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Infrastructure Equipment Skill Council

Participant Handbook

Sector
Infrastructure Equipment

Sub-Sector
Equipment Operations

Occupation
Operator

Reference ID: **IES/Q0104, Version 2.0**
NSQF Level 3

Junior Excavator Operator

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> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

Acknowledgements

About this book

With the renewed focus on infrastructure projects, the demand for construction equipment is bound to get better. The excavator market will see an increased demand which in turn will lead to larger number of skilled operators being needed to operate these machines.

To address the future sector demand, this Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit(s).

Key Learning Objectives for the specific NOS mark the beginning of the Unit(s) for that NOS. The symbols used in this book are described below.

Symbols used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objectives

Table of Contents

S.No.	Modules and Units	Page No.
1.	**Introduction**	**1**
	Unit 1.1 – About the programme	3
	Unit 1.2 – About the product	5
2.	**Assist Pre-ops Checks on an Excavators (IES/N0110)**	**9**
	Unit 2.1 - Names of Parts & Controls, Panels	10
	Unit 2.2 - Outside the machine & attachment	12
	Unit 2.3 - Inside the engine compartment	18
3.	**Assist in Operating an Excavator (IES/N0111)**	**23**
	Unit 3.1 – Inspection of worksite & safety	25
	Unit 3.2 – Standard operations	28
	Unit 3.3 – Reporting and documentation	33
4.	**Assist in Routine Maintenance of an Excavator (IES/N0112)**	**38**
	Unit 4.1 – Basic maintenance & schedules	41
	Unit 4.2 – Reporting and documentation	47
5.	**Worksite Health and Safety (IES/N7601)**	**55**
	Unit 5.1 – ESH policies and guidelines	57
	Unit 5.2 – Types and use of PPE	59
	Unit 5.3 – Common hazards and preventive measures	61
	Unit 5.4 – Segregation and disposal of waste	63
	Unit 5.5 – Basic fire-fighting equipment and use	64
	Unit 5.6 – Common injuries and appropriate first aid	66

Employability & Entrepreneurship Skills

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1. Introduction

Unit 1.1 - About the programme
Unit 1.2 - About the product

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand and Know each other
2. Share program expectations
3. Understand the role of a junior excavator operator
4. Identify the main external and internal parts of the excavator and their use
5. Identify the main excavator controls and their use

UNIT 1.1: About the Programme

Unit Objectives

At the end of this unit, you will be able to:

1. Understand training curriculum design
2. Know one and all
3. List expectations from the training

1.1.1 Overview of the Book

The training curriculum will help you to:

1. **Assist in carrying out pre-operation checks.** General introduction to excavator machine, basic working of engine, hydraulic and electrical systems, operational controls and instrument panel, preparing machine for operations

2. **Assist in operating an excavator.** Starting of excavator, moving to worksite and carrying out earth digging, load lifting and dumping; parking and shutting down the machine; post-operative checks

3. **Assist in maintenance and troubleshooting.** General maintenance procedures and periodic service schedule of a excavator; common faults and their diagnosis; reports and documents

4. **Comply with worksite health and safety guidelines.** Health, safety and environment policies; personal protective equipment, fire-fighting equipment, basic first aid for common injuries at work site

1.1.2 Knowing Each Other

Let's Know Each Other:

- Your name
- Your location
- Your hobby?

1.1.3 Expectation Mapping

My expectations from the training program are:

UNIT 1.2: About the Product

Unit Objectives

At the end of this unit, you will be able to:

1. Know the history of excavators
2. Understand the basic features and use of excavators
3. Identify the various parts of excavators and their use
4. Understand the safety features of excavators

1.2.1 Brief History of Excavators

Most construction projects, especially large-scale undertakings, begin with land excavation. During this initial phase of construction, excavation contractors use heavy equipment to carve away or fill in the existing land to make way for new buildings, roadways, and sewers. Before the rise of motorised construction machinery, earthmoving was a truly backbreaking process. With help from hydraulic excavators, it is now much easier to shape the land according to the needs of the project.

Driven by a skilled equipment operator, a hydraulic excavator aids the site supervisor in meeting construction deadlines. While their specific capabilities vary depending on size and available attachments, all excavators work in a similar fashion. Though they are most commonly seen working on large construction projects, models in the mini class are designed to handle smaller jobs.

1.2.2 Brief Specs, Features and Performance

Excavators are heavy construction equipment consisting of a boom, dipper (or stick), bucket and cab on a rotating platform known as the "Cabin". The house sits on the top of an undercarriage with tracks or wheels. They are a natural progression from the steam shovels and often mistakenly called power shovels.

All movement and functions of a hydraulic excavator are accomplished through the use of hydraulic fluid, with hydraulic cylinders and hydraulic motors. Due to the linear actuation of hydraulic cylinders, their mode of operation is fundamentally different from cable-operated excavators which uses winches and steel ropes to accomplish the movements.

1.2.2.1 General Excavator Specifications

Item	Unit	
DIMENSIONS		
Operating weight	kg	21,390
Name of engine	SAA6D107-1 diesel engine	
Engine horsepower	kW (HP)/rpm 110 (148)/2,000	
Overall length	mm	9,475
Overall height	mm	3,000
Overall width	mm	2,800
Track width	mm	600
Height of cab	mm	3,035
Radius of cabin	mm	2,800
Length of track	mm	4,080
Tumbler center distance	mm	3,270
Min. ground clearance	mm	440
PERFORMANCE		
Travel speed (Lo/Mi/Hi)	km/h	3.0/4.1/5.5
Swing speed	rpm	12.4
Max. digging reach	mm	9,875
Max. digging depth	mm	6,620
Max. digging height	mm	10,000
Max. vertical wall depth	mm	5,980
Max. dumping height	mm	7,110
Min. dumping height	mm	2,645
Max. reach at ground level	mm	9,700

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2. Assist in Pre-Operations Checks on an Excavators

Unit 2.1 - Names of Parts & Controls, Panels
Unit 2.2 - Outside the machine & attachment
Unit 2.3 - Inside the engine & cabin

IES/N0110

2.1: Names of Parts & Controls, Panels

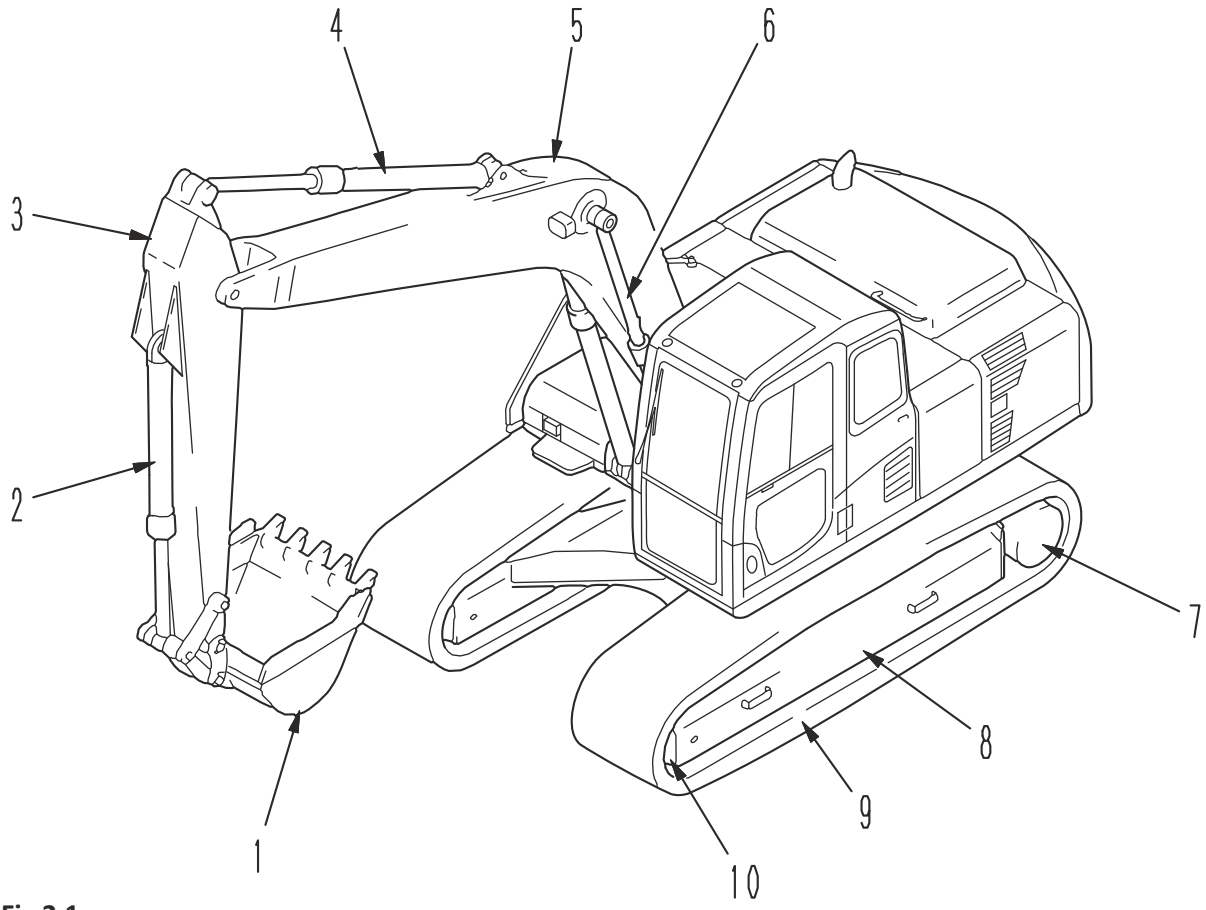
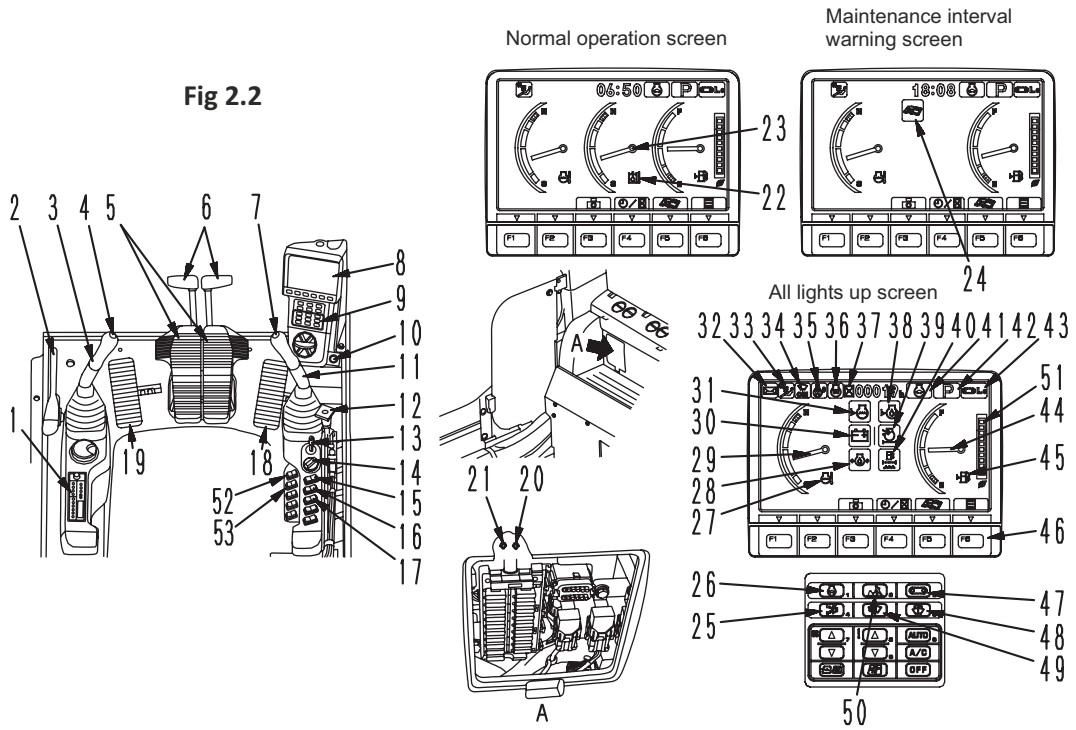


Fig 2.1

(1) Bucket
(2) Bucket cylinder
(3) Arm
(4) Arm cylinder
(5) Boom
(6) Boom cylinder
(7) Sprocket
(8) Track frame
(9) Track shoe
(10) Idler

2.1.1: Names of Parts & Controls, Panels

Fig 2.2



(1) Radio
(2) Lock lever
(3) Left work equipment control lever
(4) Knob switch (2 x spare switches)
(5) Travel pedals
(6) Travel levers
(7) Horn switch (2 x spare switches)
(8) Machine monitor
(9) Air conditioner control switches
(10) Cigarette Lighter monitor
(11) Right work equipment control lever
(12) Blade control lever (if equipped)
(13) Starting switch
(14) Fuel control dial
(15) Lamp switch
(16) Swing lock switch
(17) Revolving warning lamp switch (if equipped)
(18) Attachment control pedal (if equipped)
(19) Attachment control pedal (if equipped)
(20) Swing brake cancel switch
(21) Emergency pump drive switch
(22) Hydraulic oil temperature monitor
(23) Hydraulic oil temperature gauge
(24) Maintenance interval monitor
(25) Buzzer cancel switch
(26) Auto-deceleration switch
(28) Engine oil pressure moitor
(29) Engine coolant temperature gauge
(30) Charge level monitor
(31) Radiator coolant level monitor
(32) KOMTRAX message monitor
(33) Air conditioner monitor
(34) Wiper monitor
(35) Swing lock monitor
(36) Engine pre-heating monitor or One-touch power max,
(37) Service meter, Clock
(38) Engine oil pressure monitor
(39) Air cleaner clogging monitor
(40) Water separarator monitor
(41) Auto-deceleration monitor
(42) Working mode monitor
(43) Travel speed monitor
(44) Fuel gauge
(45) Fuel level monitor
(46) Function switches (F1 to F6)
(47) Travel speed selector switch
(48) Window washer switch
(49) Wiper switch
(50) Working mode selector switch
(51) ECO gauge
(52) Lower wiper (if equipped)
(53) Heated seat

2.2.2 Refuelling Pump

When the machine is operated on sites with no fuel container and pump, the machine may be refuelled using the refuelling pump (if fitted) from fuel barrels.

1. The refuelling pump is located next to batteries at the front right hand side of the machine.

2. Place the fuel hose (2), which is stored in tray (3) into the fuel barrel placed next to the machine.

3. Switch on refuelling pump using switch (1) on the pump assembly when adding fuel, never let the fuel overflow. This may cause a fires

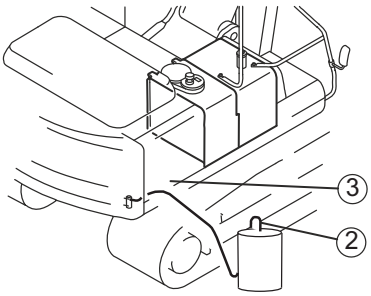


Fig 2.3

NOTICE
This pump is protected by an in line blade fuse (15A). If pump fails to function check fuse.

Ensure strainer on hose end is clean.

WARNING
Do not bring fire or sparks near the fuel.

Fig 2.4

2.2.3 Checks Before Starting

Check Coolant Level, Add Coolant

1. Open the door at the rear left of the machine, and check if the coolant in sub-tank (1) (shown in the diagram on the right) is between the FULL and LOW marks. If the coolant level is low, add coolant to the FULL level through the filler port of sub-tank (1).

2. After adding coolant, tighten the cap securely.

3. If the sub-tank (1) is empty, there is probably leakage of coolant. After inspecting, repair any problem immediately. If there is no problem, check the coolant level in the radiator. If the coolant level is low, add coolant to the radiator, then fill the sub-tank (1).

4. If the inside of sub-tank (1) is dirty and the water level cannot be seen, use the procedure in “CLEAN INSIDE OF COOLING SYSTEM (4-27)“

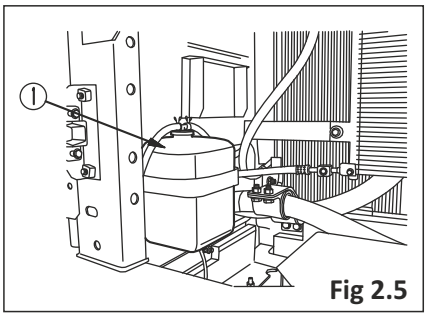


Fig 2.5

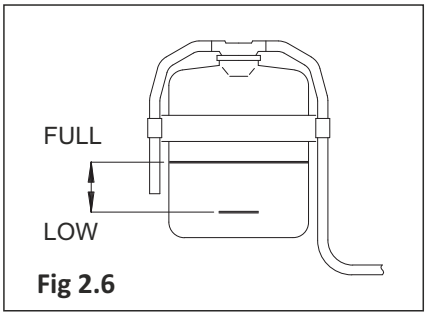


Fig 2.6

2.2 - Outside the machine & attachment

2.2.1 Before Starting Engine

Before starting the engine, look around and under the machine to check for loose nuts and bolts, or leakage of oil, fuel, or coolant, and check condition of the work equipment and hydraulic system. Also check for loose wiring, play, and accumulation of dust at places with high temperatures.

Walk-around Checks
Perform the following inspections and cleaning every day before starting engine for the day's work.

1. Check for damage, wear, play in work equipment, cylinders, linkage, hoses Check for cracks, excessive wear, play in work equipment, cylinders, linkage, and hoses. If any problem is found, repair it.

2. Remove dirt and debris from around the engine, battery, and radiator. Check for dirt accumulated around the engine and radiator. Also check for flammable material (dry leaves, twigs, etc.) around the battery, engine muffler, turbo charger, or other high temperature engine parts. If any dirt or flammable materials are found, remove them.

3. Check for coolant and oil leakage around the engine Check for oil leakage from the engine and coolant leaks from the cooling system. If any problem is found, repair it.

4. Check for oil leakage from hydraulic equipment, hydraulic tank, hoses, and joints Check for oil leakage. If any problem is found, repair the area where oil is leaking.

5. Check the undercarriage (track, sprocket, idler, guard) for damage, wear, loose bolts, or leakage of oil from rollers. If any problem is found, repair it.

6. Check for problems in handrails, steps, loose bolts. If any problem is found, repair it. Tighten any loose bolts.

7. Check for problem in gauges, monitor. Check that there is no problem in the gauges and monitor in the operator's cab. If any problem is found, replace the parts. Clean off any dirt on the surface.

8. Clean, check rear view mirror Check for damage to the rear view mirror. If damaged, replace it with a new mirror. Clean surface of the mirror and adjust angle so area at the rear can be seen from the operator's seat.

9. Seat belt and mounting clamps Check for damage or wear to the seat belt and mounting clamps. If there is any damage, replace with new parts.

10. Check bucket with hook (if equipped) for damage. Check for damage to the hook, guide, and hook mount. If any problem is found, contact your distributor for repairs.

2.2.3 cont.....

Check Oil Level in Engine Oil Pan, Add Oil

1. Open the engine hood on the machine.

2. Remove dipstick (G), and wipe the oil off with a cloth.

3. Fully insert dipstick (G) into filler pipe (F), then remove it.

4. The oil level should be between the H and L marks on dipstick (G). If the oil level is below the L mark, add oil through oil filler (F).

5. If the oil is above the H line, open drain valve (P) at the bottom of the engine oil pan, drain the excess engine oil, then check the oil level again.

6. If oil level is correct, securely tighten the oil filler cap and close the engine hood.

Remark
When checking the oil level after the engine has been operated, wait for at least 15 minutes after stopping the engine before checking. If the machine is at an angle, make it to a horizontal position before checking.

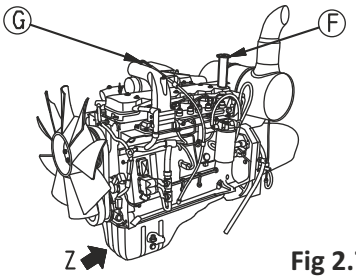


Fig 2.7

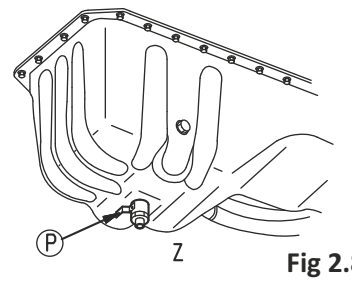


Fig 2.8

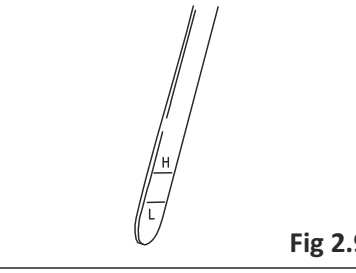


Fig 2.9

Check Fuel Level, Add Fuel

1. Open fuel filler cap (F) of the fuel tank.

2. If fuel filler cap (F) is opened, float gauge (G) rises to the fuel level. Check that the fuel tank is full. Check the fuel level visually and with float gauge (G).

3. If the fuel tank is not full, add fuel through the fuel filler until float gauge (G) rises to the maximum position.
Q Fuel tank capacity: 400 liters
Position of tip (a) of float gauge (G) when fuel tank is full:
50 mm

4. After adding fuel, push float gauge (G) straight down with fuel filler cap (F). Be careful not to get float gauge (G) caught in the tab of fuel filler cap (F), and tighten fuel filler cap (F) securely.

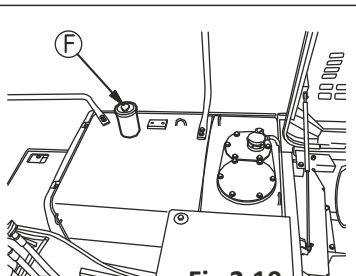


Fig 2.10

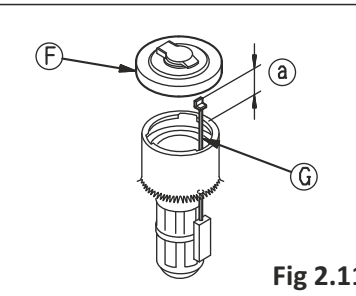


Fig 2.11

2.2.3 cont.....

Remark
If breather hole (1) in the cap is clogged, the pressure inside the tank will go down and no fuel will be supplied, so clean the breather hole periodically. The diagram on the right shows the rear surface of the cap.

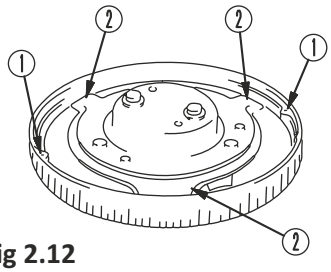


Fig 2.12

Drain Water And Sediment from Fuel Tank

1. Open the pump room door on the right side of the machine.

2. Set a container under drain hose (1) to catch the drained fuel.

3. Open drain valve (2) at the rear of the fuel tank and drain the water and sediment accumulated at the bottom of the tank together with the fuel.

4. When only clean fuel comes out, close drain valve (2).

5. Close the pump room door on the right side of the machine.

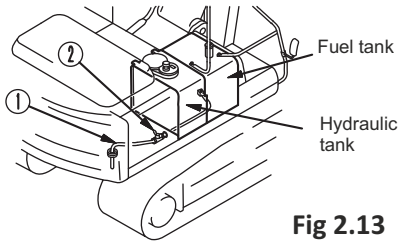


Fig 2.13

Check for Water and Sediment in Water Separator, Drain Water

1. Open the pump room door on the right side of the machine. Q The water separator forms one unit with fuel pre-filter (1) and consists of bottom parts (2) - (4).

2. Water and sediment on the bottom can be checked through transparent cap (2). If there is water or sediment, prepare a container to receive it under drain hose (4).

3. Loosen drain valve (3) to drain the water.

4. If fuel starts flowing out through drain hose (4), close valve (3) immediately.

5. On this machine, a sensor is installed to detect if water is accumulated at the bottom of fuel pre-filter (1). When the water separator monitor shown in the illustration on the right lights up red on the machine monitor at the front right of the operator's seat, it indicates that water is accumulated in fuel pre-filter (1). In this case also, use the above Steps 1 - 4 to drain the water.

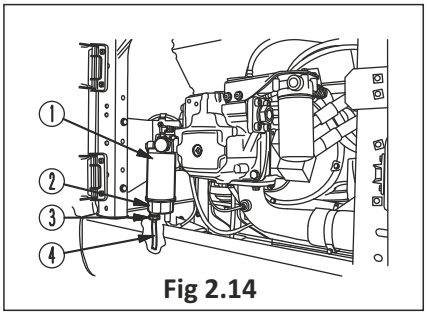


Fig 2.14

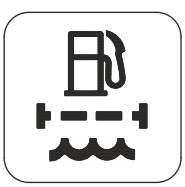


Fig 2.15

2.2.3 cont.....

6. Close valve (6) at the bottom of the fuel tank to shut off the fuel supply.

7. Set a fuel container under drain hose (4).

8. Loosen drain valve (3), then drain all the sediment together with the fuel from drain hose (4).

9. Check that nothing comes out from drain hose (4), then remove drain valve (3).

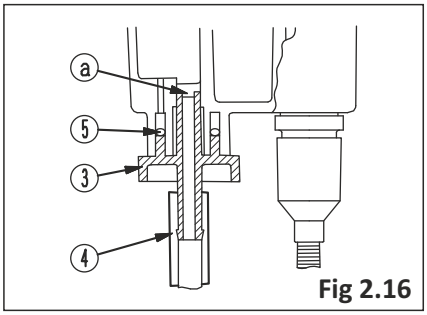


Fig 2.16

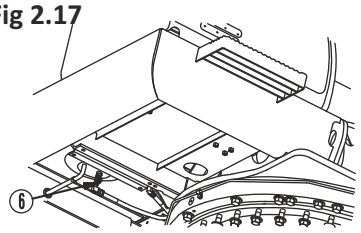
10. Coat O-ring portion (5) with a suitable amount of grease. When doing this, be careful not to let the grease get on the drain valve water drain port (a) or the drain valve thread.

11. Screw in drain valve (3) by hand until it contacts the bottom.

12. Remove the fuel container.

13. Open valve (6) at the bottom of the fuel tank.

Fig 2.17

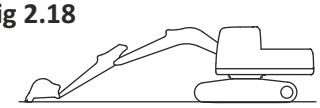


Q If transparent cap (2) is dirty and the contents cannot be easily seen, clean transparent cap (2) when replacing the filter.
Q When washing, if drain valve (3) is removed, coat the O-ring with grease, then tighten by hand until it contacts the bottom.

Check Oil Level in Hydraulic Tank, Add Oil

1. If the work equipment is not in the condition shown in the diagram on the right, start the engine, run the engine at low speed, retract the arm and bucket cylinder rods fully, then lower the boom, set the bucket teeth in contact with the ground, and stop the engine.

Fig 2.18



2. Check sight gauge (G) from the right window installed to the operator's compartment. The oil level should be between the H and L lines.

3. If the oil level is below the L line, add oil through oil filler (F) at the top of the hydraulic tank.

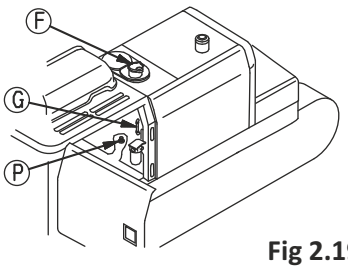


Fig 2.19

NOTICE
Do not add oil above the H line. This will damage the hydraulic equipment and may cause oil to spurt out. If oil is added above the H line, stop the engine, wait for the oil temperature to cool down, put a container to catch the oil under drain plug (P) at the bottom of the hydraulic tank, then drain the excess oil from the drain plug.

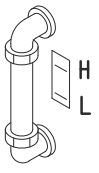


Fig 2.20

2.2.3 cont.....

Check Working Lamp Switch

Turn the lamp switch ON (night mode (a), and day mode (b)) and check that the working lamp lights up.

If it does not light up, there is probably a blown bulb or a disconnection, so contact your distributor to have repairs carried out.

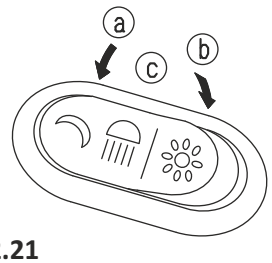


Fig 2.21

Check Electric Wiring

Check that there is no damage to the fuses; that fuses of the specified capacity are used; that there is no disconnection or trace of short-circuiting in the electric wiring and no damage to the covering. Check also that there is no loosened terminals. If any, tighten them.

Moreover, pay particular attention to the electric wiring when checking the battery, engine starting motor and alternator.

Be sure to check that there is no inflammable material accumulated around the battery. If any is found, remove immediately.

Check Function of Horn

1. Turn the starting switch to the ON position.

2. Confirm that the horn sounds immediately when the horn button is pressed. If the horn does not sound, contact your distributor for repair.

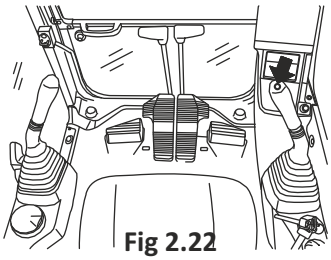


Fig 2.22

2.3 - Inside the Machine and Cabin

2.3.1 Adjustments

Seat Adjustment

Always adjust the operator's seat before starting each operation or when the operators change shift. Adjust the operator's seat so control levers and switches can be operated freely and easily with the operator's back against the backrest.

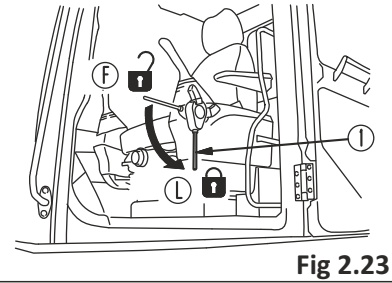


Fig 2.23

(A) Fore-and-aft adjustment
Pull lever (1) up, set the seat to the desired position, then release the lever. Fore-and-aft adjustment: 160 mm (16 stages)

(B) Adjusting reclining.
Pull up lever (2) and set the backrest to a position that is comfortable for operation, then release the lever. Sit with your back against the seat backrest when adjusting. If your back is not against the backrest, the backrest may suddenly move forward.

(C) Adjusting seat tilt
Forward tilt. Push lever (3) down to adjust angle of the front of seat. (4 stages)

To raise the angle at front of the seat, keep the lever pushed down and apply your weight to the rear of seat.

To lower the angle at front of the seat, keep the lever pushed down and apply your weight to the front of seat.

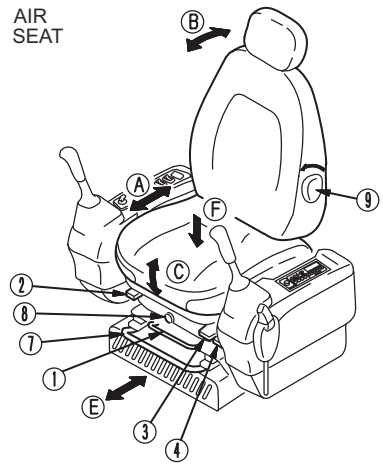


Fig 2.24

Rear tilt Pull lever (4) up to adjust angle of the rear of seat. (4 stages)
To raise the angle at rear of the seat, keep lever (3) pulled up, and stand up slightly to remove your weight from the seat.

To lower the angle at rear of the seat, keep lever (3) pulled up, and apply your weight to the seat.
Amount of tilt: Up 13°, down 13°

Adjusting seat height It is possible to move the seat up or down by combining adjustments forward tilt and rear tilt. After setting the forward tilt or rear tilt to the desired height, operate the opposite part to set the seat horizontal then secure in position.
Height adjustment: 60 mm

2.3.1 Cont....

(D) Adjusting armrest height
The height of armrest (5) can be adjusted up or down by changing the position of adjustment bolt (6) at the rear of the armrest.
Armrest height adjustment: 16.5 mm

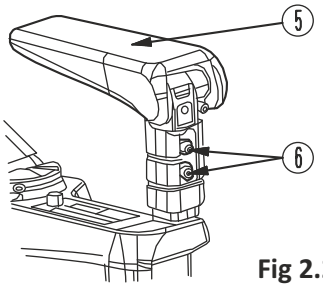


Fig 2.25

(E) Overall fore-and-aft adjustment of seat
Raise lever (7) and slide to the desired position, then release the lever. In this case, the operator's seat, left and right control levers, and lock lever all slide together.
Fore-and-aft adjustment: 180 mm

In order to function correctly, the seat suspension must be adjusted to suit the drivers weight and is done so by pressing or pulling control knob (8) The seat should be adjusted so that there is equal travel in both upward and downward directions. (weight range 60 ~ 150 Kg)

(F) Adjusting suspension - Air seat
In order to function correctly, the seat suspension must be adjusted to suit the drivers weight and is done so by pressing or pulling control knob (8) The seat should be adjusted so that there is equal travel in both upward and downward directions. (weight range 60 ~ 150 Kg)

(G) Adjusting suspension - mechanical seat (if equiped)
Turn knob (8A) to the right to make the suspension harder, or to the left to make the suspension softer. Adjust the reading of the dial to match the operator's weight and select the optimum suspension.

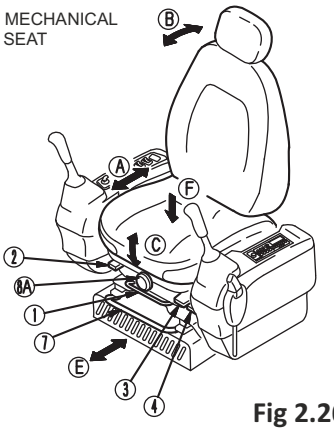


Fig 2.26

(H) Lumbar Adjustment
Rotate knob (9) in direction shown to increase the amount of lumbar support (five positions). Further rotation in the same direction causes the lumbar support to return to the original position.

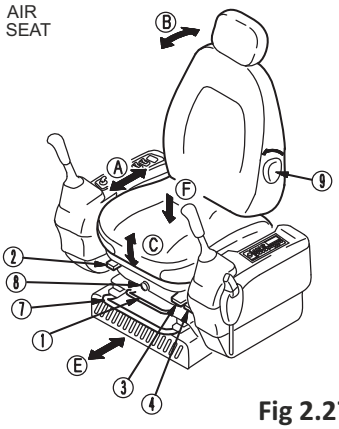


Fig 2.27

2.3.1 Cont....

Rearview Mirrors

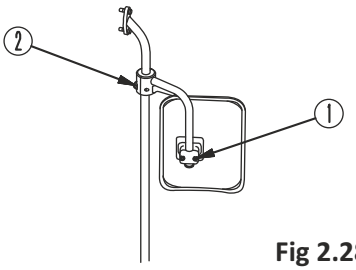


Fig 2.28

Mirrors A, B
Loosen bolt (1) or (2) of the mirror, then adjust the mirror to a position which gives the best view from the operator's seat of the blind spot at the left and right sides at the rear of the machine.

When installing the mirror, adjust so that it is possible to see any person (or any object of a height of 1 m and diameter of 30 cm) at the rear left or right of the machine.

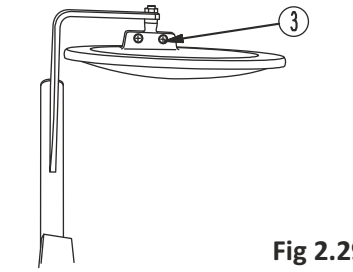


Fig 2.29

Mirrors C, D
Adjust so that is possible to see the ground around the machine at a range of 1 m from the operator's seat.

If the movement of the mirror is stiff when adjusting it, loosen screw (3) of the mirror.

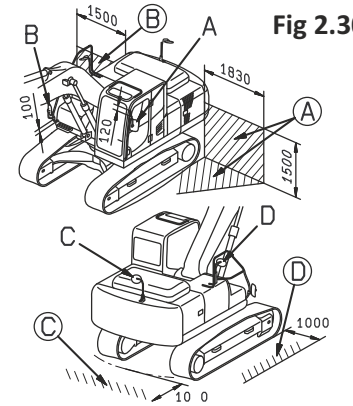


Fig 2.30

Install the mirrors at the position and dimensions shown in the diagram. The values below are reference values for the range of visibility.

Mounting height: 120 mm (mirror A), 100 mm (mirror B)
Range of view (left): 1830 mm
Range of view (right): 1500 mm
Mirror A: Must be possible to see hatched portion (A)
Mirror B: Must be possible to see hatched portion (B)
Mirror C: Must be possible to see hatched portion (C)
Mirror D: Must be possible to see hatched portion (D)

Seat Belt

Fastening and Removing This seat belt has a wind-in device, so it is not necessary to adjust the length.

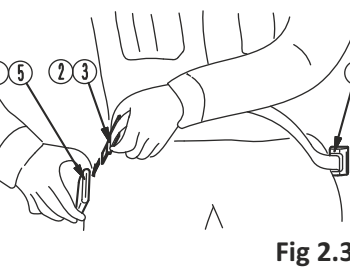


Fig 2.31

Fastening Seat Belt Hold grip (2) and pull the belt out from wind-in device (1), check that the belt is not twisted, then insert tongue (3) into buckle (4) securely.

When doing this, pull the belt lightly to check that it is properly locked.

Removing Belt
Press button (5) in buckle (4), and remove tongue (3) from buckle (4).
The belt is automatically wound in, hold grip (2) and return the belt slowly to wind-in device (1).

2.3.1 Cont....

Checking before starting the machine operation:

1) Inspection before starting the day's work be sure to carry out a pre-work inspection and walk-around check before starting the engine for the day's work, following the instructions in the Operation and Maintenance Manual.

If any abnormality is found during inspection, immediately take corrective action in accordance with instructions in the operation and maintenance manual. Operating the machine without proper corrective action can cause serious damage to the machine

2) Warm-up run before starting the machine, thoroughly warm up the engine, in accordance with the instructions in the operation and maintenance manual. Operating the machine before the engine is thoroughly warmed up can shorten the service life of the engine and hydraulic equipment. If the machine is started while the hydraulic oil is still cold, it can cause a larger time lag in the work equipment and traveling, which could result in serious accidents.

3) Use clean cloth for checking oil

Fig 2.32

4) Do not remove the strainer when refueling

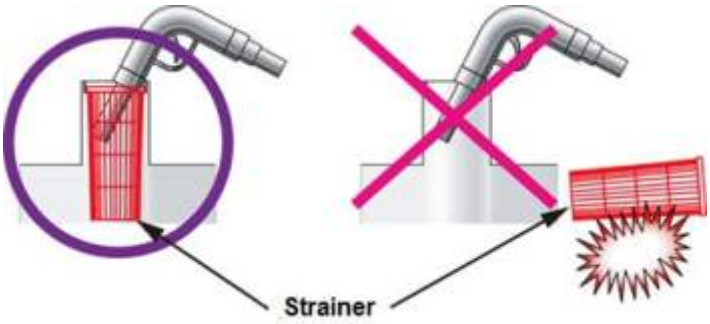


Fig 2.33

The strainer protects the fuel tank against large pieces of dust. Even if the fuel is clean, large pieces dust can get in through the fuel port during refilling, causing the fuel system to get clogged. Therefore, do not remove the strainer when refilling with fuel.

2.3.1 Cont....

5) Greasing of Attachments / Precautions:

Be sure to grease at the intervals specified in the operation and maintenance manual. When greasing the pins, keep feeding until the old grease is pushed out and the new grease begins coming out of the pin end. Wipe off the old squeezed out grease.

Failure to grease as instructed can cause squeaking pins or scuffed bushing. If the condition becomes worse, parts may need to be replaced, resulting in considerable cost.

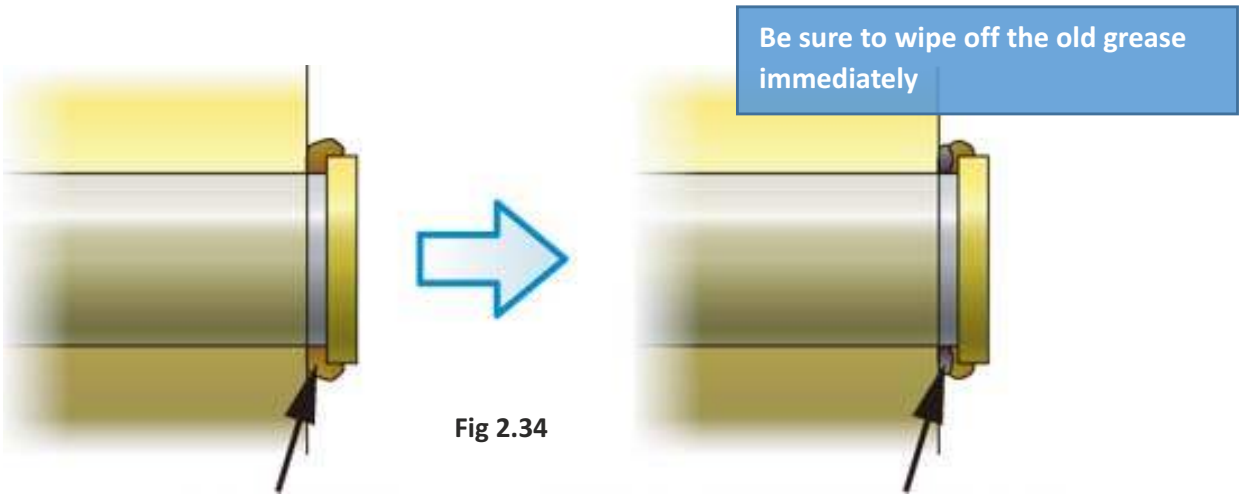


Fig 2.34

The old grease contains a high proportion of metallic dust generated as the pins and bushings wear out. Therefore, if the old grease is not removed, it can cause the pins and bushings to wear out prematurely.

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3. Assist in operating an Excavator

Unit 3.1 - Inspection of worksite and safety
Unit 3.2 - Standard operations
Unit 3.3 - Reporting & documentation

IES/N0111

Key Learning Outcomes

At the end of this module, you will be able to:

1. Comply manufacturer's instructions for care and safe operation of the excavator
2. Understand symbols and signs for guiding the excavator operator
3. Assist the excavator operator in performing various excavator operations
4. Assist the excavator operator in inspecting the worksite for safety
5. Identify and understand excavator worksite inspection checklist
6. Operate carefully so as not to put the health and safety of self or others at risk
7. Assist the excavator operator in maintaining a checking/maintenance logbook to record all activities
8. Inform the excavator operator of problems that are beyond scope of junior excavator operator's role
9. Understand importance of reporting
10. Identify and understand excavator pre-use checklist

3.1: Inspection of Worksite & Safety

Unit Objectives

At the end of this unit, you will be able to:

1. Assist the excavator operator in inspecting the worksite for safe operations
2. Understand the communication symbols used to guide the excavator operator
3. Understand symbols used for site safety

3.1.1 Inspection of the Worksite

Following are the main points to be noted for worksite inspection:

1. There could be dangerous materials such as asbestos, poisonous chemicals or other harmful substances buried on the site. If you see any signs of toxic waste, advise the excavator operator immediately.

2. Help the excavator operator check with your local public water and gas supplier if there are buried pipes and / or drains on the site. If there are, obtain a map of their locations and follow the advice given by the suppliers.

3. Hand dig trial holes to obtain precise pipe locations. Any cast iron pipes found should be assumed to be gas pipes until contrary evidence is obtained.

4. If a gas leak is suspected, assist the operator to contact the local gas company immediately and warn all personnel on the site.

5. Safety Items fire extinguisher, PPE, eye wash, first aid kit, etc.

Fig 3.1

3.1.2 Signals to guide a Excavator Operator

The signaler should stand in a secure position where he/she can see the load and can be seen clearly by the driver and should face the driver if possible. Each signal should be distinct and clear.

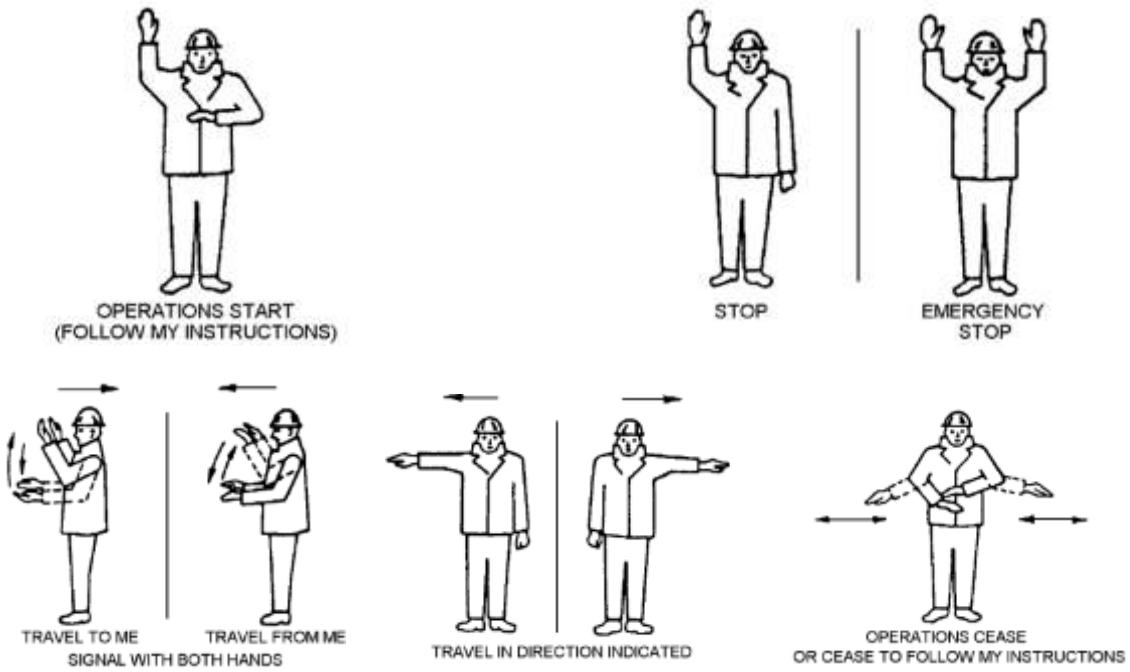

Fig 3.2

3.1.3 Sample Site Safety Notice

Fig 3.3

3.2: Standard Operations

3.2.1: Digging Operation

Stability of Machine:

Stability of the machine during operation increases production and extends the life of machine and provides safety When sprocket is at the rear, the stability is better than when it is at the front. This posture also helps in protecting the final drive.

Fig 3.4

Fig 3.5

Length of track on ground A is always longer than track gauge B. Hence, working over the front will always provide better stability

3.2.1: Cont...

When digging with the arm, keep the arm angle within the 45° to the front and 45° to the rear. Within this range, if the boom and bucket is used, the operating efficiency can be improved

When the bucket cylinder and link, and arm cylinder and arm are both at 90° to each other, the forces of each cylinder is at its maximum. If digging operation are carried out with skill full use of this angle, the operating efficiency is increased

Fig 3.7

If the digging point is far from the machine, the centre of gravity shifts to the front and causes instability.

Keeping the digging point close to the machine improves the stability and increases the digging force.

3.2.1: Cont...

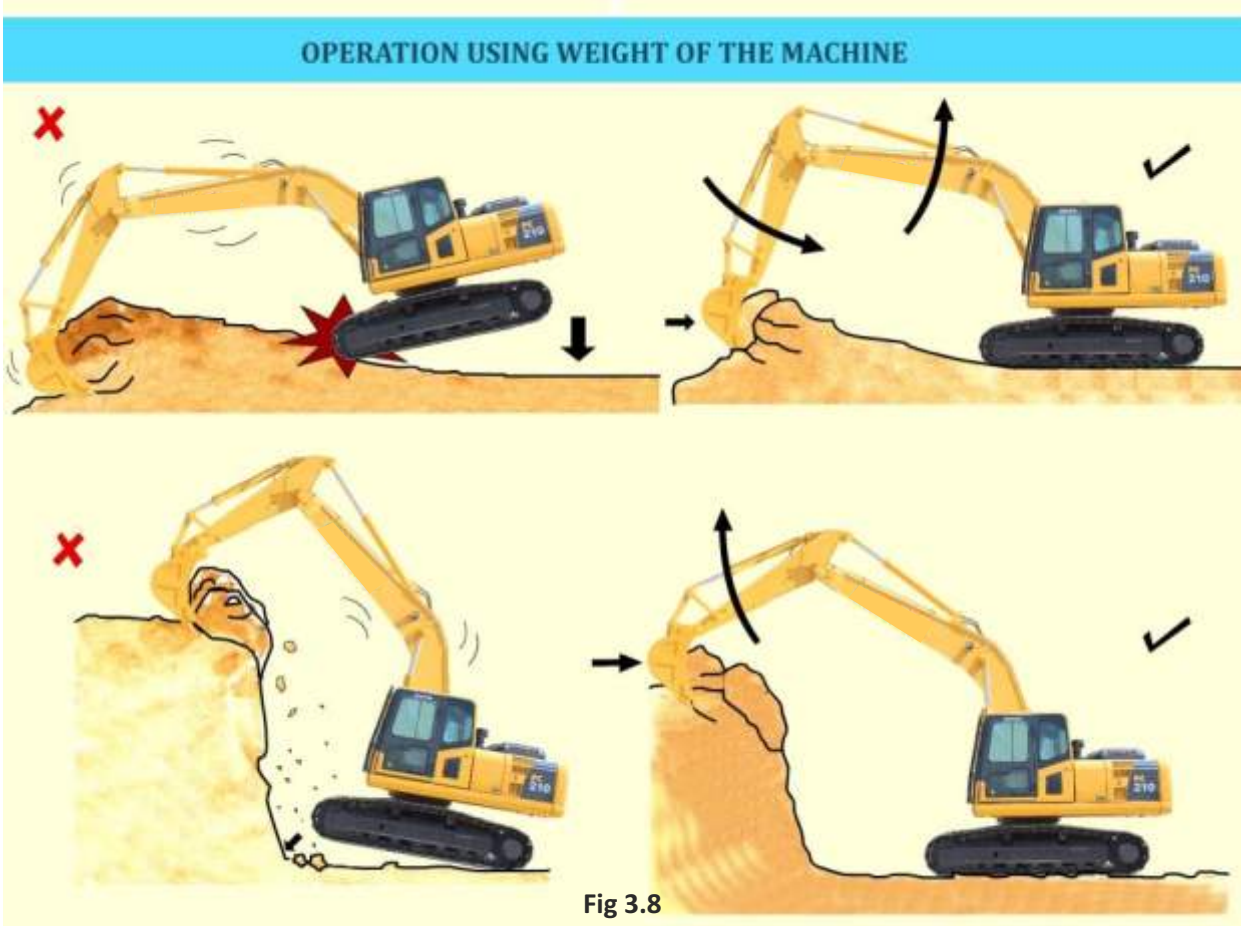

Fig 3.8

Using the weight of the machine as a method of digging brings an excessive load to bear on the structures and attachments. Carry out digging work by using hydraulic force to operate the work equipment.

Using impact force to carry out operations will cause damage and breakage to the bucket and work equipment; it will also generate pressure spikes inside the cylinder which can cause failure of seal kit and also swelling of the cylinder.

Fig 3.9

3.2.1: Cont...

DUMPING

Fig 3.10

When loading large rocks/boulders, load it close to the bottom of the dump body. If the rock is dropped from a high position, it will cause damage to the dumptruck body. Loading soil into the body before loading rocks is a method which will reduce shock/impact. When carrying out loading operations, stop the dump truck in a position where it can be seen easily by the operator.

When travelling, keep the attachment as close to the centre of the machine, this provides stability to the machine.
To protect the final drive, it is recommended to travel with the sprockets at the rear.

TRAVEL POSTURE

Fig 3.11

UPHILL - FORWARD POSTURE

Fig 3.12

This should be the posture while travelling up a slope. If the sprocket is kept in front while travelling up a slope, the surface of the track in contact with the ground will become loose and cause loss of drive force or traction.

3.2.1: Cont...

This posture should ideally be used while traveling down the slope. When traveling downhill, if the sprocket is at the rear, then the track at the top will become loose. During stopping, when the travel lever is placed at neutral, there is possibility of machine traveling forward to the amount of loose track, causing loss of control.

Fig 3.13

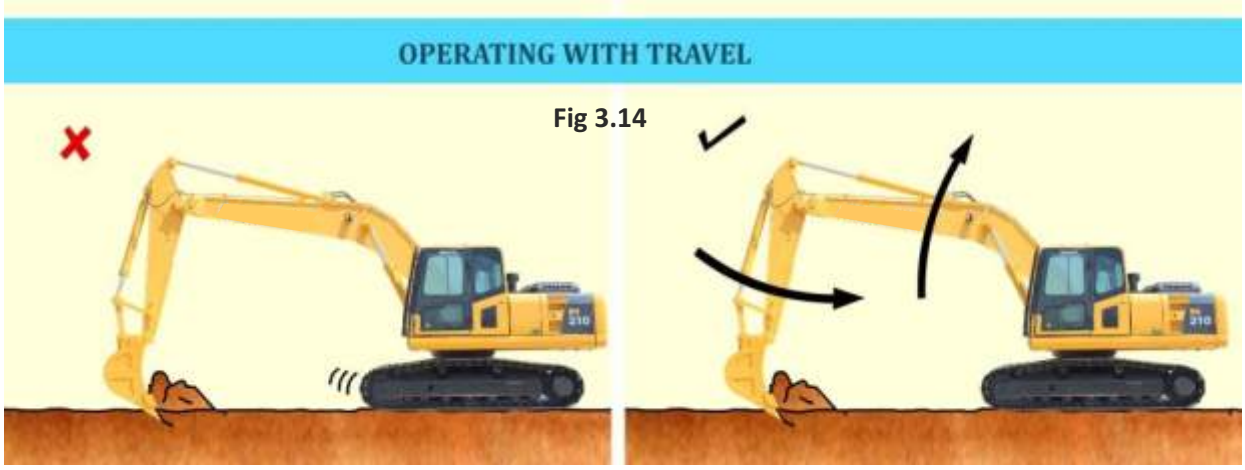

Fig 3.14

The travel force is used to move the machine. Using travel force to excavate is prohibited. Such operation can cause severe load on undercarriage components and final drive. Hence while excavating, digging force of work equipment should only be used.

3.3: Reporting & documentation

Unit Objectives

At the end of this unit, you will be able to:

1. Identify and understand an excavator pre-use checklist
2. Identify and understand an excavator worksite inspection checklist

3.3.1 Worksite Inspection Checklist

WORKPLACE INSPECTION CHECKLIST						
	Acceptable		Immediate action taken	Further action required*	Date signed off	Date to be completed
	Y	N				
Thoroughfares (access and egress)						
Pathways/walkways/stairs/ramps and access areas clear of rubbish and obstructions						
Pathways/walkways are slip free. Surfaces are even, free of holes, cracks, fraying or uplifted edges						
Slip resistant materials or absorbent mats used in wet areas						
Steps/stairs/ramps/handrails are secure and in good repair						
Electrical cables/cords kept clear of walkways or secured						
Exit and egress points clearly identified and accessible						
Other:						
Office environment (workstations and surrounding areas)						
Ergonomic furniture is appropriately adjusted e.g. keyboards, chairs						
Furniture is well maintained and in good/safe condition						
Desks and benches stable and suitable for the work						
Materials are stored appropriately e.g. not on floor around work areas						
Staff use good housekeeping practices around their work areas						
Sufficient space is provided around workstations so staff can move and work safely						
Walkways and aisles are clear of obstructions						
Floor mats do not present trip hazards						
Lifting aids are available where required						
Electrical equipment is in good working order						
Electrical leads are secured to prevent trip hazards						
Adequate ventilation in all areas						
Other:						
Storage						
Storerooms and storage areas are tidy and free from obstruction						
Stored materials are secured appropriately to prevent them falling						
Heavy equipment is stored at waist level						
Storage areas are accessible and free from trip hazards						
Shelving is stable and well maintained						
Other:						

3.3.2 Pre-Use Checklist

Pre Start / Pre Delivery Checksheet

Plant Number _____ **Branch** _____ **Location** _____

Date _____ **Current Hr/Kms** _____ **Inspected by** _____

All Equipment Daily Checks	In Branch	Cold	Hot
If ANY faults are found DO NOT continue to Operate until rectified			
1. Check all Oil Levels, Engine, Hydraulic, Compressor and Brake	☐	☐	☐
2. Radiator Coolant Level	☐	☐	☐
3. Air Cleaner Service Indicator	☐	☐	☐
4. Battery Water Level and Connections	☐	☐	☐
5. Check Radiator Hoses and Belts	☐	☐	☐
6. Check that ALL Gauges, Instruments are Operational	☐	☐	☐
7. Check and report ALL damage	☐	☐	☐
8. Check Fire Extinguisher Charge (shows as Green)	☐	☐	☐
9. Check Wheel Nuts and Tyre Condition	☐	☐	☐
10. Test Park and Service Brake Operation	☐	☐	☐
11. Check Lights / Taillights / Indicators	☐	☐	☐
12. Check General Tidiness of the Vehicle	☐	☐	☐
13. Check Fuel	☐	☐	☐
14. Has Machine Been Serviced	☐	☐	☐

Light Vehicles / Trucks Weekly Checks	
1. Check and Drain Water Traps	☐
2. Drain Air Tanks	☐
3. Check Jack and Wheel Brace	☐
4. Check Tyre Pressures	☐
5. Check Spare Tyre	☐
6. Invert Fire Extinguishers	☐
7. Grease all Lubrication Points	☐
8. Check Security of Towbar and Attachments	☐
9. Check Crane - If fitted (Please see Separate Box)	☐
Checklist Completed By *(Please initial clearly)*	☐

Diesel Welders / Generators / L / Towers	
1. Check Welding Leads and Terminals	☐
2. Replace Aircleaner (if required)	☐
3. Check RCD Operation /Test Tag	☐
4. Check Trailer Park Brake	☐
5. Invert Fire Extinguishers (if fitted)	☐
6. Check Security of Towbar and Attachments	☐
7. Light Operation	☐
Checklist Completed By *(Please initial clearly)*	☐

Air Compressors	
1. Check Air Fittings and Hoses	☐
2. Check Aircleaner and Intake	☐
3. Check Trailer Park Brake	☐
4. Check Compressor for Leaks	☐
5. Replace Aircleaner (if required)	☐
6. Invert Fire Extinguishers (if fitted)	☐
7. Check Security of Towbar and Attachments	☐
Checklist Completed By *(Please initial clearly)*	☐

Trailers and Dolly's	
1. Wheels / Tread / Pressure	☐
2. Grease all Lubrication Points	☐
3. Check Security of Towbar and Attachments	☐
4. Check Lights & Light Load	☐
Checklist Completed By *(Please initial clearly)*	☐

Forklift	
1. Check and Drain Water Traps	☐
2. Drain Air Tanks	☐
3. Check Transmission Oil Level	☐
4. Grease all Lubrication Points	☐
5. Invert Fire Extinguishers	☐
6. Check Condition of Forks and Chain Adjustment	☐
Checklist Completed By *(Please initial clearly)*	☐

Earthmoving Equipment	
1. Check and Drain Water Traps	☐
2. Drain Air Tanks	☐
3. Check Tyre / Track Condition	☐
4. Check Transmission Oil Level	☐
5. Grease all Lubrication Points	☐
6. Invert Fire Extinguishers	☐
7. Check Condition of Ground Engaging Gear	☐
Checklist Completed By *(Please initial clearly)*	☐

List any damage or faults requiring attention	

Briefly anwer the following questions.

What all do you inspect in a worksite?

List steps to remove the bucket from a excavator.

Mention the meaning of these symbols against the box provided.

Tips

Following are recommended tips:

If a fibre optic cable is cut during operations, do not look into the end of it as your eyes could be permanently damaged.

Notes

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4. Assist in Routine Maintenance of an Excavator

Unit 4.1 – Basic maintenance and schedules
Unit 4.2 – Reporting & documentation

IES/N0112

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand the basic maintenance and maintenance schedules

2. Carry-out basic troubleshooting of the excavator

3. Understand the importance of machine logs and reporting

4.1: Basic Maintenance and Schedules

Unit Objectives

At the end of this unit, you will be able to:

1. Carry-out basic machine maintenance tasks

2. Interpret and understand a machine schedule

4.1.2 Cleaning the Machine

Observe the following points while cleaning the excavator:

(A) Always dilute detergents as per the manufacturer's recommendations, otherwise damage to the paint finish may occur.

(B) When using a steam cleaner, wear safety glasses or a face shield as well as protective clothing. Steam can cause serious personal injury.

(C) Ensure that the engine air intake, alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals, the engine air intake or electrical and electronic components such as the engine electronic control unit (ECU), alternator or fuel injectors.

(D) Never use water or steam to clean inside the cab. The use of water or steam could damage the on-board computer and render the machine inoperable. Remove dirt using a brush or damp cloth.

(E) Safely disposal of debris created from machine cleaning.

(F) When cleaning is complete move the machine away from the wash area, or alternatively, clean away the material washed from the machine.

4.1.3 Maintenance Information

Do not perform any inspection and maintenance operation that is not found in this manual.

Service Meter Reading
Check the service meter reading every day to see if the time has come for any necessary maintenance to be performed.

Genuine Replacement Parts
Use genuine parts specified in the Parts Book as replacement parts.

Genuine Lubricants
Use genuine oils and grease. Choose oils and grease with proper viscosities specified for ambient temperature.

Windshield Washer Fluid
Use automobile window washer fluid, and be careful not to let any dirt get into it.

Fresh and Clean Lubricants
Use clean oil and grease. Also, keep the containers of the oil and grease clean. Keep foreign materials away from oil and grease.

Check Drained Oil and Used Filter
After oil is changed or filters are replaced, check the old oil and filters for metal particles and foreign materials. If large quantity of metal particles or foreign materials are found, always report to the person in charge, and carry out suitable action.

Fuel Strainer
If your machine is equipped with a fuel strainer, do not remove it while fueling.

Do not Drop Things Inside Machine

- When opening inspection windows or the oil filler port of the tank to carry out inspection, be careful not to drop nuts, bolts, or tools inside the machine.

  If such things are dropped inside the machine, it may cause damage and/or malfunction of the machine, and will lead to failure. If you drop anything inside the machine, always remove it immediately.

- Do not put unnecessary things in your pockets. Carry only things which are necessary for inspection.

4.1.3 Cont....

Dusty Jobsite
When working at dusty worksites, do as follows:
Clean the radiator core, oil cooler core, aftercooler core, fuel cooler core, and condenser core frequently to avoid clogging.

Replace the fuel filter more frequently.

Clean electrical components, especially the starting motor and alternator, to avoid accumulation of dust.

When checking and replacing the oil or filters, move the machine to a place where there is no dust and take care to prevent dust from entering the system.

Avoid Mixing Lubricants If a different brand or grade of oil has to be added, drain the old oil and replace all the oil with the new brand or grade of oil. Never mix different brand or grade of oil.

Locking the Inspection Covers Lock inspection cover securely into position with the lock bar. If inspection or maintenance is performed with inspection cover not locked in position, there is a danger that it may be suddenly blow shut by the wind and cause injury to the worker.

Hydraulic System - Air Bleeding When hydraulic equipment has been repaired or replaced, or the hydraulic piping has been removed and installed again, the air must be bled from the circuit. For details, see "BLEEDING AIR FROM HYDRAULIC SYSTEM (4-43)".

Hydraulic Hose Installation When removing parts at locations where there are O-rings or gasket seals, clean the mounting surface, and replace with new parts.

When doing this, be careful not to forget to assemble the O-rings and gaskets.

When installing the hoses, do not twist them or bend them sharply. If they are installed so, their service life will be shortened extremely and they may be damaged.

Checks After Inspection and Maintenance Works If you forget to perform the checks after inspection and maintenance, unexpected problems may occur, and this may lead to serious injury or property damage. Always do the following:
- Checks after operation (with engine stopped)
- Have any inspection and maintenance points been forgotten?
- Have all inspection and maintenance items been performed correctly?
- Have any tools or parts been dropped inside the machine? It is particularly dangerous if parts are dropped inside the machine and get caught in the lever linkage mechanism.
- Are there any leakage of coolant or oil? Have all nuts and bolts been tightened?

Checks when operating engine
- For details of the checks when operating the engine, see "TWO WORKERS FOR MAINTENANCE WHEN ENGINE IS RUNNING (2-38)" and pay careful attention to safety.
- Are the inspection and maintenance items working properly?
- Is there any leakage of fuel or oil when the engine speed is raised?

4.1.4 Greasing the Machine

Observe the following points while greasing the excavator:

- The machine must always be greased after pressure washing or steam cleaning.
- Greasing should be done with a grease gun. Normally, two strokes of the gun should be sufficient.
- Stop greasing when fresh grease appears at the joint.
- Use only the recommended type of grease.
- Do not mix different types of grease, keep them separate.

4.1.5 Example of Lubrication Chart

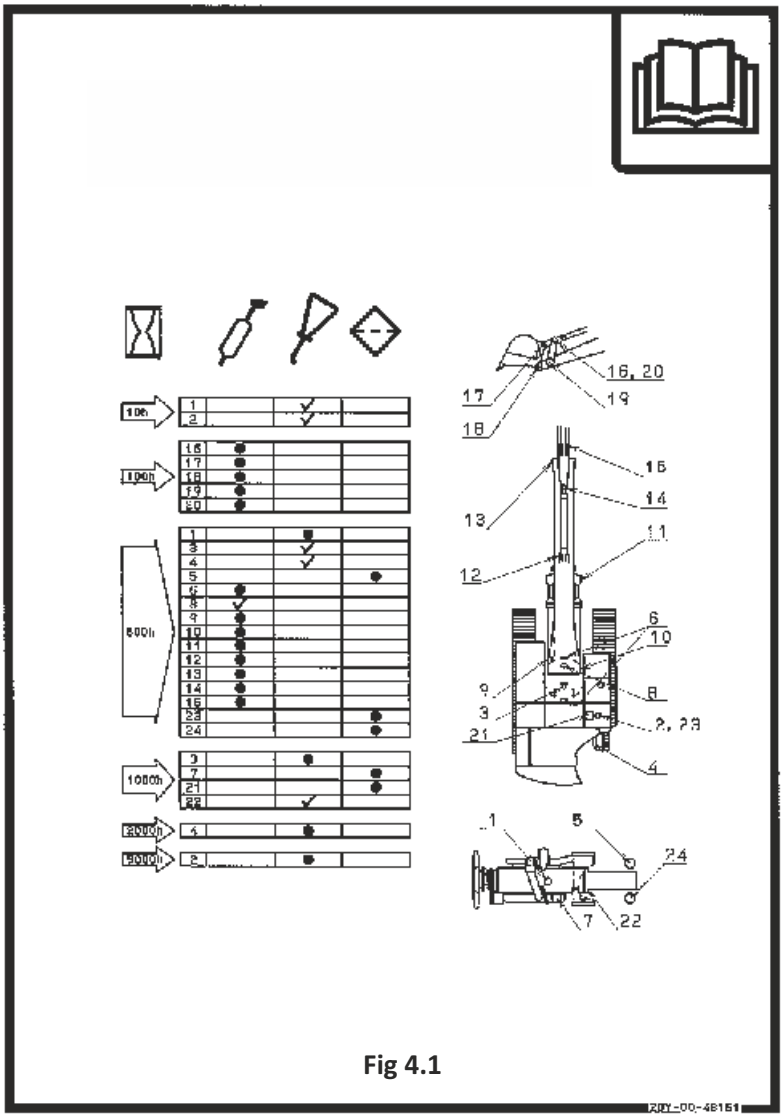

Fig 4.1

Interval of service

Change filter

Lubrication by greasing (G)

Amount of oil required at change (liters)

Check oil level/change (EO)

4.2: Reporting & documentation

Unit Objectives

At the end of this unit, you will be able to:

1. Maintain a checking/maintenance logbook to record all activities

2. Inform excavator operator of problems that are beyond the scope of a junior excavator operator

4.2.1 Maintaining Machine Logs

Machine log maintains the history of the entire machine. It acts as a guide in times of emergency when the excavator goes out of order. The log helps the technician ascertain the condition of the machine, what parts consumables, etc., have been changed.

Date	Hours	Service Procedures

4.1.5 Cont....

Item	Part	Action
1	Engine oil	Check level Change oil
2	Hydraulic oil	Check level Change oil
3	Swing machinery oil	Check level Change oil
4	Final drive oil	Check level Change oil
5	Engine oil filter	Change filter
6	Swing circle	Lubricate
7	Fuel main filter	Change filter
8	Swing pinion	Lubricate
9	Boom cylinder foot pin	Grease
10	Boom foot pin	Grease
11	Boom cylinder rod end pin	Grease
12	Arm cylinder foot pin	Grease
13	Boom arm coupling pin	Grease
14	Arm cylinder rod end	Grease
15	Bucket cylinder foot pin	Grease
16	Bucket cylinder rod end	Grease
17	Bucket-link coupling pin	Grease
18	Arm-bucket coupling pin	Grease
19	Arm link coupling pin	Grease
20	Link coupling pin	Grease
21	Hydraulic filter element	Change filter
22	Damper case	Check level
23	Hydraulic tank filter	Change filter
24	Fuel pre-filter and water seperator	Change filter

4.2.2 Maintenance Procedure

If the machine is equipped with a hydraulic breaker, the maintenance schedule for some parts will be different.

Maintenance schedule chart

Initial 250 hours maintenance (only after the first 250 hours)
Replace fuel pre-filter cartridge

Initial 500 hours maintenance (only after the first 500 hours)
Replace fuel main filter cartridge

When required
- Check, clean and replace air creaner element
- Clean inside of cooling system
- Check and tighten track shoe bolts
- Check and adjust track tension
- Replace bucket teeth (vertical pin type)
- Replace bucket teeth (horizontal pin type)
- Adjust bucket crearance
- Check window washer fluid level, add fluid
- Check and adjust air conditioner
- Washing washable floor
- Bleeding air from hydraulic system

Checks before starting
Every 100 hours maintenance
Lubricating

Every 250 hours maintenance
- Check level of battery electrolyte
- Check air conditioner compressor belt tension, adjust

Every 500 hours maintenance
- Lubricating
- Lubricate swing circle
- Change oil in engine oil pan, replace engine oil filter cartridge
- Replace fuel pre-filter cartridge
- Check swing pinion grease level, add grease
- Clean and inspect radiator fins, oil cooler fins, after cooler fins, fuel cooler fins, and condenser fins
- Clean air conditioner fresh/recirc filters
- Replace breather element in hydraulic tank
- Check oil level in swing machinery case, add oil
- Check oil level in final drive case, add oil

4.2.2 Cont...

Every 1000 hours maintenance

- Replace hydraulic oil filter element
- Change oil in swing machinery case
- Check oil level in damper case, add oil
- Replace fule main filter cartridge
- Check all tightening points of engine exhaust pipe clamps
- Replace corrosion resistor cartridge (if equipped)
- Check fan belt tension and replace fan belt
- Check nitrogen gas charge pressure in accumulator (for breaker)

Every 2000 hours maintenance

- Change oil in final drive case
- Clean hydraulic tank strainer
- Checking charge pressure of nitrogen gas in accumulator (for control circuit)
- Check alternator, starting motor
- Check engine valve clearance, adjust

Every 4000 hours maintenance

- Check water pump
- Check vibration damper
- Replace accumulator (for control circuit)
- Check for looseness of high-pressure piping clamp, hardening of rubber
- Check for missing fuel spray prevention cap, hardening of rubber
- Check operating condition of compressor
- Every 5000 hours maintenance
- Change oil in hydraulic tank

Every 8000 hours maintenance

- Replace high-pressure piping clamp
- Replace fuel spray prevention cap

4.2.3 Informing Supervisor if Problem is Unresolved

It is important to inform the excavator operator if you are unable to resolve a problem that has occurred with the excavator. The excavator operator is adequately trained and well informed to tackle the situation. In case he is unable to do so he will co-ordinate with the dealer for a solution or whatever he deems fit in such a situation.

Inform the excavator operator in the following cases:

- The machine is not functioning properly and the junior operator unable to ascertain the problem
- Even after diagnosing the junior operator is unable to rectify the faults
- The required spares and or consumables are not available
- The junior operator is not trained to do a specific task

Briefly anwer the following questions.

How do you rectify engine over-heating?

What are the possibles causes of engine/coolant leak?

What is the importance of maintaining machine logs?

Why should the operator inform the supervisor if he / she is unable to resolve issues with a excavator?

Tips

Following are recommended tips:

- Visit a construction site and have a detailed look at the excavator in the presence of the operator
- Always follow recommended safety guidelines and warning signs by the manufacturer

Notes

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MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
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Skill Development
Corporation
Transforming the skill landscape

IESC
Infrastructure Equipment Skill Council

5. Worksite Health & Safety

Unit 5.1 – ESH policies and guidelines
Unit 5.2 – Types and uses of PPE
Unit 5.3 – Common hazards and preventive measures
Unit 5.4 – Segregation and disposal of waste
Unit 5.5 – Basic fire-fighting equipment and use
Unit 5.6 – Common injuries and appropriate first aid

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand the safety guidelines and precautions a junior excavator operator has to follow

2. Identify and understand the use of Personal Protective Equipment (PPE)

3. Understand measures that can help avoid site mishaps

4. Operate safely with waste at work

5. Administer first aid for common injuries on worksite

5.1: ESH Policies and Guidelines

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the safety precautions that a junior excavator operator needs to follow while at work

2. Understand the various Dos and Don'ts while working with the machine

5.1.1 Safety Precautions to be Taken

It is of vital importance for every employer and employee involved in machine operaations and maintenance to safeguard themselves, learn safety procedures and encourage safe practices within their workplace. This prevents many accidents taking place due to carelessness and ignorance.

The **Junior Excavator Operator** too has a duty to:

1. Be responsible and as safe and careful as possible in his work, so as not to put his own health and safety or others at risk, including members of the public

2. Co-operate with and assist the excavator operator or any other person, as far as necessary, to enable them carry out their legal duties in health and safety

3. Not interfere with or misuse any safety device or equipment

4. Not intentionally or recklessly interfere with anything provided in the interest of health, safety and welfare

5. Follow excavator operator's procedures and the manufacturer's instructions which apply to the care and safe operation of the machine they are responsible for

6. Inform the excavator operator, without unreasonable delay, of any work situation that they are aware of which presents a risk to the health and safety to them or others

7. Immediately report any defects in plant and equipment which might endanger safety.

5.1.2 Do's and Don'ts During Operation

Do

- Comply fully with instructions given by the excavator operator
- Follow the manufacturer's instructions (operator manuals) for the specific excavator you are assisting on
- Take safety precautions when assisting on the machine prior to, during and after work

Don't

- Assist on machine unless you have received appropriate training and are authorised to do so
- Ignore hazards
- Misuse, tamper or interfere with your machine and any associated safety equipment provided
- Endanger your own health and safety, or that of anyone else, by being negligent

5.2: Types and Uses of PPE

Unit Objectives

At the end of this unit, you will be able to:

1. Identify different types of PPE's
2. Understand the proper use of PPE's

5.2.1 Personal Protective Equipment

PPE is equipment worn to minimise exposure to a variety of hazards. Examples of PPE include such items as gloves, foot and eye protection, protective hearing devices (earplugs, muffs) hard hats, respirators and full body suits.

Safety Helmets (Don'ts)

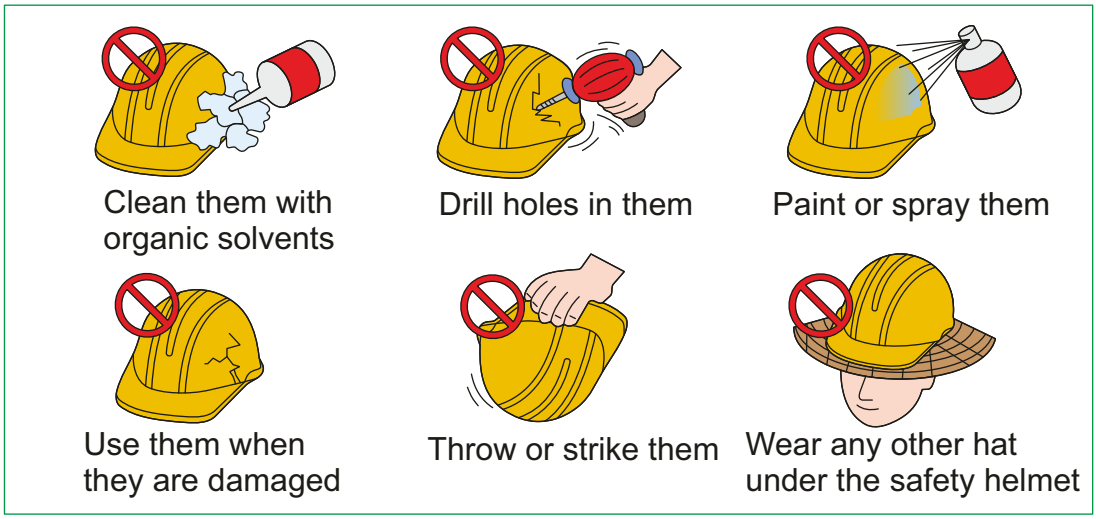


Fig 5.1

Eye Protectors

Fig 5.2

5.2.1 Personal Protective Equipment

Ear Protectors

Protective Gloves

Safety Footwear

Protective Clothing

Fig 5.3

5.3: Common Hazards & Preventive Measures

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the common hazard at work site
2. Understand the necessary Do's and Don'ts that may help avoid accidents

5.3.1 Accident Prevention and Control Do's and Don'ts

Common accidents with excavator are overturns, falls, runovers and contact with other people and other objects. By following some basic Do's and Don'ts many of such accidents can be prevented:

Do

- Wear all protective clothing and personal safety equipment issued to you or required by your working conditions
- Understand and follow safety procedures when working on site and using plant and work equipment
- Ensure you are fully aware of the job requirements and how they need to be carried out
- Know where to get help. Know the first aid and emergency procedures
- Study the manufacturer's operator's manual for using your plant and equipment. If the manual is not provided, ask your supervisor or the suppliers of the plant / equipment to supply one
- Report faulty / unsafe plant or equipment and any dangerous incidents
- Use the plant equipment safely so as not to affect its stability
- Ensure you watch out for others who are affected by your actions
- Ensure all personal injuries, no matter how slight, are reported and entered in the accident book (or equivalent)
- Take advantage of any training programme offered by your employer or contractor. You are never too old to learn new practices or techniques

Don't

- Use plant or work equipment that you have not been trained to use
- Throw or drop objects from plant or work equipment
- Attempt to carry out work on moving parts of plant or work equipment with the safety guards removed
- Indulge in horseplay on plant or work equipment
- Attempt to operate any type of plant or work equipment under the influence of drugs, alcohol or any other substance, which affects your health or judgment
- Ignore warning instructions or safety signs.

5.4: Segregation and Disposal of Waste

Unit Objectives

At the end of this unit, you will be able to:

1. Identify different types of waste and there segregation
2. Understand the procedure for correct disposal of waste

5.4.1 Waste Management

Waste if not dealt properly is a big environmental issue. A junior excavator operator needs to remember some basic waste management rules:

- Use ONLY authorised waste disposal sites
- Never store lubricants in open or unlabelled containers.
- Never pour used engine oil into sewers, drains or on the ground.
- Look out for the proper bin (black in case of general rubbish) in case of non-industrial waste at your worksite. Most bins clearly mention the waste that can go in it.

Fig 5.4

5.5: Basic Fire-Fighting Equipment and Use

Unit Objectives

At the end of this unit, you will be able to:

1. Identify different types of fire-fighting equipment
2. Understand the procedures of correct operations of these equipment

5.5.1 Fire Extinguisher

To operate an extinguisher:

Pull
Aim
Squeeze
Sweep

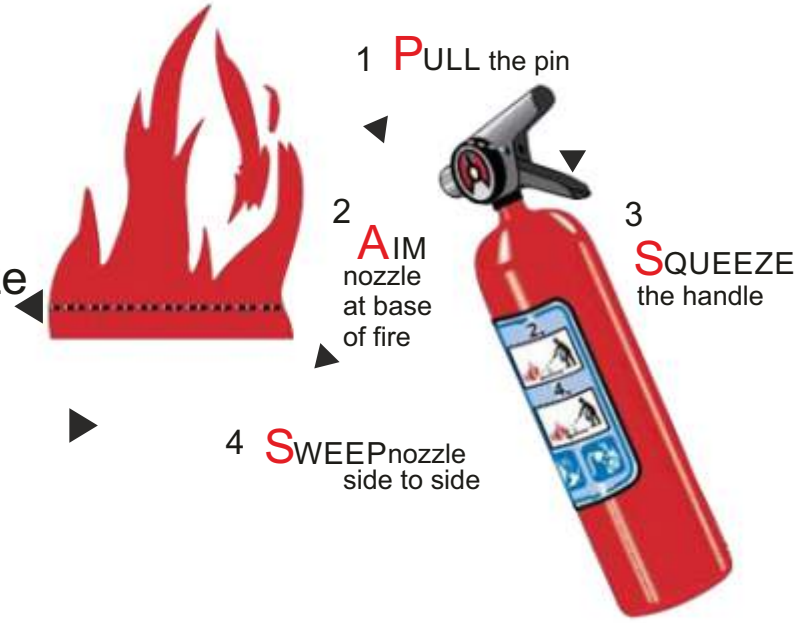


Fig 5.5

5.5.2 Sand Bucket

Fig 5.6

5.6: Common Injuries and Appropriate First Aid

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the various items of the first aid kit
2. Administer first aid for common injuries

5.6.1 Basic First Aid Kit

A junior excavator operator must have basic knowledge of emergency medicines that can be used as primary medical service for cuts, wounds, fever, etc.

Scissors

Glove

Tweezers

Anticeptic wipes

Roller Bandage

Thermometer

Alcohol

Antibiotic ointments packets(approx 1g)

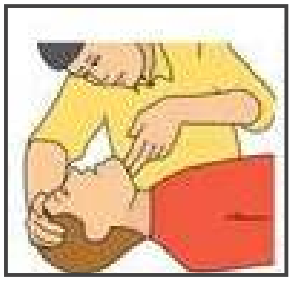
Fig 5.7

5.6.2 Administer Aid

Mouth-to-Mouth Resuscitation:

Mouth-to-mouth resuscitation, a form of artificial ventilation, is the act of assisting or stimulating respiration, where a rescuer presses his or her mouth against that of the victim and blows air into the person's lungs.

Steps

 *Fig 2.3.4 (a) Step 1*	**Step-1**: Make sure the person is lying on a hard, flat surface. Look into the mouth and throat to ensure that the airway is clear. If an object is present, try to sweep it out with the fingers (wear disposable surgical gloves if they are available). If vomiting occurs, turn the person on his or her side and sweep out the mouth with two fingers. Do not place the finger in the mouth if the person is rigid or is having a seizure.
 *Fig 2.3.4 (b) Step 2*	**Step-2**: Tilt the head back slightly to open the airway. Put upward pressure on the jaw to pull it forward.
 *Fig 2.3.4 (c) Step 3*	**Step-3**: Pinch the nostrils closed with thumb and index finger. Place the mouth tightly over the person's mouth. Use a mouthpiece if one is available. Blow two quick breaths and watch for the person's chest to rise.
 *Fig 2.3.4 (d) Step 4*	**Step-4**: Release the nostrils. Look for the person's chest to fall as he or she exhales. Listen for the sounds of breathing. Feel for the person's breath . If the person does not start breathing on his or her own, repeat the procedure.

5.6.2 Administer Aid

Choking:

Choking occurs when a foreign object becomes lodged in the throat or windpipe, blocking the flow of air. Choking cuts off oxygen to the brain, administer first aid as quickly as possible.

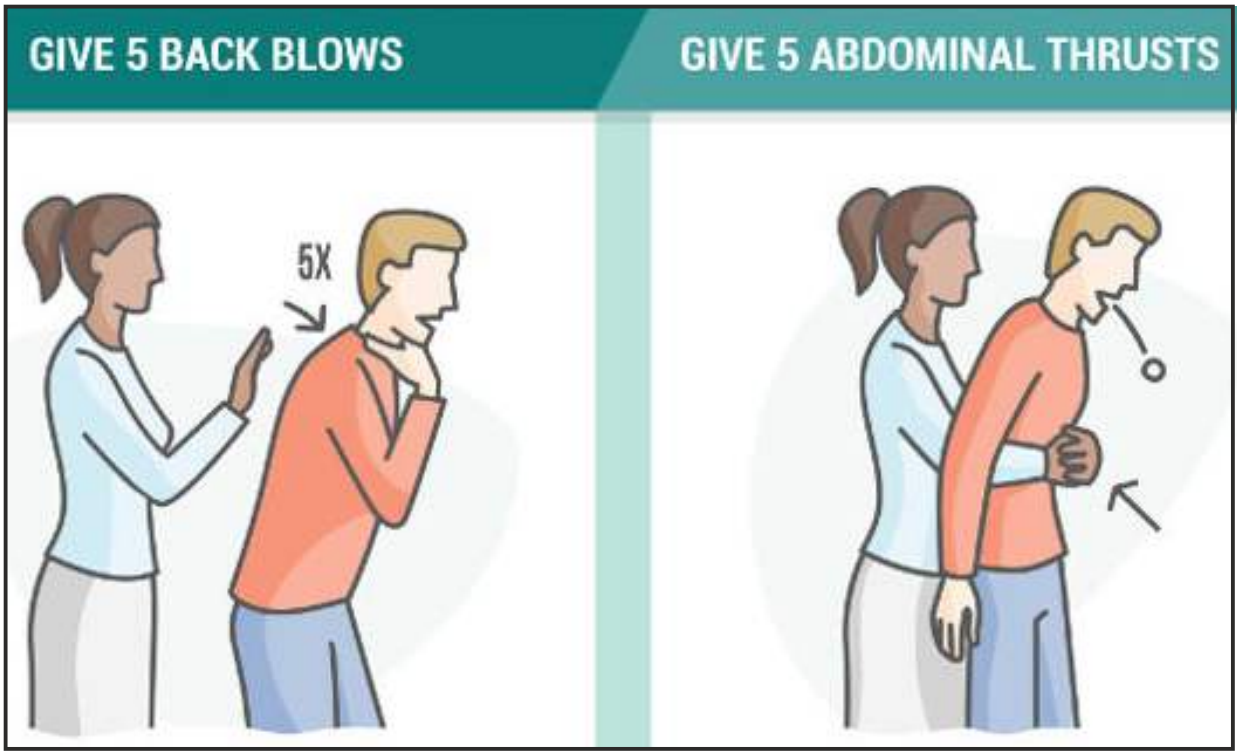


Fig 2.3.4 (e) First Aid for Chocking

- 5 back blows: First, deliver five back blows between the person's shoulder blades with the heel of your hand.
- 5 abdominal thrusts: Perform five abdominal thrusts.
- Give alternate 5 blows and 5 thrusts until the blockage is dislodged.

5.6.2 Administer Aid

Chemical Burns in an Eye:

To assist the person who has experienced chemical burns in eyes, follow these steps:

- Immediately rinse the eye or eyes under a water tap or in a gentle shower or with a clean container of water. Position the person's face so that the injured eye is down and to the side. Avoid spraying a high-pressure water stream into the eye or eyes.
- Flush with lukewarm water for 15 to 30 minutes. The person should keep the eye open as wide as possible. Wash the person's hands thoroughly to make sure no chemical is still on them.
- Do not rub the eye or place a bandage over the eye.
- While waiting for medical care, have the person wear sunglasses to decrease light sensitivity.

Foreign Particle in an Eye:

To assist the person who has experienced a foreign particle in an eye, follow these steps:

- Tell the person not to rub his/her eye – this could cause scratches on the eye surface.
- Ask the person to sit down and gently, separate his/her eyelids with thumbs or thumb and finger.
- Ask the person to look right, left, up and down and examine the eye for foreign objects.
- If something is present in the white of the eye, wash it out by pouring clean water or a sterile eye wash from the inner corner of the eye towards the outer corner.
- If this is unsuccessful, try lifting the object off with a moist swab or the damp corner of a clean handkerchief. If still the particle is not removed, seek medical help.

Fig 2.3.4 (f) Washing Eyes in Running Water

5.6.2 Administer Aid

Severe Bleeding:

For severe bleeding, take these actions immediately:

- If there is an object embedded in the wound, control bleeding by pressing firmly on either side of the object, do not remove or press the object, otherwise apply direct pressure on the wound.

Fig 2.3.4 (g) Controlling the Bleeding

- Apply a dressing firmly to control bleeding. Ensure that it is not so tight that it restricts circulation.
- Prevent/treat shock by lying the casualty down with his/her feet raised (if possible).
- If the casualty has a head injury, lay himself/herself down and slightly raise his/her head and shoulders.

Fig 2.3.4 (h) Controlling the Bleeding

- If blood comes through the dressing apply another bandage on top.
- If blood seeps through this too, remove both dressings and re-apply a new sterile dressing using direct pressure to the wound.
- Support the injured area in a raised position.
- Seek medical attention if the bleeding does not stop or if the casualty goes into shock.

5.6.2 Administer Aid

Fracture:

In case of a fracture, provide first aid before taking the injured to professional care

Aptly follow the few first-aid treatment till the professional medical treatment is given:

- If the injured person is bleeding, elevate and apply pressure to the wound using a sterile bandage, a clean cloth or a clean piece of clothing.
- If the injured person is bleeding, have fracture in his/her neck or back, help him/her stay as still as possible. If the injured person have fracture in one of his/her limbs, immobilise the area using a strap or suspend.
- Wrap an ice pack or bag of ice cubes in a piece of cloth and apply it to the injured area for up to 10 minutes at a time.
- Treat the injured for shock. Help the injured to get into a comfortable position, encourage him/her to rest and reassure. Cover him/her with a blanket or clothing to keep himself/herself warm.
- Help the injured get to the emergency department for medical care.

R-Rest

After the injury, stop the injured person from taking part in any painful activity. Moving the injured part can increase bleeding and swelling and slow down the healing process.

I-Ice

Use an ice pack to reduce the pain and swelling in the affected area. Apply ice for 15minutes every two hours for 24 hours, then for 15 minutes every four hours for 24 hours.

C-Compression

Bandage the area firmly (but not too tightly), starting just below the injured area and moving up. Overlap each layer by half. Finish bandaging about one hand's width above the injured area.

Fig 2.3.4 (i) Rest Ice Compression Method

5.6.2 Administer Aid

Electric Shock:

To assist the person who has experienced an electric shock, follow these steps:

- Look first. Don't touch. The person may still be in contact with the electrical source. Touching the person may pass the current through rescuer.
- Turn off the source of electricity if possible. If not, move the source away from the affected person, using a non-conducting object made of cardboard, plastic or wood.
- Check for signs of circulation (breathing, coughing or movement). If absent, begin resuscitation (CPR) immediately.
- Lay the person down and, if possible, position the head slightly lower than the trunk, with the legs elevated.
- Figure 2.3.4 (j) shows a man moving the power source away from the affected person using a wooden stick.

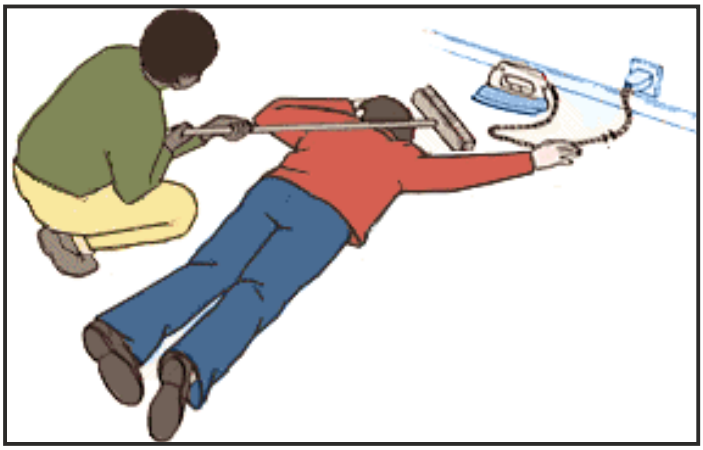


Fig 2.3.4 (j) Electric Shock

Shock due to Injury:

To assist the person who has experienced a shock, follow these steps:

- Lay the person down with their head low and legs raised and supported, to increase the flow of blood to their head. Do not raise an injured leg.
- Loosen any tight clothing around the neck, chest and waist to make sure it doesn't constrict their blood flow.
- Fear and pain can make shock worse, by increasing the body's demand for oxygen, so while waiting for help to arrive, it's important to keep them comfortable, warm and calm. Do this by covering them with a coat or blanket and comforting and reassuring them.
- Keep checking their breathing, pulse and level of response.
- If they become unresponsive at any point, open their airway, check their breathing and prepare to treat someone who has become unresponsive.

5.6.3 Do's and Dont's

Sl.No	Do's	Don'ts
1	Report suspicious activity.	Do not leave your system unlocked if not in use.
2	Communicate and co-ordinate with respective officials in case of any potential threat.	Never misuse the office resources (Pax manifest, duty mobile, system credential etc) it may lead to potential threat.
3	Stay alert.	Do not share your login credentials.
4	Closely monitor passenger (pax) activity during check-in and boarding to report any suspicious activity.	Do not only depend on human calculations, use calculator to reduce human error.
5	Ensure your safety at all point of time.	Effectively use the time to avoid flight delays.

Briefly anwer the following questions.

How can the junior excavator operator help create a safer work place?

List some common PPE?

What precautions a junior excavator operator has to follow when dealing with waste?

What makes up a basic first aid kit?

Tips

Following are recommended tips:

Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin

Notes

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