DIRECTOR GENERAL BORDER ROADS

GENERAL MAINTENANCE INSTRUCTION NO. 244

ON OPERATION AND MAINTENANCE OF

HYDRAULIC EXCAVATOR 20 TON MAKE MODEL TATA HITACHI EX 200 LC (TELCON) WITH ROCK BRAKER ATTACHMENT

INTRODUCTION:

(a) The Hydraulic Excavator make Tata Hitachi model EX 200 LC (Telcon) having operating weight 20000 Kgs (approx) and mounted on Crawler fitted Tractor type under carriage powered by Cummins make 6BT 5.9C model, 4 stroke, 6 cylinder, water cooled, Turbo charged, inline, direct injection diesel engine developing 131 HP at 2000 rpm, with 0.90 cum capacity general purpose bucket and Rock Breaker attachment.

(b) This GMI gives the technical specification and know how on the operation, maintenance and repair procedure of Hydraulic Excavator Telcon model EX 200 LC to ensure maximum performance and safe/satisfactory operation. Compliance with procedures given in this GMI will enable to get desired maximum service from the equipment.

(c) Maintenance of Hydraulic Excavator Tata Hitachi model EX 200 LC (Telcon) will lead to long life, trouble free operation and less frequent break downs and also to reduce maintenance cost. The periodic maintenance must be carried out according to the **'Periodic Maintenance Schedule'** described in this GMI. Daily care, inspection and Periodic Maintenance are essential for preventing troubles and accidents to ensure satisfaction and safe operation for prolonging the operating life of the equipment. All information and instructions given in this GMI is based on the latest Operator's manual and service booklet provided by the firm.

AIM:

The instructions are issued as guidelines for general, preventive maintenance schedule and lubrication of Hydraulic Excavator Telcon model EX 200 LC manufactured by M/s TELCO Construction Equipment CO. Ltd for regular attention to keep the equipment in good mechanical condition which must be strictly followed.

ACTION BY:

(a) User unit: To carryout periodic inspection and monitor regular/periodical maintenance as laid down in this instruction and record the tasks done in log book.

(b) Field Workshop :

(i) To carryout and monitor maintenance schedule and oil changes as per periodical maintenance laid down in the maintenance instructions and to check the record of maintenance including lubrication.

(ii) To advise the user unit in respect of any lapse noticed.

(c) Mobile Maintenance Team**:** To ensure that proper maintenance is carried out and submit report accordingly to Task Force Commander and OC Wksp for their necessary action.

DETAILS:

This instruction includes the following aspects:-

a)	Operating Procedure	- Appendix 'A'
b)	Periodic Maintenance schedule	- Appendix 'B'
c)	Technical Specification	- Appendix 'C'
d)	Recommended Lubricants with filling capacity and periodicity for change	- Appendix 'D'

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Appendix 'A'

OPERATING PROCEDURE

1. Inspect equipment daily before starting.

2. Make sure all control levers are in neutral position.

3. Stop engine immediately, if engine oil pressure indicator glows ON while operating the eqpt.

4. Drain water and deposits/sediments from fuel tank.

5. Always keep attachment pedal locked with pedal lock when attachment pedal for Rock breaker is not in use.

6. Operate the eqpt with the tracks positioned perpendicular to the eqpt which can more easily excavate if the cliff face collapses.

7. When digging, avoid hitting tracks with boom cylinders. When digging over the end of the tracks, travel motor should be at the rear to minimize the chain and sprocket loading and to maximize the eqpt stability and lifting capacity.

8. When digging deeply, avoid hitting bottom of boom or bucket cylinder hoses against the ground.

9. Use the bucket only for digging. Do not use bucket as a jack hammer or wrecking ball to avoid accident.

10. Always lower the attachment or implement to the ground before work on the eqpt.

11. Continuous operation of the engine with low or high coolant temp can damage the engine.

12. Check for worn or frayed wires and loose connections.

13. Check for leaks, kinked hoses and lines or hoses those which rub against each other or other parts.

14. Check lubrication points on the periodic service chart.

15. Grease in track adjuster is having more pressure and do not remove grease fitting or valve assy to avoid injury/damage.

16. Always be familiar and well conversant with safety signs/symbols to avoid accident.

17. Always park the eqpt on a level surface and lower the bucket to the ground.

18. Turn Auto Idle switch OFF provided to reduce the fuel consumption, turn engine at slow idle speed without load for three minutes, turn key switch to OFF to stop engine, remove key from switch and pull Pilot control shut off lever to lock position.

19. Extra care be taken when the cab is swung around so that it is facing the rear/track motor end of the under carriage, the action of the tracking controls, steering and transmission direction will be reversed.

20. When not traveling, do not place your feet on the travel pedals.

21. Always stop the eqpt to select a different speed range and do not change the speed mode while traveling.

22. When you are excavating do not rest your feet on the foot pedals. Even light pressure on the pedals can cause the brakes to be released.

23. Never excavate directly beneath the machine itself. Excavating beneath the eqpt can weaken the ground and cause the eqpt to tip over.

24. Do not excavate on hard or rocky ground with the boom positioned diagonally across the under carriage. The resulting rocking motion could cause damage to the track gear box sprockets.

25. Walking or working under raised boom is hazardous.

26. Keep all the controls of the eqpt clean and dry.

27. An incorrectly parking eqpt can move without an operator.

28. When lowering the boom, avoid sudden stop that may cause shock load damage to the equipment.

29. When operating the arm, avoid lowering the cylinder to prevent the cylinder damage.

30. When digging at an angle, avoid striking the tracks with bucket teeth.

31. When the Rock breaker is not used, apply the cover to the pipe opening on the arm top and install the plug in to the hose end of the breaker to prevent the entry of contamination in to the system.

32 Operate the equipment slowly with the Rock breaker attachment as the breaker is heavier than bucket.

33. Avoid using the Rock breaker for hammering operation.

34. To prevent the cylinder damage, do not operate the Rock breaker with hydraulic cylinder fully retracted or fully extended.

35. Stop operation if Rock breaker hydraulic hoses jump up abnormally due to change in accumulator pressure or damaged accumulator.

Do's

1. Always use correct grade of Engine oil & other Lubricants.
2. Always use clean diesel and before filling diesel to tank, filter it with fine cloth.
3. Check lifting equipments before using.
4. Always face machine when entering to cabin and descending from cabin.
5. Secure all moving parts of the machine when not in use.
6. Always ensure electrics are switched off before leaving machine.
7. Always drive carefully and avoid any sudden stops and changes of direction including Zig-zag driving.
8. Always stop the machine and lock cabin and other doors to safe guard equipment before leaving the equipment.
9. Avoid parking on slopes if it is necessary ensure parking brake is on and wheels are chocked.
10. Avoid high speed operation.
11. Before towing the equipment it is advisable to disconnect front and rear propeller shafts to avoid damage to the transmission. Also release parking brakes.
12. Keep bucket about 200 to 300 mm above the ground when traveling up or down a gradient. If the equipment starts to slip or become unstable, lower the bucket immediately.
13. Always de-pressurize the system before removing any hoses or pipes.
14. Always switch OFF Auto Idle switch and reduce the engine rpm to low idle before stopping the eqpt.
15. Always operate machine and services smoothly.
16. Operate the control levers when you are correctly seated inside the cab.
17. Understand the electrical circuit before connecting or disconnecting an electrical component to avoid injury/damage.
18. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the control levers several times to release pressure trapped in the hoses.
19. Inspect the hoses regularly for any damage/leakage.
20. Always wear protective glass and protective shoes while working on the equipment.
21. Avoid idling the engine for more than 10 minutes.
22. Allow the engine to idle 3-5 minutes before shutting it off after a full load operation.

23. Monitor the oil pressure and coolant temp gauges frequently. Shut of the engine if oil pressure or coolant temp does not met specification,

Don'ts

1. Do not open the engine cover while the engine is running and avoid using eqpt with engine cover open.

2. Do not operate the eqpt beyond its designed limits.

3. Do not carry passengers as the eqpt is a one man machine.

4. Do not overload the eqpt which can damage and make the eqpt unstable.

5. Do not walk or work under raised attachments unless they are safely blocked.

6. Do not operate controls from outside cab and start the engine only from operator's seat.

7. Do not use bare hand to check for any oil leakage.

8. Do not work under a machine when on soft ground.

9. Do not drive the eqpt with the door unlatched. It must be correctly closed or secured fully open.

10. Do not use the machine controls as handholds when entering or leaving the eqpt.

11. Do not wear loose clothing or fitting while operating Eqpt.

12. Do not engage the starting motor more than 30 seconds. Wait 2 minutes between each attempt to start.

13. Do not bend or strike high pressure lines and never install bend or damaged lines, pipes or hoses.

14. Do not operate the engine on load when temperature of coolant exceeds 98^0 C and lub oil pressure is low (18 psi).

15. Do not operate the engine at full throttle below peak torque engine speed for extended periods (more than one minute) of time

16. Do not add cold coolant to a hot engine to avoid damage to engine castings.

17. Never mix two different brands of lub oil.

18. Do not hit track with bucket when digging.

19. Do not allow contamination enter in to the system when connecting the Rock breaker with the bucket.

20. Do not operate the Rock breaker to the side of the equipment.

21. Do not use Rock breaker to move objects and for lifting operation.

22. Do not start the equipment with Auto Idle switch in ON position, otherwise rpm of engine/equipment cannot be varied through accelerator lever.

23. Never try to increase the rpm of the engine through accelerator lever when the Auto Idle feature is working. To vary the speed of the engine through accelerator lever, initially the pilot lever is to be operated.

24. Never lubricate or service the equipment while it is moving

25. Do not operate the equipment if cables or wires are loose, kinked etc.

26. Do not make contact with electric wires and bridges.

27. Avoid traveling across the face of the gradient.

28. Avoid tipping the equipment when swinging heavy load and do not swing load to the down hill side. Reduce swing speed.

29. Do not pull or push dirt/material with the bucket when traveling.

30. Never use wide track shoes on rough ground such as rocks, sand or gravel. Wide track shoes are designed only for soft ground

Rock Breaker

1. The only gas permitted for charging the accumulator is Nitrogen N_2.
2. Use only the Hose Nozzle to relieve the pressure.
3. Be sure to check the surroundings of the machine for safety before starting maintenance.
4. Never use other than Nitrogen N_2 gas in back head.
5. Do not approach front of tool, charging in back head with Nitrogen N_2 gas.
6. When back head is charged, breaker tool would be come out.
7. If the breaker is laid down the wooden square bar more than six months, please check all seals in cylinder and corrosion bolts before operation.

Appendix 'B'

PERIODIC MAINTENANCE SCHEDULE

Maintenance work	Service intervals in hours								Remarks
	Daily	50	125	250	500	1000	1500	2500	
ENGINE									
Engine oil level	*								
Engine oil change		* (Initial)		*					
Engine oil filter change		* (Initial)		*					
GEAR OIL									
Swing reduction device									
Gear oil level		*							
Gear oil change		* (Initial)				*			
Travel/Propel reduction device									
Gear oil level				*					
Gear oil change				* (Initial)		*			
HYDRAULIC SYSTEM									
Hyd oil level and condition	*								
Hyd oil tank draining				*					
Hyd oil change								*	For Rock breaker at every 500 Hrs
Hyd oil tank breather cleaning						*			
Hyd oil tank breather change									After every 4000 Hrs
Check Hyd hoses and lines	*			*					
Suction filter								*	Also whenever replacing Hyd oil
Full Flow Filter					*				For Rock breaker at every 125 Hrs
Pilot filter					*				
FUEL SYSTEM									
Fuel Tank sediment draining	*								
Fuel filter/water separator				*					
Fuel filter sediment draining				*					
Feed pump inlet filter/strainer cleaning				*	*				
Fuel tank strainer cleaning					*				
Check fuel hoses	*			*					
AIR INTAKE									
Air intake hoses for inspection				*					
Air cleaner element primary					*				

Maintenance work	Service intervals in hours								Remarks
	Daily	50	125	250	500	1000	1500	2500	
Vacum indicator change							*		
COOLING SYSTEM									
Coolant level check	*	*							
Fan belt tension	*			*	*				
Coolant change						*			
Radiator core cleaning out side				*					
Radiator core cleaning in side							*		
Radiator hoses change							*		
ELECTRICAL SYSTEM									
Battery fluid level		*							
Battery specific gravity check		*							
Wire harness check					*				
Key switch function	*								
OTHERS									
Bucket teeth loose, wear	*								
Track tension		*							
Bucket linkage clearance	As and when required								
Torque check		* (Initial)		*					
Calibrate fuel injection pump							*		
Engine valve clearance adjustment						*			
Track shoe bolts tightness		*							
GREASING									
Front joint pins (Boom pivot, boom cyl, bucket & link pins and other pins	*								
Swing bearing					*				
Swing internal gear					*				

Appendix 'C'

TECHNICAL SPECIFICATION

Description	**Hydraulic Excavator 20 Ton TATA HITACHI EX 200 LC (TELCON)**
ENGINE	
Model /Type	Cummins 6 BT 5.9C
Cylinder bore x stroke	102 mm x 120 mm
Compression ratio	17.5 : 1
Piston displacement	5.88 Ltrs
Firing Order	1-5-3-6-2-4
Direction of rotation	Clock wise from front of engine
Minimum Engine oil pressure	Idle – 10 psi and full speed/load -30 psi
Maximum output	
Maximum Torque	
Engine weight	440 kg (Max)
Minimum oil pressure	Idle- 10 psi, Full speed/Load – 30 psi
Compression Pressure	
Valve Clearance	Inlet – 0.25 mm and Exhaust 0.51 mm
ELECTRICAL SYSTEM	
Battery	12 V 120 AH Qty – 02 Nos
STATIC DIMENSIONS OF EQPT	
Overall length of Crawler	4350 mm
Overall width of crawler	2990 mm
Overall width	2990 mm
Cabin height	2850 mm
Rear end swing radius	2760 mm
Sprocket to idler centre	3550 mm
Standard shoe width	510 mm/ 600 mm
Height of engine cover	2610 mm
Overall width of superstructure	2610 mm
Ground pressure	0.46 bar (0.45 kgf/cm$^{2)}$
Minimum ground clearance	435 mm (excluding shoe lug)

Swing speed	13.7 rpm
Travel speed	4.6 Kmph
Gradeability	70% (35^0)
WORKING RANGE	
Maximum digging radius	9250 mm
Maximum digging depth	5950 mm
Maximum cutting height	8990 mm
Maximum dumping height	6230 mm
Transport height	3020 mm
Maximum overall Transport length	9680 mm
Minimum swing radius	3720 mm
ROCK BREAKER	
Description of machine	Hydraulic Breaker
Make & Model	DAEMO DMB 210
Operating weight (with top box bracket)	1800 Kgs
Overall length(with STD mounting bkt)	2826 mm
Chisel outer dia	135 mm
Chisel Length	1250 mm
Setting pressure	210 Kgf/Cm^2
Working pressure	130 to 170 Kgf/Cm^2
Oil Flow	130 to 170 lpm
Blow Rate	400 to 600 bpm
Black head Nitrogen (N_2) Gas pressure	9 Kgf/ Cm^2
Suitable excavator	18 to 25 Ton

Appendix 'D'

RECOMMENDED LUBRICANTS WITH FILLING CAPACITY AND PERIODICITY

S/No	Item	Grade of Lubricant		Filling Capacity	Periodicity for change
		IOC	TELCON		
a)	Engine Cummins 6BT 5.9 C	Servo premium CF4 15W40	Telcon 15 W 40 CH4 Engine Plus	14.2 ltrs/ 16.4 ltrs (System capacity)	First oil/filter change after 50 hrs and thereafter every 250 hrs
b)	Gear oil Swing reduction device (Front idler, swing device)	Servo Gear super 80W90	Telcon TG90 Gear Oil	7.5 ltrs	First oil change after 50 hrs and thereafter every 1000 hrs
c)	Propel/Travel reduction device		Telcon TG90 Gear Oil	5.5 ltrs x 2	First oil change after 250 hrs and thereafter every 1000 hrs
d)	Hyd Oil Hydraulic and steering system	Servo Hydrex TH 46	Telcon Super 46 S	220 ltrs	1500 Hrs
			Supreme 46 P		2500 Hrs
			Ultra 46 U		4000 Hrs
					First change at 500 Hrs and thereafter every 2500 Hrs
e)	Coolant	Servo kool	Super Cool	30 ltrs	Once in a year/after every 1000 hrs
f)	Grease (Swing Gear, Swing bearing etc)	Servo Gen RR	Heavy duty EP2 Grease	-	After every 500 Hrs
g)	Fuel System	-	-	270 ltrs	
h)	Fuel Filter/Water separator	-	-	-	Element change after every 250 hrs
j)	Air Cleaner (in take) element - primary	-	-	-	If vacum indicator shows Red mark, clean/replace air cleaner element after every 500 Hrs
k)	Air filter – safety (Secondary)	-	-	-	After cleaning outer element for six times, replace both outer and inner elements
l)	Vacuum indicator	-	-	-	After every 1500 Hrs
m)	Suction filter	-	-	-	Clean suction filter at every 2500 Hrs and also when ever replacing Hyd oil
n)	Full flow filter (Hyd oil filter)	-	-	-	Element change after every 500 Hrs (125 Hrs for Rock breaker)
o)	Pilot filter	-	-	-	Element change after every 500 Hrs
p)	Hyd oil tank breather	-	-	-	After every 4000 Hrs

Note : Never mix two different brands of oil.