

# APPENDIX 50

## UNITIZATION PROCEDURES FOR AMMUNITION AND COMPONENTS PACKED IN CYLINDRICAL METAL OR PLASTIC CONTAINERS ON 4- WAY ENTRY WOODEN PALLETS WITH METAL TOP LIFT

**MODULAR ARTILLERY CHARGE SYSTEM (MACS),  
M231, PACKED 4 PER PA161 CYLINDRICAL METAL  
CONTAINER, UNITIZED 30 PER 31-3/8" X 46-1/2" PAL-  
LET\*; APPROX CONTAINER SIZE 31-3/8" L X 7-1/2" W  
X 7-1/2" H**

**NOTICE:** THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4326-20PM1012.

\*SEE GENERAL NOTE "H" ON PAGE 3.

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### U.S. ARMY MATERIEL COMMAND DRAWING

<small>APPROVED, COMBAT CAPABILITIES DEVELOPMENT COMMAND ARMAMENTS CENTER</small>  <b>HANSSEN.JOSEP</b> <small>H.W.1376495538</small> <small>Digitally signed by HANSSEN.JOSEPH.W.13764955 38 Date: 2023.10.12 14:19:34 -05'00'</small>		<b>CAUTION: VERIFY PRIOR TO USE AT <a href="https://www.dau.edu/cop/ammo/Pages/Default.aspx">https://www.dau.edu/cop/ammo/Pages/Default.aspx</a> THAT THIS IS THE MOST CURRENT VERSION OF THIS DOCUMENT. THIS IS PAGE 1 OF 6.</b>		<b>DO NOT SCALE</b>		<b>JUNE 2000</b>		
<small>APPROVED, U.S. ARMY JOINT MUNITIONS COMMAND</small>  <b>WARD.GINA.</b> <small>M.1369379808</small> <small>Digitally signed by WARD.GINA.M.1369379808 Date: 2023.11.07 08:20:49 -06'00'</small>		<small>DESIGN ENGINEER</small>  <small>BASIC REV.</small>	<b>MICHAEL BARTOSIAK</b>  <b>SPENCER HOVEY</b>	<small>REVISION NO. 2</small>	<small>OCTOBER 2023</small>		<small>SEE THE REVISION LISTING ON PAGE 2</small>	
<small>APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND</small>  <b>BRAILSFORD.KEIT</b> <small>H.ANTHONY.10286 55661</small> <small>DEFENSE AMMUNITION CENTER</small> <small>Digitally signed by BRAILSFORD.KEITH.ANTHONY. 1028655661 Date: 2023.11.16 13:43:47 -06'00'</small>		<small>ENGINEERING DIVISION</small>  <small>TEST ENGINEER</small>  <small>TEST REPORT</small>	<b>FIEFFER.LAUR</b> <small>A.A.1230375727</small> <small>Digitally signed by FIEFFER.LAURA.A.1230375727 Date: 2023.09.29 09:52:28 -05'00'</small>	<small>CLASS</small>	<small>DIVISION</small>	<small>DRAWING</small>	<small>FILE</small>	
<small>EXPLOSIVES SAFETY DIRECTORATE</small>		<b>NA</b>	<b>FELICIANO.ADI</b> <small>N.1259200373</small> <small>Digitally signed by FELICIANO.ADIN.1259200373 Date: 2023.09.29 13:05:40 -05'00'</small>	<b>19</b>	<b>48</b>	<b>4326/ 50</b>	<b>20PM1012</b>	
<small>EXPLOSIVES SAFETY DIRECTORATE</small>		<b>CUMMINS.PAU</b> <small>L.A.1231883122</small> <small>Digitally signed by CUMMINS.PAUL.A.1231883122 Date: 2023.09.29 13:39:39 -05'00'</small>						

PALLET UNIT DATA				
ITEMS INCLUDED		*HAZARD CLASS AND DIVISION	*COMPATIBILITY GROUP	APPROX WEIGHT (LBS)
NSN	DODIC			
1320-01-454-4603	DA12	1.3	C	1,301
01-485-4372	DA23	-----INERT-----		1,301

\*HAZARD CLASSIFICATION DATA CONTAINED IN THE ABOVE CHART IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTING(S).

### REVISIONS

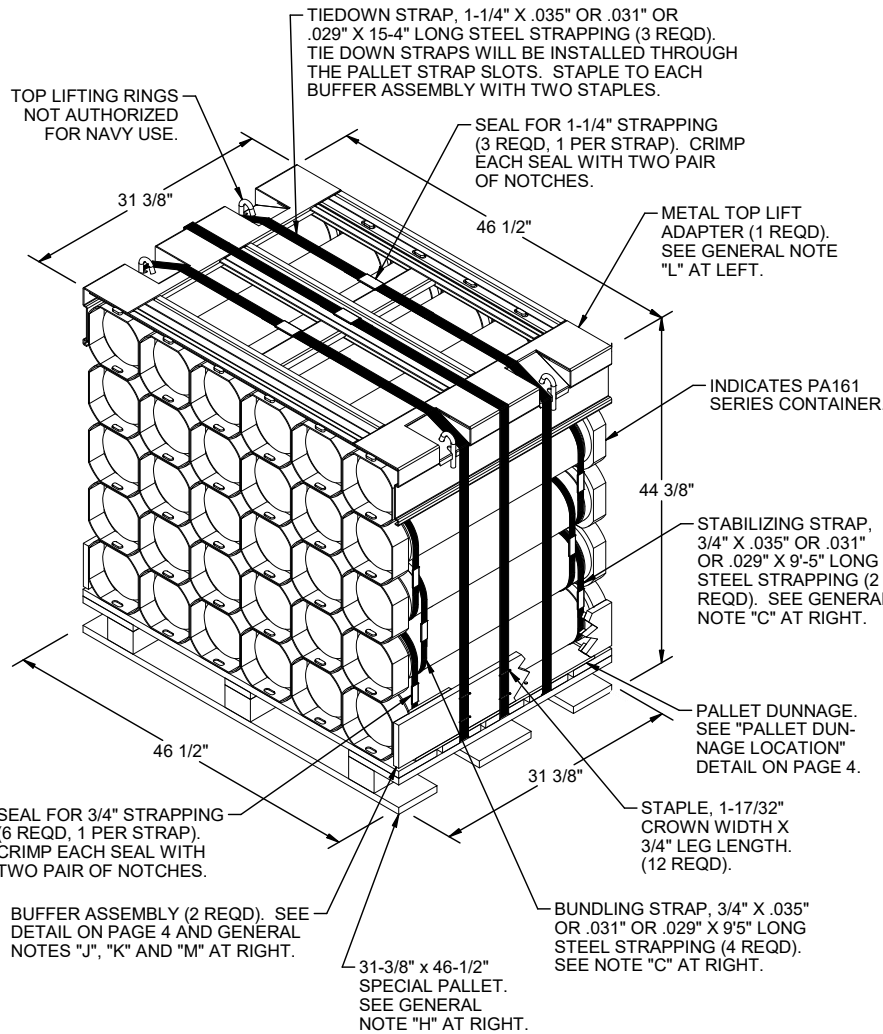
REVISION NO. 1, DATED MAY 2003, CONSISTS OF:

1. REMOVING ONE LAYER FROM THE PALLET UNIT.
2. UPDATING GROSS WEIGHT AND HAZARD CLASS.
3. ADDING ITEM BY NATIONAL STOCK NUMBER TO THE "PALLET UNIT DATA" CHART.
4. CHANGING THE PALLET UNIT DATA TO REFLECT TOTAL CONTAINER AND WEIGHT CHANGE.
5. UPDATING GENERAL NOTE "H" AND SPECIAL NOTE TO INCLUDE PALLET HEAT TREATMENT REQUIREMENTS.

REVISION NO. 2, DATED OCTOBER 2023, CONSISTS OF CHANGES PER ECP R21K3013 AND ECP R23K3001 INCLUDING:

1. ADDING .029" TO STRAP THICKNESS OPTIONS.
2. UPDATING GENERAL NOTES TO LATEST SPECIFICATIONS.
3. UPDATING SPECIAL NOTE ON PAGE 5 TO LATEST SPECIFICATIONS.
4. CHANGING PALLET DECK DUNNAGE TO SINGLE SHEET OF PLYWOOD.

**GENERAL NOTES**



- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4326-20PM1012. TO PRODUCE AN APPROVED UNIT LOAD, ALL PERTINENT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- B. DIMENSIONS, CUBE AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE CONTAINER AND THE WEIGHT OF THE SPECIFIC ITEM BEING UNITIZED.
- C. BUNDLING AND STABILIZING STRAPS MUST BE TENSIONED AND SEALED PRIOR TO THE APPLICATION OF THE UNITIZING STRAPS. TWO BUNDLING STRAPS MUST SURROUND LAYERS TWO AND THREE AND TWO BUNDLING STRAPS MUST SURROUND LAYERS THREE AND FOUR. INSTALL BUNDLING AND STABILIZING STRAPS AS CLOSE TO THE OUTER CONTAINER RINGS AS POSSIBLE, TO AVOID DAMAGE TO THE CONTAINERS. **CAUTION:** STRAPS MUST NOT BE ALLOWED TO OVERLAP.
- D. ALTHOUGH THE CONTAINERS DEPICTED IN THE UNIT LOAD AT LEFT ARE CONSTRUCTED WITH INTERLOCKING DEVICES, THE INTERLOCKS WILL NOT FUNCTION PROPERLY UNLESS THE CONTAINERS ARE POSITIONED SO THAT THE "PINS" OF THE INTERLOCKS ARE FACING UPWARD. THIS ORIENTATION WILL AID IN THE PREVENTION OF CONTAINER MOVEMENT, BOTH Laterally AND LONGITUDINALLY, DURING SHIPMENT OF THE UNIT LOAD.
- E. THE FOLLOWING AMC DRAWINGS ARE APPLICABLE FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX.
 

CARLOADING	- - - -	19-48-4330/50-5PM1007
TRUCKLOADING	- - - -	19-48-4331/50-11PM1007
STORAGE	- - - -	19-48-4335/50-1-3-4-14-22PM1007
END OPENING ISO CONTAINER	- - - -	19-48-4333/50-15PM1024
MILVAN	- - - -	19-48-4332/50-15PM1023
SIDE OPENING ISO CONTAINER	- - - -	19-48-4334/50-15PM1025
- F. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS REVISION TO THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS REVISION.
- G. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING MODULAR ARTILERY CHARGE SYSTEM (MACS) WHEN IDENTIFIED BY DIFFERENT NATIONAL STOCK NUMBERS (NSN) THAN WHAT IS SHOWN ON PAGE 2, PROVIDED THE CONTAINER DOES NOT VARY FROM WHAT IS DELINEATED HEREIN. THE EXPLOSIVE CLASSIFICATION OF OTHER ITEMS MAY BE DIFFERENT THAN WHAT IS SHOWN.
- H. THE SPECIAL PALLET WILL BE CONSTRUCTED AND ASSEMBLED IN ACCORDANCE WITH A MILITARY SPECIFICATION MIL-DTL-15011, STYLE 1A, TYPE 1, CLASS 1, PRESERVATIVE TREATED AND HEAT-TREATED PALLET AND WITH THE INSTRUCTIONS PROVIDED ON PAGES 5 AND 6.
- J. DIMENSIONS GIVEN FOR DUNNAGE PIECES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY TO THE PALLET UNIT. CONTAINERS MUST FIT SNUGLY IN THE DUNNAGE ASSEMBLIES. ALSO, DUE TO THE VARIATION OF CONTAINER DIMENSIONS, ADJUSTMENTS MAY BE REQUIRED AS TO THE LOCATION OF CERTAIN PIECES OF DUNNAGE IN A DUNNAGE ASSEMBLY.
- K. THE THICKNESS OF THE PLYWOOD BUFFER PIECES DEPICTED IN THE "BUFFER ASSEMBLY" ON PAGE 4 MUST BE ADJUSTED, AS REQUIRED, TO COMPLY WITH THE DIMENSIONAL VARIANCE OF THE PA161 CONTAINERS, SO AS TO COMPLETELY FILL OUT THE PALLET. **NOTE:** NOMINAL 1" X 6" MATERIAL MAY BE SUBSTITUTED FOR THE 3/4" PLYWOOD IF IT WILL CAUSE THE PALLET DIMENSIONS TO BE EQUAL TO OR GREATER THAN 46-1/2".
- L. FOR DETAILS OF THE METAL TOP LIFT ADAPTER, SEE DAC DRAWING ACV00636 AND MILITARY SPECIFICATION MIL-A-70788.
- M. ALL DUNNAGE SHALL BE PRESERVATIVE TREATED IN ACCORDANCE WITH GENERAL NOTE "X" IN THE BASIC PROCEDURES AND HEAT TREATED IN ACCORDANCE WITH GENERAL NOTE "AA" IN THE BASIC PROCEDURES.

**PALLET UNIT**

SEE GENERAL NOTE "B" AT RIGHT.

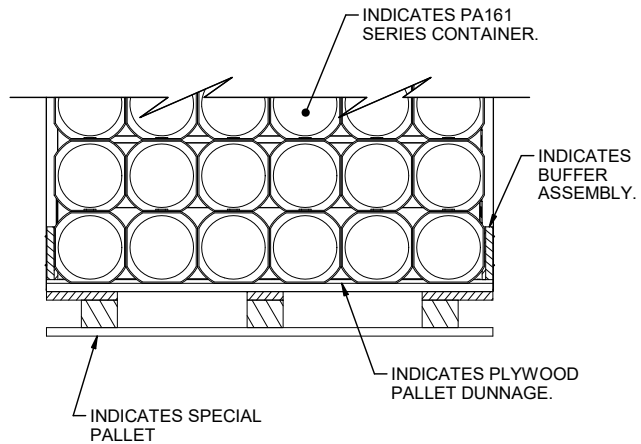
30 CONTAINERS OF MACS (4 PER CNTR) @ 38 LBS	- - - - -	1,140 LBS
DUNNAGE	- - - - -	101 LBS
PALLET	- - - - -	60 LBS
<b>TOTAL WEIGHT</b>	- - - - -	<b>1,301 LBS (APPROX)</b>
<b>CUBE</b>	- - - - -	<b>37.5 CU FT (APPROX)</b>

BILL OF MATERIAL		
NAILS	NO. REQD	POUNDS
6d (2")	28	1/4
SPECIAL PALLET, 31-3/8" x 46-1/2"	- 1 REQD	- - - 60 LBS
STEEL STRAPPING, 3/4"	- - - 56.50' REQD	- - 5.05 LBS
SEAL FOR 3/4" STRAPPING	- - - - 6 REQD	- - - NIL
STEEL STRAPPING, 1-1/4"	- - - 46.00' REQD	- - 6.57 LBS
SEAL FOR 1-1/4" STRAPPING	- - - - 3 REQD	- - - NIL
PLYWOOD 3/8"	- - - - - 8.52 SQ FT REQD	- - 8.78 LBS
PLYWOOD 3/4"	- - - - - 2.40 SQ FT REQD	- - 4.94 LBS
STRAP STAPLE, 1-17/32" x 3/4"	- - 12 REQD	- - - NIL
METAL LIFTING FRAME	- - - - - 1 REQD	- - - 75 LBS

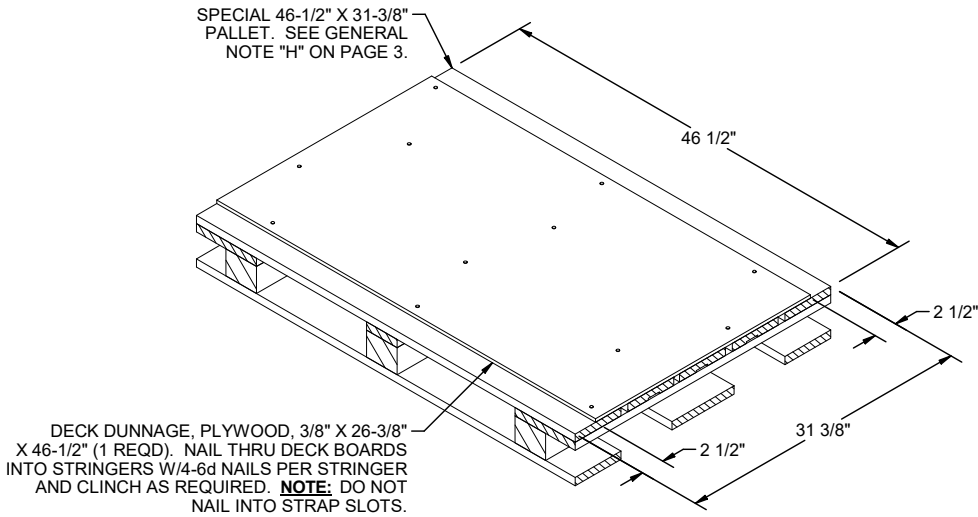
(CONTINUED ON PAGE 4)

**(GENERAL NOTES CONTINUED FROM PAGE 3)**

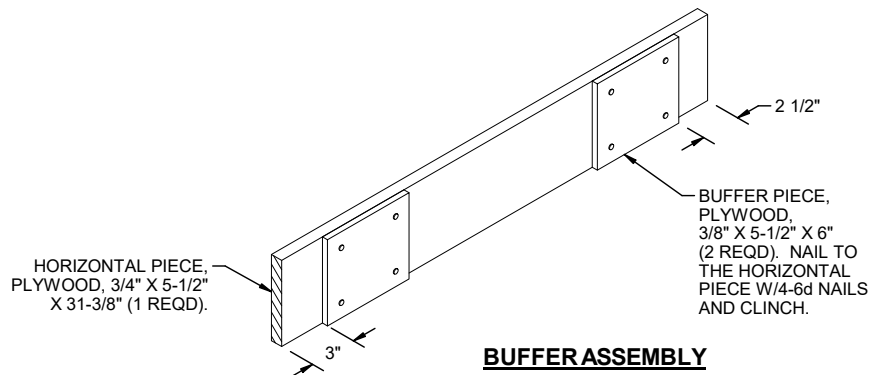
- N. EMPTY OR REJECT PA161 CONTAINERS WILL BE USED AS FILLER CONTAINERS AS NECESSARY. FILLER CONTAINERS MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER(S) OF CONTAINERS. IF SIX FULL CONTAINERS ARE TO BE OMITTED, ONE FULL LAYER OF CONTAINERS WILL BE OMITTED. WHEN (EMPTY) FILLER CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETELY FILL OUT A LAYER ON A PALLET, THEY WILL BE MARKED AS SPECIFIED IN ARDEC DRAWING NO. 12982865.
- O. WHEN ONE OR MORE LAYERS ARE OMITTED, THE BUNDLING STRAP REQUIREMENT WILL CHANGE. A FOUR LAYER UNIT WILL HAVE THE TWO BUNDLING STRAPS OMITTED THAT WERE AROUND THE THIRD AND FOURTH LAYERS. THE REMAINING BUNDLING STRAPS WILL SURROUND THE SECOND AND THIRD LAYERS. A UNIT WITH THREE OR LESS LAYERS DOES NOT REQUIRE BUNDLING STRAPS.
- P. FOR DETAILS OF THE PA161 CONTAINER SEE ARDEC DRAWING NO. 12972583.



**PARTIAL VIEW**



**PALLET DUNNAGE LOCATION**

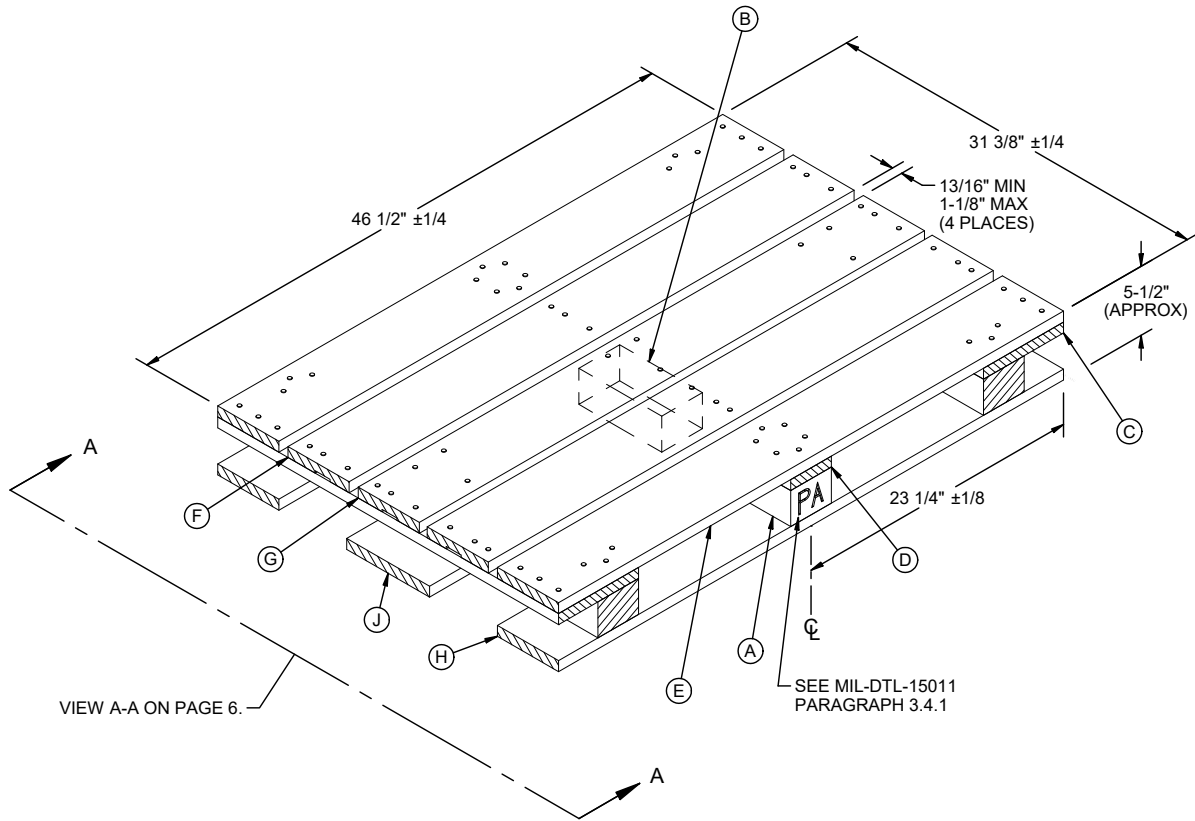


**BUFFER ASSEMBLY**

A LEFT HAND PIECE IS DEPICTED. A RIGHT HAND PIECE IS ALSO REQUIRED. SEE GENERAL NOTE "K" ON PAGE 3.

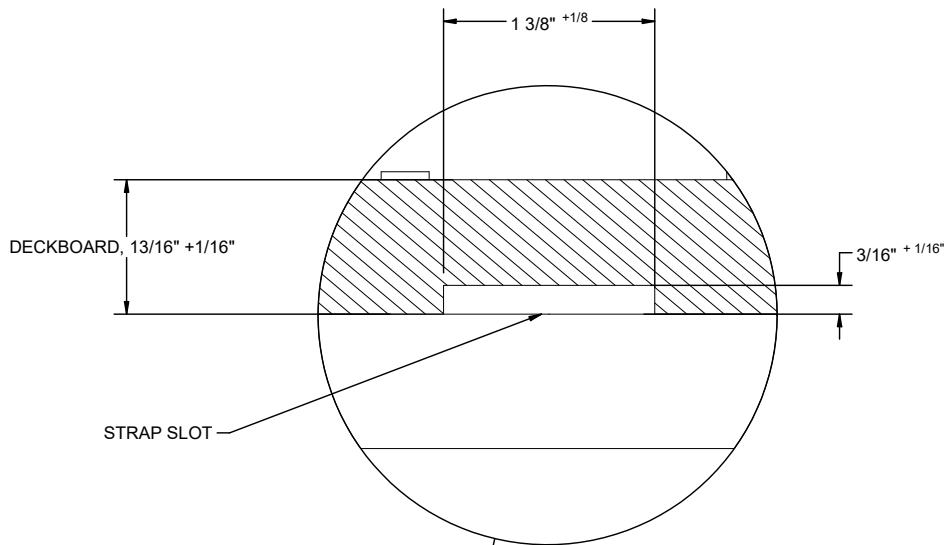
**SPECIAL NOTE:**

THE SPECIAL PALLET DEPICTED BELOW WILL BE CONSTRUCTED AND ASSEMBLED IN ACCORDANCE WITH A MILITARY SPECIFICATION MIL-DTL-15011 STYLE 1A, TYPE 1, CLASS 1, PRESERVATIVE TREATED AND HEAT TREATED PALLET, EXCEPT FOR THE DIMENSION VARIANCES AND COMPONENT QUANTITIES SHOWN IN THE KEY LETTERS AND DETAIL BELOW. **NOTE:** AVOID NAILING THROUGH STRAP SLOTS.



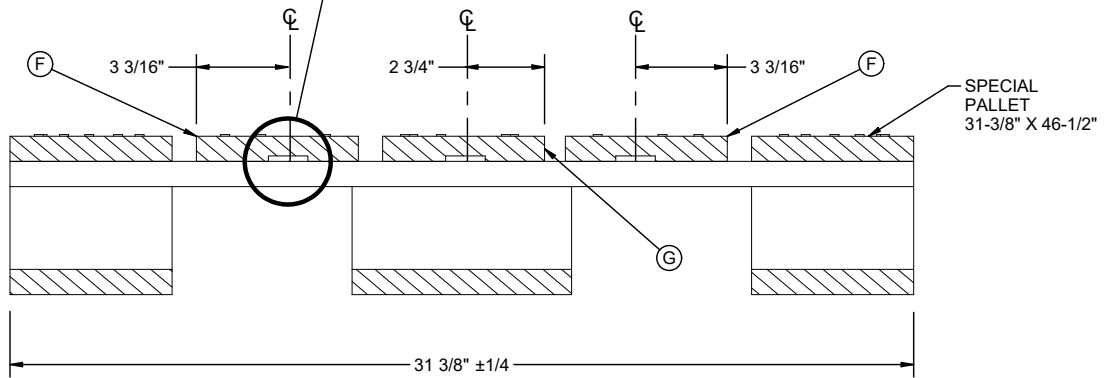
**KEY LETTERS**

- (A) POST, 3-5/8" +1/8" X 5-1/2" +1/8" X 2-3/4" +1/8" HIGH (6 REQD).
- (B) POST, CENTER, 3-5/8" +1/8" X 7-1/2" +1/8" X 2-3/4" +1/8" HIGH (3 REQD).
- (C) OUTER STRINGER, 13/16" +1/16" X 7-1/4" +1/8" X 31-3/8" +1/8" HIGH (2 REQD).
- (D) INNER STRINGER, 13/16" +1/16" X 3-5/8" +1/8" X 31-3/8" +1/8" HIGH (1 REQD).
- (E) TOP DECK BOARD, OUTER, 13/16" +1/16" X 5-1/2" ±1/8" X 46-1/2" ±1/8" (2 REQD). NAIL ALL DECK BOARDS TO THE STRINGERS W/3 NAILS (1.5" LONG X 0.120" DIAMETER) AT EACH LOCATION. NAIL THRU THE STRINGERS INTO THE POSTS W/3 NAILS (3.25" LONG X 0.135" DIAMETER) AT EACH LOCATION.
- (F) TOP DECK BOARD, INNER, 13/16" +1/16" X 5-1/2" ±1/8" X 46-1/2" ±1/8" (2 REQD). NAIL ALL DECK BOARDS TO THE STRINGERS W/3 NAILS (1.5" LONG X 0.120" DIAMETER) AT EACH LOCATION. DO NOT NAIL THRU STRAP SLOTS.
- (G) TOP DECK BOARD, CENTER, 13/16" +1/16" X 5-1/2" ±1/8" X 46-1/2" ±1/8" (1 REQD). NAIL DECK BOARD TO THE STRINGERS W/3 NAILS (1.5" LONG X 0.120" DIAMETER) AT EACH LOCATION. NAIL THRU THE STRINGERS INTO THE POSTS W/3 NAILS (3.25" LONG X 0.135" DIAMETER) AT EACH LOCATION. **NOTE:** AVOID NAILING THRU STRAP SLOTS.
- (H) BOTTOM DECK BOARD, OUTER, 13/16" +1/16" X 5-1/2" ±1/8" X 46-1/2" ±1/8" (2 REQD). NAIL TO THE POSTS W/3 NAILS (2.25" LONG X 0.120" DIAMETER) AT EACH JOINT.
- (J) BOTTOM DECK BOARD, CENTER, 13/16" +1/16" X 7-1/2" ±1/8" X 46-1/2" ±1/8" (1 REQD). NAIL TO THE POSTS W/3 NAILS (2.25" LONG X 0.120" DIAMETER) AT EACH JOINT.



**STRAP SLOT DETAIL**

SHOWING STRAP SLOT DIMENSIONS (TYPICAL, 3 PLACES). SEE LOCATIONS IN VIEW A-A.



**VIEW A-A**

SHOWING THE LOCATION OF STRAP SLOTS IN THE TOP DECK BOARDS. KEY LETTERS REFER TO KEY LETTERS ON PAGE 5.