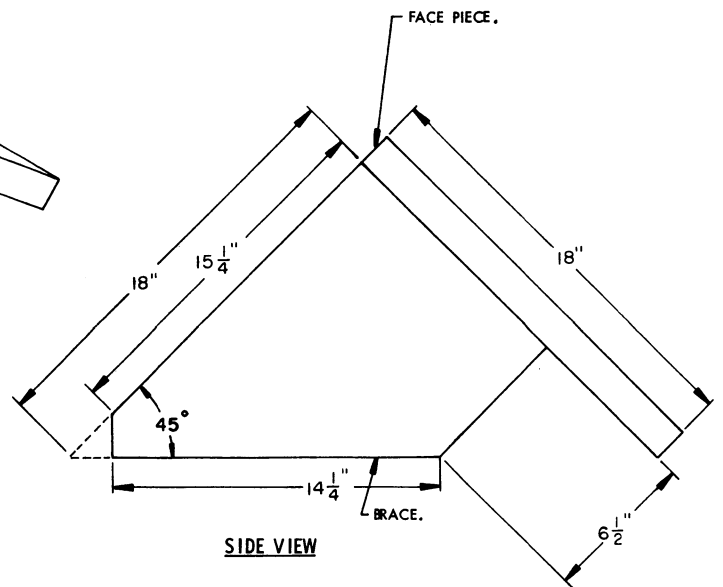
1. ONE (1) MOVEABLE ANCHOR HAVING A 1/2 INCH, 27,500 POUND PROOF TEST ALLOY CHAIN ASSEMBLY TIEDOWN DEVICE MUST BE SUBSTITUTED FOR EACH WIRE ROPE CABLE TIEDOWN MARKED (C) IN THE LOAD SHOWN ON PAGE 4. CHAINS WILL BE ATTACHED TO THE HOWITZER AT THE SAME LOCATIONS SHOWN FOR THE WIRE ROPE AND THE MOVEABLE ANCHOR DEVICES WILL BE LOCATED SO AS TO POSITION THE CHAINS WITHIN THE ANGULAR TOLERANCES SPECIFIED ON PAGES 4 AND 5.
2. 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.
3. 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.
4. 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.
5. 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.
6. ANTI-CHAFING MATERIAL MUST BE PLACED AND SECURED BETWEEN THE CHAINS AND THE LADING AT ALL POINTS OF CONTACT EXCEPT AT DEFINITIVE TIEDOWN POINTS.

REVISIONS

- REVISION NO. 1, DATED APRIL 1993, CONSISTS OF:
1. ADDED LOADING AND BRACING PROCEDURES FOR THREE HOWITZERS, HAVING NARROW TIRES, LOADED ON A 60'-0" LONG BY 10'-6" WIDE IMPLEMENT FLAT CAR.
  2. UPDATED GENERAL NOTES, MATERIAL SPECIFICATION AND DRAWING FORMAT.



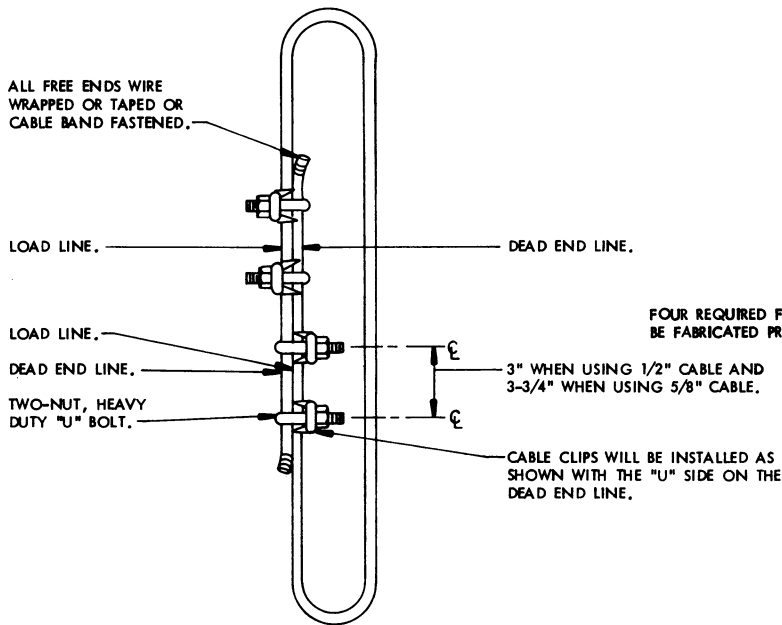
ISOMETRIC VIEW



SIDE VIEW

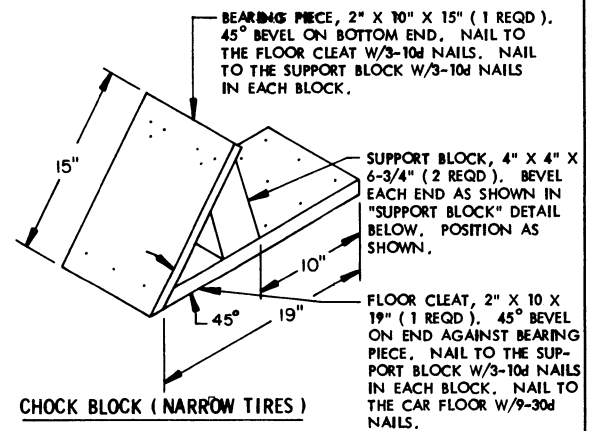
**CHOCK BLOCK (WIDE TIRES)**

EIGHT REQUIRED FOR EACH HOWITZER. THIS ASSEMBLY MAY BE FABRICATED PRIOR TO POSITIONING ON THE FLAT CAR.  
NOTE: 6" X 12" MATERIAL MAY BE USED IN LIEU OF LAMINATING FOUR PIECES OF 2" X 12" MATERIAL AS SHOWN ABOVE. SEE GENERAL NOTE "K" ON PAGE 2.



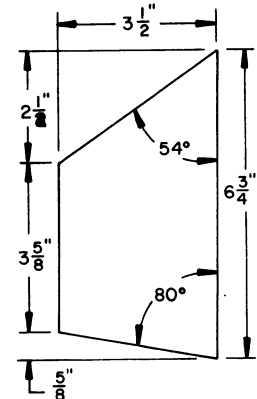
CABLE JOINT

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 TO THE SPECIFIED TORQUE, 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 2.



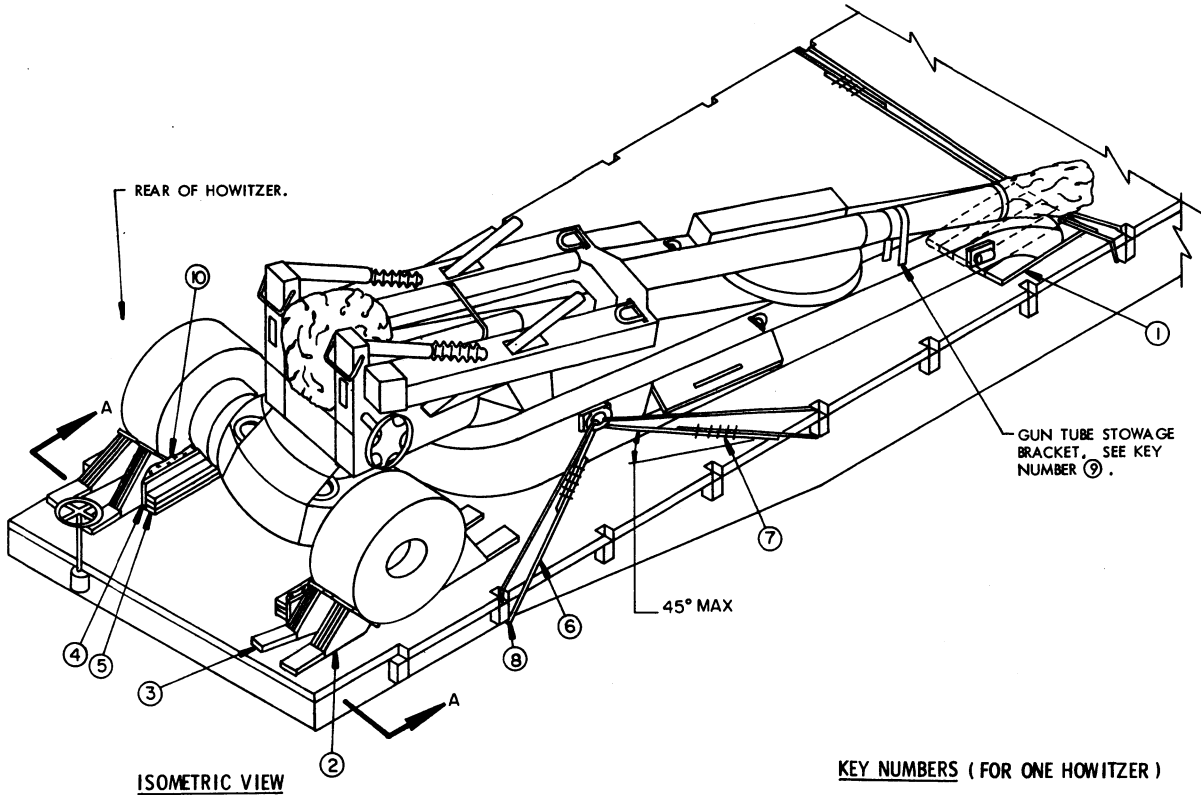
**CHOCK BLOCK (NARROW TIRES)**

FOUR REQUIRED FOR EACH HOWITZER. THIS ASSEMBLY MAY BE FABRICATED PRIOR TO POSITIONING ON THE FLAT CAR.



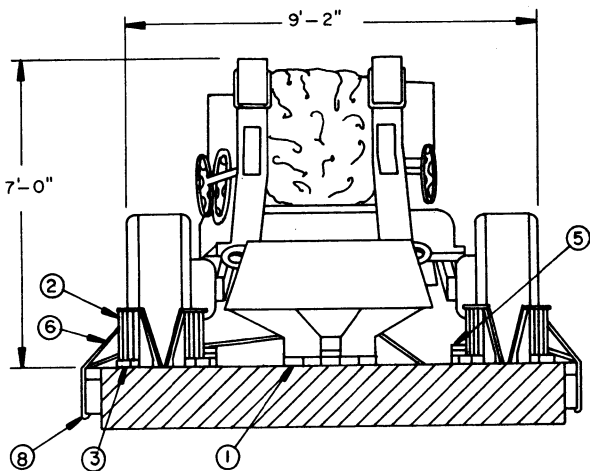
SUPPORT BLOCK

4" X 4" MATERIAL. TWO REQUIRED FOR EACH CHOCK BLOCK.



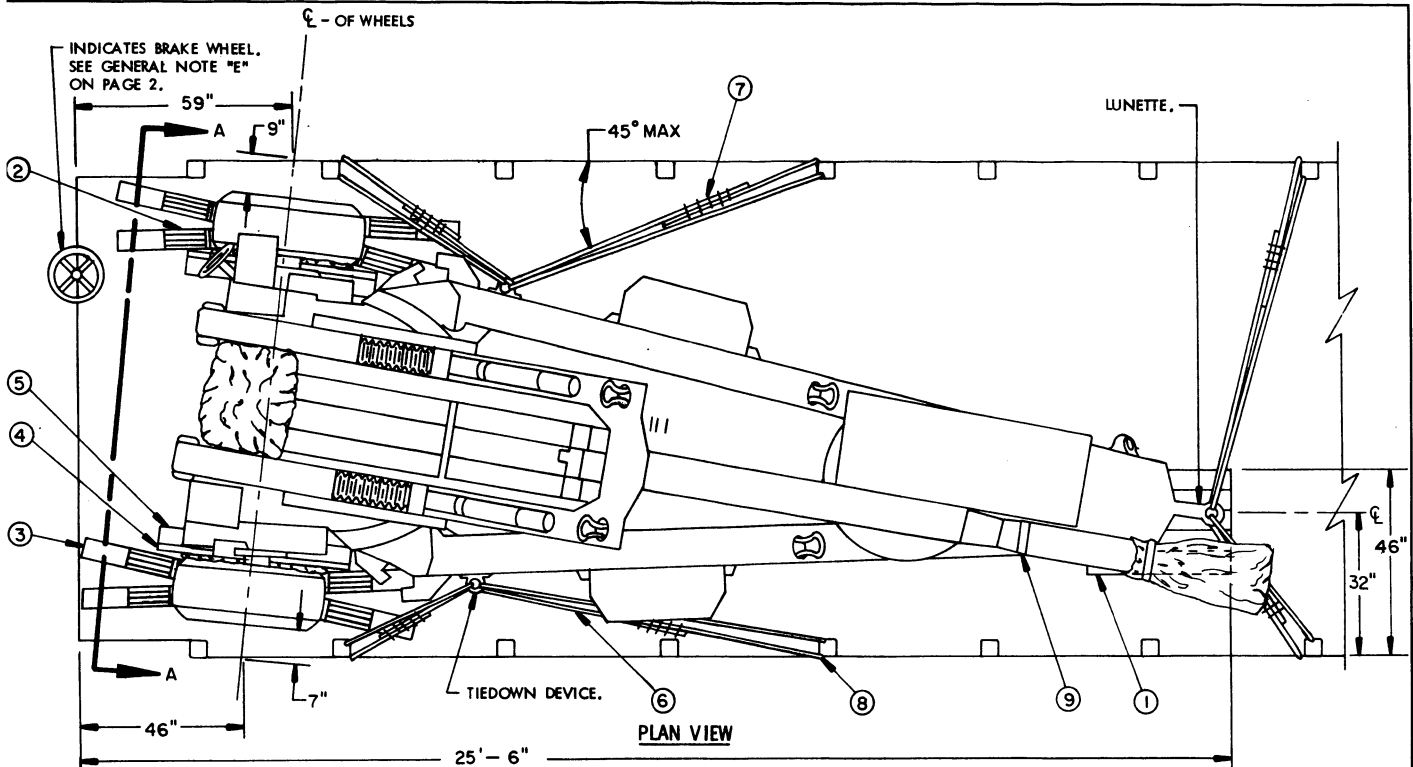
**KEY NUMBERS ( FOR ONE HOWITZER )**

- ① PLATFORM, 2" X 6" X 36" ( 5 REQD ). PRE-POSITION AND NAIL EACH PIECE TO THE CAR FLOOR W/3-30d NAILS AT EACH END. SEE SPECIAL NOTE 3 ( a ) ON PAGE 5.
- ② CHOCK BLOCK ( 8 REQD ). SEE THE DETAIL ON PAGE 3. POSITION WITH THE FACE PLATE AGAINST A WHEEL. NAIL THROUGH HEEL OF BLOCK W/2-60d NAILS. TO-NAIL TO CAR FLOOR W/2-40d NAILS ON EACH SIDE. SEE SPECIAL NOTE 3 ( b ) AND ( e ) ON PAGE 5.
- ③ BACK-UP PIECE, 2" X 6" X 12" ( 8 REQD ). POSITION AGAINST A CHOCK BLOCK AND NAIL TO THE CAR FLOOR W/3-30d NAILS.
- ④ RUBBING STRIP, 2" X 6" X 48" ( 2 REQD ). POSITION ON EDGE AND NAIL TO LOWER PIECE MARKED ③ W/5-12d NAILS.
- ⑤ SIDE BLOCKING, 2" X 4" X 48" ( TRIPLED ) ( 2 REQD ). NAIL THE FIRST PIECE TO CAR FLOOR W/5-30d NAILS. NAIL EACH ADDITIONAL PIECE IN A LIKE MANNER.
- ⑥ STEEL WIRE ROPE, 5/8" DIA., 17.9 TONS ( 6 REQD ). INSTALL CABLE TO APPROXIMATE ANGLE SHOWN AND TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH TIEDOWN DEVICE ON HOWITZER AND BACK TO STAKE POCKET. NOTE: CABLE OF A LARGER SIZE MAY BE USED IF AVAILABLE WHEN SPECIFIED CABLE IS NOT AVAILABLE. SEE GENERAL NOTES "D", "E", AND "F" ON PAGE 2. SEE THE "CABLE JOINT" DETAIL ON PAGE 3 AND SPECIAL NOTE 3 ( c ) AND ( f ) ON PAGE 5.
- ⑦ CLIP, WIRE ROPE, SIZE 5/8" ( 38 REQD ). FIVE ( 5 ) PER EACH TIEDOWN CABLE JOINT, FOUR ( 4 ) PER EACH SIDE RETAINING CABLE JOINT ( ATTACHED TO THE LUNETTE ) AND ONE ( 1 ) PER THIMBLE. SEE GENERAL NOTE "D" ON PAGE 2.
- ⑧ THIMBLE, STANDARD, SIZE 5/8" ( 10 REQD ). USE ONE ( 1 ) PER STAKE POCKET AND ONE ( 1 ) PER LADING TIEDOWN DEVICE ( NONE REQUIRED ON LUNETTE ). SECURE TO CABLE, PIECE MARKED ⑥, W/1 CLIP PER THIMBLE. A STANDARD THIMBLE, AS SPECIFIED, CAN BE SECURED TO A CABLE WITH A 5/8" CLIP. HOWEVER, IF DESIRED, OR IF THE 5/8" THIMBLE BEING USED IS OF A TYPE WHICH CANNOT BE SECURED TO A CABLE WITH A 5/8" CLIP, A 3/4" CLIP MAY BE USED. NOTE THAT AN "OPEN PATTERN" THIMBLE IS RECOMMENDED. SEE GENERAL NOTE "D" ON PAGE 2.
- ⑨ WIRE, NO. 14 GAGE, SOFT ANNEALED, ( AS REQD ). WIRE TIE THE PIN WHICH LOCKS THE GUN TUBE STOWAGE BRACKET IN SUCH A MANNER THAT THE PIN CANNOT COME OUT DURING TRANSIT. SEE THE "ISOMETRIC VIEW" ABOVE.
- ⑩ WATERPROOF PAPER OR BURLAP OF A SUFFICIENT SIZE TO POSITION UNDER AND EXTEND 2" ABOVE PIECE MARKED ④.



SEE "SECTION A-A IN THE "PLAN VIEW" ON PAGE 5.

LOADING AND BRACING PROCEDURES FOR ONE AND/OR TWO HOWITZERS HAVING WIDE TIRES ( TUBE ON ).



**SPECIAL NOTES:**

(SPECIAL NOTES CONTINUED)

1. TWO (2) HOWITZERS MAY BE SHIPPED ON A 10'-6" WIDE FLAT CAR. POSITION THE FIRST HOWITZER AT ONE END OF THE CAR AS SHOWN IN THE "PLAN VIEW" ABOVE. POSITION THE SECOND HOWITZER AT THE OPPOSITE END OF THE FLAT CAR USING THE SAME PROCEDURES AND DIMENSIONS AS SHOWN IN THE "PLAN VIEW" ABOVE AND DEPICTED IN THE "PLAN VIEW" AT THE TOP OF PAGE 9.
2. IF ONLY ONE HOWITZER IS TO BE SHIPPED, CENTER IT ON THE FLAT CAR AS SHOWN IN THE "PLAN VIEW" AT THE BOTTOM OF PAGE 9. USE THE PROCEDURES SHOWN ON PAGE 4 AND THIS PAGE.
3. LOADING PROCEDURES:
  - (a) PRIOR TO POSITIONING THE HOWITZER ON THE FLAT CAR, PRE-POSITION THE PLATFORM MARKED ① ON PAGE 4 AND NAIL IN PLACE. SEE "PLAN VIEW".
  - (b) AFTER THE HOWITZER IS PROPERLY LOCATED ON THE FLAT CAR, POSITION FOUR (4) CHOCK BLOCKS, MARKED ② ON PAGE 4, TIGHTLY AGAINST THE TIRES AT THE REAR OF THE HOWITZER AND NAIL IN PLACE. POSITION FOUR (4) BACK-UP PIECES, MARKED ③ ON PAGE 4, TIGHTLY AGAINST THE CHOCK BLOCKS AND NAIL IN PLACE. NOTE: WHEN TWO (2) CHOCK BLOCKS ARE POSITIONED SIDE-BY-SIDE AGAINST A WHEEL, IT IS ONLY POSSIBLE TO TOE-NAIL ONE (1) CHOCK BLOCK TO THE CAR FLOOR W/2-40d NAILS ON EACH SIDE. ONE CHOCK BLOCK WILL ONLY BE TOE-NAILED ON ONE SIDE.

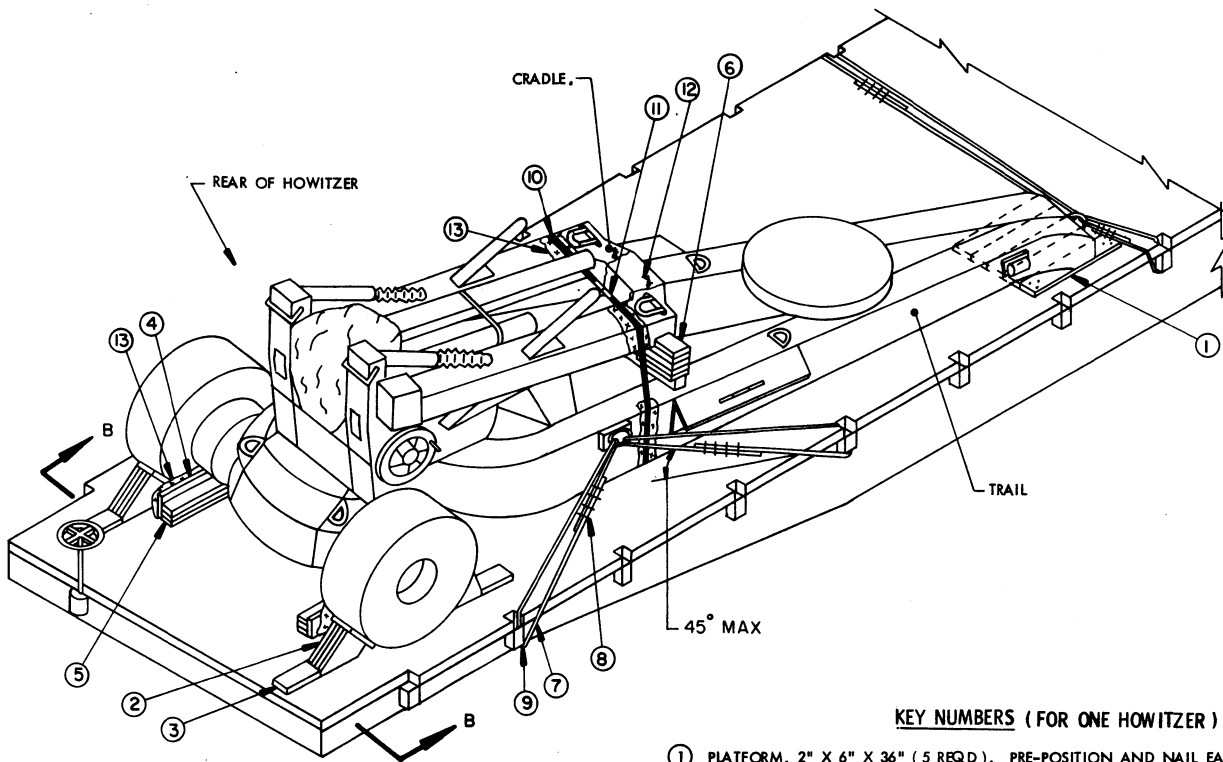
- (c) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑥ ON PAGE 4, FROM THE TIEDOWN DEVICE ON THE HOWITZER TO THE SECOND STAKE POCKET FROM THE END OF THE FLAT CAR. TENSION THESE TWO REAR CABLES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE REAR CHOCK BLOCKS. SEE GENERAL NOTES "D" AND "F" ON PAGE 2.
  - (d) POSITION THE RUBBING STRIPS MARKED ④, THE SIDE BLOCKING MARKED ⑤, AND THE WATERPROOF PAPER MARKED ⑩, AGAINST THE INSIDE OF THE TIRES AND NAIL IN PLACE.
  - (e) POSITION FOUR (4) CHOCK BLOCKS, MARKED ② ON PAGE 4, TIGHTLY AGAINST THE TIRES AND NAIL IN PLACE. POSITION FOUR (4) BACK-UP PIECES, MARKED ③ ON PAGE 4, TIGHTLY AGAINST THE CHOCK BLOCKS AND NAIL IN PLACE.
  - (f) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑥ ON PAGE 4, FROM THE TIEDOWN DEVICE ON THE HOWITZER TO THE FIFTH STAKE POCKET FROM THE END OF THE FLAT CAR. TENSION THESE TWO FORWARD CABLES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE FORWARD CHOCK BLOCKS.
  - (g) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑥ ON PAGE 4, FROM THE LUNETTE ON THE HOWITZER TO THE EIGHTH STAKE POCKET FROM THE END OF THE FLAT CAR.
4. THE PURPOSE OF THE PLATFORM MARKED ① IS TO PREVENT THE HOWITZER "TRAILS" FROM GOUGING THE FLOOR OF THE FLAT CAR. FIELD CHECK THE 25'-6" LONGITUDINAL DIMENSION, SHOWN IN THE "PLAN VIEW" ABOVE, TO ASSURE THAT THE PLATFORM WILL BE UNDER THE FORWARD END OF THE HOWITZER TRAILS PRIOR TO NAILING IN PLACE.

(CONTINUED AT RIGHT)

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	24	16
2" X 6"	43	43
2" X 12"	48	96
NAILS	NO. REQD	POUNDS
10d (3")	144	2-1/4
12d (3-1/4")	10	1/4
30d (4-1/2")	84	4-1/4
40d (5")	32	2
60d (6")	16	1-3/4
ROPE, STEEL WIRE, 5/8" DIA	97' REQD	67 LBS
CLIP, 5/8"	38 REQD	24 LBS
THIMBLE STANDARD, 5/8"	10 REQD	4 LBS
WIRE, NO. 14 GAGE	AS REQD	NIL
WATERPROOF PAPER OR BURLAP	AS REQD	NIL

**LOAD AS SHOWN**

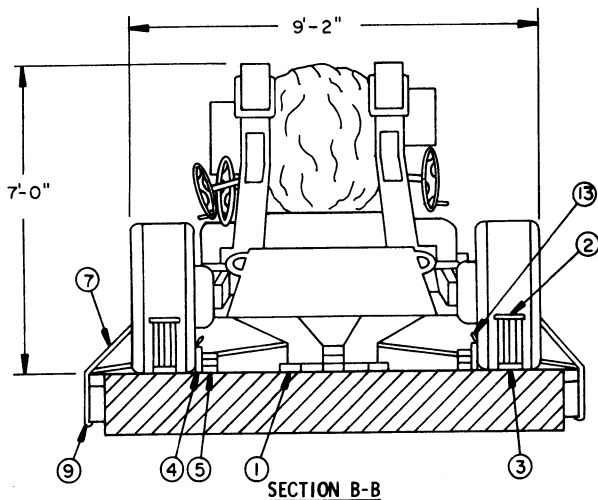
ITEM	QUANTITY	WEIGHT (APPROX)
155MM HOWITZER	1	15,760 LBS
DUNNAGE		416 LBS
<b>TOTAL WEIGHT</b>		<b>16,176 LBS</b>



ISOMETRIC VIEW

**KEY NUMBERS (FOR ONE HOWITZER)**

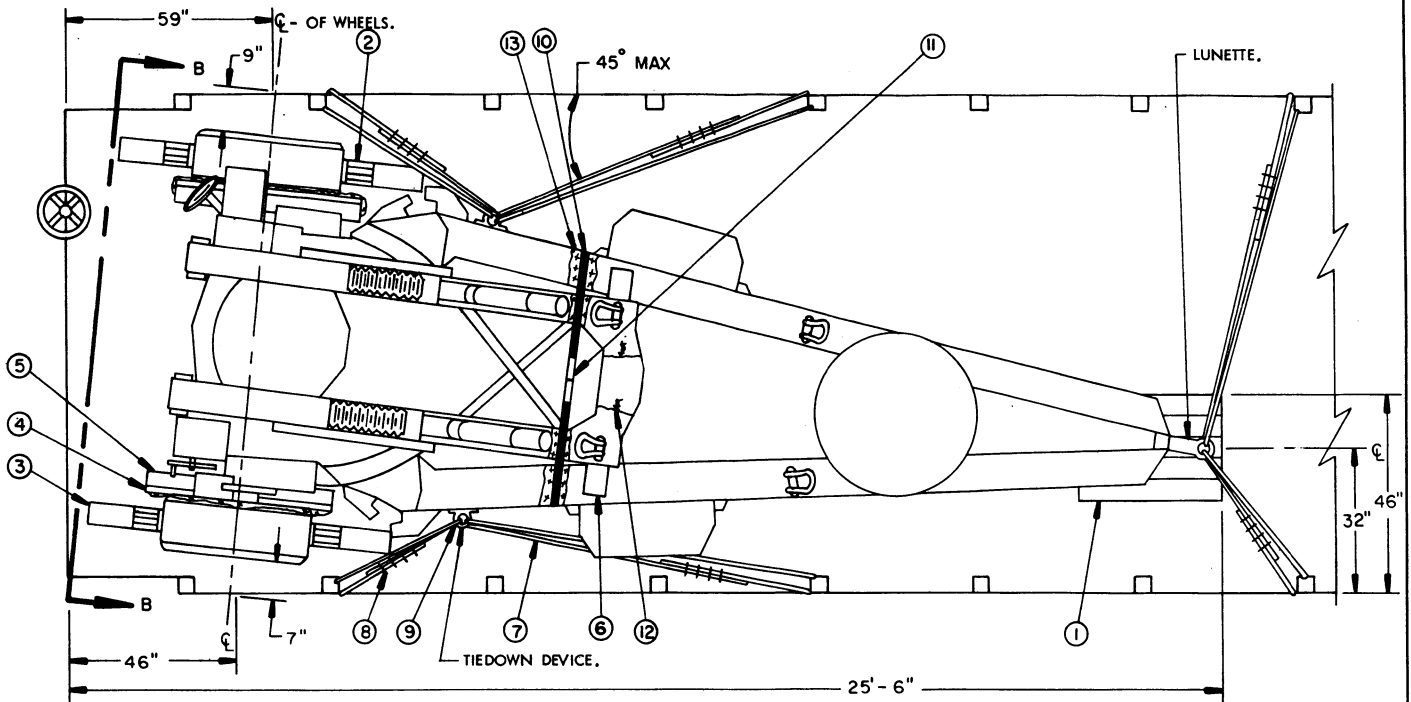
- ① PLATFORM, 2" X 6" X 36" (5 REQ'D). PRE-POSITION AND NAIL EACH PIECE TO THE CAR FLOOR W/3-30d NAILS AT EACH END. SEE SPECIAL NOTE 3 (a) ON PAGE 7.
- ② CHOCK BLOCK (4 REQ'D). SEE THE DETAIL ON PAGE 3. POSITION WITH THE FACE PLATE AGAINST A WHEEL. NAIL THROUGH HEEL OF BLOCK W/2-60d NAILS, TOE-NAIL TO CAR FLOOR W/2-40d NAILS ON EACH SIDE. SEE SPECIAL NOTE 3 (b) AND (e) ON PAGE 7.
- ③ BACK-UP PIECE, 2" X 6" X 12" (4 REQ'D). POSITION AGAINST CHOCK BLOCK AND NAIL TO THE CAR FLOOR W/3-30d NAILS.
- ④ RUBBING STRIP, 2" X 6" X 48" (2 REQ'D). POSITION ON EDGE AND NAIL TO LOWER PIECE MARKED ⑤ W/5-12d NAILS.
- ⑤ SIDE BLOCKING, 2" X 4" X 48" (TRIPLED) (2 REQ'D). NAIL THE FIRST PIECE TO CAR FLOOR W/5-30d NAILS. NAIL EACH ADDITIONAL PIECE IN A LIKE MANNER.
- ⑥ CRADLE SUPPORT ASSEMBLY (1 REQ'D). SEE THE "CRADLE SUPPORT ASSEMBLY" DETAIL AND THE "CRADLE SECUREMENT DETAIL" ON PAGE 8.
- ⑦ STEEL WIRE ROPE, 1/2" DIA, 11.5 TONS (6 REQ'D). INSTALL CABLE TO APPROXIMATE ANGLE SHOWN AND TO FORM A COMPLETE LOOP FROM STAKE POCKET ON CAR THROUGH TIEDOWN DEVICE ON HOWITZER AND BACK TO STAKE POCKET. NOTE: CABLE OF A LARGER SIZE MAY BE USED IF AVAILABLE WHEN SPECIFIED CABLE IS NOT AVAILABLE. SEE GENERAL NOTES "D", "E", AND "F" ON PAGE 2. SEE THE "CABLE JOINT" DETAIL ON PAGE 3 AND SPECIAL NOTE 3 (c) AND (f) ON PAGE 7.
- ⑧ CLIP, WIRE ROPE, SIZE 1/2" (34 REQ'D). USE FOUR (4) PER EACH CABLE JOINT AND ONE (1) TO SECURE EACH THIMBLE. SEE GENERAL NOTE "D" ON PAGE 2.
- ⑨ THIMBLE, STANDARD, SIZE 1/2" (10 REQ'D). USE ONE (1) PER STAKE POCKET AND ONE (1) PER LADING TIEDOWN DEVICE (NONE REQUIRED ON LUNETTE). SECURE TO CABLE, PIECE MARKED ⑦, W/1-CLIP PER THIMBLE. A STANDARD THIMBLE, AS SPECIFIED, CAN BE SECURED TO A CABLE WITH A 1/2" CLIP. HOWEVER, IF DESIRED, OR IF THE 1/2" THIMBLE BEING USED IS OF A TYPE WHICH CANNOT BE SECURED TO A CABLE WITH A 1/2" CLIP, A 5/8" CLIP MAY BE USED. NOTE THAT AN "OPEN PATTERN" THIMBLE IS RECOMMENDED. SEE GENERAL NOTE "D" ON PAGE 2.
- ⑩ CRADLE SECUREMENT STRAPPING, 2" X .050" X 20'-0" LONG STEEL STRAPPING (1 REQ'D). INSTALL TO ENIRCLE CRADLE AND TRAILS AS NEAR TO PIECE MARKED ② AS POSSIBLE. ASSURE THAT THE STRAPPING IS IN VERTICAL ALIGNMENT AND LAYS EVEN. SEE THE "CRADLE SECUREMENT DETAIL" ON PAGE 8. SEE GENERAL NOTE "H" ON PAGE 2.
- ⑪ SEAL FOR 2" STRAPPING (2 REQ'D). DOUBLE CRIMP EACH SEAL.
- ⑫ WIRE, NO. 14 GAGE, SOFT ANNEALED, (AS REQ'D). WIRE TIE THE "WASHERS" TO THE CRADLE AS SHOWN IN THE "CRADLE SECUREMENT DETAIL" ON PAGE 8 AND WIRE TIE "VARIABLE RECOIL MECHANISM YOKE" IN PLACE AS SHOWN IN THE "VARIABLE RECOIL MECHANISM YOKE SECUREMENT DETAIL" ON PAGE 8.
- ⑬ WATERPROOF PAPER OR BURLAP OF A SUFFICIENT SIZE TO POSITION UNDER AND EXTEND 2" ABOVE PIECE MARKED ④, ALSO FOLD INTO A THICKNESS OF SIX LAYERS AND POSITION UNDER STEEL STRAPPING, PIECE MARKED ⑩, AT ALL POINTS OF CONTACT WITH THE HOWITZER. SEE THE "CRADLE SECUREMENT DETAIL" ON PAGE 8.



SECTION B-B

SEE "SECTION B-B" IN THE "PLAN VIEW" ON PAGE 7.

LOADING AND BRACING PROCEDURES FOR ONE AND/OR TWO HOWITZERS HAVING WIDE TIRES (TUBE OFF)



PLAN VIEW

**SPECIAL NOTES:**

1. TWO (2) HOWITZERS MAY BE SHIPPED ON A 10'-6" WIDE FLAT CAR. POSITION THE FIRST HOWITZER AT ONE END OF THE CAR AS SHOWN IN THE "PLAN VIEW" ABOVE. POSITION THE SECOND HOWITZER AT THE OPPOSITE END OF THE FLAT CAR USING THE SAME PROCEDURES AND DIMENSIONS AS SHOWN IN THE "PLAN VIEW" ABOVE AND DEPICTED IN THE "PLAN VIEW" AT THE TOP OF PAGE 9.
2. IF ONLY ONE HOWITZER IS TO BE SHIPPED, CENTER IT ON THE FLAT CAR AS SHOWN IN THE "PLAN VIEW" AT THE BOTTOM OF PAGE 9. USE THE PROCEDURES SHOWN ON PAGE 6 AND THIS PAGE.
3. **LOADING PROCEDURES:**

- (a) PRIOR TO POSITIONING THE HOWITZER ON THE FLAT CAR, PRE-POSITION THE PLATFORM MARKED ① ON PAGE 6 AND NAIL IN PLACE. SEE "PLAN VIEW".
- (b) AFTER THE HOWITZER IS PROPERLY LOCATED ON THE FLAT CAR, POSITION TWO (2) CHOCK BLOCKS, MARKED ② ON PAGE 6, TIGHTLY AGAINST THE TIRES AT THE REAR OF THE HOWITZER AND NAIL IN PLACE. POSITION TWO (2) BACK-UP PIECES, MARKED ③ ON PAGE 6, TIGHTLY AGAINST THE CHOCK BLOCKS AND NAIL IN PLACE.

(CONTINUED AT RIGHT)

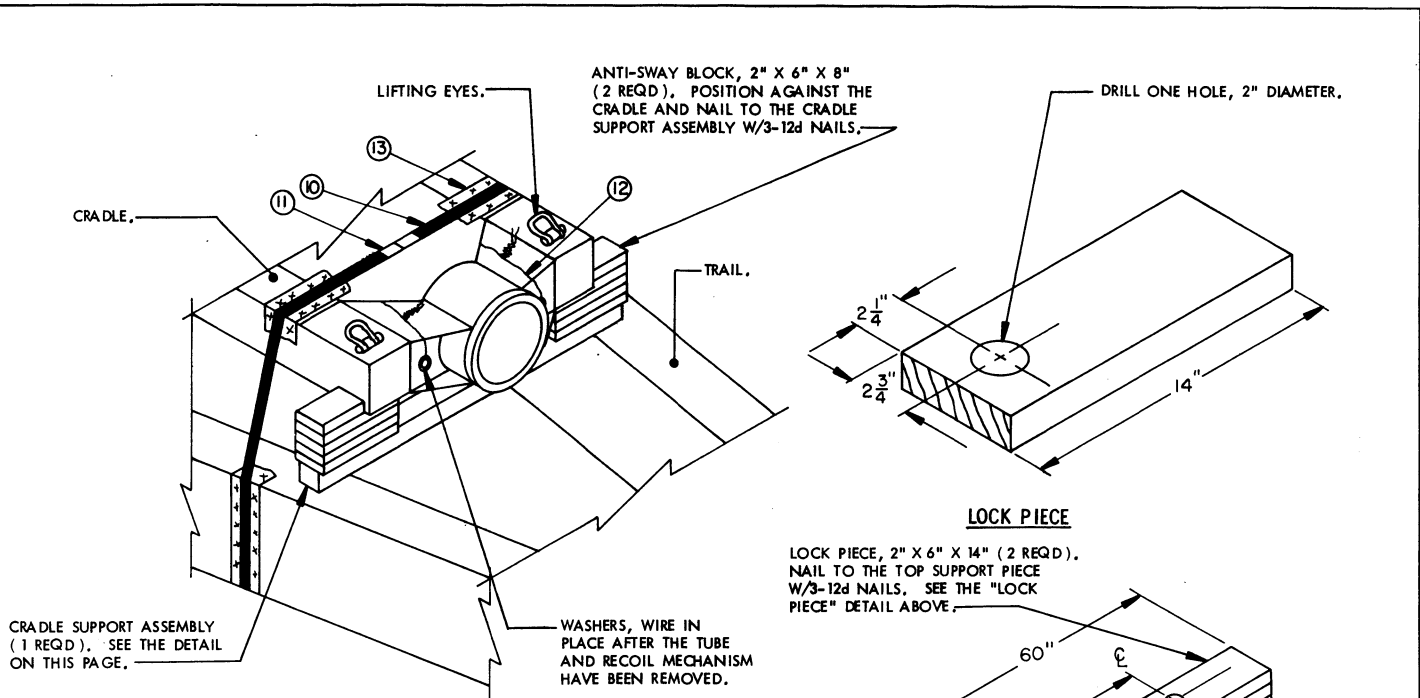
**(SPECIAL NOTES CONTINUED)**

- (c) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑦ ON PAGE 6, FROM THE TIEDOWN DEVICE ON THE HOWITZER TO THE SECOND STAKE POCKET FROM THE END OF THE FLAT CAR. TENSION THESE TWO REAR CABLES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE REAR CHOCK BLOCKS. SEE GENERAL NOTES "D" AND "F" ON PAGE 2.
- (d) POSITION THE RUBBING STRIPS MARKED ④, THE SIDE BLOCKING MARKED ⑤, AND THE WATERPROOF PAPER MARKED ⑬, AGAINST THE INSIDE OF THE TIRES AND NAIL IN PLACE.
- (e) POSITION TWO (2) CHOCK BLOCKS, MARKED ② ON PAGE 6, TIGHTLY AGAINST THE TIRES AND NAIL IN PLACE. POSITION TWO (2) BACK-UP PIECES, MARKED ③ ON PAGE 6, TIGHTLY AGAINST THE CHOCK BLOCKS AND NAIL IN PLACE.
- (f) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑦ ON PAGE 6, FROM THE TIEDOWN DEVICE ON THE HOWITZER TO THE FIFTH STAKE POCKET FROM THE END OF THE FLAT CAR. TENSION THESE TWO FORWARD CABLES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE FORWARD CHOCK BLOCKS.
- (g) INSTALL TWO (2) STEEL WIRE ROPE CABLES, MARKED ⑦ ON PAGE 6, FROM THE LUNETTE ON THE HOWITZER TO THE EIGHTH STAKE POCKET FROM THE END OF THE FLAT CAR.
- (h) INSTALL THE CRADLE SUPPORT ASSEMBLY, MARKED ⑥ ON PAGE 6.
- (i) INSTALL THE CRADLE SECUREMENT STRAPPING, MARKED ⑩ ON PAGE 6.
4. THE PURPOSE OF THE PLATFORM MARKED ① IS TO PREVENT THE HOWITZER "TRAILS" FROM GOUGING THE FLOOR OF THE FLAT CAR. FIELD CHECK THE 25'-6" LONGITUDINAL DIMENSION, SHOWN IN THE "PLAN VIEW" ABOVE, TO ASSURE THAT THE PLATFORM WILL BE UNDER THE FORWARD END OF THE HOWITZER TRAILS PRIOR TO NAILING IN PLACE.

BILL OF MATERIAL		
LUMBER	LINEAR FEET	BOARD FEET
2" X 4"	24	16
2" X 6"	44	44
2" X 12"	24	48
4" X 4"	5	10
NAILS	NO. REQD	POUNDS
10d (3")	72	1-1/4
12d (3-1/4")	10	1/4
30d (4-1/2")	72	3-3/4
40d (5")	16	1
60d (6")	8	1
ROPE, STEEL WIRE, 1/2" DIA	97' REQD	42 LBS
CLIP, 1/2"	34 REQD	15 LBS
THIMBLE, STANDARD 1/2"	10 REQD	3 LBS
STEEL STRAPPING, 2" X .050"	20' REQD	7 LBS
SEAL FOR 2" STEEL STRAPPING	2 REQD	NIL
WIRE, NO. 14 GAGE	AS REQD	NIL
WATERPROOF PAPER OR BURLAP	AS REQD	NIL

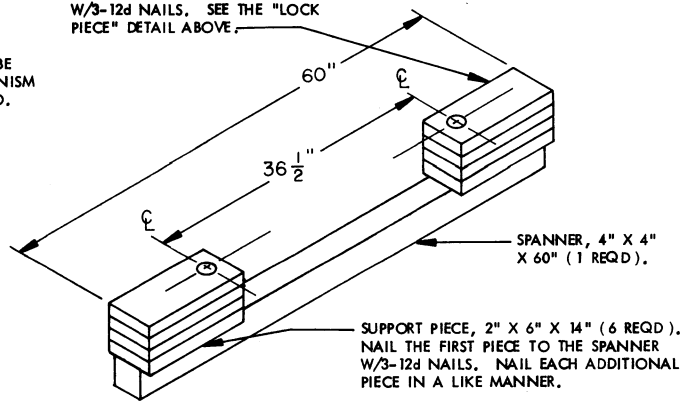
**LOAD AS SHOWN**

ITEM	QUANTITY	WEIGHT (APPROX)
155MM HOWITZER	1	10,910 LBS
DUNNAGE		311 LBS
TOTAL WEIGHT		11,221 LBS



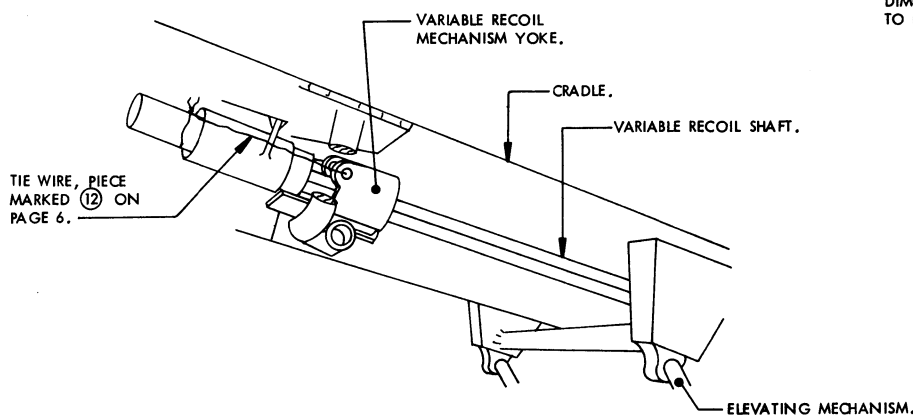
### CRADLE SECUREMENT DETAIL

CENTER THE CRADLE BETWEEN THE TRAILS. POSITION THE CRADLE SUPPORT ASSEMBLY AGAINST THE UNDERSIDE OF THE CRADLE, MAKING SURE THAT THE PROTRUDING BOLTS/NUTS ARE PROPERLY INSERTED INTO THE HOLES ON THE LOCK PIECES. LOWER THE CRADLE UNTIL THE SPANNER PIECE IS RESTING ACROSS THE TRAILS. POSITION THE ANTI-SWAY BLOCK AGAINST THE CRADLE AND NAIL IN PLACE.



### CRADLE SUPPORT ASSEMBLY

NOTE: FIELD CHECK THE 36-1/2" CENTER-TO-CENTER DIMENSION BETWEEN THE LIFTING EYE BOLTS PRIOR TO FABRICATING THE CRADLE SUPPORT ASSEMBLY.

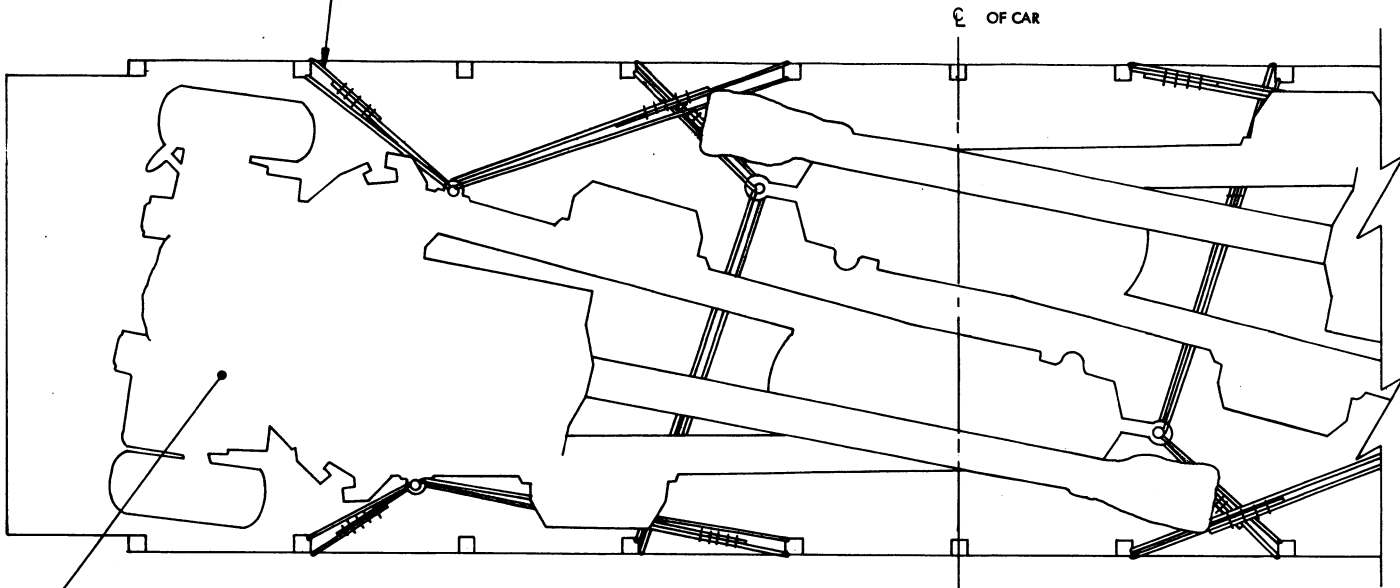


### VARIABLE RECOIL MECHANISM YOKE SECUREMENT DETAIL

THE VIEW ABOVE DEPICTS THE UNDERSIDE OF THE CRADLE. SLIDE THE VARIABLE RECOIL MECHANISM YOKE ALONG THE VARIABLE RECOIL SHAFT, TOWARD THE MUZZLE END OF THE HOWITZER, AS FAR AS POSSIBLE AND WIRE TIE IN PLACE BY PASSING THE WIRE THROUGH THE BOLT HOLES IN THE VARIABLE RECOIL MECHANISM YOKE, BRING BOTH ENDS FORWARD, WRAP AROUND SHAFT END AND TWIST ENDS OF WIRE TOGETHER.



STEEL WIRE ROPE. SEE PIECE MARKED ⑥ ON PAGE 4 AND PIECE MARKED ⑦ ON PAGE 6.

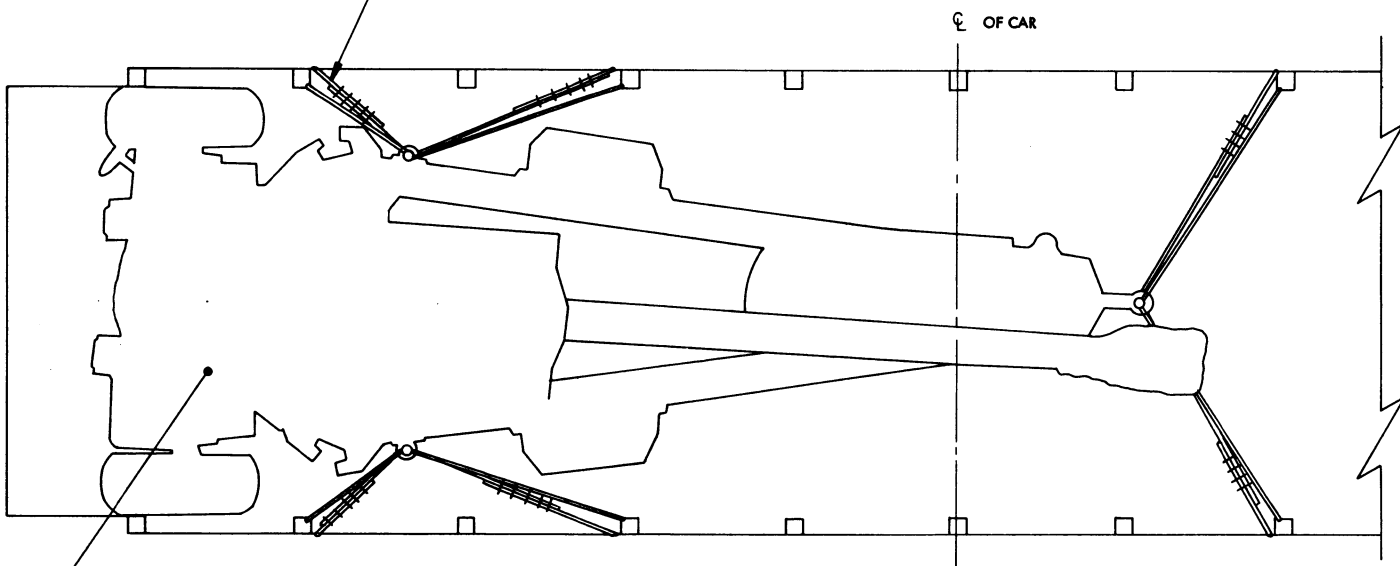


INDICATES HOWITZER WITH TUBE ON. THE SAME METHOD WILL APPLY TO HOWITZER WITH TUBE OFF.

PLAN VIEW

THE PARTIAL PLAN VIEW ABOVE INDICATES THE POSITIONING OF TWO (2) HOWITZERS ON A 10'-6" WIDE BY 40'-6" LONG FLAT CAR. THE METHOD SHOWN APPLIES TO THE HOWITZER WITH THE TUBE ON OR OFF. SEE SPECIAL NOTE 1 ON PAGE 5 AND SPECIAL NOTE 1 ON PAGE 7.

STEEL WIRE ROPE.

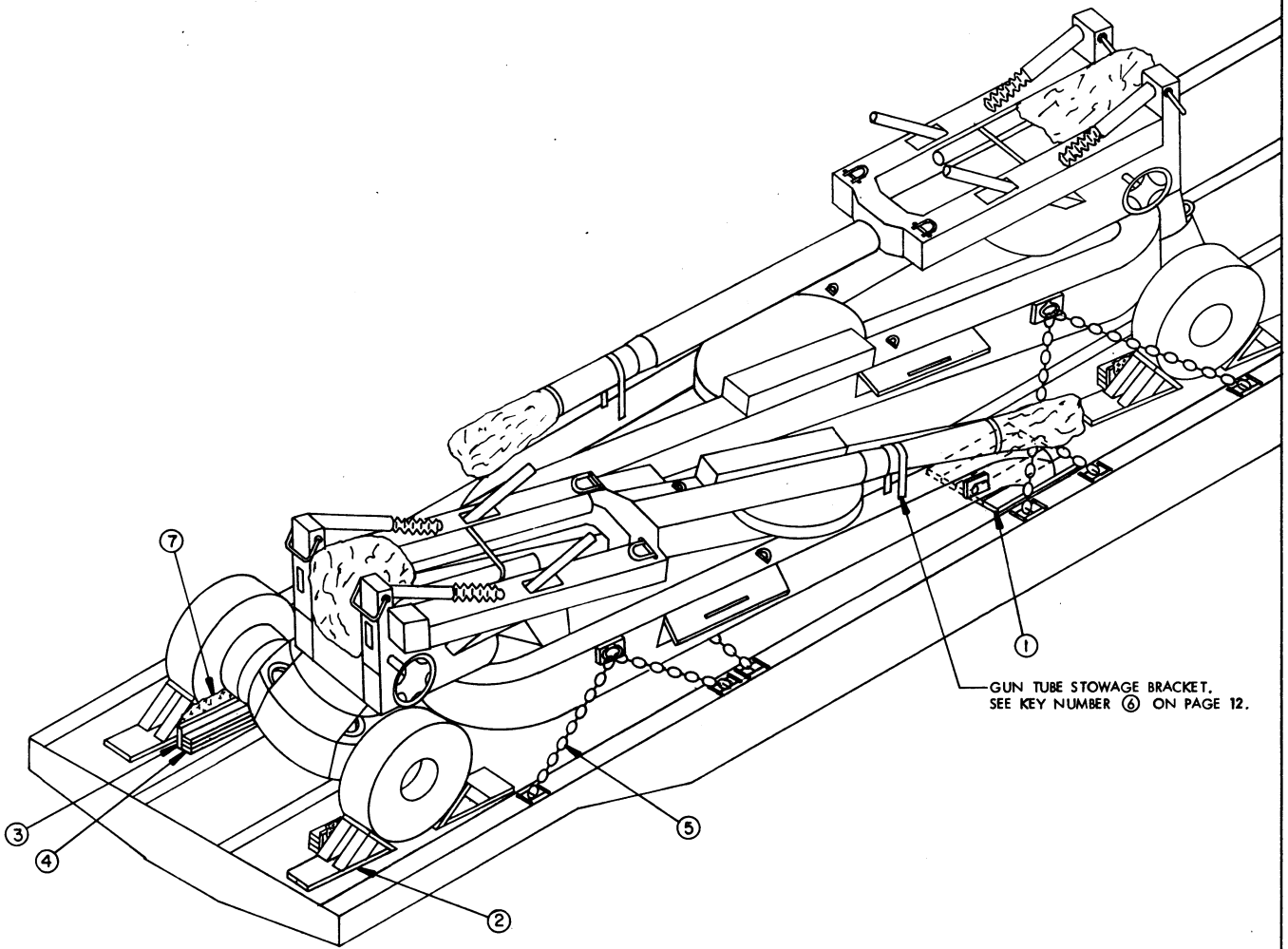


INDICATES HOWITZER WITH TUBE ON. THE SAME METHOD WILL APPLY TO HOWITZER WITH TUBE OFF.

PLAN VIEW

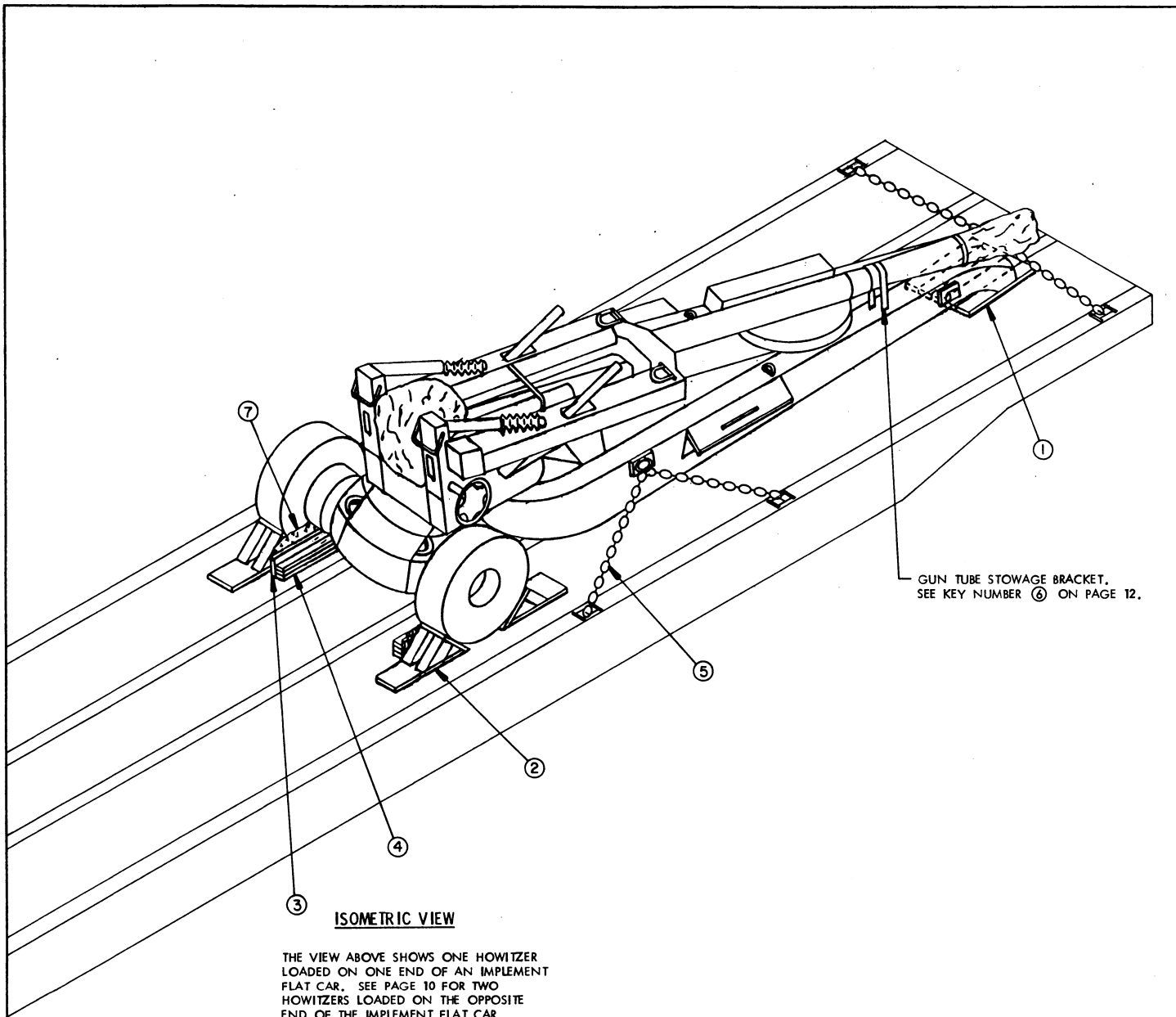
THE PARTIAL PLAN VIEW ABOVE INDICATES THE POSITIONING OF ONE (1) HOWITZER ON A FLAT CAR. A 10'-0" WIDE BY 40'-6" LONG FLAT CAR IS SHOWN. THE METHOD SHOWN APPLIES TO THE HOWITZER WITH THE TUBE ON OR OFF. SEE SPECIAL NOTE 2 ON PAGE 5 AND SPECIAL NOTE 2 ON PAGE 7.

DETAILS



**ISOMETRIC VIEW**

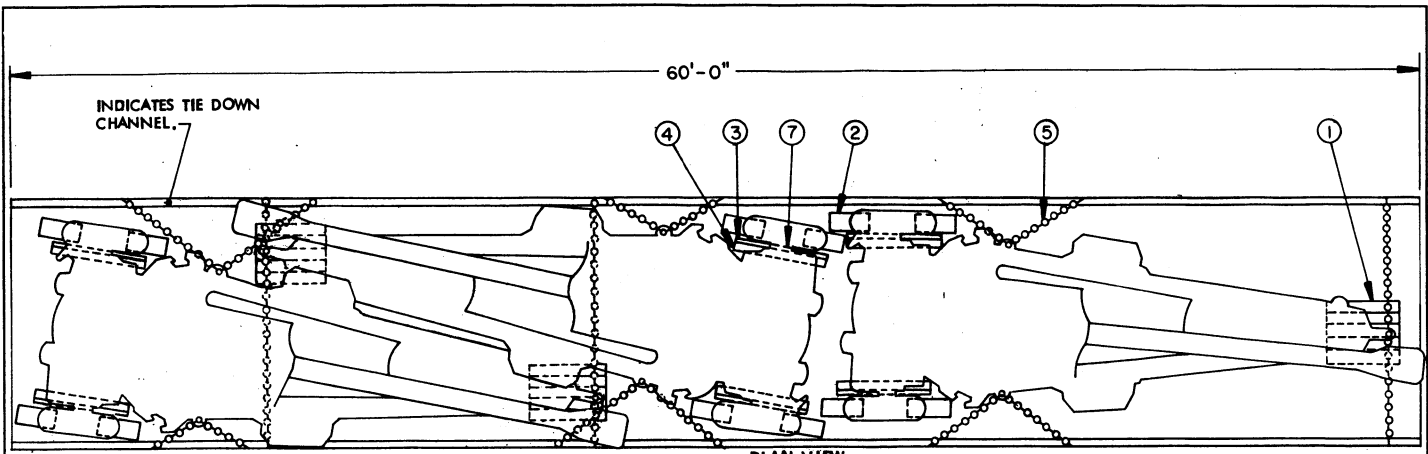
THE VIEW ABOVE SHOWS TWO HOWITZERS LOADED ON ONE END OF AN IMPLEMENT FLAT CAR. SEE PAGE 11 FOR ONE HOWITZER LOADED ON THE OPPOSITE END OF THE IMPLEMENT FLAT CAR. FOR "PLAN VIEW", "SPECIAL NOTES" AND "KEY NUMBERS" SEE PAGE 12.



GUN TUBE STORAGE BRACKET,  
SEE KEY NUMBER ⑥ ON PAGE 12.

**ISOMETRIC VIEW**

THE VIEW ABOVE SHOWS ONE HOWITZER  
LOADED ON ONE END OF AN IMPLEMENT  
FLAT CAR. SEE PAGE 10 FOR TWO  
HOWITZERS LOADED ON THE OPPOSITE  
END OF THE IMPLEMENT FLAT CAR.  
FOR "PLAN VIEW", "SPECIAL NOTES",  
AND "KEY NUMBERS", SEE PAGE 12.



PLAN VIEW

SPECIAL NOTES:

1. THREE (3) HOWITZERS MAY BE SHIPPED ON A 60'-0" LONG BY 10'-6" WIDE IMPLEMENT FLAT CAR AS SHOWN ABOVE. THE METHOD SHOWN APPLIES TO THE HOWITZER WITH THE TUBE ON OR OFF. SEE "ISOMETRIC VIEW" ON PAGES 10 AND 11.
2. IF ONLY ONE OR TWO HOWITZERS ARE TO BE SHIPPED, CENTER THEM ACROSS THE CAR WIDTH AS SHOWN FOR THE HOWITZER ON THE RIGHT END OF THE FLAT CAR IN THE "PLAN VIEW" ABOVE, AND "ISOMETRIC VIEW" ON PAGE 11.
3. LOADING PROCEDURES:

- (A) PRIOR TO SECURING A HOWITZER ON THE FLAT CAR, PRE-POSITION THE PLATFORM MARKED ① UNDER THE FORWARD END OF THE HOWITZER TRAILS AND NAIL IN PLACE AS INSTRUCTED IN KEY NUMBER ①. THE PURPOSE OF THE PLATFORM IS TO KEEP THE "TRAILS" FROM GOUGING THE FLOOR OF THE FLAT CAR. SEE THE "ISOMETRIC VIEW" ON PAGE 4 FOR ADDITIONAL GUIDANCE.
- (B) AFTER A HOWITZER IS PROPERLY LOCATED ON THE FLAT CAR POSITION TWO (2) CHOCK BLOCKS, MARKED ②, TIGHTLY AGAINST THE CENTER OF THE TIRES AT THE REAR OF THE HOWITZER AND NAIL IN PLACE AS INSTRUCTED IN KEY NUMBER ② ON THIS PAGE.
- (C) INSTALL TWO (2) CHAIN TIEDOWN ASSEMBLIES, MARKED ⑤, FROM THE TIEDOWN DEVICE ON THE HOWITZER, ANGLED TOWARD THE REAR OF THE HOWITZER, TO A MOVEABLE ANCHOR POSITIONED ON THE SIDE OF THE FLAT CAR. TENSION THESE TWO REAR CHAIN TIEDOWN ASSEMBLIES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE REAR CHOCK BLOCKS. SEE GENERAL NOTE "B" ON PAGE 2.
- (D) POSITION THE RUBBING STRIPS MARKED ③, THE SIDE BLOCKING MARKED ④, AND THE WATERPROOF PAPER MARKED ⑦, AGAINST THE INSIDE OF THE TIRES AND NAIL IN PLACE AS INSTRUCTED IN KEY NUMBER ④ ON THIS PAGE.
- (E) POSITION TWO (2) CHOCK BLOCKS, MARKED ②, TIGHTLY AGAINST THE CENTER OF THE TIRES TOWARD THE FRONT OF THE HOWITZER AND NAIL IN PLACE AS INSTRUCTED IN KEY NUMBER ② ON THIS PAGE.
- (F) INSTALL TWO (2) CHAIN TIEDOWN ASSEMBLIES, MARKED ⑤, FROM THE TIEDOWN DEVICE ON THE HOWITZER, ANGLED TOWARD THE FRONT OF THE HOWITZER, TO A MOVEABLE ANCHOR POSITIONED ON THE SIDE OF THE FLAT CAR. TENSION THESE TWO FORWARD CHAIN TIEDOWN ASSEMBLIES TIGHTLY, MAKING SURE THAT THE TIRES ARE PULLED TIGHT AGAINST THE FORWARD CHOCK BLOCKS.
- (G) INSTALL TWO (2) CHAIN TIEDOWN ASSEMBLIES, MARKED ⑤, FROM THE LUNETTE ON THE HOWITZER TO A MOVEABLE ANCHOR POSITIONED ON THE SIDE OF THE FLAT CAR.

KEY NUMBERS (FOR ONE HOWITZER)

- ① PLATFORM, 2" X 6" X 36" (5 REQD). PRE-POSITION AS SHOWN IN THE "PLAN VIEW" ABOVE AND NAIL EACH PIECE TO THE CAR FLOOR W/3-30d NAILS AT EACH END. SEE SPECIAL NOTE 3 (A) ON THIS PAGE.
- ② CHOCK BLOCK FOR NARROW TIRES (4 REQD). SEE THE DETAIL ON PAGE 3. POSITION WITH THE BEARING PIECE AGAINST THE CENTER OF A TIRE. NAIL TO THE CAR FLOOR W/9-30d NAILS. SEE SPECIAL NOTE 3 (B) AND (E) ON THIS PAGE.
- ③ RUBBING STRIP, 2" X 6" X 48" (2 REQD). POSITION ON EDGE AND NAIL TO LOWER PIECE MARKED ④ W/5-12d NAILS. SEE SPECIAL NOTE 3 (D) ON THIS PAGE.
- ④ SIDE BLOCKING, 2" X 4" X 48" (TRIPLEX) (2 REQD). NAIL THE FIRST PIECE TO THE CAR FLOOR W/5-30d NAILS. NAIL EACH ADDITIONAL PIECE IN A LIKE MANNER. SEE SPECIAL NOTE 3 (D) ON THIS PAGE.
- ⑤ CHAIN TIEDOWN ASSEMBLY, (6 REQD). INSTALL CHAIN TO APPROXIMATE ANGLE SHOWN. SEE GENERAL NOTE "B" AND "SPECIAL PROVISIONS" ON PAGE 2, AND SPECIAL NOTE 3 (C), (F), AND (G), ON THIS PAGE.
- ⑥ WIRE, NO. 14 GAGE, SOFT ANNEALED (AS REQD). WIRE THE PIN WHICH LOCKS THE GUN TUBE STOWAGE BRACKET IN SUCH A MANNER THAT THE PIN CANNOT COME OUT DURING TRANSIT. SEE THE "ISOMETRIC VIEW" ON PAGE 14 FOR GUIDANCE.
- ⑦ WATERPROOF PAPER OR BURLAP OF A SUFFICIENT SIZE TO POSITION UNDER AND EXTEND 2" ABOVE PIECE MARKED ③.

LOAD AS SHOWN

ITEM	QUANTITY	WEIGHT (APPROX)
155MM HOWITZER-----	3-----	47,034 LBS
DUNNAGE-----		933 LBS
TOTAL WEIGHT-----		47,967 LBS