

## TRUCK, LIGHTWEIGHT AND TRUCK, LIGHT – ALL TYPES – LAND ROVER 110 4X4 AND 6X6

### CHASSIS REPAIRS

## MISCELLANEOUS 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 EMEI General A 001.

### INTRODUCTION

1. During service, the chassis of some vehicles develop faults in the chassis that are sufficiently serious to require the vehicle to be classified 'XX – Not To Be Used' until they are repaired. The most common faults are cracks in the chassis. However, there are also instances where chassis rails have been crushed where components have been secured to the chassis by through bolts, without supporting bushes fitted inside the chassis member, e.g. at the steering box attaching point, and where component mounting holes have become elongated.
2. This instruction details the welding procedures to be used to perform the following:
  - a. repair chassis cracks, either partial or full penetration;
  - b. reclaim elongated chassis holes that are used to mount components; and
  - c. repair a crushed chassis member and inserting a supporting bush inside the chassis rail to prevent further crushing.

### Associated Publications

3. Reference may be necessary to the latest issue of the following documents:
  - a. Technical Regulation of Army Material Manual – Land (TRAMM-L);
  - b. Electronic Supply Chain Manual (ESCM);
  - c. [EMEI Vehicle G 104-1](#) – Truck, Utility, Lightweight and Truck, Utility, Lightweight, Winch, MC2 – Land Rover 110 4x4 – Medium Grade Repair;
  - d. [EMEI Vehicle G 204-1](#) – Truck, Cargo, Light and Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6x6 – Medium Grade Repair;
  - e. [EMEI Workshop D 180](#) – Flaw Detection, Dye Penetrant (Colour Contrast) Inspection – General Instruction;
  - f. EMEI Workshop J Series – Welding and Cutting Equipment;
  - g. AS 1443:2004 – Carbon and Carbon Manganese Steel – Cold Finished Bars;
  - h. AS/NZS 1554.1:2004 Structural Steel Welding – Part 1: Welding of Steel Structures; and
  - i. [SAFETYMAN Vol 1, Part 5, Chap 1](#) – Management of Hazardous Substances – Excluding Explosives and Radioactive Materials. Access to Material Safety Data Sheets (MSDS) for view or print is now available via the Chem Alert 2 database on at <http://dsmachem.defence.gov.au/index.jsp>.

### GENERAL

#### Application

4. This procedure is to be used to repair the following chassis faults in both 4x4 and 6x6 Land Rover variants by welding:
  - a. cracks, either partial or full penetration;
  - b. elongation of component mounting holes; and

- c. crushed chassis members (this repair includes inserting a supporting bush inside the chassis member to prevent further crushing).

**Action Required**

- 5. Actions detailed in this instruction are to be performed by technical maintenance organisations authorised to perform Medium and Heavy Grade Repairs.
- 6. Work required to prepare the vehicle for welding, e.g. removal of mechanical, electrical or electronic components, is to be performed by an appropriately qualified tradesperson. However, all weld area preparation, welding, and post-welding inspection and repair are to be conducted only by:
  - a. ECN-235-2 Metalsmith;
  - b. RAAF Ground Welder; or
  - c. a civilian equivalent.
- 7. All welding workmanship is to be in accordance with the guidelines stated in AS/NZS 1554.1, Section 5.
- 8. All welds produced during performance of this instruction are to be visually inspected in accordance with AS/NZS 1554.1, Section 6, Table 6.2.2 (SP).

**Estimated Work Hours**

- 9. The work hours required to perform the repair will depend on the extent and location of the faults. However, the following information is provided for initial planning purposes only:
  - a. repair chassis cracks – 1.5 work hours per crack;
  - b. reclaim elongated holes – 1.0 work hours per hole; and
  - c. repair crushed chassis members –2.0 work hours per crush point.

**Stores Required**

- 10. The stores required are shown in Table 1 and should be ordered on an ‘as required’ basis.

**Table 1 Stores Required**

Serial	NSN	Description	Qty Per Equipment
1	8010-66-148-8030	Paint, Cold Galvanising, Galmet	As Required
2	NIC	Steel, 19 mm diameter, Bright Bar, Grade AS 1443/D5	As Required

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**All industrial safety, work practices, and equipment operating and maintenance instructions pertaining to this EMEI are to be adhered to.**

**DETAIL**

- 11. **Preliminary Repair Activity.** Regardless of the repair being performed, the following preliminary activity is to be performed prior to starting the welding:
  - a. Park the vehicle in a convenient location within the workshop. Apply the park brake and turn the engine off.
  - b. Immobilise the vehicle for welding by disconnecting the battery earth cable and insulating the negative battery terminal to prevent accidental contact.
  - c. Remove any components that impede access to the repair area.
  - d. Remove or protect all components that may be damaged during grinding and welding.
  - e. Disconnect any sensitive electrical/electronic equipment that may be damaged during welding.

**12. Repair of Chassis Cracks.** When repairing chassis cracks that have either fully or partially penetrated the chassis member, proceed as follows:

- a. Using an electric grinder or sander, remove the zinc coating from within 25 mm of the crack in all directions.
- b. Determine the orientation and extent of the crack by using the penetrant inspection method in accordance with EMEI Workshop D 180 and allow a penetrant dwell time of 10 minutes following application. Indicated cracks will be characterised by a sharp tip and a high length-to-width ratio.
- c. If further cracking is detected, repeat the process described in Paragraph 12.a above, to include the additional cracking found.
- d. Using a 3.3 mm diameter drill, make a stop hole in the ends of the crack to prevent further crack propagation.
- e. Using a grinder or rotary burr, prepare the crack for welding in accordance with the details provided in Figure 1. Chamfer both excavation ends, i.e. the stop holes, in accordance with the details provided in Figure 2.
- f. Weld the prepared areas using either:
  - (1) the Manual Metal Arc Welding (MMAW) process using low hydrogen electrodes that conform to AS/NZS 1553.1:E4818, e.g. Ferrocraft 61 or Austarc 18TT; or
  - (2) the Gas Metal Arc Welding (GMAW) process using consumables that conform to AS/NZS 2717.1:ES6-GC/M-W503AH, e.g. Autocraft LW1 or Austmig ES6, and using shielding gas that conforms to AS 4822:SG – ACO – 16/2.75, e.g. Argoshield Universal.
- g. Clean off any weld splatter, and remove any sharp edges and burrs.
- h. Check the weldments for defects, using the penetrant inspection method in accordance with EMEI Workshop D 180 and allow a penetrant dwell time of 10 minutes following application. Any defects indicated are to be repaired using the consumables listed in Paragraph 12.f above and reinspected.
- i. Patch paint the completed repair with cold galvanising paint (Table 1, Item 1).

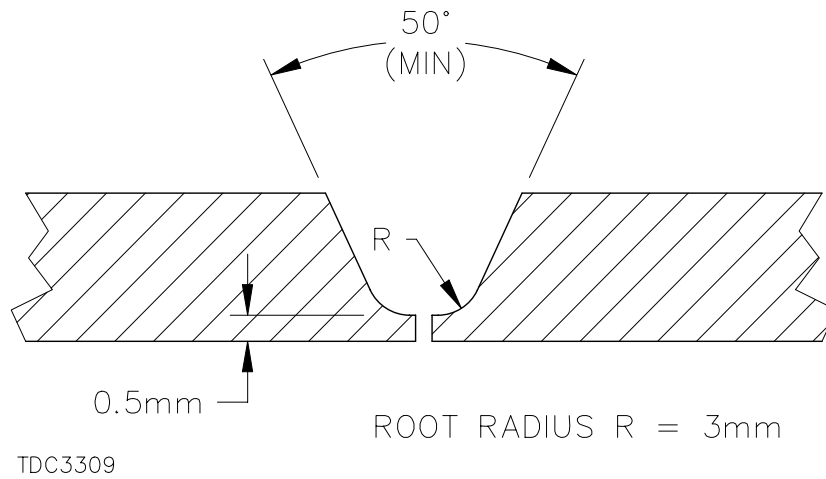
**13. Repair of Elongated Holes.** When repairing elongated holes in the chassis, proceed as follows:

- a. Using an electric grinder or sander, remove the zinc coating from within 25 mm of the repair area in all directions.
- b. Conduct penetrant inspection in accordance with EMEI Workshop D 180 and allow a penetrant dwell time of 10 minutes following application to determine whether any cracks are present. Indicated cracks will be characterised by a sharp tip and a high length-to-width ratio.
- c. If cracks are detected, repair them using the procedure described in Paragraph 12 above, except do not patch paint the repair weld.
- d. Using either a file or rotary burr, clean the surface of the hole to be repaired.
- e. Using either of the following processes, deposit sufficient weld metal to enable profiling the hole back to its original dimensions:
  - (1) the Manual Metal Arc Welding (MMAW) process using low hydrogen electrodes that conform to AS/NZS 1553.1:E4818, e.g. Ferrocraft 61 or Austarc 18TT; or
  - (2) the Gas Metal Arc Welding (GMAW) process using consumables that conform to AS/NZS 2717.1:ES6-GC/M-W503AH, e.g. Autocraft LW1 or Austmig ES6, and using shielding gas that conforms to AS 4822:SG – ACO – 16/2.75, e.g. Argoshield Universal.
- f. Clean off any weld splatter, and remove any sharp edges and burrs.
- g. Check the weldments for defects using the penetrant inspection method in accordance with EMEI Workshop D 180 and allow a penetrant dwell time of 10 minutes following application. Any defects indicated are to be repaired using the consumables listed in Paragraph 13.e above and reinspected.
- h. Profile the hole back to its original dimensions.
- i. Patch paint the completed repair with cold galvanising paint (Table 1, Item 1).

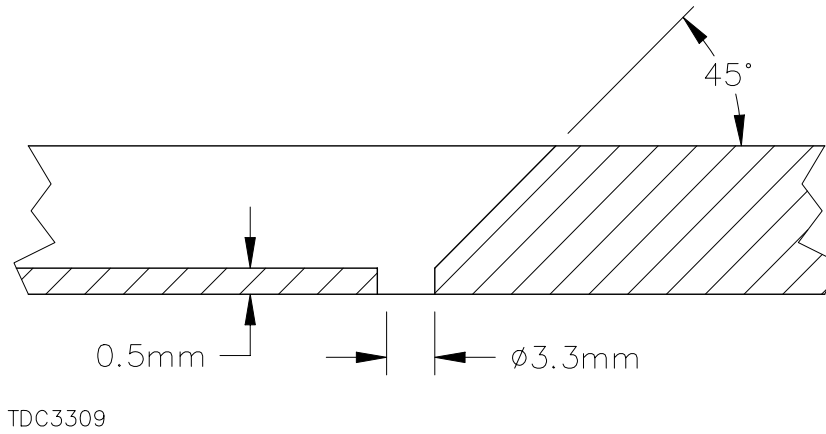
- 14. Repairing Crushed Chassis Members.** When repairing crushed chassis members, proceed as follows:
- a. If the sidewalls of the chassis member are deformed inwards, straighten them using a drift with radiused end by working through the chassis member holes from the opposite side.
  - b. Using an electric grinder or sander, remove the zinc coating from within 25 mm of the repair area in all directions.
  - c. Conduct penetrant inspection in accordance with EMEI Workshop D 180 and allow a penetrant dwell time of 10 minutes following application to determine whether there are any cracks present. Indicated cracks will be characterised by a sharp tip and a high length-to-width ratio.
  - d. If cracks are detected, repair them using the procedure described in Paragraph 12 above, except do not patch paint the repair weld.
  - e. If the holes are elongated, repair them using the procedure described in Paragraph 13 above, except do not patch paint the repair weld.
  - f. Enlarge the holes on the inside of the chassis member to 16.3 mm diameter and chamfer it 2 mm x 45 degrees.
  - g. Enlarge the holes on the outside of the chassis member to 19.3 mm diameter.
  - h. Using 19 mm diameter steel bar (Table 1, Item 2), manufacture the required number of strengthening sleeves in accordance with the details given in Figure 3. The external dimensions of the sleeves are the same for all applications. However, the diameter of the internal hole will depend on the diameter of the through bolts used in that location.
  - i. Insert the strengthening sleeves into the chassis member with the stepped end located in the inside wall (the 16.3 mm diameter hole).
  - j. Weld the sleeves into the chassis member using either of the following two processes:
    - (1) the Manual Metal Arc Welding (MMAW) process using low hydrogen electrodes that conform to AS/NZS 1553.1:E4818, e.g. Ferrocrafter 61 or Austarc 18TT; or
    - (2) the Gas Metal Arc Welding (GMAW) process using consumables that conform to AS/NZS 2717.1:ES6-GC/M-W503AH, e.g. Autocraft LW1 or Austmig ES6, and using shielding gas that conforms to AS 4822:SG – ACO – 16/2.75, e.g. Argoshield Universal.
  - k. Clean off any weld splatter and remove any sharp edges and burrs.
  - l. Check the weldments for defects using the penetrant inspection method in accordance with EMEI Workshop D 180. Any defects indicated are to be repaired using the consumables listed in Para 14.j above, and reinspected.
  - m. Profile the chassis member walls back to its original dimensions.
  - n. Patch paint the completed repair with cold galvanising paint (Table 1, Item 1).
- 15. Post-repair Activity.** The following activity is to be performed after completing the welding:
- a. Reconnect electrical/electronic equipment previously disconnected.
  - b. Refit any components removed and protection fitted prior to the repair process.
  - c. Remove the insulation from the battery earth cable terminal and reconnect the battery earth cable.
  - d. Road test the vehicle and return it to the storage area.

### Recording Action

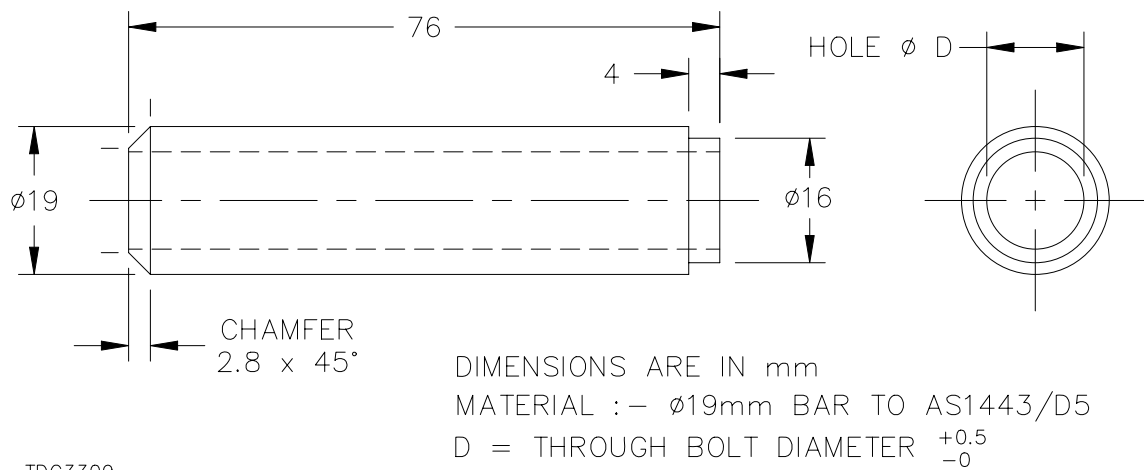
- 16.** On completion of the work, insert the following information in Section Four of the vehicle GM 120 – Record Book for Service Equipment:
- a. a completed Welding Procedure Data Sheet (see Table 2) that records the details of the welding procedure used to make the repair(s); and
  - b. the details of the repair.



**Figure 1 Crack Preparation for Welding**



**Figure 2 Excavation and (Stop Hole) Preparation for Welding**



**Figure 3 Strengthening Sleeve**

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**Table 2 Welding Procedure Data Sheet**

<b>Equipment:</b>					<b>ARN:</b>					<b>Date:</b>				
1. Welding Process (used):														
a. Manual Metal Arc Welding (MMAW) <input type="checkbox"/>					b. Gas Metal Arc Welding (GMAW) <input type="checkbox"/>									
2. Material Type:					Specification:									
3. Weld Preparation:					Weld Position:									
Included Range:					Joint Sketch:									
Root Gap:														
Roof Face:														
4. Filler Material:														
Specification:														
Size:														
Heat Treatment:														
5. Shielding Gas:					Flow Rate:									
6. Welding Machine Type:					Serial No:									
7. Power Type:					Polarity:									
8. Pre-heat:					Interpass Temp:									
9. Post-heat Treatment:														
10. Joint Preparation:														
11. Joint Cleaning:														
12. Welding Parameters:														
Pass	Current	Volts	mm/min Speed	mm/min Feed	Pass	Current	Volts	mm/min Speed	mm/min Feed					
1					5									
2					6									
3					7									
4					8									
13. Welder (Name):					Date Qualified:									
14. Signature:					Qualification Type:									
15. Authority:					Current Qualification: Yes or No									
Approved or Not Approved:														
ASM (Name):					Signature:									

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**END**  
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