DIRECTOR GENERAL BORDER ROADS

GENERAL MAINTENANCE INSTRUCTION NO. 238

ON OPERATION AND MAINTENANCE OF

JCB 3DX SUPER EXCAVATOR CUM LOADER

Introduction: - The JCB 3DX Excavator cum loader is powered by Kirloskar 4R 1040 NEUTRAL lapse rated diesel engine developing 65 HP at rated 1500 RPM. The machine is fitted with torque converter, synero shuttle, fully synchromesh, gear box and 4x4 wheel drive. The equipment has got separate excavating mechanism and clam shovel loading device fitted on same chassis.

Aim: - Aim of issuing this GMI to enumerate the details of periodic and preventive maintenance of JCB 3DX excavator loader machines.

Action by:-

(a) USER UNIT. To carry out periodic inspection, regular servicing and preventive maintenance tasks as laid down.

(b) FIELD WORKSHOP (GREF)

(i) To check the record of maintenance and lubrication in the log book of the eqpt during its inspection and repairs if carried out as per maintenance and lubrication schedules given in this instructions.
(ii) Advice user units in respect of any discrepancy/short coming noticed.

(c) MOBILE MAINTENANCE TEAM – To ensure and lubrication maintenance is carried out and report accordingly to OC filed workshop for necessary action.

Details :-

This instruction cover the following:-

(b)	Periodic maintenance tasks	Appx-'A'
(c)	Oil and lubrication capacity, periodicity and check card	Appx-'B'
(d)	Coolant capacity, antifreeze ratio/Tyre pressure	Appx-'C'
(a)	Technical data	Appx-'D'

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GENERAL

This General Maintenance Instruction is required to attention and followed by the operator and supervisor for ensuring efficient and trouble free operation of the machine, Do not start any Job until you are sure that you and those around you will be safe.

SAFETY PRECAUTION

1. Obey all laws, worksite and local regulations which affect you and your machine.

2. All the time you are working with or on the machine take care and stay alert.

3. You can wear proper clothing when you are operating the machine.

4. Operate the control levers only when you are seated correctly inside the cab.

5. Do not operate the machine which is defective or has missing parts makes sure the maintenance procedures are completed before using the machine.

6. Maintenance technicians should understand the hydraulic circuit. They should know how to release trapped pressure before disconnecting any hose.

7. Do not perform new operations until you are sure you can do them safely.

8. Do not try to upgrade the machine performance by unapproved modifications.

9. Do not operate the machine with the bonnet open.

10. Never try to dismount from a moving machine.

11. Do not use the controls as handholds.

12. Do not operate the machine until the fault has been corrected.

13. Do not reveres in third or forth gear with full throttle.

14. Always drive at safe speed to suit the conditions.

15. Do not rely on spoken commands.

16. Do not use the machine in closed areas where then is flammable material, vapour or dust.

17. Do not operate the machine in closed spaces.

18. Know the weight of the load before lifting it.

19. Never lift a load with one fork.

20. An incorrectly parked machine can move without an operator.

21. The loader arm must be lowered and backhoe closed whilst traveling.

22. Operate in first gear on hill sides.

23. Use extreme caution when driving into ramps and trailers.

24. You remove and fit metal pins such as pivot pins wear safety glasses.

25. Before starting the engine make sure the others are clear of the danger areas.

26. Get the work done by a specialist.

27. Understand the electrical circuit before attempting to connect to disconnect any electrical components.

28. Do not weld cast iron parts.

29. Keep the electrolyte away from your clothes skin mouth and eyes.

30. Do not check the battery charge by shorting the terminals with metal. Use a hydrometer or voltmeter.

31. Do not remove the radiator cup when the engine is hot.

32. Never work under a machine on soft ground.

33. Do not weld or out wheel rims.

34. Do not refuel with the engine running there could be a fire and injury if you do not follow these precautions.

35. Do not use petrol in this machine.

36. Do not use your fingers to check for small leaks.

37. Make sure the radiator/oil cooler matrix is kept clear of dirt.

38. When leaving or parking the machine close all rams if possible to avoid.

39. Do not handle used engine oil move than necessary.

40. Check the hoses regularly.

41. Do not use trichloroethylene or paint thinners in the presence of a rings and seals.

Calendar equivalents

10 Hrs	-	Daily/10 Hrs or daily which is earlier
50 Hrs	-	Weekly -do-
500 Hrs	-	Three months -do-
1000 Hrs	-	Six months -do-
2000 Hrs	-	One year -do-

Periodic maintenance schedule JCB 3DX excavator cum loader.

Every 10 hrs or daily maintenance task

1. Check the eng/hyd fluid level and replenish it up to level if required.
2. Check hyd system for any hyd oil leakage and rectify.
3. Check the opertation of all hyd systems/sub system for correct functioning.
4. Check the water/antifreeze coolant level in radiator and replenish if required.
5. Check leaks in radiator and rectified if required.
6. Observe the engine smoke emitting from exhaust pipe and report workshop if excessive smoke coming from engine exhaust.
7. Check for normal working of all electrical/electronic devices, report to workshop in respect of defective devices.
8. Check for correct working of all instruments panel meters if defective, report workshop for repair/replacement.
9. Check for correct working of transmission system and listen to any abnormal sound. Report workshop if found leaking or abnormal sound coming from components.
10. Check torque converter oil level and replenish if required.
11. Check correct working of steering system.
12. Clean air filter pre cleaner if fitted on eqpt.
13. Check the brake fluid level and replenish if required.
14. Check wheel nuts for tightness if found loose tighten them.
15. Check for correct functioning of parking brake and foot brake operation .
16. Following parts should be greased:-

    (i) Steer axle yoke pivot.
    (ii) King pins and bushes.
    (iii) Hubs (2WD only)
    (iv) Track rod ends.
    (v) Universal joints (4WD only)
    (vi) Steer ram grease nipple.
    (vii) All pivot pins.
    (viii) Propeller shaft 4WD.
    (ix) King post and carriage.

50 hrs maintenance

1. Carry out complete maintenance schedule specified for 10 hrs maintenance.
2. Check fan belt tension pressed sagging should not increase 8-10mm. If incorrect tighten or replace fan belt.
3. Check radiator hoses and their condition if found perished or leaking replace.
4. Check oil level in the following:-
    (i) Oil cooler transmission.
    (ii) Oil cooler hydraulic

5. Check axle oil level and replenish if required with correct grade of lubricant oil rectify any leakage found.
6. Check slewing actuator oil and replenish if required.
7. Check for fuel sediments trapped and drains them out.
8. Drain fuel filter.
9. Grease propeller shaft from gear box to rear axle.
10. Grease propeller shaft of 4 wheel drive.
11. Grease extending dipper.

100 hrs maintenance

The 100 hourly maintenance schedules should be carried out at either 100 hrs of continuous operation or 1 month which ever is earlier.

1. Carry out maintenance schedule specified for 10 hrs and 50 hrs maintenance.
2. Check for any damage to ram piston rods.
3. Check for correct functioning of pump drive and listen to any abnormal sound coming from drive. Report workshop if any abnormal sound coming.
4. Check all hydraulic oil carrying pipes for leakage/chaffing/damage. Replace if required
5. Get following check from workshop:-

   (i) Engine cylinder head torque setting.
   (ii) Idling speed, it should be 550-600 rpm if required adjust.
   (iii) Max speed it should be 2200 rpm it required adjust.
   (iv) Pulled down speed it should be 1200 rpm.
   (v) Valve clearance it should be as under when engine is cold.

      (a) Inlet valve .30mm
      (b) Exhaust valve .25mm

6. Check fuel system for leakage and rectify.
7. Check mounting bolts for tightness if loose tighten.
8. Check electrical wiring for chafing insulate/replace if required.
9. Check for screen washer bottle and change water.
10. Check clutch oil pressure and torque converter main line pressure following is the limit, if less notify wksp.

Convector Pressure (in NEUTRAL position)

RPM	TEMPRATURE ^{o}C	PRESSURE KG/CM2
IN PRESSURE		
1000 IN	50	1.5-2.5
2000	50	5.4-6.8
1000 IN	100	0.5-1.3
1000 OUT	50	0.8-1.6
2000	50	3.1-4.1
1000 OUT	100	0.3-0.6
2000		2.1-3.0

LUBRICATION PRESSURE (IN NEUTRAL)

1000	50	0.3-0.9
2000	50	1.8-2.4
1000	100	0.1-0.3
2000	100	1.3-2.1

MAIN LINE PRESSURE (IN NEUTRAL)

1000	50	0.3-0.9
2000	50	1.8-2.4
1000	100	10.4-12.4
2000	100	11.8-14.3

CLUTCH PRESSURE (IN NEUTRAL) all clutch pressure should be same as main line pressure with in 0.7 bar 10 Lbs.

1000 Cooler	50	2.0-2.9
2000	50	3.6-5.3
1000	100	1.1-2.2
2000	100	3.8-4.6

PUMP AT 50 ^{o}C

1000	50	3.0-4.1
2000	50	6.7-8.8

11. Grease wheel hub bearing and king pin bushes.
12. Grease pump drive shaft and all linkages.
13. Clean battery terminal. Wash corroded material with ammonia solution consisting 115 gm. Of baking soda added to 1 liter of water.
14. Clean fuel lift pump.

200 hrs maintenance schedule

1. Carry out 10, 50 & 100 hrs maintenance schedule checks.

400 hrs maintenance tasks:-

1. Carryout 100 & 200 hrs maintenance schedule checks.
2. Check following pressure.

MRV Pressure

(i) MRV Pressure (Excavator) - 210 kg/cm^2
(ii) MRV pressure (Loader) - 183 kg/cm^2

ARV Pressure Loader

(i)	Shovel ram head side	-	176 kg/cm^2
(ii)	Shovel ram rod side	-	245 kg/cm^2
(iii)	Shovel ram rod side	-	316 kg/cm^2

ARV Pressure Excavator

(i)	Bucket ram head side	-	245 kg/cm^2
(ii)	Dipper ram head side	-	245 kg/cm^2
(iii)	Dipper ram rod side	-	245 kg/cm^2
(iv)	Boom ram dead side	-	245 kg/cm^2

3. Check pivot pins and bushes for damage and grease if required any.
4. Check for parking brakes and adjust suitable.
5. Check engine injector pressure and calibrate suitably.

800 hrs maintenance task

1. Carry out 400 hrs maintenance task.

1600 hrs maintenance task

2. Carry out 800 hrs maintenance task.

Appx-'B'

OIL AND LUBRICATION CHART

Item	JCB Part No.	Standard Brand	Capacity in Litres	Check period	Drain/Refill Period	Remarks
Engine Oil 4R 1040	-20 ^{o}C to +45 ^{o}C 4001/0800	JCB Engine Oil Special	15 MAX.	10 Hrs	400 Hrs. 400 Hrs	First oil change 100 Hrs / 30 days* and then every 400 Hrs/90 days*.
Engine Oil Filter 4R 1040					400 Hrs	First oil change 100 Hrs / 30 days* and then every 400 Hrs/90 days* and Oil filter change in 100 hrs.
Air Cleaner Element						Change outer element, 350-400 Hrs Change inner element, 100-1200 Hrs (Depending on site conditions).
Fuel System		Diesel Fuel No. 2D-As per ASTM D975 (+5 ^{o}C and above) Diesel Fuel No. 1D-As per ASTM D975 for altitude above 5000 feet (-10 ^{o}C + 10 ^{o}C)	128	As required		JCB Part No. 130/77705 (Above freeze point) JCB Part No. 40/300936 (Below freeze point) 25 Litres initial fill at JCB.
Fuel filter					400 Hrs	Change filter with every engine oil change
Transmission Oil JCB Synchro Shuttle	-20 ^{o}C to 50 ^{o}C 4000/0900	JCB Transmission Fluid (F10)	19	10 Hours	800 Hrs	First oil Change 100 Hrs/30 days and then every 800 Hrs /120 days.
Transmission Oil Filter					400 Hrs	First filter change 100 Hrs/30 days and then 400 Hrs/90 days, clean strainer with every oil change.

JCB Drive Axle	-20 °C to 50 °C 4000/0500	JCB Rear Axle Oil	21	50 Hours	800 Hrs	First Oil change 100 Hrs/30 days and then every 800 Hrs/120 days
Front Axle 4WD	-5 °C to 50 °C 4000/0300	JCB Gear Oil	17.6	50 Hours	800 Hrs	first oil change 900 Hrs/150 days.
Hydraulic System & Brake System	-5 °C to 50 °C 4002/0800	JCB Hydraulic Oil	110 130	10 Hours	1600 Hrs	System capacity is related to build of the machine. Top-up with all rams closed. Clean tank and change oil first at 1700 Jrs./270 days & then every 1600 Hrs./240 days. Hydraulic oil capacity on standard machine 110 Ltrs & with 6-in-1 & extd.dipper – 130 Ltrs.
Hydraulic Filter					400 Hrs	First filter change 100 Hrs./30 days & then every 400 Hrs./90 days. Clean strainer as & when oil changed. Breather to be change every 1600 Hrs./240 days.
Grease	4003/2000	JCB Grease Special	2 Kgs Nominal		10 Hrs	To be used on Shovel, Loader arms, Stabilizer, Front axle, Prop. Shaft, Slew Actuators, Excavator end, all structure & ram pivot pins. Period to be reduced in case of different conditions.
Extending Dipper		Waxoil			50 Hrs	When adjustments are done, apply Wax oil to runner of inner dipper.
Lub Oil Recommendation for R1040/R 1080 series engines, Multi-grade oils						
	-20 to 20°	SAE 10W 30				
	-10 TO 50°	SAE 15 W 40				
	- 5 TO 45°	SAE 20 W 40				

Note : If working conditions are extremely dusty & quality of fuel/lubricants is poor, please change filter earlier than specified period.

(*) Whichever is earlier

Appx-'D'

ENGINE SPECIFICATION FOR R1040 SERIES

1.	Bore x Strore (mm x mm)	105 x 120
2.	Firing Order	1-3-4-2
3.	Displacement	4160
4.	Direction of Rotation	ACWR
5.	Aspiration	Naturally Aspirated
6.	Compression Ratio	19 : 1
7.	Starting Arrangement	Electric Start
8.	Governor type	Mechanical
9.	Lub Oil Consumption	.3% of fuel consumption
10.	Specific Fuel Consumption	165 gm/hp-hr
11.	Lub Oil Sump Capacity	11.5 Litres
12.	BHP	65.01 HP
13.	Power consumed by Radiator	3.0 HP
14.	Rate RPM	1500 RPM
15.	Dry Engine weight - With Radiator without Bell Housing - With flywheel and SAE3 Flywheel Housing and Radiator	494 kg 522 kg
16.	Radiator Capacity	15+8 = 23 Ltrs

Appx-'C'

Recommended Coolants

Castrol heavy duty coolant
Use ethylene glycol antifreeze diluted with coolant blend as mentioned below in the following proportion in (radiator) cooling system.

Ambient Temp.	Ratio by volume of antifreeze to cooling water-blend.
Deg C +50° to -5° -6° to -15° -16° to -25° Below - 25°	 20 : 80 33 : 67 40 : 60 50 : 50 (Max . permissible ratio)

Tyre Pressure

Size	PR	Pressure
		bar
9.00x16	16	7.2
12.5x18	16	3.5
14.00x25	20	2.8
16.9x28 Industrial	10	2.8