INNER BOOM RUST

MODIFICATION INSTRUCTION

This instruction is authorised for use by command of the Chief of Army. It provides direction, mandatory controls and procedures for the operation, maintenance and support of equipment. Personnel are to carry out any action required by this instruction in accordance with GENERAL A 001.

Introduction

1. This instruction details inspection, treatment and modification of the Palfinger Crane fitted to the Unimog vehicle, to prevent corrosion to the interior and exterior of the inner boom. Crane booms failing the inspection are to be replaced to prevent the possibility of injury to personnel and damage to the equipment.

2. Associated Publications. Reference may be necessary to the latest issue of the following documents:
   a. EMEI Workshop A 850 - Modifications, Trial Modifications and Local Modifications to Equipment - General Instruction;
   b. EMEI Workshop A 851 - Recording Modifications to Equipment - Use of Modification Record Plates and Documentary Requirements;
   c. Equipment Maintenance Programme (EMP) No 18/97;
   d. EMEI Miscellaneous O 011 - Power Operated Cranes and Winches - Operator's Instruction;
   e. EMEI Miscellaneous O 018 - Cranes, Hoists and Winches - Inspection Data;
   f. EMEI Workshop E Series - Occupational Health & Safety;
   g. Australian Standard (AS) 1418-1, Cranes - Part 1, dated 1994;
   h. Australian Standard (AS) 1418-5, Cranes - Part 5, dated 1995;
   i. Australian Standard (AS) 2550-1, Cranes - Part 1, dated 1993;
   j. EMEI Workshop D 700 - Painting of Army Equipment; and
   k. EMEI General P Section - Stores Procedure.

3. Authority. Ref C is the authority to carry out this modification.

General

4. Modification Application. This modification is to be applied to all Truck, Cargo, Unimog, with Crane and all Palfinger Crane assemblies on issue to units and depot stock, or in-service storage held under NSN 3820-66-123-1863.

5. Items Affected. This modification alters the Palfinger Crane (Model PK 4600/244) Inner Boom assembly.

SAFETY PRECAUTIONS WITH USE OF CHEMICAL COMPOUNDS ARE TO BE ADHERED TO.

THE PALFINGER CRANE FITTED TO THE UNIMOG FLEET OF VEHICLES IS NOT TO BE OPERATED PRIOR TO THIS MODIFICATION BEING CARRIED OUT, DUE TO POSSIBLE FAILURE OF THE INNER BOOM, RESULTING IN POSSIBLE INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT.

6. Priority - Group 1. All inner boom assemblies are to be modified prior to further use of the Palfinger crane.

7. Action Required. Actions detailed in this instruction are to be performed by RAEME workshops authorised to carry out Medium and Heavy Grade Repairs. Modification cutting and welding is only to be carried out by the following tradespeople:
   a. Metalsmith ECN 235-2;
   b. defence employed civilian welders with welding certificates 3E, 8F and 8G, or have been assessed by an authorised assessing officer to have passed ECN 235-2 welding certificate standard; or
   c. civilian contractor welders with welding certificates 3F, 8F and 8G, approved to weld AS 1204-350 steel.
8. Units without qualified tradespeople are to submit equipment to their next supporting workshop for modification.

9. Estimated Manhours. For initial planning purposes only, it is estimated that this modification will take 7.0 manhours to perform, excluding preservative applications and civilian contractor support.

10. Stores Required. The stores required are listed in Table 1. All stores are to be demanded through normal supply channels.

11. Items to be Removed. Inner booms failing Visual Inspection, Static Strength Test and Non Destructive Testing (NDT) wall thickness testing will require replacement action. They are to be demanded through Regional Fleet Managers (RFM) for notification to National Fleet Managers (NFM) to effect fleet procurement quantities, under EMP 18/97 control. The item for possible disposal action is listed at Table 2. All stores removed are to be processed in accordance with EMEI General P Section.

12. Special Equipment Required. Vehicles requiring inner booms to be NDT are to be sent to Supporting Logistic Units for submission to qualified civilian contractors to carry out inspection of inner boom wall thickness and testing/certification of crane assemblies.

Detail

13. The sequence for the modification of the inner boom for Medium and Heavy Grade Repair is to be carried out in the following procedures for rectification action.

14. Visual Inspection. All boom components are to be inspected prior to any rectification action for the following areas:

   a. all boom components visually inspected for twisting, warpage and bending;
   b. external surface areas checked for deep corrosion damage;
   c. note areas with stress/failure indications (paint cracking, flaking).

NOTE

Boom assemblies with twisting, bending, warpage and deep corrosion failure are to be replaced with new assemblies. No repair action is to be carried out on unserviceable structural members, due to the effect on component strength capabilities.

15. Access Hole/Lifting Plate. Inner booms, which have passed the visual inspection, are to have an access hole cut into the end of the inner boom. Additionally a section of the lifting plate is to be removed for an internal visual inspection, and for possible NDT requirements of the inner boom assembly. Carry out the following actions:

ENSURE THAT THE CRANE IS STOWED CORRECTLY OR SUPPORTED ON SUITABLE STANDS AND ALL COMBUSTIBLE MATERIALS ARE REMOVED OR PROTECTED PRIOR TO COMMENCING MODIFICATION.

   a. remove the bolts securing external hydraulic lines on the inner boom and secure lines clear of work area;
   b. mark out a hole centrally at the inner boom end plate, using Fig 1 for location and Fig 2 for dimensions;
   c. cut the initial hole (70 mm) with either a hole saw or oxygen/acetylene cutting equipment;
   d. dress the edges of the hole, ensuring the final hole dimension is 75 mm;

Table 1 - Stores Required

<table>
<thead>
<tr>
<th>Serial</th>
<th>NSN</th>
<th>Mfr Part No</th>
<th>Designation</th>
<th>Unit of Issue</th>
<th>Qty per Equip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3439-66-031-1007</td>
<td>E 48</td>
<td>Electrode Welding, Low Hydrogen</td>
<td>5 kg</td>
<td>as req</td>
</tr>
<tr>
<td>2</td>
<td>8030-66-132-7649</td>
<td></td>
<td>Konrust, 5 Litre Container</td>
<td>1</td>
<td>as req</td>
</tr>
<tr>
<td>3</td>
<td>8010-66-011-0476</td>
<td></td>
<td>Metal Red Oxide Paint, 1 Litre</td>
<td>1</td>
<td>as req</td>
</tr>
<tr>
<td>4</td>
<td>8010-68-025-5001</td>
<td></td>
<td>Enamel Olive Drab, 1 Litre</td>
<td>1</td>
<td>as req</td>
</tr>
<tr>
<td>5</td>
<td>8030-66-132-7650</td>
<td></td>
<td>Protector Skin (HDP), 1 Litre</td>
<td>1</td>
<td>as req</td>
</tr>
<tr>
<td>6</td>
<td>6850-00-880-7616</td>
<td></td>
<td>Silicon Sealant</td>
<td>ea</td>
<td>as req</td>
</tr>
<tr>
<td>7</td>
<td>NIC</td>
<td>NIC CP 50</td>
<td>Plug, Plastic, 75 mm</td>
<td>ea</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2 - Items for Disposal

<table>
<thead>
<tr>
<th>Serial</th>
<th>NSN</th>
<th>Mfr Part No</th>
<th>Designation</th>
<th>Qty per Equip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3820-66-123-1863</td>
<td>46.244 06</td>
<td>Inner Boom Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>
NOTE
The hole must be located centrally in the end plate and must not exceed the dimension of 75 mm.

e. using a suitable cutting wheel, or carbon arc - air gouging equipment, carefully cut a central section of 120 mm wide from the lifting plate, as shown in Fig 3;

f. two complete lengths along the lifting plate plus the 50 mm end plate weld will be required to be cut, ensuring that no boom parent metal is removed;

g. remove the 120 mm cut lifting plate away from the inner boom (this will leave two outside lifting plate sections retained on the boom);

h. using a grinder, carefully remove any high spots left over from the removal action, ensuring not to overheat or remove any of the boom parent metal;

i. with an electric wire wheel or hand brush, clean all boom surface areas of rust and corrosion, and ensure all paint is removed from areas that may require to be NDT; and

NOTE
All external and internal surface areas are to be checked for corrosion (known corrosion areas are indicated at Fig 1).

j. using a suitable light source, inspect the interior and exterior surface areas of the inner boom for deep rust and corrosion damage and pitting.

16. NDT Inspection. Inner booms with deep surface corrosion, pitting or scale areas of unknown depth are to be NDT by qualified civilian contractors. Actions required are:

a. suspected areas are to be marked on adjacent external areas so as to be easily recognised for NDT testing;

b. NDT action is to be coordinated through Supporting Logistic Units;

c. allowable limitations contained in this EMEI are to be adhered to;

d. inner booms failing NDT are to be replaced (new inner booms without this modification for access hole/lifting plate are to be modified);

e. civilian contractor certification of NDT results are to be retained in the equipment GM 120 Log Book; and

f. serviceable booms are to have the modification action completed.

NOTE
If the internal or external surfaces have deep pitting and corrosion in the parent metal, units are to submit vehicles to Supporting Logistic Units for NDT. This is to ensure that the original inner boom, metal wall thickness of 4 mm is not below the minimum allowable wall thickness of 3.2 mm. Allowable limitation with corrosion area is not to exceed and can be less than 3.0 mm² over any 150 cm² area of the inner boom assembly.

17. Modification Completion. Serviceable booms are to have the following final rectification actions carried out:

a. fit the removed lifting plate section into original position, and using a staggered welding technique (as indicated at Fig 4), maximum of 50 mm per weld run, weld along the two lengths of the cut edges (using Item 1, Table 1);

NOTE
The welding method can either be by arc welder, MIG, using ER 705G MIG wire with Argoshield 52 gas or MMA with E 48 electrodes.

DO NOT WELD ACROSS THE ENDS OF THE LIFTING PLATE (FIG 3); THIS INCLUDES THE 50 MM WELD CUT TO REMOVE THE LIFTING PLATE, AS THIS CAN WEAKEN THE INNER BOOM STRENGTH.

b. visually examine all weld lengths for full coverage of the two cut edges of the lifting plate;

c. treat interior and exterior surface areas with Item 2, Table 1, by spray gun application;

d. allow application to seep between lifting plate and inner boom, to cover surface areas beneath lifting plate;

e. drain all residue, and allow application to react for three hours;

f. apply Item 3, Table 1, ensuring all interior surface areas and all exposed boom surface areas are coated;

g. paint all external surface areas requiring application with Items 4 and 5, Table 1, and allow drying period between applications;

h. apply Item 6, Table 1, (or suitable sealant compound) to top and bottom leading edges of lifting plate, to prevent water entry under lifting plate surface area; and

i. fit Item 7, Table 1, to hole cut at end of inner boom.

NOTE
If the internal or external surfaces have deep pitting and corrosion in the parent metal, units are to submit vehicles to Supporting Logistic Units for NDT. This is to ensure that the original inner boom, metal wall thickness of 4 mm is not below the minimum allowable wall thickness of 3.2 mm. Allowable limitation with corrosion area is not to exceed and can be less than 3.0 mm² over any 150 cm² area of the inner boom assembly.

17. Modification Completion. Serviceable booms are to have the following final rectification actions carried out:

a. fit the removed lifting plate section into original position, and using a staggered welding technique (as indicated at Fig 4), maximum of 50 mm per weld run, weld along the two lengths of the cut edges (using Item 1, Table 1);

NOTE
The welding method can either be by arc welder, MIG, using ER 705G MIG wire with Argoshield 52 gas or MMA with E 48 electrodes.

DO NOT WELD ACROSS THE ENDS OF THE LIFTING PLATE (FIG 3); THIS INCLUDES THE 50 MM WELD CUT TO REMOVE THE LIFTING PLATE, AS THIS CAN WEAKEN THE INNER BOOM STRENGTH.

b. visually examine all weld lengths for full coverage of the two cut edges of the lifting plate;

c. treat interior and exterior surface areas with Item 2, Table 1, by spray gun application;

d. allow application to seep between lifting plate and inner boom, to cover surface areas beneath lifting plate;

e. drain all residue, and allow application to react for three hours;

f. apply Item 3, Table 1, ensuring all interior surface areas and all exposed boom surface areas are coated;

g. paint all external surface areas requiring application with Items 4 and 5, Table 1, and allow drying period between applications;

h. apply Item 6, Table 1, (or suitable sealant compound) to top and bottom leading edges of lifting plate, to prevent water entry under lifting plate surface area; and

i. fit Item 7, Table 1, to hole cut at end of inner boom.

16. NDT Inspection. Inner booms with deep surface corrosion, pitting or scale areas of unknown depth are to be NDT by qualified civilian contractors. Actions required are:

a. suspected areas are to be marked on adjacent external areas so as to be easily recognised for NDT testing;

b. NDT action is to be coordinated through Supporting Logistic Units;

c. allowable limitations contained in this EMEI are to be adhered to;

d. inner booms failing NDT are to be replaced (new inner booms without this modification for access hole/lifting plate are to be modified);

e. civilian contractor certification of NDT results are to be retained in the equipment GM 120 Log Book; and

f. serviceable booms are to have the modification action completed.

NOTE
If the internal or external surfaces have deep pitting and corrosion in the parent metal, units are to submit vehicles to Supporting Logistic Units for NDT. This is to ensure that the original inner boom, metal wall thickness of 4 mm is not below the minimum allowable wall thickness of 3.2 mm. Allowable limitation with corrosion area is not to exceed and can be less than 3.0 mm² over any 150 cm² area of the inner boom assembly.

17. Modification Completion. Serviceable booms are to have the following final rectification actions carried out:

a. fit the removed lifting plate section into original position, and using a staggered welding technique (as indicated at Fig 4), maximum of 50 mm per weld run, weld along the two lengths of the cut edges (using Item 1, Table 1);

NOTE
The welding method can either be by arc welder, MIG, using ER 705G MIG wire with Argoshield 52 gas or MMA with E 48 electrodes.

DO NOT WELD ACROSS THE ENDS OF THE LIFTING PLATE (FIG 3); THIS INCLUDES THE 50 MM WELD CUT TO REMOVE THE LIFTING PLATE, AS THIS CAN WEAKEN THE INNER BOOM STRENGTH.

b. visually examine all weld lengths for full coverage of the two cut edges of the lifting plate;

c. treat interior and exterior surface areas with Item 2, Table 1, by spray gun application;

d. allow application to seep between lifting plate and inner boom, to cover surface areas beneath lifting plate;

e. drain all residue, and allow application to react for three hours;

f. apply Item 3, Table 1, ensuring all interior surface areas and all exposed boom surface areas are coated;

g. paint all external surface areas requiring application with Items 4 and 5, Table 1, and allow drying period between applications;

h. apply Item 6, Table 1, (or suitable sealant compound) to top and bottom leading edges of lifting plate, to prevent water entry under lifting plate surface area; and

i. fit Item 7, Table 1, to hole cut at end of inner boom.
18. **Post Modification Testing.** Prior to tasking the vehicle crane, the crane is to be checked and operated without being loaded by qualified personnel, to ensure the crane is in a safe condition.

**NOTE**

Procedures are contained in Ref D for Operator's Instruction, and Ref E for Inspection Data prior to operating.

19. The crane (including cranes with inner boom replacement action) is to be tested to meet the requirements of Ref H, Para 11.2 (c). The two tests consist of the following:

- a. Visual Inspection, and
- b. Static Strength Test.

20. The above two test procedures are at Tables 3 and 4 and are to be conducted when any repairs or rectification action has been carried out to crane assemblies.

**NOTE**

Fig 5 of this EMEI is to be used for correct Safe Working Load Limits; EMEI Vehicle G 627-2, Fig 4, details incorrect lifting capacities and is to be amended.

21. **Inspection after Testing.** Following completion of the tests and tests for cranes classified as serviceable, a further visual inspection is to be conducted. This is to determine any evidence of buckling, permanent deformation, paint cracking, flaking or other indications or evidence of failure and stress beyond the capability of the crane.

22. Crane components with signs of failure or stress indications are to be replaced and the crane retested for static strength, as per Tables 3, 4, and 5.

23. **Record of Testing.** A Certificate of Test for Mobile Cranes (Table 5) is to be compiled, indicating the loads and radii used to test the structural integrity of the crane.

24. The certificate is to be placed inside the Record Book, GM 120, of the vehicle (Section 3) and a copy sent to MEA B Vehicle Section for future fleet inspection and testing.

25. **Post Modification, Preventive Maintenance.** For future crane preventative maintenance, after modification action has been completed, the following procedures are recommended:

- a. Non Technical Inspections are to include the removal of the plastic plug and the interior of the inner boom inspected for corrosion;
- b. cranes are to be inspected every 6 months, as detailed in Ref E;
- c. Minor and Major Services are to include Crane Inspection and, if required, booms are to be treated using this EMEI as the authority;
- d. after vehicle water operations, the plug should be removed and the interiors of the inner boom flushed with fresh water, allowed to dry, inspected and treated, as detailed in Para 18 (c) to (h) and refit the end plug; and
- e. for removal of the inner boom, after this modification has been completed, do not use the lifting plate as the lift point, as the boom will require to be slung for lift removal.

26. **Recording Action.** On completion of the modification, the following actions are to be taken:

- a. enter the appropriate details into the Equipment Record Book, GM 120;
- b. deface the number 32 on the modification record plate; and
- c. notify MEA by sending a copy of the Certificate of Test (Table 5).

---

**Figure 1 — Inner Boom Assembly**
SECOND BOOM END PLATE INSPECTION HOLE

Figure 2 - Location of Cutting Hole (75 mm)

CUT SECTION OF TOP PLATE AND REMOVE TO EXPOSE RUST
MATCHED AREA TO BE INSPECTED FOR ROUGH SURFACE RUST
REPLACE SECTION OF TOP PLATE AFTER INSPECTION AND WELD

Figure 3 - Boom Lifting Plate
Figure 4 - Replacement of Boom Lifting Plate

PALFINGER

TYPE: PK4000/46/244
YEAR: 1984

MAXIMUM LIFTING CAPACITY
3.3 m
1350 kg
1050 kg
860 kg

Figure 5 - Safe Working Load Limits
### Table 3 - Visual Inspection

Visual inspection includes checking for compliance with specifications and condition of all vital components, such as:

1. mechanisms, electrical equipment, safety devices, brakes, controls, lighting and indicating systems;
2. all guarding;
3. hooks, sheave blocks or other load-handling attachments and their connections;
4. ropes and their fastenings; and
5. boom and jib connections.

### Table 4 - Static Strength Test

**PURPOSE:** The purpose is to demonstrate the overall structural integrity of the loaded crane.

**PROCEDURE:** The test shall impose the maximum stress in the major components, as identified by the designer or manufacturer. A minimum of two tests at 125% of the rated capacity shall be selected from the strength governed area of the load chart (Fig 5) for the radii indicated.

**REQUIREMENT:** THE CRANE SHALL BE CONSIDERED AS COMPLYING WITH THIS TEST PROVIDED THAT THE TEST LOAD IS SAFELY SUPPORTED FOR 10 MINUTES WITHOUT ADVERSELY AFFECTING ANY PART OF THE CRANE.

**NOTE:**

1. only those qualified personnel necessary to carry out the test should be in the test area;
2. outriggers are to be down and locked;
3. vehicle tyres are to be inflated to correct tyre inflation pressures;
4. crane is to be level within 1% of gradient on a firm supporting surface;
5. loads are to be lifted at the correct radii, and no crane retracting or extending is to be carried out with test loads;
6. test loads are only required to be lifted sufficiently off the ground to conduct test requirements; and
7. indications of any failure during test procedures, loads are to lowered to the ground and the crane re-inspected, as per Para 15, for serviceability.
Table 5 - Certificate of Test for Mobile Cranes

<table>
<thead>
<tr>
<th>Test:</th>
<th>Certificate No:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit/Manufacturing Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Make and Model of Crane:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer's Serial No:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Load Chart Identification (EMEI/Plate on Crane):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regulatory Authority Acceptance No:</th>
<th>Identification No:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Testing performed to AS 1418-5, Cranes, Part 5, Mobile and Vehicle - Loading Cranes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of testing station/unit and by whom:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TESTS — State the loads and manner applied, state greatest and smallest loads applied and the conditions of application and the results:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>This is to certify that an Inspector witnessed the testing described on:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Date) at (Address)</td>
</tr>
</tbody>
</table>

END

List VEH G 32.0 - Code 1 (MEA 950034)