

APPROVED
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 DATE 3/4/65 MILITARY ASSISTANT

LOADING & BRACING IN CLOSED OR OPEN TOP VAN TRAILERS FOR TRAILER-ON-FLAT-CAR (TOFC) SHIPMENT OF GUIDED MISSILE AMMUNITION AND/OR COMPONENTS, PACKED IN SMALL BOXES, FOR ALL MISSILE SYSTEMS

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LOADING & BRACING IN CLOSED OR OPEN TOP VAN TRAILERS FOR TRAILER-ON-FLAT-CAR (TOFC) SHIPMENT OF GUIDED MISSILE AMMUNITION AND/OR COMPONENTS, PACKED IN SMALL BOXES, FOR ALL MISSILE SYSTEMS			
DESIGNER E.W.M.	APPROV. BY <i>[Signature]</i>	REVISION DIW/AGE	SUBMITTED <i>[Signature]</i>
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REVISIONS			APPROVED BY ORDER OF COMMANDER, ARMY MATERIEL COMMAND <i>[Signature]</i>
			U.S. ARMY MATERIEL COMMAND
			14 APRIL 1965
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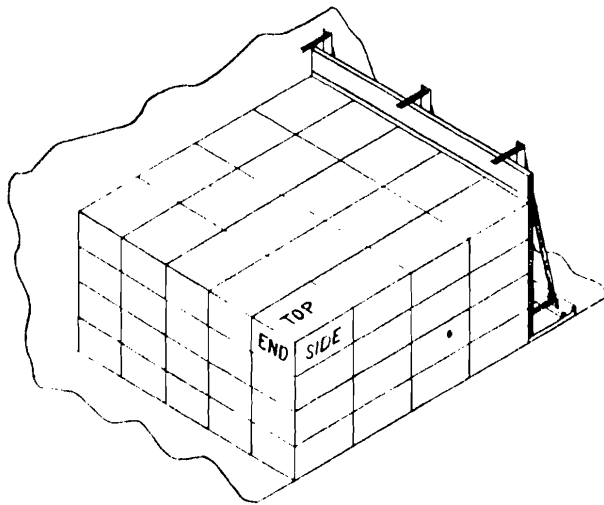
DO NOT SCALE

GENERAL NOTES

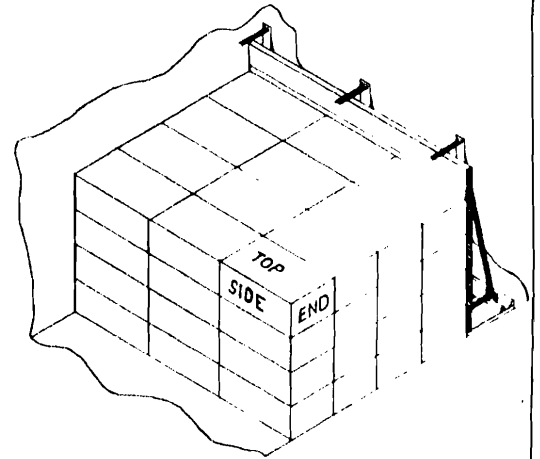
- A. LOADING AND BRACING PROCEDURES SHOWN HEREIN ARE APPLICABLE TO TRAILERS EQUIPPED WITH SPECIAL BULKHEAD BRACES AS PER ORDNANCE CORPS DRAWING 19-48-D-ORDJU-2440. TRAILER LOADS WILL BE SHIPPED ONLY ON THE APPROVED TYPE OF RAILROAD EQUIPMENT LISTED THEREIN.
- B. LOADS AS SHOWN HEREIN ARE TYPICAL ONLY AND ARE BASED ON CLOSED OR OPEN TOP VAN TRAILERS HAVING 25'-0" CLEARANCE BETWEEN INSTALLED BULKHEAD BRACES x 7'-6" WIDE (INSIDE DIMENSION).
- C. GROSS WEIGHT AND AXLE DISTRIBUTION OF WEIGHT WILL BE IN ACCORDANCE WITH PARAGRAPH B, 346.4, ORDM 3-4, VOL 3.
- D. SELECTION OF VEHICLES TO BE USED TO TRANSPORT GUIDED MISSILE AMMUNITION AND/OR COMPONENTS THEREOF, MUST COMPLY WITH AR-55-355, CHAPTER 213, FOR EXPLOSIVES OR OTHER DANGEROUS ARTICLES, IN FULL.
- E. NOTICE: SHIPMENTS WILL BE POSITIONED IN THE TRAILER CONSISTENT WITH THE WEIGHT LAWS OF THE STATES THRU WHICH THE TRAILER WILL BE TRANSPORTED VIA HIGHWAY.
- F. WHEN ANY STRAP IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF TWO (2) SEALS AND TWO (2) CRIMPS PER SEAL MUST BE USED.
- G. DO NOT NAIL BLOCKING SHOWN HEREIN TO THE TRAILER BULKHEADS, SIDE WALLS, OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.
- H. CARE SHOULD BE EXERCISED WHEN LOADS ARE BUILT (SELECTION OF BOX POSITIONS, NUMBER OF LAYERS, ETC.) TO INSURE THE MINIMUM USAGE OF BLOCKING AND BRACING.
CAUTION: THE LADING MUST BE SOLIDLY BLOCKED FORE AND AFT TO PREVENT RELATIVE LONGITUDINAL MOVEMENT WITHIN THE LADING AND BETWEEN LADING AND TRAILER, AND IN ALL CASES THREE (3) 2" x .050" STRAPS (STEEL BANDS) MUST BE USED BETWEEN THE SPECIAL TRAILER BULKHEADS.

MATERIAL SPECIFICATIONS

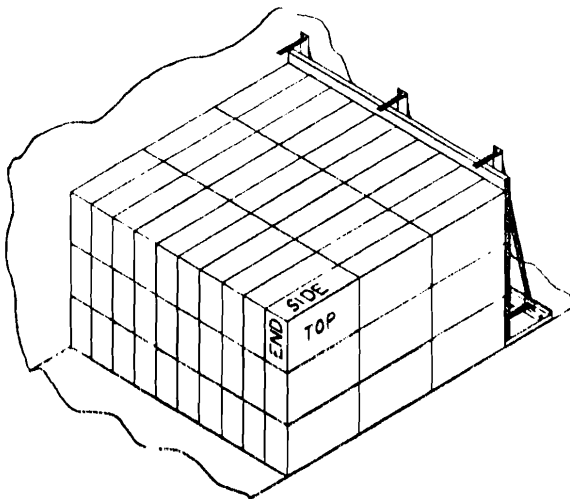
LUMBER: SEE PARAGRAPH B100, ORDM 3-4, VOL 3.
NAILS: COMMON, CEMENT COATED, FED SPEC FF-N-105.
ALT: ANNULAR-RING TYPE NAIL OF SAME SIZE.
STRAPPING, STEEL: TYPE 1, CLASS "A" OR "C", FED SPEC QQ-S-791. FOR FSN SEE SB-38-100



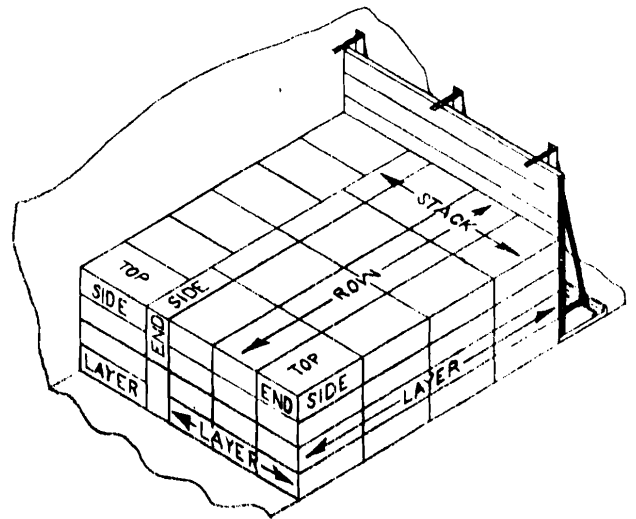
BOX POSITION "A"



BOX POSITION "B"



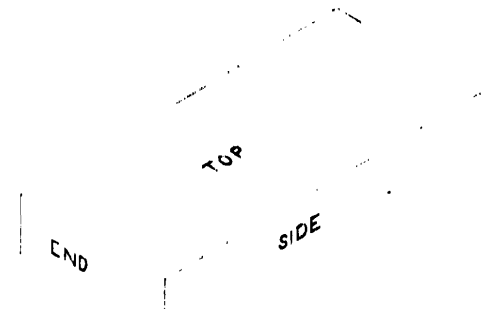
BOX POSITION "C"



COMBINATION OF POSITIONS

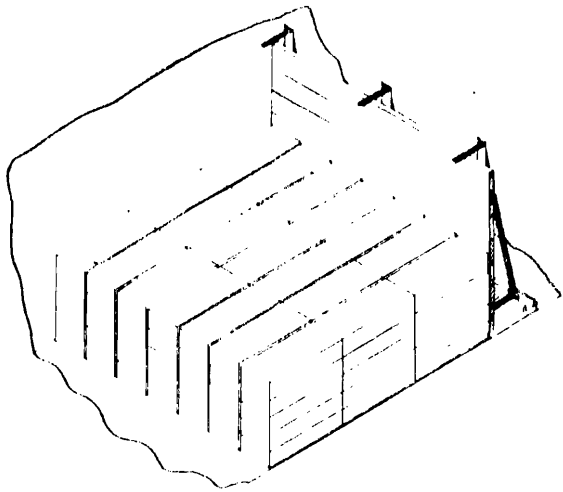
NOTES:

1. BOXED AMMUNITION, AND COMPONENTS MAY BE LOADED IN TRAILERS USING ANY ONE OR COMBINATION OF BOX POSITIONS SHOWN UNLESS THE BOX IS SPECIFICALLY MARKED "THIS SIDE UP". SUCH BOXES WILL BE POSITIONED THUSLY.
2. WHEN BOXES ARE LOADED IN TWO OR MORE POSITIONS IN THE SAME TRAILER, ALL BOXES IN ANY ONE ROW MUST BE LOADED IN THE SAME DIRECTION. ENDS AND SIDES OF BOXES MUST NOT CONTACT EACH OTHER IN THE SAME ROW WITH RESPECT TO THE LENGTH OF THE TRAILER.

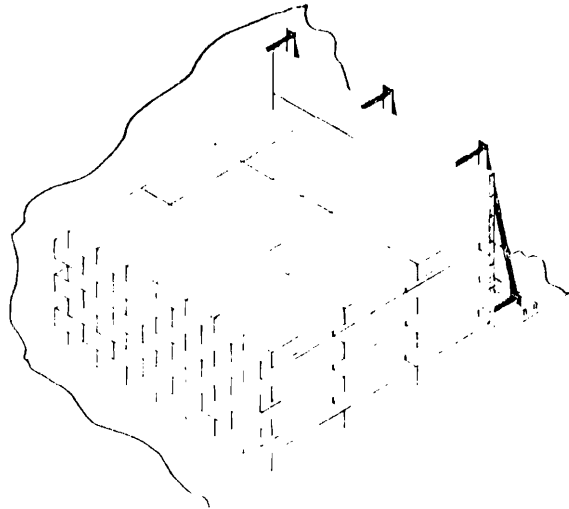


KEY TO BOX POSITIONS

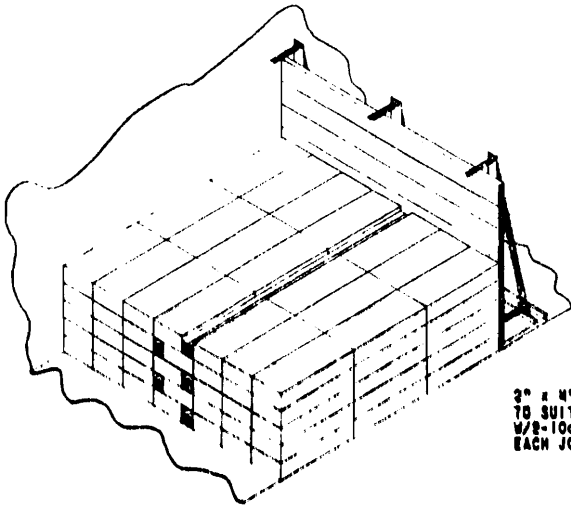
AUTHORIZED BOX POSITIONS



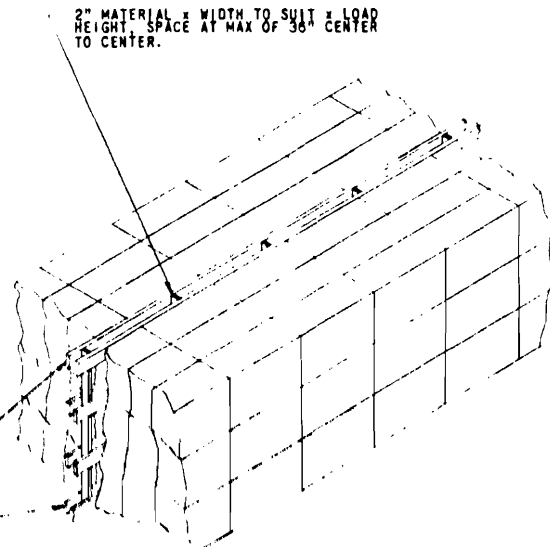
DISTRIBUTING SPACES (NOTE 1)



ALTERNATING LAYERS (NOTE 1)



SOLID FILLER (NOTE 2)



2" MATERIAL x WIDTH TO SUIT x LOAD HEIGHT SPACE AT MAX OF 36" CENTER TO CENTER.

2" x 4" x LENGTH TO SUIT. NAIL W/8-10d NAILS EACH JOINT.

SEE NOTE "a".

CRIB FILLER (NOTE 2)

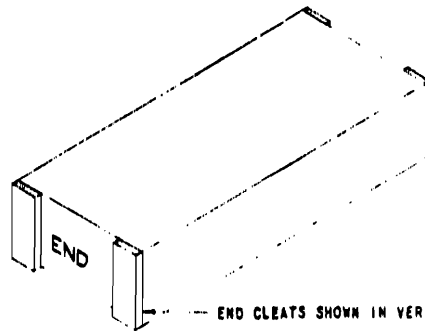
NOTES:

1. EXCESS SPACE ACROSS WIDTH OF TRAILER MUST NOT EXCEED ONE-THIRD THE WIDTH OF A BOX. WHEN BOXES WITH END CLEATS ARE POSITIONED IN THE LOAD WITH THE CLEATS VERTICAL AND FACING FORE AND AFT, THE TOTAL EXCESS SPACE MUST BE LESS THAN THE WIDTH OF A CLEAT. SEE "END CLEAT DETAIL".
2. NORMALLY, EXCESS SPACE IN WIDTH OF TRAILER CAN BE UTILIZED SATISFACTORILY BY USING A COMBINATION OF BOX POSITIONS AS SHOWN ON PAGE 3, OR ALTERNATING LAYERS, OR DISTRIBUTING SPACE AS SHOWN ABOVE. "SOLID FILLER" AND "CRIB FILLER" WILL REQUIRE VERY LIMITED USE.

RECOMMENDED TO FILL SPACE IN EXCESS OF 1/3 BOX WIDTH, OR SPACE GREATER THAN WIDTH OF END CLEAT WHEN BOXES ARE POSITIONED IN THE LOAD WITH CLEATS VERTICAL AND FACING FORE AND AFT.

NOTE "a":

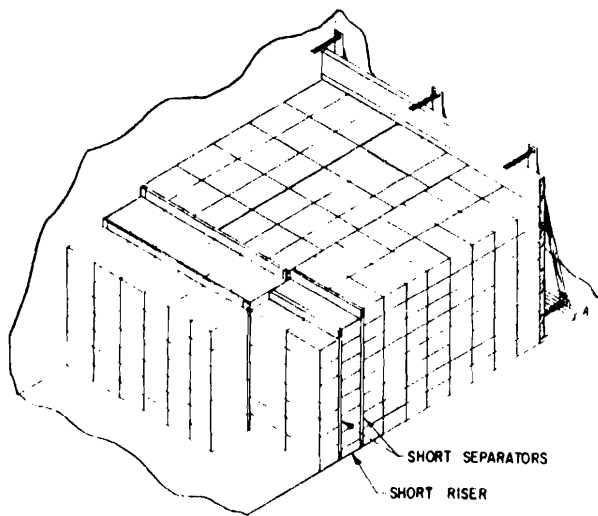
WHEN LOADS ARE MORE THAN ONE (1) LAYER IN HEIGHT, HORIZONTAL 2" x 4" MATERIAL WILL BE USED AT TOP AND BOTTOM OF LOAD, AND AT EACH JUNCTION OF LAYERS. FOR LOADS WITH ONE (1) LAYER USE 2" x 4" HORIZONTALS AT TOP AND BOTTOM ONLY.



END CLEATS SHOWN IN VERTICAL POSITION-

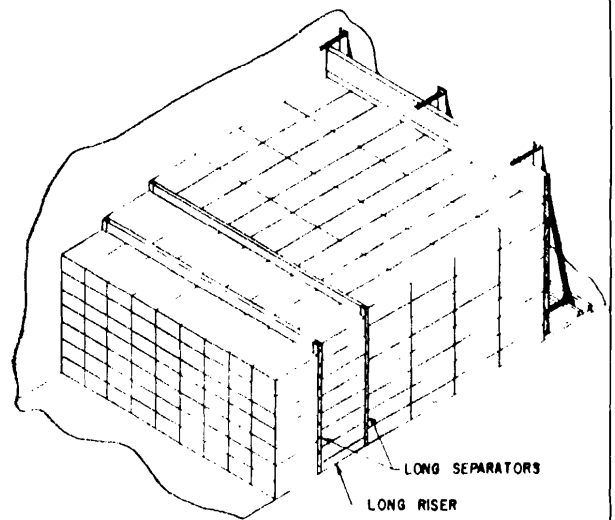
END CLEAT DETAIL

EXCESS WIDTH PROVISIONS



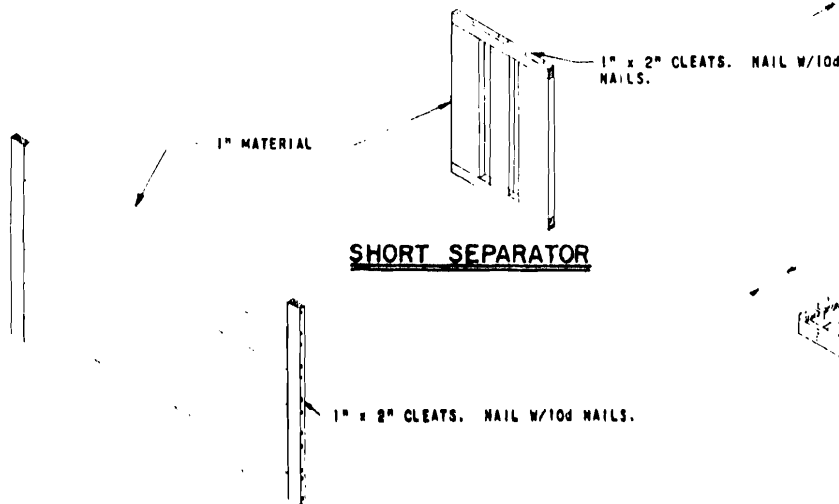
TYPICAL LOAD SECTION

SHOWING USE OF SHORT RISER AND SHORT SEPARATORS



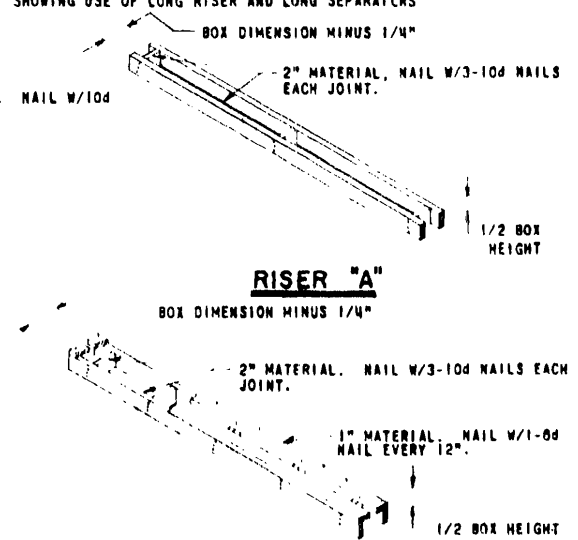
TYPICAL LOAD SECTION

SHOWING USE OF LONG RISER AND LONG SEPARATORS



SHORT SEPARATOR

LONG SEPARATOR



RISER "A"

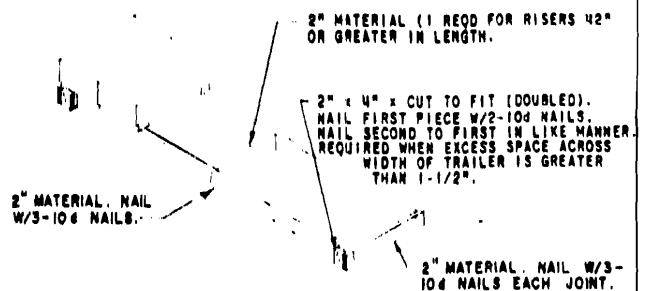
BOX DIMENSION MINUS 1/4"

RISER "B"

TO BE USED FOR LIGHTLY CONSTRUCTED OR FIBER BOARD BOXES ONLY. RISER MUST BE POSITIONED ONLY ON THE FLOOR.

NOTES:

1. RISER SHOULD BE ONE-HALF THE HEIGHT OF BOX BEING LOADED. WIDTH OF RISER IS SLIGHTLY LESS THAN BOX DIMENSION. LENGTH OF RISER IS DETERMINED BY THE OVER-ALL WIDTH OF LOAD OR PORTION TO BE STEPPED DOWN.
2. RISER(S) MAY BE PLACED ON FLOOR OF TRAILER OR UNDER ANY LAYER OF BOXES, AS DESIRED, UNLESS OTHERWISE SPECIFIED
3. SEPARATOR SHOULD BE HEIGHT OF LOAD. WIDTH OF SEPARATOR IS DETERMINED BY THE OVER-ALL WIDTH OF LOAD, OR PORTION OF LOAD TO BE SEPARATED. WHERE HEIGHT OF SEPARATOR IS GREATER THAN WIDTH, CLEATS ARE AT THE TOP AND BOTTOM. SEPARATORS WILL BE USED ONLY WHEN LOADING LIGHTLY CONSTRUCTED BOXES OR FIBER BOXES.

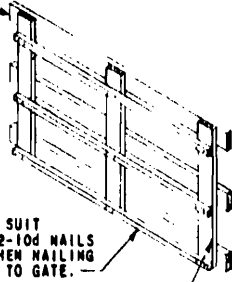


RISER "C"

FOR USE WITH SKIDDED BOXES WHEN SKIDS RUN ACROSS WIDTH OF TRAILER. THIS RISER MUST BE POSITIONED ONLY ON THE FLOOR.

RISERS AND SEPARATORS

2" x 6" x TRAILER WIDTH (CUT TO FIT) (AS REQD).
NAIL W/3-10d NAILS EACH JOINT. SEE CHART "A".



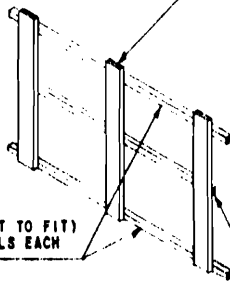
2" x 2" x LENGTH TO SUIT
(AS REQD). NAIL W/2-10d NAILS
EACH JOINT. OMIT WHEN NAILING
SOLID FILL MATERIAL TO GATE.

2" x 4" OR 2" x 6", 3 OR 4 REQD
AS PER CHART "B"

GATE "A"

TYPICAL GATE. FOR USE AGAINST LOAD

2" x 4" OR 2" x 6" MATERIAL. SIZE AND NO.
REQUIRED TO MATCH GATE USED AGAINST LOAD.



2" x 2" x TRAILER WIDTH (CUT TO FIT)
(2 REQD). NAIL W/2-10d NAILS EACH
JOINT.

2" x 2" x LENGTH TO SUIT (AS REQD).
NAIL W/2-10d NAILS EACH JOINT.

GATE "B"

TYPICAL GATE FOR USE AGAINST BULKHEAD
WHEN EXCESS SPACE REQUIRES THE USE OF
STRUTS.

CHART "A"

BOX HT.	MAX ROWS HIGH (SEE NOTE 9)	NO. GATE HORIZONTALS	LOCATION OF HORIZONTALS (SEE NOTE 8)
27-1/8 TO 45	2	3	T, 1-2, & B
18-1/8 TO 27	3	3	T, 2, & B
13-5/8 TO 18	4	3	T, 2-3, & B
1(-7/8 TO 13-1/2	5	4	T, 4, 2-3, & B
9-1/8 TO 10-3/4	6	4	T, 4-5, 2-3, & B
7-3/4 TO 9	7	5	T, 5-6, 4, 2-3, & B
6-1/8 TO 7-5/8	8	5	T, 6-7, 4-5, 2-3, & B

CODE: T - TOP OF LOAD
B - BOTTOM OF LOAD
2 - CENTERED ON BOX
1-2 - CENTERED ON JOINT.

NOTES: (GATE "A")

- 2" x 6" HORIZONTALS MUST BE TRAILER WIDTH (CUT TO FIT), OR LOAD WIDTH FOR LOADS WITH TWO (2) BOX POSITIONS AS SHOWN ON PAGE 11, AND MUST CONTACT EACH LAYER OF LOAD. SEE CHART ABOVE FOR NUMBER REQUIRED.
- FOR ONE (1) LAYER LOADS, 2" x 6" HORIZONTALS WILL BE PLACED AT TOP AND BOTTOM OF LOAD ONLY.
- SOLID FACED GATES SHOULD BE USED FOR LIGHTLY CONSTRUCTED OR FIBER BOARD BOXES.
- FOR SPLIT GATES: UP TO 48" USE TWO (2) VERTICALS, FROM 48" TO 72" USE THREE (3) VERTICALS.
- THE NUMBER OF VERTICAL PIECES REQUIRED IS DETERMINED BY THE NUMBER OF ROWS WIDE AND THE GROSS WEIGHT OF LADING. THE SIZE OF THE VERTICAL PIECES, 2" x 4" OR 2" x 6", IS DETERMINED BY THE GROSS WEIGHT OF LADING. 2" x 4" VERTICALS ARE ADEQUATE WHEN USING SOLID FILL MATERIAL LAMINATED TO GATE.
- THE 2" x 2" PIECES WILL BE CUT TO FIT ACROSS GATE VERTICALS AS SHOWN.
- THE NUMBER OF 2" x 2" PIECES IS DETERMINED BY THE NUMBER OF STRUTS REQUIRED VERTICALLY AND MUST BE POSITIONED TO ALIGN STRUTS WITH 2" x 6" HORIZONTALS.
- THE TOP HORIZONTAL OF GATE "A" FOR LOADS HIGHER THAN BULKHEAD BOARDS WILL BE POSITIONED AT 57" MAX HEIGHT, AND MUST CONTACT AT LEAST 3" OF TOP LAYER OF LADING. SEE "STRAPPING BLOCK" DETAIL, PAGE 7.
- THE FIGURES IN THIS COLUMN INDICATE THE MAXIMUM NUMBER OF BOXES OF THE SIZE LISTED IN COLUMN ONE WHICH MAY BE STACKED ADJACENT TO AN INSTALLED BULKHEAD BRACE OR A GATE. BOX HEIGHT WITHIN THE LOAD MAY BE INCREASED WITH THE USE OF RISERS. SEE DETAILS, PAGE 5.

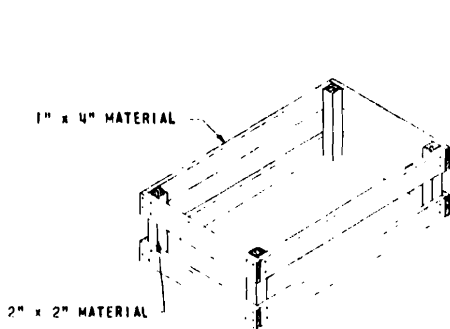
CHART "B"

MAX LOAD WT.	ROWS WIDE	GATE VERTICALS		DOUBLED STRUTS	
		NO.	SIZE	NO.	SIZE
14,000	6 OR LESS	3	2" x 4"	6	2" x 4"
18,000	OVER 6	4	2" x 4"	8	2" x 4"
21,000	6 OR LESS	3	2" x 4"	8	2" x 4"
22,000	6 OR LESS	3	2" x 6"	6	2" x 6"
29,000	OVER 6	4	2" x 6"	8	2" x 6"
33,000	6 OR LESS	3	2" x 6"	9	2" x 6"
40,000	6 OR LESS	3	2" x 6"	12	2" x 6"
40,000	OVER 6	4	2" x 6"	12	2" x 6"

NOTES: (GATE "B")

- THE NUMBER AND SIZE OF GATE VERTICALS MUST MATCH THOSE IN GATE "A".
- GATE "B" HORIZONTALS AT TOP AND BOTTOM OF GATE MUST BE TRAILER WIDTH (CUT TO FIT) TO MAINTAIN GATE ALIGNMENT. INTERMEDIATE HORIZONTALS MAY BE CUT TO FIT ACROSS GATE VERTICALS.
- THE NUMBER OF HORIZONTALS IS DETERMINED BY THE NUMBER OF STRUTS REQUIRED VERTICALLY AND MUST ALIGN WITH 2" x 2" PIECE ON GATE "A".

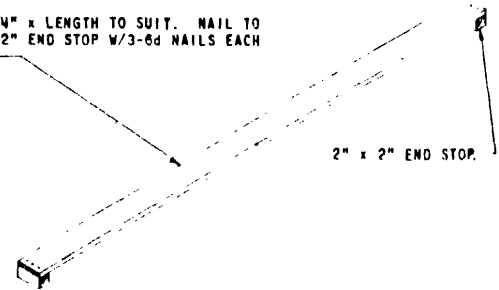
GATES



FILLER ASSEMBLY

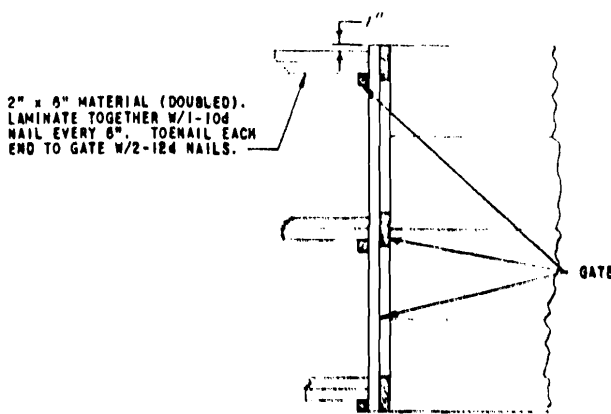
CONSTRUCT TO APPROXIMATE SIZE AND STRENGTH OF AN OMITTED BOX(ES). POSITION NEAR MID-SECTION OF LOAD.

1" x 4" x LENGTH TO SUIT. NAIL TO 2" x 2" END STOP W/3-6d NAILS EACH END.



BATTEN ASSEMBLY

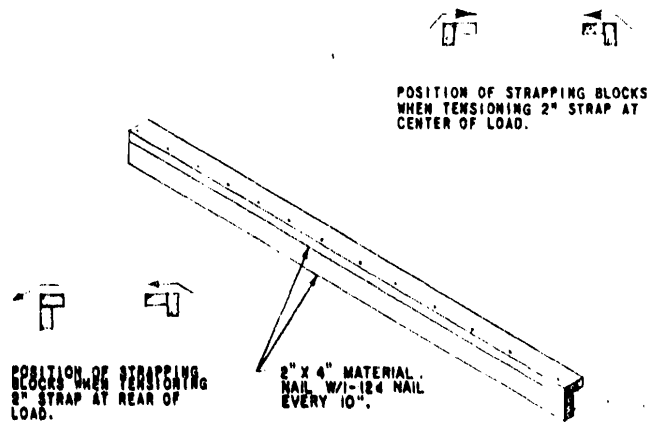
SEE NOTE 3, PAGE 8



STRUT DETAIL

2" x 6" MATERIAL (DOUBLED). LAMINATE TOGETHER W/1-10d NAIL EVERY 6". TOENAIL EACH END TO GATE W/2-12d NAILS.

GATE



POSITION OF STRAPPING BLOCKS WHEN TENSIONING 2" STRAP AT CENTER OF LOAD.

POSITION OF STRAPPING BLOCKS WHEN TENSIONING 2" STRAP AT REAR OF GATE.

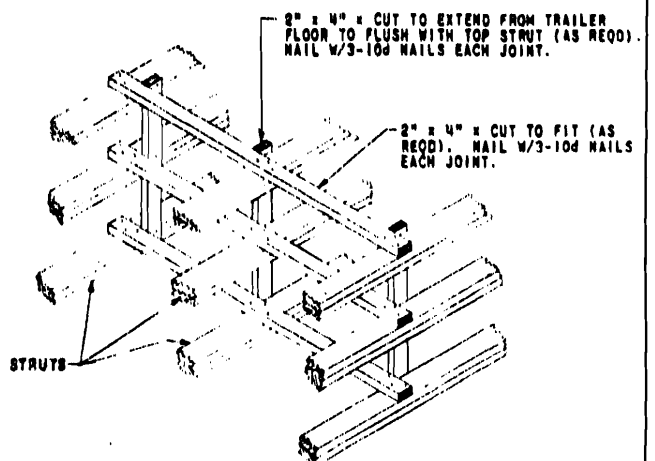
2" x 4" MATERIAL. NAIL W/1-12d NAIL EVERY 10".

STRAPPING BLOCK

TO BE USED AT ENDS OF LADING WHEN LOAD HEIGHT IS 80" OR GREATER. SEE DETAILS, ABOVE, FOR PROPER POSITIONING.

NOTES

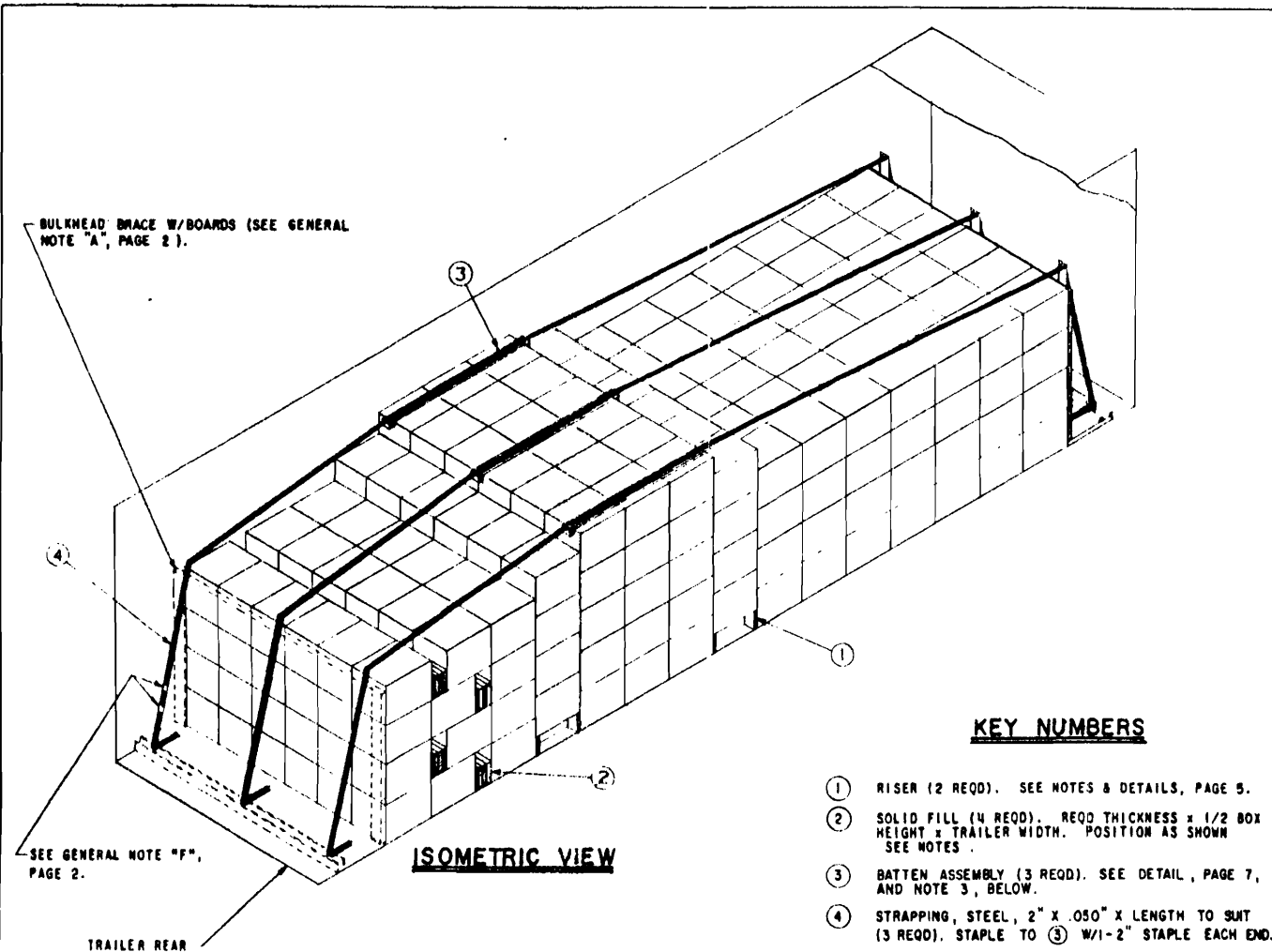
1. FOR ONE (1) LAYER LOADS POSITION STRUTS AT TOP AND BOTTOM OF GATE ONLY.
2. FOR LOADS OF MORE THAN ONE LAYER AND 80" OR LESS IN HEIGHT POSITION STRUTS AT TOP AND BOTTOM OF GATE AND AT INTERMEDIATE CROSS MEMBERS OF GATE, AS REQUIRED BY CHART, PAGE 6.
3. FOR LOADS GREATER IN HEIGHT THAN THE HEIGHT OF BULKHEAD BOARDS, STRUTS WILL BE POSITIONED AT 80" HEIGHT, AT BOTTOM OF GATE, AND AT INTERMEDIATE CROSS MEMBERS OF GATE, AS REQUIRED BY CHART, PAGE 6.



TYPICAL STRUT BRACING

FOR STRUTS 80" OR GREATER IN LENGTH: STRUTS ARE REQUIRED TO USE STRUTS GREATER THAN 80" IN LENGTH.

DETAILS



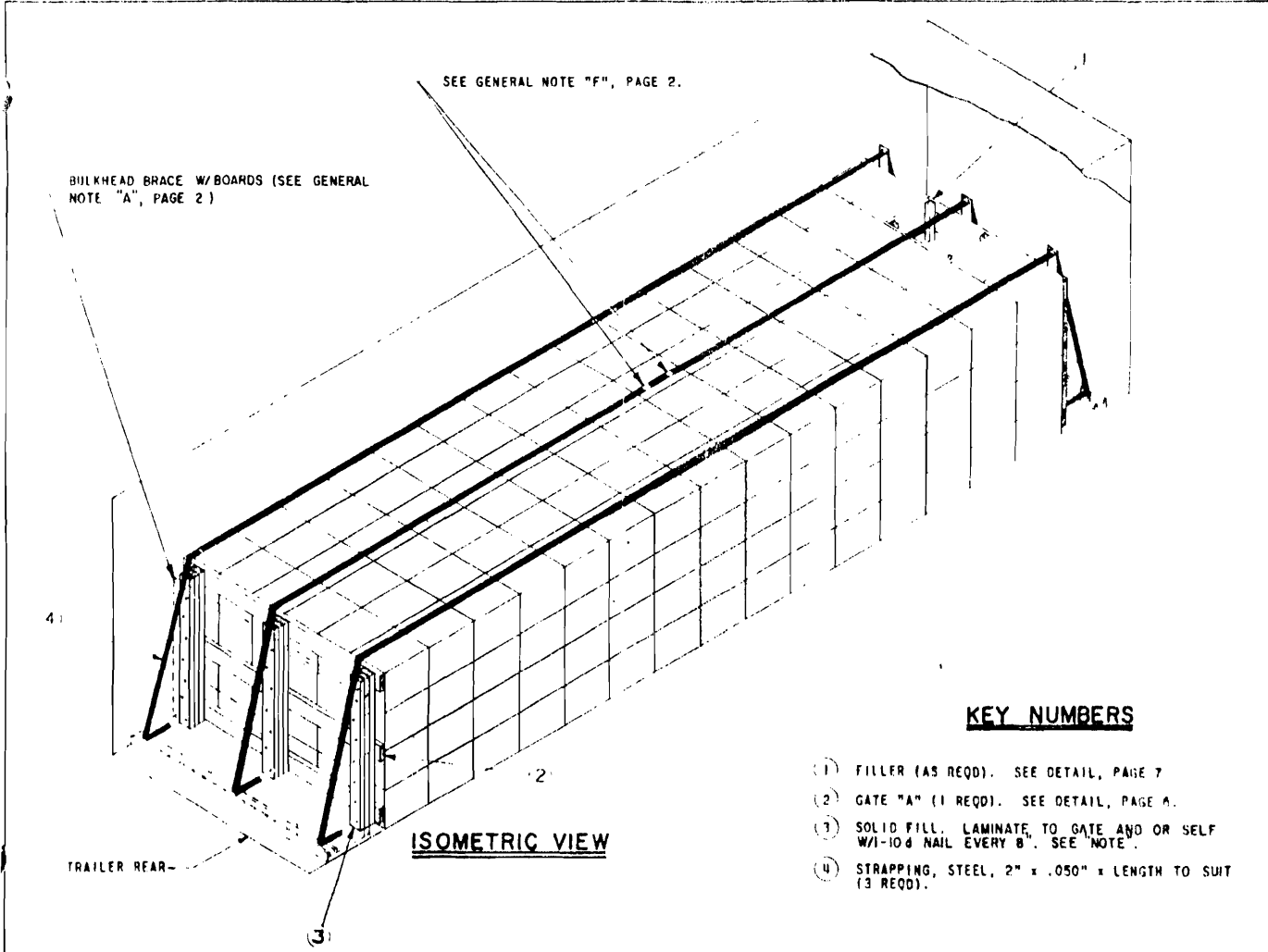
KEY NUMBERS

- ① RISER (2 REQD). SEE NOTES & DETAILS, PAGE 5.
- ② SOLID FILL (4 REQD). REQD THICKNESS \times 1/2 BOX HEIGHT \times TRAILER WIDTH. POSITION AS SHOWN SEE NOTES.
- ③ BATTEN ASSEMBLY (3 REQD). SEE DETAIL, PAGE 7, AND NOTE 3, BELOW.
- ④ STRAPPING, STEEL, 2" \times .050" \times LENGTH TO SUIT (3 REQD). STAPLE TO ③ W/1-2" STAPLE EACH END.

NOTES:

- 1. SOLID FILL SHOWN IS RECOMMENDED FOR BLOCKING OF LOAD WHEN EXCESS SPACE DOES NOT EXCEED 8". SOLID FILL MAY BE LOCATED TO SUIT. APPLY FILL IN TWO (2) LOCATIONS IN EACH LAYER IF EXCESS SPACE IS GREATER THAN 1/3 THE BOX DIMENSION POSITIONED LENGTHWISE IN TRAILER.
- 2. RISERS MAY BE LOCATED TO SUIT WEIGHT DISTRIBUTION REQUIREMENTS.
- 3. WHEN COMMODITY IS PACKED IN FIBER BOARD BOXES AND HEIGHT OF LOAD EXTENDS ABOVE BULKHEAD BRACE, "BATTEN ASSEMBLIES" WILL BE USED BETWEEN PIECE ④ AND COMMODITY. SEE "BATTEN ASSEMBLY", DETAIL, PAGE 7.

**TYPICAL LOAD
WITH RISERS AND SOLID FILL**



SEE GENERAL NOTE "F", PAGE 2.

BULKHEAD BRACE W/BOARDS (SEE GENERAL NOTE "A", PAGE 2)

4

2

ISOMETRIC VIEW

TRAILER REAR

3

KEY NUMBERS

- (1) FILLER (AS REQD). SEE DETAIL, PAGE 7
- (2) GATE "A" (1 REQD). SEE DETAIL, PAGE 4.
- (3) SOLID FILL. LAMINATE TO GATE AND OR SELF W/1-10d NAIL EVERY 8". SEE NOTE.
- (4) STRAPPING, STEEL, 2" x .050" x LENGTH TO SUIT (3 REQD).

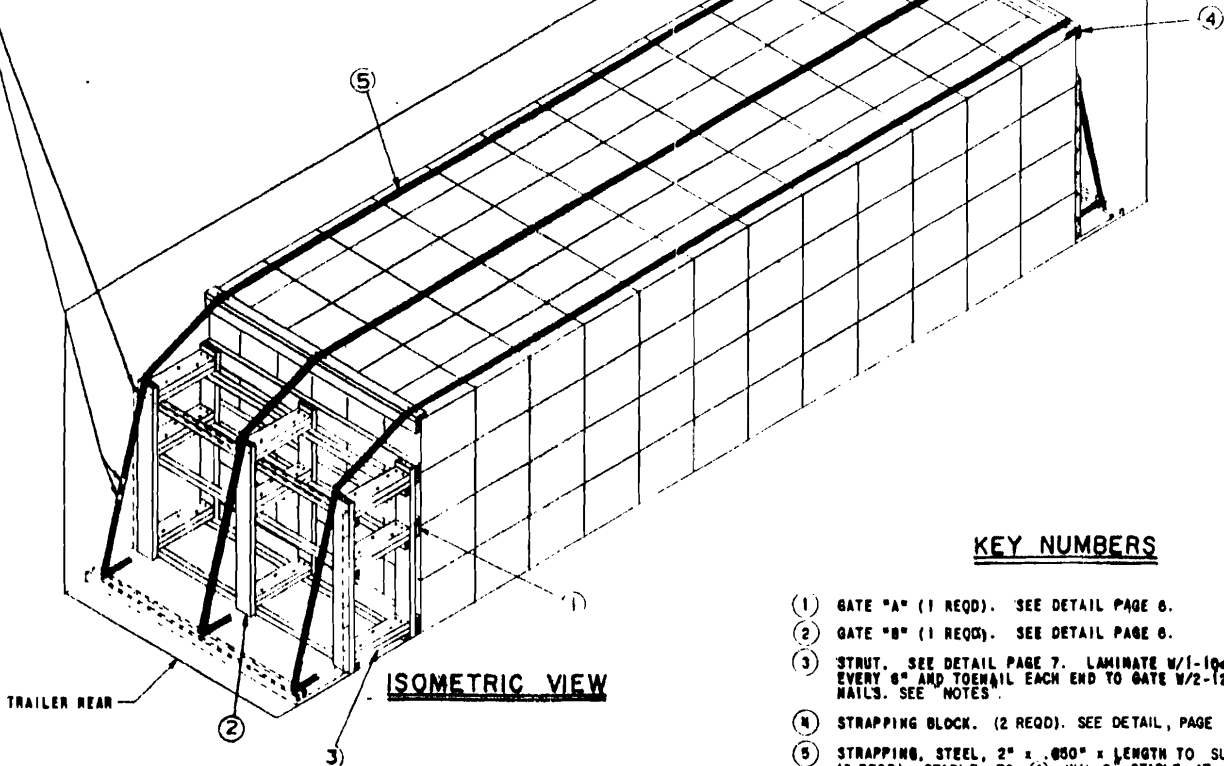
NOTE:

- 1. GATE AND SOLID FILL, AS SHOWN, IS RECOMMENDED FOR BLOCKING OF LOAD, WHEN EXCESS SPACE EXCEEDS 8" BUT IS NOT GREATER THAN 17".

TYPICAL LOAD
WITH FILLER GATE AND SOLID FILL

SEE GENERAL NOTE "F", PAGE 9.

BULKHEAD BRACE W/BOARDS (SEE GENERAL NOTE "A", PAGE 2).



KEY NUMBERS

- (1) GATE "A" (1 REQ). SEE DETAIL PAGE 6.
- (2) GATE "B" (1 REQ). SEE DETAIL PAGE 6.
- (3) STRUT. SEE DETAIL PAGE 7. LAMINATE W/1-10d NAIL EVERY 6" AND TOENAIL EACH END TO GATE W/2-12d NAILS. SEE "NOTES".
- (4) STRAPPING BLOCK. (2 REQ). SEE DETAIL, PAGE 7.
- (5) STRAPPING, STEEL, 2" x .080" x LENGTH TO SUIT (3 REQ). STAPLE TO (4) W/1-2 STAPLE AT EACH JOINT.

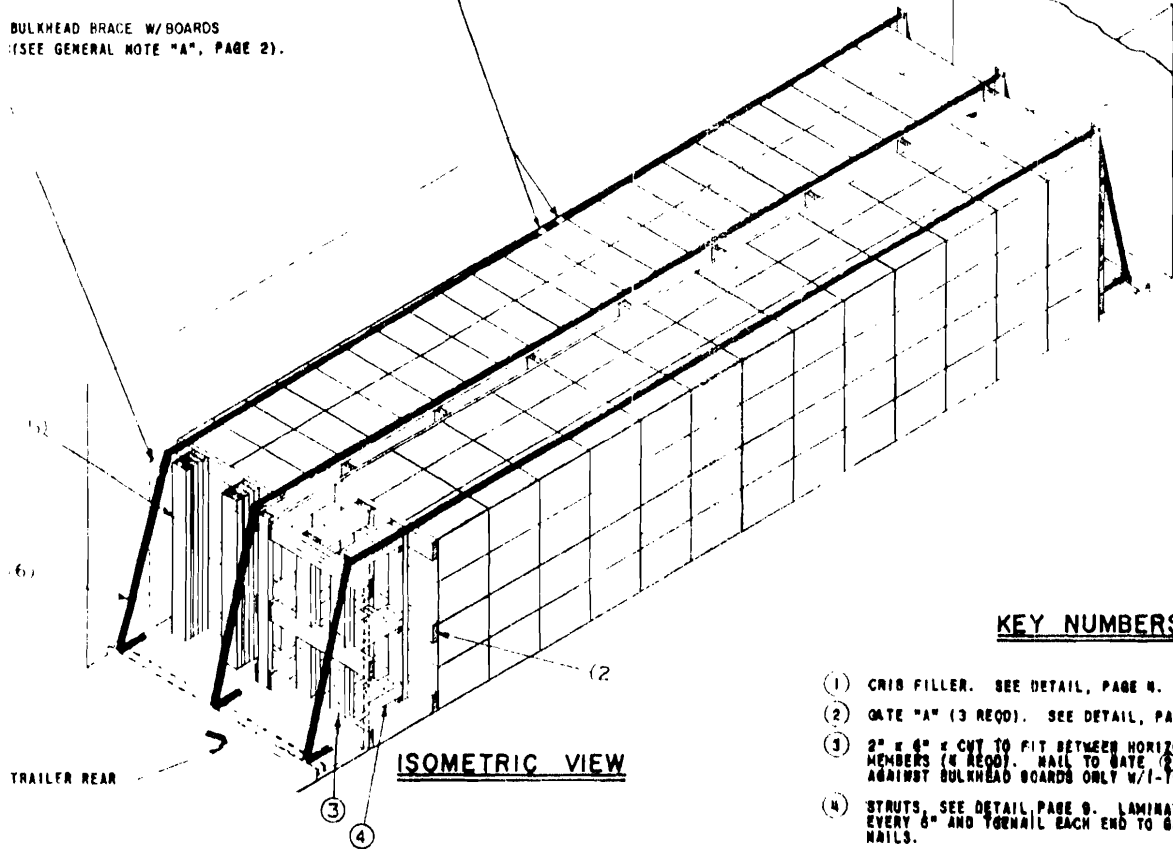
NOTES:

1. GATES AND STRUT BRACING, AS SHOWN, ARE RECOMMENDED WHEN EXCESS SPACE EXCEEDS 17". SEE DETAILS, PAGE 7.
2. GATES AND STRUTS MAY ALSO BE INSTALLED AT REAR OF FRONT BULKHEAD BRACE IF THE LADING POSITION MUST BE ADJUSTED TO SATISFY WEIGHT DISTRIBUTION REQUIREMENTS.

TYPICAL LOAD
WITH GATES, STRUTS, AND STRAPPING BLOCKS

BULKHEAD BRACE W/BOARDS
 (SEE GENERAL NOTE "A", PAGE 2).

SEE GENERAL NOTE "F", PAGE 2.



KEY NUMBERS

- (1) CRIB FILLER. SEE DETAIL, PAGE 4.
- (2) GATE "A" (3 REQD). SEE DETAIL, PAGE 6.
- (3) 2" x 4" x CMT TO FIT BETWEEN HORIZONTAL CROSS MEMBERS (4 REQD). NAIL TO GATE (2) POSITIONED AGAINST BULKHEAD BOARDS ONLY W/1-10d NAIL EVERY 8".
- (4) STRUTS. SEE DETAIL, PAGE 9. LAMINATE W/1-10d NAIL EVERY 6" AND TOENAIL EACH END TO GATE (2) W/2-12d NAILS.
- (5) SOLID FILL (2 REQD). 6" WIDE MATERIAL x REQUIRED LENGTH. NAIL AND TOENAIL TO (3) AND/OR SELF W/10d NAILS.
- (6) STRAPPING, STEEL, 2" x .060" x LENGTH TO SUIT (3 REQD).

NOTES:

- 1 CRIB FILLER MUST EXTEND FROM BULKHEAD TO BULKHEAD TO RETAIN GATES IN PROPER POSITION.
- 2 GATE "B" NORMALLY REQUIRED ADJACENT TO BULKHEAD BRACE FOR ALIGNING STRUTS, CANNOT BE USED IN LOADS CONTAINING CRIB FILLER.

**TYPICAL LOAD
 WITH CRIB FILLER, GATES, STRUTS AND SOLID FILL**

