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MINISTRY OF SKILL DEVELOPMENT
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INDIAN IRON & STEEL SECTOR SKILL COUNCIL

Facilitator Guide



Sector
Iron & Steel

Sub-Sector
Steel, Sponge Iron, Ferro Alloys, Re-Rollers, Refractory

Occupation
Mechanical Maintenance

Reference ID: **ISC/Q0903, Version 4.0**
NSQF Level: **4**

Mechanic: Hydraulic & Pneumatic System

Scan this QR Code to access eBook

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Disclaimer

> 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

Indian Iron and Steel Sector Skill Council would like to thank Iron and Steel member company representatives for believing in our vision to enhance the employability of the aspiring workforce pool.

IISSSC facilitates this by developing and enabling the implementation of courses relevant to projected industry needs. The aim is to address two key requirements, of closing the industry-academia skill gap, and of creating a talent pool that can reasonably meet current competitiveness requirements and weather future externalities in the Iron and Steel Sector providing impetus to the Make in India program.

IISSSC believes that this is an initiative of great importance for all stakeholders concerned – the industry, academia, and the aspirants. The tremendous amount of work and ceaseless support offered by the members of IISSSC in developing a meaningful strategy for the content and design of program training materials has been truly commendable.

We would like to thank all concern stakeholders who have help us in bringing much needed focus to this effort.

About this book

This Facilitator Guide is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

This job involves all about regular upkeep of hydraulic/pneumatic equipment/system, checking of hydraulic medium (hydraulic mineral oil), air under pressure and rectifying breakdowns etc. to ensure fitness of equipment.

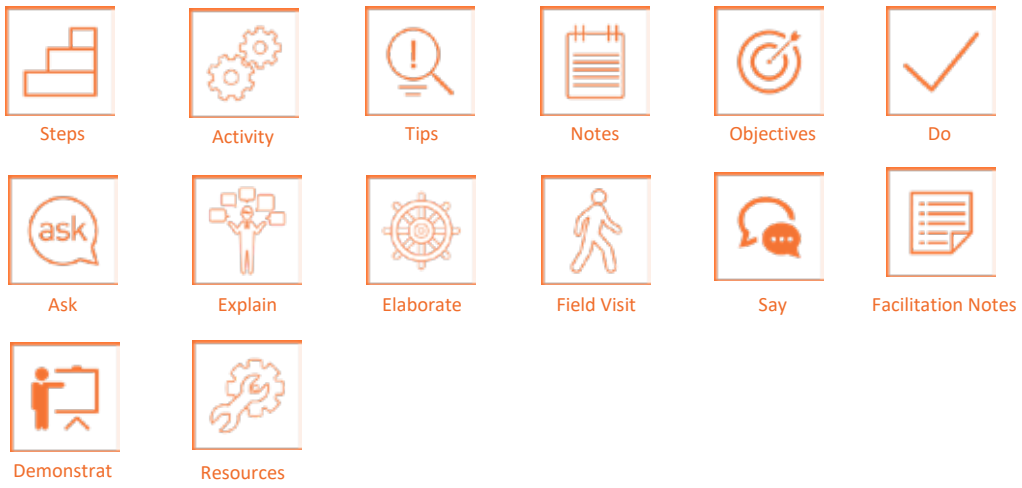
This book is designed to enable a candidate to acquire skills that are required for employment.

The Qualification pack of Mechanic: Hydraulic & Pneumatic System, Level 4 includes the following NOS's which have all been covered across the units:

1. ISC/N0008: Use basic health and safety practices at the workplace
2. ISC/N0009: Work effectively with others
3. ISC/N0918: Prepare for fitting and assembly operations
4. ISC/N0919: Perform fitting and assembly of hydraulic and pneumatic equipment
5. ISC/N0920: Perform post-assembly activities
6. ISC/N0921: Perform maintenance of hydraulic and pneumatic equipment
7. DGT/VSQ/N0102: Employability Skills (60 Hours)

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



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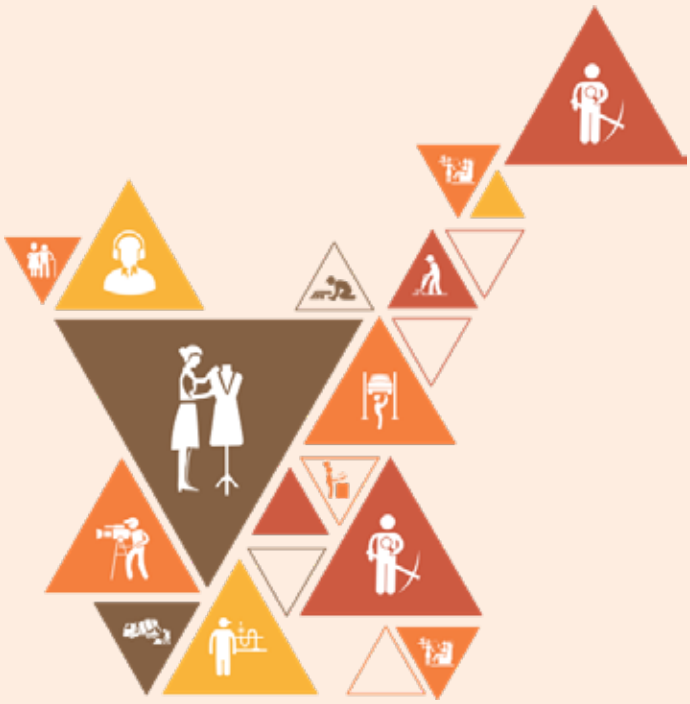
1. Introduction to the Job Role

Unit 1.1 – Introduction of Iron & Steel Industry

Unit 1.2 – Types of Iron and Steel Industry

Unit 1.3 – Role of Mechanic Hydraulic & Pneumatic System in Industry



Key Learning Outcomes

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

1. Explain Iron and Steel industry
2. List development activities in Iron and Steel industry
3. List employment opportunities in India
4. Explain Iron and Steel industry structure
5. List Iron and Steel plants in India
6. List the role and duties of Mechanic Hydraulic & Pneumatic System
7. Explain personal and professional attributes required for occupation.

UNIT 1.1: Introduction of Iron and Steel Industry

Unit Objectives

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

1. Explain about Iron and Steel industry
2. List development activities in Iron and Steel industry
3. List employment opportunities in India

Resources to be Used

- Facilitator can use the available objects such as a marker, duster, pen, notebook etc.

Do

- Take a parcel, mention some details such as student name, hobbies, likes, dislikes etc.
- Make the trainees stand in a circle, close enough to the person each side of them that they can pass the parcel quickly.
- Say 'Stop' when the trainees least expect it. The person who has the parcel at that time should get out from the class.
- Those who get out should introduce themselves by providing the details mentioned in the parcel.
- The winner of the game should stand and introduce himself/herself at the end of the game.
- At last, say thanks to the trainees for their participation.
- Ask for feedback on the exercise of participation and what they derived out of it.

Notes for Facilitation

- Ask the trainees about the expectations from the course.
- Invite trainees to participate. List the expectations on the whiteboard.
- You could ask the trainees who get out during the game to be the music keepers. They can start and stop the music as the game progresses.
- Encourage shy trainees to provide information about themselves by prompting them with questions such as 'what do you enjoy doing the most', 'what is your favorite movie or book' etc. Ask the trainees about the expectations from the course.
- Invite trainees to participate. List the expectations on the whiteboard.

Ask

- Ask them about their understanding for Iron & Steel industry.
- Ask about their expectations from the course and industry.

Say

- India is the world's third-largest producer of crude steel (up from eighth in 2003)
- India's crude steel capacity reached 109.85 Million tonnes (MT) in 2014-15, a growth of 7.4 per cent.
- Coal and iron-ore are required in large amounts in the production of iron and steel.
- According to the data released by Department of Industrial Policy and Promotion (DIPP), the Indian metallurgical industries a attracted Foreign Direct Investments (FDI) to the tune of US$ 8.7 billion, respectively, in the period April 2000–September 2015.

Elaborate

Elaborate following information about Iron and Steel Industry to trainees

- Production of Iron and Steel in India
- Conditions for the growth of Iron and Steel Industries in India
- Development activities in Iron & Steel Industry.
- Initiatives taken by Indian government for growth of Iron and Steel Industry.
- Foreign investements in Iron and Steel Industry.
- Employment opportunities in Iron and SteeliIndustry

Notes for Facilitation

- Start with a positive and happy note
- Summarize the main points.
- Encourage them to ask questions and involve during the session.
- Share your inputs and insight to encourage the trainees.
- Wrap the session up after summarizing the key points and answering questions.

UNIT 1.2: Types of Iron and Steel Industry

Unit Objectives

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

1. Explain Iron and Steel industry structure
2. List Iron and Steel plants in India

Resources to be Used

- Facilitator can use the available objects such as a marker, duster, pen, notebook etc.

Do

- Greet and welcome the participants to the next session of the program.

Say

- The Iron and Steel Industry in India has 2 separate divisions:
  - Integrated producers
  - Secondary producers
- Tata Iron and Steel Company (TISCO) is the oldest iron and steel centre of India.
- There are more than 50 Iron and Steel industries in India.

Ask

- Ask about presence of Iron and Steel industries in India.
- Ask about name of Iron and Steel players of India.

Explain

- Explain different sub-sectors comes under Iron and Steel sector.
- Explain features of each sub-sector comes under Iron and Steel sector.
- Explain about major Iron and Steel plants of India.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Scan the QR code or click on the link to watch related videos

https://youtu.be/74jI_khPUig
Iron and Steel Industry

https://youtu.be/i2xcqWoe1Og
Types of Iron and Steel Industry

UNIT 1.3: Role of Mechanic Hydraulic & Pneumatic System in Industry

Unit Objectives

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

1. Explain the role of Mechanic Hydraulic & Pneumatic System in industry
2. List personal attributes and knowledge requirements

Resources to be Used

- Available objects such as whiteboard, marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do

- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.
- Capture their responses on board and share them wherever necessary.

Say

- A fitter: hydraulic and pneumatic system perform maintenance, assembling and dismantling of hydraulic and pneumatic system components.
- He/she has to be physically fit, not have colour blindness, have analytical skills, problem solving attitude, high concentration levels, a sharp reflex and willingness to work in a factory environment.

Ask

Ask these questions to trainees

- List role and responsibilities of a fitter: hydraulic and pneumatic system.
- What are the skills required to become a fitter: hydraulic and pneumatic system?

Elaborate

Fitter: hydraulic and pneumatic system job duties

- Maintaining hydraulic and pneumatic equipment/system
- Checking of hydraulic medium (hydraulic mineral oil), air under pressure, etc.
- Identifying and rectifying root causes of any problem or breakdown
- Dismantling and re-assembling equipment
- Checking alignment and cleaning equipment parts
- Ensuring fitness of equipment prior to handover

Explain

- The roles and responsibilities of a fitter: hydraulic and pneumatic system
- The career path of a fitter: hydraulic and pneumatic system

Notes for Facilitation

- Summarize the main points.
- You could ask the trainees what they know about the need for fitter Hydraulic & Pneumatic System work.
- Give trainees some tips for how to become a successful Mechanic Hydraulic & Pneumatic System
- Give the trainees a brief overview of what all will be covered in the program.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

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2. Follow Basic Health and Safety Practices at the Workplace

Unit 2.1 – Occupational Health & Safety

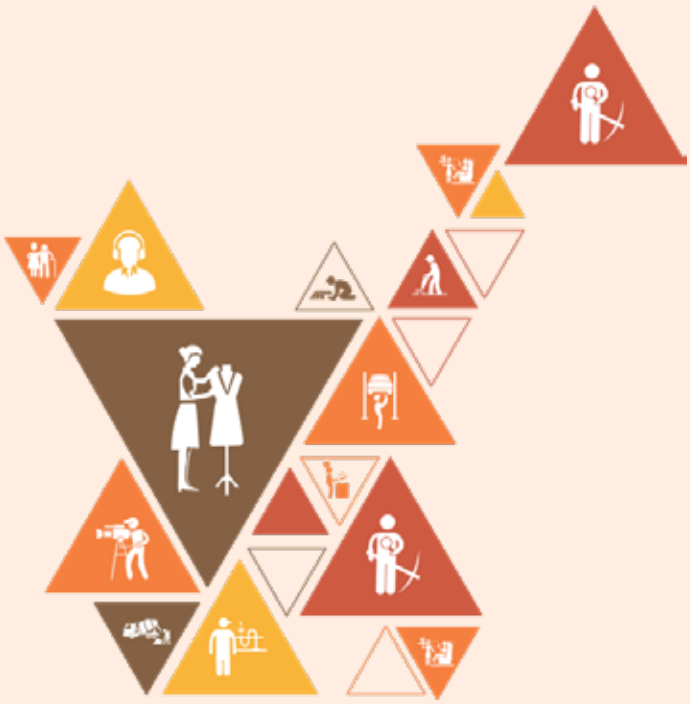
Unit 2.2 – Safe Working Practices

Unit 2.3 – Fire Safety and Emergency Procedures

Unit 2.4 – Housekeeping at Workplace

Unit 2.5 – Risk Management and Problem Escalation

Unit 2.6 – Reporting and Documentation



ISC/N0008

Key Learning Outcomes

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

1. Explain safety requirements and resources required in different areas for personal safety.
2. Demonstrate safe work practices while working at workshop.
3. Explain hazards, types of hazards and how to control hazards
4. Identify PPE required during work.
5. Demonstrate safe working practices at heights.
6. Demonstrate safe working practices at confined spaces.
7. Demonstrate actions need to perform during fire hazards.
8. Demonstrate use of fire extinguisher during fire hazards.
9. Perform first aid during an accident
10. Explain problem identification process
11. Explain risk management process
12. Explain escalation matrix and problem escalation process
13. Explain reporting and documentation requirements
14. Explain accident reporting procedure
15. Perform reporting of accidents and defective tools

UNIT 2.1: Occupational, Health and Safety (OHAS)

Unit Objectives

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

1. Discuss about health and safety requirements in industry
2. List essential elements of safety
3. Explain hazards and different types of hazards
4. Explain how to identify and control hazards

Resources to be Used

- Available objects such as a duster, pen, notebook, warning signs etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- The health and safety of employees is crucial since it affects both economic and social factors.
- The nature of various types of accidents is shown by an iceberg of incidents. They are unsafe actions, incidents, minor injuries, lost time injuries, serious accidents and fatalities.
- You have to regularly attend review meetings, trainings, emergency safety drills and safety audits to ensure safety at workplace.

Ask

Ask these questions to trainees

- What are the three important aspects of safety in Iron and Steel industry?
- List essential elements necessary for safety.
- What are the good safety practices?
- What they think about safety in Iron and Steel industry?

Elaborate

- The condition of the work place environment e.g. means of access, physical plant safety, housekeeping, and safe place of work etc.
- The training and competence of the employees which include ability to understand apply and respond to safe systems of work.
- The development of motivational and behavioral influences of employees. This includes the use of more direct strategies to identify unsafe behavior and attitudes and to motivate employees.

Say

- A hazard is something that has the potential to cause injury, disease or death in a workplace.
- Aspects for the development of a safe workplace environment are development policies, consultative process, hazard identification and control.
- Always follow safety signages to ensure safety at workplace and ensure the control measures.

Ask

- What are the different types of hazard?
- You can pick the students and ask the hazard warning sign.
- What are the most common hazard in workshop?

Elaborate

Discuss and elaborate these points with trainees:

- Important aspects to the development of a safe workplace environment.
  - The development of policies
  - The development of consultative processes
  - Hazard identification, assessment and control.
- Types of hazard
  - Physical hazard
  - Mechanical hazard
  - Chemical hazard
  - Electrical hazard
- Common hazards occur in Iron & Steel plant
  - Road hazards

- Coke oven and sinter plant
- Blast furnace and steel melting shop
- Rolling mills
- Power plant
- Material handling
- Other common hazards which occur in steel plant

- Common causes of hazard

Do

- Show all the hazard warning sign and their differences.
- Ask the various techniques to avoid and control from hazards.
- Give trainees some time to think about effects of hazard on our body.

Activity

- Ask the trainees to assemble together.
- Show the hazard signage chart to trainees and tell them to identify hazard signages one by one.
- By this activity, they will learn about different hazard signages paced at workplace.

Skill Practice	Time	Resources
Identify hazards signage	20 min	Hazard signage chart

Do

- Call each student one by one and ask him/her to identify the name of hazard sign showing on the chart.
- Wrap the unit up after summarizing the key points and answering questions.

Scan the QR code or click on the link to watch related videos

https://youtu.be/R9s6YBhyTKM
Occupational Health and Safety

https://youtu.be/rnTCcZf2qtw
Health, Safety and Hazards

https://youtu.be/hlpGUtxz6b0
Hazards

UNIT 2.2: Safe Working Practices

Unit Objectives

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

1. Demonstrate safe working practices at workshop
2. Demonstrate use of different types of PPE
3. Demonstrate safe working practices at heights and confined spaces
4. Demonstrate safe material handling practices

Resources to be Used

- Available objects such as a duster, pen, notebook, PPE, heavy weight etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- There are safe practices need to be consider for avoiding general workshop hazards.
- Use of personal protective equipment is the first step towards the safety. Personal protective equipment serves as the last resort for controlling hazards and is one, but not the only, ancillary or temporary measure.
- Every worker has to lift and move heavy weight during the job whenever required.
- Extreme care should be taken while lifting or moving the job so that no damage occurs to the job or plant and also to prevent accidents at work place.

Ask

- What are the safe practices for avoiding general shop hazards?
- What type of PPE is required for a mechanical drafter job?
- What are the benefits of PPE at workplace?

Elaborate

Discuss and elaborate the following points with trainees:

- Safe practices to avoid workshop hazards
- Safe practices to avoid machine hazards
- Personal protective equipment and their use
- Safe material handling and lifting

Fig 2.2.1: *PPE*

Do

- Show them the PPE.
- Demonstrate the use and requirement of PPE.
- Demonstrate the safe material handling practices.

Demonstrate

Take the trainees into workshop and demonstrate the safe lifting of heavy material manually

Activity

- Ask the trainees to assemble together.
- Tell the trainees to make pairs
- Tell them they have to demonstrate manual lifting of heavy material.
- By this activity, they will learn about how to lift a heavy load safely.

Skill Practice	Time	Resources
Safe weight lifting procedure	1 hours	PPE
		Heavy weight

Do

- Provide a heavy material to each pair.
- Make sure they are lifting the weight properly in correct body posture.
- Wrap the unit up after summarizing the key points and answering questions.

Notes for Facilitation

- You could ask the students about the understanding of safe working practices at heights and confined spaces.
- Invite students to participate. List the responses from students on the whiteboard.
- Give the students a brief overview of what all will be covered in the program.

Say

- Falls from height are responsible for many serious and fatal injuries every year.
- The Health and Safety Executive recommends a five-step approach to risk assessment, and the risk of slips, trips and falls should also be considered.

Elaborate

Elaborate and discuss following topics with the trainees:

- Safety equipment can used while working on heights
  - Mobile elevated platforms
  - Ladders
  - Step-ladders
  - Scaffolder
  - Harnessing belts
- Do's and don'ts while working on heights
- Risk assessment procedure

Do

- Show the risk assessment procedure
  1. Look for hazards associated with falls from height around the workplace.
  2. Decide who might be harmed and how.
  3. Consider the risks.
  4. Record your findings if you have five or more employees.
  5. Regularly review the assessment.
- Demonstrate the safe use of ladders

Demonstrate

Demonstrate the steps of using a ladder safely as given in participant manual.

Say

- The confined space can be any space of an enclosed nature where there is a risk of death or serious injury from hazardous substances or dangerous conditions. Confined space such as Storage tanks, Silos, Reaction vessels, enclosed drains and Sewers.
- If you cannot avoid entry into a confined space, make sure you have a safe system for working inside the space.

Ask

- What is confined space?
- How the danger can arise in confined space?
- What can occur if there is lack of oxygen?

Elaborate

Elaborate and discuss following topics with the trainees:

- Confined space
- Dangers in confined space
- Essential elements need to consider while working in confined space

Do

- Show them the safety equipments required while working at confined spaces.
- Show lockout and tagout procedure of the machine.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Scan the QR code or click on the link to watch related videos

https://youtu.be/su7Yv57k2x0

Safe working at heights and confined spaces

UNIT 2.3: Fire Safety and Emergency Procedures

Unit Objectives

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

1. Demonstrate fire safety practices
2. Demonstrate use of fire extinguishers
3. Discuss about emergency procedures
4. Demonstrate first-aid practices

Resources to be Used

- Available objects such as a duster, pen, notebook, fire extinguisher, fire alarm, PPE etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- Fire is defined as a self-sustaining combustion process in which a substance (fuel) combines with oxygen in air to produce immense heat and light.
- Fire hazards pose threats to life and property.
- There are four classes of fire i.e. Class A, Class B, Class C and Class D.
- A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations.

Ask

- What is fire?
- What are the common types of fire safety equipment used in industry?
- What is fire extinguisher and how you can use it?

Elaborate

Elaborate and discuss following topics with the trainees

- Fire and classes of fire
- Ways and effects of fire hazard
- Fire-fighting equipment
- Fire extinguisher
- Types of fire extinguisher and their classification according to classes of fire
- Use of fire extinguisher
- Tips during fire outbreak

Do

- Tell them about the fire fighting equipments.
- Show them the equipments and explain their use.
- Demonstrate them the use of fire extinguisher.
- Explain them about different types of fire extinguishers.

Demonstrate

- Take the trainees into the workshop.
- Demonstrate the steps of using fire extinguisher.

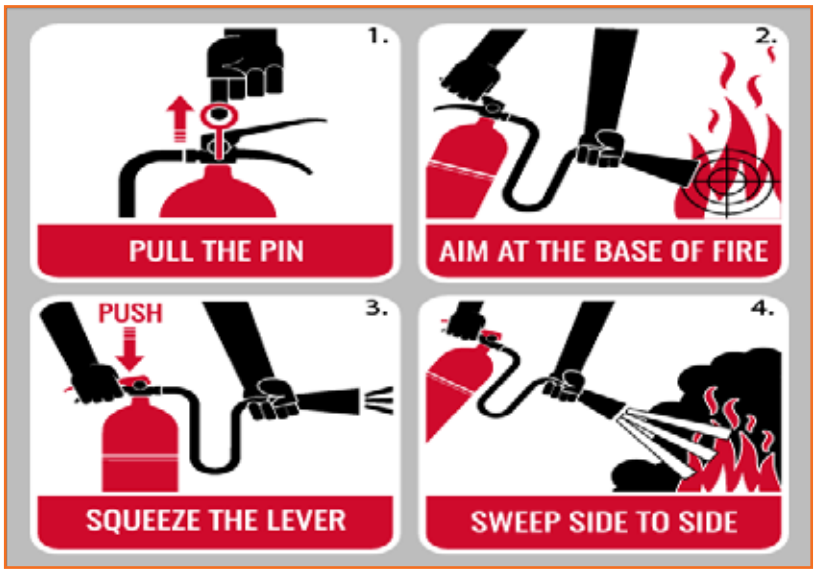


Fig 2.3.1 Steps of using fire extinguisher

Activity 1

- Ask the trainees to assemble together.
- Tell them to demonstrate the use of fire extinguisher one by one.
- By this activity, thery will learn about use of fire extinguisher

Skill Practice	Time	Resources
Use of fire extinguisher	2 hours	Fire extinguisher
		PPE

Do

- Support them in using a fire extinguisher properly.
- Go around and make sure they are doing it properly.

Activity 2

- Ask the trainees to assemble together.
- Give them a situation of fire drill and tell them to prepare a fire drill report individually.
- By this activitiy, thery will learn about writing a fire drill report.

Skill Practice	Time	Resources
Fire drill report	2 hours	Report format
		Fire drill details

Do

- Go around and make sure they are writing the report properly.
- Support them in writing the report.

Say

- If you think someone is suffering from electric shock, approach with extreme caution and its your duty to give the basic first aid to save the life of victim.

Ask

Ask these questions to trainees

- What are the basic steps of first aid?
- What is CPR process?

Demonstrate

You can make a group of few trainees to demonstrate the steps of first-aid in following situations:

- Free a person from electrocution
- Bleeding and Wounds
- Burns
  - Chemical or Compressed Gas Burns
  - Heat or Electrical Burns
- Choking
- Basic techniques of banding
- Artificial respiration and the CPR Process
- Correct method to move injured people during an emergency

Do

- Show the do's and dont's in case of an electric shock to trainees .

Do's	Don't
Take rest	Do not give the victim anything to eat or drink
Lay the victim on his/her back	Do not move the victim
Keep the victim warm by using the blanket or clothes.	Do not keep the victim in warm and hot conditions.
If the victim is not in pain, raise the feet and legs of victim with the support of a pillow.	If victim in pain, do not move.

Activity

- Ask the trainees to assemble together.
- Tell them to divide into six groups.
- Tell them to prepare a role play of an accident and demonstrate the first aid steps need to perform for saving the victim.

Skill Practice	Time	Resources
First aid practices	3 hours	Mannequin, first-aid box

Do

- Support the teams in preparation of role play
- Praise their effort during the demonstration.
- Wrap the unit up after summarizing the key points and answering questions.

Field Visit

Plan a visit to any of the industry and show the firefighting equipment. With the help of field visit show the trainees where we need to various firefighting equipment and how to use them.

Show them fire drill session. With the help of field visit explain them the importance of fire drill for safety/

Tell them, tey have to prepare a fire drill report based on the drill session they have seen.

Scan the QR code or click on the link to watch related videos

https://youtu.be/skYZJU8IGSU
Fire prevention

https://youtu.be/FY2TwtC2ppk
First-aid practices

UNIT 2.4: Housekeeping at Workplace

Unit Objectives

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

1. State the methods to keep the work area clean and tidy.
2. Apply basic housekeeping practices to ensure that the work area is clean.
3. Explain 5S Safety system
4. Explain need of 5S safety system
5. Discuss various methods of waste management and its disposal.
6. Demonstrate different disposal techniques depending upon different types of waste.

Resources to be Used

- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual etc.
- PC with LCD Projector or Flip Chart

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- Housekeeping includes keeping work areas tidy and arranged; keep floors free of slip and trip accidents; clearing of waste materials and other fire hazards.
- Good housekeeping is a basic step for preventing accident and fire hazards. Poor housekeeping and hiding hazards can cause frequent accidents which can cause injuries.
- Good housekeeping is a vital factor in preventing accidents. The great majority of all work accidents are caused during the handling of goods or materials, and by people falling, being hit by falling objects, or striking against objects in the workplace. All these causes can be reduced by good housekeeping practices.
- Examples of housekeeping are: excessive material, waste or chips in the working area, congested aisles, tools left on machines, waste containers overflowing, lockers and workrooms in disorder, acids in open containers, broken glass etc.

Explain

- Explain principle of housekeeping.
- Explain benefits of housekeeping.
- Explain the checklist of housekeeping program.

Elaborate

Elements of effective housekeeping are:

- Hearing Protection
- Eye Hazards
- Chemical Exposure
- Mechanical Hazards
- Fire Hazards
- Carbon monoxide poisoning
- Dust and fumes

Ask

Ask these questions to trainee:

- What are the housekeeping concerns in a manufacturing industry?
- How carbon monoxide poisoning effects a person?
- What are the areas and objects need to take care under effective housekeeping program in an industry?

Say

- 5S is a basic, systematic approach for productivity, quality and safety improvement.
- 5S is created by a list of five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke.

Elaborate

5S describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.

Objectives of 5S:

- The manufacturing process to be standardize
- Tools can be search in very less time.
- By 5S the quality of products and Service is improve
- Production can be increase by the use of 5S.
- Focus on safety and health

Three purposes of conducting regular 5S Audit reviews are:

- Review compliance to the 5S standards for your factory
- Note and address non-compliance – to fix what is wrong!
- Provide a formal opportunity to suggest improvements

Explain

- Explain phases of 5S system.
- Explain advantages of 5S system.
- Explain purpose of 5S audit.

Ask

Ask these questions to trainees:

- What are the objectives and advantages of 5S?
- What are the standards that were set during 5S for make a checklist?
- What are the key tasks done during 5S audit?

Activity

- Ask the trainees to assemble together.
- Divide the class in to 5 equal groups.
- Tell them to do the 5S audit of your training center and prepare a report on it.
- By this activity, they will learn about how to conduct 5S audit of workplace.

Skill Practice	Time	Resources
5S Audit	1 hours	Sample 5S audit checklist

Do

- Go around and make sure they are doing it properly.
- Support them in conducting the 5S audit and preparing the report.
- Share your inputs and insight to encourage the trainees and add onto what they are doing.

Say

- Waste management is the collection, transport, processing, recycling or disposal of waste materials.
- Waste may be classified as garbage, rubbish, industrial wastes, mining wastes etc.
- Industrial waste can be of following types: liquid waste, solid waste, organic waste, recyclable rubbish and hazardous waste.

Ask

Ask these questions to trainees:

- What are the elements of waste management strategy?
- What are the different methods of waste management?

Explain

- Explain different types of industrial waste.
- Explain different methods of waste management segregation, composting, landfill and recycling.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Share your inputs and insight to encourage the trainees and add onto what they are doing.
- Wrap the session up after summarizing the key points and answering questions.

Field Visit

Arrange a visit to any of the nearest Iron and Steel industry and show the housekeeping practices, 5S Safety system and check the various points of safety with the help of 5S audit checklist

Scan the QR code or click on the link to watch related videos

https://youtu.be/FUqD7BTfEJY
Ways of housekeeping

https://youtu.be/D7Zgn5keNtE
Ways of housekeeping

UNIT 2.5: Risk Management and Problem Escalation

Unit Objectives

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

1. Explain risk management process
2. Explain escalation matrix
3. Demonstrate how to escalate issues properly

Resources to be used

- Available objects such as a duster, pen, notebook etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- Risk Management consists of methodical steps for handling hazards in the workplace.
- One major component of risk management is workplace safety inspections. Inspections are a major tool in ensuring that a workplace remains safe.

Ask

Ask these questions to trainees

- How to control the problems?
- What is risk management process?

Elaborate

After inspection, make an inspection report, which includes the following information:

1. Fill in the name of the area inspected if not already indicated on the sheet, the date and inspectors' names in the area provided.
2. Check either yes or no according to the situation or item listed, or put a check next to each listed control.
3. Record suggested remedial action in the comments for the identified action items.
4. State what needs to be or should be done to correct and better control the hazardous situation.

Demonstrate

Demonstrate the process of risk assessment

1. Identifying any foreseeable problem
2. Assessing the problem
3. Control the problem or if this is not possible, controlling the risk from the problem - \
4. Reviewing risk assessment

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to make a checklist of inspection according to norms and standards and conduct the inspection of workplace

Skill Practice	Time	Resources
Inspection	1 hour	Checklist

Do

- Ask them to get into pairs for practice.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.

Say

- For escalating issues to the concerned department, every organization follows a specific procedure. This procedure is based on escalation matrix.

Ask

Ask these questions to trainees

- What is escalation matrix and its features?
- What they understand about the process of problem management?
- How escalation matrix works for complaints?

Explain

- Explain the process of problem management
- Explain the key features of escalation matrix
- Explain How does escalation matrix work for Complaints

Elaborate

- Escalation matrix is a complaint logging system (complaint box) allows you to specify multiple user contacts to be notified in the event of issues. By using escalation matrix you can notify the right people at the right time about critical alerts irrespective of the business hours.
- The key features of escalation matrix are as follows:
  - The escalation levels are based on schedules.
  - The service is available 24X7 and schedules are allocated accordingly.
  - The schedules are time zone specific.
  - A matrix can be defined at multiple levels ranging from senior management to lower management.

Demonstrate

Demonstrate the process of problem escalation

1. Complaint of a given category will by default be assigned and notified by email to the Level 1 department of that category.
2. It defines which an issue has to be raised to whom and within which time frame.
3. If the complaint is not resolved within X number of days (X is the time defined for Level 1 department to resolve the issue), the complaint will be escalated to Level 2 department.
4. If the complaint is not resolved within Y number of days (Y is the time defined for Level 2 department to resolve the issue), the complaint will be escalated to Level 3 department.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Answer their queries satisfactorily.

Scan the QR code or click on the link to watch related videos

https://youtu.be/jgIkdxGJblw
Problem identification and escalation

https://youtu.be/76nv-kKsNbA
Problem identification and escalation

UNIT 2.6: Reporting and Documentation

Unit Objectives

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

1. Explain accident and incident reporting
2. Explain how to write reports properly
3. Perform reporting of faulty and damage tools

Resources to be used

- Available objects such as a duster, pen, notebook, sample accident report format etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- It is extremely important to report accidents and incidents right away, no matter how minor it may be.
- Reporting of incidents and accidents is required under the Work Health and Safety (WHS) legislation
- Always report an accident to management immediately. There should be a form at each workplace that you (or the person involved) and any witnesses can fill out, where possible, otherwise it can be completed by a health and safety representative (HSR) if necessary.

Elaborate

Hazard reports can take a number of different forms:

- the standard hazard report used by workers for all hazards
- reports of infections

- near-miss incident reports
- reports of damage and faulty tools, equipment and machines
- routine inspection reports

Structure of an accident report:

- Description of the occurrence
- Nature of injury or disease
- Injury or disease happened as a result of the occurrence?
- First aid, medical treatment or hospital admission
- Part of the body affected
- Source of injury
- Probable cause or causes of injury
- Investigation
- Notification checklist
- Preventative action
- Witness details

Ask

Ask these questions to trainees

- What are the areas covered in accident report?
- Why reporting and documentation is necessary?
- What are the important things to remember filling reports and documents?

Say

- Like accident or incident reporting, reporting of faulty and damaged machine, tools and equipments is also necessary.
- Any damaged, faulty or malfunctioning tools, equipment should be immediately withdrawn from use and addressed according to organizational policies and procedures

Elaborate

Check the following details before doing reporting or providing any repair suggestions:

- Last date of inspection
- Last date of repair and which part was repaired.
- Life cycle of the tool, equipment or machine

In machine or equipment faulty or damage report you have to provide following details:

- Name of the tool or machine
- Registration details of machine
- Who does the inspection of toll and machine before the use
- Trouble or hazard from the defective tool or machine
- Defective part name or number
- Remedial action - Tool or machine has to be discontinue or need repair
- Which process is going to affect due to the faulty machine or tool
- Report whether the machine or tool is performing accurately or precisely.
- Report that there limits, fits and tolerances are set or not according to industrial standards.

Activity

- Ask the students to assemble together.
- Make pairs of students
- Tell them to imagine a fire accident and prepare a fire accident report

Skill Practice	Time	Resources
Fire accident report	1 hour	Checklist

Do

- Provide them a fire hazard situation for making report.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the trainees and add onto what they are doing.
- Wrap the unit up after summarizing the key points and answering questions.

Scan the QR code or click on the link to watch related videos

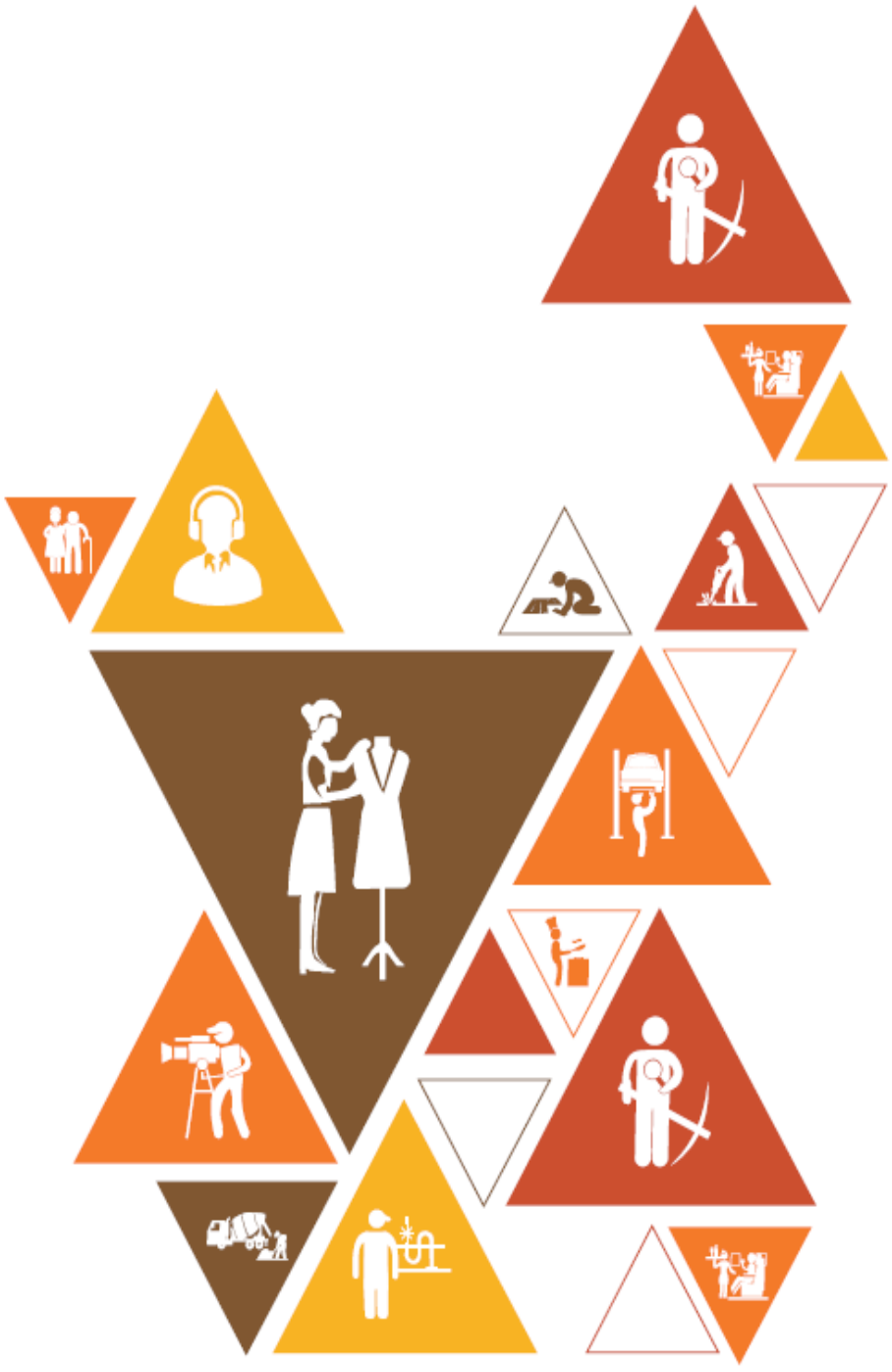
https://youtu.be/Rh1s-f7a6qg

Reporting and Documentation

Exercise

1. a 2. a 3. a 4. c
5. b 6. d 7. Ears 8. a
9. d 10. d 11. b 12. b

13. Accident report



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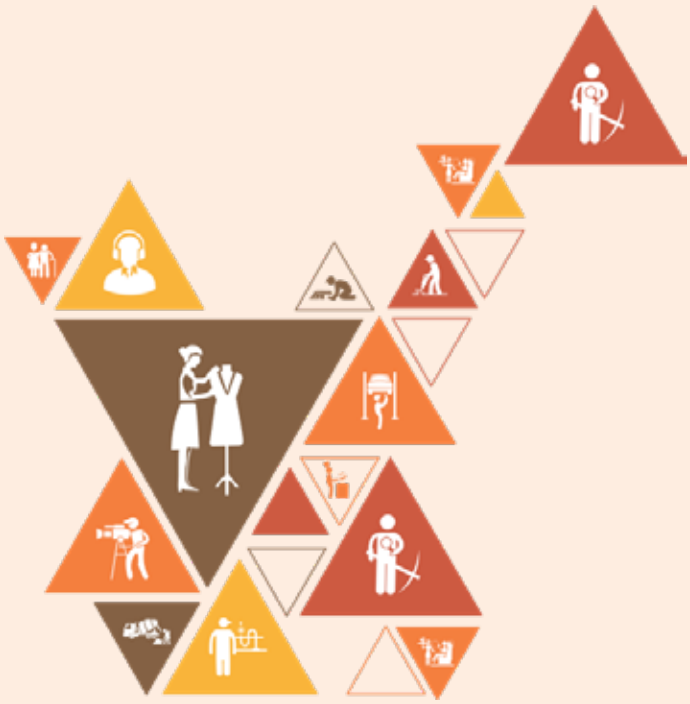
National
Skill Development
Corporation
Transforming the skill landscape

3. Effective Communication and Interpersonal Skills at Workplace

Unit 3.1 – Working with Others

Unit 3.2 – Workplace Etiquette

Unit 3.3 – People with Disability (PwD) and Gender Sensitization



ISC/N0009

Key Learning Outcomes

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

1. Discuss how to do effective communication with colleagues
2. Explain workplace etiquette
3. List characteristics of team
4. List advantages of teamwork
5. Demonstrate ways to communicate with People with Disability (PwD)
6. Demonstrate ways to communicate with different gender people.

UNIT 3.1: Working with Others

Unit Objectives

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

1. Discuss how to communicate effectively with colleagues
2. Explain effective communication
3. List characteristics of team

Resources to be used

- Available objects such as a duster, pen, notebook etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Ask

- What is the need and importance of teamwork?
- List advantages of team work.

Say

- The current trend of working in an organization is to work in form of teams. While working in an organization they have to support and guide other team members also.
- A good team is the one that motivates its members to have a positive attitude, perform better.
- Team work is a very important part of working life. They can have a big impact on the profitability of an organization, team and individual performance, company reputation, etc.
- The three important determinants of teamwork are leadership, the building of the right kind of groups or teams for better productivity.

Elaborate

Lessons from the Geese:

Teams are much more effective than individuals for work. Let's look at an example from Mother Nature to learn how an effective team works.

The geese actually fly in a group on their long flight of migration.

The flapping of the geese that are in front of the formation creates a draft for the geese at the rear reducing air resistance. This indicates their true sense of responsibility towards the fellow beings.

When the leader of the formation of the geese is tired, it goes back and another goose then comes in the front to lead the group of Geese. So, these Geese have no fixed leadership or hierarchy.

No goose likes to fly out of formation because it would get tired easily. Even if it does fly out of formation, it quickly comes back to its place. So, Geese have amazing team sense!

Geese also make a lot of noise while they fly. But it's interesting to note that the noise is not made by the geese leading the formation, but by the Geese in the back of the formation, which serve to support and keep everyone going. Isn't that the unique vocal support?

If one goose is ill and falls out of formation, a few of others stay with it, to be with it until it gets well or dies. Now, that's what we call team spirit!

Geese are unique as a team. The team behaves as a cohesive whole with a common goal of reaching a particular destination in mind. Team members help each other since they can collectively achieve much more than they can alone.

As explained about the Geese, being a human if we are sharing common set of direction and have consider our community can move fast and reach to our goal in shorter period because we move with trust on each other.

Considering the Geese if we follow their footsteps we will be connected with the persons who could lead us to reach our destination. We willing accept help from others and offer our help to others.

It pays to take turns in doing the hard tasks and share the leadership. As with Geese, people are interdependent on each other's skills, capabilities and unique arrangements of gifts, talents and resources.

We need to make sure we are encouraging each other in the team. In teams where there is encouragement, the production is much higher.

If we have as much sense as Geese, we will stand by each other in difficult times as well as when we are strong. Now, what do you say to that!!!

Explain

- Explain teamwork checklist need to follow at workplace
- Advantages of teamwork

Activity

- Divide students into teams and give them equal amounts of newspaper, gum, cello tapes – no scissors or blade should be used. Ask them to construct a castle in 30 mins. Best team will be identified based upon the following criteria:
- Which team can build the tallest, structurally-sound castle?
- Which team can build a castle the fastest?
- Divide students into teams and in each team, 1 person should be the player. The player should not speak throughout the game, The eyes of the player will be tied and the rest of the team should direct him towards the exit of the room. The player should not touch any object till he/she reaches the exit door. Also, the team members should make sure they give him the proper clue for the directions. There is one more requirement. The player should first be directed to a place where the marker pen is placed. The player needs to pick it and then go towards the exit door. The team should co-ordinate amongst them and helps the player throughout the game. Time limit is 15 mins for each team.
    - Questions to ask during the review:
    - Did you come up with a strategy before starting the challenge?
    - Did you adapt your game plan?
    - How did you feel being blindfolded? Did you always trust your communicators?
    - Did you get frustrated at any point?

Say

- Each colleague plays an important role in the success of the organization
- People like hearing their own names, don't assume a person is more or less important, Self-assess and Respect other people's personal space are some ways of communicate with others properly.
- Communication is a tool which connects us with other human beings. An effective communication not only helps in developing a sense of belonging but also facilitates better working, improves relationships, reduces stress.
- Communication is the process of exchange of words, ideas, feelings. It is the meaningful exchange of information between two or more participants.

Ask

- What are the ways of effective communication with colleagues?

Explain

- Elements of effective communication
- Ways of effective communication

Team Activity

- Ask the trainees to assemble together.
- Tell the trainees to make pairs and plan a communication on any topic.
- Each pair has to communicate together for 5 minutes.in front of class.

Skill Practice	Time	Resources
Effective communication between 2 persons	1 hour	Communication tools

Do

- Go around and make sure they are doing it properly.
- Praise them for their efforts.
- Wrap the unit up after summarizing the key points and answering questions.

Scan the QR code or click on the link to watch related videos

https://youtu.be/se3r-b_iwV8

,,, Communication with others

https://youtu.be/CQmnf5zSt5o

Workplace etiquette

UNIT 3.2: Workplace Etiquette

Unit Objectives

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

1. Explain organization policies and procedures
2. Explain workplace etiquette

Resources to be used

- Available objects such as a duster, pen, notebook etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Ask

- What is the role of colleagues in the success of the organization?
- How to make a good impression on the job?
- Why one's uniform should be neat, clean and ironed?

Say

- Office etiquette is important because bad manners at work can be bad for business by negatively affecting employee morale and productivity.
- Etiquette is basically polite behavior and courtesy, a person is expected to follow.
- The way you present yourself to others in the business world speaks volumes about you. Many people form first impressions about others within seconds of meeting them
- Make a positive impression, cooperate with colleagues and work space savvy are some important tips to help you succeed on the job.
- A well-groomed personality projects a good image and speaks well of hygiene and efficiency.

Elaborate

Discuss and elaborate these points with trainees

- Organization policies and procedures while working with colleagues:
- Work etiquettes
- Grooming of personnel

Do

Show certain etiquette that should be kept in mind at workplace:

- Stand straight, make eye contact and turn towards people when they are speaking.
- Follow the dress code prescribed by the organization.
- Limit personal calls especially when you are working in a manufacturing unit.
- Eat and smoke to the designated areas
- Discipline
- Commitment to work
- Punctuality

Activity

- Ask the students to narrate instances when they have been scolded by their school teachers/ elders for behaving inappropriately-like dragging one' feet while walking, etc.
- Look for other such instances.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 3.3: People with Disability (PwD) and Gender Sensitization

Unit Objectives

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

1. Demonstrate ways to communicate with People with Disability (PwD)
2. Demonstrate ways to communicate with different gender people

Resources to be Use

- Available objects such as white board, marker pens, duster.
- PC with LCD Projector or Flip Chart

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- Each colleague plays an important role in the success of the organization.
- We communicate with people many times every day, either face to face, on the phone or in writing. When communicating with someone with disability, it is important to treat them like others but keeping some points in mind, so that they cannot hurt due to their disability.
- Similarly when communicating with different gender person, we need to consider some points at workplace, so that it can shows any discrimination due to different gender.

Ask

- What are the ways of effective communication with PwD and different gender people?

Elaborate

Elaborate and discuss below points with trainees

- Way to communicate with PwD
- Barriers in communication with different gender
- Differences between male and female communication style in workplace
- Ways to communicate with different gender people
- Six principles of gender responsive communication

Explain

- Differences between male and female communication style in workplace
- Six principles of gender responsive communication
- Common mistakes during communication with different gender

Do

- Show them how to communicate properly with PwD
- Show them how to communicate properly with different gender

Team Activity

- Ask the students to assemble together.
- Tell the trainees to make 6 groups and plan a role play on communication on any topic.
- By this activity, thery learn how to communicate effectively with PwD and different gender people.

Skill Practice	Time	Resources
Effective communication topic with different gender and PwD	3 hours	Communication tools

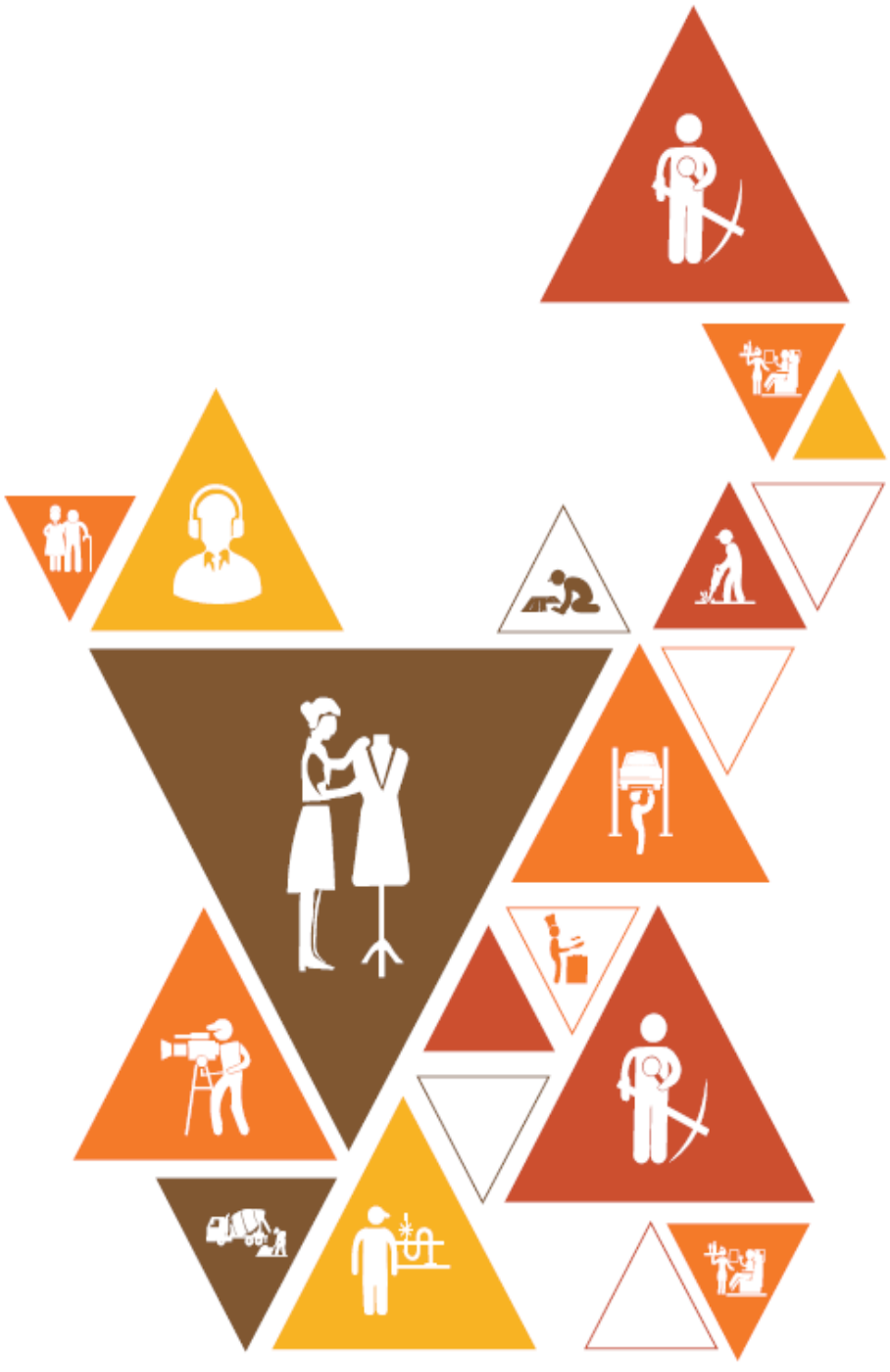
Do

- Each group has to present the role in front of class.
- Support them in preparing role play.
- Praise them for their efforts.

Exercise

Answers of the exercise

1. as discussed 2. as discussed 3. as discussed 4. as discussed
5. d 6. d 7. b 8. d 9. d 10. d



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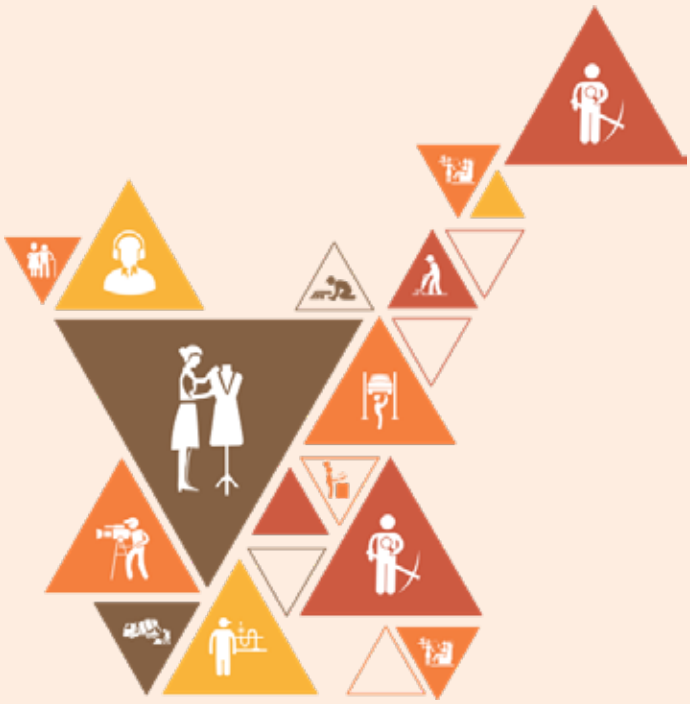
4. Prepare for Fitting and Assembly Operations

Unit 4.1 – Hydraulic System

Unit 4.2 – Pneumatic System

Unit 4.3 – Components of Hydraulic and Pneumatic System

Unit 4.4 – Basic Symbols of Hydraulic and Pneumatic Equipment



ISC/N0918

Key Learning Outcomes

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

1. Explain hydraulic system
2. Explain basic principles of hydraulic system
3. List components of hydraulic system
4. Explain pneumatic system
5. Explain basic principles of pneumatic system
6. List components of pneumatic system
7. Identify hydraulic circuit symbols
8. Identify pneumatic circuit symbols

UNIT 4.1: Hydraulic System

Unit Objectives

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

1. Explain hydraulic system
2. Explain basic principles of hydraulic system

Resources to be Used

- Available objects such as whiteboard, marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- Now, we will study about hydraulic and pneumatic system, components of hydraulic and pneumatic system, operation and maintenance of a hydraulic and pneumatic system. Firstly, we start with understanding a hydraulic system.
- A hydraulic system is a drive technology where a fluid is used to move the energy from e.g. an electric motor to an actuator, such as a hydraulic cylinder. The fluid is theoretically uncompressible and the fluid path can be flexible in the same way as an electric cable.
- The main reason for using hydraulics is the high power density and secondly the simplicity coming from using few components to realize complex and fast moving machines with a high degree of safety.

Ask

Ask these questions to trainees to check their understanding

- How a hydraulic system works?
- On what factors we can select the fluid for a hydraulic system?

Elaborate

Elaborate and discuss below points with trainees

- Basic working process of hydraulic system
- Characteristics of hydraulic system
- Basic working principles of hydraulic system
  - » Pascal's Law
  - » Computing Force, Pressure and Area
  - » Incompressibility and Expansion of Liquids
- Hydraulic fluids types and there selection criteria
- Hydraulic system components
- Applications of hydraulic system in industry

Explain

- working principles of hydraulic system
- Advantages of hydraulic system
- Selection criteria and characteristics of hydraulic fluid

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 4.2: Pneumatic System

Unit Objectives

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

1. Explain pneumatic system
2. Explain basic principles of pneumatic system

Resources to be Used

- Available objects such as whiteboard, marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- In this session, we will understand about pneumatic system.
- Pneumatic system uses the compressed air or other gas for transmitting and controlling power to actuating mechanisms.
- Pneumatics are used in factory set ups, construction, mills, building, and technology by using a central source of compressed-air for power. Practically everything could run on pneumatics including any form of transportation.

Ask

Ask these questions to trainees to check their understanding

- How a pneumatic system works?
- On what factors we can select the fluid for a pneumatic system?

Elaborate

Elaborate and discuss below points with trainees

- Basic working process of pneumatic system
- Characteristics of pneumatic system
- Basic working principles of pneumatic system
  - » Boyle's Law
  - » Charles' Law
  - » Kinetic theory of gases
  - » Compressibility and expansion of gases
- Pneumatic gases and there selection criteria
- Pneumatic system components
- Applications of pneumatic system in industry

Explain

- Working principles of pneumatic system
- Advantages of pneumatic system
- Selection criteria and characteristics of pneumatic gas
- Safety precautions need to follow while operating hydraulic and pneumatic system
- Difference between hydraulic and pneumatic system

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 4.3: Components of Hydraulic and Pneumatic System

Unit Objectives

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

1. Describe basic components of a hydraulic system
2. Describe basic components of a pneumatic system

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, samples of hydraulic and pneumatic system components.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do

- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.

Say

In this session we will discuss about various components of hydraulic and pneumatic system. After this session they can understand the functioning of hydraulic and pneumatic system components.

Notes for Facilitation

- You could explain the function of various hydraulic or pneumatic system components.
- Invite students to participate. List the responses from students on the whiteboard.
- Give the students a brief overview of what all will be covered in the unit.
- Show the components of hydraulic and pneumatic system to trainees for better understanding.

4.3.1: Components of Hydraulic System

Say

- Firstly, we will start with understanding the components of a hydraulic system.

Ask

Ask these questions to trainees to check their understanding

- List different components of hydraulic system.
- What are the various parameters need to consider for hydraulic system components selection?

Elaborate

Discuss and elaborate the following components of a hydraulic system to trainees. Use trainee handbook for explanation.

Components of a hydraulic system

- Reservoir
- Pumps
- Strainers and filters
- Valves
- Actuators
- Motors
- Accumulators
- Oil Cooler
- Cooling Fan
- Tubing, Piping, and Hose
- Connectors and fittings
- Seals

Explain

- Function of each component
- Different types of each component and their difference
- Features and characteristics of each component and their types
- Parameters for the selection of each component

Do

- Show the each hydraulic system component and their types to the students.
- Take the trainees into workshop and demonstrate functioning of each component to trainees.

4.3.2: Components of Pneumatic System

Say

- Now, we will understand the components of a pneumatic system.
- In Pneumatic system, few components are similar to Hydraulic system such as actuators, motors, valves, tubing and piping, connectors & fittings and seals which we are already discussed in previous session.

Ask

Ask these questions to trainees to check their understanding

- List different components of pneumatic system.
- What are the various parameters need to consider for pneumatic system components selection?

Elaborate

Discuss and elaborate the following components of a pneumatic system to trainees. Use trainee handbook for explanation.

Components of a pneumatic system

- Receiver tank

- Compressor
- Filters
- Coolers – Intercooler and aftercooler
- Lubricators
- Valves
- Actuators
- Motors
- Tubing, Piping, and Hose
- Connectors and fittings
- Seals

Explain

- Function of each component
- Different types of each component and their difference
- Features and characteristics of each component and their types
- Parameters for the selection of each component

Do

- Show the each pneumatic system component and their types to the students.
- Take the trainees into workshop and demonstrate functioning of each component to trainees.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 4.4: Basic Symbols of Hydraulic and Pneumatic Equipment

Unit Objectives

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

1. Identify hydraulic circuit symbols
2. Identify pneumatic circuit symbols

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, sample hydraulic and pneumatic system circuit diagram.
- PC with LCD Projector or Flip Chart
- Participant Manual

Say

To understand the structure of a hydraulic or pneumatic system, firstly we need to understand the circuit diagram of hydraulic or pneumatic system. We need to learn the symbols of various components and parts of hydraulic or pneumatic system which are illustrated in the circuit diagram.

In this session, we know about symbols representing the hydraulic or pneumatic system components in the circuit diagram.

Do

- Show the samples of circuit drawings of hydraulic and pneumatic system.
- Explain the use of circuit drawings to trainees
- Show how to read the circuit drawings and there symbols to trainees.

4.4.2: Hydraulic System Circuit Symbols

Elaborate

Elaborate and discuss below points with trainees

- Circuit diagram of hydraulic system
- Symbols of components and parts of hydraulic system such as
  - Reservoir
  - Check valves
  - Pumps
  - Filters and oil coolers
  - Gauges and meters
  - Hoses and isolation valves
  - Directional control valves (DCVs)
  - DCV Activation methods
  - Accumulators
  - Pressure reducing valves
  - Relief valves
  - Counterbalance/over-centre valves
  - Sequence valves
  - Unloading/accumulator-charging valves
  - Brake valve
  - Flow controls
  - Actuators
  - Cylinders
  - Prime movers
  - Lines
  - Miscellaneous Units
  - Color code for fluid power schematic drawings

Do

- Show them all the symbols.
- Explain the meaning of each symbol.

Activity

- Ask the students to assemble together.
- Call each student and tell them to identify the symbols drawn on whiteboard.

Skill Practice	Time	Resources
Identification of symbols	20 minutes	Hydraulic system symbols

Do

- Draw the symbols on whiteboard
- Ask trainees to identify the component symbol.
- Ensure that, they are identifying the correct component.

4.4.3: Pneumatic System Circuit Symbols

Elaborate

Elaborate and discuss below points with trainees

- Circuit diagram of pneumatic system
- Symbols of components and parts of pneumatic system such as
  - Prime movers
  - Directional control valves (DCVs)
  - Pneumatic cylinder
  - Conditioning components
  - Miscellaneous symbols

Do

- Show them all the symbols.
- Explain the meaning of each symbol.

Activity

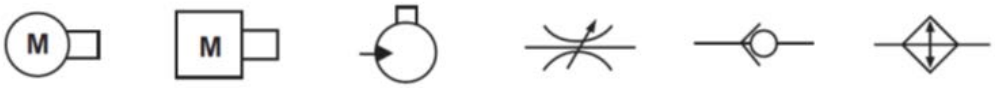
- Ask the students to assemble together.
- Call each student and tell them to identify the symbols drawn on whiteboard.

Skill Practice	Time	Resources
Identification of symbols	20 minutes	Pneumatic system symbols

Do

- Draw the symbols on whiteboard
- Ask trainees to identify the component symbol.
- Ensure that, they are identifying the correct component.

Exercise

1. Valve, Reservoir, Pump and actuator
2. d 3. d 4. b 5. c 6. b 7. a
8. A: double-acting cylinder, B: 4/2 lever-operated with detent DCV, C: pressure gauge, D: pressure-relief valve, E: flexible hose, F: return-line filter, G: pump, H: fluid conductor (pipe), I: reservoir
9. 

10. a

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Notes

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5. Perform Fitting and Assembly of Hydraulic and Pneumatic Equipment

Unit 5.1 – Tools Required

Unit 5.2 – Pre-inspection of Hydraulic and Pneumatic Equipment

Unit 5.3 – Disassembly and Assembly of Hydraulic and Pneumatic Equipment

ISC/N0919

Key Learning Outcomes

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

1. List tools and equipment required for hydraulic and pneumatic system fitting job.
2. Demonstrate use of tools and equipment required for hydraulic and pneumatic system fitting job.
3. List components need to inspect before operation
4. Demonstrate pre-inspection of hydraulic and pneumatic system
5. Explain basic assembly process of hydraulic and pneumatic components
6. Demonstrate disassembly procedure of hydraulic and pneumatic components
7. Demonstrate assembly procedure of hydraulic and pneumatic components

UNIT 5.1: Tools Required

Unit Objectives

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

1. List tools and equipment required for hydraulic and pneumatic system fitting job.
2. Demonstrate use of tools and equipment required for hydraulic and pneumatic system fitting job.

Resources to be Used

- Facilitator can use the available objects such as whiteboard, marker, duster, participant manual etc.
- Wrenches, Screw driver, Rubber Mallet, Induction Bearing Heater, Bearing Puller, Punch, Pliers, Torque Wrench, Allen Wrench, Dial Indicator, Micrometer, Measuring tape, Spirit level, Feeler gauge, PPE etc.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say

- During fitting job various types of tools and equipment are also required. In this session we learn about those tools and equipment.
- Proper handling and operation of tools and equipment is very important, otherwise this can be dangerous for you and others also.

Ask

- List various tools and equipment required during hydraulic and pneumatic system fitting work.

Elaborate

Elaborate and discuss selection criteria, functioning and use of following tools and equipment as given in participant manual

- Wrenches
- Screw driver
- Rubber Mallet
- Induction Bearing Heater
- Bearing Puller
- Punch
- Pliers
- Torque Wrench
- Allen Wrench
- Dial Indicator
- Micrometer
- Measuring tape
- Spirit level
- Feeler gauge
- PPE

Do

- Show the tools and equipment required during hydraulic and pneumatic system fitting work.
- Demonstrate the use of tools and equipment required during hydraulic and pneumatic system fitting work.

Activity

- Conduct a skill practice activity.
- Ask the students to assemble together.
- Tell them to practice use of tools and equipment required during hydraulic and pneumatic system fitting work.

Skill Practice	Time	Resources
Use of tools and equipment required during hydraulic and pneumatic system fitting work	3 hour	Wrenches, Screw driver, Rubber Mallet, Induction Bearing Heater, Bearing Puller, Punch, Pliers, Torque Wrench, Allen Wrench, Dial Indicator, Micrometer, Measuring tape, Spirit level, Feeler gauge etc.

Do

- Ask them to get into pairs for practice.
- Tell them to collect the tools and equipment and do practice of using them properly.
- Go around and make sure they are practicing properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 5.2: Pre-inspection of Hydraulic and Pneumatic Equipment

Unit Objectives

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

1. List components need to inspect before operation
2. Demonstrate pre-inspection of hydraulic and pneumatic system

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, hydraulic and pneumatic system and inspection tools.
- PC with LCD Projector
- Participant Manual

Do

- Greet and welcome the participants to the next session of the program.

Say

- It is necessary to pre-inspect the hydraulic and pneumatic system and its components before starting the operation.
- Follow the manufacturer instructions when inspecting the hydraulic and pneumatic system and its components.

Ask

- Ask about the pre-inspection checklist of hydraulic and pneumatic system and its components.

Elaborate

Elaborate and discuss the pre-inspection procedure of hydraulic and pneumatic system and its components as given in trainee handbook.

Demonstrate

Take the trainees into workshop and demonstrate the pre-inspection procedure of hydraulic and pneumatic system and its components as given in trainee handbook.

- Regular checks
- Checking reservoir and oil
- Checking cooler, lines and connectors
- Checking valves
- Checking cylinders
- Checking motors

Activity

- Conduct a skill practice activity.
- Ask the students to assemble together.
- Ask them to divide into 5 groups for practice.
- Tell them to inspect the available hydraulic and pneumatic system and its components as discussed

Skill Practice	Time	Resources
Pre-inspection of hydraulic and pneumatic system and its components	4 hours	Hydraulic and pneumatic system Inspection tools

Do

- Provide them a hydraulic and pneumatic equipment
- Tell them to inspect the given hydraulic or pneumatic equipment as discussed.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.
- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.

Exercise

1. Contamination, excessive noise, excessive heat and incorrect flow
2. Use of water and soap solution for checking leaks
3. a
4. d
5. Viscosity decreases
6. Causes of overheating
   - Improper adjustments
   - Undersized system piping
   - Undersized reservoir
   - Worn components
7. Effects of overheating
   - Unloading valve set too high
   - Fluid dirty or low supply
   - Incorrect fluid viscosity
   - System pressure too high
8. Compressor protection devices
   - The battery into the suction line.
   - Hot gas bypass valves to move the hot gas in the suction line. There, the gas can evaporate in any liquid.
   - Temperature-sensing devices and solenoid valves.
   - Electric heaters to warm the suction line of the vapor-liquid
9. Water entering oil reservoir due to compressor operating in high humidity environment
10. It is the first component of pneumatic system filter
11. Sodium chloride and sulfuric acid

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 5.3: Disassembly and Assembly of Hydraulic and Pneumatic System Components

Unit Objectives

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

1. Explain basic assembly process of hydraulic and pneumatic components
2. Demonstrate disassembly procedure of hydraulic and pneumatic components
3. Demonstrate assembly procedure of hydraulic and pneumatic components

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, hydraulic system components, pneumatic system components, tools etc.
- PC with LCD Projector or Flip Chart
- Participant manual

Say

- Once completing the pre-inspection and repairing of hydraulic or pneumatic equipment, now we are ready for starting the fitting operation.
- In this session, we will learn about fitting procedure of various hydraulic or pneumatic system components.

Notes for Facilitation

- You could ask the trainees about the fitting procedure of various hydraulic or pneumatic system components.
- Invite students to participate. List the responses from students on the whiteboard.
- Give the students a brief overview of what all will be covered in the unit.
- Demonstrate the fitting procedure of hydraulic or pneumatic system components to trainees.

5.3.1: Basic Process of Hydraulic and Pneumatic System Components Assembly

Say

- When we are going to start the fitting of hydraulic or pneumatic system components, there is a specific process need to follow for the fitting of equipment components.

Ask

Ask these questions to trainees

- What they know about basic fitting process of hydraulic or pneumatic system?
- List components of a hydraulic and pneumatic system.

Elaborate

Discuss and elaborate the basic fitting process of hydraulic or pneumatic system to trainees

- Mounting;
- Starting-up safety instructions;
- Filling;
- Flushing;
- Electrical connections;
- Pumps and devices;
- Switching ON;
- Air bleeding and
- Filter

Explain

- Explain basic fitting process to trainees.

5.3.2: Dismantle, Replace and Assemble Filter, Reservoir and Lubricator (FRL) Unit

Say

- Firstly, we will start with the dismantling, replacement and assembling of components of Filter, Reservoir and Lubricator (FRL) Unit.

Ask

- What is the function of FRL unit?

Do

- Show the components of FRL unit of a hydraulic system to the trainees.
- Show and explain the circuit diagram of FRL unit of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate following activities procedure of FRL unit components as given in trainee handbook to them.

1. Overhauling a filter of FRL unit and Lubricator
2. Overhauling a lubricator of FRL unit
3. Mounting and reading of pressure

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform overhauling of FRL unit of a hydraulic system.

Skill Practice	Time	Resources
Overhauling of FRL unit of a hydraulic system	8 hours	Hydraulic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.3: Disassembly and Assembly of Cylinder

Say

- Now, we will do the disassembly and assembly of cylinder from a hydraulic and pneumatic system.

Ask

- What is the function of cylinder in a hydraulic and pneumatic system?

Do

- Show the cylinder inside a hydraulic and pneumatic system to the trainees.
- Show and explain the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate disassembly and assembly procedure of cylinder from a hydraulic and pneumatic system as given in trainee handbook to them.

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform disassembly and assembly of cylinder in a hydraulic and pneumatic system.

Skill Practice	Time	Resources
Disassembly and assembly of cylinder in a hydraulic and pneumatic system	8 hours	Hydraulic and pneumatic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.4: Dismantling and Assembling of Solenoid Valves

Say

- Now, we will do the disassembly and assembly of solenoid valve from a hydraulic and pneumatic system.

Ask

- What is the function of solenoid valve in a hydraulic and pneumatic system?

Do

- Show the solenoid valve inside a hydraulic and pneumatic system to the trainees.
- Show and explain the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate disassembly and assembly procedure of solenoid valve from a hydraulic and pneumatic system as given in trainee handbook to them.

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform disassembly and assembly of solenoid valve in a hydraulic and pneumatic system.

Skill Practice	Time	Resources
Disassembly and assembly of solenoid valve in a hydraulic and pneumatic system	8 hours	Hydraulic and pneumatic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.5: Inspect Fluid Levels, Service Reservoirs, Clean/ Replace Filters

Say

- Now, we will do the disassembly and assembly of reservoir and filter from a hydraulic and pneumatic system.

Ask

- What is the function of filter in a hydraulic and pneumatic system?
- How can you inspect fluid levels in the reservoir?

Do

- Show the components inside a reservoir to the trainees.
- Show and explain the location of reservoir components and inlet filter in the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate following procedure as given in trainee handbook to them.

1. Disassembly of reservoir components
2. Preparing the power component for an operation
3. Starting and setting the pressure in power component
4. Removal of an inlet filter from reservoir
5. Cleaning and assembling of inlet filter
6. Dismantling of externally mounted suction strainer

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform disassembly and assembly of inlet filter from the reservoir of a hydraulic system.

Skill Practice	Time	Resources
Disassembly and assembly of inlet filter	8 hours	Hydraulic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.6: Disassembly and Assembly of Pump

Say

- Now, we will do the disassembly and assembly of pump from a hydraulic and pneumatic system.

Ask

- What is the function of pump in a hydraulic and pneumatic system?

Do

- Show the pump inside a hydraulic and pneumatic system to the trainees.
- Show and explain the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate disassembly, replacement and assembly procedure of pump from a hydraulic and pneumatic system as given in trainee handbook to them.

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform disassembly, replacement and assembly of pump in a hydraulic and pneumatic system.

Skill Practice	Time	Resources
Disassembly, replacement and assembly of pump in a hydraulic and pneumatic system	8 hours	Hydraulic and pneumatic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.7: Disassembly and Assembly of Actuator

Say

- Now, we will do the disassembly and assembly of actuator from a hydraulic and pneumatic system.

Ask

- What is the function of actuator in a hydraulic and pneumatic system?

Do

- Show the actuator inside a hydraulic and pneumatic system to the trainees.
- Show and explain the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate disassembly and assembly procedure of actuator from a hydraulic and pneumatic system as given in trainee handbook to them.

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform disassembly and assembly of actuator in a hydraulic and pneumatic system.

Skill Practice	Time	Resources
Disassembly and assembly of actuator in a hydraulic and pneumatic system	8 hours	Hydraulic and pneumatic system Tools and equipment

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

5.3.8: Preparation of Pipes, Tubes and Fittings Before Installation in a Hydraulic and Pneumatic System

Say

- For an effective hydraulic or pneumatic system, proper preparation and installation of hoses, pipes and fittings is necessary.
- In this session, we will learn about preparation and installation of hoses, pipes and fittings in a hydraulic and pneumatic system.

Ask

- Why proper preparation and installation of hoses, pipes and fittings is necessary?

Do

- Show the different types of hoses, pipes and fittings used in a hydraulic and pneumatic system.
- Show and explain the placement of hoses and pipes in the circuit diagram of a hydraulic system to the trainees.

Demonstrate

Take the trainees into workshop and demonstrate the following procedure as given in trainee handbook to them.

1. Inspection of hose, pipe and pipe fittings
2. Preparation of hose
3. Tube bending
4. Preparation of flare type fittings
5. Installation of hoses, pipes and fittings in the system

Activity

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform preparation and installation of hoses, pipes and fittings in a hydraulic and pneumatic system.

Skill Practice	Time	Resources
Preparation and installation of hoses, pipes and fittings in a in a hydraulic and pneumatic system	8 hours	Hydraulic and pneumatic system Tools and equipment Hoses, pipes and fittings

Do

- Go around and make sure trainees are performing the activity properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Field visit

- Plan a visit to nearby industry and show hydraulic and pneumatic system equipment fitting procedures to them.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Field visit

- Plan a visit to nearby industry and show assembly and dissembly of hydraulic and pneumatic system.

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Exercise

1. Take inputs from unit 7.1
2. Because system control valves protect the machine from mechanical overload
3. A pinhole leak, under pressure, could actually inject fluid under your skin, causing poisoning, infection, and threaten life and limb.
4. B
5. D
6. C
7. Excessive air choke, Air leak at regulator, Pressure problems and Filter problems
8. Advantages
    - Operator and machine safety
    - Machine efficiency
    - Cost
    - Time saving
9. Use of water and soap solution for checking leaks
10. Effects of contamination on pneumatic system
    - shorten seal life
    - damage surface finishes
    - Overheating of system

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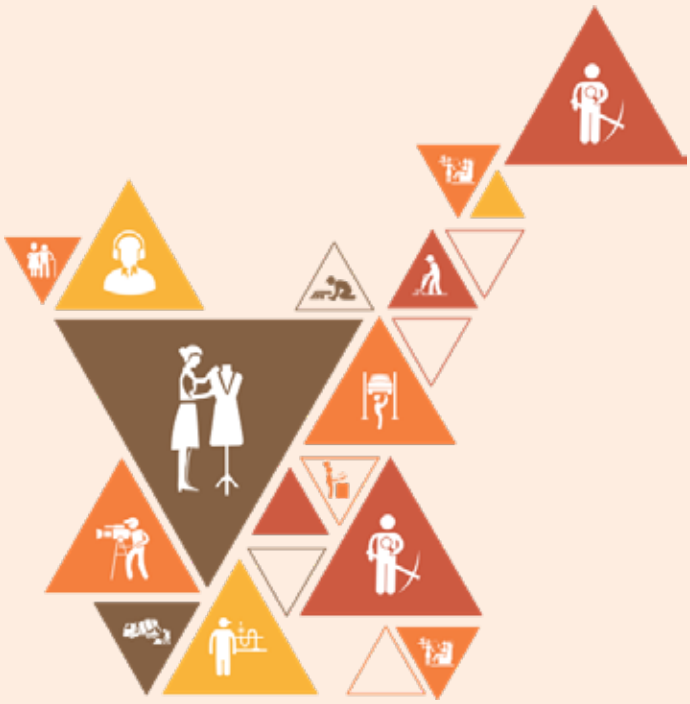
6. Perform Post-Assembly Activities

Unit 6.1 – Testing of Hydraulic and Pneumatic Equipment



ISC/N0920

Key Learning Outcomes

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

1. Explain hydraulic and pneumatic system testing process
2. Demonstrate system temperature testing process
3. Demonstrate system leakage testing process
4. Demonstrate system testing process

UNIT 6.1: Testing of Hydraulic and Pneumatic Equipment

Unit Objectives

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

1. Explain hydraulic and pneumatic system testing process
2. Demonstrate system temperature testing process
3. Demonstrate system leakage testing process
4. Demonstrate system testing process

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, hydraulic and pneumatic system, testing tools and equipment.
- PC with LCD Projector or Flip Chart
- Participant manual

Say

- Regular inspection is especially important for cranes.
- The daily safety inspection must be conducted by the operator each day and/or prior to use at the beginning of each shift.

Ask

Ask these questions to trainees

- What are the common defects occurred in a hydraulic and pneumatic system?
- How you can test a hydraulic and pneumatic system for leakage and high temperature?

Elaborate

Discuss and elaborate these points with trainees

- Basic testing process
- Hydraulic and pneumatic system temperature testing process
- Hydraulic and pneumatic system leakage testing process
- Hydraulic and pneumatic system components testing process
    - Tee Testing
    - Pump test
    - Relief valve test
    - Tee testing for leakage in control valves and cylinders
    - Motor in-line testing

Explain

- Explain hydraulic and pneumatic system temperature testing process
- Explain hydraulic and pneumatic system leakage testing process
- Explain hydraulic and pneumatic system components testing process

Demonstrate

Take the trainees into workshop and demonstrate the following testing procedures as given in trainee handbook to them.

1. Demonstrate hydraulic and pneumatic system temperature testing process
2. Demonstrate hydraulic and pneumatic system leakage testing process
3. Demonstrate hydraulic and pneumatic system components testing process

Activity 1

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform system temperature and leakage testing process.

Skill Practice	Time	Resources
System temperature and leakage testing process	8 hours	Hydraulic or pneumatic system Testing tools and equipment

Do

- Provide a hydraulic or pneumatic equipment to each group
- Tell them to perform temperature and leakage testing process as discussed in workshop.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Activity 2

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform Tee and motor inline testing process.

Skill Practice	Time	Resources
System Tee and motor inline testing process	8 hours	Hydraulic or pneumatic system Testing tools and equipment

Do

- Provide a hydraulic or pneumatic equipment to each group
- Tell them to perform Tee and motor inline testing process as discussed in workshop.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Field visit

- Plan a visit to nearby industry and show testing of hydraulic and pneumatic system.

Exercise

1. Take inputs from unit 6.1
2. Because system control valves protect the machine from mechanical overload
3. A pinhole leak, under pressure, could actually inject fluid under your skin, causing poisoning, infection, and threaten life and limb.
4. B
5. D

Notes for Facilitation

- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Scan the QR code or click on the link to watch related videos

https://www.youtube.com/watch?v=t_peXaC6DDo
Pneumatic System Testing

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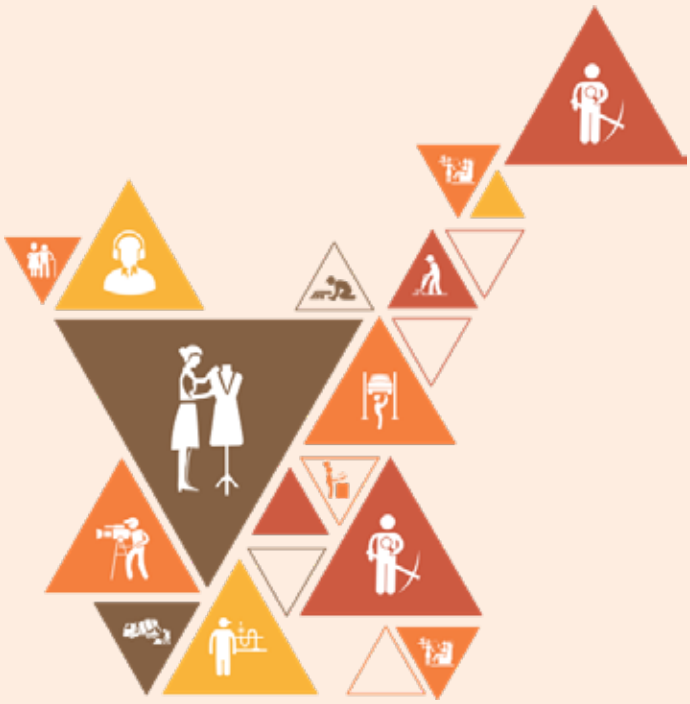
7. Perform Maintenance of Hydraulic and Pneumatic Equipment

Unit 7.1 – Maintenance of Hydraulic and Pneumatic Equipment

Unit 7.2 – Troubleshooting and Repairing of Hydraulic and Pneumatic System



ISC/N0921

Key Learning Outcomes

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

1. Explain maintenance program of a hydraulic and pneumatic system
2. Explain pressure, temperature and leakage problems in a hydraulic and pneumatic system
3. Demonstrate maintenance activities to correct problems in a hydraulic and pneumatic system.
4. Perform troubleshooting and repairing of hydraulic system components
5. Perform troubleshooting and repairing of pneumatic system components

UNIT 7.1: Maintenance of Hydraulic and Pneumatic System

Unit Objectives

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

1. Explain maintenance program of a hydraulic and pneumatic system
2. Explain pressure, temperature and leakage problems in a hydraulic and pneumatic system
3. Demonstrate maintenance activities to correct problems in a hydraulic and pneumatic system.

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, hydraulic and pneumatic system, inspection and repairing tools.
- PC with LCD Projector or Flip Chart
- Participant manual

Say

- Service life and operational safety of a hydraulic and pneumatic system depend to a large extent on proper maintenance and lubrication. All driving parts should be regularly examined for faultless operation.
- hydraulic and pneumatic system should be inspect for worn and broken parts, lubrication, loose fasteners and electrical parts during maintenance activities.
- The objective of the preventive maintenance schedule is to ensure that the equipment performs at maximum efficiency over a long period of time.

Ask

Ask these questions to trainees

- What they know about maintenance schedule of a hydraulic and pneumatic system?
- List components of a hydraulic and pneumatic system require routine maintenance and service.

Elaborate

Discuss and elaborate these points with trainees

- Components of a hydraulic and pneumatic system require routine maintenance and service.
  - Strainer
  - Breather
  - Accumulator
  - Control and safety valve
- Preventive measures
  - Leakage prevention
  - Overheating prevention
  - Water and corrosion
- Fluid contamination and its effects on hydraulic and pneumatic system components
- Effect of erosion
- Fluid filtration process
- Flushing process
- Dehumidification process

Explain

- Explain maintenance schedule of a hydraulic and pneumatic system.
- Explain maintenance suggestions and tips for a hydraulic and pneumatic system.
- Explain effect of fluid contamination on system hydraulic and pneumatic system components.

Demonstrate

- Take the trainees into workshop and demonstrate maintenance activities for a hydraulic and pneumatic system components as given in trainee handbook to them.
- General maintenance of hydraulic and pneumatic system components
- Fluid filtration process
- Flushing process
- Dehumidification process

Activity 1

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform maintenance and inspection of hydraulic and pneumatic components.

Skill Practice	Time	Resources
Maintenance of hydraulic and pneumatic components	8 hours	Hydraulic or pneumatic system Inspection tools and equipment

Do

- Provide a hydraulic or pneumatic equipment to each group
- Tell them to practice maintenance activities on the equipment as discussed in workshop
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Activity 2

- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform flushing and dehumidification process on hydraulic fluid.

Skill Practice	Time	Resources
Perform flushing and dehumidification process	8 hours	Contaminated hydraulic fluid Flushing and dehumidification process equipment

Do

- Provide a Contaminated hydraulic fluid to each group
- Tell them to practice flushing and dehumidification process as discussed in workshop
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

UNIT 7.2: Troubleshooting and Repairing of Hydraulic and Pneumatic System

Unit Objectives

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

1. Perform troubleshooting and repairing of hydraulic system components
2. Perform troubleshooting and repairing of pneumatic system components

Do

- Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Resources to be Used

- Available objects such as whiteboard, marker pens, duster, hydraulic and pneumatic system, inspection tools.
- PC with LCD Projector or Flip Chart
- Participant manual

Say

- Regular inspection of hydraulic and pneumatic system is necessary.
- The daily safety inspection must be conducted by the operator each day and/or prior to use at the beginning of each shift.
- In this unit, we will learn about troubleshooting and repairing of hydraulic and pneumatic system

Notes for Facilitation

- You could explain the troubleshooting and repairing procedure of hydraulic and pneumatic system.
- Give the students a brief overview of what all will be covered in the unit.
- Demonstrate the troubleshooting and repairing procedure of hydraulic and pneumatic system to trainees in workshop.

7.2.2: Troubleshooting of Hydraulic Systems

Say

- We start with understanding the troubleshooting and repairing procedure of a hydraulic system.

Ask

Ask these questions to trainees

- What are the common defects occurred in a hydraulic system?
- What they know about troubleshooting and repairing of various components of a hydraulic system?

Elaborate

Discuss and elaborate these points with trainees

- Steps for troubleshooting a hydraulic and pneumatic system
- Troubleshooting of defects, their causes and remedies for hydraulic system components
  - I. Excessive noise – Pump, motor and relief valve
  - II. Excessive heat - Pump, motor, relief valve and fluid
  - III. Incorrect flow – no flow, low flow and excessive flow
  - IV. Incorrect pressure – no pressure, low pressure, erratic pressure and excessive pressure
  - V. Faulty operation – no movement, slow movement, erratic movement and excessive speed or movement
  - VI. Fluid contamination
  - VII. Leakage

Explain

- Explain inspection checklist for hydraulic system.

Demonstrate

Take the trainees into workshop and demonstrate procedure for troubleshooting and repairing of defects in a hydraulic system as given in trainee handbook to them.

Activity

- Conduct a skill practice activity.
- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform troubleshooting and repairing of defects in a hydraulic system.

Skill Practice	Time	Resources
Troubleshooting and repairing of defects in a hydraulic system	5 hours	Hydraulic system Repairing tools and equipment

Do

- Provide a hydraulic equipment to each group.
- Tell them to troubleshoot the defects in the equipment.
- Ask for the remedies for repairing the defect identify in the equipment.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

7.2.3: Troubleshooting of Pneumatic Systems

Say

- Now, we understand the troubleshooting and repairing procedure of a pneumatic system.

Ask

Ask these questions to trainees

- What are the common defects occurred in a pneumatic system?
- What they know about troubleshooting and repairing of various components of a pneumatic system?

Elaborate

Discuss and elaborate these points with trainees

- Troubleshooting of defects, their causes and remedies for pneumatic system components
  I. Actuator moving abnormally slow – Excessive air choke and Pressure too low
  II. Filter / Regulator / Lubrication Unit - Air leak at regulator, Pressure problems, Filter problems
  III. Directional control valve not changing position – Coil not picking up, Valve spool stuck and Proportional valve not responding
  IV. Air Cylinders - Drift, No movement, Erratic movement, Cylinder body seal leak, Rod gland seal leak and Contamination in circuit

Explain

- Explain inspection checklist for pneumatic system.

Demonstrate

Take the trainees into workshop and demonstrate procedure for troubleshooting and repairing of defects in a pneumatic system as given in trainee handbook to them.

Activity

- Conduct a skill practice activity.
- Ask the students to assemble together.
- Divide the class into five equal groups
- Tell them to perform troubleshooting and repairing of defects in a pneumatic system.

Skill Practice	Time	Resources
Troubleshooting and repairing of defects in a pneumatic system	5 hours	Pneumatic system Repairing tools and equipment

Do

- Provide a pneumatic equipment to each group.
- Tell them to troubleshoot the defects in the equipment.
- Ask for the remedies for repairing the defect identify in the equipment.
- Go around and make sure they are doing it properly.
- Share your inputs and insight to encourage the students and add onto what they are doing.

Field visit

- Plan a visit to nearby industry and show maintenance program of hydraulic and pneumatic system.

Exercise

1. Take inputs from unit 7.1
2. Because system control valves protect the machine from mechanical overload
3. A pinhole leak, under pressure, could actually inject fluid under your skin, causing poisoning, infection, and threaten life and limb.
4. B
5. D
6. C
7. Excessive air choke, Air leak at regulator, Pressure problems and Filter problems
8. Advantages
    - Operator and machine safety
    - Machine efficiency
    - Cost
    - Time saving
9. Use of water and soap solution for checking leaks
10. Effects of contamination on pneumatic system
    - shorten seal life
    - damage surface finishes
    - Overheating of system

Notes for Facilitation

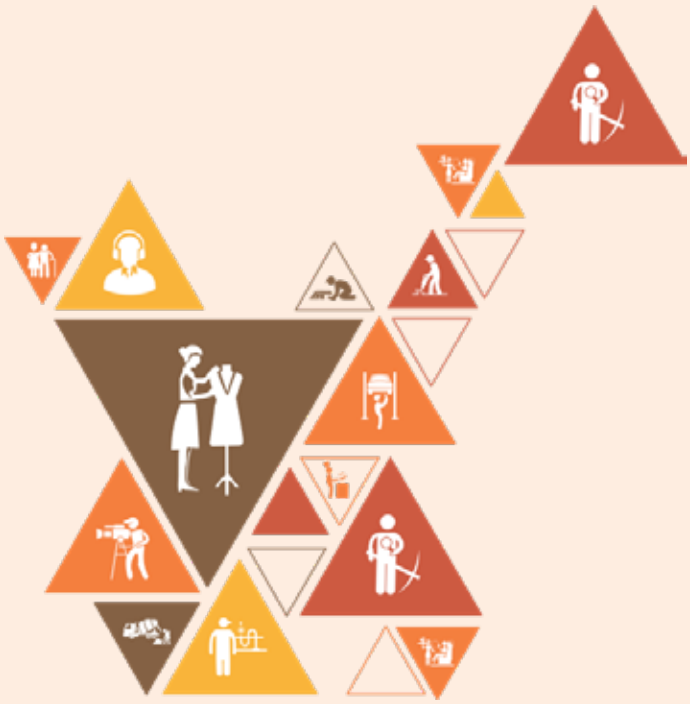
- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

Notes

9. Annexures

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria



Annexure I
Training Delivery Plan

Training Delivery Plan			
Program Name:	Certificate Course in Fitter: Hydraulic & Pneumatic System		
Qualification Pack Name & Ref. ID	Fitter: Hydraulic & Pneumatic System, ISC/Q0903		
Version No.	4.0	**Version Update Date**	31-03-2025
Pre-requisites to Training (if any)	11th grade pass Or 10th Class Pass + NTC/NAC (welding) Or 8th grade pass + 2 year NTC + 1 Year NAC in relevant field Or 10th Class Pass with 2 years of experience in the relevant field Or Previous relevant Qualification of NSQF Level 3 with minimum education as 5th Grade pass with 2 years of experience in the relevant field		
Training Outcomes	**By the end of this program, the participants will be able to:** 1. Carry out preparatory activities such as lifting of workpiece, inspection of tools and equipment etc. 2. Carry out installation of hydraulic and pneumatic systems. 3. Carry out post-installation operations such as cleaning, inspection etc. 4. Carry out maintenance of hydraulic and pneumatic systems. 5. Work effectively and efficiently as per schedules and timelines. 6. Implement safety practices. 7. Optimize the use of resources to ensure less wastage and maximum conservation.		

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
1	Introduction to the Job Role	Icebreaker	• Introduce each other • Build rapport with fellow students and the facilitator • Explain Iron & steel industry • List types of Iron & Steel Industry • List products of Iron & Steel industryList role and responsibilities of mechanic - hydraulic and pneumatic system	**ISC/N0008**	Group Activity: Passing the Parcel		T: 5 hrs

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
2	Follow Basic Health and Safety Practices at the Workplace	Hazards	• Explain occupational health & safety • Explain hazards and different types of hazards	**ISC/N0008** PC4, PC2, PC11, KA1, KB1, KB2, KB3, KB4, KB9, SA1, SA2	• Class room lecture	PPTs for OHAS related to Job Role	T: 8 hrs
		Safe working practices	• Explain safe working practices at workshop. • List various types of PPE	**ISC/N0008** PC1, PC2, PC3, PC5, PC10, PC13, KA2, KB5, KB6, KB7, KB8, KB10, KB11, KB18, KB21, KB22, KB23, KB24	• Class room lecture • Presentation • Videos • Demonstration	Display Material for PPEs related to Job Role, Safety material, warning signs	T: 2 hrs P: 6 hrs
		Fire safety	• List fire safety equipment • Demonstrate emergencies, rescue and first aid procedures	**ISC/N0008** PC6, PC7, PC14, PC15, PC16, PC17, KB12, KB13, KB14, KB15, KB16, KB17	• Group activity • Presentation • Videos • Demonstration	Fire safety equipment, fire extinguishers	T: 2 hrs P: 6 hrs
		Emergency procedures	• Demonstrate emergency procedures • Demonstrate rescue and first aid procedures	**CSC/N1335** PC6, PC15, PC16, PC21, PC22, PC25, SA5, SA6, SB1, SB8, SB9, SB11	• Group activity • Presentation • Videos • Demonstration	Display Material for PPEs related to Job Role, Safety material, warning signs	T: 2 hrs P: 6 hrs
		Housekeeping and 5S safety	• Explain need of housekeeping. • List various elements of housekeeping • Explain 5S safety system • Explain phases of 5S safety	**ISC/N0008** PC5, PC11, PC12, PC16, SB2, SB3, SB4	• Class room lecture • Presentation • Demonstration	Cleaning material and equipment	T: 8 hrs
		Waste management	• List various methods of waste management • Demonstrate segregation of waste as per type of waste	**ISC/N0008** PC5, PC11	• Presentation • Videos • Demonstration	Waste material, different color bins	T: 3 hrs P: 5 hrs
		Problem escalation and reporting	• Explain problem management process • Explain escalation matrix • Explain accident and incident reporting • Demonstrate how to write reports	**ISC/N0008** KB3, KB4, SB10, SB12, SB13, SB14	• Classroom lecture • Presentation • Group activity	Presentation, Sample Accident reports	T: 3 hrs P: 4 hrs

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Duration
3	Effective Communication and Interpersonal Skills at Workplace	Communication skills	• Define Communication Skills • Elaborate process of communication • List components of communication	**ISC/N0009** PC1, PC4 KU1, KU2 GS3, GS8	• Classroom lecture • Presentation • Activity	White board marker, duster, computer or Laptop attached to LCD projector	T:4:00 P:4:00
		Verbal and non-verbal communication	• Define verbal communication and its importance • List ways to improve verbal communication • List components of non-verbal communication • State importance of body language	**ISC/N0009** PC1 KU1, KU2 GS5, GS6, GS8	• Classroom lecture • Presentation • Activity	White board marker, duster, computer or Laptop attached to LCD projector	T:3:00 P:5:00
		Listening and writing skills	• List requirements for good listening skills • Discuss written communication medium	**ISC/N0009** PC1,, PC6, PC7, PC8, PC9 KU1, KU2 GS1, GS2, GS5, GS6, GS7	• Classroom lecture • Presentation • Activity	White board marker, duster, computer or Laptop attached to LCD projector	T:3:00 P:3:00
		Communication with PwD and different gender	• Discuss the importance of PwD and gender sensitization. • Demonstrate ways to communicate with People with Disability (PwD) • Demonstrate ways to communicate with different gender people	**ISC/N0009** PC2, PC3, PC5 KU3 GS3, GS4	• Classroom lecture • Presentation • Activity	White board marker, duster, computer or Laptop attached to LCD projector	T:3:00 P:5:00
4	Prepare for Fitting and Assembly Operations	Hydraulic system	• Explain hydraulic system • Explain basic principles of hydraulic system	**ISC/N0918** PC1, PC2, KU1, KU2, GS1, GS2	• Classroom lecture • Presentation • Activity	Drawings, Blue prints, hydraulic and pneumatic equipment	T:3:00 P:5:00
		Pneumatic system	• Explain pneumatic system • Explain basic principles of pneumatic system	**ISC/N0918** PC3, PC4, KU3, KU4, GS3, GS4	• Classroom lecture • Presentation • Activity	Drawings, Blue prints, hydraulic and pneumatic equipment	T:3:00 P:5:00
		Circuit diagram	• Explain circuit diagram • Explain circuit diagram of hydraulic system • Explain circuit diagram of pneumatic system	**ISC/N0918** PC5, PC6, KU10, GS5, GS6	• Classroom lecture • Presentation • Activity	Drawings, Blue prints, hydraulic and pneumatic equipment	T:3:00 P:5:00
		Hydraulic system components	• List components of a hydraulic system. • Explain functioning of hydraulic system components	**ISC/N0918** PC7, PC8, KU5, KU7, GS9	• Classroom lecture • Presentation • Activity	Drawings, Blue prints, hydraulic and pneumatic equipment	T:3:00 P:5:00

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
		Pneumatic system components	• List components of a pneumatic system. • Explain functioning of pneumatic system components	**ISC/N0918** PC9, KU8, KU9, GS7, GS8	• Classroom lec-ture • Presentation • Activity	Drawings, Blue prints, hydraulic and pneumatic equipment	T:3:00 P:5:00
		Hydraulic circuit symbols	• Explain hydraulic circuit symbols • Identify hydraulic circuit symbols	**ISC/N0918** PC10	• Classroom lec-ture • Presentation • Activity	Drawings, Blue prints	T:3:00 P:5:00
		Pneumatic circuit symbols	• Explain pneumatic circuit symbols • Identify pneumatic circuit symbols	**ISC/N0918** PC11	• Classroom lec-ture • Presentation • Activity	Drawings, Blue prints	T:2:00 P:2:00
5	Perform Fitting and Assembly of Hydraulic and Pneumatic Equipment	Tools required	• List tools required during fitting job • Demonstrate use of tools required during fitting job	**ISC/N0919** PC1, KU1, KU2, KU3	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Equipment required	• List equipment required during fitting job • Demonstrate use of equipment required during fitting job	**ISC/N0919** PC2, KU4, KU5	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Regular inspection	• List hydraulic and pneumatic components need to inspect regularly • Perform regular inspection of hydraulic and pneumatic components	**ISC/N0919** PC1, PC2, KU6, KU7	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Inspection checklist	• Explain checklist need to follow for hydraulic and pneumatic components inspection • Follow inspection checklist	**ISC/N0919** PC1, PC2, KU8, KU9	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools, inspection checklist	T:3:00 P:5:00
		Checking reservoir and oil	• Describe reservoir and oil checking process • Perform reservoir and oil checking process	**ISC/N0919** PC1, PC2, KU10, KU11	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Checking cooler, lines and connectors	• Describe cooler, lines and connectors checking process • Perform cooler, lines and connectors checking process	**ISC/N0919** PC1, PC2, KU12, KU13	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Checking valves	• Describe valves checking process • Perform valves checking process	**ISC/N0919** PC1, PC2, KU14	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
		Checking cylinders	• Describe cylinders checking process • Perform cylinders checking process	**ISC/N0919** PC1, GS1	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Checking motors	• Describe motors checking process • Perform motors checking process	**ISC/N0919** PC1, PC2, GS2	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Inspection and Service	• Explain hydraulic and pneumatic system inspection and service process • Follow manufacturer's manual and SOP for inspection and service	**ISC/N0919** PC1, PC2, GS3	• Classroom lec-ture • Presentation • Activity	Hand and inspection tools	T:3:00 P:5:00
		Basic assembly process	• Explain basic assembly process of hydraulic system • Explain basic assembly process of pneumatic system	**ISC/N0919** PC3, PC4M GS4	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00
		FRL unit assembly and disassembly	• Explain FRL unit assembly and disassembly process • Demonstrate FRL unit assembly and disassembly process	**ISC/N0919** PC5, PC6, GS5	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00
		Cylinder assembly and disassembly	• Explain cylinder assembly and disassembly process • Demonstrate cylinder assembly and disassembly process	**ISC/N0919** PC7, PC8, GS6	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00
		Pump assembly and disassembly	• Explain pump assembly and disassembly process • Demonstrate pump assembly and disassembly process	**ISC/N0919** PC9, GS7	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00
		Valve assembly and disassembly	• Explain valve assembly and disassembly process • Demonstrate valve assembly and disassembly process	**ISC/N0919** PC10, GS8	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00
		Actuator assembly and disassembly	• Explain actuator assembly and disassembly process • Demonstrate actuator assembly and disassembly process	**ISC/N0919** PC11, GS9	• Classroom lec-ture • Presentation • Activity	Assembly and dissembly tools	T:3:00 P:5:00

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
		Practice 1 - Hydraulic and pneumatic system assembly	• Practice assembly and dissembly of hydraulic and pneumatic system	**ISC/N0919** PC5, PC6	• Activity	Assembly and dissembly tools	P:8:00
		Practice 2 - Hydraulic and pneumatic system assembly	• Practice assembly and dissembly of hydraulic and pneumatic system	**ISC/N0919** PC5, PC6	• Activity	Assembly and dissembly tools	P:8:00
		Practice 3 - Hydraulic and pneumatic system assembly	• Practice assembly and dissembly of hydraulic and pneumatic system	**ISC/N0919** PC5, PC6	• Activity	Assembly and dissembly tools	P:6:00
6	Perform Post-Assembly Activities	Quality check	• List quality check requirementsafter assembly process • Demonstrate quality check process	**ISC/N0920** PC1, KU1, KU2, KU3, GS3, GS4, GS5	• Classroom lec-ture • Presentation • Activity	Testing tools and equipment	T:3:00 P:5:00
		Visual inspection	• Demonstrate visual inspection of system after comletion of assembly	**ISC/N0920** PC1, PC15, PC16, KU4, KU5, GS6	• Classroom lec-ture • Presentation • Activity	Testing tools and equipment	T:3:00 P:5:00
		Prepararation for testing	• List requirements for testing process • Demonstrate testing process setup	**ISC/N0920** PC2, PC3, PC14, KU6, GS7, GS8	• Classroom lec-ture • Presentation • Activity	Testing tools and equipment	T:3:00 P:5:00
		Practice 1 - preparatory activities	• Practice testing process setup	**ISC/N0920** PC1, PC2, PC3, KU7	• Activity	Testing tools and equipment	P:8:00
		Practice 2 - preparatory activities	• Practice testing process setup	**ISC/N0920** PC2, PC3, KU8, KU9	• Activity	Testing tools and equipment	P:8:00
		Hydraulic system testing	• Explain hydraulic system testing process • Demonstrate hydraulic system testing process	**ISC/N0920** PC4, PC5, PC6, PC7, KU10, GS9	• Classroom lec-ture • Presentation • Activity	Testing tools and equipment	T:3:00 P:5:00
		Practice 1 - Hydraulic system testing	• Practice hydraulic system testing process	**ISC/N0920** PC4, PC5, PC8, KU11	• Activity	Testing tools and equipment	P:8:00
		Practice 2 - Hydraulic system testing	• Practice hydraulic system testing process	**ISC/N0920** PC4, PC5, PC9, KU12	• Activity	Testing tools and equipment	P:8:00
		Pneumatic system testing	• Explain pneumatic system testing process • Demonstrate pneumatic system testing process	**ISC/N0920** PC4, PC5, PC10, KU13	• Classroom lec-ture • Presentation • Activity	Testing tools and equipment	T:3:00 P:5:00
		Practice 1 - Pneumatic system testing	• Practice pneumatic system testing process	**ISC/N0920** PC4, PC5, PC11, KU14	• Activity	Testing tools and equipment	P:8:00

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Duration
		Practice 2 - Pneumatic system testing	• Practice pneumatic system testing process	**ISC/N0920** PC4, PC5, PC12, GS1	• Activity	Testing tools and equipment	P:8:00
		Practice 2 - Pneumatic system testing	• Practice pneumatic system testing process	**ISC/N0920** PC4, PC5, PC13, GS2	• Activity	Testing tools and equipment	P:2:00
7	Perform Maintenance of Hydraulic and Pneumatic Equipment	Prepare for maintenance	• Read and interpret maintenance schedule • Identify requirements of maintenance	**ISC/N0921** PC1, PC2, PC3, PC4, KU1, KU2	• Classroom lecture • Presentation • Activity	Maintenance schedule and checklist	T:3:00 P:5:00
		Hydraulic system maintenance	• Explain hydraulic system maintenance process • Demonstrate hydraulic system maintenance process	**ISC/N0921** PC6, PC7, PC8, KU3, KU4, GS1	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00
		Practice - Hydraulic system maintenance	• Practice hydraulic system maintenance process	**ISC/N0921** PC6, PC7, PC8, KU5, KU6	• Activity	Maintenance tools and equipment	P:8:00
		Pneumatic system maintenance	• Explain pneumatic system maintenance process • Demonstrate pneumatic system maintenance process	**ISC/N0921** PC6, PC7, PC8, GS2, GS3	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00
		Practice - Pneumatic system maintenance	• Practice pneumatic system maintenance process	**ISC/N0921** PC6, PC7, PC8, GS4	• Activity	Maintenance tools and equipment	P:8:00
		Trouble shooting of hydraulic system	• Identify defects in a hydraulic system • Demonstrate troubleshooting procedure of a hydraulic system	**ISC/N0921** PC9, PC10, PC11, KU7, KU8, GS5, GS6	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00
		Repairing of hydraulic system	• Explain remedies for repairing of a hydraulic system • Carry out repairing of a hydraulic system	**ISC/N0921** PC12, PC13, PC14, KU9, KU10	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00
		Practice - Troubleshooting and repairing of hydraulic system	• Practice troubleshooting and repairing of a hydraulic system	**ISC/N0921** PC12, PC13, PC14	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	P:8:00
		Trouble shooting of pneumatic system	• Identify defects in a pneumatic system • Demonstrate troubleshooting procedure of a pneumatic system	**ISC/N0921** PC9, PC10, PC11	• Classroom lecture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/ Aids	Dura-tion
		Repairing of pneumatic system	• Explain remedies for repairing of a pneumatic system • Carry out repairing of a pneumatic system	**ISC/N0921** PC12, PC13, PC14, GS7	• Classroom lec-ture • Presentation • Activity	Maintenance tools and equipment	T:3:00 P:5:00
		Practice - Troubleshooting and repairing of pneumatic system	• Practice troubleshooting and repairing of a pneumatic system	**ISC/N0921** PC15, PC16, PC17, GS8	• Activity	Maintenance tools and equipment	P:8:00
		Safety precautions	• Explain safe working practices during hydraulic and pneumatic equipment fitting work • Demonstrate safe working practices	**ISC/N0921** PC5, KU11, GS9	• Classroom lec-ture • Presentation • Activity	PPT	T:2:00

Annexure II
Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Mechanic: Hydraulic & Pneumatic System	
Job Role	Mechanic: Hydraulic & Pneumatic System
Qualification Pack	ISC/Q0903, v4.0
Sector Skill Council	Iron and Steel

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5	In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack
7	Recommended Pass % - 70

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS 1: Use basic health and safety practices at the work place (ISC/N0008)				
Maintain safe and secure working environment	**10**	**14**	**-**	**6**
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	2	2	-	1
PC2. follow safe working practices while dealing with hazards to ensure safety of self and others	2	3	-	1
PC3. use appropriate protective clothing/equipment for specific tasks and work	1	2	-	1
PC4. follow appropriate safety practices while working in and around trenches, elevated places and confined areas	2	1	-	-
PC5. lift heavy objects safely using correct procedures	1	2	-	1
PC6. carry out routine check of the machine for identifying potential hazards	1	2	-	1
PC7. report any identified breaches in health, safety and security policies and procedures to the designated person	1	2	-	1
Emergencies, rescue and first aid procedures	**6**	**9**	**-**	**5**
PC8. use appropriate type of fire extinguisher	1	1	-	1
PC9. apply appropriate rescue techniques during fire hazard	1	2	-	1
PC10. provide appropriate first aid procedure to victims wherever required eg.in case of bleeding, burns, choking, electric shock etc.	2	2	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. follow emergency procedures such as raising alarm, safe evacuation etc.	1	2	-	1
PC12. attend safety training and fire drills to respond promptly during an emergency	1	2	-	1
Health and hygiene	**2**	**6**	**-**	**2**
PC13. follow regular cleaning and disinfection practices at work place using appropriate techniques and materials	1	2	-	1
PC14. follow hand hygiene practices at work place using appropriate techniques and materials	1	2	-	1
PC15. report regarding the contagious illness of self or people in close contact	-	1	-	-
PC16. avoid contact with ill people and self-isolate in a similar situation	-	1	-	-
Housekeeping and waste management	**7**	**12**	**-**	**5**
PC17. follow the fundamentals of 5S for housekeeping	2	3	-	2
PC18. ensure good housekeeping in order to prevent hazards and accidents	1	2	-	-
PC19. store the material, tools and equipment in the correct location and in good condition	1	2	-	-
PC20. segregate waste into different categories	1	2	-	1
PC21. identify recyclable, non-recyclable and hazardous waste	1	1	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. dispose non-recyclable, recyclable and reusable waste appropriately at identified location	1	2	-	1
Material and energy conservation	**5**	**9**	**-**	**2**
PC23. identify ways to optimize usage of material in various tasks/ activities/processes	1	2	-	-
PC24. check for spills/leakages in various tasks/activities/processes	1	2	-	1
PC25. plug spills/leakages and escalate to appropriate authority if unable to rectify	1	2	-	1
PC26. check if the equipment/ machine is functioning normally before commencing work and rectify wherever required	1	2	-	-
PC27. ensure electrical equipment and appliances are properly connected and turned off when not in use	1	1	-	-
NOS Total	**20**	**50**	**-**	**20**
NOS 2: Work effectively with others (ISC/N0009)				
Communicate effectively with colleagues and others	**13**	**20**	**-**	**9**
PC1. coordinate with colleagues to share work, as per the workload in order to achieve team goals	3	5	-	2
PC2. maintain clear communication with colleagues and others, wherever needed, through all means i.e. face-to-face, telephonic or written	5	7	-	3
PC3. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity	3	4	-	2

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC4. respect all colleagues and co-workers	1	2	-	1
PC5. resolve conflicts by communicating with colleagues and other departments	1	2	-	1
Interact with supervisor	**8**	**14**	**-**	**6**
PC6. identify work requirements by receiving instructions from reporting supervisor	2	3	-	1
PC7. escalate problems to supervisors that cannot be handled	2	3	-	2
PC8. report the completed work	2	3	-	1
PC9. interact with the reporting supervisor about any possible hazards and safety concerns	2	5	-	2
Follow appropriate behaviour at work place	**9**	**16**	**-**	**5**
PC10. extend help to people with Disability (PwD) at workplace, if required	2	4	-	2
PC11. empathize with people with disability	2	4	-	1
PC12. adopt a gender neutral behavior	2	4	-	1
PC13. adopt responsible and disciplined behaviours at the workplace	3	4	-	1
NOS Total	**30**	**50**	**-**	**20**
NOS 3: Prepare for fitting and assembly operations (ISC/N0918)				
Identify work requirements	**15**	**20**	**-**	**9**
PC1. identify the work to be done by interpreting the engineering drawings/blueprints/SOPs	2	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC2. identify correct limits, tolerance and fits of rotating machine by interpreting the drawings properly	2	3	-	2
PC3. identify the tools, measuring instruments, equipment and spares required for the job	5	4	-	3
PC4. select and arrange the right tools, measuring instruments, equipment and spares as per the SOP and job requirements	4	7	-	2
PC5. report to stores / supervisor in case of non- availability of tools, tackles and spares	2	3	-	1
Prepare for fitting and assembling activities	**15**	**30**	**-**	**11**
PC6. use appropriate Personal Protective Equipment (PPE) for safe working in workshop	2	3	-	1
PC7. plan sequence of activities need to perform fitting and assembling of the equipment	1	3	-	1
PC8. check the tools, measuring instruments and equipment for any defects and that they are as per the required quality standards	4	9	-	3
PC9. ensure that tools match the desired specifications for working in hydraulic and pneumatic systems	2	3	-	2
PC10. prepare tools, tackles, spares, lifting equipment etc. as per SOP/WI	4	9	-	3
PC11. report damaged / defective components of equipment and tools as per the escalation matrix	2	3	-	1
NOS Total	**30**	**50**	**-**	**20**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS 4: Perform fitting and assembly of hydraulic and pneumatic equipment (ISC/N0919)				
Perform installation of equipment	**10**	**17**	**-**	**6**
PC1. lift the equipment parts manually or by hoist and place the same securely on the designated place as indicated in the drawing/work instructions	2	3	-	1
PC2. mount, align, adjust and level the components to be assembled as per the design/ manufacturers' specifications	3	5	-	2
PC3. perform fitting operations as per equipment needs and prepare the components/parts and sub-assemblies of the equipment for assembly operations	5	9	-	3
Perform assembling activities	**20**	**33**	**-**	**14**
PC4. perform assembly operations and assemble all the parts of equipment as mentioned in drawing/blueprint	5	9	-	3
PC5. fasten the mechanical components/ subassemblies together by using specified screws, bolts, and collars	3	5	-	2
PC6. set and adjust the linkages, tensions and clearances of assembled components to specified specifications by using fixed gauges and hand tools	3	5	-	2
PC7. seal the required areas thoroughly to prevent penetration of water/air etc. during the usage of equipment	2	3	-	2
PC8. set and adjust flow, pressure, speed, level of hydraulic medium / air	2	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. follow the do's and don'ts of the manufacturing process as defined in SOPs/Work Instructions or given by supervisors	1	2	-	1
PC10. check the joints, connections, etc. to ensure they are adequately tightened and joint	2	3	-	2
PC11. escalate the problems faced during installation and assembly activities to the supervisor	2	3	-	1
NOS Total	**30**	**50**	**-**	**20**
NOS 5: Perform post-assembly activities (ISC/N0920)				
Conduct tests to ensure fitness of equipment	**25**	**41**	**-**	**19**
PC1. check the equipment as per the control plan, WI for proper working	2	4	-	2
PC2. set the test apparatus as per the selected testing process and SOPs/WI	2	3	-	2
PC3. connect the equipment and its components, various data capturing meters and gauges with the testing apparatus as per SOP/ WI	1	2	-	1
PC4. conduct functional tests of assembled equipment to ensure it performs as per desired performance criteria	4	7	-	3
PC5. check abnormalities to ensure they are within desired limits (temperature, leakage, pressure, level, vibration, sound and RPM	2	3	-	1
PC6. identify non-conformities and their causes to quality assurance standards	2	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC7. record observations/ readings as per the parameters mentioned in the testing manual/ Work Instructions	2	3	-	1
PC8. observe any deviation, noise or vibrations during the testing process and change or repair the equipment components as per the requirement	2	3	-	2
PC9. conduct trials of the equipment to ensure that specified parameters are attained with no abnormalities	2	4	-	2
PC10. record the test and trial results as per the organisation guidelines	2	3	-	1
PC11. suggest and implement the corrective actions to address problems in machine/electric panels	2	3	-	2
PC12. record adjustments not covered by established procedures for future reference	2	3	-	1
Perform post-testing activities	**5**	**9**	**-**	**1**
PC13. clean and store all the tools, machine and equipment after completion of work	2	3	-	1
PC14. dispose scrap or waste material into the disposal area in accordance with the company's policies and environmental regulations	1	2	-	-
PC15. report to the supervisor about any problems faced or anticipated during the complete process	1	2	-	-
PC16. maintain and update all the records and reports related to assembling activities done as per the organisational guidelines	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	**30**	**50**	**-**	**20**
NOS 6: PPerform maintenance of hydraulic and pneumatic equipment (ISC/N0921)				
Prepare for maintenance work	**6**	**8**	**-**	**4**
PC1. determine the work requirements such as type of tasks to be performed (repair, maintenance, etc.), equipment to be maintained from drawings, maintenance schedule, work instructions, process manuals, etc.	1	2	-	1
PC2. identify tools, consumables, spare parts, etc. required for performing repair and maintenance	3	2	-	2
PC3. communicate with the user/ operator about any variances observed during functioning of the equipment and other performance issues	1	2	-	1
PC4. clear the work area thoroughly to ensure no unwanted materials are present before starting the work	1	2	-	-
Repair and maintain the hydraulic and pneumatic equipment	**24**	**42**	**-**	**16**
PC5. follow safety practices during maintenance activities as per organisational SOP	1	1	-	-
PC6. perform basic health check-up of equipment as specified in the maintenance checklist	3	5	-	2
PC7. dismantle the equipment components and replace/change the spare parts and consumables of the vehicle as per the schedule	2	3	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC8. change/refill the hydraulic oil/compressor lube oil, lubricants and fluids	2	3	-	1
PC9. check the internal conditions of equipment parts to test its working status and expected conditions	2	5	-	3
PC10. check the systems of the equipment to find out root cause of the problems like any leakage, short circuit in parts, breakage of wires etc. and discuss the same with senior if required	3	5	-	2
PC11. carry out minor repairs and adjustments of the equipment and report any malfunctions/ repairs in the machine beyond own scope to the concerned person	3	5	-	2
PC12. clean the various components of equipment such as reservoir, suction strainer, return line filter, breather filter, suction air filter of air compressor, suction/delivery valves of air compressor etc.	2	4	-	1
PC13. assemble back the covers, guards, clamps, insulation etc. of the equipment after repair and maintenance	2	3	-	1
PC14. change the maintenance due/status sticker on the equipment	1	2	-	1
PC15. record all repairs carried out, parts disposed and replaced, time taken and other significant findings observed during the work process	1	2	-	1
PC16. ensure that all maintenance activities are adequately addressed	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. report information such as repair and maintenance work done, faults observed, action taken, parts replaced, next scheduled maintenance, etc. to the supervisors accurately	1	2	-	1
NOS Total	**30**	**50**	**-**	**20**
NOS 7: Employability Skills (60 Hours) (DGT/VSQ/N0102)				
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**2**	**4**	**-**	**-**
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	**1**	**2**	**-**	**-**
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	**2**	**2**	**-**	**-**
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**2**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	**2**	**3**	**-**	**-**
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	**3**	**4**	**-**	**-**
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-
Entrepreneurship	**2**	**3**	**-**	**-**
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	**1**	**2**	**-**	**-**
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**2**	**3**	**-**	**-**
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline/online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

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