FINAL REPORT
FEBRUARY 2002

REPORT NO. 01-27

2,000-POUND GUIDED BOMB UNITS,
GBU-31(V) 1/B, COMPLETE ROUND
TP-94-01,
"TRANSPORTABILITY TESTING PROCEDURES"

Prepared for:
Program Management Office
USAF Afloat Prepositioned Fleet
Ogden Air Logistics Center
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REPORT NO. 1-27
2000-POUND GUIDED BOMB UNITS GBU-31(V) 1/B, COMPLETE ROUND
TP-94-01, “TRANSPORTABILITY TESTING PROCEDURES”

FEVERARY 2002

ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division, (SOSAC-DEV), was tasked by the Program Management Office USAF Afloat Prepositioned Fleet to conduct transportability testing on the 2,000-pound guided bomb units GBU-31(V) 1/B, in a side-opening container in accordance with the procedures specified in AMC Drawing 19-48-8722. The load was tested in accordance with TP-94-01, “Transportability Testing Procedures.” Based on our review and testing, the loading and bracing procedures specified in AMC Drawing 19-48-8722, as tested 17-18 October 2001, are adequate for the transport of ammunition.

The JDAM container, as currently designed, does efficiently interface with intermodal transport. The deficiencies in the JDAM container design are:

a. The container does not have sufficient structural strength to enable one JDAM container to be stacked directly on top of another JDAM container. This requires additional wood dunnage to support the upper JDAM container when transporting JDAM containers two-high in an intermodal container.

b. The JDAM container does not have sufficient strength, or a flat and smooth surface area, on the ends to allow for loading of one JDAM against another. Therefore, wood dunnage must be used to separate rows of JDAM containers.

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VALIDATION ENGINEERING DIVISION
MCALESTER, OK 74501-9053

REPORT NO. 01-27
2000-Pound Guided Bomb Units,
GBU-31(V) 1/B, Complete Round
TP-94-01, "Transportability Testing Procedures"

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. INTRODUCTION</td>
<td>1-1</td>
</tr>
<tr>
<td>A. BACKGROUND</td>
<td>1-1</td>
</tr>
<tr>
<td>B. AUTHORITY</td>
<td>1-1</td>
</tr>
<tr>
<td>C. OBJECTIVE</td>
<td>1-1</td>
</tr>
<tr>
<td>D. CONCLUSION</td>
<td>1-1</td>
</tr>
<tr>
<td>2. ATTENDEES</td>
<td>2-1</td>
</tr>
<tr>
<td>3. TEST EQUIPMENT</td>
<td>3-1</td>
</tr>
<tr>
<td>4. TEST PROCEDURES</td>
<td>4-1</td>
</tr>
<tr>
<td>A. RAIL TEST</td>
<td>4-1</td>
</tr>
<tr>
<td>B. ON/OFF ROAD TEST</td>
<td>4-2</td>
</tr>
<tr>
<td>1. HAZARD COURSE</td>
<td>4-2</td>
</tr>
<tr>
<td>2. ROAD TRIP</td>
<td>4-3</td>
</tr>
<tr>
<td>3. PANIC STOPS</td>
<td>4-4</td>
</tr>
<tr>
<td>4. WASHBOARD COURSE</td>
<td>4-4</td>
</tr>
<tr>
<td>C. OCEAN-GOING VESSEL TEST (STS)</td>
<td>4-4</td>
</tr>
<tr>
<td>5. TEST RESULTS</td>
<td>5-1</td>
</tr>
<tr>
<td>A. RAIL TEST</td>
<td>5-1</td>
</tr>
<tr>
<td>B. ON/OFF ROAD TEST</td>
<td>5-4</td>
</tr>
<tr>
<td>1. HAZARD COURSE</td>
<td>5-4</td>
</tr>
<tr>
<td>2. ROAD TRIP</td>
<td>5-6</td>
</tr>
<tr>
<td>3. PANIC STOPS</td>
<td>5-6</td>
</tr>
<tr>
<td>4. WASHBOARD COURSE</td>
<td>5-6</td>
</tr>
<tr>
<td>C. OCEAN-GOING VESSEL TEST (STS)</td>
<td>5-6</td>
</tr>
<tr>
<td>6. DRAWINGS</td>
<td>6-1</td>
</tr>
</tbody>
</table>
PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SOSAC-DEV), was tasked by the Program Management Office USAF Afloat Prepositioned Fleet to conduct transportability testing on the 2,000-pound guided bomb units, GBU-31(V) 1/B, using the loading procedures specified in AMC Drawing 19-48-8722. The 2,000-pound guided bomb units, GBU-31(V) 1/B container load was tested in accordance with TP-94-01, “Transportability Testing Procedures.”

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Operations Support Command (OSC), Rock Island, IL. Reference is made to the following:


C. OBJECTIVE. The objective of the testing was to validate the loading and bracing procedures specified in AMC Drawing 19-48-8722, Loading and Bracing in Side Opening ISO Containers of 2,000-Pound Guided Bomb Units GBU-31 (V) 1/B, Complete Round.

D. CONCLUSION. Based on our review and testing, the loading and bracing procedures specified in AMC Drawing 19-48-8722, as tested 17-18 October 2001, are adequate for the transport of ammunition. Deficiencies in the JDAM container design are detailed in the Abstract.
<table>
<thead>
<tr>
<th>ATTENDEE</th>
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<tbody>
<tr>
<td>Philip Barickman</td>
<td>Director</td>
</tr>
<tr>
<td>General Engineer</td>
<td>U.S. Army Defense Ammunition Center</td>
</tr>
<tr>
<td>DSN 956-8992</td>
<td>ATTN: SOSAC-DEV</td>
</tr>
<tr>
<td>(918) 420-8992</td>
<td>1 C Tree Road, Bldg. 35</td>
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<td>McAlester, OK 74501-9053</td>
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<td>Patrick Dougherty</td>
<td>Director</td>
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<tr>
<td>Industrial Engineer</td>
<td>U.S. Army Defense Ammunition Center</td>
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<tr>
<td>DSN 956-8225</td>
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<tr>
<td>(918) 420-8225</td>
<td>1 C Tree Road, Bldg. 35</td>
</tr>
<tr>
<td></td>
<td>McAlester, OK 74501-9053</td>
</tr>
</tbody>
</table>
PART 3 - TEST EQUIPMENT

1. 2,000-Pound Guided Bomb Units GBU-31(V), 1/B Complete Round

Photo1. Specimen load in intermodal side-opening container on a railroad flatcar.

2. Intermodal Side-Opening Container
   Date of Manufacture: 06/89
   Manufactured by Containertechnik, Hamburg, Germany
   ID #: USAF 002 2053
   Maximum Gross Weight: 52,910 pounds
   Tare Weight: 6,050 pounds

3. Truck, Tractor
   5-Ton, 6 X 6
   Model #: XM818 wo/w
   ID #: 05E-37770-0124-12331
   Weight: 19,260 pounds
PART 4 - TEST PROCEDURES

The test procedures outlined in this section were extracted from TP-94-01, "Transportability Testing Procedures," July 1994, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical or commercial truck, railcar, and ocean-going vessel.

The rail impact test was conducted with the intermodal container with payload secured directly to the railcar. Inert (non-explosive) items were used to build the load. The test load with MK79 bomb pallets and CNU 589/E fin container was prepared using the blocking and bracing procedures proposed for use with munitions (see Part 6 for procedures). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads were identical to live (explosive) ammunition.

A. RAIL TEST. RAIL IMPACT TEST METHOD. The test load or vehicle will be secured to a flatcar. The equipment needed to perform the test will include the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars will be positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit will push the specimen car toward the anvil at a predetermined speed, then disconnect from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This will constitute an impact. Impacting will be accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The speeds will have a tolerance of plus .5 mph and minus zero mph. The impact speeds will be determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).
B. **ON/OFF ROAD TESTS.**

1. **HAZARD COURSE.** The test load or vehicle will be transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course will be traversed two times (see Figure 2).
a. The first series of ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

b. Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.

c. The second series of ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

d. The test load is driven across the hazard course at speeds that will produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

2. **ROAD TRIP.** The test load or vehicle will be transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route will include curves, corners, railroad crossings and stops and starts. The test load or vehicle will travel at the maximum speed for the particular road being traversed, except as limited by legal restrictions.
3. **PANIC STOPS.** During the road trip, the test load or vehicle will be subjected to three (3) full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7-degree grade. The first three stops are at 5, 10, and 15 mph while the stop in the reverse direction is approximately 5 mph. This testing will not be required if the Rail Impact Test is performed.

4. **WASHBOARD COURSE.** The test load or vehicle will be driven over the washboard course at a speed that produces the most violent response in the vertical load direction.

![Washboard Course Sketch](image)

**Figure 3. Washboard Course Sketch**

C. **OCEAN-GOING VESSEL TEST.** **SHIPBOARD TRANSPORTATION SIMULATOR (STS) TEST METHOD.** The test load will be secured inside an ISO container and will be positioned onto the STS and securely locked in place using the cam locks at each corner. Oscillation of the STS will be started and rotate to an angle of 30 degrees plus or minus 2 degrees, either side of center
and at a frequency of 2 cycles-per-minute (30 seconds plus or minus 2 seconds total roll period). This frequency shall be observed for apparent defects that could cause a safety hazard. The frequency of oscillation will then be increased to 4 cycles-per-minute (15 seconds plus or minus 1 second per roll period) and the apparatus operated a period of two (2) hours. An inspection of the load will then be conducted. If the inspection does not indicate an impending failure, the frequency of oscillation will be further increased to 5 cycles-per-minute (12 seconds plus or minus 1 second-cycle time), and the apparatus operated for four (4) hours. The operation does not necessarily have to be continuous, however, no change or adjustments to the load or load restraints shall be permitted at any time during the test. After once being set in place, the test load (specimen) shall not be removed from the apparatus until the test has been completed or is terminated.
PART 5 - TEST RESULTS

Payload: 2,000-Pound Guided Bomb Units GBU-31(V) 1/B, Complete Round
Gross Weight: 36,225 pounds
Testing Date: 17-18 October 2001

A. RAIL TEST.

Photo 2. Side-opening container w/GBU-31(V) 1/B on a railroad flatcar.
<table>
<thead>
<tr>
<th>Description</th>
<th>Weight</th>
</tr>
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<tbody>
<tr>
<td>Flatcar Number:</td>
<td>62,700 lbs.</td>
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<tr>
<td>DODX 48797</td>
<td></td>
</tr>
<tr>
<td>Intermodal Container with</td>
<td>36,225 lbs.</td>
</tr>
<tr>
<td>2,000 # GBU-31(V) 1/B</td>
<td></td>
</tr>
<tr>
<td>M1 Flatrack with MLRS Pods</td>
<td>28,265 lbs.</td>
</tr>
<tr>
<td>Intermodal container with Cordstrap Restraint</td>
<td>40,850 lbs.</td>
</tr>
<tr>
<td>Total Specimen Wt.</td>
<td>168,840 lbs.</td>
</tr>
<tr>
<td>Buffer Car (four cars)</td>
<td>250,000 lbs.</td>
</tr>
</tbody>
</table>

**Figure 4:**

**Remarks:** Figure 4 lists the test components and weights of the items used during rail impact tests. The intermodal container with the test load was secured to the container-on-flatcar (COFC). The M1 flatrack and intermodal container with Cordstrap were used as ballast.
<table>
<thead>
<tr>
<th>Impact Number</th>
<th>Velocity (mph)</th>
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<tbody>
<tr>
<td>1</td>
<td>4.1</td>
</tr>
<tr>
<td>2</td>
<td>6.2</td>
</tr>
<tr>
<td>3</td>
<td>8.4</td>
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<tr>
<td>4</td>
<td>8.4</td>
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</table>

Figure 5:

Remarks:
1. Figure 5 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact # 4 is the reverse impact.
2. Center portion of the load moved in the direction of impact 0.25 inches during Impact # 2.
3. Center portion of the load moved in the direction of impact 0.25 inches during Impact # 3.
4. No damage to the blocking or bracing occurred during testing.
B. ON/OFF ROAD TEST.

1. HAZARD COURSE.

![Photo 3. Side-opening container w/GBU-31(V), 1/B during Hazard Course testing.](image)

<table>
<thead>
<tr>
<th>Pass No.</th>
<th>Elapsed Time</th>
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<tr>
<td>1</td>
<td>24 Seconds</td>
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<td>2</td>
<td>25 Seconds</td>
<td>5.8</td>
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<tr>
<td>3</td>
<td>24 Seconds</td>
<td>6.1</td>
</tr>
<tr>
<td>4</td>
<td>25 Seconds</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Figure 6:

Remarks:
1. Figure 6 lists the average speeds of the test load through the Hazard Course.
2. Load moved 0.5 inches. The load returned to the original starting point prior to the beginning of the rail impact testing.
3. No damage to the blocking or bracing occurred during testing.
4. Passes # 3 and 4 occurred after the Road Trip.
2. **ROAD TRIP**: No excessive movement of the load or damage to the blocking or bracing.

3. **PANIC STOPS**: Testing was not required since the 2000-Pound Guided Bomb Units GBU-31(V) 1/B, Complete Round was rail impact tested.

4. **WASHBOARD COURSE**: No excessive movement of the load or damage to the blocking or bracing.

![Photo 4. Side-opening container w/ GBU-31(V), 1/B during Washboard Course testing.](image-url)
C. **OCEAN-GOING VESSEL TEST. SHIPBOARD TRANSPORTATION SIMULATOR (STS) TEST METHOD.**

![Photo 5](image) Side-opening container w/GBU-31(V), 1/B during STS testing.

**Remarks:**

1. The intermodal container with the test load was removed from the trailer and positioned on the STS tester.
2. No excessive movement of the load or damage to the blocking or bracing.
3. Final examination following testing revealed chafing on the intermodal container and the JDAM container due to contact during testing. Note "O" in AMC Drawing 19-48-8722 allows, as an option, the use of anti-chafing material that may prevent the chafing damage.
PART 6 – DRAWINGS

The following drawing represents the load configuration that was subjected to the test criteria. The drawing can be accessed at:

LOADING AND BRACING IN SIDE OPENING ISO CONTAINERS OF 2,000 POUND GUIDED BOMB UNITS GBU-31(V) 1/B, COMPLETE ROUND

INDEX

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PAGE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPICAL LOADING PROCEDURES (12 COMPLETE ROUNDS)</td>
<td>2</td>
</tr>
<tr>
<td>GENERAL NOTES AND MATERIAL SPECIFICATIONS</td>
<td>3</td>
</tr>
<tr>
<td>PALLET UNIT AND CONTAINER DETAILS</td>
<td>4</td>
</tr>
<tr>
<td>DETAILS (12 COMPLETE ROUNDS)</td>
<td>5-7</td>
</tr>
<tr>
<td>TYPICAL LOADING PROCEDURES (8 COMPLETE ROUNDS)</td>
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<tr>
<td>DETAILS (8 COMPLETE ROUNDS)</td>
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*LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (TICOFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.*

U.S. ARMY MATHERIEL COMMAND DRAWING

<table>
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APRIL 2001

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<td>19</td>
<td>48</td>
<td>8722</td>
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PROJECT SP 421-01

6-2
INDICATES CNU-596E WITH TWO GUIDANCE SETS. NOTE: THE CNU CONTAINERS SHOWN IN PHANTOM LINES FOR CLARITY.

ISOMETRIC VIEW

1. DECKING ASSEMBLY A (4 Req'd). See detail on page 7. Position on top of MK79 bomb pallet units and decking support assemblies. NAIL THROUGH THE STRINGERS INTO THE DECKING SUPPORT ASSEMBLIES WITH #12 NAILS AT EACH LOCATION AND NAIL TO THE CRIB FILL ASSEMBLIES WITH #12 NAIL AS APPLICABLE.

2. DECKING ASSEMBLY B (1 Req'd). See detail on page 7. Position on top of decking support assemblies between decking assemblies "A". Nail through the decking stringers into the decking support assemblies with #12 nails at each location.

3. STOP PIECE, 2" X 4" X 40" (Doubled) (6 Req'd). Position against the base of the CNU-596E containers as shown. Nail the first piece through decking assembly into the stringers with #12 nails at each location. Laminate the second board to the first with #10 nails. The two CNU containers must be positioned against the end blocking assemblies at each end of the container. The two CNU containers in the middle of the load must be centered. The containers may be pre-positioned for locating stop pieces and then removed for ease of nailing.

4. TIE PIECE, 2" X 4" BY CUT TO FIT (REF: 17-1/2") (6 Req'd). Position longitudinally on top of the stop pieces and nail with #10 nails at each end.

5. SPACER PIECE, 2" X 12" X 12" (Doubled) (6 Req'd). Position the first board against the foot of the CNU-596E container and nail through decking assembly into the stringer with #12 nails. Laminate the second board to the first with #10 nails.

KEY NUMBERS

1. END BLOCKING ASSEMBLY A (2 Req'd). See detail on page 5. Position at the front end of two high stacks of MK79 bomb pallet units as shown.

2. DECKING SUPPORT ASSEMBLY A (2 Req'd). See detail on page 6. Position between the center gates. Toenail to the center gates with #12 nails at each end. See the "Bevel Cut" detail on page 7.

3. CENTER GATE A (2 Req'd). See detail on page 6. Position on top of decking support assemblies against the end blocking assembly. Toenail to the end blocking assembly with #12 nails.

4. STRUT A, 4" X 4" BY CUT TO FIT (REF: 12-1/2") (4 Req'd). Position between the center gate and the end blocking assembly. Toenail to the center gate, strut support assembly and the end blocking assembly with #12 nails at each location. Toenail to the struts and the end blocking assembly with #12 nails at each location.

5. STRUT SUPPORT ASSEMBLY B (2 Req'd). See detail on page 6. Position on top of strut "B". The support assembly will be positioned against the end blocking assembly as shown. Toenail to the struts and the end blocking assembly with #12 nails at each location.

6. BRACE, 2" X 4" BY CUT TO FIT (REF: 43-1/2") (2 Req'd). Position diagonally between crib fill "A" assembly and decking support assembly "A". Nail with #10 nails at each end.

(Continued at left)
### Load as Shown

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<tr>
<th>Item</th>
<th>Quantity</th>
<th>Weight (Approx)</th>
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<tbody>
<tr>
<td>M79 bomb pallet unit</td>
<td>-4</td>
<td>25,728 LBS</td>
</tr>
<tr>
<td>D11-539/A 6x4</td>
<td>-6</td>
<td>2,718 LBS</td>
</tr>
<tr>
<td>M548 can with G319</td>
<td>-2</td>
<td>78 LBS</td>
</tr>
<tr>
<td>M548 can with G339</td>
<td>-2</td>
<td>180 LBS</td>
</tr>
<tr>
<td>M548A box</td>
<td>-2</td>
<td>152 LBS</td>
</tr>
<tr>
<td>D508 box</td>
<td>-2</td>
<td>72 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td>-2</td>
<td>1,502 LBS</td>
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<tr>
<td>CONTAINER</td>
<td>-1</td>
<td>5,060 LBS</td>
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<tr>
<td><strong>Total Weight</strong></td>
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<td><strong>36,255 LBS</strong></td>
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</table>

### Material Specifications

#### Lumber
- See TM 743-200-1 (Dunnage Lumber) and Voluntary Product Standard PS 20.

#### Nails
- ASTM F1567; Common steel nail (M/C8 or M/L36).

#### Plywood
- Commercial Item Description A-A-53567; Industrial plywood, interior with exterior glue, grade C-D. If specified grade is not available, a better interior or an exterior grade may be substituted.

#### Anti-Chafing Material
- MIL-B-121 (or Equal); Neutral barrier material.

#### Hardboard
- ANSI/AHA A135.4, Class 1.

---

**Note:** When BY30 is used, FW26 and G008 will be omitted. When FW26 and G008 are used, BY30 will be omitted. Weight in "Load as Shown" indicates use of BY30 with FW26 and G008 omitted.
MK70 BOMB PALLET UNIT (F275)
- Bomb: 2 each @ 1920 lbs (approx)
- Cube: 33.6 cu. ft. (approx)
- Gross weight: 4,324 lbs (approx)

**SUPPORT CUP (FW26) IN FIBERBOARD BOX**
- Gross weight: 26 lbs (approx)
- Cube: 0.17 cubic feet (approx)

**PROXIMITY SENSOR (BY30) IN M548 METAL BOX**
- Gross weight: 30 lbs (approx)
- Cube: 1.3 cubic feet (approx)

**NOSE PLUG (G008) IN FIBERBOARD BOX**
- Gross weight: 36 lbs (approx)
- Cube: 0.58 cubic feet (approx)

JDAM (EA69) IN CNU-589/E CONTAINER
- CNU-589/E container with 2 each guidance sets
- Gross weight: 453 lbs (approx)
- Cube: 50.7 cubic feet (approx)

FUZE SET (G119) IN M548 METAL BOX
- Gross weight: 39 lbs (approx)
- Cube: 1.3 cubic feet (approx)

**NOTE**: WHEN BY30 IS USED, FW26 AND G008 WILL BE OMITTED. WHEN FW26 AND G008 IS USED, BY30 WILL BE OMITTED.
SEE GENERAL NOTE "G" ON PAGE 3.

BUFFER PIECE, 2" X 6" BY INSIDE CONTAINER HEIGHT MINUS 1" (REF: 7'-3") (2 REQD). NAIL TO THE BEAMS W/2-10d NAILS AT EACH LOCATION.

BEARING PIECE, 2" X 6" X 9-1/2" (4 REQD). NAIL TO THE BEAM ASSEMBLY W/4-12d NAILS AT EACH LOCATION.

BEAM, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (2 REQD).

PLYWOOD, 1/2" X 9-1/2" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (2 REQD). NAIL TO THE BEAM EVERY 8" W/8d NAIL.

END BLOCKING ASSEMBLY

VIEW A

1-1/2"

34"

1-1/2"

34"

1-1/2"

1-1/2"

PLYWOOD, 5/4" X 11-1/2" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (4 REQD). NAIL TO THE BEAM EVERY 8" W/8d NAIL.

VIEW B

LOWER BEAM ASSEMBLY OMITTED

EXISTING VERTICAL PIECE OF CRIB FILL "A".

INDICATES M546 METAL BOX

EXISTING HORIZONTAL PIECE

SECUREMENT OF MISCELLANEOUS BOXES

MISCELLANEOUS BOXES MAY ALSO BE PLACED IN THE VOID AREA OF THE STRUT SUPPORT ASSEMBLIES AS SHOWN ON PAGE 6 OR ON TOP OF THE DECKING ASSEMBLIES BETWEEN THE CNU-589IE CONTAINERS. SECURE THE BOXES LATERALLY AND LONGITUALLY.

PROJECT SP 421-01
DECKING SUPPORT ASSEMBLY

NOTE: THE DECKING SUPPORT ASSEMBLY "A" MUST BE POSITIONED PRIOR TO INSTALLING THE CENTER GATE.

CENTER GATE A

NOTE: THE VERTICAL PIECES MUST BE IN ALIGNMENT WITH THE NOSE ENDS OF THE BOMBS.
DECKING SUPPORT ASSEMBLY B


Crib Fill A

Position this end of assembly against the end blocking assembly.

Horizontal piece, 2" x 4" x 98" (6 reqd). Nail to the vertical pieces W12-10d at each location.

Vertical piece, 2" x 4" by length as required (ref: 5-3/4") (9 reqd).

Spacer piece, 2" x 4" by length as required (ref: 10") (9 reqd).

Horizontal piece, 1" x 4" x 70" (4 reqd). Nail to the vertical pieces W12-4d nails at each location.

DECKING ASSEMBLY A

Plywood, 1/2" thick x 48" by container width minus 1" (ref: 7-4") (1 reqd). Nail through plywood into stringers W1-6d nail every 8".

Stringer, 2" x 4" x 48" (5 reqd).

Indicates a strut.

1/2" max

1/2" max

BEVEL-CUT

If desired, each end of a strut may be bevel-cut as shown above to facilitate the achievement of a tight center-gate-to-center-gate fit.

DECKING ASSEMBLY B

Plywood, 1/2" thick by width as required (ref: 20") by container width minus 1" (ref: 7-4") (1 reqd). Nail through plywood into stringers W1-6d nail every 8".

Stringer, 2" x 4" by length as required (ref: 20") (5 reqd).
**BILL OF MATERIAL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MK79 BOMB PALLET UNIT</td>
<td>4</td>
<td>16,486 LBS</td>
</tr>
<tr>
<td>CIV-569/E CONTAINER</td>
<td>4</td>
<td>1,812 LBS</td>
</tr>
<tr>
<td>H-4 CAN W/TH</td>
<td>2</td>
<td>78 LBS</td>
</tr>
<tr>
<td>H-4 CAN W/TH</td>
<td>4</td>
<td>120 LBS</td>
</tr>
<tr>
<td>BY50</td>
<td>1</td>
<td>(25 LBS)</td>
</tr>
<tr>
<td>FV65 BOX</td>
<td>1</td>
<td>(36 LBS)</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td>1</td>
<td>1,336 LBS</td>
</tr>
<tr>
<td>CONTAINER</td>
<td></td>
<td>6,050 LBS</td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong></td>
<td></td>
<td><strong>25,692 LBS (APPROX)</strong></td>
</tr>
</tbody>
</table>

**NOTE:** WHEN BY50 IS USED, FW28 AND GO08 WILL BE OMITTED. WHEN FW28 AND GO08 IS USED, BY50 WILL BE OMITTED.

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**8 COMPLETE ROUND LOAD**

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**PROJECT SP 421-01**

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**LOAD AS SHOWN**

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**ISOMETRIC VIEW**

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**INDICATES CNU-88ME WITH TWO GUIDANCE SETS**

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**INDICATES MK79 BOMB PALLET UNIT**

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**KEY NUMBERS**

1. END BLOCKING ASSEMBLY B (2 REQD). SEE DETAIL ON PAGE 9.
2. CENTER GATE B (2 REQD). SEE DETAIL ON PAGE 10.
3. STRUT, 4\(^{\circ}\) X 4\(^{\circ}\) BY CUT TO FIT (REF: 12-3/4\(^{\circ}\)) (4 REQD). POSITION BETWEEN THE CENTER GATES. TOE NAIL TO THE CENTER GATES W2-12d NAILS AT EACH END. SEE THE "BEVEL CUT" DETAIL ON PAGE 7.
4. ORIB FILL B (2 REQD). SEE DETAIL ON PAGE 10. POSITION BETWEEN MK79 BOMB PALLET UNITS.
5. DECKING ASSEMBLY C (2 REQD). SEE DETAIL ON PAGE 11. POSITION ON TOP OF MK79 BOMB PALLET UNITS.
6. DECKING ASSEMBLY D (2 REQD). SEE DETAIL ON PAGE 11. POSITION ON TOP OF MK79 BOMB PALLET UNITS.
7. ORIB FILL C (2 REQD). SEE DETAIL ON PAGE 12. POSITION BETWEEN THE CNU-88ME CONTAINERS.
8. CENTER GATE C (4 REQD). SEE DETAIL ON PAGE 12. POSITION AGAINST CNU-88ME CONTAINER WITH THE RESTRAINT PIECE POSITIONED UNDER THE FLARED LIFTING EDGE OF THE CONTAINER.
9. STRUT, 2\(^{\circ}\) X 4\(^{\circ}\) BY CUT TO FIT (REF: 7-3/4\(^{\circ}\)) (8 REQD). NAIL TO THE LEDGER BOARD AT EACH END W2-10d NAILS.
10. HORIZONTAL SUPPORT, 2\(^{\circ}\) X 4\(^{\circ}\) BY INSIDE CONTAINER WIDTH MINUS 1\(^{\circ}\) (REF: 7-3/4\(^{\circ}\)) (2 REQD). POSITION ON TOP OF STRUTS AS SHOWN. NAIL TO STRUTS W2-10d NAILS AT EACH LOCATION.
11. VERTICAL SUPPORT, 2\(^{\circ}\) X 4\(^{\circ}\) BY INSIDE CONTAINER HEIGHT MINUS 1\(^{\circ}\) (REF: 7-3/4\(^{\circ}\)) (4 REQD). POSITION AGAINST THE STRUTS AS SHOWN AND NAIL TO THE STRUTS W2-10d NAILS AT EACH LOCATION.
12. RESTRAINT PIECE, 2\(^{\circ}\) X 4\(^{\circ}\) BY CUT TO FIT (REF: 18-1/2\(^{\circ}\)) (2 REQD). POSITION AS SHOWN AND NAIL TO CENTER GATE "C" VERTICAL PIECES W2-10d NAILS AT EACH END.
SEE GENERAL NOTE "G" ON PAGE 3.

BUFFER PIECE, 2" X 6" BY INSIDE CONTAINER HEIGHT MINUS 1" (REF: 7'-1") (2 REQD). NAIL TO THE BEAMS W/2-10d NAILS AT EACH LOCATION.

BEAM, 2" X 4" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (2 REQD).

BEARING PIECE, 2" X 6" X 9-1/2" (4 REQD). NAIL TO THE BEAM ASSEMBLY W/4-12d NAILS AT EACH LOCATION.

PLYWOOD, 1/2" X 6-1/2" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (2 REQD). NAIL TO THE BEAM EVERY 8" W/6d NAIL.

END BLOCKING ASSEMBLY B

PLYWOOD, 3/4" X 11-1/2" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-3") (2 REQD). NAIL TO THE BEAM EVERY 8" W/6d NAIL.

VIEW C

VIEW D

LOWER BEAM ASSEMBLY OMITTED

CLEAT, 2" X 4" BY LENGTH AS REQD (2 REQD PER BOX). NAIL CLEAT TO THE HORIZONTAL PIECE W/2-10d NAILS AT EACH LOCATION.

EXISTING HORIZONTAL PIECE OF CRIB FILL "B".

LATERAL RESTRAINT, 2" X 4" X LENGTH TO SUIT (1 REQD). NAIL INTO HORIZONTAL PIECE W/2-10d NAILS AT EACH END.

VERTICAL RESTRAINT, 2" X 4" X 10" (1 REQD). NAIL TO CLEAT W/2-10d NAILS AT EACH END. POSITION ON TOP OF BOX.

SECUREMENT OF MISCELLANEOUS BOXES

MISCELLANEOUS BOXES MAY ALSO BE PLACED IN THE VOID AREA BETWEEN THE LOAD BEARING PIECES (STRUTS) OF THE CENTER GATE ASSEMBLIES. ADJUSTMENTS TO THE ABOVE DETAIL MAY BE MADE SO AS TO PROVIDE FOR SIMILAR SECUREMENT TO THE CENTER GATE ASSEMBLIES.

PROJECT SP 421-01
BEARING PIECE, 2" X 8" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4") (4 REQD). NAIL TO THE VERTICAL PIECES W/5-10d NAILS AT EACH JOINT.

SUPPORT PIECE, 2" X 4" X INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4") (1 REQD). NAIL TO THE VERTICAL PIECES W/5-10d NAILS AT EACH JOINT.

STRUT LEDGER, 2" X 2" X 8'-3" (1 REQD). NAIL TO THE VERTICAL PIECES W/5-10d NAILS AT EACH JOINT.

HORIZONTAL PIECE, 2" X 4" X 8'-0" (4 REQD). NAIL TO THE VERTICAL PIECES W/5-10d NAILS AT EACH JOINT.

SPACER PIECE, 2" X 4" BY LENGTH TO SUIT (REF: 10') (8 REQD). NAIL TO THE VERTICAL PIECES W/5-10d NAILS AT EACH JOINT.

VERTICAL PIECE, 2" X 4" X 23" (8 REQD).

CENTER GATE B

NOTE: THE VERTICAL PIECES MUST BE IN ALIGNMENT WITH THE NOSE ENDS OF THE BOMBS.

CRIB FILL B
DECKING ASSEMBLY C

PLANK, 1/2" THICK X 48" BY CONTAINER WIDTH MINUS 1" (REF: 7'-4") (1 REQD). NAIL THROUGH PLANK INTO STRINGERS W/H-6D NAIL EVERY 8".

STRINGER, 2" X 4" BY CONTAINER WIDTH MINUS 1" (REF: 7'-4") (3 REQD).

DECKING ASSEMBLY D

PLANK, 1/2" THICK X 22" BY CONTAINER WIDTH MINUS 1" (REF: 7'-4") (1 REQD). NAIL THROUGH PLANK INTO STRINGERS W/H-6D NAIL EVERY 8".

STRINGER, 2" X 4" BY CONTAINER WIDTH MINUS 1" (REF: 7'-4") (2 REQD).
CRIB FILL C

VERTICAL PIECE, 2" X 4" X 63" (5 REGD). NAIL TO THE VERTICAL PIECES AND THE CENTER SUPPORT PIECE W/10d NAILS AT EACH JOINT.

CENTER SUPPORT PIECE, 2" X 4" X 33" (1 REGD).

VERTICAL PIECE, 2" X 6" X 39" (2 REGD).

LEDGER BOARD, 2" X 4" X 18-1/2" (2 REGD). NAIL TO THE VERTICAL PIECES W/10d NAILS AT EACH END.

RESTRAINT PIECE, 1" X 4" X 38-1/2" (1 REGD). NAIL TO THE VERTICAL PIECES WITH 2-6d NAILS AT EACH END.

CENTER GATE C