REPORT NO. 96-28

MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) PODS ON A LOAD AND ROLL PALLET (LRP) RESTRAINED WITH WOODEN DUNNAGE TRANSPORTABILITY TESTS

19960807 007

Prepared for:
U.S. Army Defense Ammunition Center and School
ATTN: SIOAC-DET
Savanna, IL  61074-9639

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Multiple Launch Rocket System (MLRS) Pods on a Load and Roll Pallet (LRP) Restrained with Wooden Dunnage Transportability Tests

Alfred C. McIntosh, Jr.

Final

FROM  TO  1996 April

The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by USADACS, Transportation Engineering Division (SIOAC-DET), to test the proposed blocking technique on Multiple Launch Rocket System (MLRS) pods on a Load and Roll Pallet (LRP). Due to the nonavailability of serviceable MILVAN/LRP combinations, a shipping installation submitted a suggestion to ship MLRS pods loaded on an LRP in a standard munitions-type container. In order to secure the loaded LRP in this container type, a section of the closeout angle must be removed. To avoid the required modification, an alternative method of blocking the LRP in a container was suggested. The proposed blocking technique failed to properly restrain the loaded LRP in a container. Damage to the container door and door sill resulted at a rail impact speed of 7.2 mph (to pass, a container must pass a rail impact speed of 8.1 mph). With the container damaged, the container cannot be used to transport ammunition.
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PART 1

INTRODUCTION

A. BACKGROUND. Currently, there is a shortage of serviceable MILVAN/LRP combinations. The MILVANs are unservicable due to damage. The Load and Roll Pallets (LRPs) are servicable for shipping Multiple Launch Rocket System (MLRS) pods. Often serviceable containers are available; however, these containers must be physically changed (altered) to permit securing the LRP in them. To avoid modifying the servicable containers, an alternative method of securing the LRP inside the container was suggested. This suggestion (No. AMVF950060) was sent to the U.S. Army Defense Ammunition Center and School (USADACS), Transportation Engineering Division (SIOAC-DET), for evaluation (see Part 7). As a result of that evaluation, the suggestion was forwarded to USADACS, Validation Engineering Division (SIOAC-DEV), for physical testing. This report documents the results of testing the suggested blocking procedure.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to Change 4, 4 October 1974, to AR 740-1, 23 April 1971, Storage and Supply Operations; AMCCOMR 10-17, 31 August 1991, Mission and Major Functions of USADACS.

C. OBJECTIVE. The objective of these tests was to determine if the suggested method of securing an LRP loaded with MLRS pods in a container using wooden dunnage instead of the provided chocks would adequately prevent LRP movement in an intermodal transportation environment; specifically, rail and road.
D. CONCLUSION. Three 2- by 8-inch laminated boards were placed between the end of the LRP and the 1-1/4-inch welded angle parallel to the door jamb in the container. Two blocks were placed between each side of the LRP and container wall. A 1- by 8-inch board was placed between the 1-1/4-inch welded angle and the doors. The laminated 2- by 8-inch beam was restrained by the rear side of the 1-1/4-inch angle. After the first impact, the laminated beams were crushed approximately 1/8-inch at the point of contact. After the second impact, the laminated 2- by 8-inch beam cracked at the left side of the container. This failure allowed the LRP to move and strike the closed door of the container, damaging the door locks. As a result of the two tests, three 2- by 8-inch laminated boards with side bracing on the LRP is not strong enough to brace the LRP in a container and prevent damaging the container. The approved chocking method of blocking the loaded LRP in the container prevents this kind of damage.

E. RECOMMENDATION. This suggested procedure is not recommended for blocking and bracing a load of MLRS pods on an LRP in a container. More damage to the container will occur than just removing the lower portion of the closeout angle. It is recommended that the approved procedure be followed for blocking. A copy of this procedure is included in Part 6.
PART 2
28 FEBRUARY 1996

ATTENDEES

Alfred C. McIntosh, Jr.
General Engineer
DSN 585-8989
815-273-8989

Jerome H. Krohn
Supervisory Engineer
DSN 585-8908
815-273-8908

David V. Valant
Electronics Technician
DSN 585-8988
815-273-8988

Gregory Willis
Industrial Engineer
DSN 585-8075
815-273-8075

Director
U.S. Army Defense Ammunition Center and School
ATTN: SIOAC-DEV
Savanna, IL 61074-9639

Director
U.S. Army Defense Ammunition Center and School
ATTN: SIOAC-DEV
Savanna, IL 61074-9639

Director
U.S. Army Defense Ammunition Center and School
ATTN: SIOAC-DEV
Savanna, IL 61074-9639
PART 3

TEST PROCEDURES

TRANSPORTABILITY TEST. The test procedure outlined in this section was extracted from TP-94-01, July 1994, for chassis-mounted container transportation by truck on a railcar. This standard identifies six steps that a load must undergo if it is considered to be acceptable. The tests conducted on the test specimen are synopsized below.

The test load of MLRS pods on an LRP was prepared using the same blocking and bracing methods specified in the tiedown procedures for use with munitions. A copy of these procedures is contained in Part 6. The loaded LRP was placed in a 20-foot munitions container with the recommended forward blocking assembly. The LRP chocks remained stored on the pallet. The LRP was blocked to the 1-1/4-inch angle brackets welded to the container with a laminated 2- by 8-inch wood beam. A 1- by 8-inch filler board was placed between the 1-1/4-inch angle and the doors. A detailed drawing of this suggested closeout method is contained in Part 7.

RAIL IMPACT TEST. The prepared test container was secured to a container transportation chassis. The container and chassis were loaded onto a Trailer-on-flatcar (TOFC) with standard draft gear. Equipment needed to perform the test included the specimen (hammer) car, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars were positioned on a level section of track with air and hand brakes set and with the draft gears compressed. The locomotive unit pulled the specimen car several hundred yards away from the anvil cars and, then, pushed the specimen car toward the anvil at a predetermined speed, then disconnected from the specimen car approximately 50 yards away from the anvil cars, which allowed the specimen car to roll freely along the track until it struck the anvil (see Figure 1 on page 3-3). This constituted an impact. Impacting is 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 4 and 6 mph impact speeds are approximate; the 8.1 mph speed is a minimum. Impact speeds are determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.
ASSOCIATION OF AMERICAN RAILROADS (AAR)
STANDARD TEST PLAN

5 BUFFER CARS (ANVIL) WITH DRAFT GEAR
COMPRESSED AND AIR BRAKES IN A SET
POSITION
ANVIL CARS TOTAL WT 250,000 LBS (APPROX)

SPECIMEN CAR
IS RELEASED BY
SWITCH ENGINE TO
ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8.1 MPH
THEN THE CAR IS REVERSED AND
RELEASED BY SWITCH ENGINE TO
ATTAIN: IMPACT NO. 4. @ 8.1 MPH

FIGURE 1
### TEST RESULTS

#### TEST SPECIMEN AND RESULTS RAIL IMPACT DATA

**Test No.:** 1                                                                                   **Date:** 8 April 1996

**Specimen Load:** Munition container loaded with MLRS pods on a LRP.

**TOFC:** TTX 600585                                                                                     **Lt. Wt.:** 72,000

**Chassis No.:** 5394                                                                                         **Wt.:** 6,500

**Container No.:** USAA 0168656                                                                          **Wt.:** 5,170

**LRP:**                                                                                                       **Wt.:** 1,900

**Lading:**                                                                                                     **Wt.:** 21,800

**Total Specimen Wt.:** 107,370                                                                                   **Buffer Car (five cars) Wt.:** 250,000

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<td>1</td>
<td>Rear</td>
<td>6.50</td>
<td>2- by 8-inch boards in contact with the 1-1/4-inch closeout angle crushed 1/8-inch on both sides of the container.</td>
</tr>
<tr>
<td>2</td>
<td>Rear</td>
<td>7.25</td>
<td>Door closing locks and door sill were permanently deformed. Rear beam completely cracked in all three layers on the left side of the container. Does not successfully restrain the LRP.</td>
</tr>
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PART 5

PHOTOGRAPHS
Photo No. SCN-96-115-2403. This photo shows the loaded LRP with four inertly-filled MLRS pods in a container closed out with a single laminated wood beam fabricated with three each 2- by 8-inch boards. The beam was blocked against the internal steel angle just inside the container door. A single 1- by 8-inch board filled between the door and angle.
Photo No. SCN-96-115-2402. This photo shows a front view of the 1- by 8-inch filler board between the angle and the door. The LRP with inertly-filled MLRS pods is in the background. A single laminated wood beam fabricated with three each 2- by 8-inch boards blocks the LRP against the closeout angle. The beam was blocked against the internal steel angle just inside the container door.
Photo No. SCN-96-115-2404. This photo shows the suggested method used to block an LRP of MLRS pods inside a munitions container. The gap between the 1- by 8-inch board is the angle welded to the inside of the container. This is the right side of the container.
Photo No. SCN-96-115-2401. This photo shows the suggested method used to block an LRP of MLRS pods inside a munitions container. The gap between the 1- by 8-inch board is the angle welded to the inside of the container. This is the left side of the container.
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. SCN-96-115-2399. This photo shows the damage to the container door closure and locks. Note the bend in the lower latching mechanism of the lock assembly. Damage was due to the inadequate strength in blocking with three laminated 2- by 8-inch boards.
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. SCN-96-115-2398. This photo shows the damage to the container door closure and locks. Note the bend in the lower latching mechanism of the lock assembly. The latch mechanism is normally straight. Damage was due to the inadequate strength in blocking with three laminated 2- by 8-inch boards.
Photo No. SCM-96-115-2395. This photo shows the damage to the container door locks as a result of inadequate dunnage to restrain an LRP load of MLRS pods in a munitions container. Damage was due to a rail impact of 7.2 mph. The bent locking rods and deformed door sill rendered the container structurally unsafe for shipment.
Photo No. SCM-96-115-2396. This photo shows the damage to the container door locks as a result of inadequate dunnage to restrain an LRP load of MLRS pods in a munitions container. Damage was due to a rail impact of 7.2 mph. The bent locking rods and deformed door sill rendered the container structurally unsafe for shipment.
Photo No. SCM-96-115-2400. This photo shows the damage sustained by the right side of the laminated 2- by 8-inch closeout beam. Note that the wood has split in the area of the vertical closeout angle indicating too much unit pressure in the area of contact.
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. SCM-96-115-2397. This photo shows the damage sustained by the right side of the laminated 2- by 8-inch closeout beam. Note that the wood has split in the area of the vertical closeout angle indicating too much unit pressure in the area of contact.
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<tr>
<td>Photo No. SCM-96-115-2406. This photo shows the laminated 2- by 8-inch beam after the 7.2 mph impact. All three laminations are cracked to the point of permanent deformation.</td>
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MLRS

LOADING AND BRACING WITH LOAD AND ROLL PALLET (LRP) IN COMMERCIAL CONTAINERS OF ROCKET POD/CONTAINERS (RP/C) FOR MULTIPLE LAUNCH ROCKET SYSTEM, FOR SHIPMENT BY T/COFC CARRIER

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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 (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.*

SEE GENERAL NOTE "P" ON PAGE 2.

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY MISSILE COMMAND

DRAFTSMAN R. HAYNES G. WILLIS

APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND

WILLIAM J. EMMETT

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

CLASS 19

DIVISION 48

DRAWING 8184

FILE GM15RS3

PROJECT GM 820-99
GENERAL NOTES

A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).

B. THE SPECIFIED OUTLOADING PROCEDURES ARE APPLICABLE TO LOADS OF MULTIPLE LAUNCH ROCKET SYSTEM ROCKET POD/CONTAINERS (ARP/C) UTILIZING A LOAD AND ROLL PALLETS (LRP). SUCCESSIVE REFERENCE TO POD HEREIN MEANS THE RPC WITH ROCKET COMPONENTS. NOTE: THE OUTLOADING PROCEDURES ARE ALSO APPLICABLE TO THE ARMY TACTICAL MISSILE SYSTEM (ATACMS) MISSILE LAUNCH POD ASSEMBLY (MLPA) OR OTHER SIMILARLY CONFIGURED ITEMS NOT EXCEEDING 22,000 POUNDS IN TOTAL LANDING WEIGHT.

C. FOR DETAILS OF THE ROCKET POD/CONTAINER, SEE ARMY MISSILE COMMAND DRAWING NO. 13027900.

POD DIMENSIONS -- -- 13'-10" LONG BY 41'-1/2" WIDE BY 3'-3/4" HIGH
GROSS WEIGHT -- -- 5,070 POUNDS (APPROX)

D. THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE USED FOR THE SHIPMENT OF THE DEPICTED PODS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED IN THE DRAWING TITLE.

E. THE LOAD AS SHOWN IS BASED ON A 4,700 POUND 20'-4" LONG BY 8'-6" HIGH END OPENING CONTAINER WITH INSIDE DIMENSIONS OF 16'-4" LONG BY 9'-6" WIDE BY 9'-6" HIGH (103" CLEAR HEIGHT) AND A MAXIMUM GROSS WEIGHT OF 52,010 POUNDS. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCART (T/C/FC) SHIPMENT; HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY OTHER SURFACE MODES OF TRANSPORT. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN BE USED.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

LUMBER -- -- -- -- -- SEE TM 743-200-1 (DUCKAGE LUMBER) AND FED SPEC MH-L-751.

MAILS -- -- -- -- -- FED SPEC FF-N-105; COMMON.

STRAPPING, STEEL -- -- ASTM D3653: FLAT STRAPPING, TYPE 1, HEAVY DUTY, FINISH A, B (GRADE 2), OR C.

SEAL, STRAP -- -- ASTM D3653: CLASS H, FINISH A, B (GRADE 2), OR C, DOUBLE NOTCH TYPE, STYLE I, II, OR IV.

WEB STRAP -- -- ANSIA ASSEMBLY PART No. 48050-10 (BN-30-25-120OP) OR EQUIVALENT.

WIRE, CARBON STEEL -- -- ASTM A546; ANNEALED AT FINISH, BLACK OXIDE FINISH; .0500" DIA, GRADE 1000 OR BETTER.

STAKE POCKET PROTECTOR -- -- COMMERCIAL GRADE.

ANTI-CHAFING MATERIAL -- -- -- -- -- FED SPEC 565-P-360, TYPE SF (SOLID FIBERBOARD), CLASS-DOMESTIC, ALL GRADES.

LOAD AND ROLL PALLETS -- -- -- -- LOAD & ROLL INC DRAWING NO. 100-3214 AND PATENT NO. 4,634,000. CAPACITY 22,000 POUNDS.

LUMBER -- -- -- -- -- FED SPEC MH-L-751; DOUGLAS FIR OR COMPARABLE LUMBER WITH STRAIGHT GRAIN AND FREE FROM MATERIAL DEFECTS.

PLYWOOD -- -- -- -- -- COMMERCIAL ITEM DESCRIPTION A-4-55307, TYPE A, CONSTRUCTION AND 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.

F. WHEN LOADING THE PODS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE FORWARD BLOCKING ASSEMBLY). ADDITIONAL MATERIAL Vollar WITHIN THE LOAD ARE TO BE HELD TO A MINIMUM. EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE FILLER BLOCKS ON THE CORNER RETAINER PIECES. NAIL EACH ADDITIONAL PIECE TO THE FILLER BLOCKS AT APPROPRIATELY SIZED NAILS. ADDITIONAlY, THE THICKNESS OF THE FILLER BLOCKS MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE SIZE OF THE LOAD AND ROLL PALLETS OR THE CONTAINER INTERIOR LOADING SPACE.

G. DUCKAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" THICK X 5-1/2" WIDE.

H. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF ONE SEAL WITH TWO PAIR OF NOTCHES WILL BE USED TO SEAL THE JOINT WHEN A NOTCH-TYPE SEALER IS BEING USED, A MINIMUM OF TWO SEALS, BUTTED TOGETHER WITH TWO PAIR OF CRIMPS PER SEAL WILL BE USED TO SEAL THE JOINT WHEN A CRIMP-TYPE SEALER IS BEING USED. REFER TO THE "STRAP JOINT A" AND "STRAP JOINT B" DETAILS ON PAGE 5 FOR GUIDANCE.

I. DIMENSIONS GIVEN FOR DUCKAGE PIECES OR ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY AND INSTALLATION INTO THE END OPENING CONTAINER.

K. MAXIMUM LOAD WEIGHT CRITERIA:

THE MAXIMUM LOAD WEIGHTS ARE CONTROLLED BY EQUIPMENT CAPABILITY FACTORS. THE HEAVIEST MAXIMUM LOADS ARE DELINATED IN THE LOAD VIEWS. PROVISIONS ARE INCLUDED WITHIN THIS DRAWING SO THAT THE BASIC LOADS CAN BE ADJUSTED TO SATISFY A LESSER QUANTITY OF LOADING UNITS. DEPENDING ON TRANSPORTATION ROUTING, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY WEIGHT LIMITS OF CERTAIN STATES. ALSO, IT MAY BE NECESSARY TO REDUCE THE LOAD WEIGHT TO SATISFY OTHER WEIGHT RESTRICTIONS IMPOSED ON THE INTERMODAL CONTAINER SYSTEM.

L. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET ARE APPLICABLE WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLATCART (T/C/FC). SPECIAL T/C/FC NOTES FOLLOW:

1. A LOADED CONTAINER MUST BE ON A CHASSIS EQUIPPED WITH TWO BOGEY ASSEMBLIES WHEN BEING MOVED IN T/C/FC SERVICE.

2. THE LOAD LIMIT OF A T/C/FC RAILCAR MUST NOT BE EXCEEDED, NOR WILL A CAR BE LOAD SO THAT THE TRUCK UNDER ONE END OF THE CAR CARRIES MORE THAN ONE-HALF OF THE LOAD LIMIT FOR THAT CAR.

M. DURING INTRASTATE AND/OR INTERSTATE MOVES BY MOTOR CARRIER, A PROPER CHASSIS IS MANDATORY AND THE TRAILER MUST BE USED TO PREVENT VIOLATION OF OR ONE OR MORE "WEIGHT LIMITS" APPLICABLE TO THE STATE OR STATES INVOLVED.

N. THREE INCH (3") WIDE WEB CARDBOARD STRAPS MAY BE USED IN LIEU OF THE 2" WIDE STEEL HOLD-DOWN STRAPS USED TO SECURE THE LOADING TO THE LOAD AND ROLL PALLET. EACH WEB CARDBOARD STRAP ASSEMBLY MUST HAVE A MINIMUM LOAD RATING OF 9,000 POUNDS AND CONSIST OF A HEAVY CAPACITY RATCHET, 3-INCH WIDE POLYESTER WEBBING, A PAIR OF MOVEABLE CORNER PROTECTORS, A FLAT HOOK ON EACH END, AND A KEEPER ON EACH FLAT HOOK. AN ACCEPTABLE WEB STRAP ASSEMBLY IS IDENTIFIED IN THE MATERIAL SPECIFICATIONS BELOW.

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

P. THE LOAD AND ROLL PALLET IS A COMMERCIAL PRODUCT. FOR A SOURCE OF SUPPLY, CONTACT LOAD AND ROLL INC., 10100 KITTY AVENUE, CHICAGO, IL 60645. PHONE (708) 489-3370.

Q. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SOWELL, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.
SPECIAL HANDLING GUIDANCE

1. POD STACKING FOR OUTLOADING PURPOSES.
   A. THE UPPER POD SHOULD BE PLACED AS CLOSELY AS POSSIBLE IN VERTICAL ALIGNMENT WITH THE LOWER POD.
   B. WHEN STACKING THESE Pods, CARE MUST BE EXERCISED TO ENSURE THAT THE INTERLOCKING HOLES IN THE BOTTOM OF THE POD SKIDS ALIGN CORRECTLY WITH THE INTERLOCKING PINS ON THE TOP OF THE POD FRAME. THIS WILL PRECLUDE DAMAGE TO THE SKIDS AND INSURE PROPER FUNCTIONING OF THE POD INTERLOCKS.

2. POD OR POD STACK HANDLING.
   NOTES: (1) MATERIALS HANDLING EQUIPMENT (MHE) IS INTENDED TO MEAN EQUIPMENT, SUCH AS FORKLIFT TRUCKS, CRANES, HAND TRUCKS, DOLLIES, ROLLER ASSEMBLIES, SLINGS, AND SPREADER BARS, THAT CAN BE USED TO HANDLE THE DEPICTED PODS.
   (2) PRECAUTIONARY HANDLING TECHNIQUES NORMALLY EMPLOYED DR AS SPECIFIED FOR THE TYPE OF COMMODITY INVOLVED WILL BE OBSERVED.
   A. ONLY APPROVED AND APPROPRIATELY SIZED MHE WILL BE USED FOR HANDLING THE DEPICTED PODS.
   B. IF HANDLING IS ACCOMPLISHED WITH A FORKLIFT TRUCK, THE PODS SHOULD BE HANDLED FROM A SIDE POSITION ONLY. CARE MUST BE EXERCISED WHEN INSERTING THE FORKS UNDER THE POD TO PREVENT DAMAGE TO THE PODS BY THE FORK TINES OR THE FORKLIFT PACKAGE GUARD.
      ADDITIONALLY, THE FORK TINES SHOULD BE PLACED UNDER THE PODS IN STRONG AREAS; THAT IS, THE LATERAL FRAME MEMBERS/BUCKLEADS LOCATED NEAR THE LONGITUDINAL CENTER OF THE POD.

3. SEQUENTIAL CONTAINER LOADING.

(CONTINUED AT RIGHT)

SPECIAL HANDLING GUIDANCE

PROJECT GM 620-89
ISOMETRIC VIEW

Although the above view depicts only two pods secured to a load and roll pallet, the same procedures are applicable for a four pod load.
LOADING OF LRP AND MLRS CONTAINERS INTO END OPENING ISO CONTAINER

ATTACHMENT OF WEB STRAP ASSEMBLY TO LRP ANCHORING FACILITY

END-OVER-END LAP JOINT DETAILS

ATTACHMENT OF STEEL STRAPPING TO LRP ANCHORING FACILITY

SPECIAL HANDLING GUIDANCE
INDICATES AFT END OF RP/C.

INDICATES FORWARD END OF RP/C.

REAR OF CONTAINER.

ISOMETRIC VIEW

SECTION A-A

KEY NUMBERS

1. CENTER FILL PIECE, 2" X 4" X 33" (4 REQD). PREPOSITION AS SHOWN AND WIRE TIE TO A VERTICAL FRAME MEMBER OF A ROCKET POD/CONTAINER. SEE NOTE "H" ON PAGE 3.

2. TIE WIRE, NO. 14 GAGE WIRE, 24" LONG (8 REQD). INSTALL WIRE TO FORM A LOOP AROUND A VERTICAL FRAME MEMBER OF A POD AND THE CENTER FILL PIECE. PIECE MARKED (1). BRING ENDS TOGETHER AND TWIST TIGHT.

3. STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" BY A LENGTH TO SUIT (REF: 20'-0") (4 REQD). INSTALL SO AS TO ENCIRCLE THE CONTAINERS IN ONE STACK AS SHOWN.

4. HOLD-DOWN STRAP, 2" X .050" OR .044" X 28'-0" LONG STEEL STRAPPING (4 REQD). INSTALL EACH STRAP FROM TWO 14'-0" LONG PIECES.

5. SEAL FOR 1-1/4" STEEL STRAPPING (4 REQD). 1 PER STRAP. CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES. SEE GENERAL NOTE "H" ON PAGE 2.

6. SEAL FOR 2" STEEL STRAPPING (20 REQD). 5 PER STRAP. CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES. EXCEPT FOR THOSE USED TO SECURE THE PADS, WHICH ONLY REQUIRE ONE PAIR OF NOTCHES. SEE GENERAL NOTE "H" ON PAGE 2.

7. PAD, STRAPPING, 2" X .050" OR .044" X 24" (8 REQD). PRE-POSITION THE PAD BETWEEN THE STRAPPING, PIECE MARKED (3) AND THE LOAD AND ROLL PALLET TIEDOWN PROVISION AND SECURE WITH ONE SEAL WITH ONE PAIR OF NOTCHES. SEE THE "ATTACHMENT OF STEEL STRAPPING TO LFP ANCHORING FACILITY" DETAIL ON PAGE 5.

8. FIBERBOARD ANTI-CHAFING MATERIAL (AS REQD). FOLD FIBERBOARD TO FORM A DOUBLE THICKNESS AND PLACE UNDER STRAPPING AT ALL POINTS OF CONTACT WITH THE CONTAINERS.

(CONTINUED ON PAGE 7)
SPECIAL NOTES:

1. A 4-UNIT LOAD OF ROCKET POD/CONTAINERS (RP/C) IS DEPICTED ON A LOAD AND ROLL PALLET IN AN END OPENING ISO CONTAINER.

2. PRIOR TO LOADING THE PODS INTO THE END OPENING CONTAINER, SEE THE SPECIAL HANDLING GUIDANCE ON PAGES 3 AND 4.

3. ALL STRAPS MUST BE INSTALLED NEAR THE STRONG POINTS OR VERTICALLY REINFORCED AREAS OF THE PODS.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; X 4&quot;</td>
<td>11</td>
<td>B</td>
</tr>
<tr>
<td>4&quot; X 4&quot;</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>NAILS</td>
<td>NO. REQD</td>
<td>POUNDS</td>
</tr>
<tr>
<td>8d (2&quot;)</td>
<td>14</td>
<td>NIL</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>4</td>
<td>NIL</td>
</tr>
<tr>
<td>STEEL STRAPPING, 2&quot;</td>
<td>128&quot;</td>
<td>REQD</td>
</tr>
<tr>
<td>SEAL FOR 1-1/2&quot; STRAPPING</td>
<td>40</td>
<td>REQD</td>
</tr>
<tr>
<td>SEAL FOR 1-1/4&quot; STRAPPING</td>
<td>40</td>
<td>REQD</td>
</tr>
<tr>
<td>WIRE, NO. 14 GAGE</td>
<td>18&quot;</td>
<td>REQD</td>
</tr>
<tr>
<td>PLYWOOD, AS REQD</td>
<td>2 SQ FT</td>
<td>REQD</td>
</tr>
<tr>
<td>ANTI-CHAFING MATERIAL</td>
<td>AS REQD</td>
<td>NIL</td>
</tr>
<tr>
<td>LOAD AND ROLL PALLET</td>
<td>40</td>
<td>REQD</td>
</tr>
</tbody>
</table>

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLRS (RP/C)</td>
<td>4</td>
<td>20,312 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td>4</td>
<td>2,075 LBS</td>
</tr>
<tr>
<td>END OPENING CONTAINER</td>
<td>4</td>
<td>4,700 LBS</td>
</tr>
</tbody>
</table>

TOTAL WEIGHT: 27,088 LBS (APPROX)

*THE 4" X 4" MATERIAL SHOULD MEET THE REQUIREMENTS SET FORTH IN THE MATERIAL SPECIFICATIONS FOR LUMBER, LRP BLOCKING.

FULL LOAD PROCEDURES (STEEL STRAPPING METHOD)
**ISOMETRIC VIEW**

**SECTION A-B**

**KEY NUMBERS**

1. CENTER FILL PIECE, 2" X 4" X 33" (4 REQD). PREPOSITION AS SHOWN AND WIRE TIE TO A VERTICAL FRAME MEMBER OF A ROCKET POD CONTAINER. SEE NOTE 30 ON PAGE 3.

2. TIE WIRE, NO. 14 GAGE WIRE, 24" LONG (8 REQD). INSTALL WIRE TO FORM A LOOP AROUND A VERTICAL FRAME MEMBER OF A POD AND THE CENTER FILL PIECE, PIECE MARKED ①. BRING ENDS TOGETHER AND TWIST TIGHT.

3. WEB STRAP TIE-DOWN ASSEMBLY (4 REQD). INSTALL TO EXTEND FROM AN ANCHORING FACILITY ON ONE SIDE OF THE LOAD AND ROLL PALLET, OVER THE POD STACKS, TO AN ANCHORING FACILITY ON THE OPPOSITE SIDE OF THE PALLET. SEE GENERAL NOTE "N" ON PAGE 2. SEE THE "ATTACHMENT OF WEB STRAP ASSEMBLY TO LIP ANCHORING FACILITY" DETAIL ON PAGE 5.

4. CORNER PROTECTOR (2 PER STRAP PROVIDED). POSITION ON OUTER EDGE OF THE POD FRAME. NOTE: IF THE CORNER PROTECTOR IS MISSING THEN A FOLDED PIECE OF FIBERBOARD SHALL BE USED TO PROTECT THE WEBBING.

5. FORWARD BLOCKING ASSEMBLY (1 REQD). SEE THE DETAIL ON PAGE 10. PRE-POSITION PRIOR TO LOADING THE LOAD AND ROLL PALLET IN THE CONTAINER.

6. LOAD AND ROLL PALLET (1 REQD). SEE THE "SPECIAL HANDLING GUIDANCE" ON PAGES 4 AND 5. SEE GENERAL NOTE "P" ON PAGE 2.

SPECIAL NOTES:

1. A 4-UNIT LOAD OF ROCKET POD/CONTAINERS (RP/C) IS DEPICTED SECURED WITH WEB STRAPPING TO A LOAD AND ROLL PALLETT AND LOADED INTO AN END OPENING ISO CONTAINER.


3. ALL STRAPS MUST BE INSTALLED NEAR THE STRONG POINTS OR VERTICALLY REINFORCED AREAS OF THE PODS.

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2' X 4'</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>4' X 4'**</td>
<td>11</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAILS</th>
<th>NO. REDD</th>
<th>POUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6d (2&quot;)</td>
<td>14</td>
<td>NIL</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>4</td>
<td>NIL</td>
</tr>
</tbody>
</table>

WEB STRAP ASSEMBLY (3") - - - - 4 REDD - - - - 44 LBS
WIRE, NO. 14 GAGE - - - - 16' REDD - - - - NIL
PLYWOOD, AS REDD - - - - 2 SQ FT REDD - - - - NIL
ANTI-CHAFING MATERIAL - - - - AS REDD - - - - NIL
LOAD AND ROLL PALLETT - - - - 1 REDD - 1,970 LBS

LOAD AS SHOWN

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLRS (RP/C)</td>
<td>- - - - 4</td>
<td>20,312 LBS</td>
</tr>
<tr>
<td>DUNNAGE</td>
<td>- - - - -</td>
<td>2,050 LBS</td>
</tr>
<tr>
<td>END OPENING CONTAINER</td>
<td>- - - - -</td>
<td>4,700 LBS</td>
</tr>
<tr>
<td>TOTAL WEIGHT</td>
<td>- - - - -</td>
<td>27,072 LBS (APPROX)</td>
</tr>
</tbody>
</table>

*THE 4" X 4" MATERIAL SHOULD MEET THE REQUIREMENTS SET FORTH IN THE MATERIAL SPECIFICATIONS FOR LUMBER, LRP BLOCKING.

FULL LOAD PROCEDURES (WEB STRAPPING METHOD)
HEADER, LRP BLOCKING LUMBER, 4" X 4" BY INSIDE CONTAINER WIDTH
(REF: 7'-8") (1 REQD). NOTE: TO FACILITATE VARIANCE IN CONTAINER INTERIOR LOADING SPACE, THE THICKNESS OF THE HEADER MAY BE REDUCED BUT SHALL NOT BE MADE LESS THAN 3".

GUIDE BLOCK, 4" X 4" LRP BLOCKING LUMBER TRIANGLE, 3-1/2" LEG BY 6" LEG (2 REQD). LOCATE TIGHT AGAINST CONTAINER SIDEWALLS. NOTE: DIMENSIONS GIVEN FOR GUIDE BLOCK ARE REFERENCE DIMENSIONS ONLY. ACTUAL DIMENSIONS MAY BE VARIED TO FACILITATE VARIANCE IN THE WIDTH OF THE LRP OR THE CONTAINER INTERIOR.

TIE PIECE, 3/4" PLYWOOD TRIANGLE, 9-1/2" LEG BY 5-1/2" LEG (2 REQD). NAIL TO THE GUIDE BLOCKS W/2-6d NAILS AND TO THE HEADER W/3-6d NAILS. NOTE: SIZE OF PLYWOOD TRIANGLE MAY BE ADJUSTED AS REQUIRED TO CORRESPOND TO ACTUAL HEADER AND GUIDE BLOCK SIZES.

FORWARD BLOCKING ASSEMBLY

SHIM, 6" X 11" PLYWOOD BY THICKNESS TO SUIT (AS REQD). SELECT THICKNESS OF PLYWOOD TO FILL VOID BETWEEN FACE OF RETAINER AND END OF LOADING PLATFORM. NAIL PLYWOOD TO FILLER BLOCK W/2-6d NAILS BEFORE INSERTING INTO RETAINER.

FILLER BLOCK, 11" LONG PIECE OF LRP BLOCKING LUMBER BY THICKNESS AND DEPTH TO SUIT (2 REQD). SELECT SIZE OF BLOCK TO FILL VOID BETWEEN RETAINER AND SIDE OF LOADING PLATFORM.

CORNER RETAINER PIECE
NOTE: POSITION SQUARE BAR OF RETAINER PIECE INTO RECESS OF SIDEWALL LOCATED JUST AHEAD OF REAR CORNER POST.
NOTES:
1. 4" x 6" and 2" x 6" shall be nailed together.
2. Hook on lap roller will keep the 4" x 6" and 2" x 6" blocking from rising off floor.
3. Wood wedges on sides between roller and wall shall be toe nailed to 2" x 6" blocking.
EXISTING 1″ x 1″ x 1/4″ ANGLE
4″ x 6″ BLOCKING
2″ x 6″ BLOCKING
HOOK ON LRP ROLLER
SEE NOTE 2

1″ x 6″ BOARD

LRP ROLLER

SECTION A-A

SCALE: 1 1/2″ = 1′-0″