FINAL REPORT
JULY 1997

REPORT NO. 97-04

2.75-INCH, HYDRA 70, PA150,
ROCKET PALLET FIRST ARTICLE
TESTING (FAT)

Prepared for:
U.S. Army Armament Research, Development
and Engineering Center
ATTN: AMSTA-AR-ESK
Rock Island, IL 61299-7300

Distribution Unlimited

VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639
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The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct first article MIL-STD-1660, Design Criteria for Ammunition Unit Loads, testing on the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delsasco of Tennessee, Greeneville, TN. Results from the MIL-STD-1660 testing indicated that the pallet, adapters, and containers produced by Delsasco met MIL-STD-1660 test requirements.
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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct first article MIL-STD-1660, Design Criteria for Ammunition Unit Loads, testing on the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delsasco of Tennessee, Greeneville, TN.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL. Reference is made to the following:


2. AMCCOM-R, 10-17, Mission and Major Functions of USADACS, 13 January 1986.

C. OBJECTIVE. The objective of the tests was to determine if the pallets produced by Delsasco met MIL-STD-1660 test requirements prior to the acceptance of the pallets by the U.S. Army (USA).

D. CONCLUSION. Two of the three pallets submitted by Delsasco were evaluated using MIL-STD-1660 test requirements. No significant flaws were found in the two pallets during testing so the third pallet was not evaluated. As a result of the performance of the pallets during testing, the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delsasco is recommended for USA-wide use.
PART 2

MARCH - AUGUST 1996

ATTENDEES

Quinn D. Hartman
General Engineer
DSN 585-8992
815-273-8992

Jerry H. Krohn
Supervisory General Engineer
DSN 585-8908
815-273-8908

Thomas J. Michels
Supervisory General Engineer
DSN 585-8080
815-273-8080

Mark Rehmstedt
Packaging Engineer
DSN 493-8206
309-782-8206

Director
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DEV
3700 Army Depot Road
Savanna, IL 61074-9639

Director
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DEV
3700 Army Depot Road
Savanna, IL 61074-9639

Director
U.S. Army Defense Ammunition Center
ATTN: SIOAC-DES
3700 Army Depot Road
Savanna, IL 61074-9639

U.S. Army Armament Research, Development
and Engineering Center
ATTN: AMSTA-AR-ESK
Rock Island, IL 61299-7300
PART 3

TEST PROCEDURES

The test procedures outlined in this section were extracted from MIL-STD-1660, Design Criteria for Ammunition Unit Loads, 8 April 1977. This standard identifies nine steps that a unitized load must undergo if it is to be considered acceptable. The four tests that were conducted on the test pallets are summarized below.

A. STACKING TEST. The unit load was loaded to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load was simulated by subjecting the unit load to a compression weight equal to an equivalent 16-foot stacking height. The compression load was calculated in the following manner. The unit load weight was divided by the unit load height in inches and multiplied by 192. The resulting number was the equivalent compressive force of a 16-foot-high load.

B. REPETITIVE SHOCK TEST. The repetitive shock test was conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen was placed on, but not fastened to, the platform. With the specimen in one position, the platform was vibrated at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles per second. The frequency was steadily increased until the package left the platform. The resonant frequency was achieved when a 1/16-inch-thick feeler gage momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieved 1 +/- 0.1 Gs. Midway into the testing period, the specimen was rotated 90 degrees and the test continued for the duration. Unless failure occurred, the total time of vibration was two hours if the specimen was tested in one position and three hours for more than one position.
C. **EDGEWISE ROTATIONAL DROP TEST.** This test was conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The specimen was placed on its skids with one end of the pallet supported on a beam 4-1/2 inches high. The height of the beam was increased if necessary to ensure that there was no support for the skids between the ends of the pallet when dropping took place, but was not high enough to cause the pallet to slide on the supports when the dropped end was raised for the drops. The unsupported end of the pallet was then raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection conforms to the following tabulation:

<table>
<thead>
<tr>
<th>GROSS WEIGHT (WITHIN RANGE LIMITS) (Pounds)</th>
<th>DIMENSIONS OF ANY EDGE, HEIGHT OR WIDTH (WITHIN RANGE LIMITS) (Inches)</th>
<th>HEIGHT OF DROPS ON EDGES Level A (Inches)</th>
<th>Level B (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 - 250</td>
<td>60 - 66</td>
<td>36</td>
<td>27</td>
</tr>
<tr>
<td>250 - 400</td>
<td>66 - 72</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>400 - 600</td>
<td>72 - 80</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>600 - 1,000</td>
<td>80 - 95</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>1,000 - 1,500</td>
<td>95 - 114</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>1,500 - 2,000</td>
<td>114 - 144</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>2,000 - 3,000</td>
<td>Above 145 - No limit</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Above - 3,000</td>
<td></td>
<td>12</td>
<td>9</td>
</tr>
</tbody>
</table>

D. **INCLINE-IMPACT TEST.** This test was conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the incline-impact test is as follows: The specimen was placed on the carriage with the surface or edge to be impacted
projecting at least 2 inches beyond the front end of the carriage. The carriage was brought to a predetermined position on the incline and released. If it was desired to concentrate the impact on any particular position on the container, a 4- by 4-inch timber was attached to the bumper in the desired position before the test. No part of the timber was struck by the carriage. The position of the container on the carriage and the sequence in which surfaces and edges were subjected to impacts was at the option of the testing activity and depends upon the objective of the tests. This test was to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen was subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at time of impact was 7 feet per second.
PART 4

TEST EQUIPMENT

A. Compression Tester
   1. Manufacturer: Ormond Manufacturing
   2. Platform: 60- by 60-inches
   3. Compression Limit: 50,000 pounds
   4. Tension Limit: 50,000 pounds

B. Transportation Simulator
   1. Manufacturer: Gaynes Laboratory
   2. Capacity: 6,000-pound pallet
   3. Displacement: 1/2-inch amplitude
   4. Speed: 50 to 400 rpm
   5. Platform: 5- by 8-foot

C. Inclined Plane
   1. Manufacturer: Conbur Incline
   2. Type: Impact Tester
   3. Grade: 10 percent incline
   4. Length: 12-foot
PART 5

TEST RESULTS

Two of three pallets submitted by Delfasco of Tennessee were inertly loaded to the specified design weight using two 4- by 4-inch lengths of lumber, two 2- by 4-inch lengths of lumber, and a quantity of ammunition simulant to bring each container individually to the required weight. Special care was taken to ensure that each container had the proper amount of weight in order to achieve a realistic pallet center of gravity (CG). Once properly prepared, the first two pallets were tested using MIL-STD-1660, Design Criteria for Ammunition Unit Loads, requirements. As a result of the good performance of the pallets during testing, the third pallet submission was not tested.

A. PALLET NO. 1.

<table>
<thead>
<tr>
<th>Date</th>
<th>19 November 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>2,245 pounds</td>
</tr>
<tr>
<td>Length</td>
<td>78-1/2 inches</td>
</tr>
<tr>
<td>Width</td>
<td>29-3/8 inches</td>
</tr>
<tr>
<td>Height</td>
<td>43-1/2 inches</td>
</tr>
</tbody>
</table>

1. **Compression Test.** The test pallet was compressed with a load force of 9,900 pounds for 60 minutes. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** The test pallet was vibrated 90 minutes at 220 RPM in the longitudinal orientation and 90 minutes at 185 RPM in the lateral orientation. Small cracks were noted to have formed in the pallet posts next to the pallet skids at the completion of the longitudinal vibration test. No change in the cracks was noted after the lateral vibration.
3. **Edgewise Rotational Drop Test.** The test pallet was edgewise rotationally dropped from a height of 15-inches on the longitudinal and lateral drops. No additional cracking was noted in the pallet posts.

4. **Sling Compatibility Test.** The test pallet was lifted off of the ground using the toplift adapter by four points, three points, two diagonal points, two adjacent points, and one point. No shifting of the containers or permanent deformation of the toplift adapter was noted.

5. **Incline-Impact Test.** The test pallet was incline-impacted on all four sides from a height of 8 feet. No additional damage was noted at the completion of the test.

6. **Post Test Inspection.** Following completion of MIL-STD-1660 testing, the pallet was disassembled and inspected for additional damage. The cracks noted at the completion of the longitudinal vibration test had not increased significantly. No significant damage was noted in the top or bottom adapters or the pallet deck.

**B. Pallet No. 2**

<table>
<thead>
<tr>
<th>Date:</th>
<th>20 November 1996</th>
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<tbody>
<tr>
<td>Weight:</td>
<td>2,245 pounds</td>
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<tr>
<td>Length:</td>
<td>78-1/2 inches</td>
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<tr>
<td>Width:</td>
<td>29-3/8 inches</td>
</tr>
<tr>
<td>Height:</td>
<td>43-1/2 inches</td>
</tr>
</tbody>
</table>

1. **Compression Test.** The test pallet was compressed with a load force of 9,900 pounds for 60 minutes. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** The test pallet was vibrated 90 minutes at 220 rpm in the longitudinal orientation and 90 minutes at 155 rpm in the lateral orientation. Three small cracks were noted to have formed in the pallet posts next to the pallet skids at the completion of the longitudinal vibration test. Following completion of the lateral vibration, the cracks were noted
to have increased in size and extended from the edge of the skid up to the strengthening dimple in the pallet post.

3. **Edgewise Rotational Drop Test.** The test pallet was edgewise rotationally dropped from a height of 15 inches on the longitudinal and lateral drops. No additional cracking was noted in the pallet posts.

4. **Sling Compatibility Test.** The test pallet was lifted off of the ground using the toplift adapter by four points, three points, two diagonal points, two adjacent points, and one point. No shifting of the containers or permanent deformation of the toplift adapter was noted.

5. **Incline-Impact Test.** The test pallet was incline-impacted on all four sides from a height of 8 feet. No additional damage was noted at the completion of the test.

6. **Post Test Inspection.** Following completion of MIL-STD-1660 testing, the pallet was disassembled and inspected for additional damage. The cracks noted at the completion of the vibration test had not increased significantly. No significant damage was noted in the top or bottom adapters and only minor deformation was noted on the pallet deck.
PART 6

PHOTOGRAPHS
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

PHOTO NO. A0317-SCN-97-1159. This photograph shows the side view of one of the three pallets submitted by Deltasco of Tennessee.
PHOTO NO. A0317-SCN-97-1163. This photograph shows the end view of one of the three pallets submitted by Delfasco of Tennessee.
<table>
<thead>
<tr>
<th>COMBINATION OF ADOPTED ITEMS</th>
<th>PART NO</th>
</tr>
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<tbody>
<tr>
<td>PALLET - SPECIAL SIZE 78.50 x 29.31 SHEET METAL</td>
<td>ACV00165</td>
</tr>
<tr>
<td>TOP ASSEMBLY - PALLET ADAPTER PA150 CONTAINER</td>
<td>ACV00159</td>
</tr>
<tr>
<td>BOTTOM ASSEMBLY - PALLET ADAPTER PA150 CONTAINER</td>
<td>ACV00160</td>
</tr>
<tr>
<td>UNITIZATION DRAWING</td>
<td>19-48-4231/61-20PM1006</td>
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</table>

DISTRIBUTION STATEMENT A
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.
NOTES:
2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DNG AC200000423.
3. COLOR SHALL BE GREEN NO. 803 PER MIL-C-46108 (FED. STD. 595 NO. 34094).
4. DISCONTINUED CONSTRUCTION SPEC MSH-STD-1286, CLASS 1 APPLIES.
5. CHAMFERED CORNER SHALL NOT BE DUSTED IN ORDER TO ALLOW ADDITIONAL GROUND NO.
6. ALTERNATE ALIGNING LUG DNG AC200000453-5 MAY BE USED INSTEAD OF DNG AC200000451-3. IF THE ALTERNATE LUG IS USED, USE 0.32 + 0.03 IN FOUR (4) PLACES.

SECTION B-B
SCALE 1/2

SECTION A-A
SCALE 1/4

PART NO ACV00160

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.
NOTES:
1. DADO RADIUS 0.13 INCH MAX WHERE NOT NOTED.
3. MATERIAL: SHEET, BAR OR ANGI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, ASTM A365 OR A564.
4. PARTS ACV00161-2 AND ACV00161-3 MAY BE MADE OF 12 GA (.101) MATERIAL.

DIMENSION

<table>
<thead>
<tr>
<th>PART NO</th>
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<th>B</th>
<th>C</th>
<th>D</th>
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<td>78.50</td>
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</table>

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.
NOTES:
1. RENE RADIUS 0.13 INCH MAX WHERE NOT NOTED.
3. MATERIAL: SHEET, SAE ON MS1 1005-1010 STEEL,
COLD ROLL OR HOT ROLL.
PER ASTM A568, (ASTM A36 OR A569).

DISTRIBUTION STATEMENT A,
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.
NOTES:
1. MIL-4-2950, ANSI/AWS A2.4-86, ANSI Y14.5M-1992 and MIL-P-70768 apply.
2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DNG AC200000423.
3. COLOR SHALL BE GREEN NO 383 PER MIL-C-4600B (FED STD 595 NO 3409).
4. PAINTING SHALL BE IN ACCORDANCE WITH DNG AC200000429.
5. COLOR SHALL BE WHITE NO 27075 0.50 INCH HIGH LETTERS.
6. WELDMENT CONSTRUCTION SPEC MIL-STD-1281, CLASS I, APPLIES.
7. MAXIMUM GAP ALONG MELD LINE BETWEEN POST AND DECK OR POST AND SIDES
   WILL NOT EXCEED 0.02 INCHES PRIOR TO MELDING. THIS MAY BE CHECKED
   WHEN RESTRAINED BY UP TO 1500 LBS UNIFORMLY APPLIED TO THE TOP
   SURFACE OF THE DECK.
8. THIS DIMENSION IS TO BE CHECKED AT THE INSPECTION POINTS (IP) DEFINED
   IN THE TOP VIEW. THE MEASUREMENTS WILL ORIGINATE FROM DATUM A AND B.

SECTION B-B
SCALE 1/2

SECTION C-C
SCALE 1/2

ACVO0167

ACVO0167

ACVO0167

ACVO0165

SEE NOTE 5

2 Holes

14 Places

16 Places

PART NO ACVO0165

DISTRIBUTION STATEMENT A,
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.
NOTES:
1. BEND RADIUS 0.13 INCH MAX WHERE NOT NOTED.
3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL,

SECTION A-A 0.50\(\pm\)13
85 HOLES
SCALE 1/2

2.04\(\pm\)13
78.50\(\pm\)25
1.50 X 45\(\pm\)13
4 HOLES

29.31\(\pm\)25
3.50\(\pm\)13
2.75
25 PLACES

2.75
4 PLACES

3.60\(\pm\)13
0.44\(\pm\)13
4 PLACES

1.50 X 45\(\pm\)13
1.00

SOME HIDDEN LINES OMITTED FOR CLARITY

PART NO ACVO00167

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.
NOTES:
1. ANSI Y14.5M-1982, MIL-D-20200 AND MIL-P-45208 APPLY.
2. MATERIAL: SHEET, SHEAR OR MILL. 1600-1800 STEEL, CARBON, COLD ROLL
OR HOT ROLL, PER ASTM A36 (ASTM A36 OR A588).
3. DISTORTION IN THE BEND IS PERMISSIBLE.

SECTION A-A
SCALE 1/1

DIMENSION

<table>
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<th>PART NO</th>
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<th>B</th>
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<tbody>
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<td>30.38</td>
<td>60.75</td>
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<td>78.50</td>
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<td>68.50</td>
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DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

HIDDEN LINES OMITTED FOR CLARITY

PART NO ACV00168

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<th>DESIGN ACTIVITY</th>
<th>DATES</th>
<th>DESIGN ACTIVITY</th>
<th>DATES</th>
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<tr>
<td>BUK SMS SCHULTZ</td>
<td>04-02-25</td>
<td>T.J. MICHELIS</td>
<td>SKID-GATE SHEET METAL</td>
</tr>
<tr>
<td>W.F. ERNST</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPLICATION

SEND BLUEPRINTS TO
WILLIAM F. ERNST
B 28020
ACV00168

LIMIT OF 1
NOTES:
2. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL,
   CARBON, COLD ROLL OR HOT ROLL,
   PER ASTM A568, (ASTM A366 OR A569).

PART NO ACV00307

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.
1. DETAIL REQUIREMENTS FOR SURFACE PREPARATION (CLEANING AND PRETREATMENT) TO BARE METAL PRIOR TO PRIMING AND PAINTING.

1.1 ALL SURFACES SHALL BE THOROUGHLY CLEARED SUCH THAT THE BARE METAL SURFACES ARE FREE FROM OIL, GREASE, OXIDE, SCALE, RUST, FOREIGN MATTER AND LOOSE WELO SPATTER. THE CLEANSING METHOD SHALL BE IN ACCORDANCE WITH ANY METHOD IN TABLE IV OF MIL-STD-171 OR AS SPECIFIED IN PARAGRAPH 3.1 OF MIL-1-704. PARTICULAR CARE MUST BE TAKEN TO REMOVE WELO SLAG AND LOOSE WELO SPATTER FROM WELOX AND ADJACENT AREAS.

1.2 IMMEDIATELY AFTER CLEANSING, ANY SOLVENTS OR MOISTURE SHALL BE COMPLETELY REMOVED. THESE CLEAN DRY SURFACES SHALL THEN HAVE A PRETREATMENT APPLIED IN ACCORDANCE WITH MIL-STD-171. FOR STEEL SUBSTRATES THE PRETREATMENT TO USE IS ZINE PHOSPHATE, FINISH NO. 5.1.1, ZINC PHOSPHATE, FINISH NO. 5.1.2 OR WASH PRIMER, FINISH NO. 5.2.

1.3 IMMEDIATELY PRIOR TO PRIMING, ALL SURFACES WHICH HAVE BEEN CLEARED AND PRETREATED IN ACCORDANCE WITH PARAGRAPHS 1.1 AND 1.2 SHALL BE CHECKED FOR THOROUGH CLEANSING. ANY ACCUMULATION OF OIL, GREASE, OXIDE, RESIDUES FROM THE CLEANSING PROCESS OR ANY FOREIGN MATERIAL SHALL BE COMPLETELY REMOVED. THE USE OF SOLVENTS MEETING THE REQUIREMENTS OF TABLE IV, FINISH NO. 4.3 OF MIL-STD-171 IS ACCEPTABLE. THE COMPLETE DRYING OF ANY SOLVENTS OR MOISTURE IS ESSENTIAL.

2. DETAIL REQUIREMENTS FOR APPLICATION OF ANTI-CORROSION PRIMER PAINT.

2.1 PRIMER SHALL BE APPLIED ON ALL SURFACES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND PARAGRAPHS 5.2.1 AND 5.2.2 OF MIL-STD-171 (EXCEPT THAT WHEN ACCELERATED DRYING IS EMPLOYED, DRY TIME TEMPERATURE IS NOT TO EXCEED 200 DEGREES F). MIL-P-53024 OR MIL-P-53030 MAY BE USED ON EITHER FERROUS OR NON-FERROUS MATERIALS.

2.2 ONE COAT OF PRIMER SHALL BE APPLIED AS PROMPTLY AS POSSIBLE AFTER THE SURFACES HAVE BEEN PREPARED AND CLEARED BY THE AFOREMENTIONED PROCEDURES. THE PRIMER SHALL BE APPLIED TO THE THICKNESS IN ACCORDANCE WITH MIL-C-53072. ALL EPoxy PRIMERS SHALL BE PROPERLY DRIED BEFORE TOPCOATING. PRIMER DRY FILM THICKNESS SHALL BE APPLIED TO ATTAIN THE 336 HOUR SALT SPRAY REQUIREMENT. RECOMMENDED THICKNESS RANGE IS 0.010 TO 0.035 INCHES (0.025 TO 0.089 MM).

3. DETAIL REQUIREMENTS FOR APPLICATION OF POLYURETHANE TOPCOAT PAINT.

3.1 TOPCOAT SHALL BE APPLIED ON EXTERIOR SURFACES ONLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS OR PARAGRAPHS 5.2.1 AND 5.2.2 OF MIL-STD-171. UNLESS OTHERWISE SPECIFIED, THE TOPCOAT COLOR SHALL BE GREEN NO. 381 IN ACCORDANCE WITH MIL-C-46168 OR MIL-C-53039.

3.2 TOPCOAT DRY FILM THICKNESS OF MIL-C-46168 AND MIL-C-53039 SHALL BE 0.018 TO 0.035 INCHES (0.046 TO 0.089 MM) TOTAL APPLIED IN TWO COATS. THE SECOND COAT MAY BE APPLIED IN ACCORDANCE WITH MIL-C-53072 OR MANUFACTURERS RECOMMENDATIONS.

3.3 ALL WORK SHALL BE IN ACCORDANCE WITH PARAGRAPH 3.8.1 OF MIL-C-53072.

3.4 ALTERNATE COATINGS MAY BE USED IF APPROVED BY THE CONTRACTING OFFICER.

4. DETAIL REQUIREMENTS FOR APPLICATION TO PREVIOUSLY PAINTED SUBSTRATES.

4.1 ALL PREVIOUSLY PAINTED SURFACES MUST BE CLEAN AND FREE FROM RUST WHERE RUST EXISTS, MECHANICAL CLEANSING IN ACCORDANCE WITH FINISH NO. 4.1 OF MIL-STD-171 (WIREBRUSH IS ACCEPTABLE) SHALL BE PERFORMED UNTIL BRIGHT STEEL IS EXPOSED. ONE COAT OF POLYURETHANE PAINT PER MILL-C-46168 OR MIL-C-53039 CAN BE APPLIED DIRECTLY OVER EXISTING ENAMEL OR POLYURETHANE PAINTS WITHOUT ANY ADDITIONAL SURFACE PREPARATION EXCEPT CLEANSING. IF THE SURFACE IS BROKEN DOWN TO THE SUBSTRATE, THAT AREA MUST BE CLEARED, PRETREATED, PRIMED AND TOPCOATED PER PARAGRAPHS 1 THROUGH 3. THE POLYURETHANE PAINT MAY NOT BE APPLIED OVER LACQUER. THE LACQUER MUST BE REMOVED DOWN TO THE BARE METAL BEFORE POLYURETHANE COATING IS APPLIED PER PARAGRAPHS 1 THROUGH 3.

4.2 WHERE VENDOR PARTS ARE SUPPLIED TO THE PRIME ORIGINAL EQUIPMENT MANUFACTURER (OEM), ALREADY ENAMEL PAINTED, THE PRIME OEM WILL HAVE TO REPaint PER PARAGRAPHS 4.1 BY APPLYING DIRECTLY OVER THE EXISTING ENAMEL COATING. IF THE VENDOR PARTS ARE TO BE REPAINTED JUST ENAMEL PAINTED WHICH IS PREFERABLE, WITH SPECIFICATION PARTERS SUCH AS TT-P-1027 OR TT-P-406, THEN THE POLYURETHANE PAINT PER PARAGRAPH 4.1 WILL BE APPLIED DIRECTLY OVER PRIMED SURFACES. IF THE ENAMELS ON THE VENDOR PARTS ARE OF A COMMERCIAL OR UNKNOWN TYPE, THEY MUST BE TESTED BEFORE THE POLYURETHANE CAN BE APPLIED. THIS DETAILS APPLYING POLYURETHANE PAINT TO A SMALL AREA OF THE PART AND OBSERVING FOR A PERIOD OF 15 MINUTES FOR ANY DEFECTS SUCH AS BLEETING, DELAMINATION OR BLEEDING. IF NONE ARE OBSERVED, THE REMAINDER OF THE PARTS CAN BE PAINTED. IF THERE IS A DEFECT, THE PARTS MUST BE CLEARED, PRETREATED, PRIMED AND TOPCOATED AS PREVIOUSLY DESCRIBED FOR BARE SUBSTRATES IN PARAGRAPHS 1 THROUGH 3.

5. TESTING.

5.1 PALLETS AND OR ADAPTERS FINISHED IN ACCORDANCE WITH PARAGRAPHS 2.3, AND 4 AS APPLICABLE MAY BE TESTED FOR PAINT ADHESION USING ACTUAL PRODUCTION ITEMS.

5.2 THE PRIMER AND TOPCOAT SHALL BE ADHESION TESTED IN ACCORDANCE WITH PARAGRAPHS 4.2.7.7.2 OF TT-C-450.

5.3 THE PRIMER AND TOPCOAT SHALL BE TESTED IN PARAGRAPHS 4.2.8 OF TT-C-450.

5.4 MIL-C-53072, PARAGRAPHS 4.3.3.7 APPLIES.
NOTES:
1. FRAME: ‘D’-RING, 0.38 STOCK DIA, 4140 STEEL, 5,000# SAFE WORKING LOAD, ULTIMATE STRENGTH 13,000# OR GREATER.
2. PLATING: IMMERSION ZINC FLAKE/CHROMATE DISPERSION MIL-C-87115.
3. DIMENSIONS SHOWN ARE ENVELOPE DIMENSIONS NECESSARY FOR THE RING TO MATE WITH THE RING RETAINER AND TO PERFORM ITS INTENDED FUNCTION.
4. IDENTIFICATION OF THE SUGGESTED SOURCE(S) HEREON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM(S).

SUGGESTED SOURCES OF SUPPLY

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<tr>
<th>CAGE</th>
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<th>NAME AND ADDRESS</th>
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<tbody>
<tr>
<td>11007</td>
<td>1070</td>
<td>U.S. FORGECRAFT CORP. P.O. BOX 387 FT. SMITH, AR 72902</td>
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<td>6V4570</td>
<td>204-115</td>
<td>HELGESON INDUSTRIES, INC. 7261 HIGHWAY 60 WEST HARTFORD, WI 53027</td>
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SPECIFICATION CONTROL DRAWING

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.
NOTES:
1. RADIUS 0.08 INCH MAX WHERE NOT NOTED.
2. ANSI Y14.5M-1982 APPLIES.
3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL.
   PER ASTM A568, (ASTM A56B OR A56C).
4. THESE DIMENSIONS MAY BE VARIED TO ACHIEVE THE
   ASSEMBLY OBJECTIVE DETAILED ON SHEET 2.
5. DIMENSION SHOWN IS TO ACHIEVE A RING POSITION AT
   REST WHICH IS BELOW THE TOP SURFACE OF THE Pallet,
   BUT ELEVATED TO READILY ACCEPT THE SLING HOOK.
6. THIS DIMENSION IS TO BE ACHIEVED WHEN MATED WITH
   SIDE RAIL AND SQUARE RING RESTRAINT OF SIDE RAIL
   AND SQUARE RING RESTRAINT, SEE NEXT ASSEMBLY
   DRAWING FOR ASSEMBLY DIMENSIONS.
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<th>PART NUMBER</th>
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1.00 - 19
SEE NOTES 5 AND 8
APPENDIX 60

UNITIZATION PROCEDURES FOR BOXED AMMUNITION AND COMPONENTS PACKED IN CYLINDRICAL METAL OR PLASTIC CONTAINERS ON 4-WAY ENTRY METAL PALLETS

2.75" HYDRA ROCKET, PACKED 4 PER PA150 CYLINDRICAL METAL CONTAINER, UNITIZED 12 PER 78.50" X 29.31" SPECIAL METAL PALLET; APPROX CONTAINER SIZE 78.50" L X 9.25 W X 9.25" H

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4231-20PM1006.

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<td><strong>AMSTA-AR-ESK</strong></td>
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<tr>
<td><strong>LOGISTICS ENGINEERING OFFICE</strong></td>
</tr>
<tr>
<td><strong>THOMAS J. MATCH</strong></td>
</tr>
<tr>
<td><strong>APRIL 1994</strong></td>
</tr>
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<td><strong>CLASS</strong></td>
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DO NOT SCALE

SEE THE REVISION LISTING ON PAGE 2

PROJECT CA 243/60-87
### PALLET UNIT DATA

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**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).**

### REVISION

REVISION NO. 1, DATED MARCH 1996, CONSISTS OF:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO "PALLET UNIT DATA" CHART.
2. CHANGING GENERAL NOTE "H" ON PAGE 3.
3. CHANGES IN ACCORDANCE WITH ECP MST3003.
UNITIZING STRAP, 1-1/4" x .025" OR .031" x 12'-3" LONG STEEL STRAPPING (4 REQD). SEE GENERAL NOTE "C" AT RIGHT.

29-5/16" 78-1/2" 43"

SEAL FOR 1-1/4" STRAPPING (4 REQD), 1 PER STRAP), CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES.

BUNDLING STRAP, 3/4" X .025" OR .031" X 10'-3" LONG STEEL STRAPPING (4 REQD). SEE GENERAL NOTE "C" AT RIGHT.

SEAL FOR 3/4" STRAPPING (4 REQD), 1 PER STRAP), CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES.

PALLE UNIT
SEE GENERAL NOTE "B" AT RIGHT.

12 CONTAINERS OF 2.75 HYDRA ROCKETS
(4 PER CONTAINER) AT 162 LBS
DUNNAGE ----- --- 1,944 LBS (APPROX)
PALLET ------ --- 185 LBS

TOTAL WEIGHT ----- --- 2,259 LBS (APPROX)
CUBE ----- --- 57.3 CU FT (APPROX)

BILL OF MATERIAL

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<td>TOP ASSEMBLY</td>
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<tr>
<td>BOTTOM ASSEMBLY</td>
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<td>STEEL STRAPPING, 3/4&quot;</td>
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GENERAL NOTES

A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4231-20P100D. 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.


C. BUNDLING STRAPS MUST BE TENSIONED AND SEALED PRIOR TO THE APPLICATION OF THE UNITIZING STRAPS. BUNDLING STRAPS MUST ALSO BE INSTALLED AS CLOSE TO THE OUTER RINGS AS POSSIBLE, TO AVOID DAMAGE TO THE CONTAINER.

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 FACED 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 -------- 19-48-4242/60-5PM1004
TRUCKLOADING ------ 19-48-4243/60-1IPM1004
STORAGE ---------- 19-48-4250-12-3-4-14-22PM1004
END OPENING ISO CONTAINER ------ 19-48-4245/60-15PM1008
END OPENING ISO CONTAINER ------ 19-48-4272/60-15PM1015

F. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE AMC DRAWING 19-48-4127-20P1000.

G. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.


J. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING 2.75" HYDRA ROCKETS WHEN IDENTIFIED BY DIFFERENT NATIONAL STOCK NUMBERS (NSN) THAN WHAT IS SHOWN ON PAGE 2. PROVIDED THE CONTAINER PACK DOES NOT VARY FROM WHAT IS DelineATED HEREIN. THE EXPLOSIVE CLASSIFICATION OF OTHER ITEMS MAY BE DIFFERENT THAN WHAT IS SHOWN.

K. EMPTY OR REJECT PAIRED 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 FOUR FULL CONTAINERS ARE TO BE UNITIZED, ONE FULL LAYER OF CONTAINERS WILL BE OMITTED. WHEN (REJECTED) FILLER CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETE A LAYER ON A PALLET, THEY WILL BE MARKED AS SPECIFIED WITHIN MIL-STO-125-1, EXCEPT WHEN (EMPTY/REPAIRABLE) CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETE A LAYER ON A PALLET; THE WORD "EMPTY" WILL BE STENCILED IN ORANGE ON THE EMPTY CONTAINER IN 1-INCH SIZE LETTERS. THE WORD "EMPTY" WILL BE STENCILED TWICE ON THE OPEN END PORTION OF THE CONTAINER WITH THE WORDS PAINTED ALONG THE CIRCUMFERENCE, 180 DEGREES APART AND THREE TIMES ON THE BODY PORTION OF THE CONTAINER WITH THE WORDS PAINTED LENGTHWISE ON THE CONTAINER AND SPACED 120 DEGREES APART AS MEASURED AROUND THE CONTAINER CIRCUMFERENCE.

L. FOR DETAILS OF THE PAIRED CONTAINER SEE PICATINNY DRAWING 19537650-2.