

# Participant Handbook

Sector  
**Infrastructure Equipment**

Sub-Sector  
**Equipment Operations**

Occupation  
**Operator**

Reference ID: **IES/Q0111, Version 2.0**  
**NSQF Level 3**



**Junior Operator  
Crane**

Edition, September 2022

Attribution-ShareAlike : CC BY-SA



Infrastructure Equipment Skill Council

Contact Details:

Address: No. 45, Jubilee Building, (2nd Floor) Museum Road, Bengaluru - 560 025. Karnataka.

Email: [standards@iescindia.com](mailto:standards@iescindia.com)

Phone: +91 (80) 26754480

### Disclaimer

The information contained herein has been obtained from sources reliable to Infrastructure Equipment Skill Council. Infrastructure Equipment Skill Council disclaims all warranties to the accuracy, completeness or adequacy of such information. Infrastructure Equipment Skill Council shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. The publishers would be thankful for any omissions in the book being brought to their notice; which will be acknowledged as applicable in future editions of the same. No entity in Infrastructure Equipment Skill Council shall be responsible for any loss whatsoever, sustained by any person who relies on this material.





**Shri Narendra Modi**  
Prime Minister of India

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

## Acknowledgements

This Facilitator Guide has been developed with the efforts of all the stakeholders in the industry; equipment manufacturers, customers/end users as well as training organisations who are proactively involved in this pioneering project to transform the skill landscape in the infrastructure equipment sector.

We wish to acknowledge with gratitude the following organisations who whole heartedly supported us with their technical inputs as well as valuable feedback at different stages in our endeavour to bring out this Guide. We are confident this will go a long way in enabling our Trainers to deliver time bound quality skill training to our Operators and mechanics.





## About this book

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

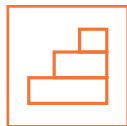
To address the future sector demand, this Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit(s).

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



Time



Tips



Notes



Unit  
Objectives



Exercise

## Table of Contents

S.No.	Modules and Units	Page No.
<b>1.</b>	<b>Introduction</b>	<b>1</b>
	Unit 1.1 – About the Programme	3
	Unit 1.2 – About the Product	5
<b>2.</b>	<b>Assist in Performing Pre-operation Checks on Crane (IES/N0131)</b>	<b>9</b>
	Unit 2.1 - Names of Parts & Controls, Panels	10
	Unit 2.2 - Outside the Machine & Attachment	11
	Unit 2.3 - Inside the Engine & Cabin	17
<b>3.</b>	<b>Assist in Operating a Crane (IES/N0132)</b>	<b>21</b>
	Unit 3.1 – Inspection of Worksite & Safety	23
	Unit 3.2 – Standard Operations	26
<b>4.</b>	<b>Assist in Regular Maintenance of a Crane (IES/N0133)</b>	<b>33</b>
	Unit 4.1 – Basic Maintenance & Schedules	35
	Unit 4.2 – Reporting and Documentation	40
<b>5.</b>	<b>Comply with Worksite Health and Safety Guidelines (IES/N7601)</b>	<b>47</b>
	Unit 5.1 – ESH Policies and Guidelines	49
	Unit 5.2 – Types and Use of PPE	51
	Unit 5.3 – Common Hazards and Preventive Measures	53
	Unit 5.4 – Segregation and Disposal of Waste	55
	Unit 5.5 – Basic Fire-Fighting Equipment and Use	56
	Unit 5.6 – Common Injuries and Appropriate First Aid	58

### Employability & Entrepreneurship Skills







# 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. Familiarize with one another
2. Outline the program expectations
3. Familiarize the role of Junior Crane Operator
4. Identify different parts of the crane along with their uses
5. List the primary controls of the crane and their uses

## UNIT 1.1: About the Programme

### Unit Objectives

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

1. Find the design of training curriculum and understand it
2. Familiarize with each other
3. List all the expectations from this training

### 1.1.1 Overview of the Book

**The training curriculum will help you:**

- 1. Assist in carrying out pre-operation checks for crane.** General introduction to mobile crane, types and uses, basic working of engine, hydraulic and electrical systems, operational controls and alarms, instrument panel, preparing machine for operations
- 2. Assist in crane operations.** Assembling crane, hooking and lifting load; moving safely and stably, parking and shutting down the machine; postoperative checks
- 3. Assist in regular maintenance of crane.** General maintenance procedures and periodic service schedule; 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

## Activity

### Knowing Each Other

1. List out two names of fellow participants whom you have met and interacted with.

---

---

---

2. List out two names of those from the same place/district/state.

---

---

---

3. List out two names among the participants whose hobbies are the same as yours.

---

---

---

### Expectation Mapping

1. My expectations from the training programme are:

---

---

---

---

---

---

---

---

---

---

---

## UNIT 1.2: About the Product

### Unit Objectives

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

1. History of cranes.
2. Understand usage and basic features of cranes.
3. Identify the various parts of cranes and their use
4. Understand the safety features of cranes

### 1.2.1 Brief History of Cranes

A crane is a type of machine, generally equipped with a hoist rope, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. It is mainly used for lifting heavy things and transporting them to other places. It uses one or more simple machines to create mechanical advantage and thus move loads beyond the normal capability of a human. Cranes are commonly employed in the transport industry for the loading and unloading of freight, in the construction industry for the movement of materials and in the manufacturing industry for the assembling of heavy equipment.

Cranes exist in an enormous variety of forms – each tailored to a specific use. Sizes range from the smallest jib cranes, used inside workshops, to the tallest tower cranes, used for constructing high buildings. Mini-cranes are also used for constructing high buildings, in order to facilitate constructions by reaching tight spaces. Finally, we can find larger floating cranes, generally used to build oil rigs and salvage sunken ships.



## 1.2.2 General Crane Specifications

Specification	Value
<b>Engine</b>	
Rated engine power	49 BHP @ 2,200 RPM
Maximum continuous engine rating	59 BHP @ 2,300 RPM
No. of cylinders	4
Piston displacement	3.33 L
Compression ratio	18.5:1
Firing order	1- 3- 4- 2
Fuel injection pump	MICO/Bosch inline
Injection pressure	230 kg/cm <sup>2</sup>
Coolant	Water
Water capacity	6 L (only engine)
Air cleaner	Dry taper paper filter with cyclonic pre cleaner
<b>Air Compressor</b>	
Type	Single cylinder, reciprocating, positive dog drive from engine
Capacity	0-170 m <sup>3</sup> /min @ 1,200 RPM
<b>Electrical system</b>	
Battery	12 V, single battery, negative earth
Capacity	75 amp hour
Alternator	PMP
Output	14 V, 55 A
<b>Clutch</b>	
Type	Single plate, heavy-duty friction
Capacity plate diameter	280 mm
<b>Transmission</b>	
Type	Sliding-mesh spur gearbox. Six forward and two reverse speed with high and low selector lever
Speed	25 kmph on even metalled road (without load)

## 1.2.2 General Crane Specifications

Specification	Value
<b>Operation Timings (at no load and rated engine RPM)</b>	
Steering (lock to lock)	8 sec
Boom lifting	20 sec
Boom lowering	16 sec
Extension out	10 sec
Extension in	8 sec
Hoisting	24 m/min (single line)
<b>Tyres</b>	
Front (4 no.)	11x20 -16 PR
Rear (2 no.)	13x24-12 PR
<b>Tyre pressure</b>	
Front	110 psi
Rear	35 psi
<b>Steering</b>	
Type	Articulated power steering hydraulically controlled through two double acting jacks.
Turning radius	5.2 m
Articulation	560
<b>Winch mechanism</b>	
Hydraulic winch	4 Falls
Rope diameter	13 mm
Winch motor for hoisting	5 m
<b>Brakes:</b>	
Front and rear tyres	Pneumatically assisted hydraulic brake on front and rear. Rear brake actuated through hydraulic slave cylinder.

## 1.2.2 General Crane Specifications

Specification	Value
<b>Hydraulic system</b>	
Pump	Vane pump directly driven from engine crank pulley.
Lift cylinder	2 double acting jacks
Steering cylinder	2 double acting jacks
Extn. Cylinder	1 double acting jacks
Hydraulic filters	Micronic type in return line hydraulic tank
Control valve	4 spool with relief valve set at 180 to 190 bar (hydra12 and 14 at 200 to 210 bar)
	90 bar (hydra 12 and 14 at 158 bar)
<b>Capacity</b>	
Fuel tank	45 L
Hydraulic oil tank	90 L
Engine oil sump	8 L
Transmission housing	23 L
Reduction housing	4.90 L (both sides)

# Notes



---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



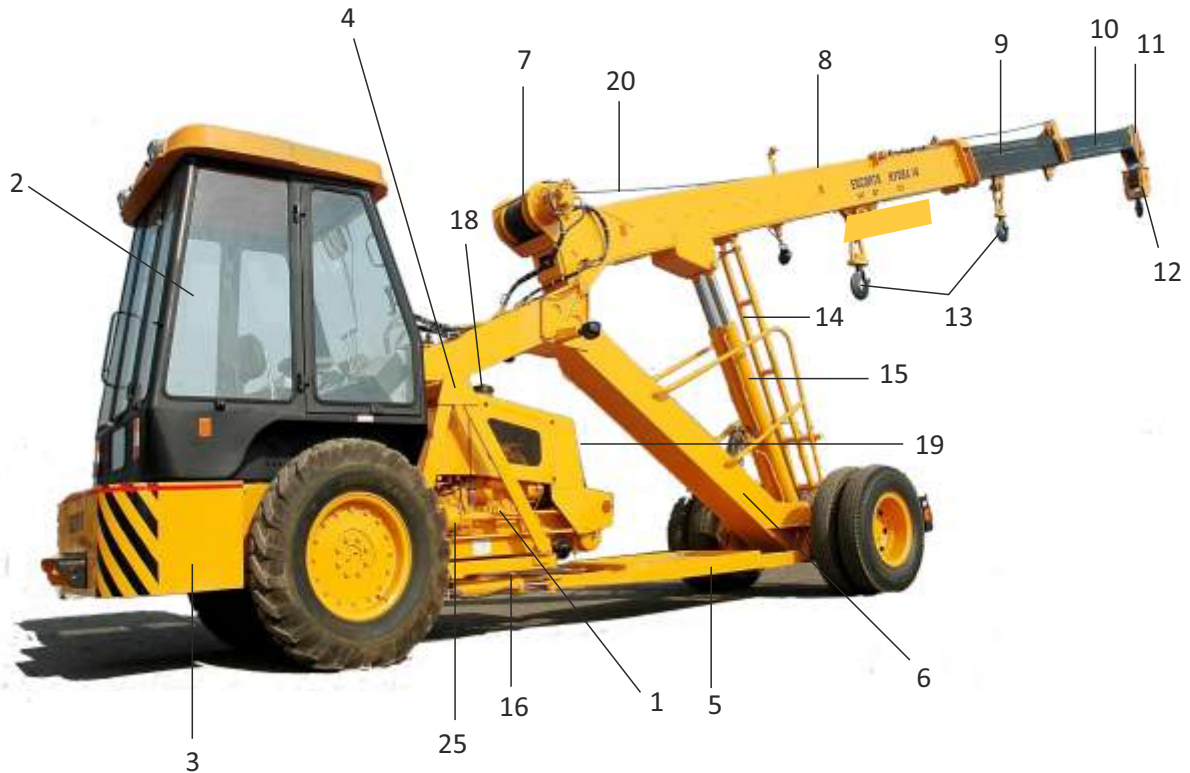


## 2. Assist in Pre-Operations Checks on Cranes

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



## 2.1: Names of Parts & Controls, Panels



**Fig 2.1 Name of Parts and Control Panel**

- |                               |                                   |
|-------------------------------|-----------------------------------|
| 1. Engine                     | 19. Bonnet                        |
| 2. Cabin                      | 20. Wire rope                     |
| 3. Counter weight             | 21. Battery                       |
| 4. Yoke and cradle            | 22. Transmission                  |
| 5. A frame                    | 23. Differential                  |
| 6. Main frame with front axle | 24. Radiator                      |
| 7. Winch assembly             | 25. Air cylinder and break system |
| 8. Mother boom                | 26. Hydraulic pump                |
| 9. First extension            | 27. Distributor                   |
| 10. Second extension          | 28. Chassis                       |
| 11. Jib head                  |                                   |
| 12. Snatch block              |                                   |
| 13. Hook                      |                                   |
| 14. Jack guard                |                                   |
| 15. Lift jack                 |                                   |
| 16. Steering jack             |                                   |
| 17. Extension jack            |                                   |
| 18. Air pre cleaner           |                                   |

## 2.2 - Outside the machine & attachment

### 2.2.1 Load Chart Lifting Capacity

1. The rated capacities are for lifting the load in straight unslewed position and level ground condition.
2. It should not be taken as capacities for pick and carry operations.
3. As the max. load acts upon the tyres, it is essential to maintain proper inflation pressure in all tyres
4. Hook load and sling load should also be added to the maximum lifting capacity
5. Gradeability of the crane is 40% unladen

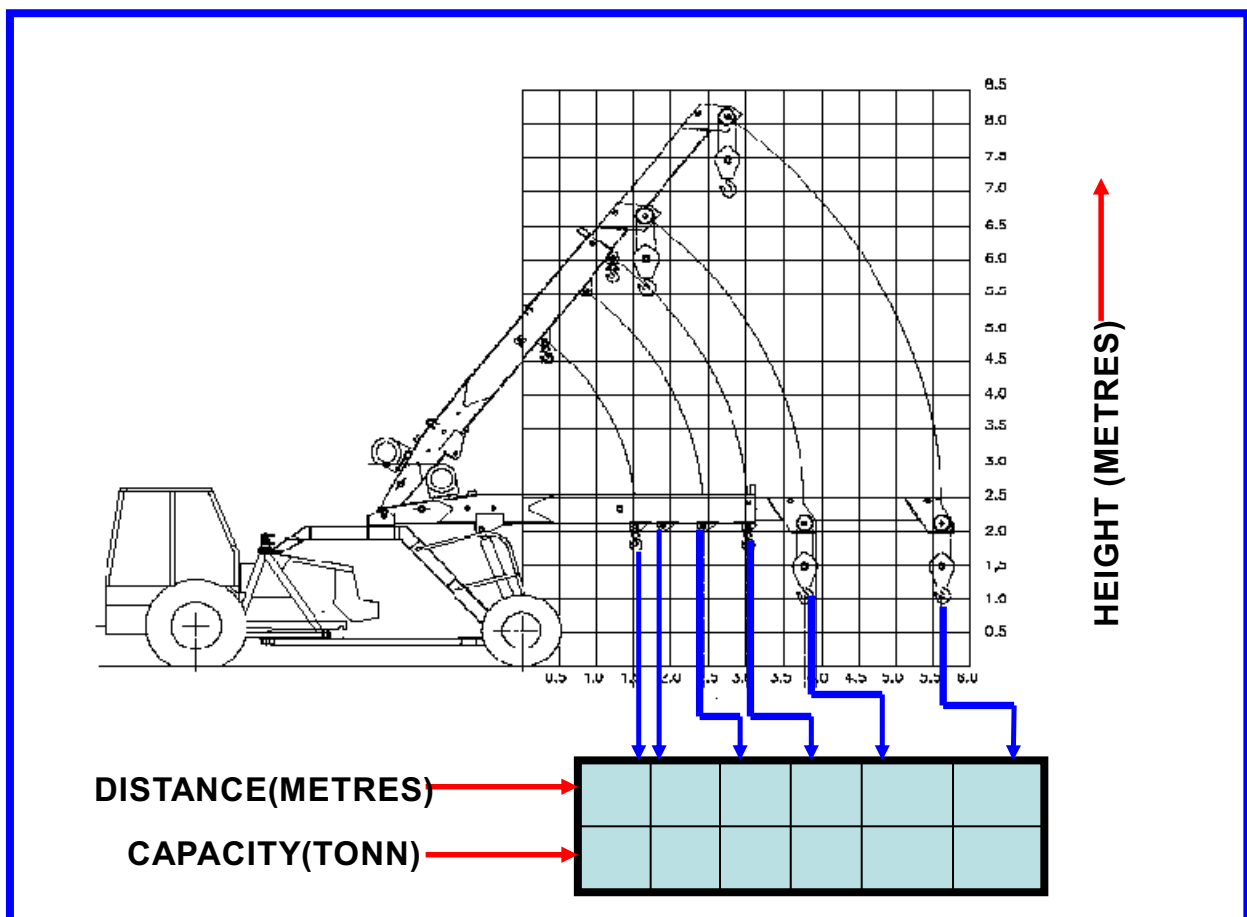


Fig 2.2 Load Chart Lifting Capacity



## 2.2.2 Checks Before Starting

- Water level in the radiator
- Oil level in engine sump .
- Oil level in transmission
- Hydraulic oil level
- Oil level in brake master cylinder
- Oil level in reduction housing
- Fuel in fuel tank
- Water in the battery
- Tyres for proper inflation pressure. It should be 110-115 P.S.I in the front tyres and 35 P.S.I. in the rear tyres
- All grease points for proper lubrication
- All nuts and bolts for proper tightness.
- All hydraulic and electrical connections
- Check wire rope and clamps
- General cleanliness of the machine.

## 2.2.3 Engine Oil Level

1. Do check the engine oil level daily before operating the crane
2. It should be between max. and min. oil level
3. Take out the dipstick and clean it with a clean piece of cloth
4. Insert the dipstick again and check the oil level.

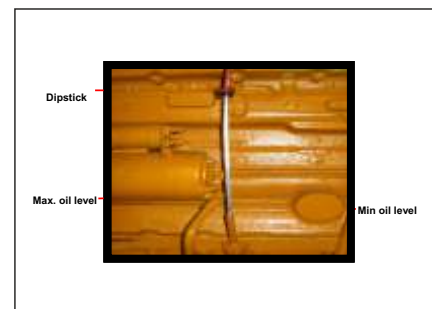


Fig 2.3 Engine oil Level

## 2.2.4 Transmission Oil Level

1. Do check the transmission oil level daily before operating the crane
2. It should be between max. and min. oil level
3. Take out the dipstick and clean it with a clean piece of cloth
4. Insert the dipstick again and check the oil level.

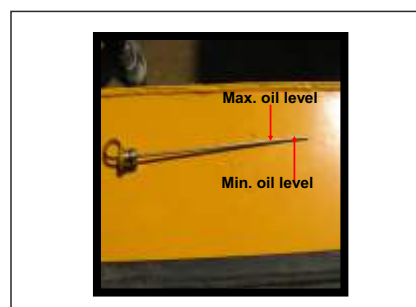
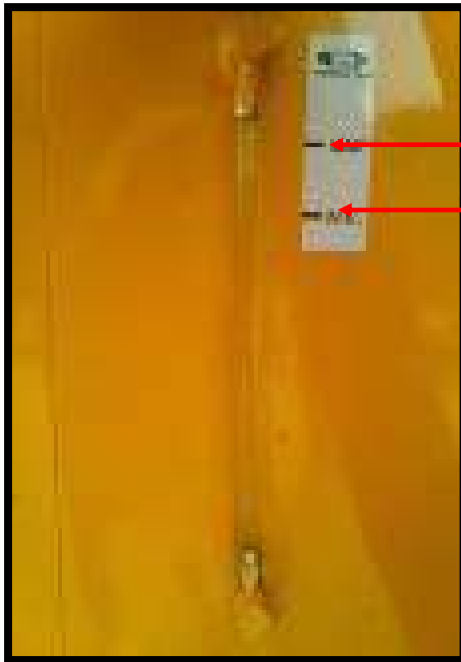


Fig 2.4 Transmission Oil Level

## 2.2.5 Hydraulic Oil Level



Max. oil level

Min oil level

1. Do check the hydraulic oil level daily before operating the crane.
2. It should be between max. and min. oil level.

Fig 2.5 Hydraulic Oil Level

## 2.2.6 Water Blasting

- 1) The process of filling water in the tyre is called water blasting .
- 2) The process is carried out in rear two tyres of the crane.
- 3) It increases the stability of the crane.

### PROCEDURE

- 1) Open the nozzle and leak out the air from the tyre.
- 2) Set the nozzle at 2'o clock position (see picture)
- 3) Now fill water in the tyre at this position.

As the water enters the tyre the air inside the tyre gets pressurized and tends to come out.

4. So remove the valve and leak out the pessurized air
5. Repeat the steps three to four times until the tyre gets filled with water at 2'o clock position
6. Now set the valve at 12'o clock position and fill in 35 P.S.I air (see picture ).

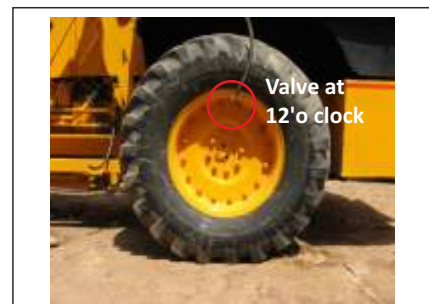


Fig 2.6 Water Blasting

## 2.2.7 Air Pressure

Front Tyres : 110-115 PSI

Rear Tyres : 35 PSI



FRONT TYRE		REAR TYRE	
PSI	KG/CM <sup>2</sup>	PSI	KG/CM <sup>2</sup>
110-115	7.5-7.8	35	2.3

Fig 2.7 Air Pressure

## 2.2.8 Number of Falls

4 Falls

13mm wire rope

1 fall = 9.8 tonnes

4 falls = 9.8 x 4 tonnes = 39.2 tonnes

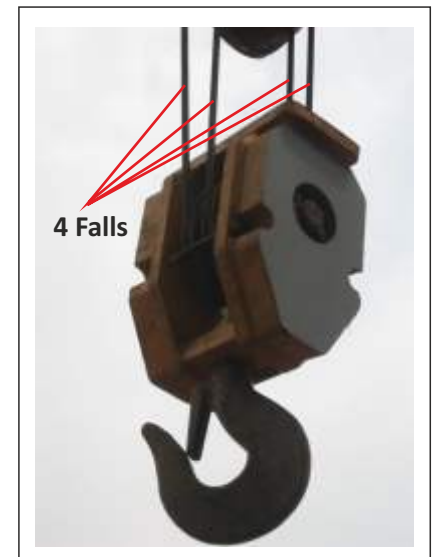


Fig 2.8 Number Of Falls

## 2.2.9 Safety Device

1. In case of overloading the plate touches the over load limit switch and the switch gets activated through which the buzzer gets on. thus preventing accident.

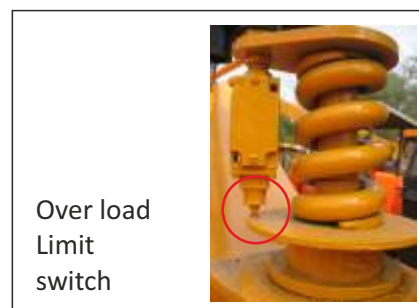
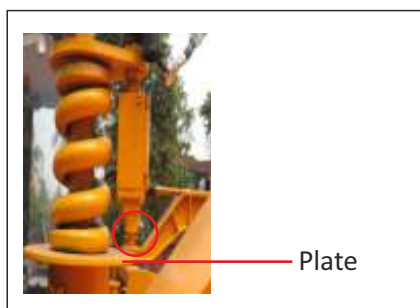


Fig 2.9 Safety Device

## 2.2.9 Safety Device

1. It prevents the snatch block from hitting to the jib head.
2. When snatch block touches the angle plate while lifting it the over hoist limit switch gets activated and the buzzer gets on. thus preventing the damage of jib head, snatch block and pulleys.



Fig 2.9 Safety Device

### Counter balance valve

- 1) It controls the speed of the boom during its lowering and prevents it from coming down rapidly.
- 2) In case of hose failure it helps in holding the load at its position. Thus prevents it from falling down.

V1 V2 From distributor

C1 From lift jack annulus side

C2 From lift jack Full bore side



Fig 2.10 Counter Balance Valve

## 2.2.9 Safety Device

### UNLOADER VALVE / INFLATOR VALVE

1. It maintains the system air pressure at 6-7 kg/cm<sup>2</sup> which helps in applying brakes effectively .If the air pressure increases beyond the specified limit, the valve opens and the excessive air leaks into the environment.
2. Inflater valve can be used for inflating the tyres etc.

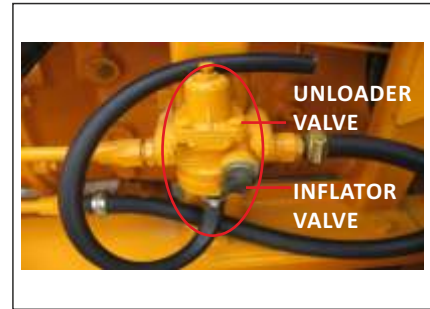


Fig 2.11 Unloader Valve /Inflator Valve

## 2.3 - Inside the engine & cabin

### 2.3.1 Inside Cabin

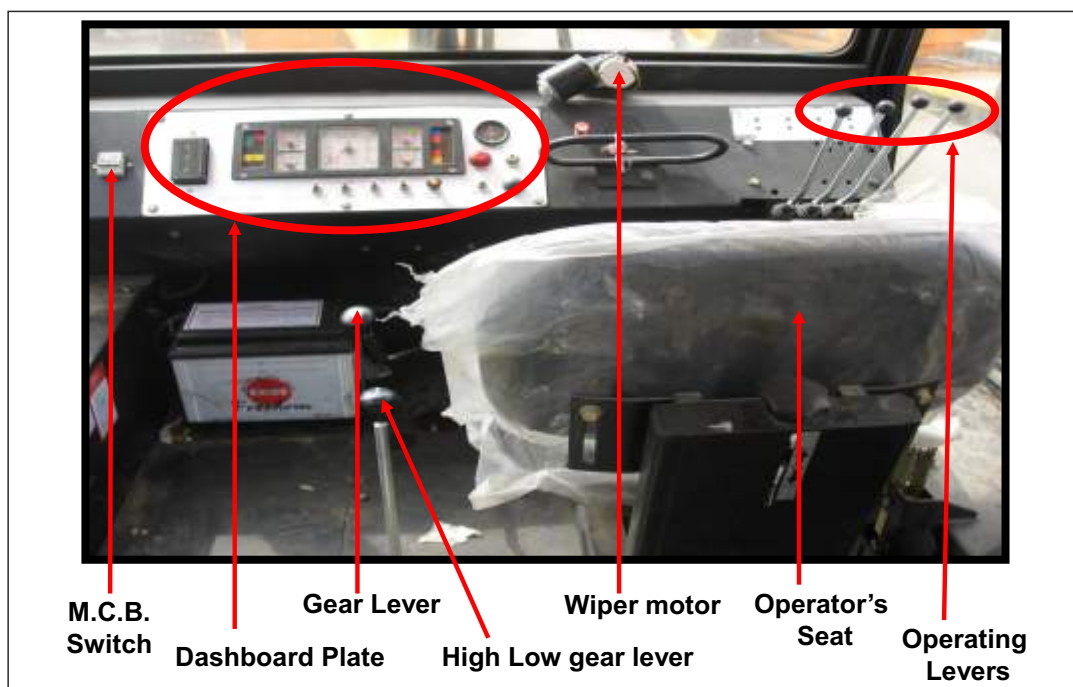
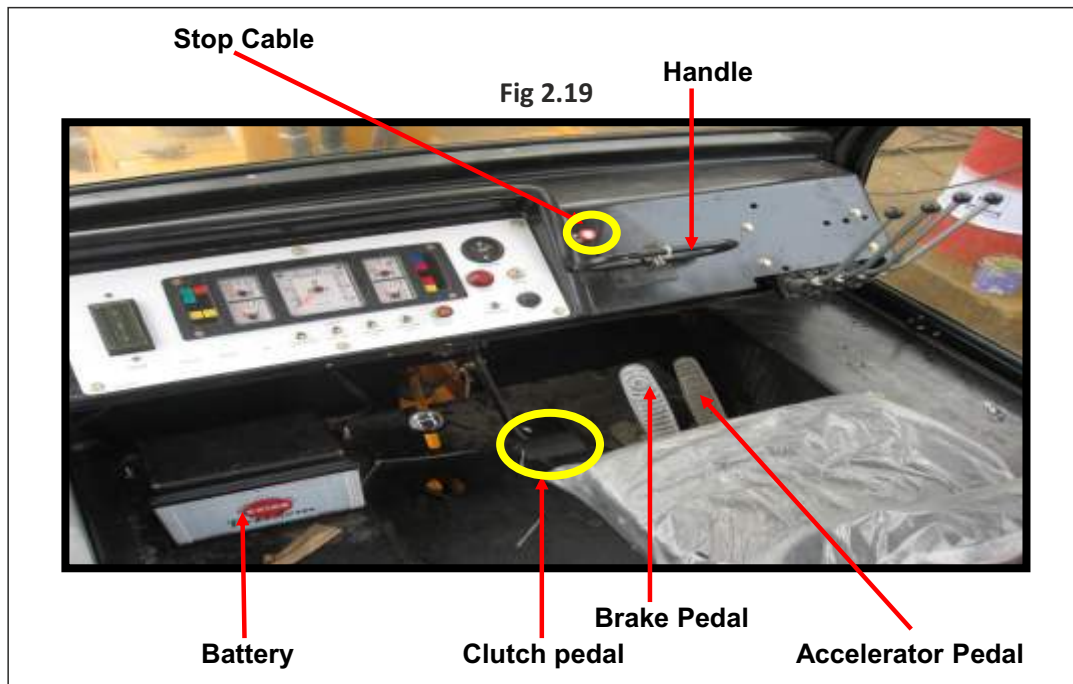
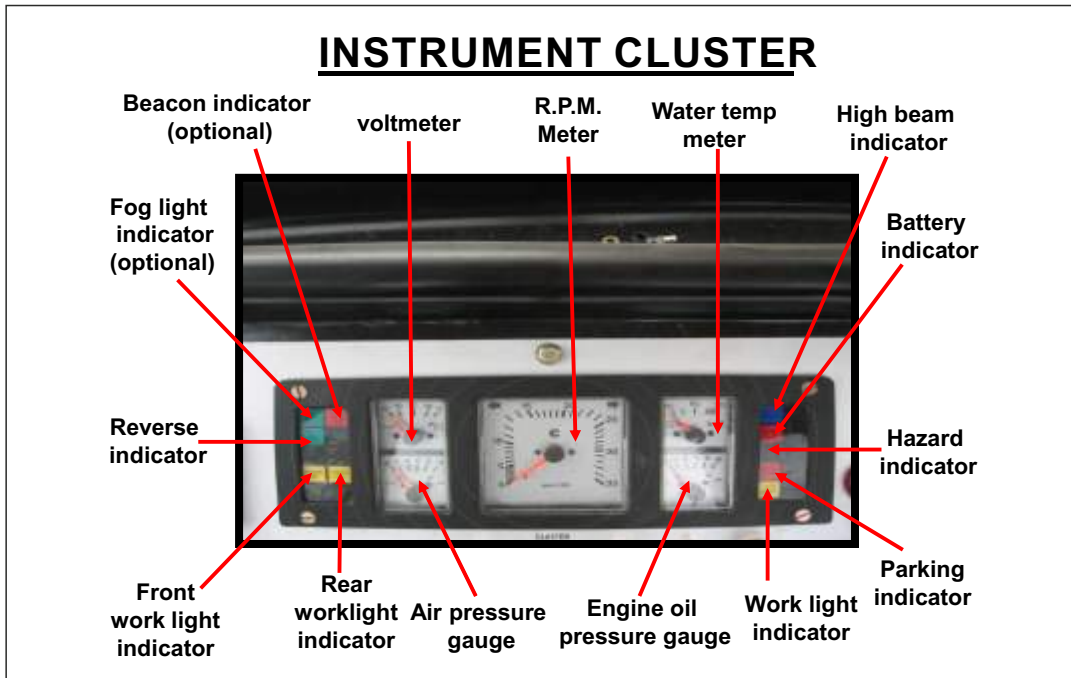
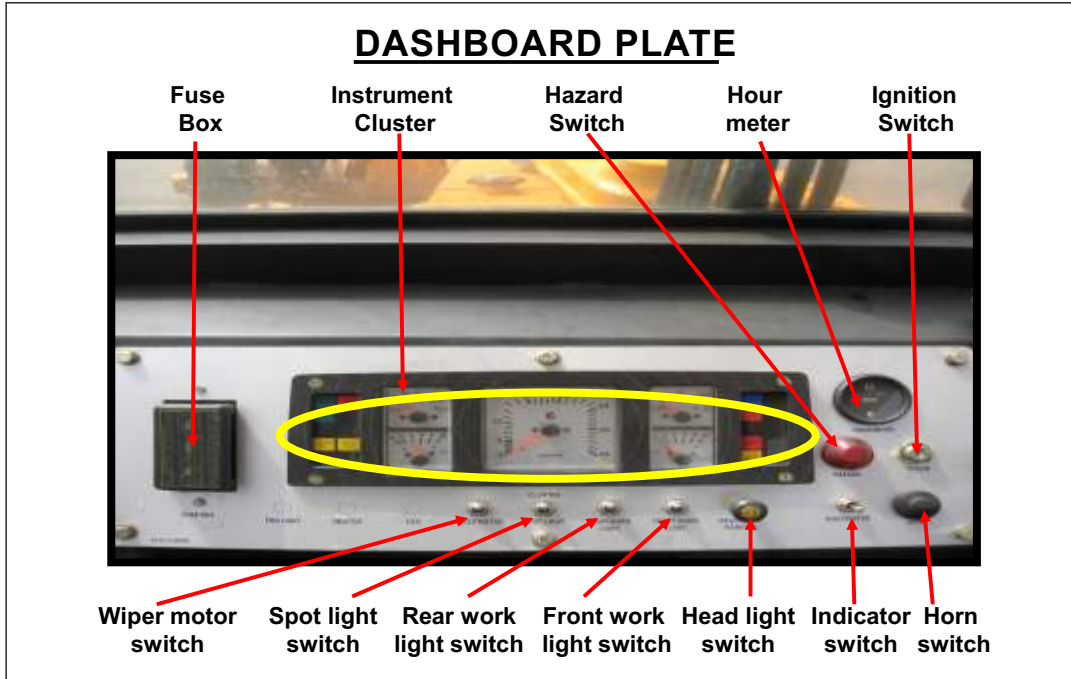


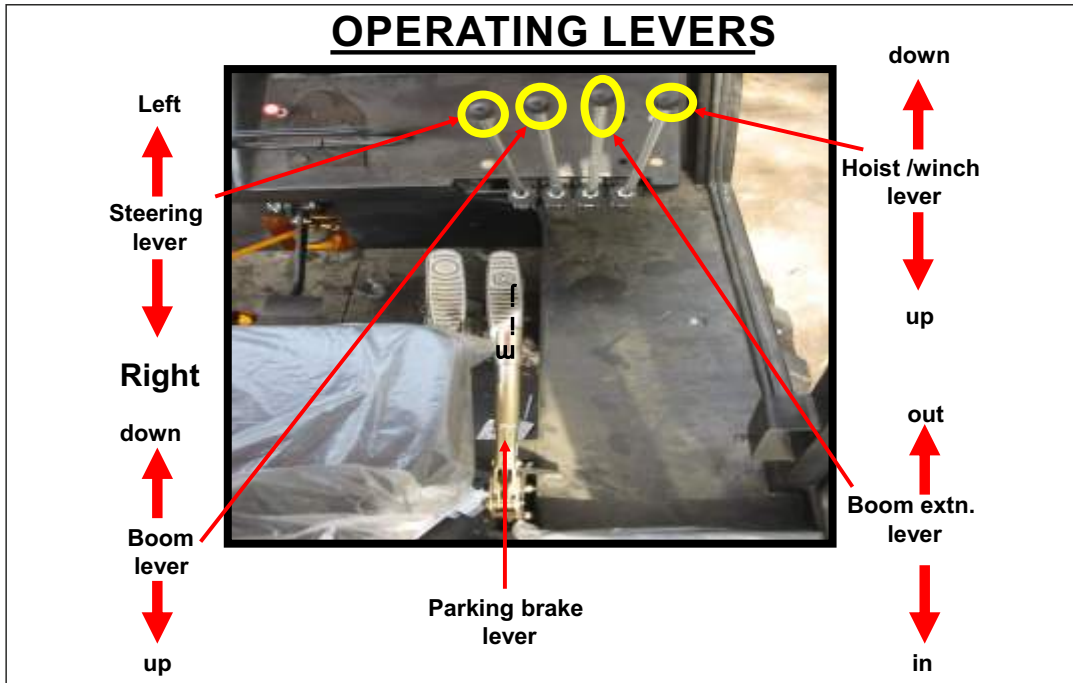
Fig 2.12 Inside Cabin

### 2.3.1 Inside Cabin





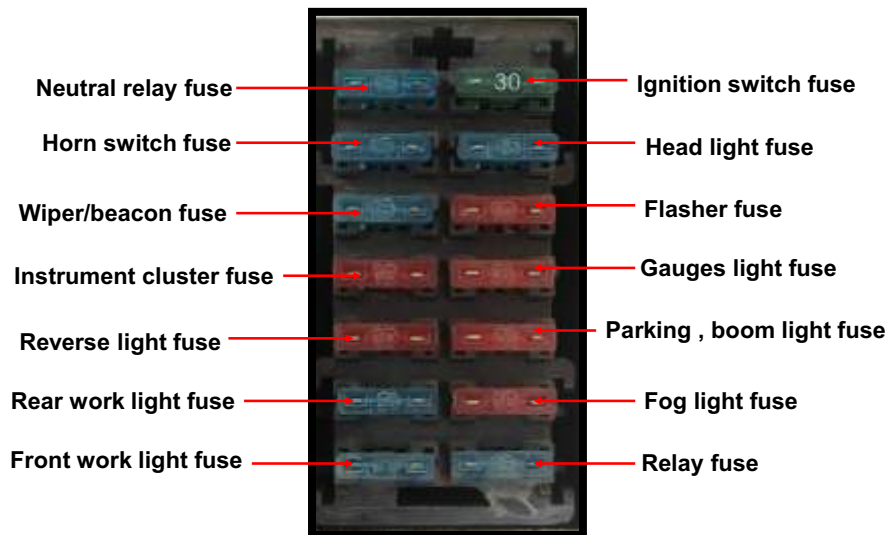
### 2.3.1 Inside Cabin





## 2.3.1 Inside Cabin

### FUSE BOX



### FUSE RATINGS

#### Plastic Body

Colour	Rating
Gray	2
Violet	3
Pink	4
Orange	5
Brown	7.5
Red	10
Blue	15
Yellow	20
Clear	25
Green	30

#### Bosch Type

Colour	Rating
Yellow	5
White	8
Red	16
Blue	25

## Exercise



Briefly answer the following questions:

1. Name any five parts of the Crane.

---

---

---

2. List five pre-start checks of a Crane.

---

---

---

3. Define water ballasting?

---

---

---



## 3. Assist in Operating a Crane



Unit 3.1 - Inspection of worksite and safety  
Unit 3.2 - Standard operations



## 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 cranes
2. Understand symbols and signs for guidance
3. Inspect the worksite for safety
4. Perform various Crane operations
5. Work carefully so as not to put the health and safety of self or others at risk
6. Maintain a checking/maintenance logbook to record all activities
7. Inform the crane operator of problems that are beyond scope of the Junior operator
8. Understand importance of reporting
9. Identify and understand crane pre-use checklist
10. Identify and understand crane worksite inspection checklist

## 3.1: Inspection of Worksite & Safety

### Unit Objectives

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

1. Inspect the worksite for safe operations
2. Understand the communication symbols used to guide the crane operator
3. Understand the symbols used for site safety

### 3.1.1 Inspection of the Worksite

**Following are the main points to be noted for work site inspection:**

1. If you see any signs of toxic waste, hazardous materials such as asbestos, poisonous chemicals or other harmful substances buried on the site, advise the operator immediately.
2. Help the Crane 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.

### 3.1.1 Inspection of the Worksite

#### Safety precautions at worksite

#### **DO NOT ALLOW THE MACHINE TO BE OPERATED BY UNTRAINED OPERATOR / HELPER.**

- Do not change the original settings of the crane
- Use only the approved grades of oils
- Speed of the crane should not exceed 15-20kmph(unladen)and 2-3 kmph with load
- Do not over load the machine
- Do not drive with foot on clutch pedal
- Do not forget to apply parking brakes while parking the crane
- Do not forget to release parking brake before moving the crane
- Use low gear while carrying loads
- Keep boom as low as possible during transportation
- Always do the timely service of the crane as recommended by the company.
- Do not leave the machine with engine on.
- The load should be lifted from the levelled ground
- Do not touch any hydraulic connections when machine is on.
- keep the battery terminals clean and covered
- Do not use ordinary water in the battery.
- Keep the stock of recommended spare parts e.g. hydraulic oil filter, lube oil filter ,primary and secondary fuel filter, fan belt ,top and bottom radiator hose ,fuel pipe from fuel filter to tank ,stop cable ,radiator cap ,diesel tank cap
- Clean the air filter elements (primary ) after checking the vacuum indicator .Do not clean them daily.
- Do not clean the safety element (secondary air filter).
- Never operate the crane bare footed

### 3.1.2 Signals to Guide a Crane Operator

The signaller 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.

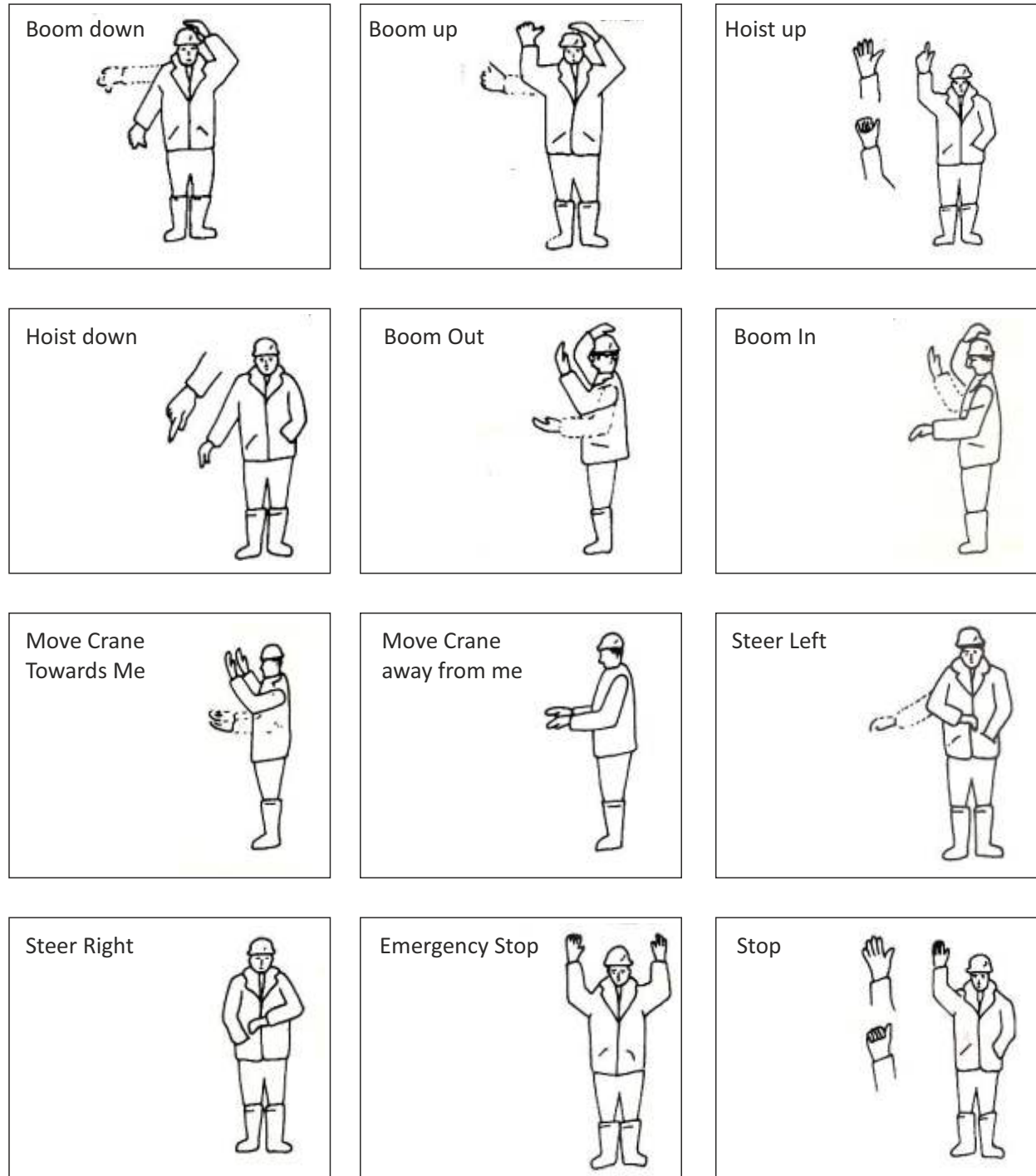


Fig 3.1 Signals to Guide the Crane Operator



## 3.2: Standard Operations

### 3.2.1 Centre Of Gravity (CG)

- Hook should be placed right over the C.G. of the load
- While marching ensure that CG should always fall between the Front Tyres

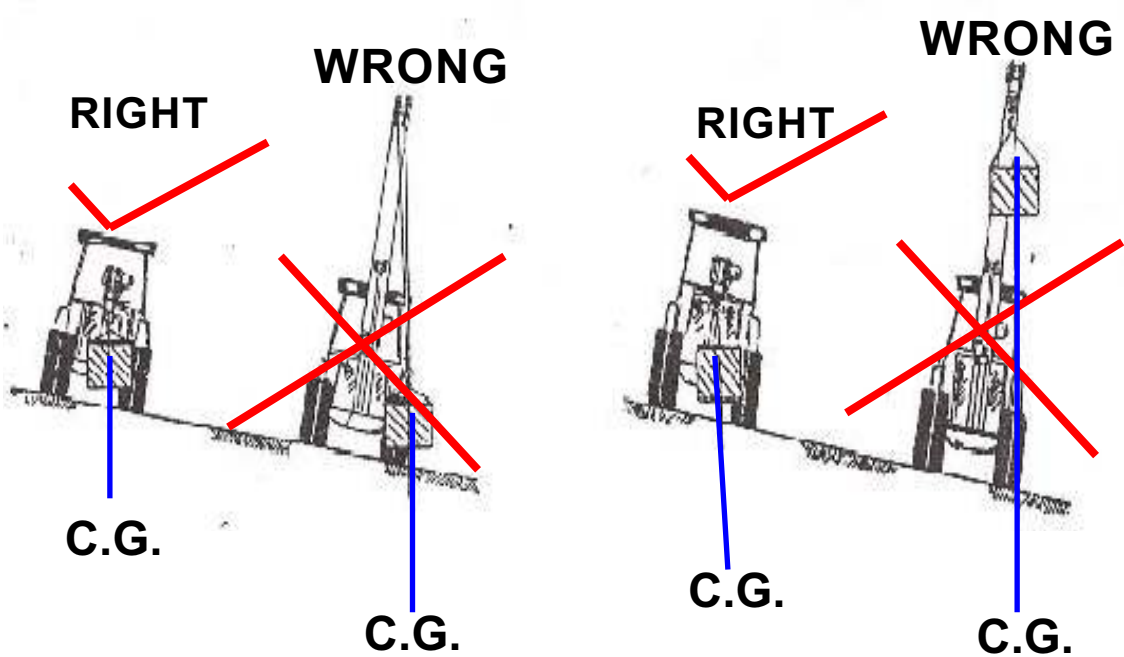


Fig 3.2 Centre of Gravity

### 3.2.2 Sling Safety Procedure

- Never insert the point of the hook in an eye bolt. Always use D-shackle
- Do not use screw pin shackle. The pin can Roll under load and unscrew

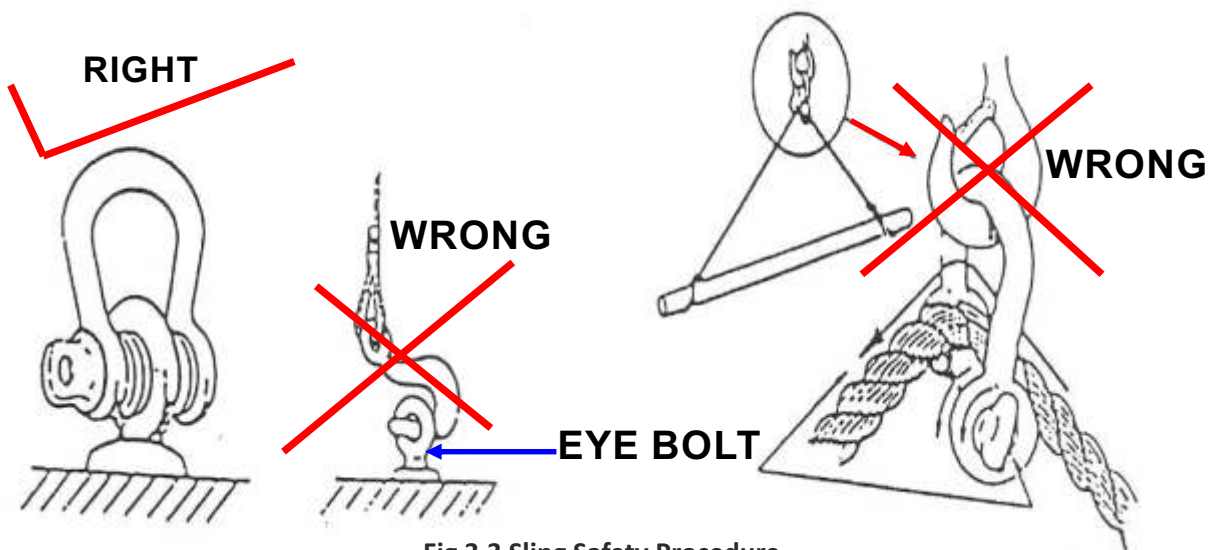
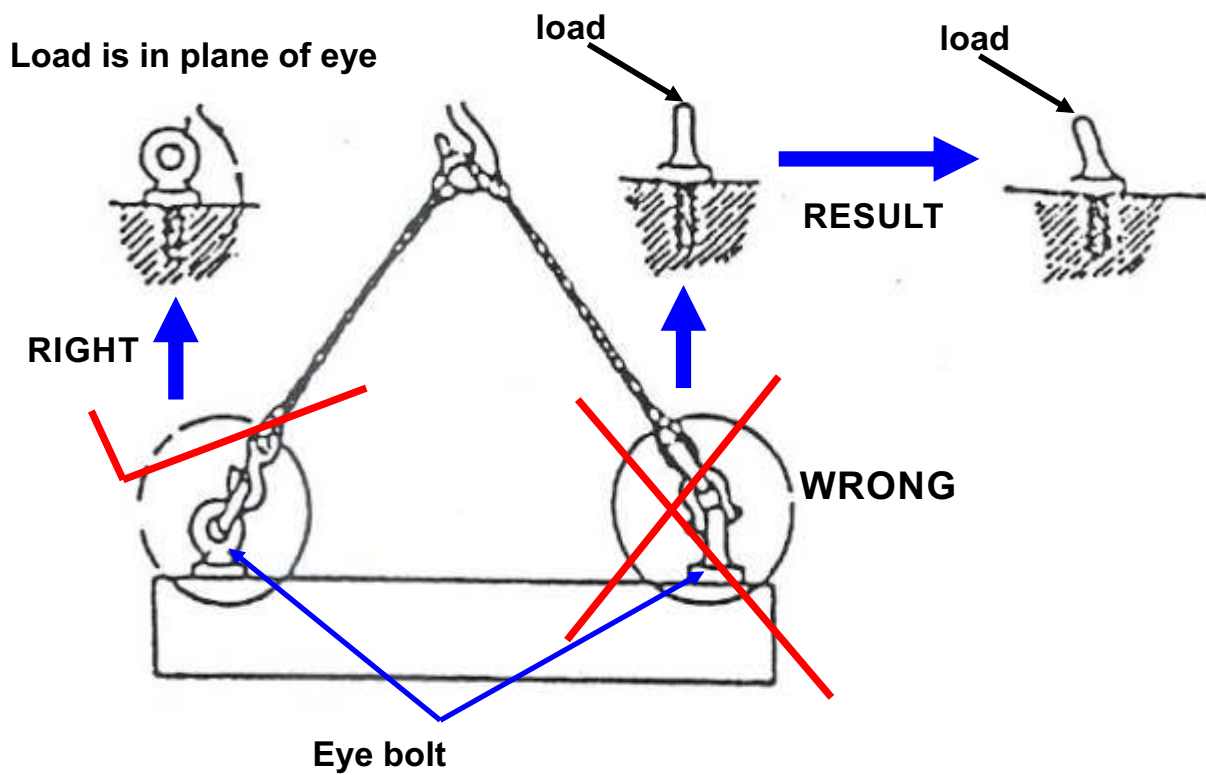
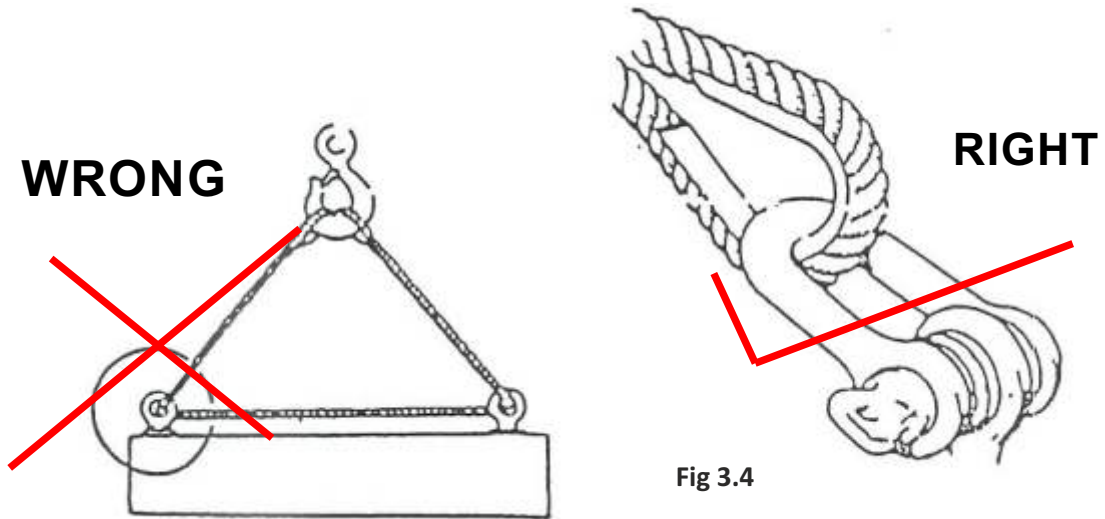


Fig 3.3 Sling Safety Procedure

### 3.2.3 Orientation of Eye Bolts

Never run a sling through a pair of eye bolts. Use a pair of shackles instead.



**Exercise** 

Briefly answer the following questions.

1. What all do you inspect in a worksite?

---

---

---

---

---

---

---

2. List steps to remove the Hook from a Crane.

---

---

---

---

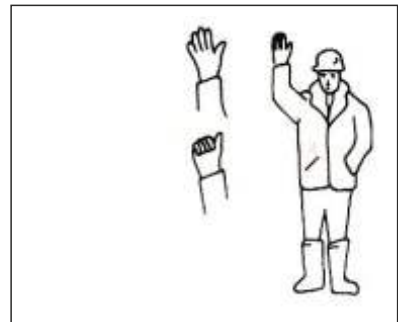
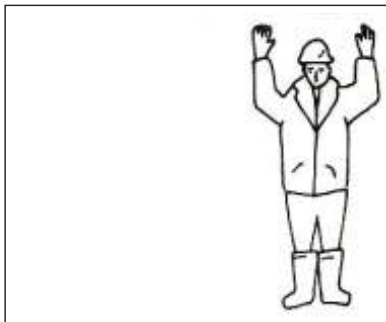
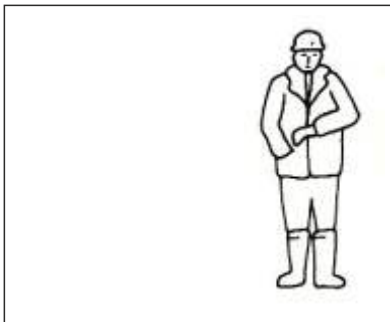
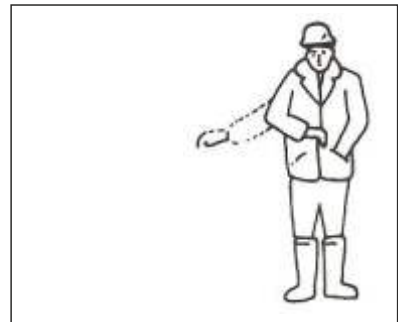
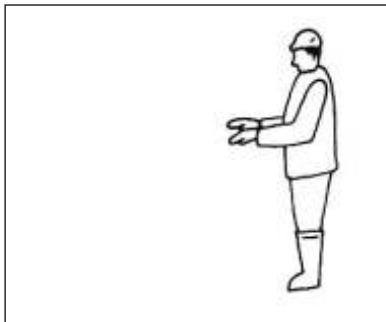
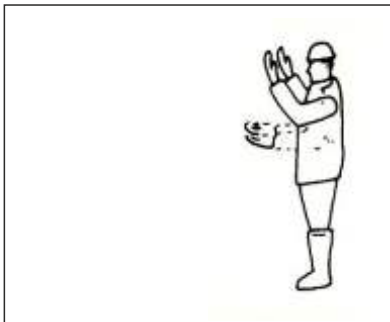
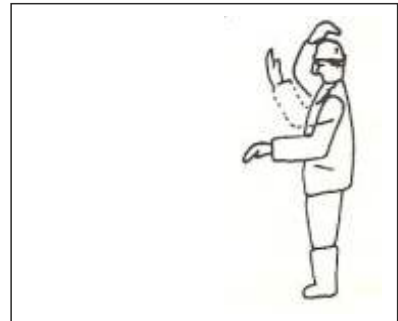
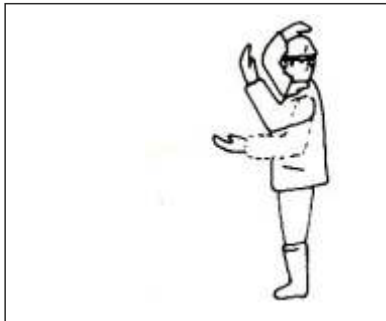
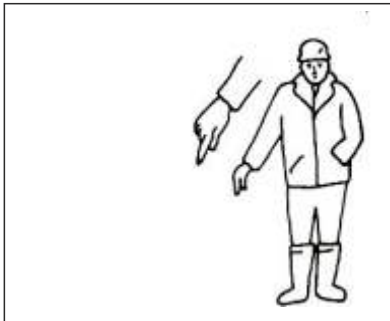
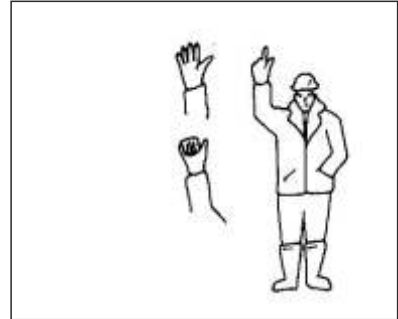
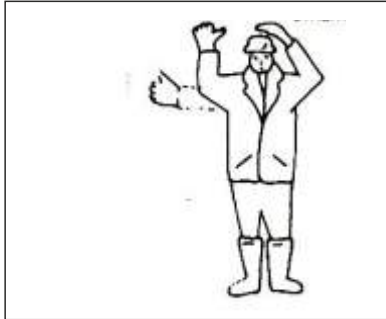
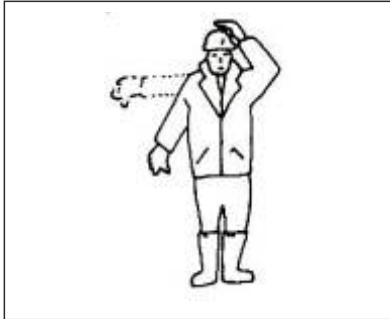
---

---

---

**Exercise** 

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.





## 4. Assist in Routine Maintenance of a Crane

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





## Key Learning Outcomes

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

1. Summarize the basic maintenance and maintenance schedules
2. Outline the importance of machine logs and reporting

## 4.1: Basic Maintenance and Schedules

### Unit Objectives

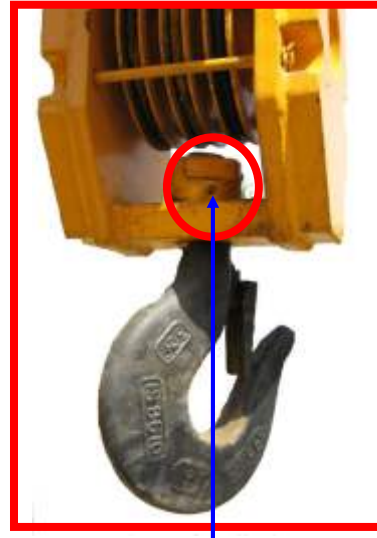
**At the end of this unit, you will be able to:**

1. Carry out basic machine maintenance tasks.
2. Understand a maintenance schedule.

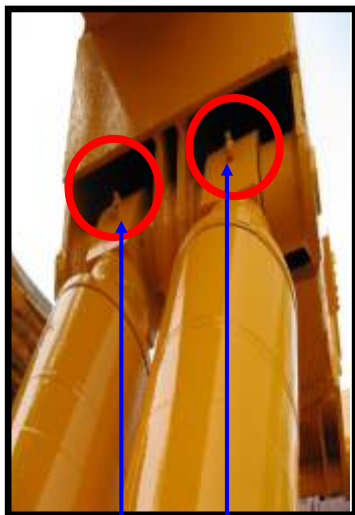
### 4.1.1 Greasing the Machine



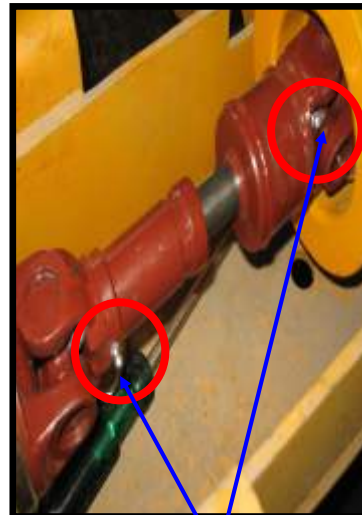
ONE POINT IN EACH HOOK



ONE POINT IN SNATCH BLOCK



ONE POINT IN EACH LIFT JACK



PROPELLER SHAFT-2 POINTS

Fig 4.1 Greasing Machine

### 4.1.1 Greasing the Machine

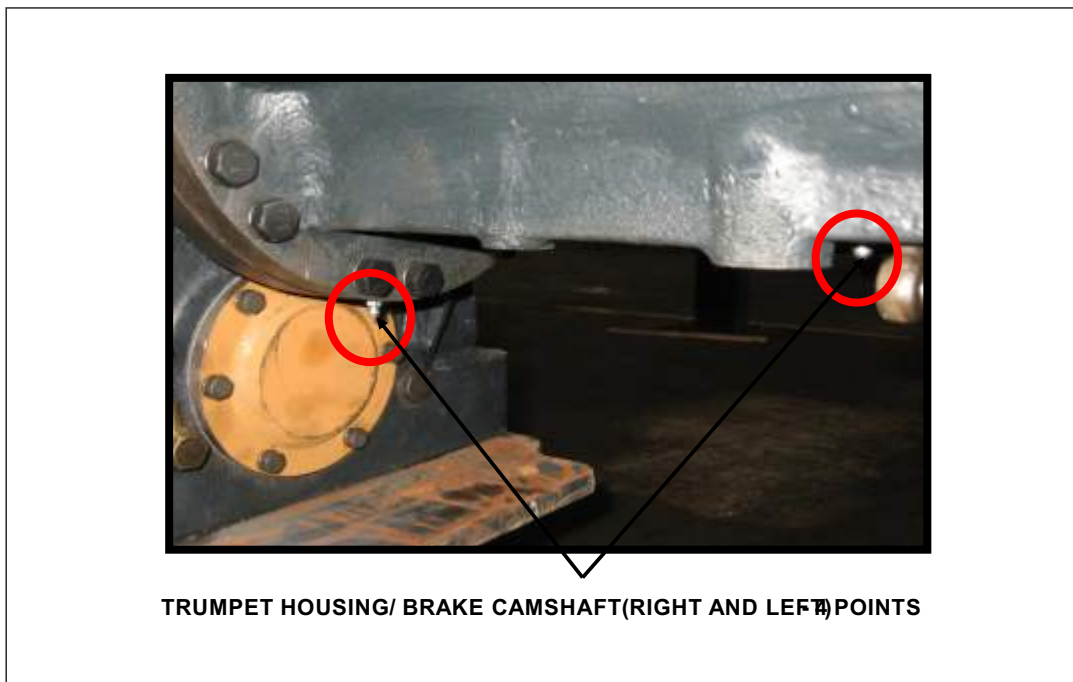
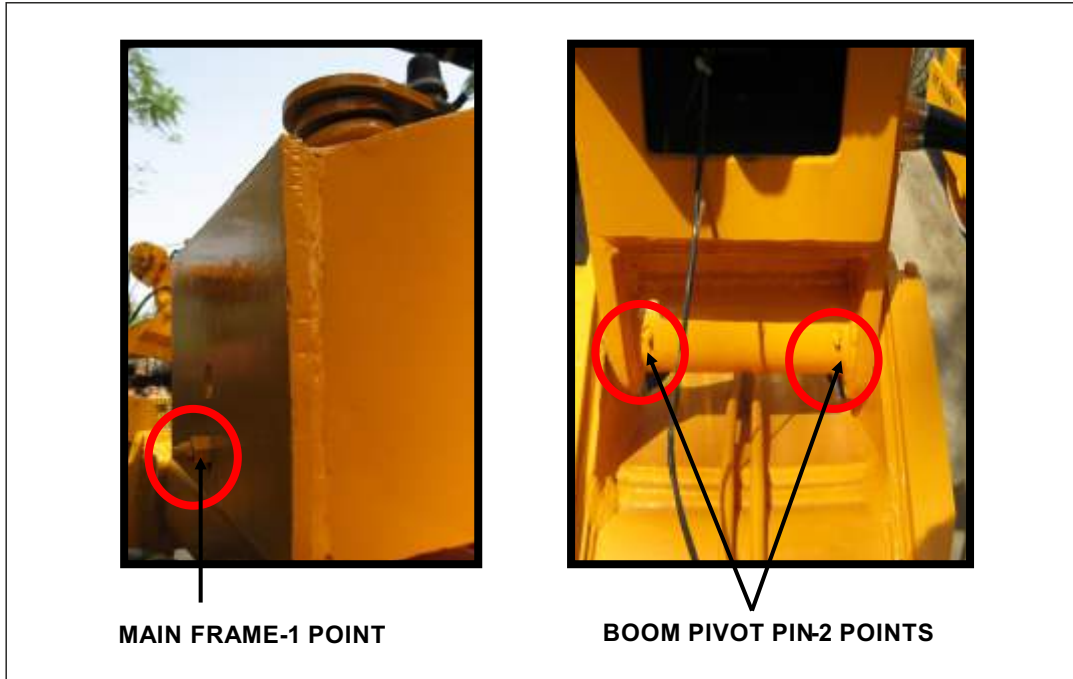
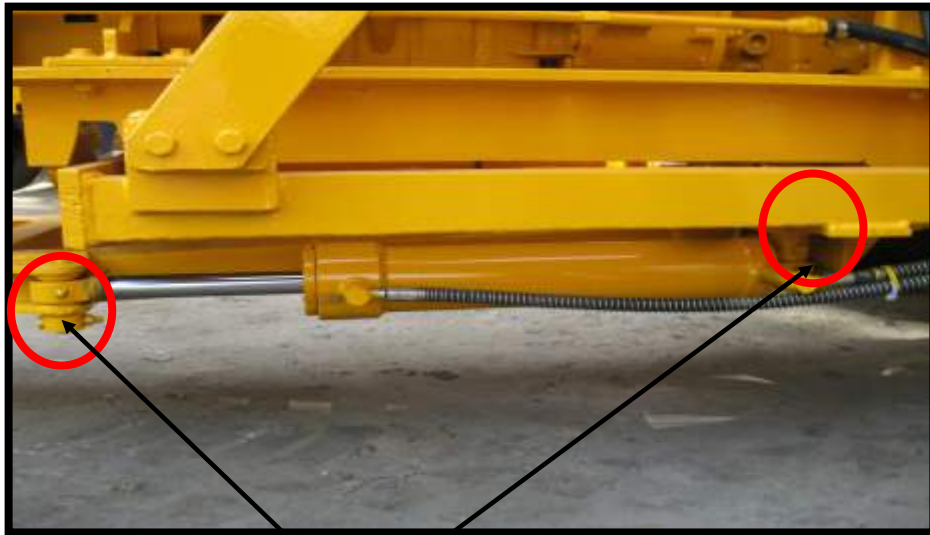
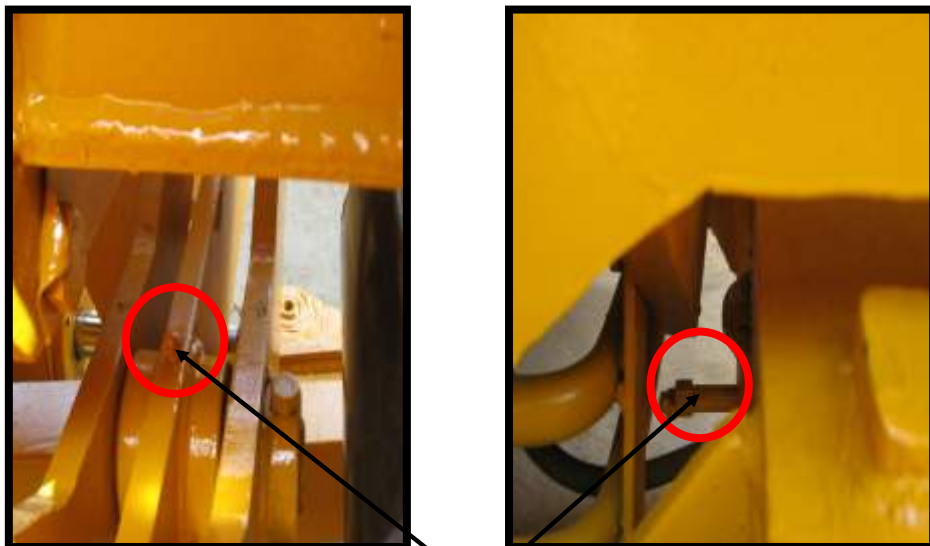


Fig 4.1 Greasing Machine

### 4.1.1 Greasing the Machine

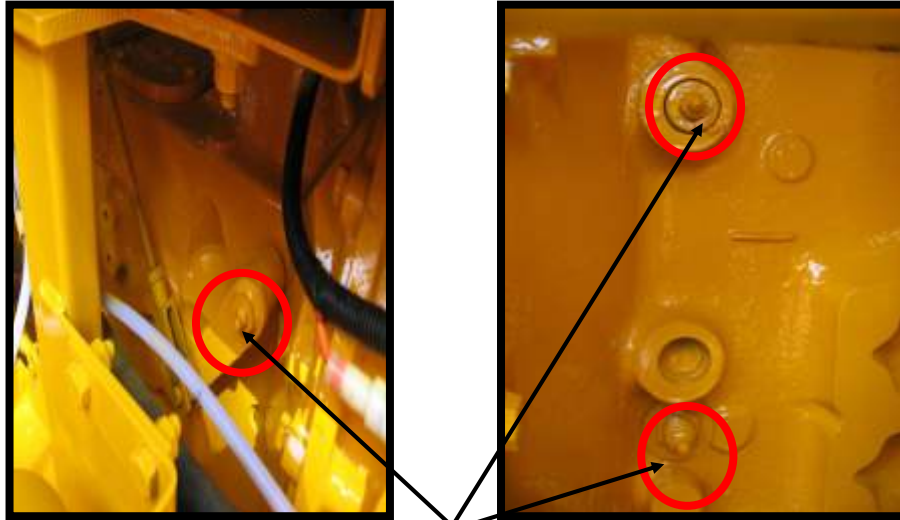


**2 POINTS IN EACH STEERING JACK**



**CRADLE - 2 POINTS**

### 4.1.1 Greasing the Machine



**CLUTCH ASSEMBLY 3 POINTS**

## 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 supervisor of problems that are beyond the scope of Crane 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 Crane goes out of order. The log helps the technician understand the condition of the machine, what parts consumables, etc., have been changed at particular operation hours.

Date	Hours	Service Procedures
DD:MM:YYYY	Hrs.:Min.	Engine and transmission oil change
DD:MM:YYYY	Hrs.:Min.	Clutch worn out; clutch disc replaced
DD:MM:YYYY	Hrs.:Min.	General inspection
DD:MM:YYYY	Hrs.:Min.	Steering hyd. cyl. found faulty; replaced
DD:MM:YYYY	Hrs.:Min.	Cooling system and hoses checked
DD:MM:YYYY	Hrs.:Min.	Brake pipes and hoses checked
DD:MM:YYYY	Hrs.:Min.	Battery replaced

## 4.2.2 Maintenance Procedure

1. Do check the following and add or change if required
  - Radiator water level
  - Engine oil Hydraulic oil ,transmission oil ,reduction oil
  - Diesel in diesel tank
  - Fan belt tension. It should be 12-15 mm.
  - Air pressure in tyres.It should be 110-115 P.S.I in the
  - Front tyres and 35 P.S.I. in the rear tyres
  - Water in the battery
2. Vacuum indicator
3. Clean the air pre cleaner
4. Check all nuts and bolts for tightness
5. Check the hydraulic connections for any leakage
6. Grease the following points.
  - Hook : 1 point in each hook
  - Jib head : 1 point
  - Lift jack : 1 point in each jack
  - Boom pivot pin : 2 points
  - Propeller shaft : 2 points
  - Clutch shaft : 2 points
  - Clutch hub(bearing) : 1 point
  - Brake cam shaft(left /right) : 4 points
  - Cradle : 2 points
  - Main frame : 1 point

### **Weekly service (every 50 hours operation)**

1. Repeat the steps of daily service including greasing points
2. Clean the battery terminals with hot water
3. Check the electrical connections for any loose contact, if appears clean, tight and insulate the connection
4. Check the oil level in the brake master cylinder bowl

### **Monthly service (every 250 hours operation)**

1. Repeat the steps of daily and weekly service
2. Change the lube oil filter
3. Clean the engine and hydraulic tank breather



## 4.2.2 Maintenance Procedure

### **Three months service (every 500 hours of operation)**

1. Check the brakes and set if necessary
2. Check the clutch free play .There should be 20 mm free play
3. Change the hydraulic oil filter
4. Change the primary oil filter
5. Clean the carbon brushes of the alternator and self starter.

### **Yearly service (every 1000 hours of operation)**

1. Repeat the steps of 10,50,250,500 hours of service
2. Clean the diesel tank
3. Change the secondary diesel filter
4. Get the following parts serviced by a skillful mechanic:
  - Check the valve spring and tappet
  - Check oil in rocker shaft assembly
  - Clean the carbon on piston
  - Grind the valve if necessary
  - Get the water pump, starter and alternater serviced

### 4.2.3 Informing Supervisor if Problem is Unresolved

Inform to senior crane operator in case of crane breakdowns which you are unable to resolve without any delay. The crane operator is adequately trained and well informed to tackle the situation. In case he is unable to do so he will consult the dealer for a solution or whatever he believes that is appropriate to tackle the situation.

**Inform the supervisor in the following cases:**

- Major crane breakdowns and improper functioning of cranes if junior operator is unable to detect the problem.
- Even after diagnosing the operator is unable to rectify the faults
- The required spares and or consumables are not available

## Exercise

Briefly answer the following questions.

1. How do you rectify engine over-heating?

---

---

---

---

---

---

2. What are the possible causes of engine/coolant leak?

---

---

---

---

---

---

3. What is the importance of maintaining machine logs?

---

---

---

---

---

---

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

---

---

---

---

---

---

**Tips** 

**Following are recommended tips:**

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





## 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 Crane operator has to follow
2. Identify and understand the use of Personal Protective Equipment (PPE)
3. Understand about 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 Crane 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 vital important for every employer and employee involved in machine operations and maintenance to safeguard themselves, learn safety procedures and encourage safe practices within their work place. This prevent many accident taking place due to carelessness and ignorance.

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

1. Be responsible and careful to avoid himself or others life getting into risk.
2. Co-operate with and assist the Crane operator or any other person, as far as necessary, to enable them carry out their legal duties in health and safety.
3. Do not hamper or handle roughly and safety device or equipment.
4. Not intentionally or recklessly interfere with anything provided in the interest of health, safety and welfare.
5. Follow Junior Crane 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 crane 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 supervisor
- Follow the manufacturer's guidance provided in operator manuals for the specific Crane you are assisting on
- Take safety precautions when assisting on the machine prior to, during and after work

### Don't

- Don't operate the 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

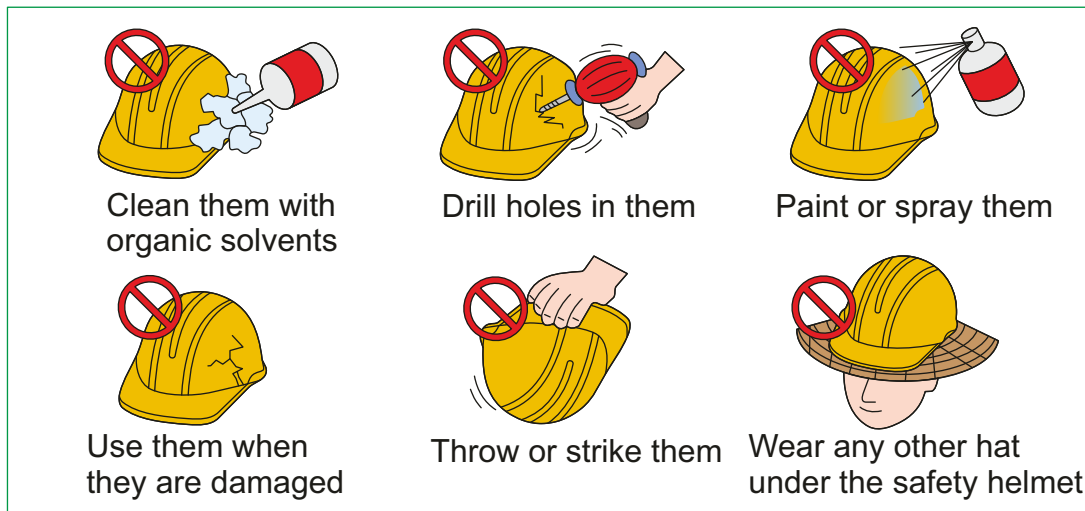
At the end of this unit, you will be able to:

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. The following are List of PPE Equipment Safety gloves, Safety Footwear, Eye Protection, Protective hearing devices (earplugs, muffs) hard, Safety helmets, Respiratory Protecting Equipment, Safety harnesses and Full body suit.

#### Safety Helmets (Don'ts)



#### Eye Protectors



Fig 5.1 Personal Protective Equipment

## 5.2.1 Personal Protective Equipment

Ear Protectors

Protective Gloves

Safety Footwear

Protective Clothing



Fig 5.1 Personal Protective Equipment

## 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 Dos and Don'ts that may help avoid accidents

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

Common accidents with Crane 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 workinconditions
- 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
- Read manufacturer's operator's manual before using plant and equipment. If the manual is not provided, ask your supervisor or the suppliers of the plant / equipment to provide a copy or original of it.
- 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)
- Attend all training courses being organised by your employer. If is possible to learn new techniques and safety practices at any age!!

#### 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 their segregation
2. Understand the procedure for correct disposal of waste

### 5.4.1 Waste Management

Waste management is an approach that aims to reduce the waste, recycling and safe disposal of hazardous waste for environmental and economical beneficial.

- 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 5.2 Waste Management

## 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

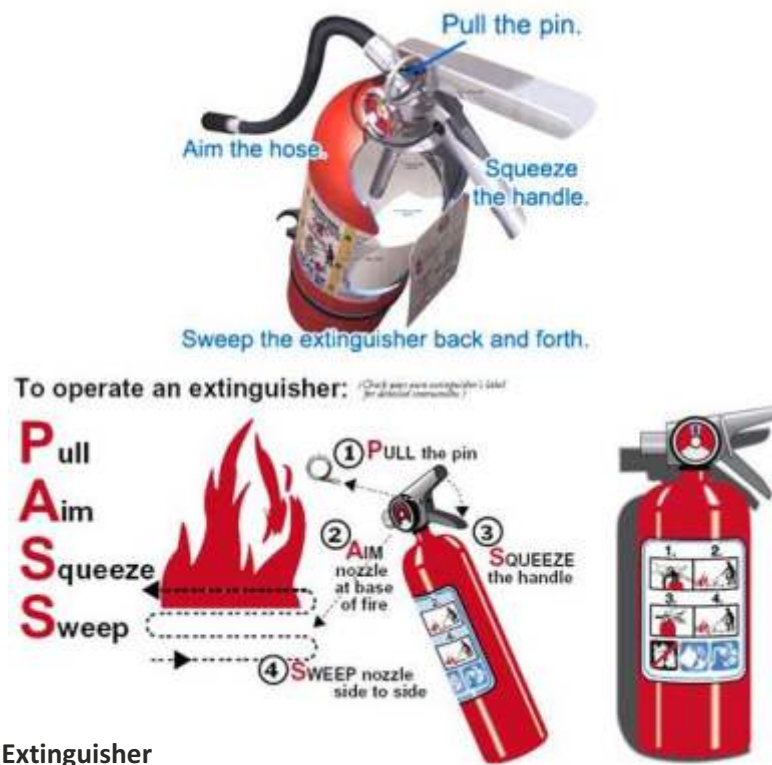


Fig 5.3 Fire Extinguisher

### 5.5.2 Sand Bucket



Fig 5.4 Sand Bucket



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



Scissors



Glove



Tweezers



Antiseptic wipes



Roller Bandage



Thermometer



Alcohol



Antibiotic ointments packets(approx 1g)

Fig 5.5 Basic First Aid Kit

5.6.2 Administer Aid

# EMERGENCY FIRST AID

## ABC'S OF IMMEDIATE FIRST AID ACTION

**A** Open the Airway **B** Check for Breathing **C** Check for Circulation

### MOUTH TO MOUTH RESUSCITATION



1 Lay victim on back and clear airway.



2 Pinch victim's nostrils with thumb and forefinger. Place your mouth tightly over victim's mouth and give 2 - quick breaths. CONTINUE WITH 12 BREATHS PER MINUTE.



3 Tilt the victim's head back by tilting back of neck and pressing on forehead.



4 Stop blowing when victim's chest rises and listen for wheezed air. Repeat breathing procedure.

### CHOKING

If choking victim can cough, speak or breathe, do not interfere. Call a paramedic.

IF VICTIM CANNOT BREATHE



1 Stand behind victim and put arms around victim's waist. Make a fist, placing thumb side against victim's abdomen (between navel and rib cage).



2 Grasp fist with other hand and give 5-10 forceful upward thrusts. Repeat until object is dislodged.

### SEVERE BLEEDING



1 Please place compress over wound and apply direct pressure. Elevate limb if bleeding severely.



2 When bleeding stops, tie pressure bandage. Do not cut off circulation by tying bandage too tightly.

### FRACTURE

- 1 Do not move victim.
- 2 Splint injured arm.
- 3 Treat for shock, being careful when handling injured arm.

### BURNS

- 1 Hold burn under cold running water or apply a cold compress.
- 2 Cover burn with clean bandage.
- 3 DO NOT treat burn with grease or butter.

### EYE INJURY

#### CHEMICAL BURNS OF THE EYE

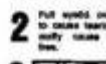


1 Flush eye with eye and skin neutralizer or clear water for 15 minutes.

#### OBJECT IN EYE (PARTICLE):



1 Do not rub eye.



2 Put eyelid over eye and hold to close eyelid. Tears will naturally cause object to wash free.



3 If above procedure is unsuccessful, hold eyelid up and have victim look downward.



4 Place a cotton tip applicator horizontally across the eyelid and hold back over it.

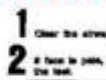


5 Carefully remove object with Eye Magnifying Loop or damp, clean cloth.

### ELECTRIC SHOCK

- 1 Remove victim from source of shock using stick or other non-conductive object.
- 2 Begin mouth to mouth resuscitation if breathing has stopped.
- 3 Call for medical assistance promptly.

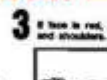
### SHOCK DUE TO INJURY



1 Clear the airway.



2 If limb is pain, elevate the foot.



3 If limb is red, elevate the head and shoulders.



4 Keep the victim warm.

### YOUR LOCATION

### EMERGENCY TELEPHONE NUMBERS

Paramedic \_\_\_\_\_  
 Police \_\_\_\_\_  
 Fire \_\_\_\_\_  
 Doctor \_\_\_\_\_  
 Police Control Center \_\_\_\_\_

The sign is a combination of general first aid information obtained from sources believed to be reliable. However, we cannot guarantee the medical validity of the information or the results obtained from using the information for the reasons that every emergency safety procedure is contained herein, or that information or general instructions may not vary or require further or additional attention.

ABC

Fig 5.6 Administer Aid

## Exercise



Briefly answer the following questions.

1. How can the operator help create a safer work place?

---

---

---

---

---

---

---

2. List some common PPE?

---

---

---

---

---

---

---

3. What precautions a operator has to follow when dealing with waste?

---

---

---

---

---

---

---

4. What makes up a basic first aid kit?

---

---

---

---

---

---

---

**Tips** **Following are recommended tips:**

Wash skin dirtied and stained with oil intensely with warm soap water. Do not use petrol, diesel fuel or paraffin to clean your skin

## Notes



A large rectangular area with a thin orange border, containing 25 horizontal black lines for writing notes.



**Skill India**  
कौशल भारत - कुशल भारत

  
सत्यमेव जयते  
GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT  
& ENTREPRENEURSHIP



N · S · D · C  
National  
Skill Development  
Corporation

Transforming the skill landscape



**Address :** # 23-29, FF-5 White House Building, St. Marks Road, Bengaluru 560001. Karnataka.

**Email :** standards@iescindia.com

**Web :** www.iescindia.com

**Phone :** +91 80 4212 6666

**CIN No :** 00000000