

**TRUCK, DUMP, MEDIUM, WINCH, MC2 – UNIMOG
MEDIUM AND HEAVY GRADE REPAIR**

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.

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GENERAL

Introduction

1. This EMEI details procedures for the removal, repair and installation of Unimog truck dump system components. Dump system components that can be removed, repaired and installed include:
 - a. the hydraulic oil pump (Para 9.);
 - b. the hoist valve (Para 12.);
 - c. the hoist cylinder (Para 15.);
 - d. the air switch (Para 19.);
 - e. the tailgate cylinder (Para 22.); and
 - f. the truck body (Para 25.and 28.).

Associated Publications

2. Reference may be necessary to the latest issue of the following documents:
 - a. [AS 1665](#) – Welding of Aluminium Structures;
 - b. [AS 2717.1](#) – Welding – Electrodes – Gas Metal Arc;
 - c. [Defence Safety Manual](#) (SAFETYMAN);
 - d. [EMEI Vehicle G 604](#) – Truck, Cargo, Medium, MC2 – Unimog – Medium Grade Repair;
 - e. [EMEI Vehicle G 633](#) – Truck, Dump, Medium, Winch, MC2 – Unimog – Light Grade Repair;
 - f. [EMEI Workshop D 180](#) – Flaw Detection – Dye Penetrant (Colour Contrast) Testing;
 - g. [EMEI Workshop D 701](#) – Painting of Army Equipment – Repair Policy for Equipment Painted in Polyurethane Paint;
 - h. [EMEI Workshop E 621](#) – Safety Precautions – Welding – Arc Welding Operation;
 - i. [EMEI Workshop E 652](#) – Occupational Health and Safety Instructions – Application and Removal of Polyurethane Paints and Solvents;
 - j. [EMEI Workshop J 003](#) – Welding Techniques, General;
 - k. [Material Safety Data Sheet](#) (MSDS) – Production Information Sheet; and
 - l. [Technical Regulation of Army Materiel Manual](#) (TRAMM).

Safety

3. Before commencement of this task, safety procedures and practices in EMEI Vehicle G 604 must be observed.

WARNING

Precautions should be taken prior to carrying out repairs which include painting, sanding, scraping or welding. Refer to EMEI Workshop D 701 – Repair Policy for Equipment Painted in Polyurethane Paint.

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

The handling, storage and use of chemical substances are to be in accordance with Safetyman, MSDS and EMEI workshop series requirements.



Do not start the engine whilst replacement procedures are being carried out on any dump system component.

Trade Requirements

4. Actions detailed in this instruction are to be performed by technical maintenance organisations authorised to carry out Medium or Heavy Grade Repairs using the following qualified tradespeople:
 - a. ECN 229 Vehicle Mechanic, or
 - b. civilian equivalent.
5. Weld repairs are to be carried out by the following qualified tradespeople:
 - a. ECN 235-2 Metalsmith, or
 - b. Defence civilian employee with welding certificate 3E (minimum).

Special Tools and Gauges

6. There are no special tools, gauges and apparatus required to perform this task.

Access for Repair

7. **Raise and Lower the Truck Body.** When lifting equipment is required to raise and lower the truck body (e.g. hydraulic failure), overhead lifting equipment and lifting tackle with a capacity greater than 1 tonne must be used. Lifting tackle should be padded to prevent damage to the truck body.



Before raising the truck body, ensure that the parking brake is applied and wheels are chocked at the front and rear. Remove all loose objects and ensure the tailgate is closed and secured.

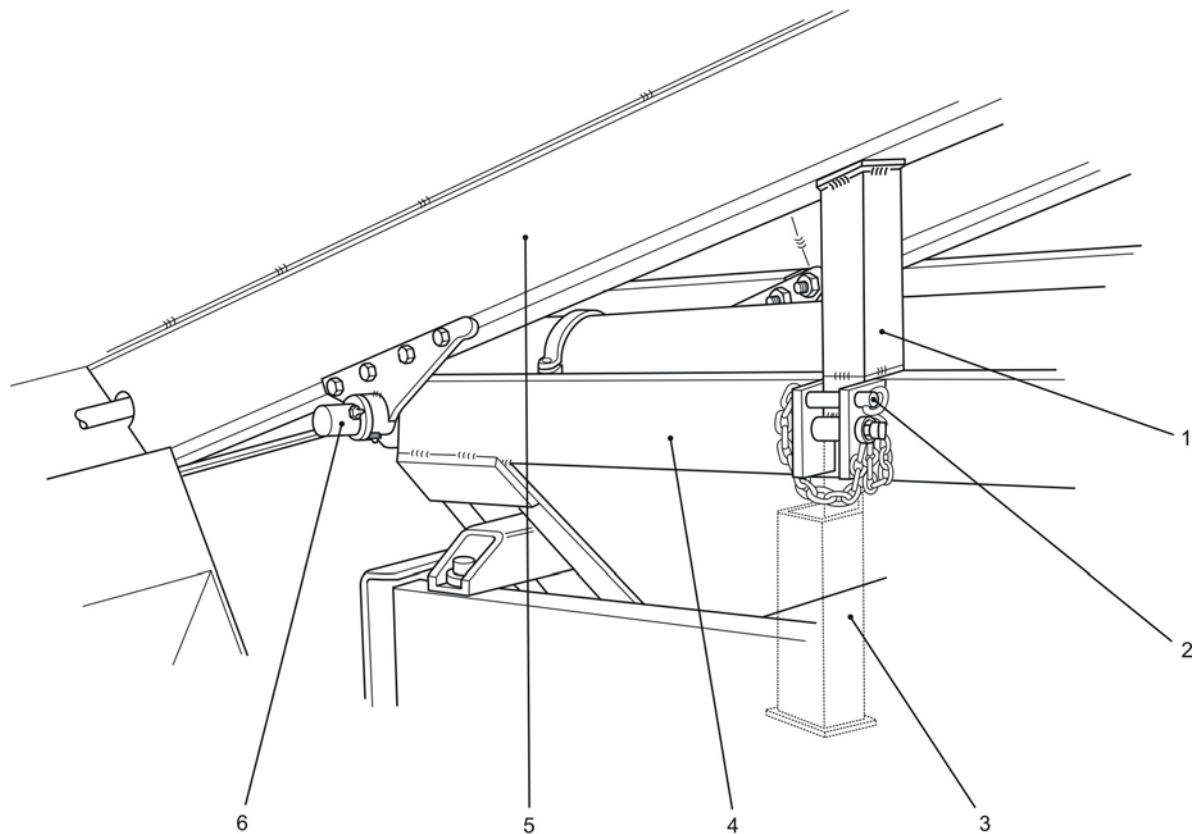
8. Raise and lower the truck as follows (Figure 1):



Do not secure lifting tackle to the tie rail.

Do not work underneath the truck body until the safety support is in position.

- a. Attach lifting tackle around the front end of the truck body. Reeve it between the first tie rail and the body.
- b. Secure lifting tackle to overhead lifting equipment.
- c. Lift the truck body to a height which enables the body safety support (1) to be raised from the stowage position (3).
- d. Raise the body safety support (1) and lock the bracket in position with the cotter pin (2).
- e. Lower the truck body (5) to rest on the safety support (1)



1. Safety support (raised position)
2. Cotter pin
3. Safety support (stowage position)
4. Sub-frame
5. Truck body
6. Body pivot bolt

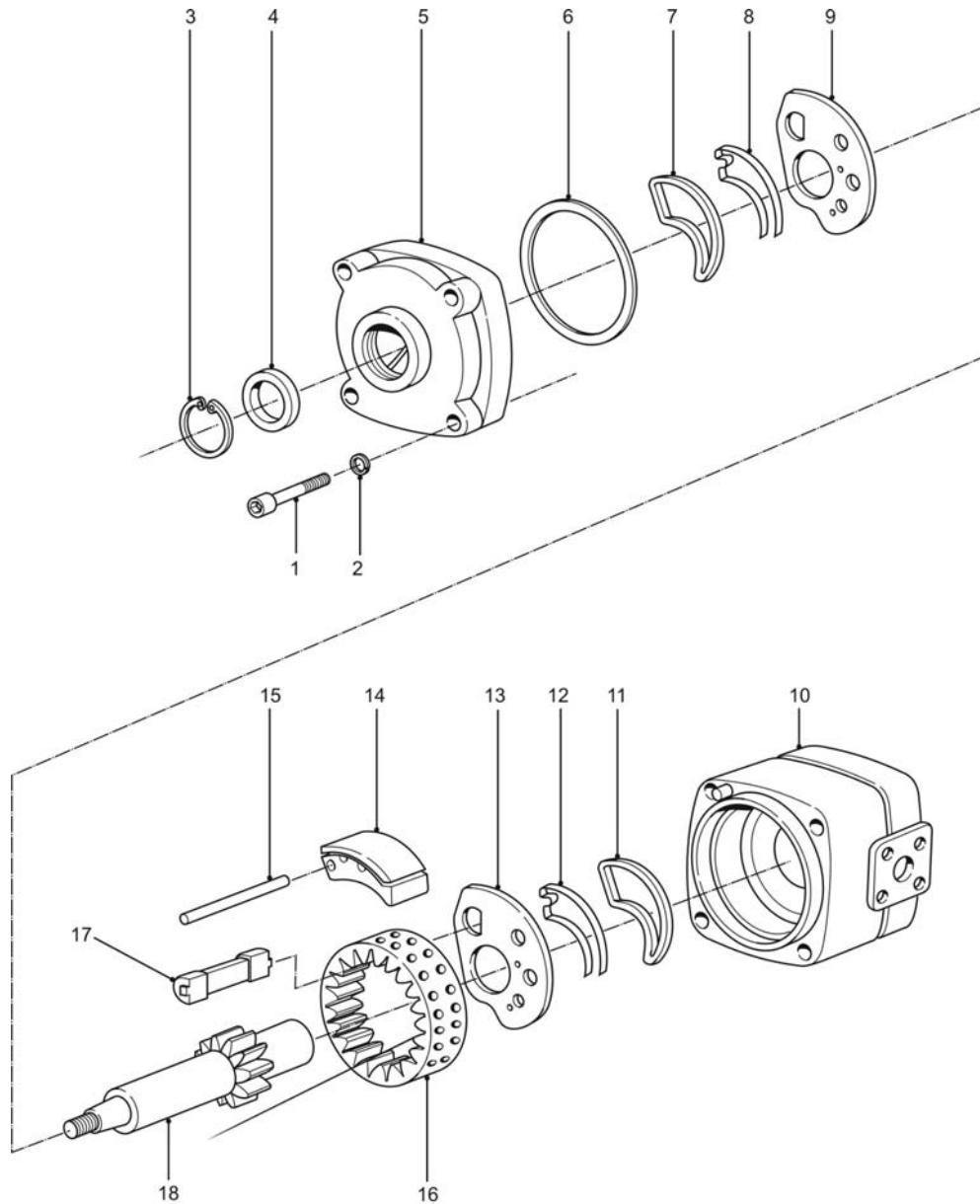
Figure 1 Truck Body Safety Support Location

MEDIUM GRADE REPAIR

Hydraulic Oil Pump

9. **Removal.** Remove the hydraulic oil pump from the engine (Ref EMEI Vehicle G 633).
10. **Repair.** The oil pump is repaired as follows (Figure 2):
 - a. Using an Allen key, remove the bolts (1) and lock washers (2) attaching the cover (5) to the pump body (10). Separate the cover and pump body.
 - b. Lift out the thrust plate (9) from the cover.
 - c. Remove and discard the seal spring (8), seal (7), O ring (6), circlip (3) and gasket (4).
 - d. Remove the rod (15) from the sealing segment (14).
 - e. Using long nose pliers, compress the sealing segment (14) to prevent loss of the internal springs and balls. Remove the positioning pin (17).
 - f. Withdraw the pump shaft (18) and the sealing segment (14).
 - g. Remove the internal ring gear (16).
 - h. Remove the thrust plate (13).

- i.** Remove and discard the seal spring (12) and seal (11) from the pump body.
- j.** Inspect the pump parts and body for wear and damage. Replace the complete pump assembly if it is damaged.
- k.** Install the new seal (11) and secure it with a new spring (12) into the pump body (10).
- l.** Install the thrust plate (13).
- m.** Insert the internal ring gear (16) and the pump shaft (18).
- n.** Insert the positioning pin (17) to engage the thrust plate (13).
- o.** Insert the sealing segment (14) between the pump shaft and internal ring gear.
- p.** Install the thrust plate (9) over the positioning pin.
- q.** Insert the rod (15) to retain the sealing segment (14).
- r.** Fit the new O ring (6) and new seal (7) and retain them with the new spring (8).
- s.** Insert the new gasket (4) and retain it with the new circlip (3) into the cover (5).
- t.** Align the cover (5) and the pump body (10) and secure it with the lock washers (2) and bolts (1).
- u.** Tighten the bolts to 80 N.m.



- | | |
|-----------------|------------------------|
| 1. Cover bolt | 10. Pump body |
| 2. Lockwasher | 11. Seal |
| 3. Circlip | 12. Seal spring |
| 4. gasket | 13. Thrust plate |
| 5. Pump cover | 14. Sealing segment |
| 6. O-ring | 15. Rod |
| 7. Seal | 16. Internal ring gear |
| 8. Seal spring | 17. Positioning pin |
| 9. Thrust plate | 18. Pump shaft |

Figure 2 Hydraulic Oil Pump Components

11. Installation. Install the hydraulic oil pump onto the engine (Ref EMEI Vehicle G 633).

Hoist Valve

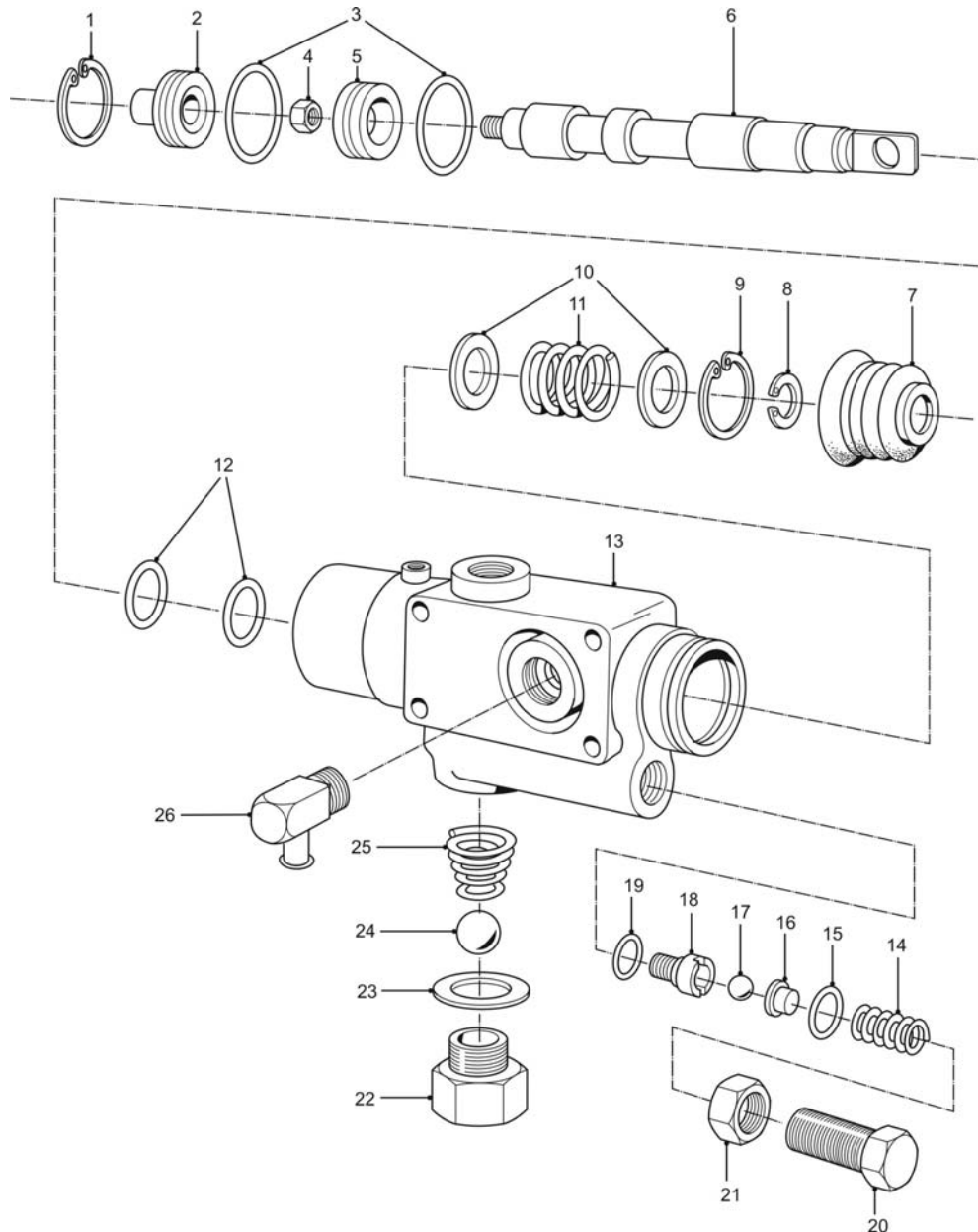
12. Removal. Remove the hoist valve from the mounting bracket (Ref EMEI Vehicle G 633).

13. Repair. The hoist valve is repaired as follows (Figure 3):

- a. Remove the circlip (1) and the piston end-cap (2).

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- b.** Remove the rubber boot (7) and the circlips (8 and 9).
- c.** Withdraw the piston shaft (6) complete with piston (5), piston shaft nut (4), O rings (3) and piston end-cap (2) from the hoist valve body (13).
- d.** Remove all parts from the piston shaft.
- e.** Remove the washers (10), piston spring (11) and oil seals (12).
- f.** Before removal, observe the position of the adjustment screw (20) and locknut (21) in the regulator chamber to facilitate installation. Unscrew the pressure regulator adjustment screw (20) and locknut (21) from the regulator chamber.
- g.** Withdraw the relief spring (14), oil seal (15), spring seat (16), valve ball (17), ball seat (18) and oil seal (19).
- h.** Unscrew the inlet oil valve bush (22) and remove the lock-washer (23), non-return ball (24) and spring (25).
- i.** Unscrew the elbow joint (26).
- j.** Discard all circlips, oil seals and O rings.
- k.** Clean and inspect the piston shaft, piston, valves, balls and valve seats and replace any damaged or worn items.
- l.** Lightly coat all parts with hydraulic oil.
- m.** Install the elbow joint (26), non-return valve spring (25), ball (24), washer (23) and valve bush (22).
- n.** Install the new oil seal (19), ball seat (18), valve ball (17), spring seat (16), oil seal (15) and spring (14) into the regulator chamber.
- o.** Assemble the pressure regulator screws (20) and locknut (21).
- p.** Install the assembly into the regulator chamber to the position noted in step f.
- q.** Fit the oil seals (12), piston spring (11), washers (10) and O rings (3) to the piston shaft (6).
- r.** Install the piston (5) and secure it with the piston shaft nut (4).
- s.** Insert the piston assembly into the hoist valve body (13).
- t.** Fit the circlips (8 and 9) and rubber boot (7).
- u.** Install the piston end-cap (2) and secure it with the circlip (1).



- | | |
|----------------------|---|
| 1. Circlip | 14. Relief spring |
| 2. Piston and cap | 15. Oil seal |
| 3. O-ring | 16. Spring seat |
| 4. Piston shaft nut | 17. Valve ball |
| 5. Piston | 18. Ball seat |
| 6. Piston shaft | 19. Oil seal |
| 7. Rubber boot | 20. Pressure regulator adjustment screw |
| 8. Circlip | 21. Adjustment locknut |
| 9. Circlip | 22. Inlet oil valve bush |
| 10. Washer | 23. Lockwasher |
| 11. Piston spring | 24. Non-return valve ball |
| 12. Oil seal | 25. Non-return valve spring |
| 13. Hoist valve body | 26. Elbow joint |

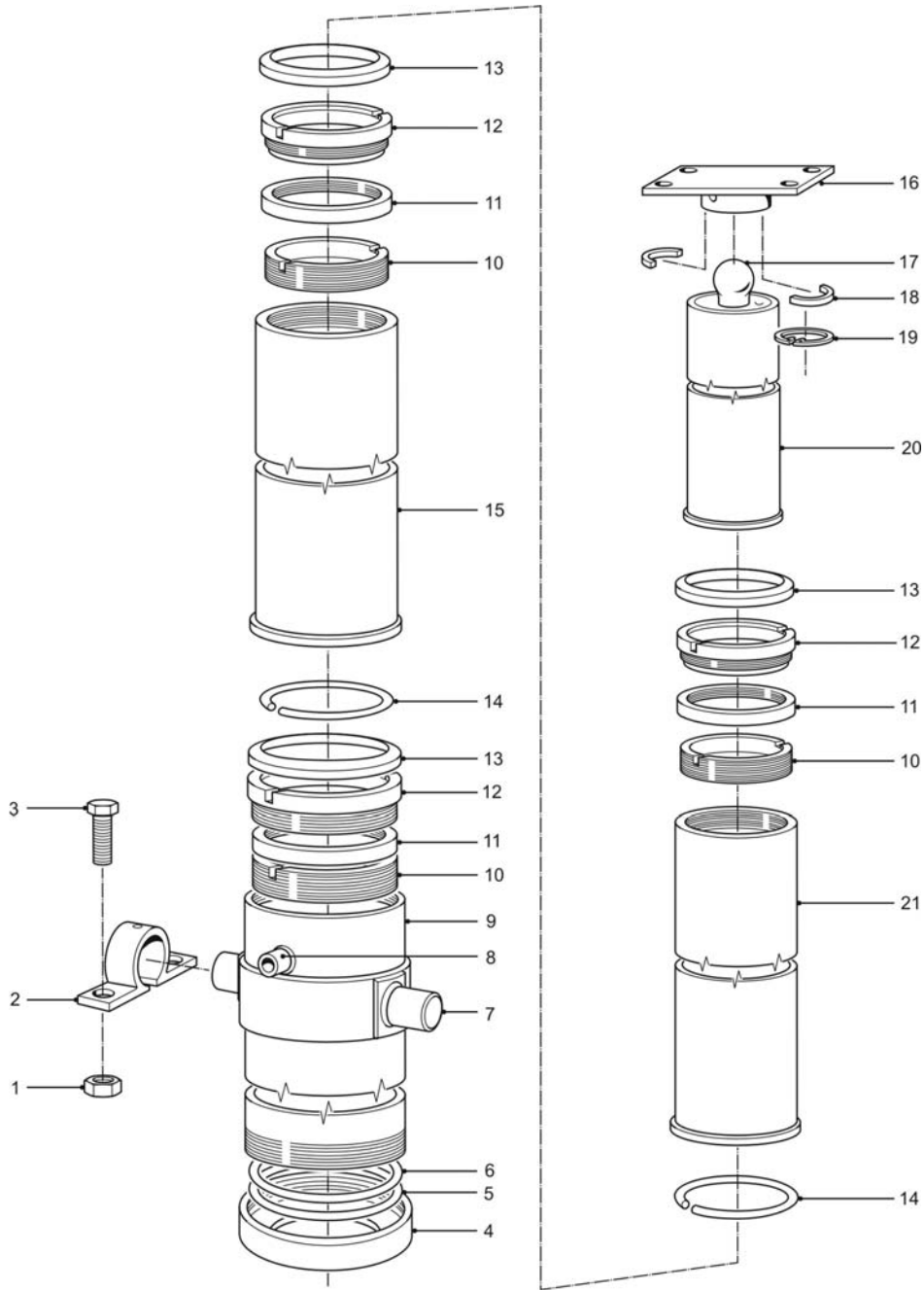
Figure 3 Hoist Valve Components

14. Installation. Install the hoist valve (Ref EMEI Vehicle G 633).

Hoist Cylinder

15. Individual hoist cylinder wiper and fluid seals can be serviced through the top of each extension tube without disturbing other seals or ram nuts. Extension tubes can be removed through the top or the base tube of the cylinder. For ease of inspection and replacement of components, it is advisable to remove the hoist cylinder as a complete unit.

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|------------------------|---------------------------|
| 1. U-bracket nut | 12. Ram nut |
| 2. U-bracket | 13. Wiper seal |
| 3. U-bracket bolt | 14. Retaining ring |
| 4. Base tube cap | 15. First extension tube |
| 5. O-ring | 16. Lift plate |
| 6. Back-up ring | 17. Ball joint |
| 7. Trunnion arm | 18. Ball retainer |
| 8. Oil hose connection | 19. Circlip |
| 9. Base tube | 20. Third extension tube |
| 10. Ram insert | 21. Second extension tube |
| 11. Fluid seal | |

Figure 4 Hoist Cylinder Components

16. Removal. The hoist cylinder is removed as follows (Figure 4):

- a. Raise the truck body and rest it on the safety support (Para 8.).

- b.** Place a suitable container (10 litres minimum capacity) beneath the oil connection (8) on the base tube (9). Disconnect the oil hose and allow the oil to drain into the container. Leave the container in position.
- c.** Remove and discard the circlip (19) and ball joint retainer halves (18) attaching the ball joint (17) to the lift plate socket (16).
- d.** Detach the ball joint from the socket (the ball joint forms part of the extension tube (20)).
- e.** Force the extension tubes (20), (21) and (15) into the base tube (9).
- f.** Allow the remainder of the oil to drain and remove the container.
- g.** Remove the U-bracket nuts (1) and bolts (3) securing the trunnion arm U-brackets (2) to the sub-frame cradle unit.
- h.** Remove the U-brackets from the trunnion arms (7).
- i.** Lift the hoist cylinder clear of the cradle unit.

17. Repair. The hoist cylinder is repaired as follows (Figure 4):

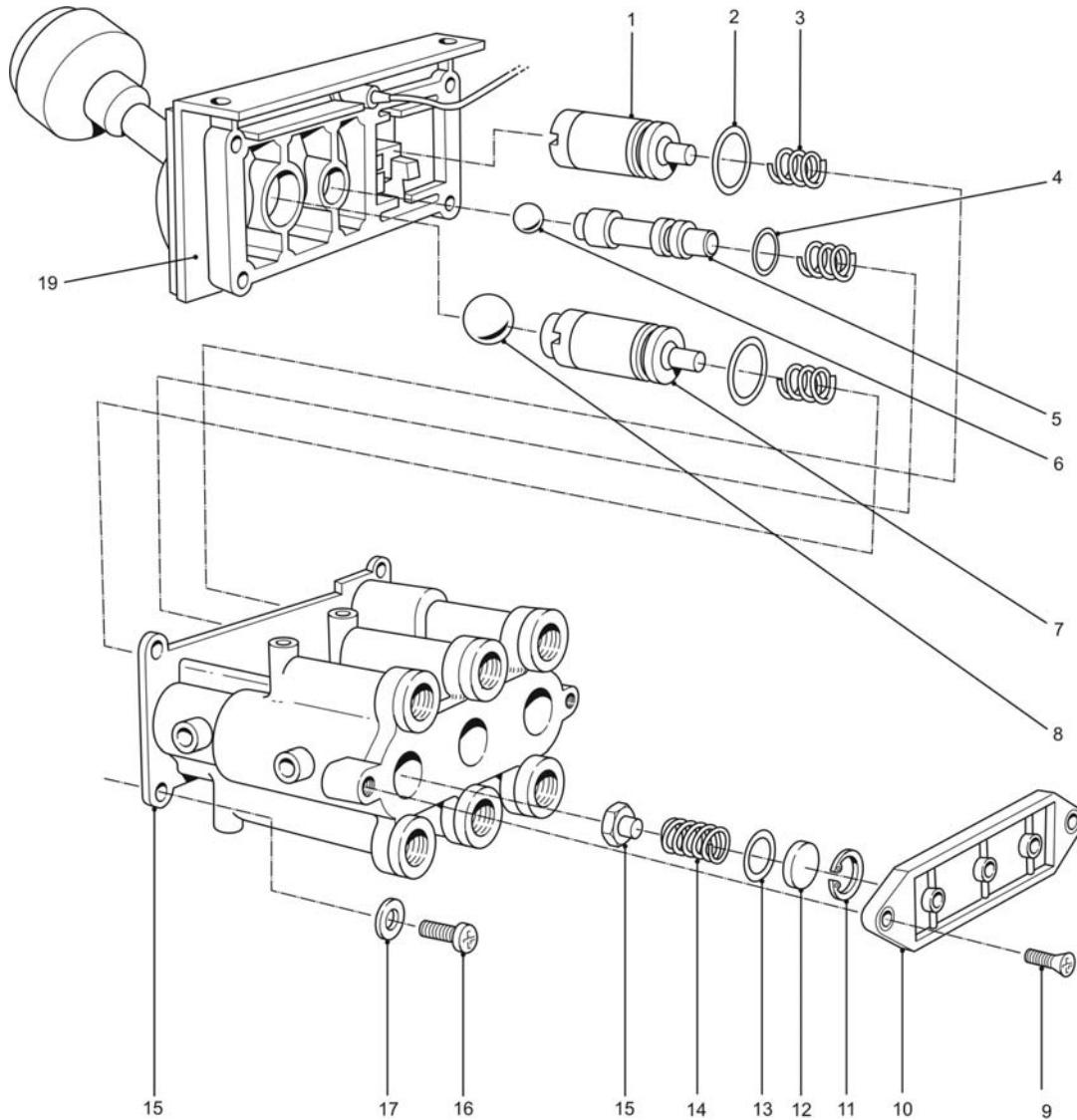
- a.** Remove the ram insert (10), fluid seal (11), ram nut (12) and wiper seal (13) from the associated extension tubes (21), (20) or (15). Discard the fluid and wiper seals.
- b.** Unscrew the base tube cap (4) and withdraw the back-up ring (5) and O ring (6). Discard the O ring.
- c.** Withdraw the two retaining bushes (14) and slide extension tubes (15), (21) and (20) through the base tube (9).
- d.** Clean and inspect the ram inserts and ram nut threads. Carefully inspect the extension tube surfaces for scratch or score marks. Replace any damaged or worn part.
- e.** Lightly coat all parts with hydraulic oil.
- f.** Slide the third extension tube (20) into the base tube (9).
- g.** Slide the second extension tube (21) into the base tube and install new ram inserts (10), fluid seal (11), ram nut (12) and wiper seal (13).
- h.** Install the retaining bush (14) to secure the extension tube (21).
- i.** Repeat steps g and h for the first extension tube (15).
- j.** Install the new back-up ring (6) and O ring (5) into the base tube (9).
- k.** Screw the base tube cap (4) onto the base tube.

18. Installation. The hoist cylinder is installed as follows:

- a.** Align the hoist cylinder trunnion arms (7) to the sub-frame cradle unit and fit the trunnion arm U-brackets (2).
- b.** Insert the U-bracket bolts (3) and nuts (1) to secure the U-bracket (2).
- c.** Connect the oil hose to the oil hose connection (8).
- d.** Extend the rams sufficiently to engage the ball joint (17) into the lift plate socket (16).
- e.** Insert the ball retainer halves (18) and circlip (19) to retain the ball joint.
- f.** Raise the truck body clear of the safety support (Para 8.).
- g.** Lower the safety support into the stowage position and lock it with the cotter pin.
- h.** Lower the truck body to rest upon the sub-frame and remove the lifting equipment.
- i.** Run the engine and test the dump system in accordance with the instruction plate in the cabin. Check the cylinders for leaks.

Air Switch

19. Removal. Remove the air switch (Ref EMEI Vehicle G 633).



- | | |
|-------------------------|---------------------------|
| 1. Piston A | 11. Circlip |
| 2. O-ring (18.5 mm OD) | 12. Retainer plate |
| 3. Piston return spring | 13. O-ring (14.5 mm OD) |
| 4. O-ring (13.5 mm OD) | 14. Spring |
| 5. Piston B | 15. Exhaust valve |
| 6. Piston ball | 16. Air switch body screw |
| 7. Piston C | 17. Washer |
| 8. Piston ball | 18. Air switch body |
| 9. Rear cover screw | 19. Air switch cover |
| 10. Rear cover | |

Figure 5 Air Switch Components

20. Repair. The air switch is repaired as follows (Figure 5):

- a. Remove the four screws (16) and washers (17) securing the air switch body (18) to the air switch cover (19).
- b. Separate the cover and body.
- c. Remove the two screws (9) securing the rear cover (10) to the air switch body.

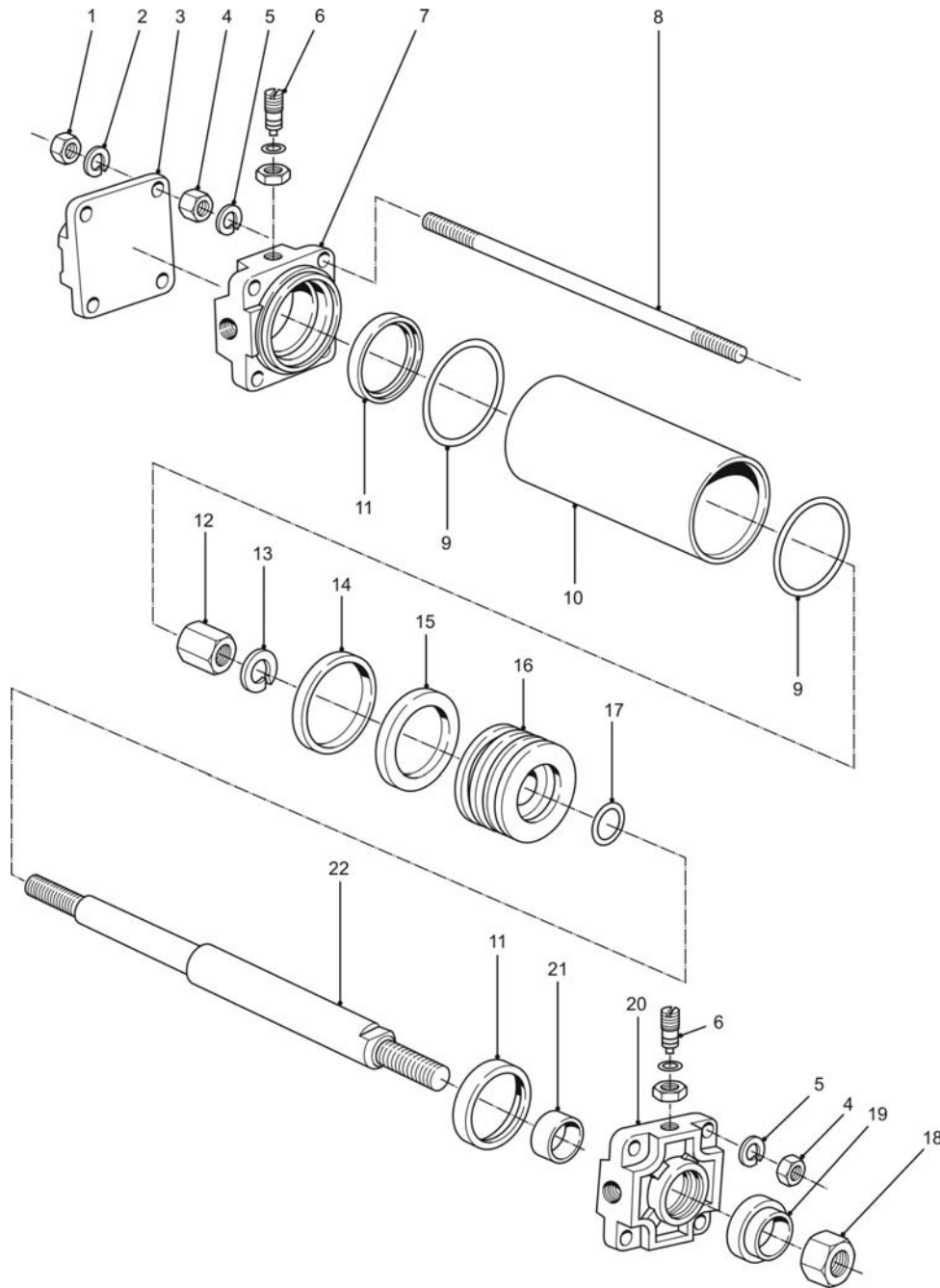
- d. Remove the circlip (11). Withdraw and discard the retaining plate (12), O ring (13), spring (14), and valve (15) from each cylinder in the air switch body.
- e. Remove and discard the piston return spring (3) and O rings (2 and 4) from the pistons A (1), B (5) and C (7) from the switch cover (19). Piston B O ring (4) is smaller than the O rings for pistons A and C however it is supplied as part of the same seal kit.
- f. Remove pistons A (1), C (7) and B (5) and piston balls (6 and 8) (piston A does not contain a ball).
- g. Clean the cylinder bores using an approved solvent.
- h. Inspect the pistons and cylinder bores for scoring and if scoring found, replace the complete air switch.
- i. Lubricate the new O rings, seals and bearing surfaces with grease supplied in a sachet with the seal kit.
- j. Fit the piston balls (6 and 8) to pistons B (5) and C (7).
- k. Fit the correct O rings (2 and 4) to their respective pistons A, B and C.
- l. Install each piston assembly into the bores in the air switch cover.
- m. Insert the return spring (3) to each piston.
- n. Secure the air switch body (18) to the air switch cover (19) with the four washers (17) and screws (16).
- o. Tighten the screws to between 2.25 and 3.5 N.m.
- p. Install the new valve (15), spring (14), O ring (13) and retaining plate (12) in each cylinder and secure them with the circlip (11).
- q. Install the rear cover (10) and secure it with the two screws (9).
- r. Apply air pressure of 840 kPa to the supply port and check for leakage at each port.

21. Installation. Install the air switch (Ref EMEI Vehicle G 633).

Tailgate Cylinder

22. Removal. Remove the tailgate cylinder (Ref EMEI Vehicle G 633).

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|-----------------------------|--------------------|--------------------|
| 1. Cylinder bracket locknut | 9. Cylinder gasket | 17. O-ring |
| 2. Spring washer | 10. Cylinder | 18. Adjustment nut |
| 3. Cylinder bracket | 11. Cushion seal | 19. Rod seal |
| 4. Tie-rod cover locknut | 12. Piston nut | 20. Head cover |
| 5. Spring washer | 13. Spring washer | 21. Bush |
| 6. Cushion needle assembly | 14. Wear ring | 22. Piston rod |
| 7. Tie-rod cover | 15. Piston seal | |
| 8. Tie-rod | 16. Piston | |

Figure 6 Tailgate Cylinder Components

- 23. Repair.** The tailgate cylinder is repaired as follows (Figure 6):
- a. Remove the nut (1) and spring washer (2) securing the cylinder bracket (3) to the cylinder.
 - b. Remove the cylinder bracket.
 - c. Remove the four nuts (4) and spring washer (5).
 - d. Remove the tie-rod cover (7).

- e. Withdraw the four tie-rods (8) and cylinder (10) from the head cover (20).
- f. Remove and discard all seals, O rings and gaskets from the piston (16) and piston rod (22).
- g. Remove the bush (21) from the head cover (20).
- h. Remove the two cushion needle assemblies (6). Note the position of the cushion needle assembly retention nut for installation purposes.
- i. Inspect all parts and replace them if they are worn or damaged.
- j. Fit the new seals, O rings, gaskets and bushes.
- k. Install the cylinder (10) to the head cover (20) and insert the four tie-rods (8).
- l. Align the tie-rod cover (7) to the tie-rods and secure it with the four spring washers (5) and locknuts (4).
- m. Tighten the locknuts to 80 N.m.
- n. Align the cylinder bracket (3) to the tie-rods and secure it with the four spring washers (2) and locknuts (1).
- o. Tighten the locknuts to 80 N.m.
- p. Install the two cushion needle assemblies (6) including the cushion needle assembly retention nut and washer.

24. Installation. Install the tailgate cylinder (Ref EMEI Vehicle G 633).

Truck Body

25. Repairs to the truck body are to be carried out using standard workshop practices. If the truck body requires panel beating and/or spray painting, carry out repairs in accordance with current instructions.

Dump Body Cross-member Weld Cracks

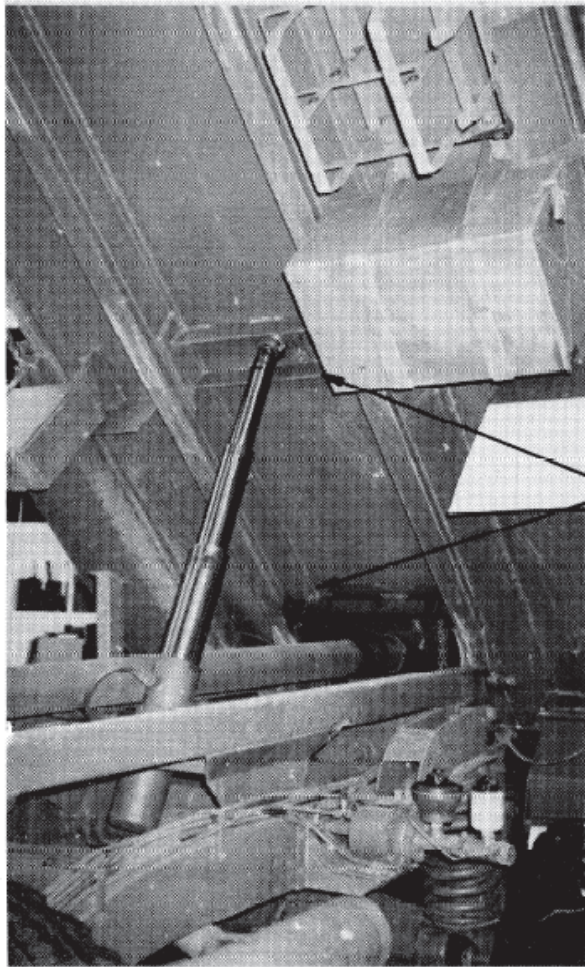
26. Repair. The procedure for repair of weld cracks that occur where dump body cross-members meet the outer frame is as follows (Figure 7):

WARNING

Do not work underneath the truck body until the safety support is in position.

- a. Raise the truck dump body in accordance with the instruction plate in the truck cabin to enable cross-member weld inspection and repair.

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Inspect both cross-members for weld cracks. Re-weld cracks in the lower cross-member in accordance with this instruction

Figure 7 Dump Body Cross-members

- b. Remove all surface protective coatings from the repair area for a distance of 25 mm in all directions in accordance with EMEI Workshop D 701. Personal Protective Equipment (PPE) required to carry out this task is detailed in EMEI Workshop E 652.
- c. Prepare the cross member/s for welding as illustrated in Figure 8. A visual inspection of the repair is required during the preparation and setting up of the joint to ensure alignment.

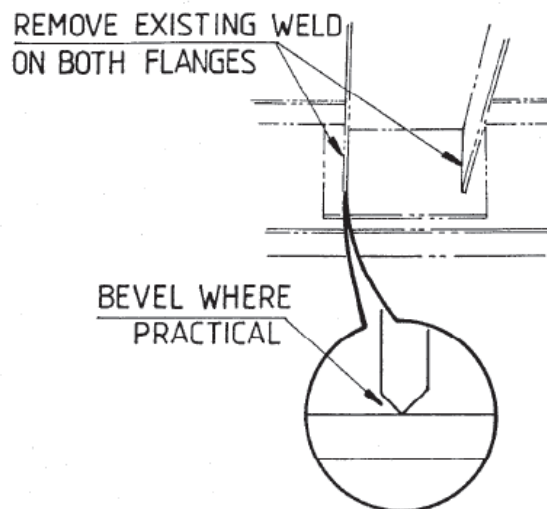


Figure 8 Preparation of Cross-member for Welding

NOTE

The weld repair area should be maintained at a temperature of not less than 10°C and the temperature of the actual metal should not be less than 20°C.

- d. Weld an 8 mm single run fillet weld Vertical 3G / PF-PG along the cross-member/s as per the manufacturer's instructions using the Gas Metal Arc Welding (GMAW) process with AS 2717.2 Autocraft 5356 – 1.2 filler wire.

NOTE

All workmanship/welding is to be in accordance with the guidelines stated in AS 1665 (Cat B).

- e. After welding, a visual inspection is to be conducted for any weld defects. If a Dye Penetrant Inspection is required, refer to EMEI Workshop D 180.

27. A weld data sheet is to be completed and placed in Part 4 of the GM 120 – Record Book of Service Equipment at the completion of the repair.

HEAVY GRADE REPAIR

Truck Body

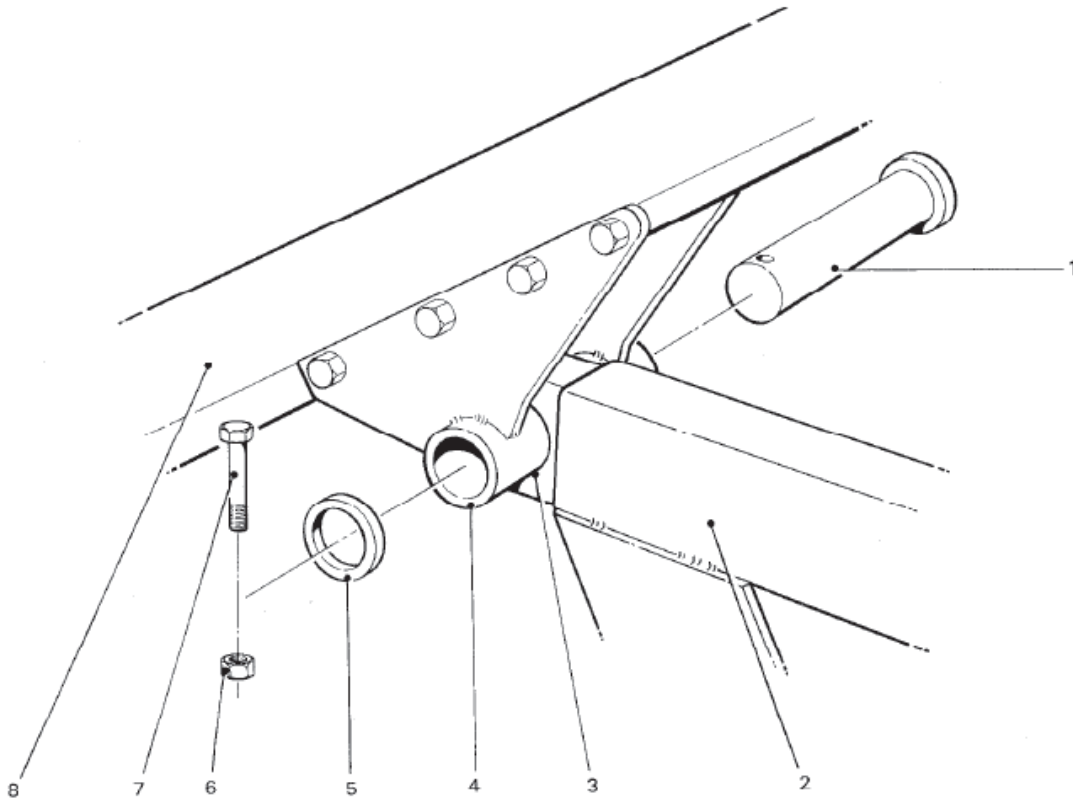
28. **Removal.** The truck body is removed as follows (Figure 9):

- a. Disconnect the tail light cables from the cable connector on the chassis.
- b. Disconnect the air line on the tailgate cylinder (Ref EMEI Vehicle G 633).
- c. Remove the jerrican holder, tool boxes and tool holder from their various locations on the truck body.
- d. Remove the rear and centre mud flaps from the truck body.
- e. Remove and store the canopy, bows and slats if necessary.

WARNING

Do not secure lifting tackle to the tie rail.

- f. Use an overhead lifting device and lifting tackle with a capacity greater than 1 tonne to lift the truck body. Reeve the lifting tackle under each end of the body and between the tie rails and the body. Pad the lifting tackle as necessary to prevent damage to the truck body.
- g. Lift the truck body sufficiently to enable the lifting device to take the body weight.
- h. Remove the pivot pin nut (6), bolt (7) and bush (5) from the left-hand and right-hand hinge brackets (4).
- i. Knock out the pivot pin (1) from each hinge bracket.
- j. Lift the truck body high enough to gain access to the hoist cylinder ball joint. Detach the ball joint from the truck body lift plate (Para 16.).
- k. Remove the truck body to pre-prepared stowage.



Note: Right hand side shown. Left hand side identical

- | | |
|----------------------|-------------------|
| 1. Pivot pin | 5. Pivot pin bush |
| 2. Chassis sub-frame | 6. Pivot pin nut |
| 3. Pivot bar block | 7. Pivot pin bolt |
| 4. Hinge bracket | 8. Truck body |

Figure 9 Truck Body Pivot Arrangement

29. Installation. The truck body is installed as follows (Figure 9):

WARNING

Do not secure lifting tackle to the tie rail.

- a. Fit lifting tackle to the replacement truck body. Pad the lifting tackle as necessary to prevent damage to the replacement truck body.
- b. Lift the body over the chassis subframe.
- c. Lower the body enough to enable the hoist cylinder ball joint to be attached to the body lift plate. Attach the ball joint (Para 18).
- d. Lower the body to align the hinge brackets (4) with the pivot bar blocks (3).
- e. Install the pivot pins (1), bushes (5), bolts (7) and nuts (6) to secure the body to the pivot bar blocks (3).
- f. Tighten the bolts to 80 N.m.
- g. Grease all grease nipples with all-season multipurpose grease type XG-291 or equivalent.
- h. Lower the body onto the chassis subframe (2) and remove the lifting tackle.

- i. Install the mud flaps, tool holder, tool boxes and jerrican holders.
- j. Connect the air line to the tailgate cylinder (Ref EMEI Vehicle G 633).
- k. Connect the tail light cables to the cable connector on the chassis.
- l. Run the engine and test dump the system in accordance with the instruction plate in the cabin.

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END

Distribution List: **VEH G 33.1 – Code 3** (Maint Level)
(Sponsor: LV SPO, Mdm/Hvy B Veh)
(Authority: TRAMM)