



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



Facilitator Guide



Sector
Tower Technician

Sub-Sector
Passive Infrastructure

Occupation
Operation & Maintenance

Reference ID: TEL/Q4100, Version 1.0
NSQF Level: 4

Tower Technician

Published by

All Rights Reserved,
First Edition, March 2016

ISBN

Printed in India at

Copyright © 2016

Telecom Sector Skill Council
Sector Skill Council Contact Details:
2nd Floor, Plot No:- 105, Sector 44 Rd,
Sector 44, Kanahi,
Haryana - 122003
Email: tssc@tsscindia.com
Phone: 0124-414 8029

Disclaimer

The information contained herein has been obtained from sources reliable to TSSC. TSSC disclaims all warranties to the accuracy, completeness or adequacy of such information. TSSC shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. Every effort has been made to trace the owners of the copyright material included in the book. The publishers would be grateful for any omissions brought to their notice for acknowledgments in future editions of the book. No entity in TSSC shall be responsible for any loss whatsoever, sustained by any person who relies on this material. The material in this publication is copyrighted. No parts of this publication may be reproduced, stored or distributed in any form or by any means either on paper or electronic media, unless authorized by the TSSC.





Shri Narendra Modi
Prime Minister of India

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

Acknowledgements

Telecom Sector Skill Council would like to express its gratitude to all the individuals and institutions who contributed in different ways towards the preparation of this “Facilitator Guide”. Without their contribution it could not have been completed. Special thanks are extended to those who collaborated in the preparation of its different modules. Sincere appreciation is also extended to all who provided peer review for these modules.

The preparation of this guide would not have been possible without the Telecom Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

This Facilitator guide is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavors.

About this Guide

In the last five years, the growth of the Indian telecommunications sector has outpaced the overall economic growth. This sector is poised for strong growth of about 15 percent in short term during 2013–17, driven by growth in organised retail, technological advancements, changing consumer preferences and government support. With over 1000 million subscribers, India is the second largest telecom market in the world.

The sector currently employs over 2.08 million employees and is slated to employ more than 4.16 million employees by 2022. This implies additional creation of ~2.1 million jobs in the nine-year period.

This Facilitator Guide is designed to impart theoretical and practical skill training to students for becoming a Tower Technician. Tower Technician in the Telecom industry is also known as Site Engineer/Tower Engineer/Site Technician.

Individuals at this job needs maintain site live 24x7, maintain and repair level-1 faults/issues at telecom tower site, level-1 preventive and corrective maintenance and report faults to the supervisor in time. Individual also needs to travel inter-state and work during odd hours, when required.

This Facilitator guide is based on Tower Technician Qualification Pack (TEL/Q4100) & includes the following National Occupational Standards (NOSs)

1. Site Hygiene (TEL N/4100)
2. Preventive and Corrective Maintenance (TEL N/4101 & TEL N/4104)
3. Site Management (TEL N/4102)
4. Task reporting (TEL N/4103)

The Key Learning Outcomes and the skills gained by the participant are defined in their respective units.

Post this training, the participant will be able to keep sites live 24x7 through site maintenance.

We hope that this Facilitator Guide will provide a sound learning support to our young friends to build an attractive career in the telecom industry.

Symbols Used



Ask



Elaborate



Notes



Objectives



Do



Exercise



Say



Activity



Demonstrate



Practical



Learning Outcomes



Summary

Table of Contents

S.No	Modules and Units	Page No
1.	Introduction	1
	Unit 1.1 – Icebreaker	3
	Unit 1.2 – Objectives of the Course	4
	Unit 1.3 – Telecom Industry in India	4
	Unit 1.4 – Types of Communication	5
	Unit 1.5 – Types of Cellular Network	5
	Unit 1.6 – Component of Cellular Network	6
	Unit 1.7 – Tower Infrastructure Industry	7
	Unit 1.8 – Career Progression as Tower Technician	7
2.	Site Hygiene (TEL/N4100)	10
	Unit 2.1 – Introduction to Components at Tower Site	11
	Unit 2.2 – Telecom Tower	12
	Unit 2.3 – Telecom Shelter Unit	17
	Unit 2.4 – PIU - Power Interface Unit	20
	Unit 2.5 – Battery Bank	22
	Unit 2.6 – Power Plant/Rectifier Unit	40
	Unit 2.7 – Air Conditioning	43
	Unit 2.8 – Fire Extinguisher and Smoke Detectors	45
	Unit 2.9 – EB Supply	48
	Unit 2.10– Earthing	49
	Unit 2.11– Aviation Lamp	56
	Unit 2.12– Diesel Generator	57
	Unit 2.13– Guidelines for First-Aid Facilities	81
3.	Preventive and Corrective Maintenance(TEL/N4101 & TEL/N4104)	83
	Unit 3.1 – Guidelines for Maintenance Activities	84
	Unit 3.2 – Routine Preventive Maintenance	85
	Unit 3.3 – Maintenance of Batteries	87
	Unit 3.4 – Maintenance of a Diesel Generator	94
	Unit 3.5 – Maintenance of the Tower & Shelter	106
	Unit 3.6 – Maintenance of AC Plant	107





Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



1. Introduction

Unit 1.1 - Icebreaker

Unit 1.2 - Objective of the Course

Unit 1.3 - Telecom Industry in India

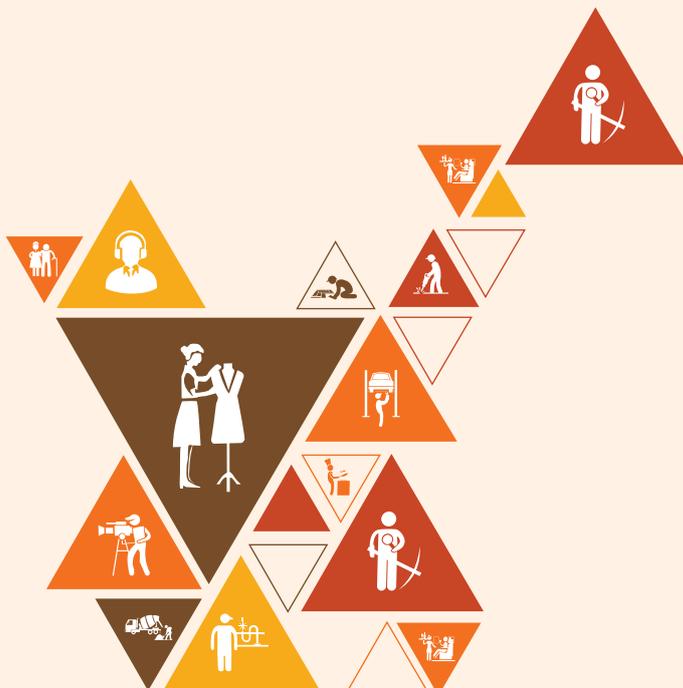
Unit 1.4 - Types of Communication

Unit 1.5 - Types of Cellular Network

Unit 1.6 - Component of Cellular Network

Unit 1.7 - Tower Infrastructure Industry

Unit 1.8 - Career Progression as Tower Site



Key Learning Outcomes

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

1. Develop rapport with the participants of the program.
2. Get Introduction of all the participants and let everyone know each other.
3. Share an understanding of the telecom industry.
4. Discuss about communication and types of communication networks.
5. Explain about types of cellular networks and components used in these networks.
6. Discuss about tower Infrastructure industry.
7. Share details about the job role of tower technician and what will be his role and responsibilities.

UNIT 1.1: Icebreaker

Unit Objectives

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

- Get the introduction of the faculty
- Introduce themselves with all the fellow students
- Build rapport with other students and the trainer

Resources to be Used

- Available objects such as a duster, pen, notebook etc
- Internet, PC/Laptop and projector

Do

- Make the students stand in a circle, close enough to the person each side of them that they can pass the parcel quickly.
- Say 'Stop' when the students least expect it. The person who has the parcel at that time should get out.
- Those who get out should introduce themselves by providing their names and a little additional information such as favorite hobbies, likes, dislikes etc.
- The winner of the game should stand and introduce himself/herself at the end of the game.

Say

- Thank the students for their participation
- Tell them to please take their seat
- Let's start with your course

Notes for Facilitation

- You could ask the students who get out during the game to be the music keepers. They can start and stop the music as the game progresses.
- Encourage shy students 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.
- This will ensure a healthy bonding in the class and also open up shy students.

UNIT 1.2: Objectives of the Course

Unit Objectives

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

1. Discuss about the telecom industry in India.
2. Identify the technologies being deployed in cellular networks.
3. Gain an overview of tower infrastructure industry in India.
4. Understand the Job role of tower technician and expectation from them.
5. Discuss the components of a cellular networks and bringing the focus on tower site.

Notes for Facilitation

- You could ask the students about the expectations from the course
- Invite students to participate. List their expectations on the whiteboard
- Give the students a brief overview of what all will be covered in the program

UNIT 1.3: Telecom Industry in India

Unit Objectives

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

1. Discuss the evolution and growth of the telecom industry in India.
2. Talk about the future growth which is expected in the industry.
3. Touch upon international scenario of telecom industry.
4. Discuss about the telecom product companies worldwide and in India.
5. Explain how network solution companies are important for telecom operators.

Say

- The global Telecom industry is US \$ 670 Billion and market Cap of these Companies is US \$ 991 billion. convert this figure in Indian rupees to show them big number. This industry is growing at a CAGR of 15 % annually over the last many years.
- India is the second largest growth markets worldwide after China with more than 1 billion telephone subscribers.
- Talk about Indian telecom operators, discuss a bit about Airtel, Reliance, BSNL etc.
- Give some insight about few top global telecom operators to students.
- Discuss the role of telecom product companies and solution providers in a telecom operator network.

Notes for Facilitation

- You could ask the students what they know about various telecom operators in India. Lead this towards a discussion so that everyone gets a good knowledge about the operators.
- Give students some time to discuss about some global telecom operators, you can name few and let people add more knowledge/ inputs to this.

UNIT 1.4: Types of Communication

Unit Objectives

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

1. Clearly understand the definition of telecommunication.
2. Understand the types of networks used for telecommunications.
3. Differentiate between wireless and wire line communication.

Say

- Definition of telecommunication.
- Lead the discussion in a way where everyone in the class gets a clear idea about the term telecom.
- Telecommunication happens on two types of networks wire line and wireless networks.
- Talk about both these types and explain this in a bit of details.

Ask

- Ask one student to explain what he understands from word telecommunication.
- Ask the students regarding the difference between wireless and wire line communication.
- Ask the students as how the call gets routed between wireless and wire line communication.

UNIT 1.5: Types of Cellular Network

Unit Objectives

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

1. Know about CDMA and GSM networks.
2. Differentiate between 2G, 3G, 4G and 5G networks.
3. Understand the advantages of new technology networks over previous ones.

Say

- Give an overview of GSM and CDMA technology.
- Give an overview of 2G, 3G, 4G, 5G networks.
- Talk about the advantage of the progressive technology enhancement.
- Explain how convergence of CDMA and GSM technology is happening after LTE (Long term evolution) or 4G.
- Explain the new applications like IOT (Internet of Things), which are coming up by adopting latest technologies like 4G and 5G.

Ask

- Ask students to prepare notes on GSM, CDMA, 2G, 3G, 4G and 5G. Take 10 min session in the class. This will create an excellent awareness about technologies in students.
- Ask the students to prepare 10 min session on IOTs and how are they are going to change the world.

UNIT 1.6: Components of Cellular Network

Unit Objectives

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

1. Figure out the components used in a GSM network.
2. Understand the use of a SIM card in a mobile station.
3. Identify the role of a BTS (Base Transceiver Station) in the mobile communication.
4. Explain how internet traffic flows from a mobile station to IWF (Inter working function) and internet.
5. Discuss the use of various databases and how security is implemented.

Say

- Explain the terms related to cellular networks like Mobile Station, Base Station, Gateway, data bases
- Talk about the security mechanism used to prevent unauthorized users from entering the network.
- Elaborate on the types of radio waves used in cellular networks.

Ask

- Ask the students to explain what is mobile station
- Tell them to talk about the mobile switching center
- Ask them questions on how data connectivity is achieved on mobile network.
- Let them explain, how a mobile station gets connected to a base station

UNIT 1.7: Tower Infrastructure Industry

Unit Objectives

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

1. Highlight the need of a tower infrastructure industry and the investment needed in it.
2. Appreciate the reasons of frequent mergers and acquisitions in this industry.
3. Talk about the major companies in this industry in India.
4. Understand the concept of Infrastructure sharing.

Do

- Give an overview of tower infrastructure industry.
- Discuss various companies in India who are part of Tower Infra Industry.
- Talk about some mergers which are happening in this industry and give reasons why.
- Discuss about infrastructure sharing and need of the same.

Ask

- Ask students to find out top three Tower infra companies in India and number of towers they have.
- One student should speak of about infrastructure sharing as to what they understood from this.

Notes for Facilitation

- Faculty should spend some time on internet and google about the topics covered in this unit to get the latest updated information about the topics covered.

UNIT 1.8: Career Progression as Tower Technician

Unit Objectives

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

1. Understand the responsibilities of a tower technician.
2. Get aware of the SLAs which he has to work on.
3. Understand the organizational hierarchy in an tower infrastructure company.
4. Define the growth path for him as a career.

Say



- About the responsibilities of a tower technician.
- That the job role is very critical for continuous working of a cell site.
- That if the cell site goes down the communication gets lost for all the people in that area.

Ask



- Ask few students why they want to become a tower technician.
- Ask the participants to elaborate on the role as to what they think is expected from them

Summarize



In this chapter students have learnt about

- Details of telecom industry.
- Technical details of communication and telecom networks.
- Details about tower infrastructure industry.



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



2. Site Hygiene

- Unit 2.1 - Introduction to Components at a Tower Site
- Unit 2.2 - Tower
- Unit 2.3 - Telecom Shelter Unit
- Unit 2.4 - PIU- Power Interface Unit
- Unit 2.5 - Battery Bank
- Unit 2.6 - Power Plant/ Rectifier Unit
- Unit 2.7 - Air Conditioning
- Unit 2.8 - Fire Extinguisher and Smoke Detectors
- Unit 2.9 - EB Supply
- Unit 2.10 - Earthing
- Unit 2.11 - Aviation Lamp
- Unit 2.12 - Diesel Generator
- Unit 2.13 - Guidelines for First-Aid Facilities



TEL/N4100

Key Learning Outcomes

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

1. Learn about the components at a cellular tower site.
2. Know about the equipments to be maintained at a cellular tower site.
3. Maintain site hygiene of AC, DG, PIU, SMPS and battery bank, as per organization's norms.
4. Understand about other important components at site like Earthing, Lightning arrester etc.
5. Check if installation of fire safety instruments are in place.
6. Control incidents like fire accident.
7. Check the site as per electrical safety norms.
8. Check proper floor markings, shadow board display and labels.
9. Explain Dos and Don'ts at a tower site.
10. Maintain checklist of standards laid by the company based on its knowledge and understanding.

UNIT 2.1: Introduction to Components at a Tower Site

Unit Objectives

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

- Get an overview of various components at a tower site
- Identify and position these components in the telecom tower
- Understand the functioning of each component

Notes for Facilitation

- You could ask the students about their knowledge of a tower site and what are the components present.
- Invite students to participate. Tell them to give a brief description of the components they know.
- Let there be a debate in the class on the functioning of each component.

2.1.1: Components at a Tower Site

Say

- As we move forward it's very important to know about all the components at a tower site
- You should also know about the functioning of each component

Do

- Explain to the participants the need of getting things clear during this session
- Clarify all their doubts
- Ask them to get into pairs for practice.
- Go around and make sure that they are doing it properly.

Activity

- This is a skill practice activity to understand the components of a tower site
- Ask the students to assemble together and form groups. Take them to a tower site to demonstrate the working of the site and make them acquaint with the equipments/ components used at the site
- Encourage students to ask questions, so that they can understand it properly
- Ask the students not to touch any equipment at site
- Details of the skill activity are given below
- Method to do this activity:

Show and explain various components/ equipments at the site, ensure they understand the need of each equipment.

Skill Practice	Time	Resources
To get acquainted with the equipments and components at a tower site	4 hours	Take permission to visit a tower site with participants.

Method to do this activity

- Refer unit 2.1.1, page 16 of the participant handbook
- Discuss all the components given in the participant handbook
- Ensure that student gets a basic overview of these components at a tower site

Activity



- This is a skill practice activity to demonstrate the tools used at a tower site on day to day basis
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Demonstrate and make them acquainted with the functioning of these tools
- Tell all the students to do this activity individually to gain practice
- Details of the skill activity are given below

Skill Practice	Time	Resources
To practice the use of various tools at the tower site, on day to day basis.	4 hours	Batteries, Gloves, Voltmeter, spanners, Cable and Lugs, Jelly, Voltmeter, ammeter, amp-hour meter, hydrometer, screw driver set, hammer

Method to do this activity:

- Take out and display all the tools and meters used at a tower site
- Explain functioning of each tool to participants
- Give them some exercises to use these tools
- Ensure they are able to use these tools as and when at the site

UNIT 2.2: Telecom Tower

Unit Objectives

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

1. Understand the steps involved in identifying a telecom tower site.
2. Describe the civil works required for the construction of a site.
3. Explain the important points for the takeover of a site once it is ready.
4. Differentiate between various types of towers used in a telecom networks.

2.2.1: Construction of a Telecom Tower Site

Say

- Welcome and greet the participants.

Do

- Explain the definition and use of a telecom tower.

Ask

- Make few students to stand and ask them the need and use of a telecom tower?

2.2.2: Civil work Scope and Survey

Do

- Talk about the requirements at a site for installation of the tower?
- Organize a group discussion among the participants to identify the points to be looked at while doing survey for the selection of a site.

2.2.3: Site Civil Work Execution and Takeover

Elaborate

Elaborate this activity of site work execution and finally takeover of the site. Talk about the steps involved in creating an engineering drawing of the site based on the specifications of the site. Post completion of civil work like laying of foundation etc fixing of shelters and DG set is done.

2.2.4: Types of Tower Unit

Do



- List the four types of towers used at various sites

Elaborate



- Refer page 20-22 of participant handbook and differentiate between all four types of towers.
- Share specific reasons when a particular type of tower is used
- Talk about the specifications of each tower

Activity



- This is a skill practice activity to demonstrate the specifications of different types of towers used at various tower sites. This activity will provide complete knowledge of various types of towers.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To understand different types of towers used at a tower site.	2 hours	Projector, Board, Marker, visit to a tower site

Method to do this activity

1. Display the specification Table 2.2.10 on the page 22 of the participant handbook and explain the specifications to the participants.
2. Discuss questions/queries, if any.
3. See if you can visit a tower site and show a specific tower to the participants.

2.2.5: Tower Site Takeover

Say



- Once the site is ready it should be verified by the site engineer
- Once certified site is taken over, its ready for the operations

2.2.6: Site Hygiene of a Tower

Say 

- Refer Subunit 2.2.6 on page 23 of the participant handbook
- These are few key points which are important for proper upkeep of a tower
- Explain these points to participants as described in the participant handbook

Ask 

- If they have any doubts, clarify them

Excercise 

- Discuss the questions asked in the participant handbook



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



**Telecom
Sector
Skill
Council**

Facilitator Guide



Sector
Tower Technician

Sub-Sector
Passive Infrastructure

Occupation
Operation & Maintenance

Reference ID: TEL/Q4100, Version 1.0
NSQF Level: 4

Tower Technician

Published by

All Rights Reserved,
First Edition, March 2016

ISBN

Printed in India at

Copyright © 2016

Telecom Sector Skill Council
Sector Skill Council Contact Details:
2nd Floor, Plot No:- 105, Sector 44 Rd,
Sector 44, Kanahi,
Haryana - 122003
Email: tssc@tsscindia.com
Phone: 0124-414 8029

Disclaimer

The information contained herein has been obtained from sources reliable to TSSC. TSSC disclaims all warranties to the accuracy, completeness or adequacy of such information. TSSC shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. Every effort has been made to trace the owners of the copyright material included in the book. The publishers would be grateful for any omissions brought to their notice for acknowledgments in future editions of the book. No entity in TSSC shall be responsible for any loss whatsoever, sustained by any person who relies on this material. The material in this publication is copyrighted. No parts of this publication may be reproduced, stored or distributed in any form or by any means either on paper or electronic media, unless authorized by the TSSC.





Shri Narendra Modi
Prime Minister of India

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

Acknowledgements

Telecom Sector Skill Council would like to express its gratitude to all the individuals and institutions who contributed in different ways towards the preparation of this “Facilitator Guide”. Without their contribution it could not have been completed. Special thanks are extended to those who collaborated in the preparation of its different modules. Sincere appreciation is also extended to all who provided peer review for these modules.

The preparation of this guide would not have been possible without the Telecom Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

This Facilitator guide is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavors.

About this Guide

In the last five years, the growth of the Indian telecommunications sector has outpaced the overall economic growth. This sector is poised for strong growth of about 15 percent in short term during 2013–17, driven by growth in organised retail, technological advancements, changing consumer preferences and government support. With over 1000 million subscribers, India is the second largest telecom market in the world.

The sector currently employs over 2.08 million employees and is slated to employ more than 4.16 million employees by 2022. This implies additional creation of ~2.1 million jobs in the nine-year period.

This Facilitator Guide is designed to impart theoretical and practical skill training to students for becoming a Tower Technician. Tower Technician in the Telecom industry is also known as Site Engineer/Tower Engineer/Site Technician.

Individuals at this job needs maintain site live 24x7, maintain and repair level-1 faults/issues at telecom tower site, level-1 preventive and corrective maintenance and report faults to the supervisor in time. Individual also needs to travel inter-state and work during odd hours, when required.

This Facilitator guide is based on Tower Technician Qualification Pack (TEL/Q4100) & includes the following National Occupational Standards (NOSs)

1. Site Hygiene (TEL N/4100)
2. Preventive and Corrective Maintenance (TEL N/4101 & TEL N/4104)
3. Site Management (TEL N/4102)
4. Task reporting (TEL N/4103)

The Key Learning Outcomes and the skills gained by the participant are defined in their respective units.

Post this training, the participant will be able to keep sites live 24x7 through site maintenance.

We hope that this Facilitator Guide will provide a sound learning support to our young friends to build an attractive career in the telecom industry.

Symbols Used



Ask



Elaborate



Notes



Objectives



Do



Exercise



Say



Activity



Demonstrate



Practical



Key Learning Outcomes



Summary

Table of Contents

S.No	Modules and Units	Page No
1.	Introduction	1
	Unit 1.1 – Icebreaker	3
	Unit 1.2 – Objectives of the Course	4
	Unit 1.3 – Telecom Industry in India	4
	Unit 1.4 – Types of Communication	5
	Unit 1.5 – Types of Cellular Network	5
	Unit 1.6 – Component of Cellular Network	6
	Unit 1.7 – Tower Infrastructure Industry	7
	Unit 1.8 – Career Progression as Tower Technician	7
2.	Site Hygiene (TEL/N4100)	10
	Unit 2.1 – Introduction to Components at Tower Site	11
	Unit 2.2 – Telecom Tower	12
	Unit 2.3 – Telecom Shelter Unit	17
	Unit 2.4 – PIU - Power Interface Unit	20
	Unit 2.5 – Battery Bank	22
	Unit 2.6 – Power Plant/Rectifier Unit	40
	Unit 2.7 – Air Conditioning	43
	Unit 2.8 – Fire Extinguisher and Smoke Detectors	45
	Unit 2.9 – EB Supply	48
	Unit 2.10– Earthing	49
	Unit 2.11– Aviation Lamp	56
	Unit 2.12– Diesel Generator	57
	Unit 2.13– Guidelines for First-Aid Facilities	81
3.	Preventive and Corrective Maintenance(TEL/N4101 & TEL/N4104)	83
	Unit 3.1 – Guidelines for Maintenance Activities	84
	Unit 3.2 – Routine Preventive Maintenance	85
	Unit 3.3 – Maintenance of Batteries	87
	Unit 3.4 – Maintenance of a Diesel Generator	94
	Unit 3.5 – Maintenance of the Tower & Shelter	106
	Unit 3.6 – Maintenance of AC Plant	107



Table of Contents

S.No	Modules and Units	Page No
	Unit 3.5 – Maintenance of the Tower & Shelter	106
	Unit 3.6 – Maintenance of AC Plant	107
	Unit 3.7 – Maintenance of AMF/PIU	108
	Unit 3.8 – Maintenance of SMPS Power Plant	109
4.	Site Management (TEL/N4102)	112
	Unit 4.1 – Introduction to Site Management	113
	Unit 4.2 – Waste Management at Site	117
	Unit 4.3 – Operating Equipment at Site	119
	Unit 4.4 – Fault Management System	121
5.	Task Reporting (TEL/N4103)	123
	Unit 5.1 – Introduction to Task Reporting	124
	Unit 5.2 – Site Check List	126
	Unit 5.3 – Alarm Management Report	127
	Unit 5.4 – Preventive Maintenance Report	127
	Unit 5.5 – Acceptance Testing Reporting	127
	Unit 5.6 – Fuel and Energy Management Report	128
	Unit 5.7 – Outage Analysis Report	128
	Unit 5.8 – Outage Management Report	128
	Unit 5.9 – Site Equipment Data Management	129
	Unit 5.10– Battery Testing Report	129
6.	Employability & Entrepreneurship Skills	132
	Unit 6.1 – Personal Strengths & Value Systems	136
	Unit 6.2 – Digital Literacy: A Recap	165
	Unit 6.3 – Money Matters	173
	Unit 6.4 – Preparing for Employment & Self Employment	188
	Unit 6.5 – Understanding Entrepreneurship	203
	Unit 6.6 – Preparing to be an Entrepreneur	225
7.	Annexures	244
	Annexure I : Training Delivery Plan	245
	Annexure II : Assessment Criteria	253





Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



1. Introduction

Unit 1.1 - Icebreaker

Unit 1.2 - Objective of the Course

Unit 1.3 - Telecom Industry in India

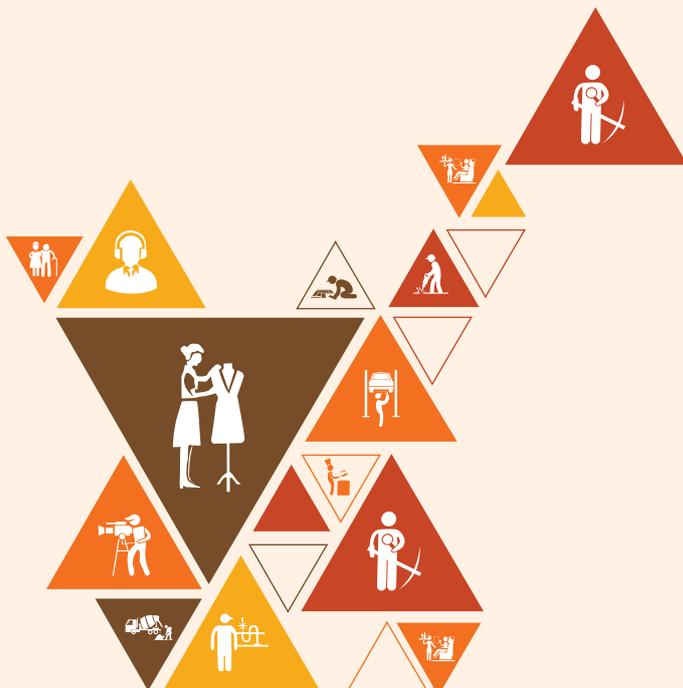
Unit 1.4 - Types of Communication

Unit 1.5 - Types of Cellular Network

Unit 1.6 - Component of Cellular Network

Unit 1.7 - Tower Infrastructure Industry

Unit 1.8 - Career Progression as Tower Site



Key Learning Outcomes

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

1. Develop rapport with the participants of the program.
2. Get Introduction of all the participants and let everyone know each other.
3. Share an understanding of the telecom industry.
4. Discuss about communication and types of communication networks.
5. Explain about types of cellular networks and components used in these networks.
6. Discuss about tower Infrastructure industry.
7. Share details about the job role of tower technician and what will be his role and responsibilities.

UNIT 1.1: Icebreaker

Unit Objectives

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

- Get the introduction of the faculty
- Introduce themselves with all the fellow students
- Build rapport with other students and the trainer

Resources to be Used

- Available objects such as a duster, pen, notebook etc
- Internet, PC/Laptop and projector

Do

- Make the students stand in a circle, close enough to the person each side of them that they can pass the parcel quickly.
- Say 'Stop' when the students least expect it. The person who has the parcel at that time should get out.
- Those who get out should introduce themselves by providing their names and a little additional information such as favorite hobbies, likes, dislikes etc.
- The winner of the game should stand and introduce himself/herself at the end of the game.

Say

- Thank the students for their participation
- Tell them to please take their seat
- Let's start with your course

Notes for Facilitation

- You could ask the students who get out during the game to be the music keepers. They can start and stop the music as the game progresses.
- Encourage shy students 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.
- This will ensure a healthy bonding in the class and also open up shy students.

UNIT 1.2: Objectives of the Course

Unit Objectives

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

1. Discuss about the telecom industry in India.
2. Identify the technologies being deployed in cellular networks.
3. Gain an overview of tower infrastructure industry in India.
4. Understand the Job role of tower technician and expectation from them.
5. Discuss the components of a cellular networks and bringing the focus on tower site.

Notes for Facilitation

- You could ask the students about the expectations from the course
- Invite students to participate. List their expectations on the whiteboard
- Give the students a brief overview of what all will be covered in the program

UNIT 1.3: Telecom Industry in India

Unit Objectives

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

1. Discuss the evolution and growth of the telecom industry in India.
2. Talk about the future growth which is expected in the industry.
3. Touch upon international scenario of telecom industry.
4. Discuss about the telecom product companies worldwide and in India.
5. Explain how network solution companies are important for telecom operators.

Say

- The global Telecom industry is US \$ 670 Billion and market Cap of these Companies is US \$ 991 billion. convert this figure in Indian rupees to show them big number. This industry is growing at a CAGR of 15 % annually over the last many years.
- India is the second largest growth markets worldwide after China with more than 1 billion telephone subscribers.
- Talk about Indian telecom operators, discuss a bit about Airtel, Reliance, BSNL etc.
- Give some insight about few top global telecom operators to students.
- Discuss the role of telecom product companies and solution providers in a telecom operator network.

Notes for Facilitation

- You could ask the students what they know about various telecom operators in India. Lead this towards a discussion so that everyone gets a good knowledge about the operators.
- Give students some time to discuss about some global telecom operators, you can name few and let people add more knowledge/ inputs to this.

UNIT 1.4: Types of Communication

Unit Objectives

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

1. Clearly understand the definition of telecommunication.
2. Understand the types of networks used for telecommunications.
3. Differentiate between wireless and wire line communication.

Say

- Definition of telecommunication.
- Lead the discussion in a way where everyone in the class gets a clear idea about the term telecom.
- Telecommunication happens on two types of networks wire line and wireless networks.
- Talk about both these types and explain this in a bit of details.

Ask

- Ask one student to explain what he understands from word telecommunication.
- Ask the students regarding the difference between wireless and wire line communication.
- Ask the students as how the call gets routed between wireless and wire line communication.

UNIT 1.5: Types of Cellular Network

Unit Objectives

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

1. Know about CDMA and GSM networks.
2. Differentiate between 2G, 3G, 4G and 5G networks.
3. Understand the advantages of new technology networks over previous ones.

Say

- Give an overview of GSM and CDMA technology.
- Give an overview of 2G, 3G, 4G, 5G networks.
- Talk about the advantage of the progressive technology enhancement.
- Explain how convergence of CDMA and GSM technology is happening after LTE (Long term evolution) or 4G.
- Explain the new applications like IOT (Internet of Things), which are coming up by adopting latest technologies like 4G and 5G.

Ask

- Ask students to prepare notes on GSM, CDMA, 2G, 3G, 4G and 5G. Take 10 min session in the class. This will create an excellent awareness about technologies in students.
- Ask the students to prepare 10 min session on IOTs and how are they are going to change the world.

UNIT 1.6: Components of Cellular Network

Unit Objectives

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

1. Figure out the components used in a GSM network.
2. Understand the use of a SIM card in a mobile station.
3. Identify the role of a BTS (Base Transceiver Station) in the mobile communication.
4. Explain how internet traffic flows from a mobile station to IWF (Inter working function) and internet.
5. Discuss the use of various databases and how security is implemented.

Say

- Explain the terms related to cellular networks like Mobile Station, Base Station, Gateway, data bases
- Talk about the security mechanism used to prevent unauthorized users from entering the network.
- Elaborate on the types of radio waves used in cellular networks.

Ask

- Ask the students to explain what is mobile station
- Tell them to talk about the mobile switching center
- Ask them questions on how data connectivity is achieved on mobile network.
- Let them explain, how a mobile station gets connected to a base station

UNIT 1.7: Tower Infrastructure Industry

Unit Objectives

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

1. Highlight the need of a tower infrastructure industry and the investment needed in it.
2. Appreciate the reasons of frequent mergers and acquisitions in this industry.
3. Talk about the major companies in this industry in India.
4. Understand the concept of Infrastructure sharing.

Do

- Give an overview of tower infrastructure industry.
- Discuss various companies in India who are part of Tower Infra Industry.
- Talk about some mergers which are happening in this industry and give reasons why.
- Discuss about infrastructure sharing and need of the same.

Ask

- Ask students to find out top three Tower infra companies in India and number of towers they have.
- One student should speak of about infrastructure sharing as to what they understood from this.

Notes for Facilitation

- Faculty should spend some time on internet and google about the topics covered in this unit to get the latest updated information about the topics covered.

UNIT 1.8: Career Progression as Tower Technician

Unit Objectives

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

1. Understand the responsibilities of a tower technician.
2. Get aware of the SLAs which he has to work on.
3. Understand the organizational hierarchy in an tower infrastructure company.
4. Define the growth path for him as a career.

Say



- About the responsibilities of a tower technician.
- That the job role is very critical for continuous working of a cell site.
- That if the cell site goes down the communication gets lost for all the people in that area.

Ask



- Ask few students why they want to become a tower technician.
- Ask the participants to elaborate on the role as to what they think is expected from them

Summarize



In this chapter students have learnt about

- Details of telecom industry.
- Technical details of communication and telecom networks.
- Details about tower infrastructure industry.



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



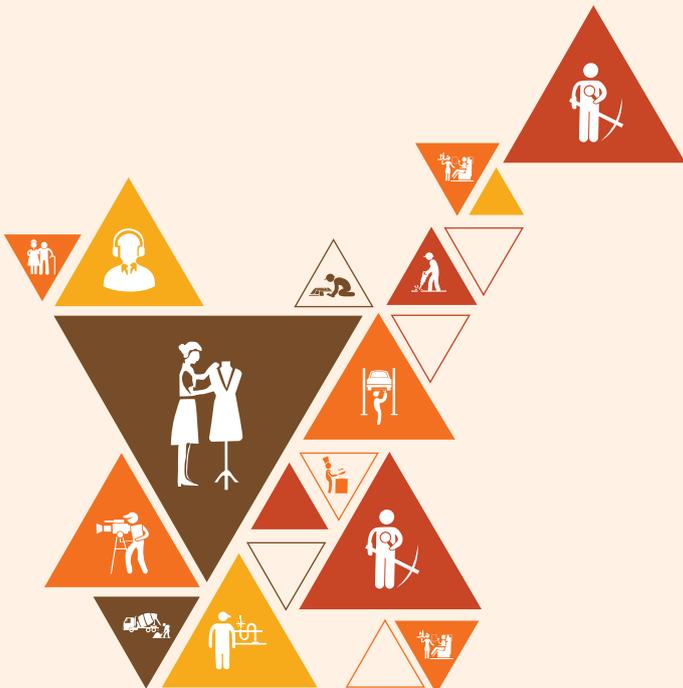
N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



2. Site Hygiene

- Unit 2.1 - Introduction to Components at a Tower Site
- Unit 2.2 - Tower
- Unit 2.3 - Telecom Shelter Unit
- Unit 2.4 - PIU- Power Interface Unit
- Unit 2.5 - Battery Bank
- Unit 2.6 - Power Plant/ Rectifier Unit
- Unit 2.7 - Air Conditioning
- Unit 2.8 - Fire Extinguisher and Smoke Detectors
- Unit 2.9 - EB Supply
- Unit 2.10 - Earthing
- Unit 2.11 - Aviation Lamp
- Unit 2.12 - Diesel Generator
- Unit 2.13 - Guidelines for First-Aid Facilities



TEL/N4100

Key Learning Outcomes

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

1. Learn about the components at a cellular tower site.
2. Know about the equipments to be maintained at a cellular tower site.
3. Maintain site hygiene of AC, DG, PIU, SMPS and battery bank, as per organization's norms.
4. Understand about other important components at site like Earthing, Lightning arrester etc.
5. Check if installation of fire safety instruments are in place.
6. Control incidents like fire accident.
7. Check the site as per electrical safety norms.
8. Check proper floor markings, shadow board display and labels.
9. Explain Dos and Don'ts at a tower site.
10. Maintain checklist of standards laid by the company based on its knowledge and understanding.

UNIT 2.1: Introduction to Components at a Tower Site

Unit Objectives

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

- Get an overview of various components at a tower site
- Identify and position these components in the telecom tower
- Understand the functioning of each component

Notes for Facilitation

- You could ask the students about their knowledge of a tower site and what are the components present.
- Invite students to participate. Tell them to give a brief description of the components they know.
- Let there be a debate in the class on the functioning of each component.

2.1.1: Components at a Tower Site

Say

- As we move forward it's very important to know about all the components at a tower site
- You should also know about the functioning of each component

Do

- Explain to the participants the need of getting things clear during this session
- Clarify all their doubts
- Ask them to get into pairs for practice.
- Go around and make sure that they are doing it properly.

Activity

- This is a skill practice activity to understand the components of a tower site
- Ask the students to assemble together and form groups. Take them to a tower site to demonstrate the working of the site and make them acquaint with the equipments/ components used at the site
- Encourage students to ask questions, so that they can understand it properly
- Ask the students not to touch any equipment at site
- Details of the skill activity are given below
- Method to do this activity:

Show and explain various components/ equipments at the site, ensure they understand the need of each equipment.

Skill Practice	Time	Resources
To get acquainted with the equipments and components at a tower site	4 hours	Take permission to visit a tower site with participants.

Method to do this activity

- Refer unit 2.1.1, page 16 of the participant handbook
- Discuss all the components given in the participant handbook
- Ensure that student gets a basic overview of these components at a tower site

Activity



- This is a skill practice activity to demonstrate the tools used at a tower site on day to day basis
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Demonstrate and make them acquainted with the functioning of these tools
- Tell all the students to do this activity individually to gain practice
- Details of the skill activity are given below

Skill Practice	Time	Resources
To practice the use of various tools at the tower site, on day to day basis.	4 hours	Batteries, Gloves, Voltmeter, spanners, Cable and Lugs, Jelly, Voltmeter, ammeter, amp-hour meter, hydrometer, screw driver set, hammer

Method to do this activity:

- Take out and display all the tools and meters used at a tower site
- Explain functioning of each tool to participants
- Give them some exercises to use these tools
- Ensure they are able to use these tools as and when at the site

UNIT 2.2: Telecom Tower

Unit Objectives

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

1. Understand the steps involved in identifying a telecom tower site.
2. Describe the civil works required for the construction of a site.
3. Explain the important points for the takeover of a site once it is ready.
4. Differentiate between various types of towers used in a telecom networks.

2.2.1: Construction of a Telecom Tower Site

Say

- Welcome and greet the participants.

Do

- Explain the definition and use of a telecom tower.

Ask

- Make few students to stand and ask them the need and use of a telecom tower?

2.2.2: Civil work Scope and Survey

Do

- Talk about the requirements at a site for installation of the tower?
- Organize a group discussion among the participants to identify the points to be looked at while doing survey for the selection of a site.

2.2.3: Site Civil Work Execution and Takeover

Elaborate

Elaborate this activity of site work execution and finally takeover of the site. Talk about the steps involved in creating an engineering drawing of the site based on the specifications of the site. Post completion of civil work like laying of foundation etc fixing of shelters and DG set is done.

2.2.4: Types of Tower Unit

Do



- List the four types of towers used at various sites

Elaborate



- Refer page 20-22 of participant handbook and differentiate between all four types of towers.
- Share specific reasons when a particular type of tower is used
- Talk about the specifications of each tower

Activity



- This is a skill practice activity to demonstrate the specifications of different types of towers used at various tower sites. This activity will provide complete knowledge of various types of towers.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To understand different types of towers used at a tower site.	2 hours	Projector, Board, Marker, visit to a tower site

Method to do this activity

- Display the specification Table 2.2.10 on the page 22 of the participant handbook and explain the specifications to the participants.
- Discuss questions/queries, if any.
- See if you can visit a tower site and show a specific tower to the participants.

2.2.5: Tower Site Takeover

Say



- Once the site is ready it should be verified by the site engineer
- Once certified site is taken over, its ready for the operations

2.2.6: Site Hygiene of a Tower

Say 

- Refer Subunit 2.2.6 on page 23 of the participant handbook
- These are few key points which are important for proper upkeep of a tower
- Explain these points to participants as described in the participant handbook

Ask 

- If they have any doubts, clarify them

Excercise 

- Discuss the questions asked in the participant handbook

UNIT 2.3: Shelter/Room

Unit Objectives

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

1. Discuss the definition of a shelter.
2. Identify the parts of a shelter.
3. Differentiate between different types of shelters.
4. Understand the usages of a shelter.
5. Explain the structure of PUF panel.
6. Maintain the site hygiene for a shelter site.

2.3.1: Shelters

Say

- Shelters provide protection to all the equipments at a tower site from all weathers.
- It provides controlled environment to the equipments deployed at the site.

2.3.2: Types of Shelter

Elaborate

- Refer unit 2.3.2, page 28-29 of the participant handbook
- On two types of shelters used in the telecom industry
- On the material used for construction of pre-fabricated shelters
- On the way they are connected /put together to ensure that they are weather proof

Activity

- This is a skill practice activity to show different types of shelters and to demonstrate the construction/features of shelters . This activity will provide complete knowledge of various shelters at a tower site.
- Ask the students to assemble together and form groups
- Take them to a tower site
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To provide a complete knowledge of various shelters used at a tower site. Also describe all the accessories used in the shelter.	4 hours	Visit to a tower site

Method to do this activity

1. Take the participants to a telecom tower site.
2. Instruct them not to touch any equipment at the site.
3. Any touch may harm them or damage the equipments.
4. Show them the shelter and all the accessories used in a shelter.
5. If this is a pre-fabricated shelter, tell them the way they are connected together.
6. Show the interlocking mechanism which could be either cam lock or tongue or groove joint.
7. Explain the difference between riveted or non riveted shelters.
8. Show all the equipments and accessories used in the shelter to the participants.
9. Give a brief about the functioning of all accessories.
10. Demonstrate the points which are important for maintaining site hygiene.
11. Ask questions from the participants to check their understanding.
12. Answers to their doubts, if they have.

2.3.3: Accessories used in a shelter

Say 

- The accessories used in a shelter have specific functions.
- Refer page no 30 of participant handbook and elaborate on the functioning of all various accessories in the shelter.

Ask 

- After you have explained about different accessories used in the shelter, ask the students to stand one by one and explain the functions of each accessories used in a shelter.
- If participants have any doubts ask them to clarify their doubts.

2.3.4: Site Hygiene for a Shelter

Say 

- Refer subunit 2.3.4, page 31 of the participant handbook.
- Talk about the importance of the site hygiene at a tower site.
- Discuss these points one by one.
- Correlate these details with the observations which participants had during the site visit.

Do 

- Ask the participants to clarify their doubts.

2.3.5: Shelter from Inside

Do 

- Ask the students to write down the observations from the site visit.
- Based on their observations they should draw the layout of the site.
- They should compare their layout with a recommended layout as shown in Fig 2.3.1, page 32 of participant handbook

Excercise 

- Discuss the questions asked in the participant handbook

UNIT 2.4: Power Interface Unit (PIU)

Unit Objectives

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

1. Understand the concept of Power Interface unit (PIU).
2. Know the features of a PIU.
3. Identify the components of a PIU.
4. Explain the functioning of a PIU.
5. Identify Do's and Don'ts of a PIU site.
6. Understand the technical specification of a PIU.

2.4.1: Key features of a PIU

Say

- The definition of a PIU.
- Use of the PIU at a telecom site.

2.4.2: Components of a PIU

Say

- Talk about the basic structure of the PIU.
- Describe the components of the PIU.

Elaborate

- Refer unit 2.4.2, page 35 of the participant handbook.
- Discuss and explain in detail the critical components of a PIU.

Ask

- If participants have understood the points being shared

2.4.3: Block Diagram of a PIU

Do

- Refer fig 2.4.9, page 27 of the participant handbook.
- Ask one student to come up and draw the block diagram of PIU on the Board.
- Tell him to describe the uses of a PIU .
- Explain the functioning of each components in detail
- Explain about the AMF (Auto Main Failure) or change over in detail.

Ask

- Ask the participants whether they have understood the concept.

2.4.4: Site Hygiene Requirements of a PIU

Say

- Discuss site hygiene conditions of a PIU
- Do's at a PIU site
- Don't at a PIU site

2.4.5: Technical Details of a PIU

Do

- Refer page 39-41 and display the technical specification diagram of a PIU
- Discuss important parameters with the participants

Ask

- Ask the participants to complete the practical and exercise as given in the participant handbook.
- Ask the students to clarify their doubts ,if any.

Activity

- This is a skill practice activity to demonstrate the key components and functioning of a PIU. This activity will provide complete understanding of the working of a PIU
- Ask the students to assemble together and groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify their points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To understand the key component and functioning of a PIU.	3 hours	PIU which can be opened for demonstration to the participants.

Method to do this activity

1. Refer unit 2.4, page 34-42 and various diagrams shown in the unit of participant handbook
2. Take the students in front of a PIU and demonstrate various components to the students
3. Show them all the hygiene guidelines which they have to follow
4. Refer unit 2.4.5 and describe all the technical specification practically to the participants

UNIT 2.5: Battery Bank

Unit Objectives

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

1. Understand the concept of a battery bank.
2. Differentiate between a cell and a battery.
3. Know about the types of batteries used.
4. Understand the working of the Lead acid batteries.
5. Differentiate between types of lead acid batteries.
6. Select the right capacity of VRLA battery needed for site.
7. Understand the need of the site hygiene for a battery bank.
8. Know about the do's and don'ts of a battery bank.

2.5.1: A Cell and a Battery

Say

- Refer page 44 of the participant handbook and discuss the definition of a cell and of a battery
- Draw diagrams of a battery and a cell and explain the concept of polarities
- Explain how the flow of electrons is linked to movement of current in a cell.

2.5.2: Types of Battery

Say

- Tell the difference between primary and secondary batteries.
- Discuss on various types of batteries with examples.

2.5.3: Lead Acid Battery

Say



- Elaborate on the history of the Lead Acid Battery
- Talk about various types of Lead Acid Batteries, refer pages 43-48 of the participant handbook:
 - a. Open flooded battery
 - b. SMF
 - c. SMF VRLA: These are available in two types GEL and AGM batteries which are explained below.
 1. GEL battery is a lead-acid electric storage battery which
 - Is sealed using special pressure valves and should never be opened.
 - Is completely maintenance-free.
 - Uses thixotropic GEL electrolyte.
 - Uses a recombination reaction to prevent the escape of hydrogen and oxygen gases.
 - Have more electrolyte (15~20% more than VRLA) to ensure long life.
 - Is non-spill able, and therefore can be operated in virtually any position. However, upside-down installation is not recommended.
 2. AGM (Absorbed Glass Material) battery is a lead-acid electric storage battery which:
 - Is sealed using special pressure valves and should never be opened.
 - Is completely maintenance-free.
 - Have electrolyte absorbed in separator's (70~80%) and plate's (20~30%) microspore.
 - Uses a recombination reaction to prevent the escape of hydrogen and oxygen gases, normally lost in a flooded lead-acid battery (particularly in deep cycle applications).
 - Is non-spill able and therefore can be operated in virtually any position. However, upside-down installation is not recommended.

Describe the difference between GEL and AGM batteries:

- Both are recombinant batteries.
- Both are sealed VRLA battery.
- AGM batteries and GEL batteries, both are considered “acid-starved”.
- In an AGM and GEL battery, the electrolyte does not flow like a normal liquid.
- In a GEL battery, the electrolyte has the consistency and appearance of jelly. Like gelled electrolyte batteries, absorbed electrolyte batteries are also considered non-spill able – all of the liquid electrolyte is trapped in the sponge-like matted glass fiber separator material. The “acid-starved” condition of GEL and AGM batteries protects the plates during heavy deep-discharges. The GEL battery is more starved, giving more protection to the plate; therefore, it is better suited for super deep discharge applications.
- Due to the physical properties of the gelled electrolyte, GEL battery power declines faster than an AGM battery's as the temperature drops below 32°F. AGM batteries excel for high current, high power applications and in extremely cold environments.

Elaborate



- On the working of a lead acid battery refer section 2.5.3 and 2.5.4 of the participant handbook.
- On charged state, discharged state and overcharged state.
- On how to measure a charged state of a battery – Refer to figure 2.5.1 (shows the method of checking the specific gravity value of the battery and its relationship with the % of charging of the battery).



Fig. 2.5.1 Battery Charge Measurement

Refer to figure 2.5.2 and 2.5.3 below, this shows the relationship between the battery charging voltage/Specific gravity value and the charging %. Explain this to the participants so that they can understand this relationship.

Specific Gravity Value	Charging %
1.265 to 1.275	100%
1.225 to 1.235	75%
1.190 to 1.200	50%
1.155 to 1.165	25%
1.120 to 1.130	0% charging required

Fig. 2.5.2 Specific Gravity Value V/S Charging %

Battery charging voltage	Charging %
12.60	100%
12.45	75%
12.30	50%
12.15	25% Charging Required

Fig. 2.5.3 Battery Charging Voltage V/S Charging %

Activity



- This is a skill practice activity to measure the specific gravity of a battery.
- Ask the students to assemble together and groups.
- Explain to them that we are going to do a practical exercise.
- Please ensure that since the hydrometer will carry electrolyte which is an acid, special precaution need to be taken to ensure that no participant gets acid burn.
- Details of the skill activity are given below.
- Ask the students to do this activity separately and gain practice.
- Each participant should gain experience of doing this activity.

Skill Practice	Time	Resources
Measuring specific gravity of a Battery	2 hours	Battery, Hydrometer, Gloves, eye protection gear

Method to do this activity

1. Put on eye protection and rubber gloves.
2. It is recommended to disconnect the battery especially if on a high rate of charge / discharge.
3. Remove vent cap.
4. Carefully draw liquid into the hydrometer and avoid "bumping" the hydrometer.
5. Obtain a reading by looking directly at the float.
6. Compare the reading with the chart shown above.
7. Repeat steps 3-5 to reconfirm reading.
8. Record the cell number and result.
9. If it is very warm or very cold, correct the specific gravity at given temperature. If the ambient temperature is fairly consistent and original gravities are taken when the batteries are put into service, temperature correction is not critical and is only necessary when problems arise. Make sure that electrolyte is not hot, when taken out of service. Let it to reach at the room temperature.

2.5.4: Types of Lead Acid Batteries

Say



1. There are three types of Lead Acid Batteries as explained in earlier section:
 - Open type battery
 - Sealed maintenance free (SMF) battery
 - SMF – VLRA (Valve Regulated Lead Acid) battery
2. Explain all three types of batteries
3. Show the differences between three batteries.

Ask



- If participants have understood these differences
- Clarify their doubts, if any

Activity



- This is a skill practice activity to check the water level in an open type battery and filling water incase level is less.
- Ask the students to assemble together and form groups.
- Explain to them that we are going to do a practical exercise on filling water in battery.
- Please ensure that since we might get in touch with electrolyte which is an acid, special precaution need to be taken to ensure that no participant gets acid burn.

- Ask the students to do this activity separately and gain practice.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Checking water level in a Battery	2 hours	Battery, Gloves, Distilled water, Funnel, turkey baster

Method to do this activity:

- (Refer to Figure 2.5.4 on next page) open the covers of the cells (vent cap) of the open type battery.
- Through a torch check the level of water in individual cells.
- If the level of water is about 1 cm above the plates its fine.
- If the level is lower than this, you need to fill in distilled water in individual cells.
- Fill in water in the turkey baster and through a funnel add water to the cells.
- Checks the water levels again in the cell, if it's less, add more.
- Don't use the tap water otherwise minerals will get added to battery thus starting a chemical reactions in the cell.
- If it's fine, close the covers of the cell to prevent flow of gases in the atmosphere.
- Clean the battery and its ready for use again.

Explain



Watering:

Watering is the single most important step in maintaining a flooded lead acid battery; a requirement that is all too often neglected. The frequency of watering depends on usage, charge method and operating temperature. Over-charging also leads to water consumption.

A new battery should be checked every few weeks to estimate the watering requirement. This assures that the top of the plates are never exposed. A naked plate will sustain irreversible damage through oxidation, leading to reduced capacity and lower performance.

If low on electrolyte, immediately fill the battery with distilled or de-ionized water. Tap water may be acceptable in some regions. Do not fill to the correct level before charging as this could cause an overflow during charging. Always top up to the desired level after charging. Never add electrolyte as this would upset the specific gravity and promote corrosion. Watering systems eliminate low electrolyte levels by automatically adding the right amount of water.

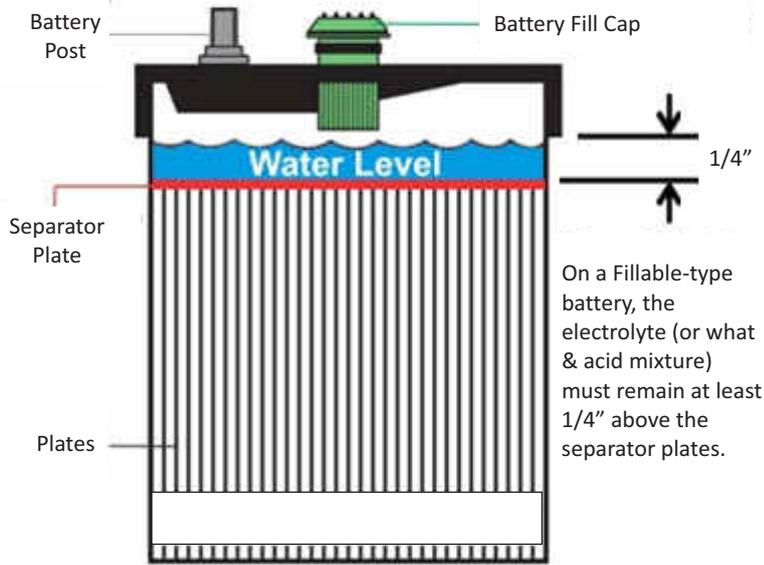


Fig. 2.5.4 Battery Water Level

2.5.5: Specification of a Lead Battery

Do

- Go to the board and write down all the key characteristics of the battery.

Elaborate

Refer Unit 2.5.5, page 49 of the participant handbook and explain/clarify all the points mentioned there as they form specifications of a battery. Few major points can be explained as below.

While our VRLA batteries accept a charge extremely well due to their low internal resistance, any battery will be damaged by continual under-or overcharging. Capacity is reduced and life is shortened.

Overcharging is especially harmful to any VRLA battery because of the sealed design. Overcharging dries out the electrolyte by driving the oxygen and hydrogen out of the battery through the pressure relief valves. Performance and life gets reduced. If a battery is continually undercharged, a power-robbing layer of sulfate will build up on the negative and positive plates, which acts as a barrier to recharging. Over discharge and Premature shedding can occur. Thus performance gets reduced and life of a battery is shortened.



WARNING-Never leave a VRLA battery in a discharged state:

When a battery is left in a discharged state for prolonged periods of storage, lead sulphate crystals begin to form acting as a barrier to recharge and will prevent normal battery operation. Depending on the degree of sulphate, a battery may be recovered from the condition by constant current charging at a higher voltage with the current limited to one tenth of the battery capacity for 12h or longer. This is called Boost Charging. In extreme circumstances a battery may never fully recover from sulphate and must be replaced.

Thus the charger must be temperature-compensated to prevent under or overcharging due to ambient temperature changes.

Rate of Discharge

Minutes discharged at 50, 25, 15, 8 and 5 Amperes

Minutes discharged is the time in minutes that a new, fully charged battery will deliver at various currents and maintain at least 1.75 volts per cell. These are nominal or average ratings.

Ampere Hour Capacity C20, C3, C1 etc

These are nominal or average ratings. Ampere Hour Capacity is an expression describing rate of discharge. The number indicates the number of hours to completely discharge the battery at a constant current. So C/20 is the current draw at which the battery will last for 20 hours (C20), C/1 is the current at which the battery will last 1 hour (C1). The useful capacity of a battery changes depending on the discharge rate, so battery capacities are stated with respect to a particular rate. For instance, a particular model of our battery CJ12-40 is rated at 40 amp-hours at the C/10 rate of 4.0 amps, but only 26 Ah at the C/1 rate of 26A.

Example

10 amperes for 20 hours (10×20) = 200 Ah @ the 20-hour rate(C20)

8 amperes for 3 hours (8×3) = 24 Ah @ the 3-hour rate(C3)

30 amperes for 1 hour (30×1) = 30 Ah @ the 1-hour rate(C1)

Therefore, if you have an application that requires a draw of 17 amperes for 3 hours, you would need a 51Ah battery (@ the 3 hour rate)...($17 \times 3 = 51$). However, this is 100% of the capacity of this 51 Ah battery

Battery Life

The life of Lead Acid batteries is usually limited by several factors :

The battery cycle life for a rechargeable battery is defined as the number of charge/recharge cycles a secondary battery can perform before its capacity falls to 80% of what it originally was (end of Life). This is typically between 500 and 1200 charge – discharge cycles also known as cycle life.

The battery shelf life is the time a battery can be stored inactive before its capacity falls to 80%. The reduction in capacity with time is caused by the depletion of the active materials by undesired reactions within the cell.

Age also affects batteries as the chemistry inside them attacks the lead plates. The healthier the "living Conditions" of the batteries, the longer they will serve you. Lead-Acid batteries like to be kept at a full Charge in a cool place. Only buy recently manufactured batteries. The longer the battery is kept in a store, less time it will serve you! Since lead-acid batteries will not freeze if fully charged, you can store them in the cold during winter to maximize their life.

Batteries can also be subjected to premature death by:

- Over-charging
- Over-discharging
- Short circuiting

Battery Life

- Drawing more current than it was designed to produce
- Subjecting to extreme temperatures
- Subjecting to physical shock or vibrations

Sulphation is a constant threat to batteries that are not fully re-charged. A layer of lead sulphate can form in these cells and inhibit the electro-chemical reaction that allows you to charge/discharge batteries. Many batteries can be saved from the recycling heap if they are Equalized.

Say



What is Depth of Discharge

DOD, short for the Depth of Discharge, is used to describe how deeply the battery is discharged. If we say a battery is 100% fully charged, it means the DOD of this battery is 0%. If we say the battery have delivered 30% of its energy, here 70% energy reserved, we say the DOD of this battery is 30%.

Ask



Does depth of discharge affect cycle life?

Yes! The harder any battery has to work, the sooner it will fail.

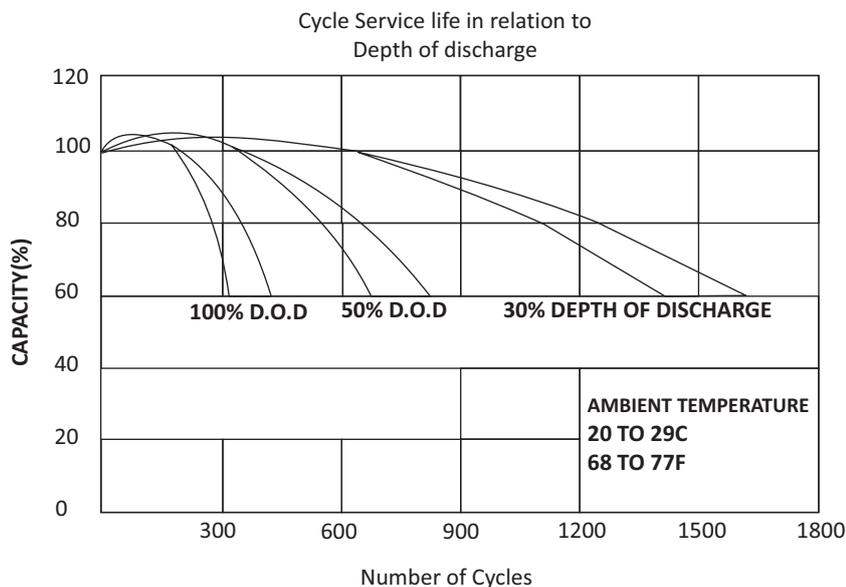


Fig. 2.5.5 Depth of Discharge

This is a typical graph showing number of cycles and its relation to the D.O.D (GEL)

As you can see, the shallower the D.O.D (depth of discharge), the longer the life. This is why it's important to size a battery system to deliver at least twice the average power required, to assure shallow discharges, therefore prolong the cycle life. Please:

- Avoid ultra-deep discharges.
 - Don't leave a battery at a low stage of charge for an extended length of time. Charge a battery as soon as possible after discharged.
 - Don't cycle a battery at a low state of charge without regularly recharging fully.
- Ultra-deep discharging is what causes life-shortening plate shedding and accelerated positive grid corrosion which can destroy a battery.

Ask



Why does temperature have such a dramatic effect on batteries?

Temperature is a major factor in battery performance, shelf life, charging and voltage control. At higher temperatures there is dramatically more chemical activity inside a battery than at lower temperatures.

What is Stack Design and Weight?

This is the new technology used to increase the power of the battery by packing more numbers of cell together and reducing their weight by using new innovation.

What is a float charge and how does this work?

A float charger (also called a storage charger, maintenance charger, or smart charger) will charge a battery at a similar rate as a battery self-discharges, thus maintaining a full capacity battery. However, the main difference between a trickle charger and a float charger is that a float charger has circuitry to prevent battery overcharging. A float charger senses when a battery voltage is at the appropriate float level and temporarily ceases charging; it maintains the charge current at zero or a very minimal level until it senses that the battery output voltage has fallen, and then resumes charging. It is important to note that the appropriate float voltage varies significantly with the construction of the battery and the ambient temperature. With the appropriate voltage for the battery type and with proper temperature compensation, a float charger may be kept connected indefinitely without damaging the battery.

Activity



- This is a skill practice activity to understand the difference between Float Charging, Trickle Charging and Boost Charging of a Battery
- Ask the students to assemble together and groups
- Explain to them, what we are going to do in this practical exercise
- Please ensure that since we might get in touch with electrolyte which is an acid, special precaution need to be taken to ensure that no participant gets acid burn
- Ask the students to do this activity separately and gain practice
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Understanding Boost Charging, Trickle Charging and Float Charging in a Battery.	4 hours	Battery, Gloves, Boost and Float Charger, Voltmeter, Ammeter.

Method to do this activity

Refer to figure 2.5.5 which explains the working of a Float Charging.

- These wires carry the 12/24/48 volt DC output current that goes to the battery.
- This printed circuit board contains the core of the float charger, which does many functions together. One it will reduce the input AC voltage to a output DC (Direct Current) Voltage which could be at 12/24/48 V. Two, it will continuously monitor the battery's charge status; fully-charged or under-charged. Third, if a battery becomes undercharged, it will automatically turn the charging cycle on.

C. These wires carry the 220 volt AC (house current) into the printed circuit board. The voltage will later be reduced by the circuitry.

E. These LED indicators let the user know the battery's charge or charging status. Some float chargers use 1 indicator to show that there is power going into the PC board. Other chargers use multiple or multi-color indicators to indicate power to the PC board as well as the on / off state of charger going to the battery.

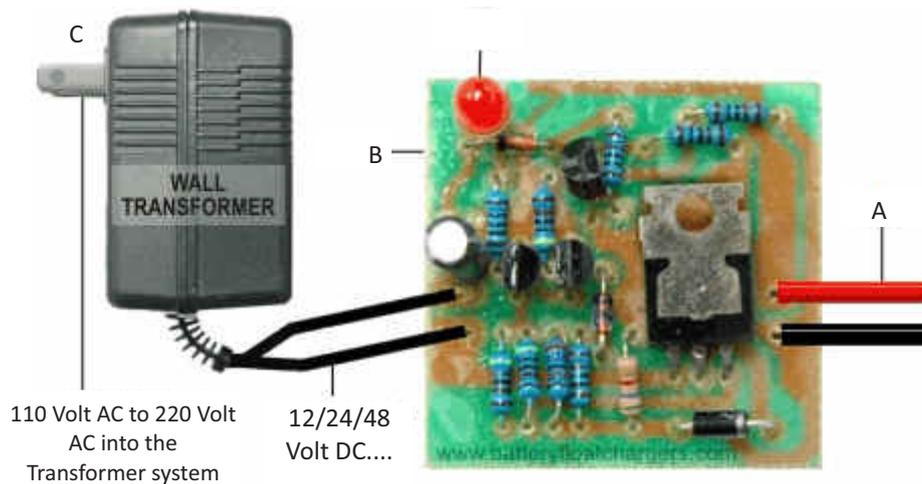


Fig. 2.5.5 Float Charging System

Elaborate



Charging of a Lead Acid battery:

The lead acid battery uses the constant current, constant voltage (CC/CV) charge method for charging. A regulated current raises the terminal voltage until the upper charge voltage limit is reached, at which point the current drops due to saturation. The charge time is 12–16 hours. With higher charge currents and multi-stage charge methods, the charge time can be reduced to 8–10 hours; however, without full topping charge. Lead acid is sluggish and cannot be charged as quickly as other battery systems.

Lead acid batteries should be charged in three stages, which are [1] constant-current charge, [2] topping charge and [3] float charge. The constant-current charge applies the bulk of the charge and takes up roughly half of the required charge time; the topping charge continues at a lower charge current and provides saturation, and the float charge compensates for the loss caused by self-discharge.

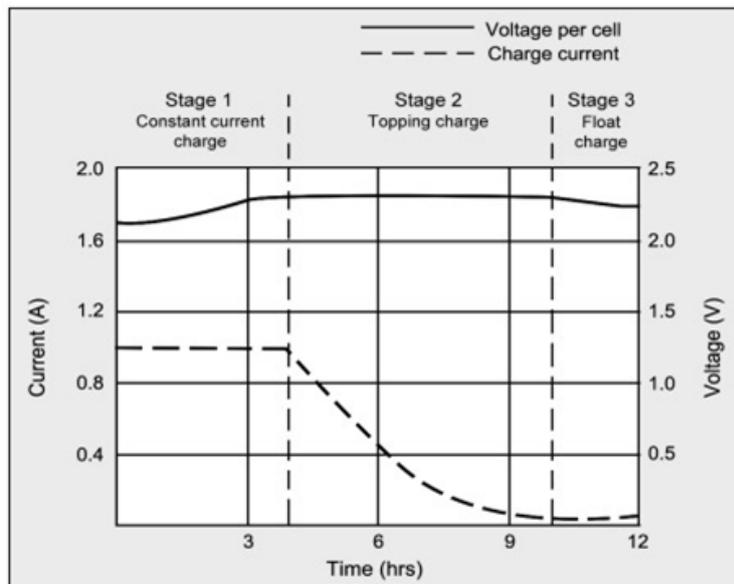
During the constant-current charge, the battery charges to about 70 percent in 5–8 hours; the remaining 30 percent is filled with the slower topping charge that lasts another 7–10 hours. The topping charge is essential for the well-being of the battery. If continually deprived, the battery will eventually lose the ability to accept a full charge and the performance will decrease due to sulfation. The float charge in the third stage maintains the battery at full charge. Figure 2.5.6 on the next page illustrates these three stages.

The battery is fully charged when the current drops to a set low level. The float voltage is reduced. Float charge compensates for self-discharge that all batteries exhibit.

The switch from Stage 1 to 2 occurs seamlessly and happens when the battery reaches the set voltage Setting, the voltage threshold. On one hand, the battery wants to be fully charged to get maximum capacity and avoid

sulfation on the negative plate; on the other hand, over-saturation by not switching to float charge causes grid corrosion on the positive plate. This also leads to gassing and water-loss.

Voltage threshold changes with temperature changes the voltage and this makes “dancing on the head of a needle” more difficult. A warmer ambient requires a slightly lower voltage threshold and a colder temperature prefers a higher setting. Chargers exposed to temperature fluctuations include temperature sensors to adjust the charge voltage for optimum charge efficiency.



Stage 1: Voltage rises at constant current to V-peak
 Stage 2: Current drops; full charge is reached when current levels off
 Stage 3: Voltage is lowered to float charge level

Fig. 2.5.6 Three Stages of a Battery Charging

The charge temperature coefficient of a lead acid cell is $-3\text{mV}/^\circ\text{C}$. Establishing 25°C (77°F) as the midpoint, the charge voltage should be reduced by 3mV per cell for every degree above 25°C and increased by 3mV per cell for every degree below 25°C . If this is not possible, it is better to choose a lower voltage for safety reasons. Refer to Figure 2.5.7 below, this compares the advantages and limitations of various peak voltage settings.

	2.3V to 2.35V/Cell	2.40V to 2.45V/Cell
Advantages	Maximum service life; battery stays cool; charge temperature can exceed 30°C (86°C).	Higher and more consistent capacity reading; less sulfation
Limitations	Slow charge time; capacity readings may be inconsistent and declining with each cycle. Sulfation may occur without equalizing charge	Subject to corrosion and gassing. Needs water refill not suitable for charging at high room temperatures, causing severe overcharge.

Fig. 2.5.7 Effect of Changing Charge Voltage

Once fully charged through saturation, the battery should not dwell at the topping voltage for more than 48 hours and must be reduced to the float voltage level. This is especially critical for sealed systems because they are less tolerant to overcharge than the flooded type. Charging beyond the specified limits turns redundant energy into heat and the battery begins to gas.

The recommended float voltage of most flooded lead acid batteries is 2.25V to 2.27V/cell. Large stationary batteries at 25°C (77°F) typically float at 2.25V/cell. Manufacturers recommend lowering the float charge when the ambient temperature rises above 29°C (85°F).

If your charger stays on topping charge and does not drop below 2.30V/cell, remove the charge after 48 hours of charging. Recharge every 6 months while in storage; AGM every 6–12 months.

These described voltage settings apply to flooded cells and batteries with a pressure relief valve of about 34kPa (5psi). Cylindrical sealed lead acid, requires higher voltage settings and the limits should be set to manufacturer's specifications. Failing to apply the recommended voltage will cause a gradual decrease in capacity due to sulfation. This allows some recombination of the gases generated during charge.

Aging batteries pose a challenge when setting the float charge voltage because each cell has its own unique condition. Connected in a string, all cells receive the same charge current and controlling individual cell voltages as each reaches full capacity is almost impossible. Weak cells may go into overcharge while strong cells remain in a starved state. A float current that is too high for the faded cell might sulfate the strong neighbor due to undercharge. Cell-balancing devices are available which compensate for the differences in voltages caused by cell imbalance.

Ripple voltage also causes a problem with large stationary batteries. A voltage peak constitutes an overcharge, causing hydrogen evolution, while the valley induces a brief discharge that creates a starved state resulting in electrolyte depletion. Manufacturers limit the ripple on the charge voltage to 5 percent.

Lead acid batteries must always be stored in a charged state. A topping charge should be applied every 6 months to prevent the voltage from dropping below 2.05V/cell and causing the battery to sulfate. With AGM, these requirements can be relaxed.

Measuring the open circuit voltage (OCV) while in storage provides a reliable indication as to the state-of-charge of the battery. A cell voltage of 2.10V at room temperature reveals a charge of about 90 percent. Such a battery is in good condition and needs only a brief full charge prior to use.

Observe the storage temperature when measuring the open circuit voltage. A cool battery lowers the voltage slightly and a warm one increases it. Using OCV to estimate state-of-charge works best when the battery has rested for a few hours, because a charge or discharge agitates the battery and distorts the voltage.

Buyers should not accept shipments of new batteries if the OCV at incoming inspection is below 2.10V per cell. A low voltage suggests a partial charge due to long storage or a high self-discharge caused by a micro-short. Battery users have found that a pack arriving at a lower than specified voltage has a higher failure rate than those with higher voltages. Although in-house service can often bring such batteries to full performance, the time and equipment required adds to operational cost.

Activity



- This is a skill practice activity to understand the way to check the State of Charge (SOC) of a battery.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Please ensure that special precautions like use of gloves and glasses are used as the participants might get in touch with the electrolyte which is an acid to prevent acid burn.
- Ask the students to do this activity separately and gain practice.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To measure battery's State of Charge (SOC).	2 hours	Battery, Gloves, Boost and Float Charger (SMPS), Voltmeter, Ammeter, Ampere-hour meter, Battery Hydrometer.

Method to do this activity

With proper care, quality batteries that are sized correctly for your application will last for years. If abused, an expensive battery bank may last only in months. Taking out too much power without recharging is what kills most batteries. Also, batteries that are low will freeze easily, while a fully-charged battery is good to at least 30 below zero.

Battery capacity is measured in ampere-hours (amp-hours). In rough terms, a 100 amp-hour battery can give out 1 amp for 100 hours, or 100 amps for one hour, or 20 amps for 5 hours. However, see the first item below--you should actually never want to use the entire capacity before recharging.

Meters can be as simple as a voltmeter to measure battery bank voltage and an ammeter to show net gain or loss of power, or as complicated as a digital amp/hour meter (highly recommended).

If possible, never use more than 20% of your battery bank's capacity. If your capacity is 1000 amp-hours, start your back-up generator when the meter shows -200 amp-hours (80% of capacity remaining). Never use more than half your battery capacity without recharging. If you use 75 to 80% of your capacity without recharging, your batteries WILL be damaged, even if they are "deep-cycle" batteries.

To measure battery state-of-charge, there are 3 possible methods.

1. **By Voltage:** (Refer to fig 2.5.8 and 2.5.9) This method is the least accurate, but requires only a cheap digital voltmeter. Analog meters (with a needle) are generally not accurate enough for this. Wait for 2 hours after any charging or discharging to take your measurement (use your disconnect switches to stop all charging or discharging if necessary). Measure DC voltage across the main positive and negative terminals. As batteries age, this voltage reading will gradually get lower. Measuring voltage across each cell can help diagnose failed cells. Divide the 12 volt reading from this chart by 2 for 6 volt batteries, and by 6 for individual 2 volt cells to figure state of charge (or amount of damage) for the cell. Example: An individual cell would show 2.12 volts at 100% charge when new.

2. **By Specific Gravity:** This is the most accurate method, but the most messy. You do not have to wait 2 hours to take this reading. It will not work with gel cells or NiCads. You'll need a good battery hydrometer--it will look like a foot long glass turkey baster with a glass float and thermometer inside.

- a. Wear goggles and rubber gloves! Keep baking soda and water handy in case you spill!
- b. Open up one cell on each battery and suck out enough acid to float the float (or measure every cell if you are ambitious enough).
- c. write down the reading
- d. average all these readings and compare to the chart



Fig. 2.5.8 Multimeter



Fig. 2.5.9 Checking Battery Voltage

3. By Ampere-Hours: This is best method to measure state of charge, both in accuracy and ease of use. This also makes it easy for people not familiar with your system to avoid abusing the batteries.

- a. Amp-hour meters keep track of all power moving in or out of your batteries by time. The efficiency of your battery bank is calculated by the meter while the system operates, and is automatically corrected.
- b. Amp-hour meters can sense when the batteries reach full charge, and automatically reset themselves to zero (full) when that point is reached. (Refer to Fig 2.5.10 and 2.5.11)



Fig. 2.5.10 AMP-Hour Meter



Fig. 2.5.11 Measuring State of Charge

- c. Any positive reading of amp-hours refers to power that was generated but not stored by the batteries because they were full. This power is in effect wasted, but switching systems can be built to divert the extra power.
- d. An amp-hour meter measures power running both ways in the main negative power cable through a "shunt". Any circuit or equipment that is on the wrong side of the shunt (the battery side) will not be metered--this will make your reading inaccurate. Connect all load and charging circuits to the side of the shunt away from the battery bank.
- e. The shunt must be big enough to handle all power the system can produce, including the inverter. A standard 500-amp shunt is big enough for most systems. A 100-amp shunt can usually be used in a small system.

2.5.6 Characteristics of a Lead Acid Battery

Say



We are going to see the impact of various parameters on the output voltage and the time of discharge.

1. **Temperature Dependence:** The rate of the reaction in the cell will be temperature dependent according to theories of kinetics. The internal resistance also varies with temperature; low temperatures give higher internal resistance. At very low temperatures the electrolyte may freeze giving a lower voltage as ion movement is impeded. At very high temperatures the chemicals may decompose, or there may be enough energy available to activate unwanted, reversible reactions, reducing the capacity. The rate of decrease of voltage with increasing discharge will also be higher at lower temperatures, as will the capacity. This is illustrated in fig 2.5.11.

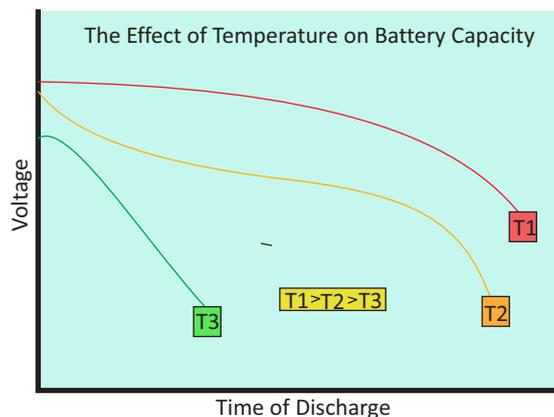


Fig. 2.5.12 Effect of Temperature on Battery Capacity

2. **Charge Discharge Cycle:** There are many aspects of the cycle that need consideration, such as:
- Voltage necessary to charge
 - Time necessary to charge
 - Availability of charging source
 - Potential safety hazards during charge/discharge
3. **Performance Curve at different Rate of Discharge:** As the current drawn increases battery capacity reduces refer fig 2.5.11 of the participant's handbook. As shown if the current is drawn at a rate where battery gets drained out in 1 hr vs 10 hrs the performance of the battery will be drastically different.

2.5.7 Site Hygiene for a Battery Bank

Do



- Based on the knowledge gained by the participants till now, make them speak up few site hygiene conditions for a battery bank.

Say



- Complete and explain the other site hygiene conditions which participants have missed out.

Activity



- This is a skill practice activity to understand the various site hygiene activities are performed on a battery Bank.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Please ensure that special precautions like use of gloves and glasses are used as the participants might get in touch with the electrolyte which is an acid to prevent acid burn.
- Ask the students to do this activity separately them self and gain practice.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To understand various site Hygiene conditions for a battery bank.	4 hours	Batteries, Gloves, Voltmeter, spanners, Cable and Lugs, Jelly,

Method to do this activity

With proper care and by maintaining site Hygiene conditions the performance and age of the battery can be enhanced many times. In order to do so a proper understanding of these site hygiene conditions is needed by the participant. In this activity all the site hygiene conditions discussed in the unit will be demonstrated to the participants refer page 51-54 of the participant handbook. Participants are suggested to perform/practice on their own so that when on field these technicians should be able to manage the site.

Few of the activities are provide below:

1. Cleaning of the battery Bank(Refer to Figure 2.5.13): Clean the battery tops with rags dipped in a baking soda and water solution. Do not let this cleaning solution get into the batteries-be careful of the vent holes in the caps on each cell, as cleaning solution can enter the battery here.
 - a. Re- torque the terminal bolts.
 - b. Crimping of the lugs on the wires.
 - c. Understand the procedure of dismantling of the battery from a battery Bank.
 - d. Understand the procedure of apply jelly on the terminal posts.
2. Few other activities which need to be performed on day to day basis are given below. Its important to practice doing these activities.



Fig. 2.5.13 Cleaning of Batteries

- e. Procedure to identify the plates polarity and stick the stickers in the battery providing date of installation, cell number and polarity labels.
- f. Check for corrosion on all the battery terminals (Refer to Figure 2.5.14): If any terminals are encrusted in green “stuff” you should:
 - Make sure that your main power switch is off. If you don't have a main switch, turn off the inverter, all load circuits, and all charging circuits.
 - Carefully disconnect wires from the dirty terminal and clean off the gunk with a wire brush. Don't breath in the dust! Wear a mask if necessary.
 - Apply anti-corrosion paste to the terminal (available at any hardware store in the electrical department).
 - Reconnect the wires.



Fig. 2.5.14 Corrosion on the Battery Terminals

2.5.8: Selecting Capacity of a Battery Bank

Say



1. Capacity of a battery bank depends on the power load of the equipment deployed at a tower site. Some other points on which the selection of a Battery capacity depends are:
 - Discharge current
 - Back-up time required
 - Operating voltage window
 - Temperature
2. Different correction factors used for capacity selection are refer unit 2.5.8, page 55 of the participant handbook:
 - 'k' factor – To consider battery capacity available at particular discharge rate for a particular end cell voltage (ECV)
 - Temperature correction factor – Battery capacity derates with lowering of temp
 - Ageing factor – 1.25 as per IEEE standard 485
 - Design margin – 1.1 to take care of design uncertainties
 - Max %DOD permissible during normal site operation (so that spare capacity is available in case DG fails to start)

Explain



- Explain various correction factors as mentioned above in details, used while selecting the battery capacity.
- Explain the process of calculating the required tower power with an example.

Activity

- This is a skill practice activity to understand the way to calculate the capacity of a battery bank.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to do these calculations themselves so that they are well versed with the procedure to calculate this.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To understand the method, to calculate the capacity of a battery bank.	2 hours	Projector, Board, Marker, Duster

Method to do this activity

Total Energy Consumption Calculation

Description	Calculations Steps	Result (units)
Total AC Consumption	SUM 1 (Wh/d)	Wh/day
Total DC Consumption	SUM 2 (Wh/d)	Wh/day
Total Consumption Watt-hours per 24-Hr Day	SUM 1+SUM 2= SUM 3 (Wh/d)	Wh/day
Battery Bank Voltage	Common Voltages: 12V,24V or 48V (V)	V
Total consumption Amp-hours per-24-Hr Day	SUM 3/Battery bank Voltage	Ah

Fig. 2.5.15 Energy Consumption Calculation

Formula for calculating Capacity in AH

Capacity in AH = Load current * K factor for backup hours required * Ageing Factor * Design Margin * temperature correction factor (if ambient temp is lower is lower to 27C)/Normal % DOD permissible

Symbol	Parameter	Range	Comments
TC	Temperature Compensation	Flooded Lead Acid	See Temperature Correction Table
DA	Days of Autonomy	2 – 10*	System Dependent *
DM	Design Margin	1 – 1.25 **	System Dependent
DOD	Depth of Discharge	0.2 – 0.8 ***	Shallow – Deep DOD

Fig. 2.5.16 Battery Adjustment Factors

(°F)	(°C)	Flooded (FLA)	AGM	GEL
70	25.0	1.00	1.00	1.00
50	10.0	1.19	1.08	1.11
32	0	1.39	1.20	1.25
14	-10	1.70	1.35	1.42

Fig. 2.5.17 Temperature Correction Factor

- Refer unit 2.5.8 of the participant handbook and Refer to Figure 2.5.15,2.5.16 and 2.5.17.
- Explain the example of the battery capacity selection in front of all participants.
- Ensure that they understand the way this calculation is done.
- Ask if they have any doubts.

Exercise

- Discuss the questions asked in the participant handbook.

UNIT 2.6: A SMPS Power Plant

Unit Objectives

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

1. Get an understanding of a SMPS power plant.
2. Know the features of a power plant.
3. Identify the components of SMPS power plant.
4. Maintain the site hygiene for a power plant.

2.6.1: Features of a Power Plant

Say

- The definition of a power plant.
- All about a power plant.
- Explain In detail about the Rectifier technology used in SMPS power plant.
- Why power plants in telecom are called as SMPS plants.

2.6.2: Components of a Power Plant

Explain

- The block diagram of a SMPS power plant.
- The battery current limiting circuitry which controls the current supplied to the battery.

Activity

- This is a skill practice activity to know about the components of a power plant and understand the way they operate thus providing a stable DC Power.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to do these calculations themselves so that they are well versed with the procedure to calculate this.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To know about the components of a power plant and understand the way they operate to provide a stable DC power.	4 hours	SMPS Power Plant,

Method to do this activity

1. Take the participants in front of a SMPS power plant. Refer unit 2.6 of the participant handbook.
2. Open the cover of the power plant so that all components of the plant are visible to participants.
3. Explain all the components in detail so that everyone gets the concept of working of this plant.
4. Describe the technical specifications of each component.
5. Elaborate on the site hygiene conditions which need to be followed. Demonstrate them if possible.

2.6.3: Specification of a Power Plant

Elaborate



- The input and output specifications of a power plant.

Ask



- In case participants have any doubts which they must ask.

2.6.4: Site Hygiene for a Power Plant

Do



- Discuss all site hygiene points with the participants.

Explain



- All the points discussed in this unit, so that participants get the full concept of these hygiene points.

Exercise



- Discuss the questions asked in the participant guide.

2.7: Air Conditioning System

Unit Objectives



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

1. Understand the need of AC at a tower site.
2. Demonstrate a good knowledge of different types of AC systems.
3. Identify how to provide perfect environment protection at a site.
4. Maintain the site hygiene for air conditioner unit.

2.7.1: Types of Air Cooling System

Do



- Explain different types of air conditioning systems used in industry.
- Talk about the most used systems in the telecom towers.

Explain



The most used system in telecom towers are:

1. Window Air conditioner (Refer to Figure 2.7.1)

This type is the most commonly used system for shelters. In this air conditioner, a single box houses all the components, namely the condenser, evaporator, compressor, cooling coil, and expansion valve. A window air conditioner unit is fitted in a window sill or a slot in the room's wall that is specially made for it. This type is also referred to as a “unitary” air conditioning system. It blows out cooled air on one end (the one inside the room) and ejects heat on the other (the external end).

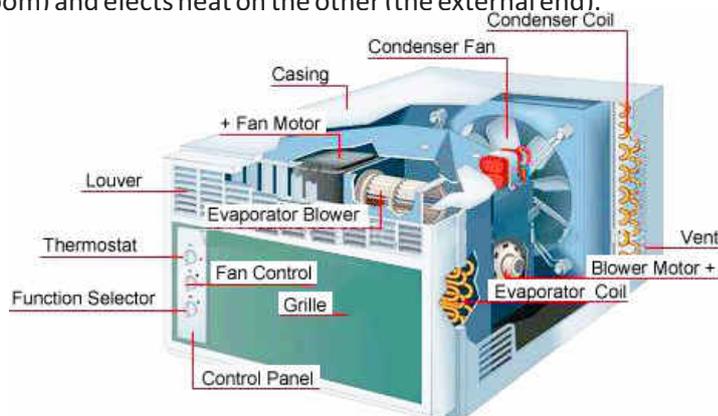


Fig. 2.7.1 Window Air-Conditioning Unit

2. Split or ductless air conditioner (Refer to Figure 2.7.2)

This system is called a “split” system because it is made up of two units: one indoor and one outdoor. The former houses the evaporator and cooling fan. The latter, meanwhile, houses the compressor, expansion valve, and condenser. Split air conditioning systems provide the added convenience of not having to make a slot in the room wall. Also, modern split air conditioners do not take as much space as window units.



Fig. 2.7.2 Split Air-Conditioning Unit

2.7.2: Site Hygiene for a Air Conditioning Unit

Do

- Tell all participants to assemble in a group

Describe

- All the points for maintaining the site hygiene at an AC unit

Activity

- This is a skill practice activity to demonstrate an Air Condition Unit. Show the components of an AC. Explain the site hygiene condition and how to maintain these conditions.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
To identify the components of an Air Conditioner. Understand the functioning of each component. Explain the site hygiene condition and how to maintain these conditions.	4 hours	Air Conditioner Unit, Screw Driver set.

Method to do this activity

- Open an Air Conditioner unit in front of the group.
- Explain them about each component as visible in the Air Conditioner unit.
- Discuss the site hygiene conditions and the process to implement these conditions.

2.8: Fire Safety

Unit Objectives



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

1. Understand the reasons of fire hazards.
2. Take timely action to control the fire.
3. See how extension of alarms help in fire safety.
4. Discuss about the sensors used for fire safety.

2.8.1: Basics of Fire Safety

Basics of Fire Safety

To minimize and mitigate related risks, usually the companies have taken up various safety related initiatives including safety training for all employees; mock fire drills (day / night) every six months and percolation of safety guidelines and knowledge management on health and safety through mailers and videos (Do's & Don'ts during emergency, Road Safety, articles related to Health, Safety during Fire, Flood and Earthquake etc.). These are a part of the company's transformation journey based on the four pillars - Excellence on Awareness & Employee Communication, Risk Assessment through Audit Mechanism, Corrective & Preventive Actions (“CAPA”), and Bench Marking & best practice sharing within and outside the companies.

Explain



- Reasons of a Fire Hazard
- According to NPFA (National Fire Protection Association) what are the types of fire and what type of Fire extinguishers are used in these fires.

Activity



- This is a skill practice activity to demonstrate a Fire Prevention Drill. This drill should be performed every year to ensure that the all involved with the telecom tower and site work are aware of the actions they need to take to prevent fire.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To undergo a fire safety drill and explain the precautions need to be taken while going through a fire incident	2 hours	Fire safety equipment, Sensors

Method to do this activity

Fire drills are critical for ensuring the safety of the staff, that enter your business, building or site. Practicing scheduled fire drills will help ensure individuals have the knowledge to safety escape during a fire with out injuring themselves or others.

Fire drills are conducted by the person that is responsible for the maintenance of the site.

Pre-Fire Drill Procedures

To be conducted by supervisory staff or maintenance personnel. Check the fire alarm system and advise them of the upcoming fire drill. Ensure to supply the monitoring company with the estimated time line to conduct the fire drill.

Initiating the Fire Drill

1. Is there a “Fire Drill” feature on the panel?

Yes – utilize this feature to activate alarms for the purpose of the fire drill.

No – activate the nearest manual pull station.

- Record the time from the activation of the fire alarm to the evacuation of all staff members.

During the Fire Drill

Supervisory staff is to monitor the evacuation process and note any of the following:

- Are individuals closing the doors upon exiting rooms?
- Are individuals remaining calm and proceeding towards the nearest exit?
- Are individuals assembling at the designated muster point?
- Are fire wardens ensuring the safe evacuation of all individuals?
- Are all individuals being accounted for (if applicable)?
- Are exits guarded to prevent re-entry into the building?
- Any fire needed to be exhausted by use of proper fire extinguishers to be done first.

After the Fire Drill

- Record the total evacuation time in the evacuation checklist report.
- Silence the alarms, reset the manual pull station and reset the fire alarm system.
- Ensure the fire alarm system is back to normal operating condition. All Extinguishers are filled up and are back to operating conditions.
- Inform individuals that they can re-enter the building.
- Contact the fire alarm monitoring company and the O&M team to advise that the fire drill is complete.
- Re-evaluate any concerns that arose during the fire drill and discuss as a group (ex. safety meeting).
- Keep record of the fire drill and any notes on the evacuation checklist report.

2.8.2: Devices and Sensors

Elaborate



- About various types of fire extinguishers used in a telecom tower refer page 64-64 of participant handbook.
- Explain the procedure to use these fire extinguishers at the time of fire.
- On various types of sensors used at a tower site.
- Talk about the connectivity of the sensors with the NOC
- Site Hygiene conditions for Fire Safety.

2.9: Electricity Board (EB) Supply

Unit Objectives

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

1. Know about the three phase power supply from Electricity Board.
2. Explain how this energy coming from EB is measured.
3. State that how electricity flow through a tower site happens.
4. Maintain the Site Hygiene guidelines for the Electricity Board Supply.

Ask

- The participants as what do they understand with Electricity Board and Electricity Board Supply

Say

- The definition of Electricity Board Supply

Explain

- The concept of three phase supply and how is this metered

2.9.1: Electrical Signal Flow

Elaborate

- The overall electrical signal flow through the tower site and distribution of AC and DC (display fig 2.9.3, page 67 of the participant handbook in front of participant.)

2.9.2: Site Hygiene of Electricity Board Supply

Say

- The main points of Site Hygiene as per unit 2.9.2 of participant's handbook

2.10: Earthing at Site

Unit Objectives

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

1. Discuss why Earthing is important for a site.
2. Demonstrate different Earth pits needed at a site.
3. Identify internal details of the Earth pit.
4. Discuss Internal Grounding Bar and its connections.
5. Discuss External Grounding Bar and its connections.
6. Understand overall Earthing connectivity at a tower site.
7. Understand different types of Earthing.
8. Maintain the Site Hygiene needed for proper Earthing.

2.10.1: Objectives of Earthing at Site

Say

- The reasons of having an Earth at the tower site.

Elaborate

- The above mentioned reasons.
- The reasons of having multiple Earth Pits at a tower site.

2.10.2: Anatomy of the Earth Pit

Elaborate

The construction of the Earth Pit and talk of grounding systems consisting of multiple ground rods, connected, meshed or grid networks, ground plates, and ground loops refer page 69-70 of the participant handbook.

Activity

- This is a skill practice activity to demonstrate construction of an Earthing Pit. This activity will provide complete knowledge of how to construct a proper Earthing at a site. .
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below.

	Time	Resources
To construct a new Earth pit as per required specification of a tower site.	6 hours	Multiple ground rods for connected, meshed or grid networks, ground plates, and ground loops. Megger, Funnel with Wire mesh.

Method to do this activity:

An accurate assessment of the soil resistivity should be made around the tower base to determine among other things, the appropriate depth to drive in the copper earth rods, the number of rods and the need for an earth mat, among other things.

Following procedure is followed to create an earth pit.

1. Excavation on earth for a normal earth pit size is 1.5M X 1.5M X 10M
2. Use 500 mm X 500 mm X 10 mm GI Plate (Plate may be use as big as possible to contact more and more area of earth for low resistance & best result)
3. Make a mixture of wood, coal, powder salt & sand, all in equal part:
 - (a) Wood Coal Powder use as good conductor of electricity, anti-corrosive, rust proof for GI plate for long life.
 - (b) Salt use as electrolyte to form conductivity between GI plate coal and earth with humidity.
 - (c) Sand has used to form porosity to cycle water & humidity around the mixture.
4. Put GI plate (EARTH PLATE) of size 500 mm X 500 mm X 10 mm in the mid of mixture.
5. Use double GI strip size 30 mm X 10 mm to connect GI plate to system earthling.
6. It will be better to use GI Pipe of size 2.5" diameter with a Flange on the top of GI Pipe to cover GI Strip from earth Plate to top flange.
7. Cover top of GI pipe with a T joint to avoid jamming of pipe with dust & mud and also use water time to time through this pipe to bottom of earth plate.
8. Maintain less than one ohm resistance from Earth pit conductor to a distance of 15 meters around the earth pit with another conductor dip on the earth at least 500 mm deep.
9. Check voltage between earth pit conductor to neutral of mains supply 220V AC 50 Hz it should be less than 2.0 volts.

Explain



Why do we need to test the grounding systems?

Over time, corrosive soils with high moisture content, high salt content, and high temperatures can degrade ground rods and their connections. So although the ground system when initially installed, had low earth ground resistance values, the resistance of the grounding system can increase if the ground rods are eaten away. Grounding testers are indispensable troubleshooting tools to help you maintain uptime. With frustrating, intermittent electrical problems, the problem could be related to poor grounding or poor power quality. That is why it is highly recommended that all grounds and ground connections are checked at least annually as a part of your normal preventive maintenance plan. During these periodic checks, if an increase in resistance of more than 20 % is measured, the technician should investigate the source of the problem, and make the correction to lower the resistance, by replacing or adding ground rods to the ground systems.

What is a good ground resistance value?

There is a good deal of confusion as to what constitutes a good ground and what the ground resistance value needs to be. Ideally a ground should be of zero ohms resistance. There is not one standard ground resistance threshold that is recognized by all agencies. However, the NFPA (National Fire Protection Association) and IEEE(Institute of Electrical and Electronics Engineers) have recommended a ground resistance value of 5.0 ohms or less. The NEC(National Electrical Code) has stated to “Make sure that system impedance to ground is less than 25 ohms specified in NEC 250.56. In facilities with sensitive equipment it should be 5.0 ohms or less.” The Telecommunications industry has often used 5.0 ohms or less as their value for grounding and bonding. The goal in ground resistance is to achieve the lowest ground resistance value possible that makes sense economically and physically.

Activity



- This is a skill practice activity to demonstrate measurement of earth resistance at any tower site. This activity will provide complete knowledge of how to measure the resistance of earth at a site and keep it under the permissible limits.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Measurement of Earth pit resistance and keep it within limits as per required specification of a tower site.	4 hours	Clamp on test meter, Megger, Geo Earth Ground tester like Fluke-1625

Method to do this activity

1. Why Determine the Soil Resistivity?
Soil Resistivity is most necessary when determining the design of the grounding system for new installations (green field applications) or when additional load/ equipment are getting installed at a site to meet your ground resistance requirements. Ideally, you would find a location with the lowest possible resistance. But as we discussed before, poor soil conditions can be overcome with more elaborate grounding systems.
2. Setup for soil resistivity testing: The soil composition, moisture content, and temperature all impact the soil resistivity. Soil is rarely homogenous and the resistivity of the soil will vary geographically and at different soil depths. Moisture content changes seasonally, varies according to the nature of the sub layers of earth, and the depth of the permanent water table. Since soil and water are generally more stable at deeper strata, it is recommended that the ground rods be placed as deep as possible into the earth, at the water table if possible. Also, ground rods should be installed where there is a stable temperature.
3. Soil resistivity measurements are often corrupted by the existence of ground currents and their harmonics. To prevent this from occurring, the Fluke 1625 uses an Automatic Frequency Control (AFC) System. This automatically selects the testing frequency with the least amount of noise enabling you to get a clear reading.
4. An accurate assessment of the soil resistivity should be made around the tower base using any of the following method as shown in the table.(Refer to Figure 2.10.1)
5. Explain all the four methods of calculating soil resistivity to participants.

There are four ways of measuring Earth at a site.

Figures below explain the selective method (single Clamp) and Stakeless Method (two Clamps).

	Advantages	Drawbacks
Fall-of-Potential	<ul style="list-style-type: none"> Widely accepted When you see the characteristic curve you know you've got a good measurement. 	<ul style="list-style-type: none"> You have to disconnect ground The stakes may not be to drive There may not be space around the ground electrode to drive the stakes.
Selective Method	<ul style="list-style-type: none"> Don't have to disconnect electrode Widely accepted When you see the characteristic curve you know you've got a good measurement. 	<ul style="list-style-type: none"> The stakes may not be easy to drive. There may not be space around the ground.
Stakeless Method	<ul style="list-style-type: none"> Convenience 	<ul style="list-style-type: none"> Assumes a low-impedance parallel path Possible to get very low readings by mistakenly measuring on a hard-wired loop.
Two-pole Method	<ul style="list-style-type: none"> Convenience 	<ul style="list-style-type: none"> Impossible to judge the integrity of the "auxiliary electrode." Can't be sure you are outside the area of influence

Fig. 2.10.1 Methods of Calculating Earth Resistance

Elaborate



Explain all four ways of checking the resistance of the soil.

1. Fall of potential:

Connect the ground tester as shown in the picture. Press START and read out the RE (resistance) value. This is the actual value of the ground electrode under test. If this ground electrode is in parallel or series with other ground rods, the RE value is the total value of all resistances. (Refer to Figure 2.10.2)

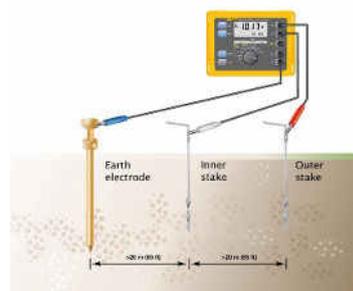


Fig. 2.10.2 The Fall-of-Potential test

2. The selective method is based on the fall of potential test but without the need to disconnect the ground electrode under test. Under this test a current clamp is used to isolate the test current injected into the electrodes. This application example shows the benefit of the selective test in a typical installation. Firstly the ground spikes are positioned according to the requirements of the system under test. Then individual elements of the system can be measured by placing the current clamp around the different connections to ground without the need of any power down or disconnection of existing circuits. Multiple electrodes can be tested quickly simply by moving the current clamp to individual electrodes which needs to be tested. The pictures below explain the same (Refer to Figure 2.10.3 and 2.10.4).

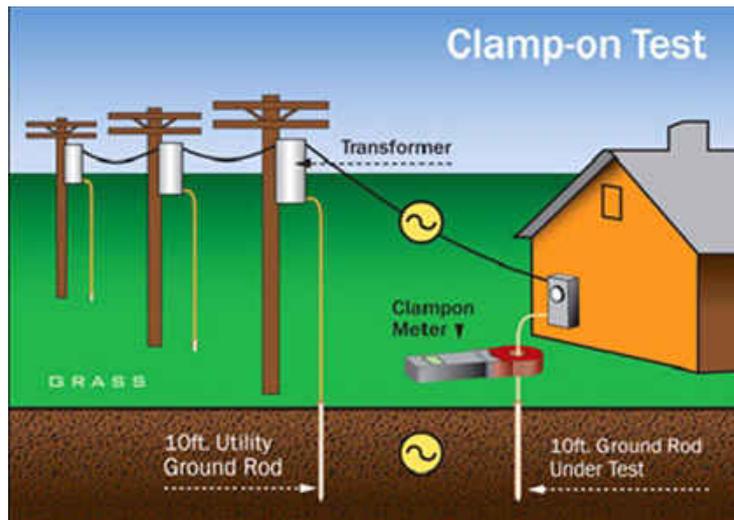


Fig. 2.10.3 Selective Method

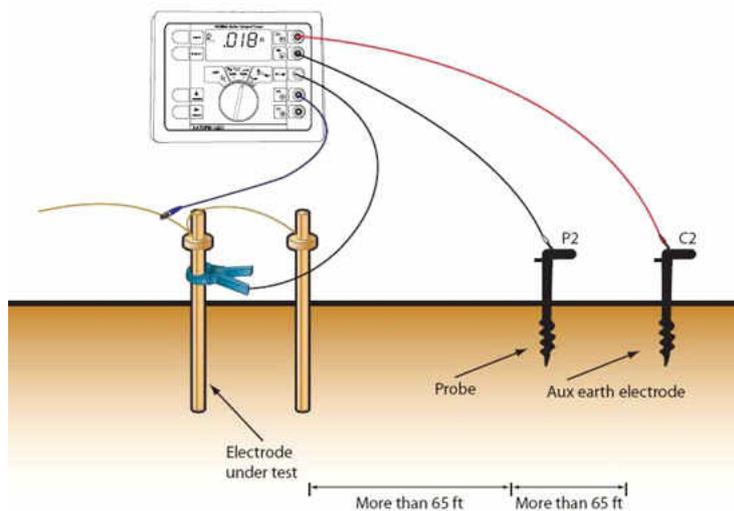


Fig. 2.10.4 Selective Method

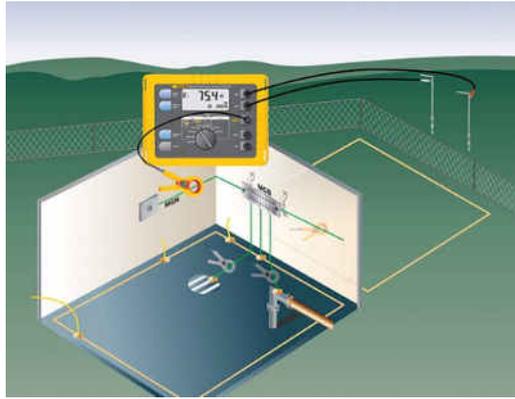


Fig. 2.10.5 Stakeless Method

3. In case there is no space for fixing Stakes then the most commonly used method is Stakeless method which can be done by using Clamp-on Earth Loop tester. In stakeless method (Refer to Figure 2.10.6) the temporary ground stakes are replaced by two current clamps. The first clamp generates a voltage on the ground conductor; the second clamp measures the current flowing due to the generated voltage. With this test method, two clamps are placed around the earth ground rod or connecting cable and each connected to the tester. As one clamp is generating a field and the other is measuring a field they should be kept apart. Earth ground stakes aren't used at all.
4. The fourth method i.e. two pole method is not used much in telecom systems as the results produced by this test are not much reliable

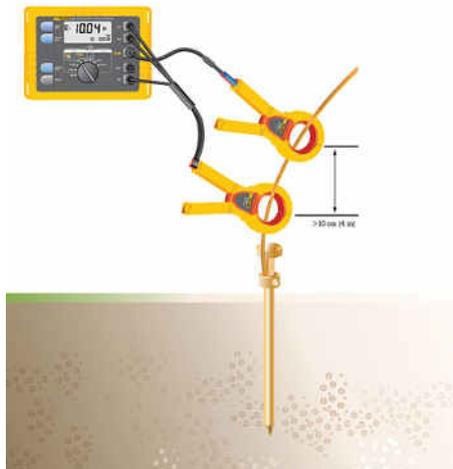


Fig. 2.10.6 Stakeless Method

Ask



2.10.3: Types of Earthing

Say



There are four types of Earthing which can be used at a tower site which are (refer page 73 of participant handbook):

1. Chamber/ Earth Pit or Spike Electrodes Earth.
2. Pipe/ Bore Earthing.
3. Strip Electrode Earthing.
4. Chemical Earthing.

Elaborate



- Discuss all four types of earthing systems in details with participants. Explain them how each type of earthing is useful and what is the advantage of each vs others

2.10.4: Site Hygiene of Earthing System

Do



Refer page 73 of the participant handbook and explain all the points to the participants.

Ask



If participants have any doubts in the Earthing System and clarify their doubts

2.11: Lightning Arrestors and Aviation Lamp

Unit Objectives

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

1. Understand the concept of Lightning Arrestor.
2. Understand the concept of Aviation Lamp.
3. Discuss the use of Lightning Arrestor and Aviation Lamp.
4. Demonstrate the connectivity details of a Lightning Arrestor.
5. Maintain the Site Hygiene for Lightning Arrestor and Aviation Lamp.

2.11.1: Lightning Arrestor

Ask

- What is the use of Lightning Arrestor?
- How does it protect the telecom site from Lightning.

Elaborate

- Explain in detail the function of Lightning Arrestor using Figure 2.11.1 of the participant handbook. Talk about all the components used in setting up the Lightning Arrestor system

2.11.2: Aviation Lamp

Explain

The use of Aviation Lamp at a Tower site. Clarify doubts of the participant if they have any on this.

2.11.3: Site Hygiene for Lightning Arrestor and Aviation Lamp

Do

Explain the points of Site Hygiene on both Lightning Arrestor and Aviation Lamp to the participants.

2.12: Diesel Generator

Unit Objectives

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

1. Develop good understanding about a diesel generator.
2. Discuss the components of a diesel generator:
3. Identify DG safety devices.
4. Demonstrate installation and commissioning check points.
5. Identify the safety measures to be observed while working on a DG.
6. Maintain the site hygiene at a diesel generator site.

2.12.1: Diesel Generator - An Overview

Say

What is a Diesel Generator?

A diesel generator (Refer to Fig. 2.12.1 and 2.12.2 on next page) is the combination of a diesel engine with an electric generator (often an alternator) to generate electrical energy.

Explain

Draw fig 2.12.2 in participant handbook and explain all the blocks of the Diesel generator.

2.12.2: Components of a Diesel Generator

Activity

- This is a skill practice activity to demonstrate the components of a Diesel Generator. This activity will provide complete knowledge of parts of a diesel generator to the participants
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate all the parts of a Diesel Generator.	2 hours	Tool set, A Diesel Generator which can be dismantled.

Method to do this activity:

Take the participants in front of a Diesel Generator. Open the Diesel Generator. Demonstrate various parts of DG as shown below.

Demonstrate 

-Refer page 78-81 of the participant handbook and the figure 2.12.1 and 2.12.2 below. Explain all the parts shown in the guide to participants. Post this practical, they should be able to identify all components of a Diesel Generator.

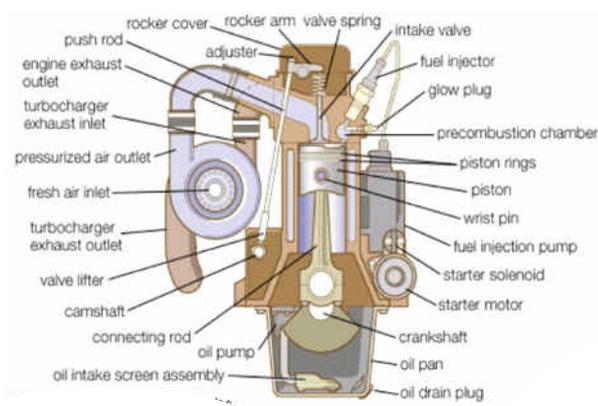


Fig. 2.12..1 Parts of Engine

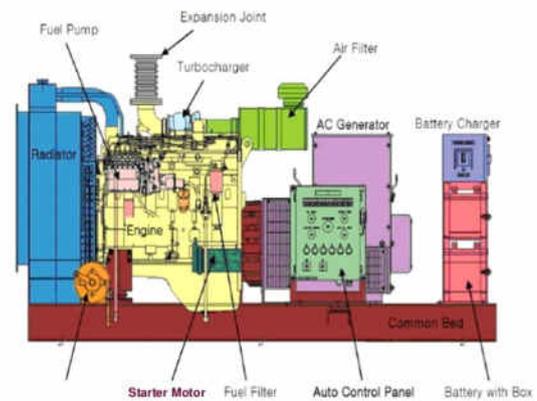


Fig. 2.12.2 Diesel Generator

2.12.3: Engine of a Diesel Generator

Say 

- Engine converts the chemical energy to heat energy and mechanical energy

Discuss

- Refer block diagram 2.12.3 of the participants handbook. Discuss the block diagram in detail and explain how the chemical energy gets converted to mechanical energy

Explain 

- Four strokes of the diesel generator referring to fig 2.12.4 to 2.1.2.8 of the participant handbook

Activity

- This is a skill practice activity to demonstrate the working of the engine of a Diesel Generator. This activity will provide complete knowledge of four Strokes of the engine of a diesel generator and how these four strokes work in synchronization to generate mechanical energy
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate four strokes of a Diesel Generator and how they work in synchronization to produce Mechanical Energy.	4 hours	Toolset, A Diesel Generator which can be dismantled.

Method to do this activity

1. Take a diesel generator which is used to demonstrate activities to participants
2. Ask the students to form groups around the generator
3. Open the covers of the engine
4. Show the participants all four engine cylinders
5. Rotate the crank shaft and demonstrate the Piston movement
6. Explain them what happens during suction stroke, compression stroke, power stroke and exhaust stroke.
7. Discuss the movement of piston up and down and how the pressure of air in the engine is increased to increase the temperature of air to 560 degree centigrade. Explain how mixing of diesel with Hot air pushes the piston down.
8. Show Intake valve and exhaust valve to the participants.
9. Explain the movement of the emission gases and how they are thrown out of the engine chamber.
10. Demonstrate how all four engines work in synchronization to produce continuous mechanical energy which is used by alternator to produce electrical energy.

Ask

- Ask participants if they have any doubts about the practical demonstrated.

2.12.4: Systems in a Diesel Generator

Say

- Diesel Generator consists of many systems which are defined as:
 1. Air Intake System
 2. Engine Fuel System
 3. Lubrication System
 4. Air Cooling System
 5. Liquid Cooling System
 6. Exhaust System

Let's discuss these systems one by one to get a better understanding about all.

Air Intake System

Say

Air Intake system is the system which is used in a diesel generator to suck fresh air from the atmosphere into the Diesel Generator set. This air is cleaned and dust is removed using a evacuator valve and an Indicator (Ref Fig 2.12.10 to 2.12.13 of participant handbook and figure 2.12.3 below).

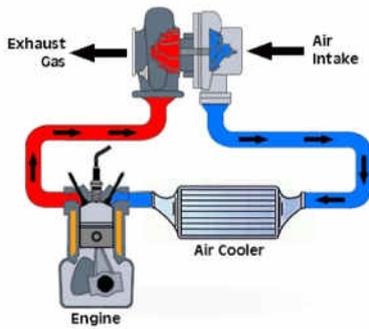


Fig. 2.12.3 Air Intake System

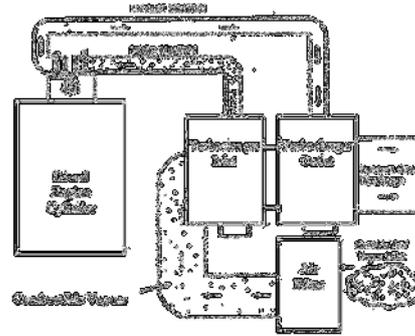


Fig. 2.12.4 Block Diagram of Air Intake system

Activity

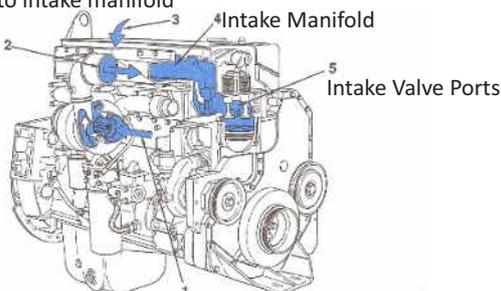
- This is a skill practice activity to demonstrate the working of the Air intake system of a diesel engine. This activity will provide complete knowledge of the Air intake system of a diesel Engine
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate Air Intake System of a Diesel Engine	2 hours	Tool set, A Diesel Generator which can be dismantled.

Method to do this activity

1. Open the engine of the diesel generator
2. (Refer to Figure 2.12.4 and 2.12.5) explain the Air intake system to the participants.
3. Show the indicator and Dry Air Filter to participants and explain them how to remove the filtered dust from the system.

Charge air Cooler Intake air to intake manifold
 Turbo charge air to charge air cooler



Filtered Intake Air to Turbo charge

Fig. 2.12.5 Flow Diagram of Air Intake System

Engine Fuel System

Say



Engine fuel system consists of following parts (Refer Fig 2.12.14 of participant handbook)

1. Fuel Tank
2. Feed Pump
3. Fuel Filter
4. Fuel Pump
5. Injector or Nozzle
6. Combustion Chamber
7. Return Pipe Tank

Activity



- This is a skill practice activity to demonstrate the working of Engine Fuel System of a Diesel Engine. This activity will provide complete knowledge of the Engine Fuel System of a diesel Engine.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate Engine Fuel System of a Diesel Engine	2 hours	Tool set, A Diesel Generator which can be dismantled

Method to do this activity

1. Open the Engine of the Diesel Generator
2. (Refer to Figure 2.12.6 below and page 86 of participant handbook) Explain the Engine Fuel system to the participants
3. Explain the functioning of each component for this system

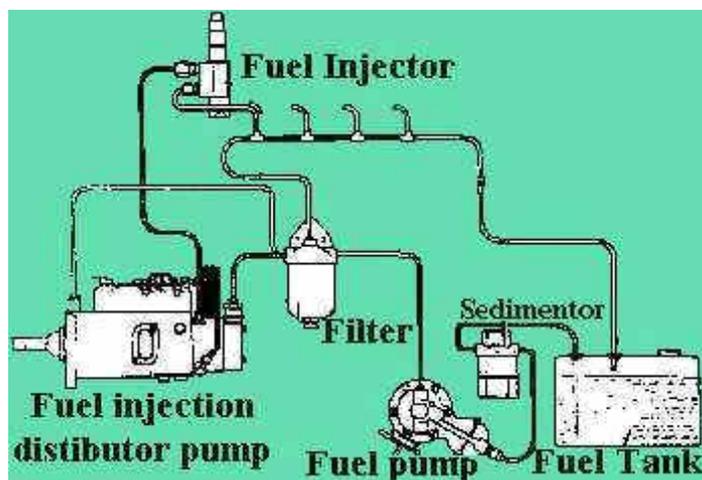


Fig. 2.12.6 Engine Fuel System

Lubrication System

Explain



Refer page 87-89 of the participant handbook. Talk about all three type of mechanisms used in lubrication systems used in a diesel engine.

1. Pressure Lubrication
2. Splash Lubrication
3. Mist Lubrication

Lubrication system consists of the following components:

1. Oil Sump
2. Dipstick
3. Strainer
4. Oil Pump
5. Oil Pressure Gauge
6. Oil Pressure regulating Valve
7. Lube Oil Switch

Small holes

Six or eight small holes around the central hole, and oil flow into those holed to filter impurities



Fig. 2.12.7 Oil Filter and it's construction

Refer to fig 2.12.7 this shows the dissection of an oil filter and the figure below (Refer to 2.12.8) shows the working of the Lubricant system in a Diesel Engine. In the diagram below the light green color represents flow of lubricant oil.

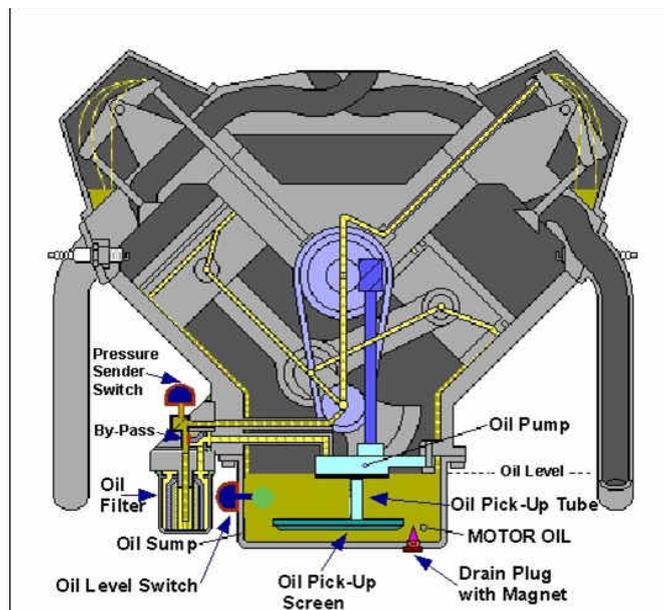


Fig. 2.12.8 Lubricant System of DG

Activity



- This is a skill practice activity to demonstrate the lubrication System of a Diesel Engine. This activity will provide complete knowledge of working of the Lubrication system of a diesel engine
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate Lubrication System of a Diesel Engine and also explain the site hygiene conditions for a lubrication system.	2 hours	Tool set, A Diesel Generator which can be dismantled.

Method to do this activity

1. Open the Engine of the Diesel Generator
2. As per the figure 2.12.8 explain the Lubrication system to the participants.
3. Explain the functioning of each component for the Lubrication system.
4. Explain the Site Hygiene conditions of the lubricating system.

Air Cooling System

Explain



The functioning of the Air Cooling System deployed in the Engine of a Diesel generator. Talk about the components of a Air Cooling System (Refer fig 2.12.18 of the participant handbook)

Activity



- This is a skill practice activity to demonstrate the Air Cooling System of a Diesel Engine. This activity will provide complete knowledge of the Air Cooling System of a Diesel Engine.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate working of the Air Cooling System of a Diesel Engine and also explain the site hygiene conditions for the Air Cooling system.	2 hours	Tool set, A Diesel Generator which can be dismantled.

Method to do this activity

1. Open the Engine of the Diesel Generator
2. As per the diagram below (Refer to Figure 2.12.9) explain the Air Cooling system to the participants.
3. Explain the functioning of each component of the Air Cooling System.
4. Explain the Site Hygiene conditions which need to be taken care for this system.

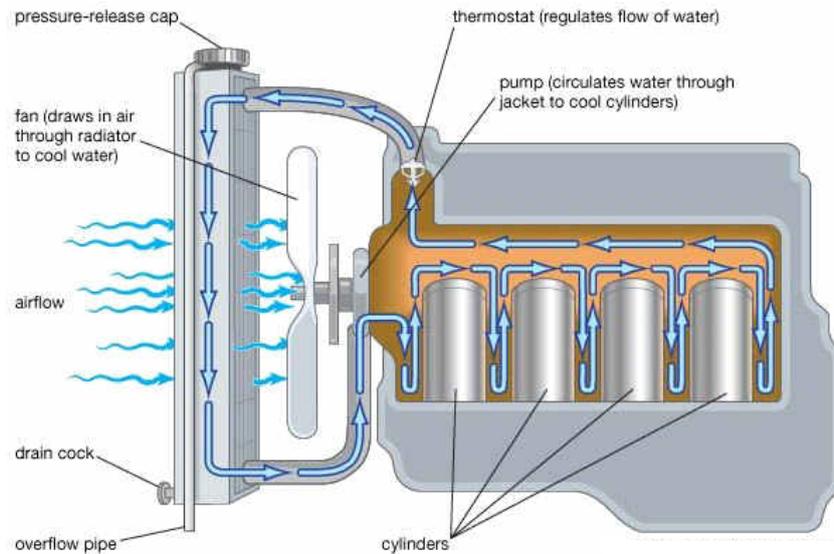


Fig. 2.12.9 Air Cooling System

Water Cooling System

Explain



The functioning of the Water Cooling System deployed in the Engine of a Diesel generator. Talk about the components of the Water cooling system (Refer fig 2.12.19) and the picture below.

Activity



- This is a skill practice activity to demonstrate the Water Cooling System of a Diesel Engine. This activity will provide complete knowledge of the Water Cooling System of a diesel Engine.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate working of the Water Cooling System of a Diesel Engine and also explain the site hygiene conditions for the Water Cooling system.	2 hours	Tool set, A Diesel Generator which can be dismantled.

1. Open the Engine of the Diesel Generator
2. As per the diagram below(Refer to Figure 2.12.10) explain the Water Cooling system to the participants.
3. Explain the functioning of each component for the Water Cooling system.
4. Explain the Site Hygiene conditions which need to be taken care for this system.

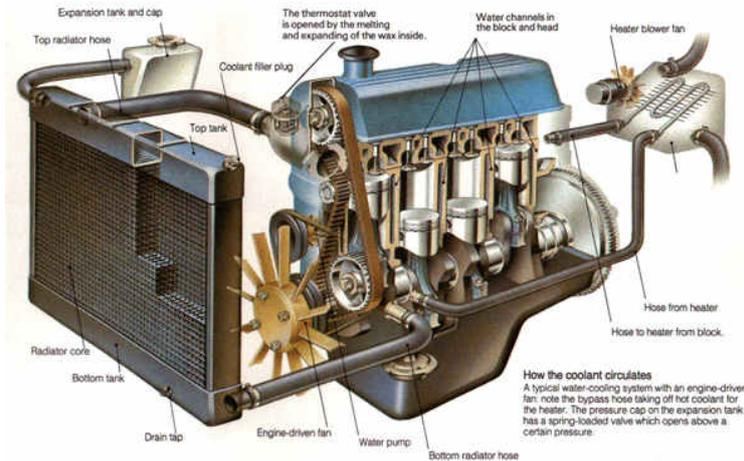


Fig. 2.12.10 Water Cooling System

Exhaust System

Say



- Exhaust system is used to throw out hot smoke generated from the engine after burning of the fuel. This system includes the following:
 1. Exhaust Pipe
 2. Exhaust Silencer
 3. Condensation Trap
 4. Rain Cover

Explain



- The functioning of the Exhaust System deployed in the Engine of a Diesel generator. Talk about the components of the Exhaust system (Refer fig 2.12.20 of the participant handbook) and figure 2.12.11 on next page

Activity



- This is a skill practice activity to demonstrate the Exhaust System of a Diesel Engine. This activity will provide complete knowledge of the Exhaust System of a diesel Engine
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate working of the Exhaust System of a Diesel Engine and also explain the site hygiene conditions for the Water Cooling system.	2 hours	Tool set, A Diesel Generator which can be dismantled.

Method to do this activity:

1. Open the engine of the diesel generator
2. As per the diagram below(Refer to Figure 2.12.11) explain the exhaust system to the participants.
3. Explain the functioning of each component for the exhaust system(refer page 91-92 of the participant handbook).
4. Explain the site hygiene conditions which need to be taken care for this system.

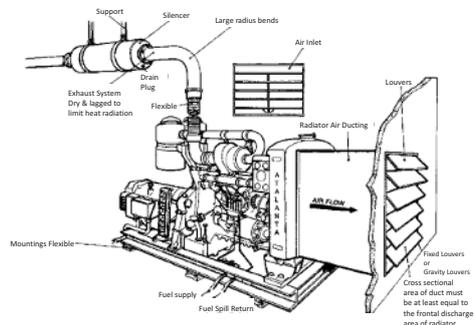


Fig. 2.12.11 Exhaust System

Elaborate



- Refer page 92 of the participant handbook. Explain different types of smokes produced in a diesel generator and the reason for that color of smoke

2.12.5: Alternator of a Diesel Generator

Ask



- Talk to students about their understanding on Alternator

Say



An alternator is a machine that converts mechanical energy to electrical energy. In a diesel generator alternator performs the most important function of producing the electrical energy from the fuel burnt in the engine of the generator. Alternators work on the principle of electromagnetic induction and consist of a stationary armature (stator) and a rotating field rotor.

Elaborate



How Does an alternator Work?

Below figure(Refer to Figure 2.12.12) helps you understanding how an alternator or AC generator works. According to the Faraday's law of electromagnetic induction, whenever a conductor moves in a magnetic field EMF gets induced across the conductor. If the close path is provided to the conductor, induced emf causes current to flow in the circuit.

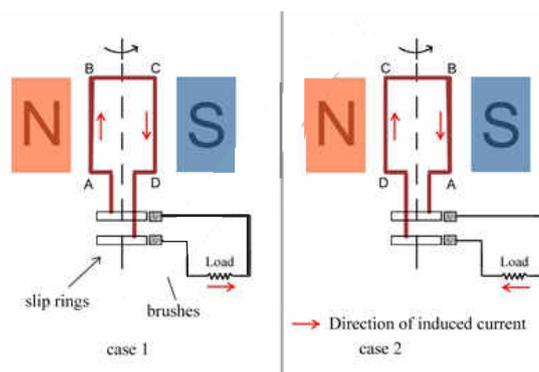


Fig. 2.12.12 Working of Alternator in a AC Generator

Now, see the above figure. Let the conductor coil ABCD is placed in a magnetic field. The direction of magnetic flux will be from N pole to S pole. The coil is connected to slip rings, and the load is connected through brushes resting on the slip rings.

Now, consider the case 1 from above figure. The coil is rotating clockwise, in this case the direction of induced current can be given by Fleming's right hand rule, and it will be along A-B-C-D.

Fleming's right-hand rule (for generators) shows the direction of induced current when a conductor moves in a magnetic field. It can be used to determine the direction of current in a generator's windings.

When a conductor such as a wire attached to a circuit moves through a magnetic field, an electric current is induced in the wire due to Faraday's law of induction. The current in the wire can have two possible directions. Fleming's right-hand rule gives which direction the current flows. The right hand is held with the thumb, first finger and second finger mutually perpendicular to each other (at right angles), Refer to Figure 2.12.13

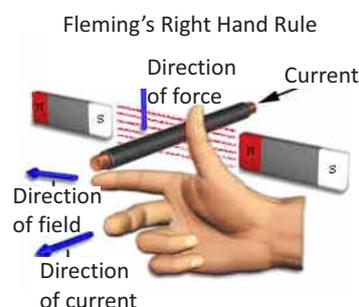


Fig. 2.12.13 Fleming's right hand rule

- The **thumb** is pointed in the direction of **m**otion of the conductor.
- The **first** finger is pointed in the direction of the magnetic **f**ield. (north to south)
- Then the **second** finger represents the direction of the induced or generated **c**urrent (the direction of the induced current will be the direction of conventional current; from positive to negative).

The bolded letters in the directions above give a mnemonic way to remember the order. Another mnemonic for remembering the rule is the initialism "FBI", standing for **F**orce (or otherwise motion), **B** the symbol for the magnetic field, and **I** the symbol for current. The subsequent letters correspond to subsequent fingers, counting from the top. Thumb -> F; First finger -> B; Second finger -> I

As the coil is rotating clockwise, after half of the time period, the position of the coil will be as in second case of above figure. In this case, the direction of the induced current according to Fleming's right hand rule will be along D-C-B-A. It shows that, the direction of the current changes after half of the time period that means we get an alternating current.

Activity

- This is a skill practice activity to demonstrate the Flemings's Right Hand Rule for generation of Electricity and direction of flow of current induced in the generator. This activity will provide complete knowledge of the direction of current generated in a Diesel Generator.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify their all points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate Fleming's Right Hand Rule and the direction of current generation in a Diesel Engine.	2 hours	Magnet, Coil and a Galvanometer

Method to do this activity

The Figure above(Refer to Figure 2.12.14) shows the setup needed to do this activity. Follow the following steps:

1. Move the Wire in one direction and see the direction of the current
2. Now move the wire in the opposite direction and see the direction of the current
3. Use Fleming's Right Hand Rule diagram(Refer to Figure 2.12.14) to determine the direction of the flow of current in the circuit(Refer to 2.12.14)

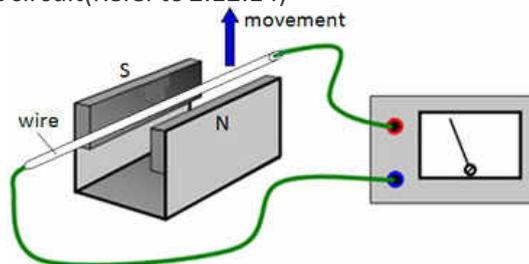


Fig. 2.12.14 Circuit Demonstrating Current Generation

Explain

Faraday Law:

In 1831, Michael Faraday, an English physicist gave one of the most basic laws of electromagnetism called Faraday's law of electromagnetic induction. This law explains the working principle of most of the electrical motors, generators, electrical transformers and inductors. This law shows the relationship between electric circuit and magnetic field. Faraday performed an experiment with a magnet and coil. During this experiment, he found how emf is induced in the coil when flux linked with it changes.

Activity

- This is a skill practice activity to demonstrate the Faraday's law and its relationship with the EMF/voltage generated. This activity will provide complete knowledge of the concept behind generation of Electricity in a diesel generator.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate Faraday's Law and its relationship with the Voltage generation in a Diesel Engine.	2 hours	Magnet, Coil and a Galvanometer

Method to do this activity

Faraday's Experiment: Relationship between induced EMF and Flux

This is the basic working principle of electrical generator. Electric generator is used to convert mechanical energy into electrical energy.

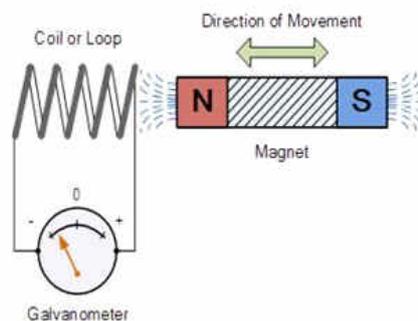


Fig. 2.12.15 Principle of Electrical Generator

In this experiment, Faraday takes a magnet and a coil and connects a galvanometer across the coil. At starting, the magnet is at rest (Refer to Figure 2.12.15), so there is no deflection in the galvanometer i.e. needle of galvanometer is at the center or zero position. When the magnet is moved towards the coil, the needle of galvanometer deflects in one direction. When the magnet is held stationary at that position, the needle of galvanometer returns back to zero position.

Now when the magnet is moved away from the coil, there is some deflection in the needle but in opposite direction and again when the magnet becomes stationary, at that point with respect to coil, the needle of the galvanometer returns back to the zero position. Similarly, if magnet is held stationary and the coil is moved away and towards the magnet, the galvanometer shows deflection in similar manner. It is also seen that, the faster the change in the magnetic field, the greater will be the induced emf or voltage in the coil. Table below explains the condition of the voltage at different positions of the magnet.

Position of magnet	Deflection in galvanometer
Magnet at rest	No deflection in galvanometer
Magnet moves towards the coil	Deflection in galvanometer in one direction
Magnet moves away from the coil	Deflection in galvanometer but in opposite direction
Magnet is held stationary at same position (away from the coil)	No deflection in galvanometer

Conclusion: From this experiment, we concluded that whenever there is relative motion between conductor and a magnetic field, the flux linkage with a coil changes and this change in flux induces a voltage across a coil. Michael Faraday formulated two laws on the basis of above experiments. These laws are called Faraday's laws of electromagnetic induction.

Faraday's Laws

Faraday's First Law

Any change in the magnetic field of a coil of wire will cause an emf to be induced in the coil. This emf induced is called induced emf and if the conductor circuit is closed, the current will also circulate through the circuit and this current is called induced current. Method to change magnetic field:

1. By moving a magnet towards or away from the coil
2. By moving the coil into or out of the magnetic field.
3. By changing the area of a coil placed in the magnetic field
4. By rotating the coil relative to the magnet.

Faraday's Second Law(Refer to Figure 2.12.16)

It states that the magnitude of emf induced in the coil is equal to the rate of change of flux that linkages with the coil. The flux linkage of the coil is the product of number of turns in the coil and flux associated with the coil.

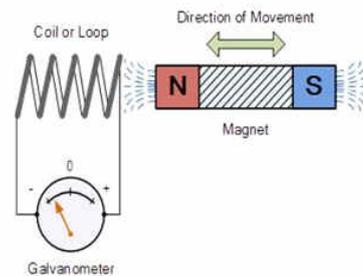


Fig. 2.12.16 Faraday's Law

Faraday Law Formula

Consider a magnet approaching towards a coil.

Here we consider two instants at time T_1 and time T_2 .

Flux linkage with the coil at time, $T_1 = N\Phi_1$ Wb(Weber).

Flux linkage with the coil at time, $T_2 = N\Phi_2$ wb.

Change in flux linkage = $N(\Phi_2 - \Phi_1)$.

Let this change in flux linkage be, $\Phi = \Phi_2 - \Phi_1$.

So, the Change in flux linkage = $N\Phi$

Now the rate of change of flux linkage = $N\Phi / t$

Take derivative on right hand side we will get The rate of change of flux linkage = $Nd\Phi/dt$

But according to Faraday's law of electromagnetic induction, the rate of change of flux linkage is equal to induced emf.

$$E = N \frac{d\phi}{dt}$$

Considering **Lenz's law** states that when an emf is generated by a change in magnetic flux according to Faraday's **Law**, the polarity of the induced emf is such, that it produces an current that's magnetic field opposes the change which produces it.)

$$E = - N \frac{d\phi}{dt}$$

Where, flux Φ in Wb = $B.A$

B = magnetic field strength

A = area of the coil

HOW TO INCREASE EMF INDUCED IN A COIL

- By increasing the number of turns in the coil i.e N - From the formulae derived above it is easily seen that if number of turns of coil is increased, the induced emf also gets increased.
- By increasing magnetic field strength i.e B surrounding the coil- mathematically if magnetic field increases, flux increases and if flux increases emf induced will also get increased. Theoretically, if the coil is passed through a stronger magnetic field, there will be more lines of force for coil to cut and hence there will be more emf induced.
- By increasing the speed of the relative motion between the coil and the magnet - If the relative speed between the coil and magnet is increased from its previous value, the coil will cut the lines of flux at a faster rate, so more induced emf would be produced.

Activity

- This is a skill practice activity to demonstrate the Lenz's law and its relationship with the direction of the current produced in the Generator. This activity will provide complete knowledge of the direction of the current generated by change in flux through movement in a magnetic field in a Diesel Generator.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.

Skill Practice	Time	Resources
Demonstrate Lenz's law and its relationship with the direction of the current produced in the Generator. This activity will provide complete knowledge of the direction of the current generated by change in flux through movement in a magnetic field	2 hours	Magnet, Coil and a Galvanometer.

Method to do this activity

For understanding Lenz's law, consider two cases:

When the north pole of the magnet is approaching towards the coil (Refer to 2.12.17), the magnetic flux linked to the coil increases. According to Faraday's law of electromagnetic induction, when there is change in flux, an EMF and hence current is induced in the coil and this current will create its own magnetic field. Now according to Lenz's law, this magnetic field created will oppose its own or we can say opposes the increase in flux through the coil and this is possible only if approaching coil side attains north polarity, as we know similar poles repel each other. Once we know the magnetic polarity of the coil side, we can easily determine the direction of the induced current by applying right hand rule. In this case, the current flows in anticlockwise direction.

CASE-II When a magnet is moving away from the coil

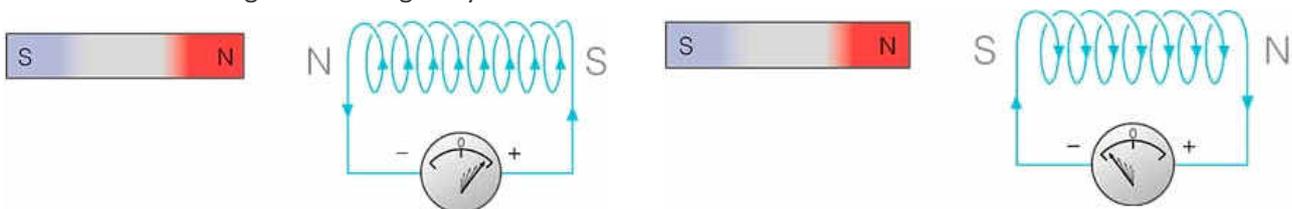


Fig. 2.12.17 Lenz's Law

When the north pole of the magnet is moving away from the coil, the magnetic flux linked to the coil decreases. According to Faraday's law of electromagnetic induction, an EMF and hence current is induced in the coil and this current will create its own magnetic field. Now according to Lenz's law, this magnetic field created will oppose its own or we can say opposes the decrease in flux through the coil and this is possible only if approaching coil side attains south polarity, as we know dissimilar poles attract each other. Once we know the magnetic polarity of the coil side, we can easily determine the direction of the induced current by applying right hand rule. In this case, the current flows in clockwise direction.

NOTE : For finding the directions of magnetic field or current, use right hand thumb rule i.e if the fingers of the right hand are placed around the wire so that the thumb points in the direction of current flow, then the curling of fingers will show the direction of the magnetic field produced by the wire as shown in the figure below. (Refer to Figure 2.12.18)

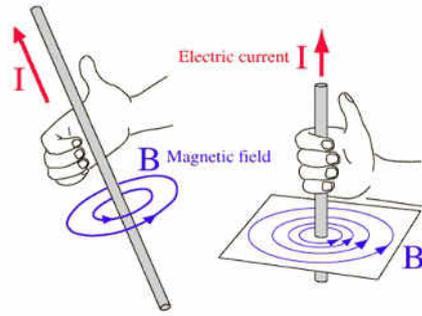


Fig. 2.12.18 Magnetic Field Product by Wire

The Lenz law can be summarized as under:

If the magnetic flux Φ linking a coil increases, the direction of current in the coil will be such that it will oppose the increase in flux and hence the induced current will produce its flux in a direction as shown below (using right hand thumb rule). (Refer to figure 2.5.19)

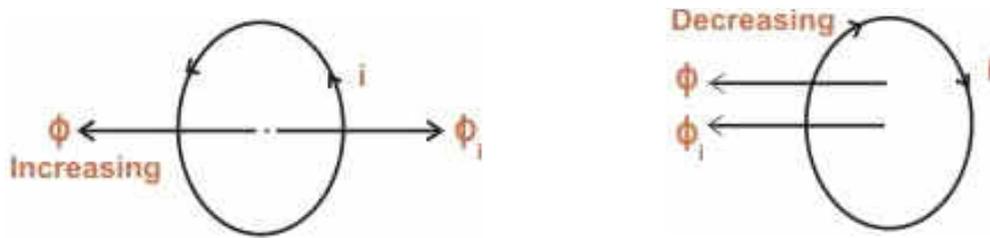


Fig. 2.12.19 Magnetic Flux V/S Current induced

If magnetic flux Φ linking a coil is decreasing, the flux produced by the current in the coil is such, that it will aid the main flux and hence the direction of current is as shown (Refer to Figure 2.12.19).

The working of an Alternator

Diagram shown in the picture (Refer to Figure 2.12.20, 2.12.21 and 2.12.22) explains the working of an Alternator.

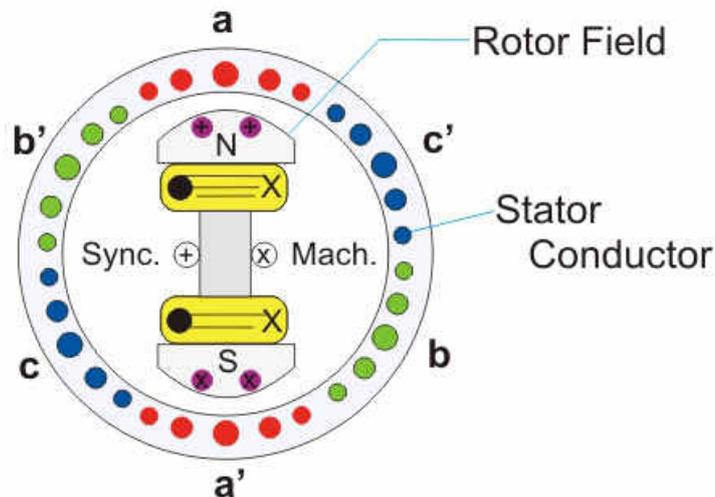


Fig. 2.12.20 Schematic of an Alternator

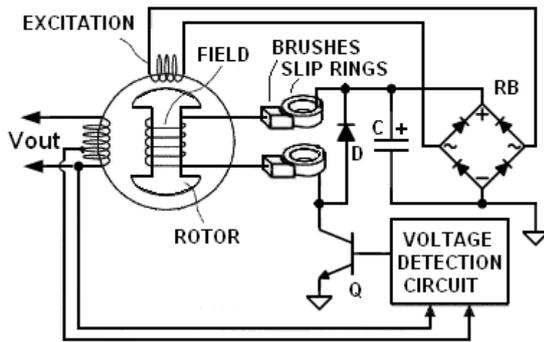


Fig. 2.12.21 Working of an Alternator

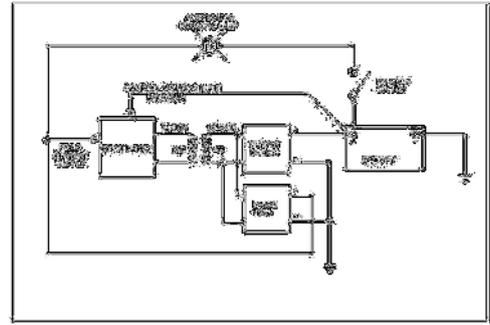


Fig. 2.12.22 Block Diagram of Alternator

A brushless alternator is composed of two alternators built end-to-end on one shaft. Smaller brushless alternators may look like one unit but the two parts are readily identifiable on the large versions. The larger of the two sections is the main alternator and the smaller one is the exciter. The exciter has stationary field coils and a rotating armature (power coils).

The main alternator uses the opposite configuration with a rotating field and stationary armature. A bridge rectifier, called the rotating rectifier assembly, is mounted on a plate attached to the rotor. Neither brushes nor slip rings are used, which reduces the number of wearing parts. The main alternator has a rotating field as described above and a stationary armature (power generation windings). Also in brushless alternator the permanent magnet (or excitation) is used at rotor and the output is taken from stator.

The Alternator consists of the following parts

1. Main Stator
2. Main Rotor
3. Exciter Stator
4. Exciter Rotor
5. Automatic Voltage Regulator (AVR)
6. Rotating Rectifier Assembly (RRA)
7. Terminal Box

Each of the components mentioned above are explained below.

Main Stator

Say 

Stator of an alternator is not meant to serve path for magnetic flux. Instead, the stator is used for holding armature winding. The stator core is made up of lamination of steel alloys or magnetic iron. (Refer to Figure 2.12.23)

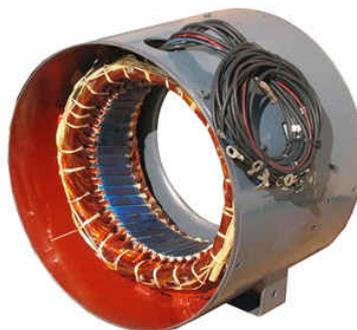


Fig. 2.12.23 Main Stator

Activity

- This is a skill practice activity to demonstrate the Stator of the Alternator of a Diesel Engine. This activity will provide complete knowledge of the Stator of a diesel Engine
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate the Stator of the Alternator and explain the working of the Stator.	2 hours	Tool set, Diesel Generator which can be dismantled, Stator.

- Method to do this activity

1. Open the Alternator of a Diesel Generator .
2. Take out the Stator of the Alternator.
3. Explain the construction of the Stator and the windings over the Core.
4. Explain the Site Hygiene conditions which need to be taken care for this system.

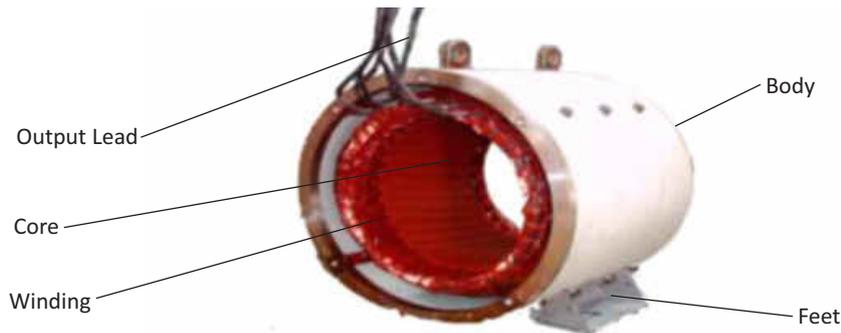


Fig. 2.12.24 Main Stator

5. The Main Stator has the following parts(Refer to Figure 2.12.24)
 - a. Core: Consists of laminated stampings having slots.
 - b. Winding : Coils are made up of Class H enameled copper conductors, double/Vacuum impregnation with epoxy gel coat on over hangs.
 - c. Output Leads: Twelve leads are brought out, sleeved and terminated with suitable crimping sockets.

Main Rotor

Say

Main Rotor moves within the main stator and is made of the winding coils on a core. Coil support blocks are provided for adequate supporting of winding from Centrifugal forces.

Do



Open the main rotor (Refer to Figure 2.12.25) in front of participants

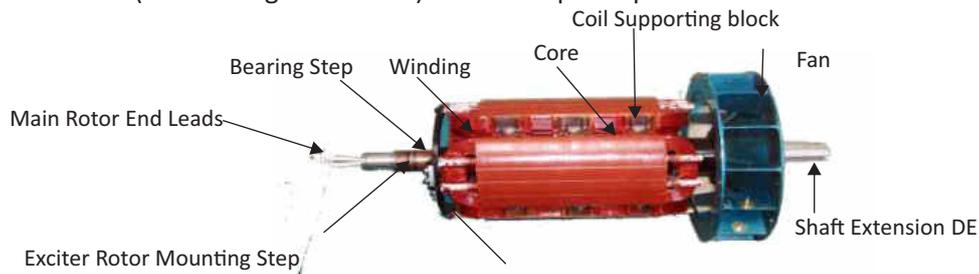


Fig. 2.12.25 Main Rotor

Activity



- This is a skill practice activity to demonstrate the Main Rotor of the Alternator of a Diesel Engine. This activity will provide complete knowledge of the Rotor of a diesel Engine
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate the Rotor of the Alternator and explain the working of the Main Rotor.	2 hours	Tool set, Diesel Generator which can be dismantled, Main Rotor.

Method to do this activity

1. Open the Alternator of a Diesel Generator
2. Take out the Rotor of the Alternator.
3. Explain the construction of the Rotor which includes the following parts
 - a. Core : Consists of laminated stampings with salient poles
 - b. Winding : Coils are wound using Class H enameled copper conductor
 - c. Resin applied during winding and curing followed by epoxy gel coat on overhangs
 - d. Coil support blocks are provided for adequate supporting of the winding from high centrifugal forces
4. The end connections are made and routed through the shaft and to be connected to RRA.

Excitation System: Exciter Rotor and Stator

Say



Excitation System is connected to the main Alternator and provide small amount of Electricity to the field coils of Alternator to generate Electricity. For a machine using field coils, which are used in most large generators, the field current must be supplied, otherwise the generator will be useless. Thus it is important to have a reliable supply. Although the output of a generator can be used once it starts up, it is also critical to be able to start the generators reliably. In any case, it is important to be able to control the field since this will maintain the system voltage. A generator produces output voltage proportional to the magnetic field, which is proportional to the excitation current; if there is no excitation current there is zero voltage. A small amount of (electric) power may control a large amount of power. This principle is very useful for voltage control: if the system voltage is low, excitation can be increased;

if the system voltage is high, excitation can be decreased. For large generators, it is usual to have a separate **exciter** dynamo to be operated in conjunction with the main power generator. This is a small permanent-magnet or battery-excited dynamo that produces the field current for the larger generator. The smaller generator can be either a magneto with permanent field magnets or another self-excited generator. This controls the output of the main Alternator.

Advantages of PMG Excitation Support Systems:

1. A PMG with its appropriate regulator can enhance a generator's transient performance because it will provide a constant Ac voltage input to the automatic voltage regulator (AVR) regard less of the generator's terminal voltage.
2. When the load on the generator is nonlinear due to thyristor (SCR) power supplies such as UPS Systems, variable speed drives etc. the load may produce notches on the voltage severe enough to cause misfiring of the power rectifiers in a shunt excited generator's AVR. When this occurs, the generator's terminal voltage will become unstable. If the generator is fitted with a PMG, the input power to the AVR is isolated from these disturbances, and no voltage un-stability will occur.
3. A PMG is constructed with a permanent magnet rotor which has a very strong magnetic field. This eliminates the need for field flashing which is sometimes necessary with shunt type synchronous generators.
4. Strong and very fast voltage build-up is possible in PMG types of Alternators.

Activity



- This is a skill practice activity to demonstrate the Exciter Rotor and Stator of the Alternator of a Diesel Engine. This activity will provide complete knowledge of the Exciter system of a diesel engine.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate the Exciter Rotor and Stator of the Alternator and explain the working of the Exciter System.	2 hours	Tool set, Diesel Generator which can be dismantled, Exciter Rotor and Stator.

Method to do this activity

1. Open the Alternator of a Diesel Generator .
2. Take out the Exciter system of the Alternator. The positioning of the Exciter system is shown in the figure below(Refer to Figure 2.12.26 and 2.12.27).

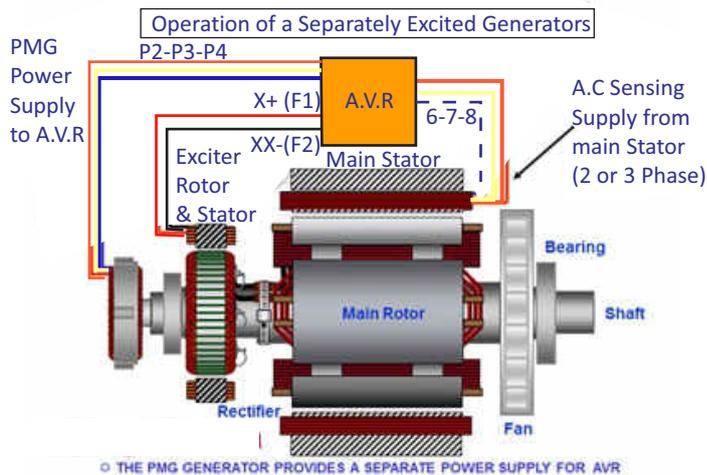


Fig. 2.12.26 Operation of Separately Excited Generators

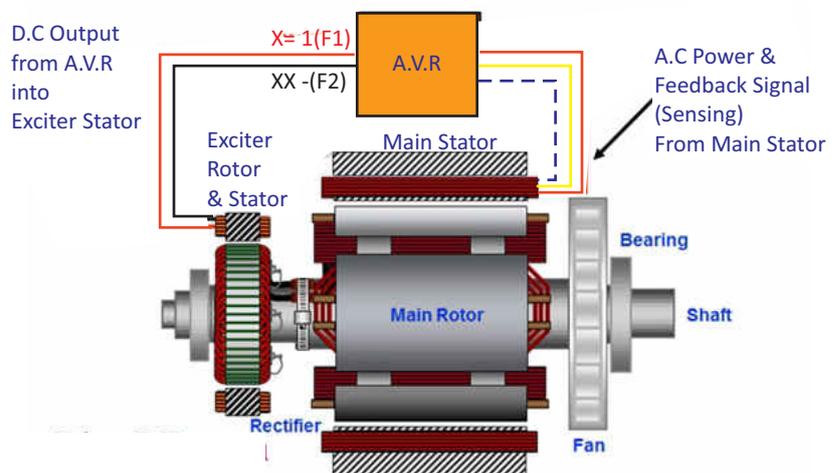


Fig. 2.12.27 Operation of the Self Excited Generator

3. Explain the working of the Exciter System and how it is important for the operation of a DG system(Refer to Figure 2.12.28

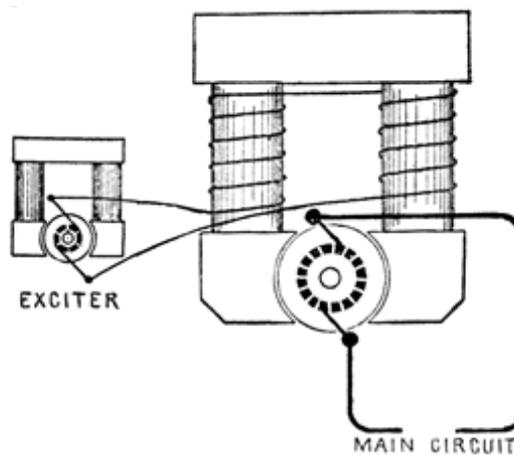


Fig. 2.12.28 Working of Exciter System

4. Explain the construction of the Exciter Rotor and Exciter Stator as shown in the figure below(Refer to Figure 2.12.29):

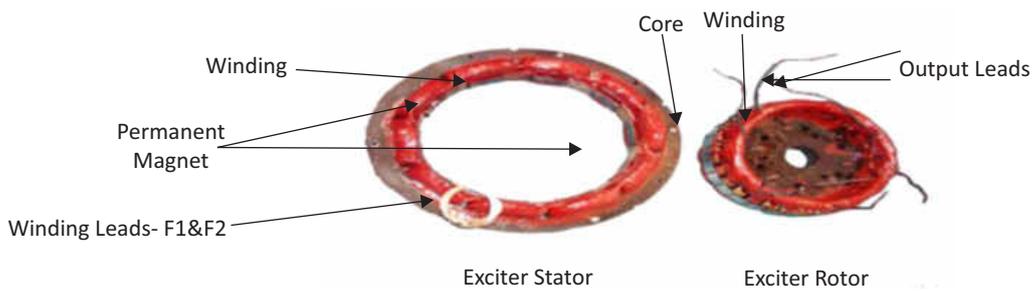


Fig. 2.12.29 Exciter Rotor And Stator

5. Exciter Stator consists of the following:

Core: Consists of laminated stampings

Winding: Coils are made using Class H enameled copper conductor. The end connections are made to form alternate N & S poles. Double Impregnation is followed by epoxy gel coat on overhangs.

6. Exciter Rotor consists of the following:

Core: Consists of thin laminated stamping having slots.

Winding: Coils are made using Class H enameled copper conductor. Impregnation followed by epoxy gel coat on overhangs.

7. Modern generators with field coils are self-excited, where some of the power output from the rotor is used to power the field coils. The rotor iron retains magnetism when the generator is turned off. The generator is started with no load connected; the initial weak field creates a weak voltage in the stator coils, which in turn increases the field current, until the machine "builds up" to full voltage. Self-excited generators must be started without any external load attached. An external load will continuously drain off the buildup voltage and prevent the generator from reaching its proper operating voltage. If the machine does not have enough residual magnetism to build up to full voltage, usually a provision is made to inject current into the rotor from another source. This may be a battery, a house unit providing direct current, or rectified current from a source of alternating current power. Since this initial current is required for a very short time, it is called "field flashing".

Automatic Voltage Regulator (AVR)

AVR or Automatic voltage regulator's function for generator is to ensure that the voltage generated from power generator running is smooth enough to maintain a stable voltage with in specified limit. It can stabilize the voltage value when suddenly change of load for power supply demand. (Refer to Figure 2.12.30)



Fig. 2.12.30 Automatic Voltage Regulator (AVR)

A signal proportional to generator terminal voltage obtained from the rectified output of a voltage transformer is compared to a stabilized reference voltage obtained within the regulator.

If any abnormal, different or error signal is detected, it will be amplified and this will control the excitation supply, increase or decrease the input to the main field winding or exciter field. The main purpose is to reduce the error signal to zero or an acceptable value.

Adjustment of the set voltage is obtained either by adjustment of the reference voltage or by adjusting the proportion of machine voltage compared to the reference voltage (Refer to Figure 2.12.31). The stabilizing loop is included to prevent hunting. Below is basic diagram for AVR circuit.

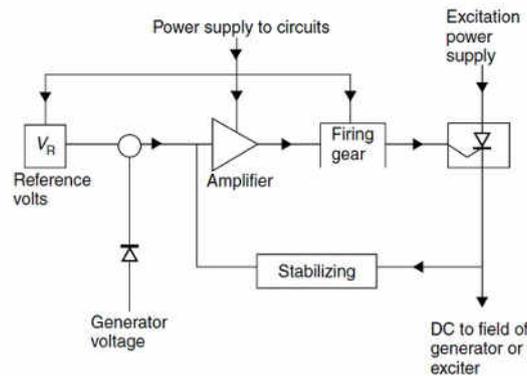


Fig. 2.12.31 Basic Diagram of AVR Circuit

The Permanent Magnet Generator (PMG) with its rotating field and stationary armature supplies high frequency AC power to the voltage regulator. The voltage regulator receives voltage and reactive current feedback provided by potential and current transformers. Comparing these signals to a reference set point in the voltage regulator, the voltage regulator provides a controlled variable DC current to the stationary field of the rotating exciter. With its stationary field and rotating armature, the exciter generates three phase high frequency AC output. This output is rectified by the rotating rectifiers. This DC current is fed via conductors to the center of the rotor shaft and carried by a special lead bar in the hollow shaft area under the bearing journal which is then applied to the main generator field winding. The rotating rectifier is a three phase full wave diode bridge which we will study in next section.

Rotating Rectifier Assembly (RRA)

Rotating Rectifier Assembly (RRA) is a three-phase bridge rectifier mounted on two aluminum heat sinks. Exciter Armature leads are connected to input of RRA as indicated in the diagram below. The output of the rectifier assembly is connected to the main rotor leads. Varistor is provided across the RRA output to suppress any surge voltages as shown in the diagram below. (Refer to Figure 2.12.32)

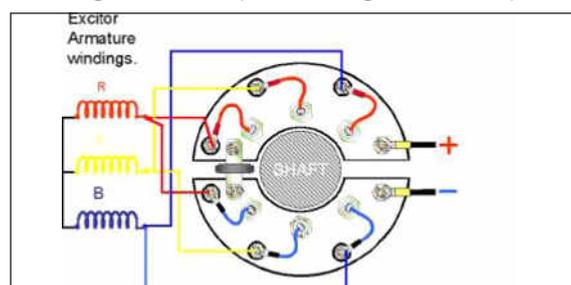


Fig. 2.12.32 Rotating Rectifier Assembly

In this arrangement, the exciter consists of an inverted three phase alternator which has its three phase armature on the rotor and its field on the stator. Its AC armature voltage is rectified in diodes mounted on the rotating shaft and then fed directly into the field (Rotor) of the main synchronous generator.

Activity

- This is a skill practice activity to demonstrate the Automatic Voltage Regulator (AVR) and RRA of an Alternator of a Diesel Engine. This activity will provide complete knowledge of AVR and RRA of a diesel Engine.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate the Automatic Voltage Regulator (AVR) and Rotating Rectified Assembly of the Alternator and explain their working in an Diesel Generator.	2 hours	Toolset, Diesel Generator which can be dismantled, Automatic Voltage Regulator and Rotating Rectified Assembly.

Method to do this activity

1. Open the Alternator of a diesel generator
2. Open the Exciter system
3. Demonstrate the AVR and RRA to participants
4. Explain the block diagram as shown above
5. Explain how AVR and RRA helps in continuous operation of the a diesel generator.

2.13: Guidelines for First-Aid Facilities

Say



- At a working tower site there are possibilities of encountering an emergency situation where an employee or worker can get hurt accidentally. In such a situation it is mandatory to maintain the first aid facilities at site.

Explain



- Refer Fig 2.13.1 of participant handbook and explain the activities in detail.

Ask



- If participants have any questions, answer and clarify the same.

Activity



- This is a skill practice activity to demonstrate the First Aid Activities which can be performed at a Tower site. This activity will provide complete knowledge on how to take care of first aid incase that needs to be given to someone.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below:

Skill Practice	Time	Resources
Demonstrate the First Aid Activity to be given to any person at a tower site.	4 hours	First Aid Specialist team, First Aid Box

Method to do this activity

1. Ask participants about the type of issues which can happen at a site.
2. Explain the precautions which they can take to prevent such happening.
3. Elaborate about the First Aid Box and facilities which are present at a site.
4. Talk about the basic First Aid which can be administered to any person.
5. Tell them about some medicines and Bandages which can be given.
6. Show them how to tie a bandage in case of an emergency.

Summarize



In this chapter students have learnt about

- Tower site and its components.
- Details about these components used at site.
- Hygiene conditions required to be followed at site.
- Do and don't need to be followed.



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



3. Preventive and Corrective Maintenance

Unit 3.1 - Guidelines for Maintenance Activities

Unit 3.2 - Routine Preventive Maintenance

Unit 3.3 - Maintenance of Batteries

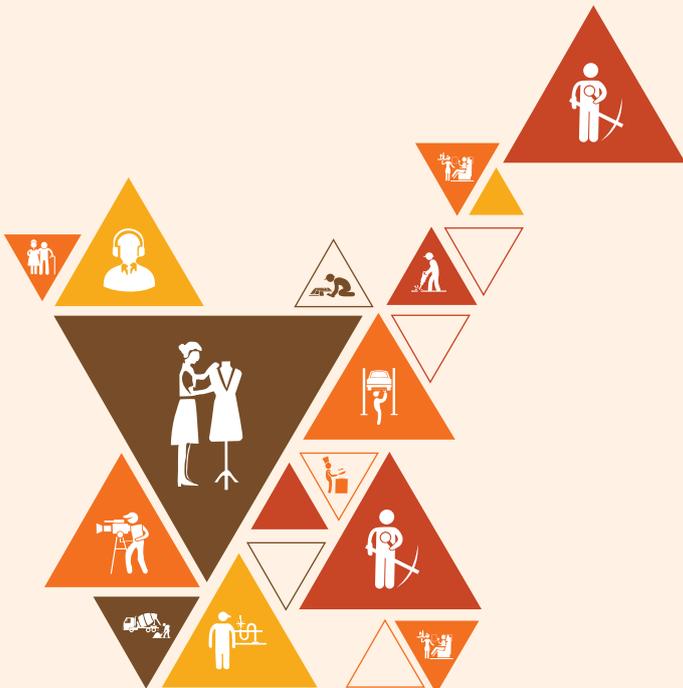
Unit 3.4 - Maintenance of a Diesel Generator

Unit 3.5 - Maintenance of the Tower & Shelter

Unit 3.6 - Maintenance of AC Plant

Unit 3.7 - Maintenance of AMF/PIU

Unit 3.8 - Maintenance of SMPS Power Plant



TEL/N4101
&
TEL/N4104

Key Learning Outcomes

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

1. Adhere to PM (preventive maintenance) plan.
2. Comply with beat plan execution for self.
3. Conduct site PM (preventive maintenance).
4. Keep a check on site up-time.
5. Perform unique site down PM (preventive maintenance).
6. Perform health check on site like checking engine oil, voltage etc.
7. Check premature ageing of Battery Bank, Diesel Generator, Air Conditioner, PIU and SMPS.
8. Monitor outages due to Diesel Generator.
9. Close maximum number of complaints registered by doing Corrective Maintenance.
10. Provide timely resolution to trouble tickets raised.

UNIT 3.1: Guidelines for Maintenance Activities

Unit Objectives

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

- Understand the description of the key words used during the maintenance activity.
- Identify the guidelines which are to be followed while doing the maintenance activity.

Notes for Facilitation

- Invite students to participate. List the expectations on the whiteboard.
- Give the students a brief overview of what all will be covered in the module.

UNIT 3.1.1: Maintenance Activities

Do

- Explain all the definitions and terminology used during maintenance activities to the participants
- Clarify all their doubts and ensure that all participants have understood the key definitions and terminologies
- Discuss and clarify the step by step approach towards maintenance activities
- Explain the procedures involved during these activities

Elaborate

- Refer page 101-102 of the participant guide.
- Project the steps of maintenance on the screen/whiteboard.
- Discussed and explain all the points which are important to provide proper maintenance of the equipments.

UNIT 3.2: Routine Preventive Maintenance

Unit Objectives

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

- Explain the daily maintenance activities.
- Implement the weekly maintenance activities.
- Execute the monthly maintenance activities.
- Timely deliver quarterly maintenance.
- Plan for half yearly and yearly activities in advance.
- Take up maintenance activities as and when they are required.

UNIT 3.2.1: Regular Preventive Maintenance Activities

Say

- Preventive maintenance has to be performed on regular basis for the upkeep of the equipment and structures at the site.

Do

- Put up the list of activities to be done on regular basis in front of the participants.
- Divide these activities to be performed on Daily Basis, Weekly basis, Monthly Basis, Quarterly basis, Half yearly and Annual basis.
- There are some activities which needs to be done as and when they are required.

Explain

- Explain all these activities one by one so that participants understand them clearly.
- Briefly describe the process involved in doing these activities.

UNIT 3.3: Maintenance of Batteries

Unit Objectives

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

- Understand the maintenance activities to be performed on a battery bank.
- Identify the precautions to be taken while handling batteries.
- Differentiate between system monitoring and trouble shooting while maintaining the battery.
- Remove the faulty cell from battery bank by performing discharge test and by using equalization charging
- Demonstrate the procedure of Boost charging of cell.
- Trouble shoot the problem in a battery bank.

UNIT 3.3.1: Installation of Batteries

Say

- Proper installation of the batteries reduces maintenance activities at a later stage.
- It also increases the life of the batteries.

Do

- Put up a list of activities which are performed during the installation of batteries

Explain

- All the listed activities one by one

Activity

- This is a skill practice activity to demonstrate steps involved in installation of a Battery at a tower site. This activity will provide complete knowledge on how to install a Battery and the precautions need to be taken while installing these batteries
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all their points during this interaction
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in the installation of Battery and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of installation of battery.	4 hours	Packed battery and tool kit for installation, Voltmeter, stickers, Markers, Petroleum Jelly, Cloth

Method to do this activity

1. Receive the batteries at site.
2. Check the battery of any damage during transit.
3. If battery is damaged write a note for insurance claim.
4. Explain the precautions which need to be taken while storing these batteries.
5. Demonstrate the process of unpacking the batteries.
6. Show how to do the terminations at the terminals of the batteries.
7. Discuss the precautions to be taken during this process.
8. Explain the post installation process like putting cell numbers, nameplates, date of installation
9. Apply petroleum Jelly on the contractor points
10. Demonstrate this process and explain the utility of applying this Jelly.

UNIT 3.3.2: Preventive Maintenance of Battery Bank

Say



- After proper installation of the batteries, proper preventive maintenance of the batteries has to be done.
- This will increase the life of a battery multiple times.

Do



- Put up a list of activities which are performed for the preventive maintenance of the batteries.

Explain



- The block diagram of a SMPS power plant.
- The Battery current limiting circuitry which controls the current supplied to the battery.

Activity



- This is a skill practice activity to demonstrate various Preventive Maintenance activities to be performed for a Battery at a tower site. This activity will provide complete knowledge on how to do preventive Maintenance of a Battery/ Battery Bank and the precautions need to be taken while doing this.

- Y Ask the students to assemble together and form groups
- Y Explain to them what we are going to do in this practical exercise
- Y Ask the students to clarify all their points during this interaction
- Y Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the preventive maintenance of a Battery/ Battery Bank and the precautions which need to be taken while doing this activity at site. After this activity participant should be completely aware of the process of doing preventive maintenance of battery/ Battery Bank.	6 hours	Battery Bank, PIU, SMPS, and tool kit, Ammeter, Voltmeter, stickers, Markers, Petroleum Jelly, Cloth

Method to do this activity

1. Discuss the list of activities to be performed while doing PM of a battery bank.
2. Demonstrate the process of cleaning the battery on regular basis.
3. Show how to check the leakage in any battery cell.
4. Check all the connections and inter cell connections for tightness.
5. Examine if all Batteries are properly seated on the battery bank stand.
6. Check the earthing connection with the battery bank stand.
7. Show how to check the temperature of individual cell for overheating.
8. Explain how we check the voltage of the individual Cell.
9. Demonstrate how to measure the battery bank charging current.
10. Demonstrate how to check the float charging voltage and current of the battery bank. (voltage should be 2.23 V per cell, current should be 10% of the cell rated capacity)
11. Check the environment condition of the Bank like temp, air flow, no direct sunlight, humidity in the room/ Chiller unit/ area where battery bank is installed. (optimum temperature should be 27 degree C. The temperature compensation factor is -3mv/cell degree rise from the ambient temp of 27°C and vice versa).
12. Any other activity needed depending on the area of deployment.

UNIT 3.3.3: Corrective Maintenance of Battery Bank

Say

- After proper installation of the batteries and proper preventive maintenance of the batteries there will be instances when batteries still don't perform to the expected level then Corrective actions need to be taken.
- In order to perform these corrective actions two different set of activities need to be undertaken.
- These two set of activities are divided as
 - Y System Monitoring
 - Y Trouble Shooting

Do

- Put up a list of activities which are performed for doing the corrective maintenance.
- List down what is covered under system Monitoring and what is covered under Trouble Shooting.

Explain

- Discuss in detail all the activities which are covered under System Monitoring and Trouble shooting.

Activity

- This is a skill practice activity to demonstrate various Corrective Maintenance activities to be performed for a Battery at a tower site. This activity will provide complete knowledge on how to do Corrective Maintenance of a Battery/Battery Bank and the precautions need to be taken while doing this.
- Ask the students to assemble together and form groups
- Explain to them what we are going to do in this practical exercise
- Ask the students to clarify all the points during this interaction
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the Corrective maintenance of a Battery/Battery Bank and the precautions which need to be taken while doing this activity at site. After this activity participant should be completely aware of the corrective maintenance activities of battery/ Battery Bank.	4 hours	Battery Bank, PIU, SMPS, and tool kit, DC Voltmeter/ multimeter, stickers, Markers, Petroleum Jelly, Cloth.

Method to do this activity

1. Discuss the list of activities to be performed while doing CM of a Battery Bank.
2. Demonstrate the process of cleaning the battery on regular basis.
3. Show how to check the leakage in any battery cell.
4. Various test to be performed are:
 - a. Battery short term discharge test
 - b. Equalization charging of Batteries
 - c. Boost charging of Batteries (Page 193 of Participant handbook)
 - d. Battery Backup test on System Load (Page 194 of Participant handbook)

A. Short Term Discharge Test

Activity

- This is a skill practice activity to demonstrate the Corrective Maintenance activity of Battery Bank called short term discharge test to be performed for a Battery at a tower site. This activity will provide complete knowledge on how to do this corrective Maintenance of a Battery/ Battery Bank and to

remove the damaged cell from the Battery Bank.

- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the corrective maintenance test involving Short term discharge test of a Battery/ Battery Bank and to use these results in identifying the damaged cells which needs to be changed for proper functioning of a battery bank.	4 hours	Battery Bank, PIU, SMPS, DC Voltmeter/ Multimeter, DC Clamp meter, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Blank Test format Printouts, Pen/ Pencil

Method to do this activity

1. Go to page 111 of the Participant handbook.
2. Explain all these steps in detail and follow the steps as described there.
3. Fill in the Battery Backup test format sheet with voltage on each cell after 30 min.
4. If the average cell voltage is $> 2.0\text{ V}$, individual cell readings should be within a range of $+0.03\text{ V}$, but if the average cell voltage is $< 2.0\text{ V}$, individual cell reading should be within a range of $+0.1\text{ V}$.
5. If any of the cell voltage falls out of this range cell should be monitored very closely.

B. Equalization Charge of Batteries

Activity



- This is a skill practice activity to demonstrate the Corrective Maintenance activity of Equalization Charging of a battery bank to be performed for a battery at a tower site. This activity will provide complete knowledge on how to do this corrective maintenance activity of Equalization Charging of a Battery/ Battery Bank leading to identification of the damaged cell from the Battery Bank or improving the health of the batteries in a battery bank.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the corrective maintenance activity of Equalization charging of a Battery/ Battery Bank and to use these results in identifying the damaged cells or improving health of the batteries in a Battery Bank.	4 hours	Battery Bank, PIU, SMPS, DC Voltmeter/ Multimeter, DC Clamp meter, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Blank Test format Printouts, Pen/ Pencil

Method to do this activity

1. Go to page 112 of the participant handbook.
2. Explain all these steps in detail and follow the steps as described there.
3. Fill in the Battery Backup test format sheet with voltage on each cell.
4. As soon as the cell voltage reaches 1.75 V stop discharge cell and remove the cell from the bank and continue the discharge cell activity till the time all cells reach an end cell voltage (ECV) of 1.75 V and is removed from the bank.
5. Once all the cells are discharged put them back in the bank and charge the battery bank at 0.1 C to 0.2 C rate current for a period of at least 21 hours.
6. Check the individual cell voltage after this charging. If the variation is more than 0.1V in the cells carry out the discharge test.
7. If during the discharge test cells marked prior to Equalization test are not showing any improvement and voltage is dropping wrt other cells, replace these cells for proper functioning of the battery bank.

C. Boost Charging of a Battery Bank

Explain



- Explain the concept of boost Charging and how this is performed on a battery bank connected to a power plant and a generator.

Activity



- This is a skill practice activity to demonstrate the Corrective Maintenance activity of Boost Charging of a Battery Bank to be performed for a Battery at a tower site. This activity will provide complete knowledge on how to do this corrective maintenance activity of Boost Charging of a Battery/ Battery Bank increasing the charge/Voltage levels of the Battery Bank thus improving the health of the batteries in a battery bank.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the corrective maintenance activity of Boost charging of a Battery/ Battery Bank and to use this to increase the voltage level of each cell improving health of the batteries in a Battery Bank.	4 hours	Battery Bank, PIU, SMPS, DC Voltmeter/ Multimeter, DC Clamp meter, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Blank Boost Charging format Printouts, Pen/ Pencil

Method to do this activity

1. Go to page 113 of the Participant handbook.
2. Explain all these steps in detail and follow the steps as described there.

3. Fill in the Boost Charging format sheet (page 194) with voltage on each cell and the Charge current before this boost charging exercise.
4. Ensure that the boost charge mode in the power supply (voltage of 2.35 V and charge current of 10% of battery AH capacity) is on for at least 16 Hrs.
5. Measure and record the individual cell voltage and bank charge current during the last hour of boost charging as per the format of Boost Charging sheet.

D. Activity of Battery Backup Test on System Load

Activity



- This is a skill practice activity to demonstrate the corrective maintenance activity of battery backup test on system load to be performed for a battery at a tower site. This activity will provide complete knowledge on how to do this corrective maintenance of a battery/battery bank and to remove the damaged cell from the battery bank.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in doing the corrective maintenance test involving Backup test on system load of a Battery/ Battery Bank and to use these results in identifying the cells which needs to be changed for proper functioning of a battery bank. This test is performed once a year.	4 hours	Battery Bank, PIU, SMPS, DC Voltmeter/ Multimeter, DC Clamp meter, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Blank Test format Printouts, Pen/ Pencil

Method to do this activity

1. Go to page 192 of the Participant handbook.
2. Explain all these steps in detail and follow the steps as described there.
3. Fill in the Battery Backup test format sheet with all the readings taken throughout the test.
4. Write the observations and conclusions in the test format sheet.
5. Take action on the conclusions as described in participant handbook.

UNIT 3.4: Maintenance of a Diesel Generator

Unit Objectives

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

- Know about the critical requirements of a DG site.
- Identify the check points that need to be observed while installation of DG.
- Understand the common mistakes that occur during the process of installation and efforts need to be taken to correct these mistakes.
- Learn the importance of proper maintenance.
- Follow the general safety instructions while using a DG.
- Discuss the precautions need to be taken while using an Alternator.
- Perform the corrective maintenance of a DG.

UNIT 3.4.1: Impact of proper installation

Say

- Proper installation of a DG set will ensure that given points are taken care at the time of installation.

Do

- Put up the list of issues to be taken care in front of the participants.

Explain

- Explain all these activities one by one so that participants understand them clearly.
- Briefly describe the process involved in doing these activities.

UNIT 3.4.2: Pre-Requisite for installation of a DG

Do

- Put up the following list of pre-requisites to be taken care before installation of a DG in front of the participants.
 - Selection of location of DG set
 - Ventilation aspects to be considered
 - Foundation for placement of a DG
 - Earthing system
 - Cabling for a DG set
 - Battery for starting the DG

Elaborate



Implementing all the above mentioned points ensure that the Diesel Generator performs without too many problems year after year. Explain all these important conditions in detail so that participants are clear about these factors.

UNIT 3.4.3: Safety Precautions while using a DG

Say



- Refer to 3.4.3 of the participant handbook, points mentioned in this unit need to be followed and understood by all participants.

Explain



- All the safety precautions need to be explained in details with the reasons why they have to be followed.

UNIT 3.4.4: Precautions while using an Alternator

Say



Alternator produces electrical energy from the mechanical energy which gets generated by moving crank shaft of the DG set. This process we have understood in the previous sections. Since the mechanical energy is used to generate the electrical energy precautions need to be taken to ensure that the wastage of this generated energy is avoided and the system is efficient.

Explain



Take few minutes to brush up the concepts used in production of electricity from an alternator. Based on these concepts explain the precautions which need to be taken for efficient running of the Alternator. Refer section 3.4.4 of the participant handbook to talk about the Do's and Don't to be followed for an alternator. Develop the understanding within the participants about various Checkpoints in operation of an alternator. By keeping check on these points you can easily identify the health of an alternator.

Elaborate



Refer Figure 3.4.1 of participants handbook to explain various checkpoints used in an Alternator and proceed to undertake the following activity to create proper understanding of these checkpoints.

Activity



- This is a skill practice activity to demonstrate the Precautions to be taken and the Checkpoints for verifying the proper working of an Alternator for a DG at a tower site. This activity will provide complete knowledge on how to perform various check on a working Alternator to know about the health of its operations. The observations gained from these checks guides the technician to perform right preventive or corrective maintenance on a DG set.
- Ask the students to assemble together and form groups.

- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the precautions to taken for operation of a DG set and also get a thorough understanding of the check points in an Alternator which provides complete information about the healthy operation of an alternator.	2 hours	Diesel Generator, DC Voltmeter/ Multimeter, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Pen/ Pencil

Method to do this activity

1. Refer pages 117-122 of the participant handbook.
2. Explain all the points in detail and follow the steps as described there.
3. Describe in details the precautions to be taken during the operations of a DG set.
4. Demonstrate important activities for safe working of an Alternator.
5. Make participants practice to take the readings at Point of observations in an Alternator and how to make inference out of these readings.

UNIT 3.4.5: Steps to Increase Life of a Starter Motor

Say



Starter Motor is used in the Diesel Generator in the following way.

The diesel generator is a combination of diesel engine coupled to an alternator, the engine is a prime mover which in turn rotate the rotor of generator as a result it induces EMF across stator. To do this first, the engine has to be started either manually or by electrically, if the engine is of high capacity then it has to started electrically with the help of electrical starter motor, initial crank or rotation to the engine is given by motor with a high starting torque so as to start the engine. When the engine picks up speed the starter motor is disconnected and pinion is detached from the fly wheel of engine and engine run on its own. The rotor of the generator which is coupled start running as long as the engine is running and produces and supplying electrical power.

Explain



- Refer page 122 of the participant handbook and discuss the steps to be taken to increase the life of a starter motor.

Demonstrate



- Show the position of the starter motor to the participants in the Diesel Generator and demonstrate its working.

Discuss

- Check with the participants if they have understood the same.

UNIT 3.4.6: Maintaining Various Systems of a DG

Air Intake System

Say



Firstly we will discuss maintenance of Air Intake System. Managing the supply of air to the combustion chamber is an important process to ensure consistent and reliable performance of modern diesel generators. Air management encompasses all aspects that affect the quantity, composition, temperature, pressure, bulk motion and cleanliness of the combustion air.

Activity



- This is a skill practice activity to demonstrate the maintenance of the Air Intake system of a Diesel Generator at a tower site. This activity will provide complete knowledge on the activities to be undertaken to perform the maintenance of the Air Intake System.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the maintenance of Air Intake System of a DG set and also get a thorough understanding of the way to perform the activities.	2 hours	Diesel Generator , Air Filter Primary element, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Clean Cloth.

Method to do this activity

1. Refer page 123 of the participant handbook.
2. Go through the steps mentioned in the participant hand book.
3. Demonstrate the way to open up the air filter unit.
4. Remove the air filter primary element and show how to replace this element.
5. Explain the way Choke indicator works and show various indicators on the Choke indicator.
6. Describe the way to open and clean the dust accumulated in the evacuator valve.
7. Close the Air Filter unit and put the DG back in action.

Engine Fuel System Maintenance

Say



"Give a diesel engine clean fuel and it will run forever." This old saying is less of an exaggeration than you might think. Repair statistics show that 90% of diesel engine problems stem from contaminated fuel. This promise of eliminating 9 out of 10 potential failures should put fuel-system maintenance at the top of your list.

Elaborate

Revise the construction of the Engine Fuel System in front of the participants. Refer page 86 of the participant handbook to explain the utility of each part of this system. Also explain the mandatory precautions which need to be taken while maintaining the Engine fuel system by referring page 123.

Demonstrate

• Open the Engine Fuel System and demonstrate the way to do this.

Engine Fuel System

Activity

- This is a skill practice activity to demonstrate the Maintenance of the Engine Fuel system of a Diesel Generator at a tower site. This activity will provide complete knowledge on the activities to be undertaken to perform the maintenance of the Engine Fuel System.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the maintenance of Engine Fuel System of a DG set and also get a thorough understanding of the way to perform the activities.	2 hours	Diesel Generator, Primary Fuel Filter element and secondary fuel filter element, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Clean Cloth.

Method to do this activity

1. Refer page 123 -125 of the participant handbook.
2. Go through the steps mentioned in the participant handbook.
3. Demonstrate the way to open up the fuel filter unit.
4. Clean the primary and secondary fuel filter element with clean diesel or kerosene.
5. Shows the way to replace these filter elements.
6. Explain the use of the drain screw to remove the impure diesel from the fuel filter.
7. Demonstrate the process of cleaning the bowl thoroughly with kerosene or diesel.

Air Locking in Engine Fuel System

Activity

- This is a skill practice activity to demonstrate the maintenance of the engine fuel system of a diesel generator at a tower site by demonstrating how to remove Air locking from the fuel pipes. This activity will provide complete knowledge on the activities to be undertaken to perform the maintenance of the engine fuel system.

- Y Ask the students to assemble together and form groups.
- Y Explain to them what we are going to do in this practical exercise.
- Y Ask the students to clarify all the points during this interaction.
- Y Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the maintenance of Engine Fuel System of a DG set and also get a thorough understanding of the way to perform the activities.	2 hours	Diesel Generator, Primary Fuel Filter element and secondary fuel filter element, Standard Toolkit containing Tester, Screwdriver, Plier, Insulation Tape etc., Clean Cloth.

Method to do this activity

1. Refer page 123 -125 of the participant handbook.
2. Go through the steps mentioned in the participant handbook.
3. Demonstrate the way to open up the Fuel filter unit.
4. Clean the Primary and Secondary fuel filter element with clean diesel or kerosene.
5. Shows the way to replace these filter elements.

Lubricant System Maintenance

Elaborate



Refer page 87 of participant's handbook and explain the types of Lubrication Systems. Review the parts of the Lubrication system as shown in the figure below(Refer to Figure 3.4.1).

1. Oil Pressure Gauge Conn
2. Pressure relief Valve
3. Oil Pump
4. Oil drain Plug
5. Oil Strainer
6. Dipstick
7. Oil Filter
8. Bypass Valve
9. Oil Filler Cap

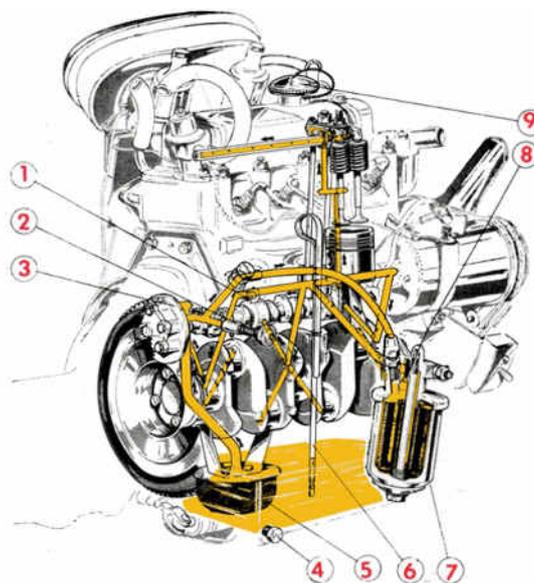


Fig. 3.4.1 Lubrication System

Ask



- Ask few questions on the Lubrication System from the participants to get an idea of the understanding they have got about this system. Explain again if they have any doubts.

Say



- Oil Filter is used to clean the Lubricant oil flowing in the engine. Since oil filter removes dust and other particles from the oil, after some time there is a need to replace this oil filter. The following activity explains how to perform this corrective maintenance function.

Activity



- This is a skill practice activity to demonstrate steps involved in Oil Filter Replacement of a Diesel Generator at a tower site. This activity will provide complete knowledge on how to replace the Oil Filter and the precautions need to be taken while replacing this filter.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction as this activity they have to perform multiple times while maintaining the site.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in the replacement of the Oil Filter and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of replacement of the oil filter.	2 hours	Diesel Generator, Oil Filter element, Sealing Ring, Standard Toolkit containing Tester, Screwdriver, Plier, Oil filter wrench etc., Clean Cloth.

Method to do this activity

1. Open the Diesel Generator Engine.
2. Focus your attention on the lubrication system.
3. Refer page 129 (Steps: Oil Filter Replacement) of the participants handbook.
4. Follow the steps as described in the participant handbook.
5. Close the DG set and it's ready for operations.

Say



After replacement of the Oil Filter, there is a requirement to change the lubricant oil in the engine. The following activity explains the steps to do that.

Activity



- This is a skill practice activity to demonstrate steps involved in refilling the lubrication oil in a Diesel Generator at a tower site. This activity will provide complete knowledge on how to refill the Lube oil and the precautions need to be taken while refilling the oil. This activity also explains the process of checking the Lube Oil level on regular basis using the dipstick.

- Y Ask the students to assemble together and form groups.
- Y Explain to them what we are going to do in this practical exercise.
- Y Ask the students to clarify all the points during this interaction.
- Y Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in the refilling of the lubricant oil and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of refilling of Lube Oil and also check the Oil level by using dipstick on regular basis.	2 hours	Diesel Generator, Oil Filter element, Sealing Ring, Standard Toolkit containing Tester, Screwdriver, Plier, Oil filter wrench etc., Clean Cloth.

Method to do this activity

1. Open the Diesel Generator Engine.
2. Focus your attention on the lubrication system.
3. Refer page 129 (Steps: Refilling of Lube Oil) of the participants handbook.
4. Follow the steps as described in the participant handbook.
5. Close the DG set and it's ready for operations.

Tappet Clearance for Air/Exhaust Valves

Say



Tappet Clearance is of utmost importance in a four stroke engine. It is a clearance between the Rocker arms and the point where they rest on the valves (top of the valve stem). Its purpose is to allow for some mechanical expansion and lengthening of the valve stem and push rods as the engine warms up. This clearance is also called Valve Rush. Usually both the surfaces are flat surfaces.

Elaborate



In a four stroke engine Rocker arms open and closes both inlet and outlet valves for Air and Exhaust flow to/from the engine. But there is no direct connection between the two. In fact Rocker just sits on the valve and then push rods moves the rocker arms thus the valves(Refer to Figure 3.4.2).

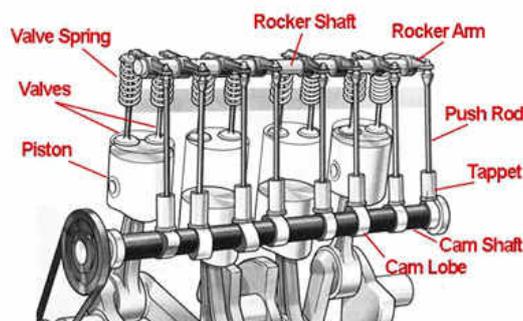


Fig. 3.4.2 Tappet Clearance



Fig. 3.4.3 Adjusting Tappet Clearance

What will happen if Tappet Clearance is less.

- Value will open early and close late.
- Air induced through Air inlet may leak out so less air for combustion.
- Power will be reduced.
- Fuel consumption will increase, engine may become unbalanced, exhaust temp will become very high.
- In worst condition valve may remain open resulting in loss of compression pressure thus burning of the exhaust valve and T/C fouling will increase.

What will happen if the Tappet clearance is more.

- Valve will open late and close early
- Lesser heat energy to T/C, so reduction in scavenge air and heat production
- No proper removal of gases
- Hammering of valve stem may cause damage to valve stem.

Adjusting Tappet clearance is one of the most important activities in generator maintenance, which is demonstrated below.

Activity

- This is a skill practice activity to demonstrate steps involved to perform tappet clearance adjustment of a Diesel Generator at a tower site. This activity will provide complete knowledge on how to do this adjustment and the precautions need to be taken while performing this important activity.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all the points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate the steps involved in the Tappet clearance adjustment and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of doing this adjustment.	4 hours	Diesel Generator, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth.

Method to do this activity

1. Take all safety precautions.
2. Make sure piston is on TDC (Top Dead Center).
 - a. From marking of the flywheel
 - b. From the fuel cam
 - c. Push rod should be free (both the valve should be close at this stage i.e. at the end of compression stroke)
3. Make sure engine has cooled down.
4. Loosen the lock nut of the rocker arm.
5. Now adjust the Tappet clearance between the rocker arm and valve stem by tightening and losing the nut below lock nut.
6. Use the feeler gauge (Refer to Figure 3.4.5)to adjust this clearance depending on the specifications of the manufacturer. This feeler gauge should be placed inside the gap while adjusting the clearance through the nut (Refer to Figure 3.4.4). For best adjustment the feeler gauge should gently go out and in to get the best clearance (not too tight not so loose).

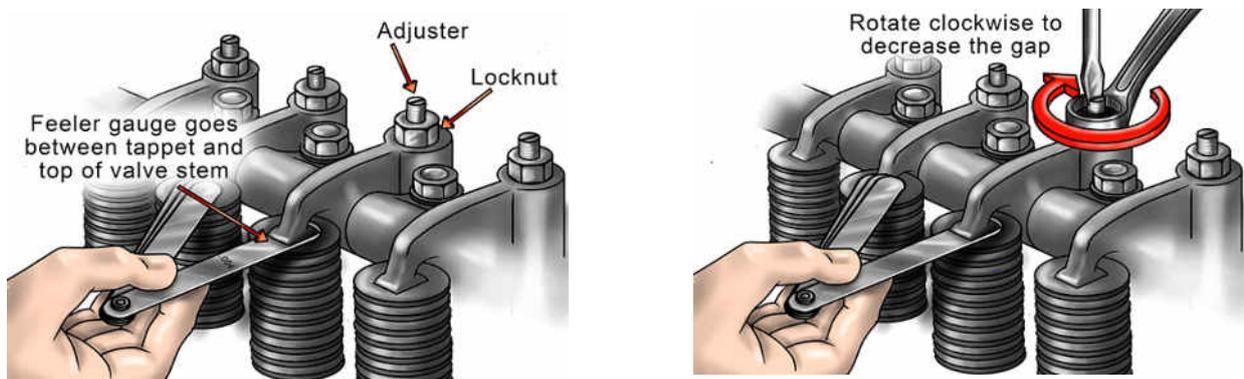


Fig. 3.4.4 Process of Adjusting Tappet Clearance



Fig. 3.4.5 Feeler gauge

Say



Once the Diesel Engine is working fine and Mechanical energy is getting generated by burning of fuel, this mechanical energy has to get transmitted to Alternator which converts the mechanical energy to Electrical energy. This transmission of mechanical energy from engine to alternator happened through V Belt (Refer to Figure 3.4.6 and 3.4.7) (V belt is designed to run in a pulley with a 60 degree V-groove. The V-groove transmits torque through a wedging action, thus increasing friction. They provide the best combination of traction, speed of movement, load of the bearings, and long service life).



Fig. 3.4.6 V Belt



Fig. 3.4.7 Replacing V Belt

Since V Belt is used regularly, wearing out of this belt is a common problem faced while maintaining a Diesel Generator. In such a case replacement of V belt has to be undertaken. The process to do this is explained in the activity below.

Activity

- This is a skill practice activity to demonstrate steps involved to perform V belt replacement of a Diesel Generator at a tower site. This activity will provide complete knowledge on how to replace this belt and the precautions need to be taken while performing this important activity.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate the steps involved in replacement of a V belt and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of doing this activity	4 hours	Diesel Generator, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth. V belt.

Method to do this activity

1. Take all safety precautions.
2. Refer page 130 of the participant's handbook.
3. Maintenance of V belt involves three types of activities which are
 - a. Checking the V belt
 - b. Adjusting the V belt
 - c. Replacing the V belt
4. Check the tension in the V belt by pressing the V belt, it should be as defined in the technical manual of the generator.
5. Inspect both sides of the V belt, if it's grooves are becoming smooth and shiny, replace the belt.
6. Also inspect the crankshaft/ pulley for any glazing of the surface. In case you find that replacement of crankshaft/ pulley need to be performed.
7. While different generators has specific procedures to change/ adjust the v belt which can be looked at from the maintenance manual but we should demonstrate this on one of the DG set so that participant get a clear understanding of this important process.

Activity



- This is a skill practice activity to demonstrate various other maintenance activities of a diesel generator to be performed by site technician at a tower site. This activity will provide complete knowledge of maintenance of a diesel generator and the precautions need to be taken while performing this important activity.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate various other maintenance activities to be performed on a diesel generator and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of doing these activities.	4 hours	Diesel Generator, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.

Method to do this activity

1. Refer page 132 of the participant's handbook and go through the table showing various other maintenance activities.
2. Perform each activity step by step as given in the table.
3. Ensure that all the participants develop expertise in performing these activities.

UNIT 3.5: Maintenance of the Tower & Shelter

Unit Objectives

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

- Understand the activities to be performed under Preventive Maintenance of Tower & Shelter.
- Make their beat as per the company's policies.

UNIT 3.5.1: PM Schedule of the Tower & Shelter

Say

- Overall hygiene of the shelter and the overall tower site is something which needs to be looked at regular basis.
- In order to achieve this preventive maintenance and Corrective Maintenance at the site has to be performed regularly by the technician at site.
- Following activity will demonstrate the maintenance schedule of tower and shelter.

Activity

- This is a skill practice activity to demonstrate various maintenance activities to be performed by site technician at a tower site while maintaining Tower and shelter. This activity will provide complete knowledge of maintenance of a tower and shelter. Also the precautions need to be taken while performing these important activities.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below.

Skill Practice	Time	Resources
Demonstrate various other maintenance activities to be performed at a shelter/ tower and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of doing these activities.	4 hours	Diesel Generator, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.

Method to do this activity

1. Refer page 133 of the participant's handbook and go through the table showing various other maintenance activities.
2. Perform each activity step by step as given in the table.
3. Ensure that all the participants develop expertise in performing these activities.

UNIT 3.6: Maintenance of AC Plant

Unit Objectives

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

- Understand the activities to be performed under preventive and corrective maintenance of AC plant
- Make their beat plan as per the company's policies
- Perform practical exercises to get exposure to required maintenance activities for a AC plant

UNIT 3.6.1: Maintenance a Schedule of AC Plant

Say

- Ÿ Overall hygiene of the AC plant is something which needs to be looked at regular basis.
- Ÿ In order to achieve this, preventive maintenance and corrective maintenance at the site has to be performed regularly by the technician at site.
- Ÿ Following activity will demonstrate the maintenance schedule of AC plant.

Activity

- Ÿ This is a skill practice activity to demonstrate various maintenance activities to be performed by site technician at a tower site while maintaining AC plant. This activity will provide working knowledge of maintenance of an AC plant. This will also discuss the precautions need to be taken while performing these important activities.
- Ÿ Ask the students to assemble together and form a group.
- Ÿ Explain to them what we are going to do in this practical exercise.
- Ÿ Tell all the students to clarify all the points during this interaction.
- Ÿ Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate various other maintenance activities to be performed for an AC plant and the precautions which need to be taken while doing this activity at site. After this activity you should be completely aware of the process of doing these activities.	4 hours	Diesel Generator, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.

Method to do this activity

1. Refer page 135 of the participant's handbook and go through the table showing various other maintenance activities.
2. Perform each activity step by step as given in the table.
3. Ensure all participants develop expertise in performing these activities.

UNIT 3.7: Maintenance of AMF/PIU

Unit Objectives

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

- Understand the activities to be performed under preventive and corrective maintenance of AMF/ PIU.
- Make your own beat plan as per your company's maintenance policy.
- Perform practical exercises to get exposure to required maintenance activities for AMF/PIU.

UNIT 3.7.1: Maintenance Schedule of AMF/PIU

Say

- Power Interface Unit/Auto Main Failure Unit is used to convert three phase power supply from the Electricity Board to a stabilized 230 V AC power supply. All the surges coming from the electricity board gets removed at the PIU. This output AC power from PIU is fed to the SMPS power unit which provides a stable DC power output.
- AMF is an automatic switch over to generator/ Battery backup incase AC mains from the Electricity Board fails. This is a Microprocessor based system which senses the electricity failure and switches over to a different power source. This is also called ATS (Automatic Transfer Switch).
- In order to achieve uptime of PIU/AMF preventive maintenance and corrective maintenance at the unit has to be performed regularly by the technician at site.
- Following activity will demonstrate the maintenance schedule of the AMF/ PIU

Activity

- This is a skill practice activity to demonstrate various maintenance activities to be performed by site technician at a tower site while maintaining PIU/ AMF. This activity will provide good working knowledge of maintenance of a PIU/ AMF. This activity will also discuss about the precautions need to be taken while performing these maintenance activities.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Ask the students to clarify all their points during this interaction.
- Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate various other maintenance activities to be performed for a PIU/ AMF and the precautions which need to be taken while doing this activity at site. After this activity you should have a good working knowledge of the process of performing these activities.	4 hours	PIU/ AMF, ACPDB, SMPS Unit, DCPDB, Input AC Power, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.

Method to do this activity

1. Refer page 137-138 of the participant's handbook and go through the table showing various other maintenance activities.

2. Perform each activity step by step as given in the table.
3. Configure the parameters of the PIU/ AFM as per the table provided.
4. Ensure that all the participants develop expertise in performing these activities.

UNIT 3.8: Maintenance of SMPS Power Plant

Unit Objectives

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

- Understand the activities to be performed under preventive and corrective maintenance of the SMPS power plant.
- make their beat as per the company's policies
- Perform practical exercises required for maintaining a SMPS power plant.

UNIT 3.8.1: Maintenance of SMPS Power Plant

Say

- SMPS power plant is installed to convert the AC power supply to a DC power supply at the required voltage at a telecom site.
- In order to achieve this, Preventive Maintenance and Corrective Maintenance at the site has to be performed regularly by the technician at site.
- Following activity will demonstrate the maintenance schedule of AC plant.

Activity

☛ This is a skill practice activity to demonstrate various maintenance activities to be performed by site technician at a tower site while maintaining a power plant. This activity will provide good working knowledge of maintenance of a SMPS power plant. This activity will also discuss about the precautions need to be taken while performing these maintenance activities.

☛ Ask the students to assemble together and form groups.

☛ Explain to them what we are going to do in this practical exercise.

☛ Ask the students to clarify all their points during this interaction.

☛ Details of the skill activity are given below

Skill Practice	Time	Resources
Demonstrate various maintenance activities to be performed for maintaining a Power plant and the precautions which need to be taken while doing this activity at site. After this activity you should have a good working knowledge of the process of performing these activities.	4 hours	PIU/ AMF, ACPDB, SMPS Power Unit, DCPDB, Input AC Power, Diesel generator set, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.

Y Method to do this activity

1. Refer page 139 of the participant's handbook and go through the table showing various other maintenance activities.
2. Perform each activity step by step as given in the figure 3.5.3.
3. Configure the parameters of the power supply unit as per the table provided.
4. Ensure that all the participants develop expertise in performing these activities.

Summarize

In this chapter students have learnt about

- Preventive and corrective maintenance of a tower site.
- Beat plan and the way it has to be executed.
- Timely resolution of the faults incurred at site.



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



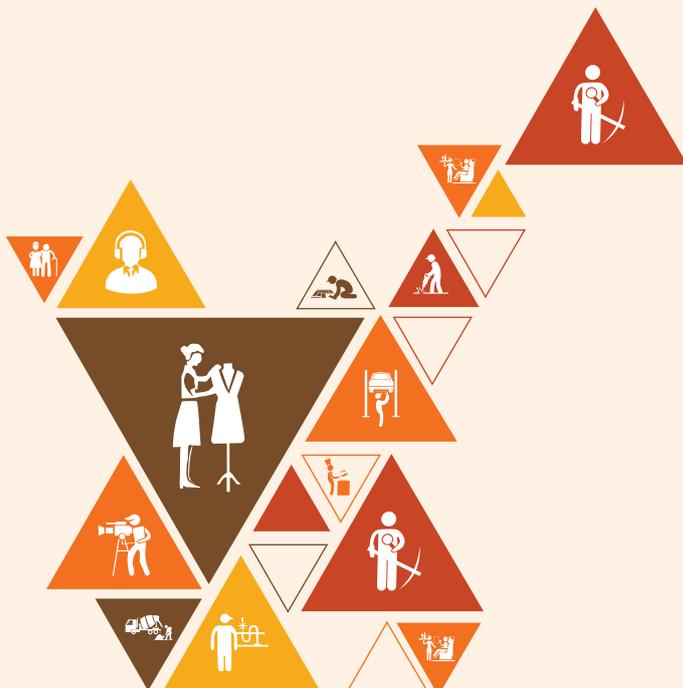
4. Site Management

Unit 4.1 - Introduction to Site Management

Unit 4.2 - Waste Management at Site

Unit 4.3 - Operating Equipment at Site

Unit 4.4 - Fault Management System



TEL/N4102

Key Learning Outcomes

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

1. Monitor reading as per EB (electricity bill) against reading on PIU (power interface unit).
2. Timely collect and submit the EB (electricity bill) at the office.
3. Operate key equipment at site.
4. Check number of alarms active at the site.
5. Check site for faulty alarms.
6. Attend alarms within the defined SLA.
7. Identify the reason for site lock.
8. Co-ordinate with service providers for quality fuel to be filled.
9. Interact with site owners w.r.t. rent, access issues etc.

UNIT 4.1: Introduction to Site Management

Unit Objectives

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

1. Explain the process of site management.
2. Understand day to day site management activities.
3. Interact with the electricity board and ensure timely payment of their bills.
4. Maintain healthy relationship with landlord and ensuring your's organization needs and landlord's requirements are met timely.
5. Coordinate with the fuel filling vendors.
6. Understand the process of interaction with other authorities.

Notes for Facilitation

- You could ask the students about their knowledge and understanding about the concept of management.
- Invite students to participate. Tell them to give a brief description of management.
- Let there be a debate in the class and link the concept of management with management of site. This will provide students to understand the meaning of site management.

UNIT 4.1.1: Site Management Activities

Say

- Management is the process of dealing/interacting with or controlling things and people to achieve desired objectives.
- Term site management is the process of dealing and interacting with people, personals and authorities to achieve the organization's objectives for the site.

Do

- Explain to the participants the need of getting the processes understood properly during this session so that when on field the sites can be managed properly.
- Clarify all their doubts.

Explain

Talk about various types of interactions and activities which are to be performed on day to day basis for proper operation of the site like.

- Electricity Board Interaction
- Interaction and management of the landlord.
- Activities involving fuel filling vendors.
- Coordination with other authorities

UNIT 4.1.2: Electricity Board (EB) Intention

Say



Cordial relationship and timely payments of Electricity Board and its staff is needed from the tower technician for proper operations of the site. Following activity provides details of what need to be done by the personal at site.

Activity



- This is a skill practice activity to understand the activities to be performed with the Electricity board.
- Ask the students to assemble together and form groups.
- Encourage students to ask questions so that they can understand properly.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To get acquainted with the processes and check list of the activities to be performed with electricity board	4 hours	Projector, Board and marker, slide showing the activities to be performed.

Method to do this activity

- Refer page 145 of the participant handbook
- Project Figure 4.1.1 in front of the participant
- Step by step discuss all the activities mentioned in the table
- Explain the importance of each activity
- Project flowchart from figure 4.1.2 on the screen
- Discuss how Electricity boards are organized
- Talk about the SLA s required to achieve various talks and escalation matrix within the organization
- Clarify all doubts of the participants

UNIT 4.1.3: Landlord Interaction

Say



Most of the tower sites are rented sites where the site owners control the activities happening at site by controlling the access to site. It is needed that in case of any shifting of material, downtime or visit of any official, employees to the site, there should be no access issues. Usually the activities which are performed with the site owner are

- Access Management
- Increase in site sharing
- Rental Payment
- Rental Revision

Activity

- This is a skill practice activity to demonstrate the process of interaction with the Landlord on day to day basis. Understand the SLA's and organization escalation matrix.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To acquaint with the process of interaction with the Landlord, understand the escalation matrix and the committed SLAs which need to be met.	3 hours	Projector, Board and marker, slide showing the activities to be performed.

Method to do this activity

- Refer page 149-153 of the participant handbook.
- Project Figure 4.1.3 to 4.1.6 in front of the participant.
- Step by step discuss all the activities mentioned in the table
- Explain the importance of each activity.
- Talk about the SLA s required to achieve various talks and escalation matrix within the organization.
- Clarify all doubts of the participants.

UNIT 4.1.4: Fuel Vendor Interaction

Say

- Site Management activities include interaction with fuel filling vendors on day to day basis as and when diesel is required to be filled. The tower technician present at the site also needs to interact with them regularly to ensure that there is enough fuel at the site and also to ensure that the payment to the vendors is made on timely basis. He has to submit the invoices with vendor bills and various other details as mentioned in the activity below and then follow to ensure timely payment of the vendor.

Activity

- This is a skill practice activity to demonstrate the process of interaction with the Fuel filling vendor as needed. Understand the SLA's and organization escalation matrix.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To acquaint with the process of interaction with fuel filling vendor, ensure timely payments and understand the escalation matrix and the committed SLAs which need to be followed.	3 hours	Projector, Board and marker, slide showing the activities to be performed

Method to do this activity

- Refer page 154 of the participant handbook.
- Project Figure 4.1.7 in front of the participant.
- Step by step discuss all the activities mentioned in the table
- Explain the importance of each activity.
- Talk about the SLA s required to achieve various talks and escalation matrix within the organization.
- Clarify all doubts of the participants.

UNIT 4.1.5: Statutory Approvals

Say

- Site Management activities include interaction with other local statutory authorities. The tower technician present at the site also needs to interact with these authorities to sort out in case of any development.

Activity

- This is a skill practice activity to demonstrate the process of interaction with the Statutory Authorities as needed. Understand the SLA's and organization escalation matrix.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To acquaint with the process of interaction with the statutory authorities for various approvals, understand the escalation matrix and the committed SLAs which need to be met.	3 hours	Projector, Board and marker, slide showing the activities to be performed.

Method to do this activity

- Refer page 155 of the participant handbook.
- Project Figure 4.1.8 in front of the participant.
- Step by step discuss all the activities mentioned in the table
- Explain the importance of each activity.
- Talk about the SLA s required to achieve various talks and escalation matrix within the organization.
- Clarify all doubts of the participants.

UNIT 4.2: Waste Management at site

Unit Objectives

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

1. Understand the concept of waste management.
2. Differentiate between types of waste generated at the site.
3. Identify actions need to be taken to dispose off this video.

Say

- Lot of waste gets generated at any tower site which needs to be disposed off properly and timely to ensure that the hazardous waste is not accumulated at the site.
- Waste material if accumulated at site can lead to accidents like fire, explosions etc.
- This can lead to loss of human capital and equipment at site

Do

- Demonstrate the process of waste management at the tower site. Also provide an update on how to dispose this waste generated at site.
- Talk about the responsibilities as who is responsible for which activity.

Elaborate

- Refer page 156 of the participant handbook.
- Display Figure 4.2.1 in front of the participant.
- Step by step discuss all types of wastes as mentioned in the table
- Explain the importance of each activity.
- Clarify all doubts of the participants.

UNIT 4.3: Operating Equipment at Site

Unit Objectives

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

1. Understand the procedure to start a DG Set
2. Perform the steps to transfer the load on DG
3. Perform the steps to stop a DG Set
4. Operate the Fire Extinguisher at site

Say

- After human interaction proper management and operation of equipment at a site is another important parameter of site management.
- While technicians have gained expertise on technical details earlier, in this unit we will cover operational procedure of frequently used equipment.

UNIT 4.3.1: Operation of a DG Set

Do

1. Demonstrate the process of
 - Starting of a DG Set
 - DG Load transfer procedure
 - Stopping of a DG set

Activity

- This is a skill practice activity to demonstrate the operating process of a DG set.
- Ask the students to assemble together and form groups.
- Explain to them what we are going to do in this practical exercise.
- Details of the skill activity are given below

Skill Practice	Time	Resources
To acquaint with the operating procedure of a DG set.	1 hours	PIU/ AMF, ACPDB, SMPS Power Unit, DCPDB, Input AC Power, Diesel generator set, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc, Clean Cloth

Method to do this activity

- Refer page 157 of the participant handbook.
- Step by step discuss all the activities mentioned.
- Demonstrate these activities on the test setup.
- Explain the importance of each activity.
- Ask questions to check the understanding of the participants.

UNIT 4.3.2: Operational Procedure of a Fire Extinguisher

Say



- In case of fire at site immediate action by the technician present at site can save life and equipment deployed.
- This quick action will depend on the presence of mind and working knowledge of the person at site.
- We have earlier discussed about various types of fire extinguishers which can be used at various types of fire.
- Co2 based fire extinguishers are most commonly used at the tower site.

Do



- Demonstrate the process of using a Co2 based fire extinguisher.
- Take proper precautions as it can induce a situation of lack of Oxygen as Co2 replaces oxygen.

Elaborate



- Refer page 158 of the participant handbook.
- Step by step discuss the procedure of using these extinguishers.
- Explain the precautions which need to be taken while doing this activity.
- Discuss the escalation procedure in case of a fire.
- Clarify all doubts of the participants.

Ask



- Check the understanding of the participants by asking them questions on the topics.

UNIT 4.4: Fault Management System

Unit Objectives

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

1. Understand the concept of Network Management and fault management.
2. Describe the architecture of the fault management system.
3. Identify the component of a fault management system.
4. Understand how alarms get routed to various interface.
5. Explain the back end system used in Fault Management.

Say

- We discussed various types of Human interaction and Equipment Management as initial two pillars for proper operation of a site.
- Third pillar of site management is proper usage and understanding of fault management system for regular operation of a site.

Do

- Refer page 159 of the participant handbook
- Provide overview of Fault Management to all the participants
- Talk about need of fault management while doing site management of a site
- Discuss and explain various terms which are used in Fault management system
- Elaborate on fault management architecture, students should develop understanding about the basic architecture
- Explain the concept of network notification and event flow
- Display figures 4.4.3 to 4.4.7 in front of students and ensure that students get good understanding of Fault management internals and FM back end

Elaborate

- Display fig 4.4.8 and 4.4.9 in front of participants
- Discuss all major alarms present at a site
- Explain the importance of each alarm and the actions to be taken in case of those alarms

Ask

- Check the understanding of the participants by asking them questions on the topics

Summarize

In this chapter students have learnt about

- Site management processes.
- Fault management system and its operation



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



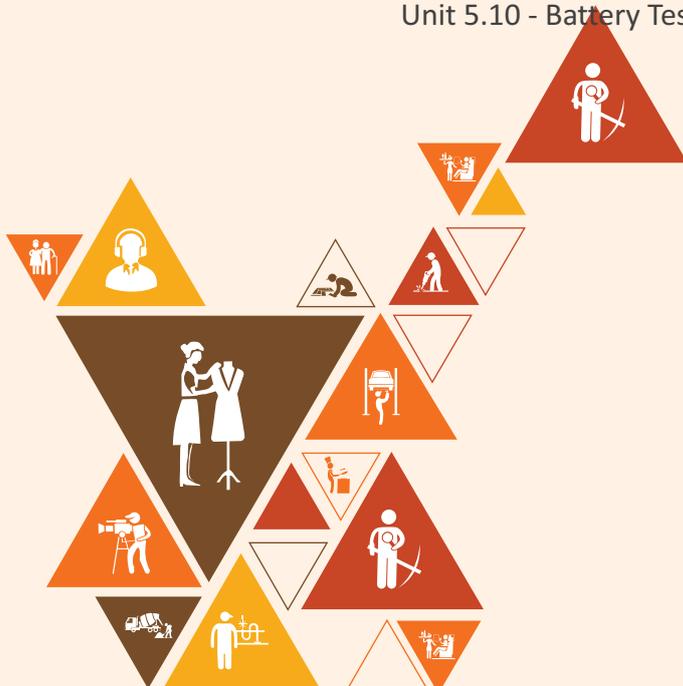
N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



5. Task Reporting

- Unit 5.1 - Introduction to Task Reporting
- Unit 5.2 - Site Check List
- Unit 5.3 - Alarm Management Reporting
- Unit 5.4 - Preventive Maintenance Report
- Unit 5.5 - Acceptance Testing Reporting
- Unit 5.6 - Fuel and Energy Management Report
- Unit 5.7 - Outage Analysis Report
- Unit 5.8 - Outage Management Report
- Unit 5.9 - Site Equipment Data Management
- Unit 5.10 - Battery Testing Report



TEL/N4103

Key Learning Outcomes

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

1. Escalate faults/issues at site to supervisor.
2. Fill the Preventive Maintenance checklist/report
3. Fill the Corrective Maintenance checklist/report
4. Accurately report diesel filling, electricity bill and DG reading.
5. Report any changes in the site or movement of any material.
6. Report theft if any from the site location
7. Report movement of staff to the supervisor

UNIT 5.1: Introduction to Task Report

Unit Objectives

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

1. Understand the concept of Task Reporting.
2. Discuss the need to Task Reporting.
3. Timely Report and record various activities happening at a site.

Notes for Facilitation

- You could ask the students about their knowledge and understanding of the concept Task Reporting. Why Task Reporting is important?
- Invite students to participate. Tell them to give a brief description of task reporting.
- Let there be a debate in the class on this concept. This will provide students in depth understanding of the meaning of Task Reporting and what is expected from them.

Say

- Task Reporting is presenting a written account of the result or performance of a task which is assigned to someone by superiors or authorities.
- In order to standardize collection of results or information from many people at different locations reporting formats or reports are created which are followed by everyone.
- These reports are collected and the collected information which helps in taking decisions.
- In the following pages we will discuss various reporting formats which will be used by the participants to report daily activities at their site.

UNIT 5.2: Site Check List

Unit Objectives

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

1. Develop an understand the reporting formats and structures
2. Get well versed with the record keeping formats and the SLAs as per company policy.
3. Update all information about the site at one place.
4. Discuss the format of daily reporting
5. Record all activities at site on daily basis.

UNIT 5.2.1: Tower Site Audit Check List

Say

- This checklist is the first step towards record keeping at any tower site/ location
- This is used to track all the information about the site, location, contact details
- Equipment installed, type, make, model and serial number of the equipment
- Expansion capacity of the site for future planning

Do

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely.

UNIT 5.2.2: Daily Tower Site Maintenance Check List

Say

- This checklist is the next step towards record keeping at any tower site/ location
- This is used to track all the activities done at site on daily basis
- This also records the status of key parameters on daily basis

Do

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

UNIT 5.3: Alarm Management Reporting

Say

- This reporting sheet is used to track the progress of resolution of an alarm/ fault by field O&M person or by operator incase resource sharing is happening at a site.
- Records are entered in this sheet as soon as any fault is reported at a site.
- This sheet is circulated to various senior team members who can also look at the progress of the fault resolution and points out if there are delays.

Do

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely.

UNIT 5.4: Preventive Maintenance Reporting

Say

- These reporting sheets are used to record the Preventive Maintenance schedule and actual Preventive Maintenance activity at a tower site.
- The parameters of all equipment are recorded and activities to be performed every 15 days, 30 days and 90 days are clearly depicted.
- This sheet records Preventive Maintenance Activities, observations and other Corrective Maintenance Activities.
- Name of the technician, engineer and in charge is also recorded for every activity.

Do

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely.

UNIT 5.5: Acceptance Testing Report

Say

- This reporting format is used at the time of site is getting installed and as soon as site is ready for handover acceptance testing report is to be submitted.
- It provides the complete status of all the components at the site at the time of acceptance testing.
- This sheet is kept in records and can be checked incase of any requirement

Do 

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

UNIT 5.6: Fuel and Energy Management Report

Say 

- This report records the diesel consumption and energy usage at a tower site.
- This also tracks the % performance of DG set and any Open reduction measures taken at the site.
- Records of EB bills are also maintained in this reporting sheet.

Do 

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

Ask 

- Bring out some questions to check the understanding of students

UNIT 5.7: Outage Analysis Report

Say 

- This report records the diesel consumption and Energy usage at a tower site
- This also tracks the % performance of DG set and any Opex reduction measures taken at the site
- Records of EB bills are also maintained in this reporting sheet

Do 

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

Ask 

- Bring out some questions to check the understanding of students

UNIT 5.8: Outage Management Report

Say

- Outage management report is used to keep a detailed description of any outages happening at a site. This has many reporting formats which are described below.
 - Daily critical Activity – Site Visit Report
 - Material Requirement Plan – Any material required for doing maintenance
 - Escalation matrix- for any fault whom to connect and in what time frame.
 - FMC Log (Fault Management and Commissioning Log)- this tracks the duration of the call open time.
 - Incident Report – reporting any incident leading to need of monetary settlement.
- This also records the downtime of the site and the reason for such a downtime.

Do

- Open the check list in front of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

Ask

- Bring out some questions to check the understanding of students

UNIT 5.9: Site Equipment Data Management

Say

1. This reporting format is used to records the details of equipment present at various sites. There are two types of reports in this:
 - Monthly Active Equipment Status Report (Master) – this list down additional equipment's which are installed at site to take care of additional requirements.
 - Equipment Maintenance plan – reports maintenance activity on each equipment.

Do

- Open these reports in front of the participants one by one
- Fill in all the information discussed step by step in the reporting format
- Explain all the points to the participants so that they can understand this exercise completely

Ask

- Bring out some questions to check the understanding of students

UNIT 5.10: Battery Testing Report

Say

- Many tests are performed on batteries for efficient working and long life. In this section we are discussing two reports
 - Boost Charge Report
 - Battery Backup test on System Load.
- Guidelines to perform battery backup test are also provided in this subunit.
- Use these reports in continuation of unit 3.3 – Maintenance of Batteries

Do

- Open the check list in from of the participants
- Fill in all the information step by step
- Explain all points to participants so that they understand this exercise completely

Ask

- Bring out some questions to check the understanding of students.

Summarize

In this chapter students have learnt about

- The concept of task reporting.
- How to keep the record of all the activities at site on daily basis.
- How to escalate the faults or issues occurred at the site.
- Tracking the progress of resolution of an alarm or fault.



Skill India
कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N · S · D · C
National
Skill Development
Corporation

Transforming the skill landscape



6. Employability & Entrepreneurship Skills

Unit 6.1 – Personal Strengths & Value Systems

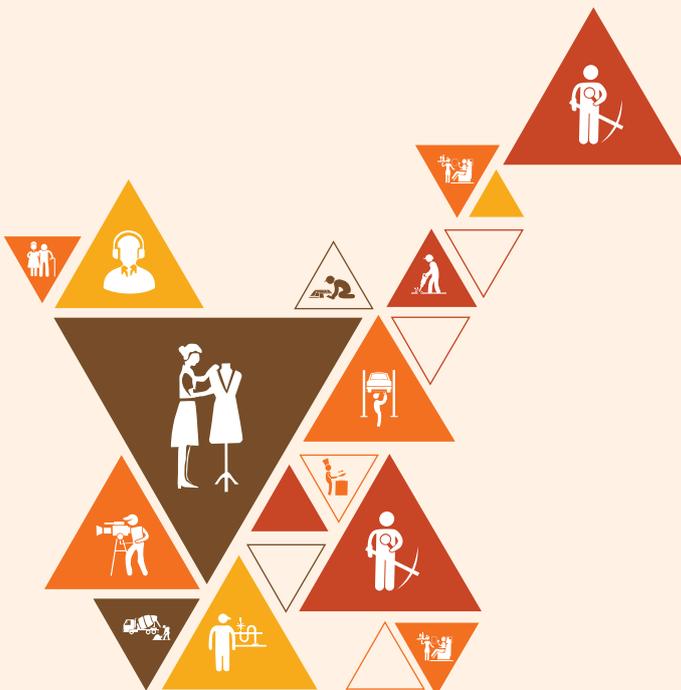
Unit 6.2 – Digital Literacy: A Recap

Unit 6.3 – Money Matters

Unit 6.4 – Preparing for Employment & Self Employment

Unit 6.5 – Understanding Entrepreneurship

Unit 6.6 – Preparing to be an Entrepreneur



Introduction: Employability and Entrepreneurship Skills

This Facilitator's guide includes various activities which will help you as a facilitator to make the sessions participative and interactive.

Ice breaker

- You can begin the module with the following ice breaker:

Five of Anything Ice Breaker Steps:

- Divide the participants into groups of four or five by having them number off. (You do this because people generally begin a meeting by sitting with the people they already know best.)
- Tell the newly formed groups that their assignment is to share their five favourite movies of all time, their five favourite novels or their five least liked films. The topic can be five of anything - most liked or disliked.
- This ice breaker helps the group explore shared interests more broadly and sparks lots of discussion about why each person likes or dislikes their selected five.
- Tell the groups that one person must take notes and be ready to share the highlights of their group discussion with the class upon completion of the assignment.

Expectation Mapping

1. During the first session and after ice breaker session, ask the participants to answer the following question: "What do I expect to learn from this training?"
2. Have one of the participants write their contributions on a flip chart sheet.
3. Write down your own list of covered material in the training on another flip chart sheet.
4. Compare the two sheets, commenting on what will and what will not be covered during the training.
5. Set some ground rules for the training sessions. Ask the participants to put these rules on a flipchart and display it in the class.
6. You may get back to those sheets once again at the end of the last session of the training.
7. Benefits of doing this activity:
 - Participants feel better as their opinions are heard.
 - Participants get to know what they should expect from the training.
 - The facilitator gets to know which points to emphasize, which to leave out, and which to add during the training.
8. Expectations from the participants:
 - Must sign the attendance sheet when they arrive for class.
 - Conduct themselves in a positive manner
 - Be punctual, attentive, and participative
9. Explain the contents that are going to get covered one by one and connect it with the expectation mapping done earlier.
10. By the end of this exercise, the participants should have a clear understanding of what to expect from the session and what are the areas that will not get covered.

Defining Objectives

1. Defining the objectives in the beginning of the units sets the mood for the unit.
2. To begin with the end in mind sets the expectations of the participants as what could be the important takeaways from the session.
3. It is also a way of making participants take responsibility of their own learning process.
4. For the facilitator, the objectives decide a designed path to progress on so that the learning stays aligned and on track.

5. Read the objectives slowly, one by one, and ask the participants to explain what they think it means.
6. At the end of the session, you could again revisit the objectives to find out from the participants about how many objectives have been achieved.

In order to effectively facilitate this workshop:

1. You must have thorough knowledge of the material in the Participant Handbook, and be prepared to answer questions about it.
2. You may also wish to read other material to enhance your knowledge of the subject.
3. There may be issues raised with which you are not able to deal, either because of lack of time or knowledge. You can either state that you will obtain answers and get back to the participants with the information. In case the query can be turned to an assignment to the class, do so. You can work with the the participants on the assignment.
4. You must have a very clear understanding of what the participants want to accomplish by the end of the workshop and the means to guide the participants.
5. As the facilitator, it is your responsibility to make sure that all logistical arrangements are made for the workshop. This may involve doing it yourself or confirming that someone else has made all necessary arrangements associated with the workshop. Assume nothing and check everything before the workshop begins.
6. To break the monotony and boredom during sessions, introduce mini breaks in the form of stretching exercises, jokes, some group songs or games.
7. Invite discussion from the participants.
8. Probe the participants further and lead them to come to affirmative conclusions.
9. Let the participants answer. No answer is incorrect.
10. Ask one participant to write all the points on the whiteboard.
11. Build the sessions from the answers provided by the class.
12. Prepare for the sessions in advance so that the resources like flipcharts, handouts, blank sheets of paper, marker pens, etc. can be kept ready.
13. Ensure that resources like board, markers, duster etc. is available before your session starts.

General instructions for role playing:

1. You are not being asked to be an actor or to entertain. The purpose of the role play is to provide a situation in which you can practice certain skills.
2. When you read the brief, try to imagine yourself in the situation described and behave in a way you feel to be natural – but be conscious of the fact that your role may require a different approach from that which you might normally use.
3. You (and others) may benefit from the change in approach and behaviour. Therefore, try to use the approach you feel to be most appropriate for the circumstances described in your brief.
4. The brief is just the starting point. It simply sets the scene and the tone of session or activity. Try not to keep referring to the brief as this will affect the spontaneity of the meeting. Allow the role play to develop as you think it might in real life and change your reactions in line with the behaviour and responses of others involved.
5. If you find that you have too little information to answer questions or to describe what has happened in the situation, do feel free to add your own thoughts and ideas. Try to keep these within the framework of the role you are taking and try to make your improvisations as realistic as possible.

UNIT 6.1: Personal Strengths & Value Systems

Key Learning Outcomes



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

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Discuss the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Discuss motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss the role of attitude in self-analysis
15. Discuss how to maintain a positive attitude
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management

UNIT 6.1.1: Health, Habits, Hygiene: What is Health?

Unit Objectives

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

- Explain the meaning of health
- List common health issues
- Discuss tips to prevent common health issues
- Explain the meaning of hygiene
- Discuss the purpose of Swachh Bharat Abhiyan
- Explain the meaning of habit

Resources to be Used

- Participant Handbook

Ask

- What do you understand by the term “Health?”
- According to you, who is a healthy person?

Say

- Discuss the meaning of health and a healthy person as given in the Participant Handbook.

Ask

- When did you visit the doctor last? Was it for you or for a family member?

Say

- Discuss the common health issues like common cold, allergies etc. Refer to the Participant Handbook.
- Let us do a small activity. I will need some volunteers.

Role Play

- Conduct a small skit with volunteers from the class. Consider one of the villagers has been appointed as a health representative of the village, what measures will you as a health representative suggest to the common villagers to prevent common health issues discussed.
- You will need at least 4 volunteers (Narrator, Health Representative, Head of the Village, Doctor).
- Explain the health concerns of the village to the Narrator. The Narrator will brief the class about the skit.
- Give the group of volunteers, 5 minutes to do discuss.
- At the end of 5 minutes, ask the group to present the skit to the class assuming them as the villagers.
- The class can ask questions to the group as a common villager.

Summarize

- Through this activity we got some tips on how can we prevent these common health issues.

Say 

- Let us now see how many of these health standards we follow in our daily life.

Activity 

- Health Standard Checklist from the Participant Handbook.

Ask 

- How many of you think that you are healthy? How many of you follow healthy habits?

Say 

- Let's do an exercise to find out how healthy you are.
- Open your Participant Handbook section 'Health, Habits, Hygiene: What is Health?', and read through the health standards given.
- Tick the points which you think are true for you.
- Try to be as honest as possible as this test is for your own learning.

Do 

- Ensure that all the participants have opened the right page in the Participant Handbook.
- Read aloud the points for the participants and explain if required.
- Give them 5 minutes to do the exercise.
- At the end of 5 minutes, ask the participants to check how many ticks have they got.

Summarize 

- Tell them that they need to follow all the tips given in this checklist regularly in order to remain healthy and fit.

Ask **Discuss:**

- Is it necessary to practice personal hygiene every day? Why?
- How does a person feel when they do not practice good personal hygiene? Why?
- Can good personal hygiene help a person feel good about his/her self? How?

Say 

- Discuss the meaning of hygiene as given in the Participant Handbook.

Activity 

- Health Standard Checklist: Hygiene

Say 

- Let's do an exercise to find out if we maintain good hygiene habits or not.
- Open the Participant Handbook and read through the Health Standard checklist given.
- Tick the points which you think are true for you.
- Try to be as honest as possible as this test is for your own learning.

Do 

- Ensure that all the participants have opened the right page in the Participant Handbook.
- Read aloud the points for the participants and explain if required.
- Give them 5 minutes to do the exercise. .
- At the end of 5 minutes, ask the participants to check how many ticks have they got.
- Ask them to calculate their score.
- Tell them what each score indicates by reading aloud what has been mentioned in the Participant Handbook.

Ask 

- How many of you have heard about “Swachh Bharat Abhiyan”?
- Can you tell the class what it is about?

Summarize 

- Tell them about Swachh Bharat Abhiyan as given in the Participant Handbook and request them to take a pledge to keep our country clean.

Ask 

- What is a habit?

Say 

- Discuss some good habits which can become a way of life.

Summarize 

- Tell them about good and bad habits and the reasons to make good habits a way of life.

UNIT 6.1.2: Safety

Unit Objectives

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

- Discuss ways to set up a safe work environment
- Discuss critical safety habits to be followed by employees

Resources to be Used

- Participant Handbook
- Safety signs and symbols
- Safety equipments
- Blank papers
- Pens

Say

- There are many common safety hazards present in most workplaces at one time or another. They include unsafe conditions that can cause injury, illness and death.
- Safety Hazards include:
 - Spills on floors or tripping hazards, such as blocked aisles or cords running across the floor.
 - Working from heights, including ladders, scaffolds, roofs, or any raised work area.
 - Unguarded machinery and moving machinery parts; guards removed or moving parts that a worker can accidentally touch.
 - Electrical hazards like cords, missing ground pins, improper wiring.
 - Machinery-related hazards (lockout/tag out, boiler safety, forklifts, etc.)

Team Activity

Safety Hazards

- There are two parts to this activity.
- First part will cover the potential safety hazards at work place.
- Second part will cover a few safety signs, symbols and equipments at work place.
- Use this format for the first part of the activity.

PART 1		
Hazard	What could happen?	How could it be corrected?

Ask

- How could you or your employees get hurt at work?

Say

- Let's understand it better with the help of an activity. You will be given a handout within your groups. You have to think about the possible hazards of your workplace, what damage these hazards could cause and about the corrective action.

Do

- Divide the class into five to six groups of four participants each.
- Put the format on the board for the activity.
- Give blank papers and pens to each group.
- The group is expected to think and discuss the potential safety hazards in the workplace.
- Ask the group to discuss and fill the format using the blank sheet.
- Give the groups 5 minutes for the activity.
- For the second part of the activity, show the class some pictures of safety signs, symbols and equipments.
- Now they will put down a few safety symbols, signs or equipment against the safety hazards identified.
- Give them 5 to 10 minutes to discuss and draw/note it.
- At the end of 10 minutes the groups will present their answers to the class.

Say

- Now, let's discuss the answers with the class.
- All the groups will briefly present their answers.

Do

- Ask the audience to applaud for the group presentation.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time.
- Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Ask

De-briefing

- What did you learn from the exercise?
- As an entrepreneur, is it important to ensure the safety of your employees from possible hazards? Why?

Summarize

- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the tips to design a safe workplace and non-negotiable employee safety habits.

UNIT 6.1.3: Self Analysis- Attitude, Achievement Motivation: What is Self Analysis?

Unit Objectives

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

- Explain the importance of self- analysis
- Discuss motivation with the help of Maslow's Hierarchy of Needs
- Discuss the meaning of achievement motivation
- List the characteristics of entrepreneurs with achievement motivation
- List the different factors that motivate you
- Discuss the role of attitude in self- analysis
- Discuss how to maintain a positive attitude
- List your strengths and weaknesses

Resources to be Used

- Participant Handbook
- Old newspapers
- Blank papers
- Pencils/ pens

Activity

- This is a paper pencil activity.

What are the three sentences that describe you the best?

What do you need to live happily?

What are your strengths and weaknesses?

Do

- Write the three questions on the board/ flipchart before the session begins.
- Give plain papers and pencils/ pens to each participant.
- Tell participants to write the answer for the three questions on the paper.
- Tell them the purpose of this activity is not to judge anyone but to understand more about self.

Say

- Discuss the concept of Self Analysis and motivation with reference to Maslow's Hierarchy of Needs as discussed in the Participant Handbook.

Team Activity

Tower building

- Each group which will create tower using the old newspapers.

Do 

- Divide the class into groups.
- Give them some old newspapers.
- The task is to create a tower out of the newspapers.
- The group which will create the highest tower standing on its own will be considered the winning group.
- Groups can use as many newspapers as they want to and in any way they want.

Ask 

- What did the winning group do differently?
- If you were given a chance, how would you have made the tower differently?
- How did you feel while making the tower?
- Did you feel motivated?

Say 

- Discuss the concept of achievement motivation and characteristics of entrepreneurs with achievement motivation as discussed in the Participant Handbook.

Ask 

- Is your attitude positive or negative?

Say 

- Let me tell you a story :

It's Little Things that Make a Big Difference.

There was a man taking a morning walk at the beach. He saw that along with the morning tide came hundreds of starfish and when the tide receded, they were left behind and with the morning sun rays, they would die. The tide was fresh and the starfish were alive. The man took a few steps, picked one and threw it into the water. He did that repeatedly. Right behind him there was another person who couldn't understand what this man was doing. He caught up with him and asked, "What are you doing? There are hundreds of starfish. How many can you help? What difference does it make?" This man did not reply, took two more steps, picked up another one, threw it into the water, and said, "It makes a difference to this one." What difference are we making? Big or small, it does not matter. If everyone made a small difference, we'd end up with a big difference, wouldn't we?

Ask 

- What did you learn from this story?

Activity **What Motivates You?**

- This is an individual activity.
- It is an exercise given in the Participant Handbook.

Do 

- Ask the class to open their Participant Handbook and complete the exercise given in the section What Motivates You?
- Ensure that the participants have opened the correct page for the activity.
- Give the class 5 minutes to complete the activity.

Say

- Discuss the concept of attitude and how to cultivate a positive attitude as discussed in the Participant Handbook.

Summarize

- Close the discussion by summarizing how self-analysis, knowledge about what motivates you and your positive attitude can help in your business as well in life.

UNIT 6.1.4: Honesty & Work Ethics

Unit Objectives

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

- Discuss the qualities of honest people
- Describe the importance of honesty in entrepreneurs
- Discuss the elements of a strong work ethic
- Discuss how to foster a good work ethic

Resources to be Used

- Participant Handbook

Ask

- What do you understand by honesty?
- Why is it important for entrepreneurs to be honest?
- Do you remember any incident where your honesty helped you in gaining confidence?
- Do you remember any incident where someone lost business due to dishonesty?

Say

- Talk about honesty, qualities of an honest person, and the importance of honesty in entrepreneurs as discussed in the Participant Handbook.
- “Let's understand it better with the help of some case scenarios. You will be given some cases within your groups. You have to analyse the case scenario that has been given to you and then find an appropriate solution to the problem.
- Keep your discussion focussed around the following:
 - What went wrong?
 - Who was at fault?
 - Whom did it impact- the customer or the businessman?
 - How would it impact the business immediately? What would be the long term impact?
 - What could be done?
 - What did you learn from the exercise?

Do

- Divide the class into four groups of maximum six participants depending on the batch size.
- Give one case study to each group.
- Instruct them to read the case carefully.
- Put down the de-brief questions on the board and ask the groups to focus their discussion around these questions.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem. Give the class 5-10 minutes to discuss the case and note down their solutions.
- At the end of 10 minutes the team should present their case solution to the class. The presentation can be a narration or a role play.
- Ask the group to select a group leader for their group. The group leader to discuss and assign roles to the group members for the presentation.

Team Activity

Case Study Analysis

Scenario 1

Aakash has a small mobile retail sales and repair shop in Allahabad. He has one of the most popular outlets and has great rapport with his customers.

It's around 11 AM when a customer barges in to the shop and starts shouting at Aakash for giving her a faulty instrument. The screen of her mobile is cracked from one side. Aakash remembered thoroughly checking the handset before handing it over to the customer. The customer threatens to sue him and to go to Consumer Court for cheating her. Now, the problem occurred somewhere outside the shop but as other customers were listening to the conversation, it might impact his business. The situation needs to be managed very sensitively. What would you do if you were in Aakash's place?

Scenario 2

Rajni does beautiful Phulkari embroidery on suits and sarees. She has a small home-based business. She has a huge list of customers on Facebook and WhatsApp who give her orders regularly. Smita is one of her old and regular customers. As her sister-in-law's wedding was around the corner, Smita wanted to buy few handcrafted Phulkari duppatta. She placed an order for three duppattas via WhatsApp and requested Rajni to send them as soon as possible. When the parcel reached Smita through courier she found that out of the three duppattas, only one was hand embroidered and the other two had machine embroidery on them. Even the length and the quality of the material was not as desired. Smita was heartbroken. It was a complete waste of money and moreover she couldn't wear what she had planned to during the wedding functions. She sent a message to Rajni on WhatsApp, expressing her anger and disappointment.

Smita has also sent a feedback and expressed her disappointment on the social media... this will directly affect Rajni's business. What would you do if you were in Rajni's place?

Scenario 3

Shankar is a tattoo artist who has a small tattoo showroom in a big, reputed mall in New Delhi. Mr Saksham had an appointment for today, at 11:00 am but he reached at 11:50 am. Meanwhile, Shankar had to reschedule his next appointment. After availing Shankar's services, Mr Saksham started yelling in an abusive language, refusing to pay the requisite amount, and finding faults in the services provided by him. Who was at fault in this case? What should Shankar do? Should he confront Saksham or give in to the demands of the client?

Scenario 4

Shailender is an online cloth reseller who does business through social networking sites such as Facebook and WhatsApp. Priyanka made online payment for a dress to Shailender. But she did not receive the dress for a month. When she asked for a cancellation, Shailender started misleading her. For almost 45 days, he kept promising her that he will pay the amount today, tomorrow, day after etc. Even after repeated calls and messages when she did not receive the payment or the dress, she decided to write a post against him on a popular social media platform. As a result, Shailender lost lots of customers and his flourishing business faced a major crisis. How could this situation have been managed?

Say

- Now, let's discuss the problem and solution with the larger group.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Once the presentation is over, the class can ask their questions.

Do 

- Congratulate each group for the group presentation.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time. Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Summarize 

- Ask the participants what they have learnt from the exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of honesty and work ethics for entrepreneurs.

UNIT 6.1.5: Creativity and Innovation

Unit Objectives

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

- List the characteristics of highly creative people
- List the characteristics of highly innovative people

Resources to be Used

- Participant Handbook
- Chart papers
- Marker pens

Ask

- You must be aware of the term 'Rags to riches' and heard stories related to the term.
- What do these stories tell us?
- What was so special about these people?

Say

- Let's have a look at these stories.
- There are some inspiring stories about people which I would like to share with you.
- Narrate these stories to the class.

A.P.J. Abdul Kalam

Who has not heard of A.P.J. Abdul Kalam: Avul Pakir Jainulabdeen Abdul Kalam hailed from a very humble background. His father was a boat owner. To help his family, Kalam would work as a newspaper vendor. With limited resources, he graduated in Physics and studied aerospace engineering. He was instrumental in India's step towards nuclear energy. In 2002, he became the 11th President of India.

Water filter/purifier at source

Two young boys studying in classes 4 and 5, from Lingzya Junior High School, Sikkim designed a simple innovative low cost water purifier.

Inspiration behind the idea: Most people today prefer to use a water filter/purifier at their home.

Both the children have given idea to have filter/purifier at the source of water so that everyone has access to clean water without having to make an investment in purchasing a filter/purifier.

Spring's idea is to have a centralised purification system at the point of distribution like water tank while Subash's idea is to have such purifiers attached to public taps.

Source: <http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-indians/20151208.htm>

Solar seeder

This is a story of a innovative solar seeder and developed by Subash Chandra Bose, a class 8, student from St Sebastiyar Matriculation School, Pudukkottai, Tamil Nadu. Subash has developed a solar powered seed drill, which can undertake plantation for different size of seeds at variable depth and space between two seeds.

Source: <http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-indians/20151208.htm>

Looms for physically challenged

Now this is really inspiring of two sisters, Elakkiya a Class 6 student and Pavithra a Class 9 student of SRC Memorial Matriculation, Erode, Tamil Nadu.

The two sisters have come up with loom for lower limbed physically challenged. In their loom they have replaced the pedal operated system with a motor and a gearbox attached to a pulley mechanism.

Source: <http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-indians/20151208.htm>

Ask

- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

Say

- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

Team Activity

- This is a group activity.

- Think of any one famous entrepreneur and write a few lines about him or her.

Activity De-brief

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

Do

- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6 depending on the batch size.
- Give each group a chart paper.
- Tell the participants they have to write a few lines about any one famous entrepreneur.
- Give the participants 10 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.
- Ask each group to read out what they have written.
- Ask the de-brief questions.

Summarize



- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

Notes for Facilitation



- Source for stories on innovations:

<http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-indians/20151208.htm>

UNIT 6.1.6: Time Management

Unit Objectives

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

- Discuss the benefits of time management
- List the traits of effective time managers
- Describe effective time management techniques

Resources to be Used

- Participant Handbook

Ask

Does this sound like you?

- I can never get enough time to finish what I am doing in a day.
- I have so many things to do that I get confused.
- I want to go for a walk and exercise, but I just do not have the time.
- I had so much to do, so I could not deliver that order on time.
- I would love to start my dream business; but, I just do not have the time.

Example

- Let's look at these two examples:

Example 1:

Ankita works from home as a freelance writer. She says she can easily put in 8 hours of dedicated work in a day. Because she works from home, she saves money on travel and has a comfortable work routine. But there is a challenge and it is distraction. As she works from home, she can easily just get up and sit down on the sofa to watch TV, wasting valuable time. She may have chores to do, errands to run and bills to pay. She ends up working only two to three hours a day and the result is, her work gets piled up. She is unable to take on more work due to this. Even though her quality of work is appreciated her clients are not very happy about the delay in submission.

Example 2:

Javed has started a successful online selling company from home and makes a good living from his sales. He has set up a small office space in his living room. As both his parents are working full-time, he also has the role of taking care of his two younger siblings. He almost spends half of his day with the younger kids. He does not mind it but it means taking time away from the work. He is still able to manage his online business with these commitments. He wants to spend some more dedicated hours so as to increase his profits. He also wants to look into new business avenues. What should he be doing.

Ask

- Does this happen with you too?
- Do you find it difficult to prioritize your work?
- Are you able to manage your time effectively?

Activity



- Conduct a group discussion based on the above examples.
- Direct the discussion on how to prioritize work and manage time effectively.

Say



- Time management is not only about how hard you work but also about how smart you work.
- Discuss “What is Time Management” with the participants as given in the Participant Handbook.

Ask



- Why is it important to manage time? How does it help?
- What happens when you don't manage your time effectively?
- Do you find it difficult to prioritize your work?

Say



- Discuss the benefits of time management given in the Participant Handbook.
- Let's learn effective time management with the help of an activity.

Activity



Effective Time Management

- This activity has two parts:

PART 1 TO-DO LIST

- You have to make a to-do list.
- List all of the activities/ tasks that you have to do.
- Try to include everything that takes up your time, however unimportant it may be.
- If they are large tasks, break them into action steps, and write this down with the larger task.
- You can make one list for all your tasks or have separate to-do lists for personal and professional tasks.

PART 2 URGENT-IMPORTANT GRID

- You have to make a grid as shown on the board here. .
- This grid has four boxes. As you can see, each box has a different heading.
- At the heart of the urgent-important grid, are these two questions:
 - ♦ Is this task important?
 - ♦ Is this task urgent?
- Now, you have to think about each activity that you have written in your to-do list and put it into one of the four categories.
- **What do these categories depict?**
- **Category 1: Urgent/Important**
 - ♦ This category is for the highest priority tasks. They need to get done now.

- **Category 2: Not Urgent/Important**

- This is where you want to spend most of your time.
- This category allows you to work on something important and have the time to do it properly.
- This will help you produce high quality work in an efficient manner.
- The tasks in this category are probably the most neglected ones, but also the most crucial ones for success.
- The tasks in this category can include strategic thinking, deciding on goals or general direction and planning – all vital parts of running a successful business.

- **Category 3: Urgent/Not Important**

- This is where you are busy but not productive. These tasks are often mistaken to be important, when they're most often busywork.
- Urgent but not important tasks are things that prevent you from achieving your goals.
- However, some may be activities that other people want you to do.

- **Category 4: Not Important and Not Urgent**

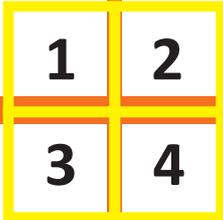
- This category doesn't really include tasks, but rather habits that provide comfort, and a refuge from being disciplined and rigorous with your time management.
- Some may be activities that other people want you to do.
- These might include unplanned leisure activities as well.

TO- DO list format

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

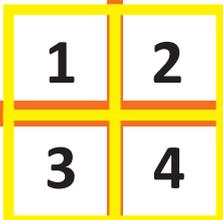
URGENT-IMPORTANT GRID

<p>URGENT/ IMPORTANT</p> <ul style="list-style-type: none"> • Meetings • Last minute demands • Project deadlines • Crisis 	<p>NOT URGENT/ IMPORTANT</p> <ul style="list-style-type: none"> • Planning • Working towards goals • Building relationship • Personal commitments
<ul style="list-style-type: none"> • Interruptions • Phone calls/ E-mails • Other people's minor demands <p>URGENT/ NOT IMPORTANT</p>	<ul style="list-style-type: none"> • Internet surfing • Social media • Watching TV <p>NOT URGENT/ NOT IMPORTANT</p>



URGENT/ IMPORTANT GRID format

<p>URGENT/ IMPORTANT</p>	<p>NOT URGENT/ IMPORTANT</p>
<p>URGENT/ NOT IMPORTANT</p>	<p>NOT URGENT/ NOT IMPORTANT</p>



Do

- Put down the formats for the to-do list and the urgent/important grid on the board.
- Instruct the participants to prepare their to-do list first.
- Give the participants 10 minutes to prepare the list.
- Once done, instruct them to divide the tasks in to-do list into the four categories.
- Explain the four categories to the participants giving examples specific to their context.
- As you explain the categories fill the grid with the type of tasks.
- Give the participants 40 minutes to fill the grid.
- Then explain how to balance the tasks between the four categories.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say

Activity De-brief:

How can we balance tasks between the four categories?

How to manage time through this grid?

- **Category 1: Urgent/Important**
 - ♦ Try to keep as few tasks as possible here, with the aim to eliminate.
 - ♦ If you spend too much of your time in this category, you are working solely as a trouble shooter, and never finding time to work on longer-term plans.
- **Category 2: Not Urgent/Important**
 - ♦ Plan these tasks carefully and efficiently as they are most crucial ones for success.
 - ♦ If necessary, also plan where you will do these tasks, so that you're free from interruptions.
 - ♦ Include strategic thinking, deciding on goals or general direction and planning in your planning process.
- **Category 3: Urgent/Not Important**
 - ♦ Ask yourself whether you can reschedule or delegate them.
 - ♦ A common source of such activities is other people. Sometimes it's appropriate to say "no" to people politely, or to encourage them to solve the problem themselves.
- **Category 4: Not Important and Not Urgent**
 - ♦ You also want to minimize the tasks that you have in this category.
 - ♦ These activities are just a distraction – avoid them if possible.
 - ♦ You can simply ignore or cancel many of them.
 - ♦ Politely say "no" to work assigned by others, if you can, and explain why you cannot do it.
 - ♦ Schedule your leisure activities carefully so that they don't have an impact on other important tasks.
- Discuss the traits of effective time managers and effective time management techniques as given in the Participant Handbook.

Summarize

- Discuss the traits of effective time managers and effective time management techniques as given in the Participant Handbook.

Notes for Facilitation

- Here is a short story. You can conclude the session narrating the story. To make it more interesting you can perform the demonstration described and discuss the short story.
 - ♦ One day an expert in time management was speaking to a group of students. As he stood in front of the group, he pulled out a large wide-mouthed glass jar and set it on the table in front of him. Then he took out a bag of about a dozen rocks and placed them, one at a time, into the jar. When the jar was filled to the top and no more rocks would fit inside, he asked, "Is this jar full?" Everyone in the class said, "Yes." Then he said, "Really?"
 - ♦ He reached under the table and pulled out a bucket of gravel (small stones). He dumped some gravel in and shook the jar causing pieces of gravel to work themselves down into the space between the rocks. Then he asked the group once more, "Is the jar full?" By this time, the class began to understand. "Probably not," one of them answered. "Good!" he replied.
 - ♦ He reached under the table and brought out a bucket of sand. He started dumping the sand in the jar and it went into all of the spaces left between the rocks and the gravel. Once more he asked the question, "Is this jar full?" "No!" the class shouted. Once again he said, "Good." Then he grabbed a jug of water and began to pour it in until the jar was filled to the brim. Then he looked at the class and asked, "What is the point of this illustration?" "One student raised his hand and said, "No matter how full your schedule is, if you try really hard you can always fit some more things in it!" "No," the speaker replied, "that's not the point. The truth this illustration teaches us is: If you don't put the big rocks in first, you'll never get them in at all." What are the 'big rocks' in your life? Your children; your loved ones; your education; your dreams; a worthy cause; teaching or mentoring others; doing things that you love; time for yourself; your health; your mate (or significant other). Remember to put these BIG ROCKS in first or you'll never get them in at all. If you sweat about the little stuff (the gravel, sand, and water) then you'll fill your life with little things you worry about that don't really matter, and you'll never have the time you need to spend on the big, important stuff (the big rocks).
- End the story with these lines...

So, tonight, or in the morning tomorrow, when you are reflecting on this short story, ask yourself this question: What are the 'big rocks' in my life? Then, put those in your jar first

UNIT 6.1.7: Anger Management

Unit Objectives

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

- Discuss the importance of anger management
- Describe anger management strategies
- Discuss tips for anger management

Resources to be Used

- Participant Handbook

Ask

- What is anger? Is anger good or bad?
- Is anger normal or an abnormal behaviour? How can anger harm you?
- Why is it important for entrepreneurs to manage their anger?

Say

- Talk about anger and the importance of anger management in entrepreneurs as discussed in the Participant Handbook.
- Let us do a small activity. This is an individual activity.
- Think of the incidents and situations that angered you and hurt you.

Do

- Instruct them to note down these situations under different categories (as given in the Activity).
- Give the class 3-5 minutes to think and note down their answers.
- At the end of 5 minutes, ask some participants to volunteer and present their answers.
- They can also share these situations with their fellow participants if they do not wish to share it with the entire class.

Activity

- Do you remember any incident which has hurt
 - ♦ you physically
 - ♦ you mentally
 - ♦ your career
 - ♦ your relationships.

Ask

- Do you ever get angry?
- What are the things that make you angry?
- Do you remember any incident where your anger management helped you in maintaining healthy relationship?
- Do you remember any incident where someone lost business/ friend/ relationship due to temper (anger)?

Say

- There are a few strategies which can help in controlling your anger. Let's do an activity to understand the anger management process better.
- This is an individual activity.
- Think of the incidents/ situations which trigger your anger (the cause).
- Then think what happened as a result of your anger (the effect).
- You need to come up with some techniques to manage your anger.

Do

- Give the class the anger triggers (the cause) as listed in the activity.
- Put down the activity format (Anger Triggers, Result of your Anger, Anger Management Techniques) on the board and instruct the class to write the answers under different categories.
- Give the class 3-5 minutes to think and note down their answers.
- At the end of 5 minutes, ask the participants who wish to volunteer and present their answers.

Activity

Trigger points and Anger Management Techniques Activity

Anger Triggers

List of triggers that make you angry:
Someone says you did something wrong.
You want something you can't have now.
You get caught doing something you shouldn't have been doing.
You are accused of doing something you didn't do.
You are told that you can't do something.
Someone doesn't agree with you.
Someone doesn't do what you tell him to do.
Someone unexpected happens that messes up your schedule.

Result of your anger:

--

Write the techniques that you use to manage your anger:

Anger Management Techniques

Say

- Now, let's discuss the problems and solution with all.
- The individual will first briefly describe trigger points to the class.
- Then discuss the result of the anger. Other participants are requested to remain quiet while one is making the presentation.
- Post presentation, other participants may ask questions.

Do

- Congratulate each individual for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions after the presentation to the class.
- Keep a check on the time. Ask the participants to wind up the activity quickly if they go beyond the given time limit.

Ask

De-brief questions:

- In the situation described by the presenter, who was at fault?
- How could you have handled this situation alternatively?

Summarize

- Close the discussion by summarizing the strategies and tips of anger management for entrepreneurs.
- Ask the participants what have they learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation

- Encourage the participants to share information about them while presenting the situations to the class.
- Keep the format of the Activity prepared in a chart paper so that it can be displayed during the session.

UNIT 6.1.8: Stress Management: What is stress?

Unit Objectives

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

- Discuss the causes of stress
- Discuss the symptoms of stress
- Discuss tips for stress management

Resources to be Used

- Participant Handbook

Ask

- You are waiting in the reception for an interview or a very important meeting, suddenly your legs are shaky, your hands are cold, you are feeling nervous. Have you ever been in this kind of situation?
- Have you had days when you had trouble sleeping?
- Have you ever been so worried about something that you ended up with a terrible headache?

Say

- You've probably heard people say, "I'm really stressed out" or "This is making me totally stressed."

Ask

- What do you understand by stress?
- What gives you stress?
- How do you feel when you are stressed or what are the symptoms of stress?
- How can stress harm you?
- Why is it important for entrepreneurs to manage stress?

Say

- When we feel overloaded or unsure of our ability to deal with certain challenges, we feel stressed.
- Discuss about stress, causes of stress, and symptoms of stress as discussed in the Participant Handbook.
- Let's understand the causes of stress and how to deal with them with the help of some case scenarios.
- You will be given some cases.
- You have to analyse the case scenario and then find an appropriate solution to the problem.
- This will be a group activity.

Do

- Divide the class into four groups of 5-6 participants (depending on the batch size).
- Assign one case scenario to each group.
- Instruct them to read the case carefully.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem.
- Explain their discussion should result in getting answers for the following questions:

- What was/were the cause(s) of stress?
 - ♦ Was the stress avoidable or manageable under the given circumstances?
 - ♦ If yes, how do you think that the stress could be avoided (managed)?
 - ♦ If no, then why not?
- Give the class 10-12 minutes to discuss the case and note down their solutions.
- At the end of 12 minutes, the team should present their case solution to the larger group.
- Ask the group to select a group leader for their group.
- The group leader to discuss and assign roles to the group members for the presentation.

Team Activity

Case Study Analysis

Scenario 1

Akash's alarm doesn't go off and he gets late getting out of the house. He hits traffic and ends up 15 minutes late to work, which his boss notices. He gets to his desk and finds he has to complete 2 reports in next one hour. Just when he is about to begin work, a message pops up "Telecon with the client begins in 10 minutes. Please be in the conference room in 5 minutes."

His is not prepared for the call. He is stressed. He does not want to speak to his boss about this. He is stressed, feeling uncomfortable and sick. Not in a position to attend the call or finish the reports on time.

Scenario 2

While paying his overdue bills, Rahul realised that it's the middle of the month and he has only Rs 500 left in his account. He has already asked all of his friends, and family for loans, which he hasn't paid back yet. He is still contemplating over the issue when his phone rings. His sister's birthday is due next week and she has seen a beautiful dress which she wants to buy but cannot tell the parents as it is a bit expensive. She wishes if Rahul could buy the dress for her. Rahul has promised to buy her the dress for her birthday.

Rahul is stressed, does not understand what to do. He is unable to concentrate on his work and unable to complete the tasks assigned. His team leader has already warned him of the delay.

Scenario 3

Sheela calls the cable company as she has unknown charges on her bill. She has to go through the automated voice mail menu three times and still can't get through to a customer care executive. After 15 minutes of repeated efforts, her call is answered. She explains the entire issue to the customer care executive but before the person could suggest a way out, the call drops.

Now Sheela has to call back and repeat the whole process all over again with a new customer care executive. She is very angry and calls again but cannot connect this time.

She has to leave to office so she decides to call from office and check. When she connects this time she is angry and argues with the executive on the call. All her co-workers around are looking at her as her volume has suddenly increased. She bangs the phone and ends the call.

Her co-worker Neelam enquires what has happened to her. She ignores her and just walks off. She has become irritable and her behaviour and tone with other co-workers is not acceptable.

Scenario 4

Arpit is a young entrepreneur who started doing business through Facebook few weeks back. He had always been into a job. Although Arpit has very few financial liabilities, it wasn't an easy decision to leave a comfortable job at once and look for newer pastures. Arpit's boss warned him of the consequences and the challenges of starting a business when nobody ever in his family had been in business.

He has not been able to get a good deal till now. This is an important life shift for him which comes with unknown variables. Arpit is nervous and is wondering if he has what it takes to fulfill the requirement of his new role, or the new experiences he's likely to face.

Ask**De-brief questions:**

- What was/ were the cause(s) of stress?
- Was the stress avoidable or manageable under the given circumstances?
- If yes, how do you think that the stress could be avoided (managed)?
- If no, then why not?

Say

- Now, let's discuss the problem and solution with the larger group.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Post presentation, the other groups may ask questions to the group that has presented.

Do

- Congratulate each group for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time. Tell participants to wind up the discussion quickly if they go beyond the given time limit.

Say

- While it is common and normal to feel some tension. This feeling nervous and tensed can interfere with your thinking process and can have a negative impact on your performance.
- Stress can deplete the most vibrant of souls. It can have a negative effect on every aspect of a person's life including their health, emotional well-being, relationships, and career. However, one needs to understand the causes and types of stress before looking for ways to manage it.

De-brief:**Scenario 1**

The cause of stress was lack of time management and the habit of procrastinating. If Akash would have managed his time well, planned alternate ways to get up on time, finished prior tasks on time and planned for client meetings in advance then he wouldn't have faced stress.

Scenario 2

The cause of stress was lack of financial planning. Rahul should have planned his financial resources well in advance and saved some money for the rainy day. Also, differentiating between needs and wants and keeping a check on non-essential expenditure would have saved Rahul from this situation.

Scenario 3

Sometimes, stress is caused due to external factors instead of internal ones. In this case, the stress was unavoidable because we have no control over this customer care system. Every time, you will get in touch with a new executive and will have to explain all over again. This might cause stress but despite being frustrated and angry there is little that we can do about it. All Sheela could do was to find ways to calm herself down through some breathing exercises and meditation, reading some good book or listening to music and then start afresh.

Scenario 4

A positive, major life change can be a source of good stress. Regardless of how good the change is, it can be stressful. Stress caused by a positive and major life change can be beneficial because it causes a person to step out of their comfort zone and learn new skills. Here, Arpit may become a successful entrepreneur or learn new ways to do things differently.

Now let us see this scenario, can I have a volunteer to read out this case to the class.

Do 

- Ask one of the participant who can volunteer and read out this scenario to the class.

Scenario 5

Rakesh lives in Kathmandu with his wife and two beautiful daughters Sarah and Sanya. Nepal was hit by a massive earthquake and Rakesh's building collapsed during the earthquake. During evacuation, Rakesh realised that though his wife and Sarah were fine and suffered only minor bruises, Sanya was nowhere in the scene. Panic stricken, he started calling her name and searching her frantically. A little later, he heard a meek voice from beneath the debris. He quickly removed the rubble to find a huge bed. Rakesh was pretty sure that Sanya was trapped underneath. Though he was badly bruised, he gathered all his courage and with all his might, he lifted the several-ton bed to save Sanya's life. Everyone was relieved to see Sanya alive and also extremely surprised to see this father's ability to access superhuman strength.

- Ask the audience to applaud for the participant after the scenario is read completely.
- Discuss the scenario, ask de-brief questions:
 - ♦ What kind of stress was Rakesh undergoing in this case?
 - ♦ Was the stress avoidable or manageable under the given circumstances?
 - ♦ What was the result of the stress?

Say **De-brief:**

- Not all stress is harmful; good stress is actually energizing. This was a case of lifesaving stress, or hero stress, which is an important example of good stress. You may have heard stories in which a person performs an impossible feat of physical strength in order to save their life or the life of someone they love. This type of stress causing a surge of adrenaline is good for us.

Summarize

- Close the discussion by summarizing the tips to manage stress as given in the Participant Handbook.
- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation

- Keep printed copies of the activities/ scenarios ready for the session.
- Put down the de-brief questions on a flip chart so that it can be displayed in the class during the activity.
- Encourage participation and make the discussions interactive.

UNIT 6.2: Digital Literacy: A Recap

Key Learning Outcomes



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

1. Identify the basic parts of a computer
2. Identify the basic parts of a keyboard
3. Recall basic computer terminology
4. Recall the functions of basic computer keys
5. Discuss the main applications of MS Office
6. Discuss the benefits of Microsoft Outlook
7. Identify different types of e-commerce
8. List the benefits of e-commerce for retailers and customers
9. Discuss Digital India campaign will help boost e-commerce in India
10. Describe how you will sell a product or service on an e-commerce platform

UNIT 6.2.1: Computer and Internet Basics: Basic Parts of a Computer

Unit Objectives

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

- Identify the basic parts of a computer
- Identify the basic parts of a keyboard
- Recall basic computer terminology
- Recall the functions of basic computer keys

Resources to be Used

- Participant Handbook
- Computer Systems with the required applications

Say

- Let's take a quick recap of the basic computer parts.
- Discuss 'Basic Parts of Computer' and 'Basic Parts of a Keyboard' with the class as given in the Participant Handbook.

Explain

- Explain all the parts of the computer and the keyboard by demonstrating on the real system.

Ask

- Do you know about internet?
- Have you ever used internet?
- Why do you think internet is useful?
- What was the last task you performed on internet?

Say

- Let's look at some basic internet terms.
- Discuss 'Basic Internet Terms' with the participants as given in the Participant Handbook.

Summarize

- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of computer and internet for entrepreneurs.

Practical

- Conduct a practical session.
- Ask the participants to assemble in the computer lab.
- Give some hands on practice exercises.

Do

- Group the participants for the activity depending on the batch size and the number of computer systems available in the lab.
- Explain the purpose and duration of the activity.
- Ensure the participants complete the practical exercises assigned.

UNIT 6.2.2: MS Office and Email: About MS Office

Unit Objectives

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

- Discuss the main applications of MS Office
- Discuss the benefits of Microsoft Outlook

Resources to be Used

- Participant Handbook
- Computer Systems with MS Office

Ask

- What is the most frequent activity that you do on the computer?
- Do you know how to make presentations on the computer?

Say

- Give a brief introduction of MS Office as given in the Participant Handbook.
- Discuss the most popular office products. Explain in brief their application, benefits and working.
- **Microsoft Word** is a word processing program that allows for the creation of documents. The program is equipped with templates for quick formatting. There are also features that allow you to add graphics, tables, etc.
- **Microsoft Excel** is a tool for accounting and managing large sets of data. It can also simplify analysing data. It is also used to create charts based from data, and perform complex calculations. A Cell is an individual data box which will have a corresponding Column and Row heading. This gives the cell a name, referred to as the Cell Reference. There can be multiple pages in each workbook. Each page, or sheet, is called a Worksheet. When you open a new Excel file, it automatically starts you with three worksheets, but you can add more.

Explain

- Explain the working and frequently used features of Office on a real system.

Ask

- What do you know about e-mails?
- Do you have an email id?
- How often do you check your e-mails?

Say

- Communication is vital for every business. The fastest and the safest way to communicate these days are through emails. MS Outlook helps to manage your emails in a better way and also offers a host of other benefits.
- Discuss “Why Choose Microsoft Outlook?” with the participants as given in the Participant Handbook.

Do 

- Ask the participants to assemble in the computer lab.
- Explain the working of Outlook on a real system..

Demonstrate 

- Demonstrate how to create email id.
- Demonstrate how to write new mails, send mails.
- Demonstrate how to use MS Office application to create a letter and send it as attachment in an email.
- Demonstrate how to use other MS Office applications.

Practical 

- Give some hands on practice exercises
- Group the participants for the activity depending on the batch size and the number of computer systems available in the lab.
- Explain the purpose and duration of the activity.

Summarize 

- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.

UNIT 6.2.3: E-Commerce

Unit Objectives

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

- Identify different types of e-commerce
- List the benefits of e-commerce for retailers and customers
- Discuss Digital India campaign will help boost e-commerce in India
- Describe how you will sell a product or service on an e-commerce platform

Resources to be Used

- Computer System with internet connection
- Participant Handbook

Ask

- How many of you have done shopping online?
- Can you name at least five shopping websites?
- What is the product that you most frequently buy online?
- Why do you do shopping online instead of going to the market?

Say

- Give a brief introduction of “What is E-commerce”. Refer to the Participant Handbook.
- E-commerce emerged in the early 1990s, and its use has increased at a rapid rate. Today, many companies sell their products online. Everything from food, clothes, entertainment, furniture and many other items can be purchased online.

Ask

- What other types of transactions have you performed on the internet other than buying products?

Say

- Give examples of e-commerce activities from Participant Handbook.

Team Activity

E-commerce examples

- Instruct the participants to list some of the payment gateways that they have used for e-commerce activities.
- Give them 5 minutes to make this list.
- Discuss payment gateways and transaction through payment gateways.
- Conclude the discussion by mentioning how important e-commerce has become in our day to day transactions.

Say

- E-commerce activities can be classified based on the types of participants in the transaction.
- Discuss “Types of E-commerce” from the Participant Handbook.

Do

- Discuss all types of E-commerce by giving examples and names of some popular websites which use them.
- Make the discussion interactive by asking the class to share some popular e-commerce sites of each type.

Say

- E-commerce activities bring a host of benefits for both, retailers and customers.
- Discuss benefits of E-commerce from the Participant Handbook.

Explain

- The majority of the population that uses E-commerce activities lives in tier-1 and tier-2 cities. To encourage the use of digital money in tier-3 and 4 areas, PM Mr. Modi launched the “Digital India Campaign”.
- Discuss “Digital India Campaign” from the Participant Handbook.
- By Digital India project the government will deliver services via mobile connectivity and in doing so, is expected to bring the internet and broadband to remote corners of the country. This connectivity will in turn enhance e-commerce activities also. Furthermore, the Indian Government is also modernizing India Post and aims to develop it as a distribution channel for e-commerce related services.

Say

- Now let us discuss how to sell a product using E-commerce.
- Every product has to be sold on a platform on the internet. Think of it as a shop that you have to sell your product. Now this shop can be your own or shared or rented. If the shop is your own or rented there will be only your products in that shop. If the shop is shared, there will be products of multiple sellers in that shop. A common example is a departmental store which has products from multiple brands in the shop.
- Similarly, in E-commerce the shop is the website where your products are displayed. If it is your own website it will exclusively showcase your products. In this case the cost that you will incur will be:
 - ♦ Developing the website
 - ♦ Hosting the website
 - ♦ Maintenance of the website
- If you rent a website it will also showcase your own products but the development, hosting and maintenance parts goes to the owner. This saves time and the cost to manage these activities.
- Smaller companies usually go for renting a website and the bigger ones develop their own website.
- The concept of shared platforms has become very popular in recent times. In this platform the sellers have to register and then they can sell their goods on a common platform. Among the most popular of these are Amazon, Myntra, Flipkart, etc.

Role Play

- Tell the participants to choose a product or service that they want to sell online.
- Tell them to write a brief note explaining how they will use existing e-commerce platforms, or create a new e-commerce platform to sell their product or service.

Ask 

- How much money are you carrying in your wallet?
- Do you have a credit/debit card?
- How do you make payments while doing online shopping?

Say 

- Demonetization has made carrying cash in the wallet very difficult. People either shop through cards or some other form of digital money.
- So what do you think is digital money?
- In this form the money is both paid and received digitally. There is no hard cash involved. It is an instant and convenient way to make payments.
- There are various types of digital payments. Let us discuss some of them in brief here.
- The first one is the most commonly used system i.e. the cards. Debit card, credit card, prepaid card, all fall under this category.
- Then is the e-wallet or the mobile wallet. This has become the most used form of digital money after demonetization. Examples are Paytm, state bank buddy, Freecharge, etc.
- Many other forms of digital money are also coming up in market like mobile apps, Aadhar card based payment, etc.

Do 

- Demonstrate how to make and receive payments through digital models like Paytm and state bank buddy.

Ask 

- Why do you think people have started using digital money instead of hard cash? Is demonetization the only reason?

Say 

- Digital money gives a lot of advantages over the conventional hard cash. Some of them are:
 - ♦ Digital payments are easy and convenient. You do not need to take loads of cash with you, a mobile phone or a card will suffice.
 - ♦ With digital payment modes, you can pay from anywhere anytime.
 - ♦ Digital payments have less risk.

Summarize 

- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of e-commerce and digital money.

UNIT 6.3: Money Matters

Key Learning Outcomes



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

1. Discuss the importance of saving money
2. Discuss the benefits of saving money
3. Discuss the main types of bank accounts
4. Describe the process of opening a bank account
5. Differentiate between fixed and variable costs
6. Describe the main types of investment options
7. Describe the different types of insurance products
8. Describe the different types of taxes
9. Discuss the uses of online banking
10. Discuss the main types of electronic funds transfer

UNIT 6.3.1: Personal Finance – Why to Save?

Unit Objectives

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

- Discuss the importance of saving money
- Discuss the benefits of saving money

Resources to be Used

- Participant Handbook

Ask

- How many of you save money?
- Why do you feel the need to save it?
- Do you plan your savings?
- Where do you keep the money you save?
- How do you use the money that you have saved?

Example

- Let's look at these two examples:

Example 1:

Suhani works in a good company and earns Rs.30,000 month. She always saves 5000 per month and keeps it aside as a personal saving. She keeps the money at home and has saved quite a lot. One day her mother has a medical emergency and has to be taken to the hospital. Her family is worried about the amount they have to spend for the treatment. It will cost them atleast 40,000.

Suhani says tells her family not to worry and that she has about 50,000, which she has saved over the months.

Example 2:

Jasmeet works in the same company and earns the same as Suhani. She is very fond of shopping and spends most of her money on buying new clothes. At the end of the month, she is always asking her father for money as her pay is finished.

Ask

- Who do you identify with –Suhani or Jasmeet ?
- How do you think Suhani manages to save money which Jasmeet is unable to do?

Say

- We should always set aside some and save some money from our monthly pay. The future is unpredictable. Saving money not only gives you a sense of financial security but it can be used in case of emergencies.
- Discuss “Importance of Saving” with the participants as given in the Participant Handbook.

Ask

- What are the benefits of saving money?
- What does being financially independent mean to you?

Say

- Discuss “Benefits of Saving” with the participants as given in the Participant Handbook.
- Now let us continue with Suhani's story. Suhani has told her family not to worry and that she has about 50,000, which she has saved over the months. The family is happy about Suhani's decision of saving money, which will be of great help for them now.

Suhani is going to the hospital today to pay the first instalment for the treatment. Suddenly finds only 35,000 in her cash box when she counts and does not remember using it. She has not kept any record and now she is upset.

Ask

- Was it a good decision by Suhani to save a part of her earnings every month?
- Was it a wise decision to keep all her savings as cash in a cash box?
- Could she have managed to save money in a better and more effective manner?
- Do you want to learn how to save money and use it effectively?

Say

- Let's learn personal saving with the help of a group activity.

Team Activity

Personal Finance- Why to save

- This activity has two parts:

PART 1

WAYS TO SAVE MONEY

- You are earning 30,000/- per month. You have recently changed your job and have to move to a metropolitan city. You are now living as a paying guest paying 10,000/- per month. Your other estimated expenditures like travel, food, recreation would be around Rs. 17, 000 per month.
- Make a list of different ways to save money.

PART 2

HOW WILL YOU USE THE MONEY

- After a year how much have you been able to save?
- How will you use the money that you have saved?

Do

- Divide the class into groups of four.
- Instruct the participants to think and prepare a list of the various ways they can save money.
- Give the participants 10 minutes to prepare the list.
- Once done, instruct them to think of how they could use the money they have saved.
- Give the participants 10 minutes to prepare the list.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Activity De-brief

- What were the different ways you could save money?
- How much money were you able to save?
- How will you use the money you have saved in one year?

Say



- Discuss the importance of personal finance and why it is important to save money.

Summarize



You can summarize the session by discussing:

- The importance of saving money.
- Ways to save money.
- How the money saved can be used for different purposes.

UNIT 6.3.2: Types of Bank Accounts, Opening a Bank Account

Unit Objectives

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

- Discuss the main types of bank accounts
- Describe the process of opening a bank account

Resources to be Used

- Account opening sample forms
- Participant Handbook

Ask

- How many of you save money?
- Where do you keep the money you save?
- How many of you have a bank account?
- What type of account do you have?

Example

- Let's look at the given example:

Reena is in the third year of college but in the evening she gives tuitions for children living in her colony. She earns 15,000/- per month. As her students stay in different parts of the city, she has to walk a lot.

To save time, she decides to buy a second hand scooter for herself. But she has to save money for it. Her class mate advises her to open a recurring deposit account in the bank.

She goes to the bank close to her home. The personal manager gives her some forms to fill. She is confused as she has never done this before. Her elder sister has an account in the same bank. She asks for help from her sister. She goes to the bank the next day with her sister. The personal banker gives her a list of documents that she will need to submit with the form for opening an account. The banker advises her to open a 6 months recurring deposit.

Ask

- Do you try to save money monthly but have to spend it on unforeseen expenditure?
- Have you ever thought of depositing your savings in a bank?

Say

- Before opening a bank account, you need to know the types of accounts we have in India.
- Discuss “Types of Bank Accounts” with the participants as given in the Participant Handbook.

Ask

- Can someone say what are the different types of bank accounts?

Say

- Let's learn about the different types of bank accounts through an activity.

Team Activity

- Divide the class in four groups.
- Label the groups as savings account, current account, recurring account and fixed deposit.
- On a chart paper, ask them to write the key points of their account.

Activity De-brief

- Ask each group to present the key points of their account.

Say

- Now that you know about the four different types of accounts, let's learn how to open a bank account.
- Discuss “Opening a Bank Account” with the participants as given in the Participant Handbook.
- Discuss “Tips” that the participants should keep in mind while opening a bank account as given in the Participant Handbook.

Ask

- What are the main documents required for opening a bank account?
- What are some important points to ask the bank personnel while opening an account?

Say

- Mention officially valid KYC documents (refer to the Participant Handbook)
- Now, let's understand the procedure of opening a bank account through an activity.

Team Activity

Opening a Bank Account

- This activity is done in groups.
- Divide the class in groups of four or six.

PART 1

FILLING A BANK ACCOUNT OPENING FORM

- You have to fill a bank opening form.
- You can refer to the section “Opening a Bank Account” of your Handbook for reference.
- List all the steps that you will be required to fill in the form.
- List the documents that you needs for filling the form.
- Now fill in the form.

Activity De-brief

How did you design the form?

- What all details did you fill in the form?
- What were your KYC documents?
- How would this activity help you in future?

Do

- Instruct the participants to read the section "Opening a Bank Account" of the Participant Handbook.
- Give each group one sample account opening form.
- Give the participants 5 minutes to read the form.
- Give them 15 minutes to fill it.
- Assist them by explaining each category and how to fill it.
- Keep a check on time.
- Tell the group to wind up quickly if they go beyond the given time limit.

Summarize

Note:

- You can summarize the unit through a role play.
 - ♦ A person wanting to open an account in the bank.
 - ♦ What is the procedure that he will go through?
 - ♦ Discuss the key points of different types of bank accounts.
 - ♦ How to select the type of account
 - ♦ How to fill the account opening form.
- A sample account opening form is given in the following page for reference. Use it for the activity in the class.

Sample Bank Account Opening form.

Photograph	XXX Bank			
SAVING BANK ACCOUNT OPENING FORM				
Account No.: _____	Date: _____			
Name of the Branch				
Village/Town				
Sub District / Block Name				
District				
State				
SSA Code / Ward No.				
Village Code / Town Code	Name of Village / Town			
Applicant Details:				
Full Name	Mr./Mrs./Ms.	First	Middle	Last Name
Marital Status				
Name of Spouse/Father				
Name of Mother				
Address				
Pin Code				
Tel No. Mobile				Date of Birth
Aadhaar No.				Pan No.
MNREGA Job Card No.				
Occupation/Profession				
Annual Income				
No. of Dependents				

Detail of Assets	Owning House : Y/N	Owning Farm :
	Y/N	
	No. of Animals :	Any other :
Existing Bank A/c. of family members / household	Y / N	If yes, No. of A/cs. _____
Kisan Credit Card	Whether Eligible	Y / N

I request you to issue me a **Rupay Card**.

I also understand that I am eligible for an Overdraft after satisfactory operation of my account after 6 months of opening my account for meeting my emergency/ family needs subject to the condition that only one member from the household will be eligible for overdraft facility. I shall abide by the terms and conditions stipulated by the Bank in this regard.

Declaration:

I hereby apply for opening of a Bank Account. I declare that the information provided by me in this application form is true and correct. The terms and conditions applicable have been read over and explained to me and have understood the same. I shall abide by all the terms and conditions as may be in force from time to time. I declare that I have not availed any Overdraft or Credit facility from any other bank.

Place:

Date:

Signature / LTI of Applicant

Nomination:

I want to nominate as under				
Name of Nominee	Relationship	Age	Date of Birth in case of minor	Person authorised in case to receive the amount of deposit on behalf of the nominee in the event of my /minor(s) death.

Place:

Date:

Signature / LTI of Applicant

Witness(es)*

1. _____

2. _____

*Witness is requires only for thumb impression and not for signature

UNIT 6.3.3: Costs: Fixed vs. Variables: What are Fixed and Variable Costs?

Unit Objectives

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

- Differentiate between fixed and variable costs

Resources to be Used

- Participant Handbook
- Blank sheets of paper
- Pens

Ask

- What is cost?
- Will a telephone bill fall under the category of a fixed or variable cost?

Say

- Discuss: Fixed and Variable cost with examples. Let us do a small activity.

Team Activity

Identify the type of cost

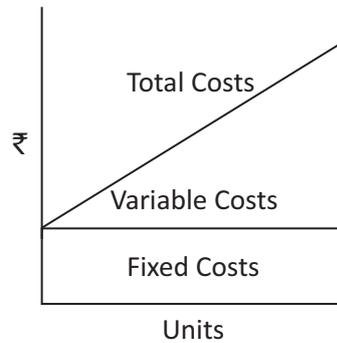
1. Rent
2. Telephone bill
3. Electricity bill
4. Machinery
5. Insurance
6. Office supplies/ Raw materials
7. Employee salaries
8. Commission percentage given to sales person for every unit sold
9. Credit card fees
10. Vendor bills

Do

- Divide the class into two groups. Read out the list of costs given in the activity.
- Read out each item from the cost list and ask the groups in turns to identify whether it is a fixed or variable cost.

Say

- We saw that your utility bills like rent, electricity, telephone etc. are all fixed costs because you have to pay it every month.
- Variable costs is an expense which varies with production output or volume. For example commission, raw material etc.
- Discuss “Cost: Fixed vs. variables” with the participants as given in the Participant Handbook.
- Illustrate the relation between the costs with a graph.



- Let's learn the difference between fixed and variable cost with the help of an activity.

Team Activity

Fixed vs. Variable Costs

- This is a group activity.

- You want to start your own entrepreneur business.
- State the type of business you want to start.
- List down all the cost or requirements for your business.
- How will you differentiate between the fixed and variable cost.

Activity De-brief

- What is the total cost of your business?
- What are the fixed costs?
- What are the variable costs?
- How did you differentiate between the fixed and variable costs?

Do

- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6.
- Give each group a sheet of paper.
- Tell the participants that they have to start their own entrepreneur business.
- Ask them the type of business they want to start.
- Instruct them to differentiate between the fixed and the variable costs of the business they want to start.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize

- Note: You can summarize the unit either by having a role play between a consultant and a budding entrepreneur explaining the differences between fixed and variable costs or by discussing the key points of the unit.

Notes for Facilitation

- Answers for the activity - Identify the type of cost

1. Rent	(Fixed)
2. Telephone bill	(Fixed)
3. Electricity bill	(Fixed)
4. Machinery	(Fixed)
5. Insurance	(Fixed)
6. Office supplies/Raw materials	(Variable)
7. Employee salaries	(Fixed)
8. Commission percentage given to sales person for every unit sold	(Variable)
9. Credit card fees	(Variable)
10. Vendor bills	(Variable)

UNIT 6.3.4: Investments, Insurance and Taxes

Unit Objectives

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

- Describe the main types of investment options
- Describe the different types of insurance products
- Describe the different types of taxes

Resources to be Used

- Participant Handbook

Ask

- Ask the participants- “What do you see first thing in when you get your mobile bill? Apart from the amount and due date do you have a look at the taxes you are being billed for?”
- Why do you think people get their cars insured or have a medical insurance?
- You have saved money and want to invest it, how would you decide what is the best investment for your money?

Example

- Let's have a look at a few scenarios.

Ranbir has sold his house and deposited the money in his bank. His Chartered Accountant tells him that he will have to re-invest the money otherwise he will have to pay capital tax. What is capital tax and how is it different from income tax?

Jasmeet and Anup are blessed with a baby girl. They decide to have an insurance policy that will mature when their daughter is ready to higher education.

Shivani is working in a corporate office and getting good pay. She will have to pay income tax so she decides to invest her money in tax saving schemes. She goes to the bank manager to discuss the best products in which she can invest.

Say

- Discuss the Investment, Insurance and Taxes as given in the Participant Handbook.

Ask

- How do investments, insurances and taxes differ from each other?

Say

- Let's learn the differences between the three by having an activity.

Say

- We will have a quiz today.

Team Activity

- The activity is a quiz.

Do

- Divide the class into groups of three and give a name to each group
- Explain the rules of the quiz. For each correct answer the group gets 1 mark. If the group is unable to answer the question is rolled over to the next group.
- Explain the purpose and duration of the activity.
- On the blackboard write the names of the groups.
- Ask the questions of the quiz.
- Keep a score for the groups.
- Set guidelines pertaining to discipline and expected tasks.

Summarize

- Summarize the unit by discussing the key points and answering question

Notes for Facilitation

Questions for the quiz

1. What are bonds?
Bonds are instruments used by public and private companies to raise large sums of money.
2. Who issues the bonds?
Private and public companies issue the bonds.
3. Why are bonds issued?
To raise large amount of money as it cannot be borrowed from the bank.
4. Who is the buyer of stocks and equities?
The general public is the buyer.
5. What types of scheme is the Sukanya Samriddhi Scheme?
Small Saving Scheme
6. What is the difference between mutual and hedge funds?
Mutual funds are professionally managed financial instruments that invest the money in different securities on behalf of investors. Hedge funds invest in both financial derivatives and/or publicly traded securities.
7. Why is a loan taken from the bank to purchase real estate?
To lease or sell to make profit on appreciated property price.
8. Name the two types of insurances?
Life Insurance and Non-life or general insurance
9. Which insurance product offers financial protection for 15-20 years?
Term Insurance
10. What is the benefit of taking an endowment policy?
It offers the dual benefit of investment and insurance.
11. Mr. Das gets monthly return on one of his insurance policies. Name the policy?
Money Back Life Insurance

12. What are the two benefits of a Whole Life Insurance?

It offers the dual benefit of investment and insurance

13. Which policy covers loss or damage of goods during transit?

Marine Insurance

14. After what duration is the income tax levied?

One financial year

15. What is long term capital gain tax?

It is the tax payable for investments held for more than 36 months.

16. Name the tax that is added while buying shares?

Securities Transaction Tax

17. What is the source of corporate tax?

The revenue earned by a company.

18. Name the tax whose amount is decided by the state?

VAT or Value Added Tax

19. You have bought a T.V. What tax will you pay?

Sales Tax

20. What is the difference between custom duty and OCTROI?

Custom duty is the charges payable when importing or purchasing goods from another country. OCTROI is levied on goods that cross borders within India.

UNIT 6.3.5: Online Banking, NEFT, RTGS, etc.

Unit Objectives

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

- Discuss the uses of online banking
- Discuss the main types of electronic funds transfer

Resources to be Used

- Participant Handbook
- Computer System with internet connection
- Debit card

Ask

- When was the last time you visited a bank?
- How do you pay your bill for electricity and telephone?
- Have you ever tried to transfer money from one bank account to another bank account using the online banking facility?

Say

- Most of us lead a busy life. Time has become more important than money. In this busy schedule no one has time to stand in bank queues. That's where Online Banking comes in. Online banking or internet banking means accessing your bank account and carrying out financial transactions through the internet.
- Discuss "What is online banking?" from the Participant Handbook.
- There are various advantages of online banking:
 - ♦ It saves time, as you need to visit the branch. .
 - ♦ You can conduct your banking transactions safely and securely without leaving the comfort of your home.
 - ♦ Online Banking also gives you round the clock access.
 - ♦ Online Banking makes it possible for you to pay your bills electronically.

Do

- Show them how they can use the internet banking.
- Use the computer system and show the demo videos on how to use internet banking provided on most banking sites. the computer system.
- Tell the class the various features of online banking:
 - ♦ Through their website set-up your online account.
 - ♦ Choose a secure username and password.
 - ♦ Set-up your contact information.
 - ♦ Once your information is verified, you are good to go.
 - ♦ Once you enter the portal explore all the features and learn your way through the portal.
- Discuss about maintaining the security of the online account.

Say

- One of the biggest advantage that online banking offers, as discussed earlier, is transferring money from one account to another. This transaction is called electronic funds transfer. Electronic transfers are processed immediately with the transferred amount being deducted from one account and credited to the other in real time, thus saving time and effort involved in physically transferring a sum of money.
- Discuss “Electronic Funds Transfer” from the Participant Handbook.

Do

- Discuss how to transfer money from one account to another using online banking (NEFT/ RTGS, etc.).
- Illustrate with an example.

Summarize

- Close the discussion by summarizing the about online banking.
- Ask the participants if they have any questions related to what they have talked about so far.

UNIT 6.4: Preparing for Employment & Self Employment

Key Learning Outcomes

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

1. Discuss the steps to follow to prepare for an interview
2. Discuss the steps to create an effective Resume
3. Discuss the most frequently asked interview questions
4. Discuss how to answer the most frequently asked interview questions
5. Identify basic workplace terminology

UNIT 6.4.1: Interview Preparation: How to Prepare for an Interview?

Unit Objectives

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

- Discuss the steps to follow to prepare for an interview

Resources to be Used

- Participant Handbook

Ask

- Have you ever attended an interview?
- How did you prepare before going for an interview?

Say

- An interview is a conversation between two or more people (the interviewer(s) and interviewee) where questions are asked by the interviewer to obtain information from the interviewee.
- It provides the employer with an opportunity to gather sufficient information about a candidate and help them select the ideal candidate.
- It also provides the interviewee with an opportunity to present their true potential to the employer, build confidence and help make a decision about the job by asking questions regarding designation, salary, perks, benefits, promotions, transfers, etc.
- Let's do an activity to understand how to prepare for interviews better.

Activity 1

- Introducing Yourself

Do

- Select a participant and ask him/her to answer the following questions: "What can you tell me about yourself?"
- Give the participant at least one minute to speak.
- Once he/she is done, ask the rest of the participant what they gathered about the participant who was providing information.
- Now repeat the exercise with five other participants.

Ask

- What information you should include when you are describing or introducing yourself in an interview?
- What information you should not include when you are describing or introducing yourself in an interview?

Say

- Tell the participants that when an interviewer asks you to say something about yourself, he/she is not asking you to present your life history.
- Introduction should be short and crisp, and should present you in a positive light. It should include the following points:
 - ♦ Any work experience that you might have
 - ♦ A brief summary of your educational qualifications
 - ♦ Your strengths and achievements
 - ♦ Any special projects that you might have been part of
- The following topics should be avoided during an introduction:
 - ♦ Detailed description of your family (unless you are specifically asked to do so)
 - ♦ Too much information about your weaknesses
 - ♦ Information that is not true

Do

- Congratulate each participant for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time.

Activity 2

- Planning the right attire

Do

- Describe 2 individuals to the participants. One is wearing a casual t-shirt, jeans, and slippers. He has not combed his hair and neither has he trimmed or shaved his beard. The other individual is dressed formally with a shirt and pant, and is well-groomed. He has also worn formal shoes and a belt. Ask the participants which person would they prefer to hire in their organization and why?

Summarize

- Close the discussion by discussing 'how to prepare for an interview' as discussed in the Participant Handbook.
- You can add the following points to it:
 - ♦ Tell the participants to create a positive and good impression in an interview. It is important for them to prepare for an interview beforehand.
 - ♦ The interviewer analyses not only your technical knowledge in relation to the job, but also whether or not you are a fit for the organization.
 - ♦ Every employer looks at the whole package and not just one or two things in isolation. Therefore, the way you dress and the way you present yourself is also important along with your skills and talents.
 - ♦ The participants will get only one chance to create a good first impression.

UNIT 6.4.2: Preparing an Effective Resume: How to Create an Effective Resume?

Unit Objectives

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

- Discuss the steps to create an effective Resume

Resources to be Used

- Participant Handbook
- Blank papers
- Pens

Ask

- When preparing for an interview, what are the most important things that you need to do?
- What documents do you carry with you, when you go for an interview?
- What is a resume?
- Why do you need a resume?

Say

- Resume is not just a sheet of paper with your qualifications printed on it.
- It is a selling tool that will help the employer to see how and what you can contribute for company.
- Talk about the steps involved in creating an effective/attractive resumes discussed in the Participant Handbook.
- Now let's prepare a resume to understand the process in a better way.

Do

- This is an individual activity.
- Give the details of the activity.
- Instruct them to read the activity carefully.
- The participant is expected to make an attractive resume based on the information provided.
- Give the class 25-30 minutes to study the case and create a resume.
- At the end of 30 minutes, the participants should exchange the resume with the person sitting next to him or her.
- Every participant will evaluate the resume prepared with their fellow participants.

Say

- Do you think the candidate should apply for the job posting described in the advertisement?
- We have already discussed the steps involved in creating an effective/attractive resumes.
- Now let's prepare a resume for the candidate details given in the activity.

Activity

Case Study Analysis

- In the first section of the activity, you are being given the information about a candidate who is applying for a particular job.
- In the second section, you are being given the detailed description of the job posting. Create a resume for the candidate to apply for the job posting.
- Use the information that has been provided about the candidate to create this resume.

Candidate Details

Nipesh Singla was born on 20th April, 1988 in Chandigarh, India. He currently resides at 1XX7, Sector XX D, Chandigarh –160018. His mobile number is 988XXXXX01, and e-mail address is nxxxxxxxla@gmail.com. Nipesh attended middle and senior school at Government Boys Senior Secondary School, Sector 15, Chandigarh. He has been a very talented boy since school. He was fond of painting and watching old Hindi movies. As part of a school charity program, he volunteered at the children's hospital during his senior years.

In July 2007, he joined Westwood School of Hotel Management, Zirakpur to pursue a diploma course in Hotel Management and Catering. After completing this course, he joined XYZ Group of Hotels as a Housekeeping intern in June 2010 for six months. In this role, he was responsible for cleanliness and maintenance of one floor in the hotel. Taking advantage of his strong interpersonal skills, he also got opportunities to make housekeeping arrangements for corporate meetings. While pursuing education, he gained working knowledge of Microsoft Word, Excel, Access and PowerPoint.

Nipesh is detail-oriented, flexible and adaptable. He has successfully worked with a diverse work force. He gelled well with his peers, both in college and during his internship. After completing the internship, his objective has been to find a job opportunity where he can use his skills and experience. Backed by experience, he is confident about his skills as housekeeping assistant.

Job Posting

* Do you see yourself as a HOUSEKEEPING SUPERVISOR?

What's your passion? Whether you're into cricket, reading or hiking, at IHG we are interested in YOU. At IHG, we employ people who apply the same amount of care and passion to their jobs as they do in their hobbies - people who put our guests at the heart of everything they do. And we're looking for more people like this to join our friendly and professional team.

THE LOCATION:

At the moment, we are looking for HOUSEKEEPING SUPERVISOR to join our youthful and dynamic team at Holiday Inn Amritsar, Ranjit Avenue in Amritsar, Punjab (India). Holiday Inn Amritsar is ideally located in Amritsar's commercial district on Ranjit Avenue with the world famous Golden Temple located only a short distance away. Sparkling chandeliers mark an incomparable arrival experience as you escape to the welcoming environment that is, Holiday Inn Amritsar. The fresh international brand to celebrate and explore Amritsar.

Salary: Negotiable

Industry: Travel / Hotels / Restaurants / Airlines / Railways

Functional Area: Hotels, Restaurants

Role Category: Housekeeping

Role: Housekeeping Executive/Assistant.

Desired Candidate Profile

Friendly, pleasant personality, Service - oriented.

You should ideally be Graduate/ Diploma holder in HM and at least 2 years of experience as a supervisor in good brand with good communication skills, English is a must.

In return we'll give you a competitive financial and benefits package. Hotel discounts worldwide are available as well as access to wide variety of discount schemes and the chance to work with a great team of people. Most importantly, we'll give you the room to be yourself.

*Please get in touch and tell us how you could bring your individual skills to IHG.

Education-

UG: Any Graduate/ Diploma holder

PG: Post Graduation Not Required

Say

- Now, let's share the resume with the fellow participant sitting next to you and evaluate each other's effort.

Do

- Congratulate each participant for making their first attempt towards creating an effective resume.
- As a follow up activity, you can suggest them to prepare their own resume and show it to you the next day.

Summarize

- Close the discussion by showing some effective resume samples to the candidates.
- Ask the participants what they have learnt from this activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation

- Keep printed copies of the activity ready for the session.
- Put down the suggested format of the resume on the board while explaining the steps in preparing a resume.
- Do check the participants' resume and suggest necessary changes.
- Suggested example for the case presented:

Nipesh Singla

#1XX7, Sector XX-D

Chandigarh-160018

Mobile No: 91-988XXXXX01

E-mail: nxxxxxxxxla@gmail.com

Objective: Seeking an opportunity to use my interpersonal skills and experience to contribute to your company's growth, profitability and objectives.

Professional strengths:

- Proficient in housekeeping
- Experienced in and capable of working with a diverse work force
- Team player and friendly in nature
- Successful working in a multi-cultural environment

- Detail oriented, flexible, and adaptable
- Knowledge of Microsoft Word, Excel, Access and PowerPoint

Educational background:

- Diploma in Hotel Management and Catering, Westwood School of Hotel Management, Zirakpur
- High School, Government Boys Senior Secondary School, Sector 15, Chandigarh

Professional internships:

- Housekeeping Intern, XYZ Group of Hotels, New Delhi (June 2010 – August 2010)
 - ♦ Responsible for cleanliness and maintenance of one floor in the hotel.
 - ♦ Got opportunities to make housekeeping arrangements for corporate meetings.

Volunteer Work:

- Student volunteer at children's hospital in Chandigarh.

Nipesh Singla

UNIT 6.4.3: Interview FAQs

Unit Objectives

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

- Discuss the most frequently asked interview questions
- Discuss how to answer the most frequently asked interview questions

Resources to be Used

- Participant Handbook

Say

- Tell the participants you will provide them with interview situation and questions and they have to try to answer them.
- Tell them you will also explain the different ways to approach these questions.

Do

- Divide the class in pairs and ask the participants to perform a role play.
- One partner will play the role of the interviewer while the other will play the role of the interviewee.
- Tell them the interviewer can start the interview by asking the interviewee to introduce himself/herself.
- Call all the pairs one by one in front of the class to enact the role play.
- Follow the same pattern for all other situations.
- Time allotted for each situation is 8-10 minutes.
- Congratulate each participant for giving their input.
- Ask the class to applaud each time a team has completed their role play.
- Keep a check on time.

Role Play

Conduct a role play for the situation given.

Situation 1

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Then, the interviewer will bluntly ask the following questions:
 - ♦ How do you explain this huge time gap in your resume?
 - ♦ What is the reason for this?
 - ♦ Weren't you looking for a job or is it that no one selected you?

Say

De-brief:

- When you put information on your resume, you should be prepared to answer any questions about it.
- Be present and focused on the questions being asked to you.
- One way of tackling the blunt questions is to tell the interviewer you did not come across an opportunity where you were sufficiently satisfied with both the remuneration offered as well as the profile. Therefore, you waited for the right opportunity to come along while looking for an ideal job.

Role Play

Conduct a role play for the situation given.

Role Play – Situation 2

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Then, at the end of the interview, ask the interviewee:
 - ♦ There are over 200 people who have applied for this job, some with excellent work experience. Why should I hire you?

Say

De-brief:

- There is nothing wrong with stating your strengths and achievements. However, do not come across as arrogant or too boastful.
- You need show the interviewee that you have unique skills or talents to contribute to the company. The interviewer needs to know how you stand apart from the rest of the crowd.
- Tell the interviewer you are looking forward to working with the company and that you are a hard-working individual.

Role Play

Conduct a role play for the situation given.

Role Play – Situation 3

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Then, lean forward, clasp your hands on the table and in a soft voice ask the interviewee:
 - ♦ Did you ever experience any neglect or disregard from your previous office? In other words, did you ever suffer because your office or team displayed favouritism?

Say

De-brief:

- Keep this in mind: Do not criticize anyone during an interview.
- You are free to express your opinion, however, your language, answers, body language, and the tone of your voice should remain constructive and neutral.
- Since criticism will show you in negative light, you should keep your answers honest yet diplomatic.
- You can tackle such questions by saying, “I got along well with most of my faculty and peers.”

Role Play

Conduct a role play for the situation given.

Role Play – Situation 4

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Then very bluntly ask the interviewee:
 - ♦ How long do you plan to stay with this company if you are selected?
- After the candidate responds, ask sarcastically:
 - ♦ Do you seriously mean that?

Say

De-brief:

- Don't provide unreal and idealistic answers.
- Your answers should be honest yet diplomatic. In a situation like this, the interviewer does not expect you to provide a specific timeline.
- You can say something like, “I would like to stay with the company as long as I can contribute constructively and develop as an employee, within the organization, professionally and financially.”

Role Play

Conduct a role play for the situation given.

Role Play – Situation 5

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Ask him/her how important he/she thinks it is to be punctual in the corporate world.
- After he/she answers, look up sternly at the interviewee and in a crisp voice, say:
 - ♦ You were late for this interview by 10 minutes. That surely does not seem to be in line with what you just said?

Say

De-brief:

- Politely apologize for being late.
- You can add something such as, “I assure you this is not a habit”. All your future actions should be in line with this statement.
- Avoid giving any excuses.
- You might feel obligated to provide a justification for your tardiness, but the interviewer is not interested in that.
- Do not over apologize. Once this response is out of the way, turn your focus back to the interview.

Role Play

Conduct a role play for the situation given.

Role Play – Situation 6

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- After asking a few academic or job-related questions, ask the interviewee:
 - ♦ If you get this job, what salary package do you expect us to give you?

Say

De-brief:

- If there is no way for you to avoid this question, respond to the interviewer by providing a reasonable and well-thought out salary range.

Role Play

Conduct a role play for the situation given.

Role Play – Situation 7

- The interviewer will start by asking the interviewee a few generic questions such as:
 - ♦ What is your name?
 - ♦ Tell me something about yourself?
 - ♦ Can you tell me something about your family?
- Then, bringing the interview to a close, ask the interviewee:
 - ♦ Do you have any questions for me?

Say

De-brief:

- Ask relevant questions.
- Don't bombard the interviewer with questions.
- If you have questions about the result of the interview, you can limit your questions to 1 or 2. Keep them short and relevant like:
 - ♦ When will I be informed about the results of the interview?
 - ♦ What are the working hours?
 - ♦ Will the job require me to travel?

Explain

- Tell the participants to be prepared for answering different types of questions in an interview.
- Stay calm and focused, and take a moment to think about how you should respond. Always maintain a confident tone.
- Even if you don't intend to, your body language conveys your level of discomfort with a particular question. Try to keep your actions, tone, and gestures neutral.
- Maintain your composure while answering personal question.

Do

- Tell all the participants to form pairs again.
- Tell them to use the following list of frequently asked interview questions to conduct mock interviews.
- They will use all or some of these questions to conduct mock interviews with their partners.
- One partner will play the role of the interviewer while the other will play the role of the interviewee.
- After they are through asking and answering the questions, the roles will be reversed.
- The same list of questions will be used again.
- After each mock interview ask the interviewer to provide feedback and clear any doubts that may arise.
- Time allotted for each situation is 30-35 minutes.

Activity

Mock Interview Questions

Mock Interview Questions
Tell me something about your family.
What qualities would you look for in a Manager or a Supervisor?
Why did you apply for this job?
What do you know about this company?
How do you deal with criticism?
How do you plan to strike a good work-life balance?
Where do you see yourself five years from now?
Have you applied for jobs in other companies?
What kind of salary do you expect from this job?
Do you have any questions for me?

Summarize

- Close the discussion by discussing the questions in the both activities.
- Ask the participants what they have learned from this activity.
- Ask if they have any questions related to what they have talked about so far.

UNIT 6.4.4: Work Readiness – Terms and Terminology

Unit Objectives

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

- Identify basic workplace terminology

Resources to be Used

- Participant Handbook
- Chart papers
- Blank sheets of paper
- Pens

Ask

- What do you understand by workplace terminology?
- Are offer letter and contract of employment the same?

Say

- Let's start this unit with an activity.

Team Activity

Workplace terminology

- This is a group activity conducted in three parts.

Part 1

Sheila received a call from the recruiter of MND Company. Before she is recruited by the company, think of the recruitment process she will have to go through. Start from the telephone call to signing her letter of acceptance. Write down all the words that come to your mind.

Activity De-brief

- Have the participants read out the words they have written
- Encourage all the participants to participate in the activity

Do

- Divide the class into small groups of 4 or 6.
- Instruct the participants that they will be doing a brainstorming activity.
- Give them one chart paper each. Tell them to divide the chart in two parts.
- Instruct them that they have to use one half of the chart paper now. The other half will be used later.
- The participants have to write all the words that come to their mind related to the recruitment process.
- Give them 10 minutes to do the activity.
- Tell them that there are no right or wrong answers.
- Keep a track of the time.

Say 

- You all know quite a few words related to the terms used in the office.
- Let us talk about some new terms that have been missed out.
- Discuss “Work Readiness – Terms and Terminology” with the participants as given in the Participant Handbook.

Ask 

- Why is it important to know the workplace terms?
- How do they help?
- Can the words be categorised further?

Say 

- Let's now continue the activity.

Team Activity **Terms and Terminology**

- This is again a group activity. The members of the group remain the same as in Activity 1.

Part 2

With the help of the new terms you have learned, make a flow chart of the hiring process of MND Company.

Activity De-brief

- Ask the groups to share the flow charts and the new terms they added while preparing the flow chart.

Do 

- Instruct the participants that they have to use the 2nd half of the same chart they had used before.
- Using the new terminology and the terms they had previously written on the chart, they have to make a flow chart of the hiring process of the MND Company.
- Give them 10 minutes for this activity.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say 

- Let's go ahead with the activity.

Team Activity **Terms and Terminology**

- The activity continues with the same group members.

Part 3

Sheila now works for the MND Company. She is not aware of the company culture and policies. She goes to the HR Department to get her doubts clarified. Can you think of the terms for which she wants clarity? Make a list of those words.

Activity De-brief

- Ask the groups to share their list of words. Some of the words are benefits, comp. time, deduction, employee training, holidays, lay-off, leave, maternity leave, mentor, notice, paternity leave, and time sheet.

Do 

- Instruct the participants to identify the key terms an employee of a company should know. They can use the same chart paper for this activity.
- Give them 5 minutes for this activity.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize 

- Note: You can either summarize the key points of the unit or have a role play where an employee has just joined a company and the HR Manager explains the terms of employment.

UNIT 6.5: Understanding Entrepreneurship

Key Learning Outcomes



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

1. Discuss the concept of entrepreneurship
2. Discuss the importance of entrepreneurship
3. Describe the characteristics of an entrepreneur
4. Describe the different types of enterprises
5. List the qualities of an effective leader
6. Discuss the benefits of effective leadership
7. List the traits of an effective team
8. Discuss the importance of listening effectively
9. Discuss how to listen effectively
10. Discuss the importance of speaking effectively
11. Discuss how to speak effectively
12. Discuss how to solve problems
13. List important problem solving traits
14. Discuss ways to assess problem solving skills
15. Discuss the importance of negotiation
16. Discuss how to negotiate
17. Discuss how to identify new business opportunities
18. Discuss how to identify business opportunities within your business
19. Explain the meaning of entrepreneur
20. Describe the different types of entrepreneurs
21. List the characteristics of entrepreneurs
22. Recall entrepreneur success stories
23. Discuss the entrepreneurial process
24. Describe the entrepreneurship ecosystem
25. Discuss the purpose of the Make in India campaign
26. Discuss key schemes to promote entrepreneurs
27. Discuss the relationship between entrepreneurship and risk appetite
28. Discuss the relationship between entrepreneurship and resilience
29. Describe the characteristics of a resilient entrepreneur
30. Discuss how to deal with failure

UNIT 6.5.1: Concept Introduction (Characteristic of an Entrepreneur, types of firms/ types of enterprises)

Unit Objectives

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

- Discuss the concept of entrepreneurship
- Discuss the importance of entrepreneurship
- Discuss the characteristics of an entrepreneur
- Describe the different types of enterprises

Resources to be Used

- Participant Handbook

Say

- Let's start this session with some interesting questions about Indian entrepreneurs.

Team Activity

Quiz Questions

1. Who is the founder of Reliance Industries?
Dhirubhai Ambani
2. Who is the Chairman of Wipro Limited?
Azim Premji
3. Who launched e-commerce website Flipkart?
Sachin Bansal and Binny Bansal
4. Who is the founder of Paytm?
Vijay Shekhar Sharma
5. Who is CEO of OLA Cabs?
Bhavish Aggarwal
6. Who is the founder of Jugnoo?
Samar Singla (autorickshaw aggregator)
7. Who is the founder of OYO Rooms?
Bhavish Aggarwal

Do

- Tell them that you will ask them few questions about a few entrepreneurs.
- Divide the class in to two groups.
- In turns ask the quiz questions to the groups.
- If the answer is incorrect pass the question to the other group.
- Share the answer if the groups are not able to answer.
- Congratulate the participants who answered correctly.

Ask

- What do you understand by entrepreneurs?
- What is the importance of entrepreneurship in today's scenario?
- What do you think are the characteristics of successful entrepreneurs?
- What are different types of enterprises that an entrepreneur in India can own and run?

Say

- Talk about entrepreneurs, importance of entrepreneurship, characteristics of successful entrepreneurs, and different types of enterprises in India as discussed in the Participant Handbook.
- Tell the participants, stories of successful Indian entrepreneurs- their struggles, the moments of heartbreak, the perseverance and triumph.
- Ask them if they know of any such entrepreneur.

Summarize

- Close the discussion by summarizing about the opportunities for entrepreneurs in India.

Notes for Facilitation

- Check out different Government schemes for small entrepreneurs. Share the information with the participants.
- You can tell them about the government websites like Start Up India, mudra.org.in etc.
- Discuss about various schemes and policies by the Government of India for entrepreneurs.

UNIT 6.5.2: Leadership and Teamwork

Unit Objectives

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

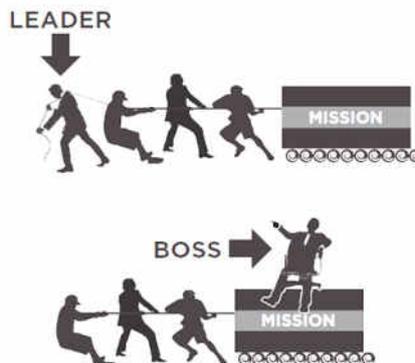
- List the qualities of an effective leader
- Discuss the benefits of effective leadership
- List the traits of an effective team

Resources to be Used

- Participant Handbook
- Blank sheets of paper
- Pens

Do

- Show the picture given below to the class.
- Ask them to quickly write on a piece of paper what comes to their mind after seeing the picture.
- Now ask them, “What do you understand from this picture?”
- Encourage participants to share their thoughts.



Say

- This picture depicts the qualities of a leader and the difference between a leader and a boss.
- A boss focuses on structure and inspires fear whereas a leader follows vision and generates enthusiasm.
- A boss blames employees for the breakdown whereas a leader fixes breakdowns.
- A boss depends on authority whereas a leader depends on goodwill.
- A boss says “I” and a leader says “We.”
- A boss drives employees whereas a leader coaches them.
- A boss takes credit whereas a leader gives credit.

Say

- Talk about leadership and leadership qualities for an entrepreneur as discussed in the Participant Handbook.

Ask

- Why is it important for a leader to be effective? How does it help the organization?

Say 

- Let us discuss benefits of effective leadership as discussed in the Participant Handbook.
- “Out-of-the-box thinking” is one of the new leadership styles. It means thinking differently and from a new perspective.

Ask 

- Do you consider yourself a team player?

Team Activity **Long Chain**

- This is a group activity.

Do 

- Divide the class into 2 teams.
- Ask each team to create a chain using materials they have in class such as shoe laces, belts, paper, handkerchief, ribbons, etc.
- The team that creates the longest chain wins the game.
- Observe if the participants are interacting with their team or working in isolation.
- Share your observations with the class.

Say **De-brief:**

- What did the winning team do differently?
- Who was responsible for the winning team's success?
- How does this activity explain the role of teamwork in entrepreneurial success?

Say 

- Tell the class that both the teams performed well.
- Discuss that the objective of this activity was to open communication channels and how this has been achieved.
- The participants should aim to keep the communication channels open when interacting with their peers and team members.
- It will set the pace and enthusiasm required for all the ensuing teamwork activities.
- Talk about teamwork and importance of teamwork in entrepreneurial success as discussed in the Participant Handbook.

Summarize 

- Close the discussion by summarizing about the importance of teamwork for employees.
 - Teamwork helps in reducing stress for the employees.
 - Teamwork helps employers in generating more number of solutions to a problem and developing improved communication amongst employees.
- Ask the participants what they have learned from these exercises.
- Ask if they have any questions related to what they have talked about so far.

UNIT 6.5.3: Communication Skills: Listening & Speaking: The Importance of Listening Effectively

Unit Objectives

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

- Discuss the importance of listening effectively
- Discuss how to listen effectively
- Discuss the importance of speaking effectively
- Discuss how to speak effectively

Resources to be Used

- Participant Handbook

Activity 1

Activity – Chinese Whisper

Step 1: Form a circle.

Step 2: Start a whisper chain. Any one participant will whisper a message into his/her neighbour's ear. No one else must hear the message. The message can be serious or downright silly.

Step 3: The next person who first heard the message should whisper the message very quickly to the person sitting next to them.

Step 4: The game goes on until the last person says whatever they heard out loud and the first person reveals the real message.

Compare them and have a great laugh!

Ask

De-brief questions:

- Was the original message the same as the message that is communicated at the end of the game?
- Why do you think there was a difference in the messages?

Say

- No, the original message was not same at the end of game.
- The barriers to communication like language, disturbance and noise, poor listening skills, boredom, poor speaking skills, etc. are the potential reasons this happens.
- There are various aspects to communication. Speaking skills and listening skills are two major components to any communication. There is always some room for improvement in the way we communicate.
- It is important to accept the reality of miscommunication and work to minimise its negative impacts.

Say

- Communication is a two-way process where people exchange information or express their thoughts and feelings
- It involves effective speaking and effective listening.
- If I go to the store to get bread, I exchange money for the bread. I give something and get something in return. Communication takes place in the same manner. You have to provide and receive information for communication to take place.

Ask

- How often do you hear these statements?
 - ♦ “You're not listening to me!”
 - ♦ “Why don't you let me finish what I'm saying?”
 - ♦ “You just don't understand!”
- What do you think the other person is trying to convey to you through these sentences?
- We will not talk about the importance of listening effectively as discussed in the Participant Handbook.

Say

- Let's play a game to understand effective listening process better.

Do

- This is a class activity.
- The participants need to answer the questions they hear.
- Instruct them to listen carefully.
- You will read it at a stretch and if need be repeat it once more.
- Tell the participants to raise their hand if they know the answer to the question asked.
- Keep a check on time.

Activity 2

Riddles:

Is there any law against a man marrying his widow's sister?

If you went to bed at eight o'clock at night and set the clock's alarm to ring at nine o'clock, how many hours of sleep would you get?

Do they have a 26th of January in England?

If you had only one match and entered a dark room that had a kerosene lamp, oil heater, and a wood stove, what would you light first?

The Delhi Daredevils and the Chennai Super Kings play five IPL matches. Each wins three matches. No match was a tie or dispute. How is this possible?

There was an airplane crash. Every single person died, but two people survived. How is this possible?

If an airplane crashes on the border of two countries, would unidentified survivors be buried in the country they were travelling to or the country they were travelling from?

A man builds an ordinary house with four sides except that each side has a southern exposure. A bear comes to the door and rings the doorbell. What is the colour of the bear?

Answers:

There's no law against a man marrying his widow's sister, but it would be the neatest trick in the book since to have a widow, the man would have to be dead.

You'd get one hour's sleep since alarm clocks do not know the difference between morning and night.

Oh, yes. They have a 26th of January in England. They also have a 27th, a 28th, and so on.

First of all, you would light the match.

Who said the Delhi Daredevils and the Chennai Super Kings were playing against each other in those games?

Every SINGLE person died, but those two were married.

You can't bury survivors under any law especially if they still have enough strength to object.

The bear that rang the doorbell would have to be a white bear. The only place you could build a house with four southern exposures is at the North Pole where every direction is in South.

Ask **De-brief question:**

- What were the barriers that came into your way of listening?
- How can you overcome barriers to listening?

Say 

- There is a difference between hearing and listening.
- If you don't listen properly, the message may be misunderstood.
- Be open-minded while listening to someone.
- It is important to listen effectively and carefully without making assumptions.

Activity 3 **Elevator Pitch:**

You are in the lift of a hotel and you bumped into your former client who is a famous businessman. He has financed a lot of small business ventures and can finance your new start-up too. After exchanging pleasantries, he asks you what your new company does. You open your mouth, and then pause. Where do you even begin?

Then, as you try to organize your thoughts, his meeting is called, and he is on his way. If you would have been better prepared, you're sure that he would have stayed long enough to schedule a meeting with you too.

If you were given another chance, what would you have said to this person?

Do 

- Start off the task by providing a beginning sentence to get the story started, and then go around the classroom getting each one to add a new sentence to keep the story going.
- This task should be done spontaneously allowing only a little time to think (30 seconds).
- For example: **There was once a student who was looking for a job after graduation.**

Notes for Facilitation



- Tell the participants to follow these steps to create a great pitch, but bear in mind that you'll need to vary your approach depending on what your pitch is about.
 1. **Identify Your Goal:** Start by thinking about the objective of your pitch. For instance, do you want to tell the potential clients about your organization? Do you have a great new product idea that you want to pitch to an executive or do you want a simple and engaging speech to explain what you do for a living?
 2. **Explain What You Do:** Start your pitch by describing what your organization does. Focus on the problems that you solve and how you help people. Ask yourself this question as you start writing: what do you want your audience to remember most about you? Keep in mind that your pitch should excite you first. After all, if you don't get excited about what you're saying neither will your audience. People may not remember everything that you say, but they will likely remember your enthusiasm.
 3. **Communicate Your USP:** Your elevator pitch also needs to communicate your unique selling proposition or USP. Identify what makes you, your organization or your idea unique. You'll want to communicate your USP after you've talked about what you do.
 4. **Engage with a Question:** After you communicate your USP, you need to engage your audience. To do this, prepare open-ended questions (questions that can't be answered with a "yes" or "no" answer) to involve them in the conversation. Make sure that you're able to answer any questions that he or she may have.
 5. **Put it all Together:** When you've completed each section of your pitch, put it all together. Then, read it aloud and use a stopwatch to time how long it takes. It should be no longer than 20-30 seconds. Remember, the shorter it is, the better!

Example:

Here's how your pitch could come together:

"My company deals with cloth retail online business and we use various e-commerce platforms to sell our products. This means that you can do shopping with ease and spend time on other important tasks. Unlike other similar companies, we have a strong feedback mechanism to find out exactly what people need. This means that, on average, 95 percent of our clients are happy with our products. So, how can you help us in creating our own web portal?"

6. **Practice:** Like anything else, practice makes perfect. Remember, how you say it is just as important as what you say. If you don't practice, it's likely that you'll talk too fast, sound unnatural or forget important elements of your pitch. Set a goal to practice your pitch regularly. The more you practice, the more natural your pitch will become. Practice in front of a mirror or in front of colleagues until the pitch feels natural.

Summarize



- Close the discussion by summarizing how to speak effectively as discussed in the Participant Handbook.

UNIT 6.5.4: Problem Solving & Negotiation Skills

Unit Objectives

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

- Discuss how to solve problems
- List the important problem solving traits
- Discuss ways to assess problem solving skills
- Discuss the importance of negotiation
- Discuss how to negotiate

Resources to be Used

- Participant Handbook

Ask

- What is a 'problem'?
- What do you think are the problems you may face in the process of becoming a successful entrepreneur?

Say

- Discuss the definition of problem as given in the Participant Handbook.
- In a hurdle race the hurdles are the obstacles on the way to reach your goal.
- Similarly, obstacles are the hurdles you may face while reaching your goal i.e. to set-up your own business. Your goal will be to reach the finishing line after crossing these hurdles.

Ask

- What do you do when you face a problem?
- How do you resolve it? You can pick examples from the question asked previously 'the problems they are likely to face in the process of becoming a successful entrepreneur'.

Say

- Discuss how to solve problems as given in the Participant Handbook.

Team Activity

- This is a group activity.
 - The groups will solve the problem and come up with the best solution in each case.
1. Unable to arrange for some extra finance for setting up a beauty parlour. The loan sanctioned and disbursed is not enough. You have tried all your contacts, friends and relatives. But unable to manage the extra amount. Bank will not sanction more amount as you have used up the complete sanction limit.
 2. You have rented a space for your business and all arrangements are done. You will be operating from the office space rented in two days. Now the owner comes up to you and says he wants to sell the place and wants you to vacate in 15 days.
 3. You have just set up your business and need extra human resource. You have tried inviting a few also tied up with an agency for getting the right candidate. But you are unable to get the right candidate. If the candidate is good, you cannot offer the salary demanded. If the candidate agrees to the salary, he/she has other demands like working hours to be reduced, leaves etc. which may not work for your set up.

Do 

- Divide the class into three groups. Give one scenario to each group.
- Explain the purpose and duration of the activity.
- Ask the groups to build on the scenario and present their solution as a role play.

Say **De-brief questions:**

1. What was the problem?
2. Is there any other alternative solution?
3. Is this the best solution presented?

Ask 

- Try to think of some people around you who are able to solve problems very easily. Even you or your friends might be approaching them when there is a problem. What qualities do they have? What personality traits do such people possess?

Say 

- Discuss the important traits for problem- solving as given in the Participant Handbook.

Ask 

- In order to build a successful organization, you need to hire people who possess good problem solving skills. How would you assess the level of problem solving skills of potential candidates before hiring them?

Say 

- Discuss how to assess for problem- solving skills as given in the Participant Handbook.

Summarize 

- Ask the participants the things that they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Summarize the discussion on problem solving.

Activity 

- The activity is to organise an election event. Select three volunteers from the group. They have to give a speech on their election manifesto to the class. They have to negotiate with the fellow participants and convince them to vote for them. The best negotiator will win the election.

Do 

- Ask three participants to volunteer for the activity.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Ask 

- Out of the three contestants, whom would you support? Why? What did they say or do which convinced you to make your decision?
- Have you ever tried to negotiate in your personal or professional life?
- Ask the class to share some of their experiences where they have been able to strike a deal by negotiating.

Say 

- Discuss “What is Negotiation?” as given in the Participant Handbook.

Ask 

- Why is it important to negotiate? As an entrepreneur, where do you think that negotiation skills will be needed?

Say 

- Discuss the importance of negotiation while starting a business as given in the Participant Handbook.

Say 

- Discuss the important steps to negotiate as given in the Participant Handbook.

Role Play 

- Conduct a role play activity.
- Ask the participants to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Do 

- Divide them into groups of four (4) (depending on the batch size).
- Give them the hand-outs for role play scenarios.
- Two groups to be given scenarios on problem solving.
- Other two groups to be given scenarios on negotiation.
- The groups will build on the scenarios and prepare for the role play.
- Give the groups atleast 5 mins to discuss and be ready with the role play.
- Invite each group one by one to come and present their role play.

Problem solving Scenario 1

Avinash has a Mobile Repair Store in Allahabad. His outlet is one of the most popular one in the vicinity and he has great rapport with his customers. He is always well-dressed, jovial and full of energy.

It's around 11 AM, when a customer barges in to the shop and starts shouting at Avinash for giving her back the instrument which is still not working. The screen of her mobile is also cracked from one side. Avinash remembered thoroughly checking the handset before handing it over to the customer. The customer threatens to sue the company and to go to Consumer Court for cheating her.

Problem solving Scenario 2

You are running a successful small scale business, Shreeji Aggarbattis,. Your staff members do door to door selling and organise marketing campaigns in local markets. Your brand has established it's name in last few years.

Recently, lot of customers have been coming to you and lodging complaints that your staff members indulge in malpractices. Few of them informed you that a staff member engaged them in a friendly conversation. In the meanwhile, the other gave them lesser packets of aggarbattis than they paid for.

Another set of customers lodged complaint about the misconduct and rude behaviour of a particular staff member. You often hear from your customers that the orders don't get delivered on time or wrong products get delivered.

You have already been struggling with shortage of staff and such complaints are a serious concern as it is hampering your brand image. What strategies will you adopt to solve this problem?

Negotiation Scenario 1

You have interviewed a prospective new employee who could be a key member of your new entrepreneurial venture. The new person is demanding a salary that is 20% higher than you thought based on your business plan. Finances are tight, yet you believe this person could make a significant impact on future profits. If you paid the required salary for the new person, then you would have to restructure your entire business plan. You've been searching for an individual with this skill level for three months. to the candidate is waiting for your response. Now you have to call him in to make the final negotiations.

Negotiation Scenario 2

You are a young entrepreneur who has just registered his start up project and applied for a bank loan accordingly. You receive a letter saying that your loan application has been rejected as your start up idea did not appeal to the bank and they think that it is not a revenue generating model. You have taken an appointment to meet the manager and show your negotiation skills to get your loan approved.

Notes for Facilitation

**Facilitating Role Plays****Preparing for the activity**

1. Carefully review the details of the scenario and the character descriptions.
2. Become familiar with the key issues being addressed in the scenario.
3. Study the provided material so that you are ready to address issues related to the situations depicted in the role-plays.
4. Anticipate and know how to address issues participants might raise during the activity.

Conducting the activity

1. Introduce the activity. Emphasize that role-playing provides participants with an opportunity to apply their new knowledge, skills, and tools in situations that simulate actual interactions with customers.
2. Ask participants to form pairs. Direct the members of each group to choose who will play the roles. Remind the groups that each participant should be given the opportunity to play/practice the different roles.
3. Conduct a demonstration so that participants become familiar with the expectations related to the roles and support materials.
4. Give the pairs/ groups 10 to 15 minutes to conduct the role-play (depending on the duration of the session).
5. After all the groups have finished with the role-play, conduct a debriefing session on each role-play.
6. Ask the groups to take five minutes to talk about what happened during the role-play. The groups should discuss the questions given in the debriefing for each role-play. Encourage participants to provide constructive criticism during their discussions.

Summarize



- Wrap the unit up after summarizing the key points and answering questions.

UNIT 6.5.5: Business Opportunity Identification: Entrepreneurs and Opportunities

Unit Objectives

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

- Discuss how to identify new business opportunities
- Discuss how to identify business opportunities within their business

Resources to be Used

- Participant Handbook
- Blank sheets of paper
- Pens

Ask

- How does an entrepreneur identify an opportunity?
- What do you think are the common queries or concerns faced by entrepreneurs?
- How can you identify new business opportunity?

Say

- Let's talk about opportunity, common queries or concerns faced by entrepreneurs, idea as an opportunity, factors to consider when looking for opportunities, ways to identify new business, and opportunity analysis as discussed in Participant Handbook.
- Let's do an activity to understand ways to identify business opportunities within your business.

Do

- Tell the class that this is an individual activity.
- Tell the participants to create a matrix on their notebooks.
- There will be four boxes in your matrix.
- Strength, Weakness, Opportunity and Threats will be the four headings of the matrix. This is called the SWOT matrix.
- Read out the questions to them and tell the participants they need to answer the questions asked in each matrix.
- Tell them they can also use their own understanding of themselves to fill the SWOT matrix.

Activity

Do your SWOT analysis

Strength

What are your strengths?
What unique capabilities do you possess?
What do you do better than others?
What do others perceive as your strengths?

Weakness

What are your weaknesses?
What do your competitors do better than you?

Opportunity

What trends may positively impact you?
What opportunities are available to you?

Threat

Do you have solid financial support?
What trends may negatively impact you?

Do

- Congratulate everyone for the class activity.
- Ask the audience to applaud for themselves.
- Allot the participants sufficient time to complete this activity, but do keep a check on time.
- Ask de-brief questions to cull out information from the participants.

Ask

De-brief questions:

- What are your weaknesses according to your SWOT analysis?
- Do you think you can change your weakness into strength? How?
- Do you think you can work on your threats? How?

Summarize

- Close the discussion by summarizing ways to identify business opportunities within your business.
- Ask the participants what they have learned from this exercise.
- Ask if they have any questions related to what they have talked about so far.

UNIT 6.5.6: Entrepreneurship Support Eco-System

Unit Objectives

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

- Explain the meaning of entrepreneur
- Describe the different types of entrepreneurs
- List the characteristics of entrepreneurs
- Recall entrepreneur success stories
- Discuss the entrepreneurial process
- Describe the entrepreneurship ecosystem
- Discuss the purpose of the 'Make in India' campaign
- Discuss the key schemes to promote entrepreneurs

Resources to be Used

- Participant Handbook
- Chart papers
- Marker pens
- Pencils
- Colour pencils
- Scale
- Eraser
- Other requisite stationery material

Ask

- Do you think that entrepreneurs need support?
- What do you think is an eco-system?
- What do you think 'entrepreneurship support eco-system' means?

Say

- Let's learn what entrepreneurship support eco-system means.
- Discuss 'Entrepreneurship Support Eco-System' as given in the Participant Handbook.

Ask

- Can you define entrepreneurship support eco-system?
- What are the key domains of the support eco-system?

Say

- Let's learn more about these domains by conducting an activity.
- You have to make a poster showing the components of the six main domains of entrepreneurship support eco-system.

Team Activity

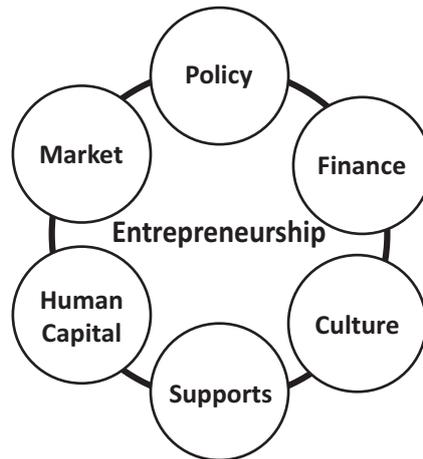
- Making a poster showing the entrepreneurship support eco-system.

Do

- Divide the class into groups of four or six.
- Hand out chart paper and coloured pens.
- Explain the purpose and duration of the activity.
- Go around checking the progress of each group.
- Set guidelines pertaining to discipline and expected tasks.

Activity De-brief

Ask each group to display their poster and explain the key domains of entrepreneurship support eco-system.



Ask

- What kind of government support eco-system is available for entrepreneurs in India?

Say

- Discuss 'Make in India' campaign as given in the Participant Handbook.

Team Activity

- Presentation on key schemes to promote entrepreneurs

Do

- Divide the class into pairs.
- Number each pair from 1-15.
- Assign a scheme, same as their group number, to each group.
- Ask them to read the scheme carefully and present it to the class.
- Explain the purpose and duration of the activity.
- Go around checking the progress of each group.
- Set guidelines pertaining to discipline and expected tasks.

Activity De-brief

- Ask each group to explain the scheme offered by government to promote entrepreneurs.

Summarize

- Summarize the unit by discussing the key points and answering questions the participants may have.

UNIT 6.5.7: Risk Appetite & Resilience

Unit Objectives

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

- Discuss the relationship between entrepreneurship and risk appetite
- Discuss the relationship between entrepreneurship and resilience
- Describe the characteristics of a resilient entrepreneur

Resources to be Used

- Participant Handbook
- Chart papers
- Blank sheets of paper
- Pens
- Marker pens

Ask

- Can you define risk or explain what constitutes a risk?
- What do you people mean when they say, “This may be a risky proposition”?
- What risks are they talking about?

Example

- Let's have a look at these two examples:

Rohit and his family were travelling by car from Delhi to Nainital. It was their second trip there. Rohit was familiar with the road. His friends told him that the highway after Rampur was in a bad condition. They advised him to take a shortcut and turn left from Moradabad and take the Kaladhungi road. This road is in a better condition.

Since he was going with his family, and did not want to take the risk of getting lost, he left early. He took the Kaladhungi road and reached Nainital well in time.

Suresh and his family too were travelling by car from Delhi to Nainital. It was their second trip there. His friends too advised him to take a shortcut and turn left from Moradabad and take the Kaladhungi road as this road was in a better condition.

Suresh too decided to take the Kaladhungi road but he left Delhi in the afternoon. It was dark by the time he reached Kaladhungi, and he was sure that he was taking the correct turn. As it was late, he could not find anyone to give him directions. He ended up being in an unknown place that was scarcely inhabited.

Say

- Let's see what type of risks Rohit and Suresh took.
- Discuss 'Risk Appetite and Resilience' with the participants as given in the Participant Handbook.

Say

- Let's learn more about risk appetite and resilience with the help of an activity.

Team Activity

Risk Appetite

- This is a group activity.

- In the previous unit, you read success stories of Mr Dhirubhai Ambani and Dr Karsanbhai Patel.
- Mr Ambani left his job and started his company Reliance with just Rs. 50,000/-.
- Dr Patel kept his job, went door-to-door to sell Nirma, and only when the brand started gaining popularity did he start his own company.
- What types of risk did both of them take?
- What risk factors, do you think, did they keep in mind before launching their company?
- Write the Risk Appetite Statement of both the companies.

Activity De-brief

- Who took a greater risk?
- What are the differences between the Risk Appetite Statement of both the companies?

Do

- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper.
- Tell the participants that they have to evaluate the risks taken by Mr Dhirubhai Ambani and Dr Karsanbhai Patel.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Ask

- Do you think all entrepreneurial ventures are successful?
- What happens if the first venture is not successful?
- Should the entrepreneur stop when faced with challenges or face them?

Example

- Let's have a look at the following example:

Vijay Shekhar Sharma is the founder of Paytm, which is a giant Indian e-commerce. He was born in a middle-class family in Uttar Pradesh. He started his first job at an MNC. He quit after six months and built a company One97 with his friends. As One97 grew bigger, it needed more money because it was running more servers, bigger teams, and had to pay royalty. At that time, the tech bubble popped and technology companies were running in losses. Finally, money ran out. So One97 took loans and then more loans at higher rates of interest, as high as 24 per cent, and became caught in a vicious cycle.

In 2014, Paytm was launched with online wallet services after which, the company enabled online payment transactions. The company got licenses from RBI in 2016 to launch India's first ever payment bank. Moreover, the main motive of Paytm was to transform India into a cashless economy.

After demonetization came into effect, Vijay Shekhar Sharma started promoting online and digital transactions to deal with the cash crunch. In fact, the service of the company's mobile wallet is accepted across India. The logo of Paytm is now popular almost everywhere from tea stalls to major companies.

Say 

- Let's see what qualities made Vijay Shekhar Sharma a resilient entrepreneur.
- Discuss Entrepreneurship and Resilience with the participants as given in the Participant Handbook.

Say 

- Let's learn more about entrepreneurship and resilience with the help of an activity.

Team Activity **Entrepreneurship and Resilience**

- This is a group activity.
- Think of some entrepreneurship ventures that faced challenging times, but later resulted in success stories.
 - Who is the founder of that company?
 - What challenging times did it face?
 - How did it overcome those challenges?
 - List the resilient characteristics of the entrepreneur.

Activity De-brief

- Each group to give their presentation.
- Why did you choose this company?
- What is the success story of the company?

Do 

- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper.
- Tell the participants that they have to think of an entrepreneur who faced challenging times, but eventually succeeded.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize 

- You can summarize the key points of the unit.
- Ask the participants what they learned from the activities.
- Clarify any questions or doubts they might have.

UNIT 6.5.8: Success and Failures

Unit Objectives

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

- Discuss how to deal with failure

Resources to be Used

- Participant Handbook

Ask

- Have you heard the quote 'nothing is impossible'?
- What do you think it means?
- Do you think that all successful entrepreneurs became famous overnight or did they have to struggle or face failure before succeeding?

Example

- Let's have a look at this example.

Shah Rukh Khan, also known as, SRK or King Khan is a force to reckon with. Did he achieve stardom overnight? Shah Rukh Khan, who has seen many struggles in his life – he has slept on streets, struggled to support himself and his sister at a very young age, and lost his parents very early in life, which led to his sister seeking mental health support. Amidst all the chaos and challenges, he kept pushing himself, and today he stands tall as the 'Badshah of Bollywood'. Certainly those years were not easy for him.

When he was young, he stood at Marine Drive and said, "I will rule this city one day". Failure was not just his companion during or before his stardom, it is still a substantial part of his life. Success does not come easy. What made him a star was his acceptance of failure and the urge to improve.

Say

- How do you define success and failure?
- What is fear?
- Discuss "success and failure" with the participants as given in the Participant Handbook.

Ask

- Have you felt or experienced fear?
- What led you to feel that emotion?
- How did you handle it?

Say

- Let's learn the about success and failure with the help of an activity.

Team Activity

- Divide the class into groups of four.
- Instruct them to think of one scenario where they have to interview a successful entrepreneur.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- They have to choose one person from the group as the interviewee and one as the interviewer.
- Go around and make sure they have understood what is to be done and are discussing the roles properly.
- Check that everyone understands their role. Give clarifications if needed. Give the participants about 5 minutes to discuss and decide their roles.
- Ask the groups to stop the discussion as soon as the time is over.
- Invite each group one by one to come and present their interview as a role play.

Notes for Facilitation

Facilitating Role Plays

Preparing for the activity

1. Carefully review the details of the scenario and the character descriptions.
2. Become familiar with the key issues being addressed in the scenario.
3. Study the provided material so that you are ready to address issues related to the situations depicted in the role plays.
4. Anticipate potential questions that might be raised by the participants and be ready to address them.

Conducting the activity

1. Introduce the activity. Emphasize that role playing provides participants with an opportunity to apply their new knowledge, skills, and tools in situations that simulate actual interactions with customers.
2. Ask participants to form pairs. Direct the members of each group to choose who will play the roles. Remind the groups that each participant should be given the opportunity to play/practice the different roles.
3. Conduct a demonstration so that participants become familiar with the expectations related to the roles and support materials.
4. To maintain spontaneity of the interactions during the role play, ask the participants not to discuss the details of their roles prior to the role play.
5. Give the pairs 15-20 minutes to conduct the role play.
6. Circulate among the groups to answer any questions that may arise and provide guidance as needed.
7. After all the pairs have finished with the role play, conduct a de-briefing session on each role play.
8. Ask the groups to take five minutes to talk about what happened during the role play. The groups should discuss the questions given in the de-briefing for each role play. Encourage participants to provide constructive criticism during their discussions.
9. Conclude the activity by asking participants to think about whether and how they might use scripted role plays in their real life.

Summarize

- Wrap the unit up after summarizing the key points and answering questions.

UNIT 6.6: Preparing to be an Entrepreneur

Key Learning Outcomes



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

1. Discuss how market research is carried out
2. Describe the 4 Ps of marketing
3. Discuss the importance of idea generation
4. Recall basic business terminology
5. Discuss the need for CRM
6. Discuss the benefits of CRM
7. Discuss the need for networking
8. Discuss the benefits of networking
9. Discuss the importance of setting goals
10. Differentiate between short-term, medium-term and long-term goals
11. Discuss how to write a business plan
12. Explain the financial planning process
13. Discuss ways to manage your risk
14. Describe the procedure and formalities for applying for bank finance
15. Discuss how to manage their own enterprise
16. List the important questions that every entrepreneur should ask before starting an enterprise

UNIT 6.6.1: Market Study/ The 4Ps of Marketing/ Importance of an IDEA: Understanding Market Research

Unit Objectives

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

- Discuss how market research is carried out
- Describe the 4 Ps of marketing
- Discuss the importance of idea generation

Resources to be Used

- Participant Handbook
- Chart papers
- Markers pens
- Blank sheets of paper

Ask

- Suppose, you want to open a restaurant, what are the factors you will consider?
- How will you promote your restaurant?

Example

- Let's have a look at this example.

Arjun was an MBA working in a company. But he wanted to start a low cost budget hostel for foreign tourists coming to India. He did a lot of market research before starting the project. Based on the information he gathered, he made his business plan. His hostel is now flourishing and he is thinking of expanding to other tourist destinations.

Say

- Discuss “Market Study” with the participants. Refer to the Participant Handbook.
- Let's learn about market study and research with the help of an activity.

Team Activity

Market Study

- This is a group activity.
- You want to start your own tuition centre.
- What type of research will you do?

Activity De-brief

- Ask each group to come forward and give a brief presentation.
- Encourage other groups to be interactive and ask questions.
- What factors did you keep in mind while doing your research?
- Based on our research would you go ahead and open a tuition centre?

Do 

- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6.
- Give each group a chart paper.
- Tell the participants that they have to start their own tuition centre.
- Give the participants 10 minutes to discuss and write the research work they need to do.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say 

- By opening a tuition centre you are offering a service.

Ask 

- What factors will you keep in mind before opening it?

Say 

- Discuss “The 4Ps of Marketing” with the participants as given in the Participant Handbook.

Say 

- Let's learn about the 4Ps of Marketing with the help of an activity.

Team Activity **4 Ps of Marketing**

- This is a group activity.
- You have to sell a pen to four different segments:
 1. Rural villagers
 2. Rural middle class
 3. Urban middle class
 4. Upper end rich people (Niche market)

Keeping the 4Ps of Marketing in mind, what marketing strategy will you design to sell the pen?

Activity De-brief

- Ask each group to present their strategy.
- Encourage other groups to be interactive and ask questions.

Do 

- Instruct the participants that this is group work.
- Divide the class into four groups.
- Give each group a chart paper.
- Assign each group a target audience for selling the pens:
 1. Rural villagers
 2. Rural middle class
 3. Urban middle class

- 4. Upper end rich people
- Tell the participants that they have to design a marketing strategy keeping the 4Ps of Marketing in mind.
- Give the participants 20 minutes to discuss and come up with their strategy.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit

Activity De-brief

- Ask each group to come forward and give a brief presentation.
- Ask each group what they kept in mind while designing their marketing strategy.
- Encourage other groups to be interactive and ask questions.

Say 

- Each entrepreneur has an idea of wants he wants to sell. It may be a service or a product.
- Discuss “Importance of an IDEA” as given in the Participant Handbook.

Summarize 

- Summarize the key points of the unit.
- Ask the participants what they learnt from the activities.
- Encourage them to ask if they have any doubts.

UNIT 6.6.2: Business Entity Concepts

Unit Objectives

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

- Recall basic business terminology

Resources to be Used

- Participant Handbook

Say

- Let's recall some basic business terminology.
- Discuss the Business Entity Concepts as given in the Participant Handbook.
- Let's learn some basic business terminology by having an activity.
- We will have a quiz today.

Activity

- The activity is a quiz.

Do

- Divide the class in two groups and give a name to each group.
- Explain the rules of the quiz. For each correct answer the group gets 1 mark.
- If the group is unable to answer the question is passed to the next group.
- Explain the purpose and duration of the activity.
- Ask the questions of the quiz.
- Keep a score of the groups.
- Set guidelines pertaining to discipline and expected tasks.

Summarize

- Summarize the unit by discussing the key points.

Notes for Facilitation

QUESTIONS FOR THE QUIZ

1. What does B2B mean?
Business to business
2. What is a financial report?
A comprehensive account of a business' transactions and expenses
3. Who is a sales prospect?
A potential customer
4. How is working capital calculated?
Current assets minus current liabilities

5. What is an estimation of the overall worth of a business called?

Valuation

6. You are buying a house. What type of transaction is it?

Complex transaction

7. How will you calculate the net income?

Revenue minus expenses

8. How is Return on Investment expressed?

As percentage

9. How will you calculate the cost of goods sold?

Cost of materials minus cost of outputs

10. What is revenue?

Total amount of income before expenses are subtracted.

11. What is a Break-Even Point?

This is the point at which the company will not make a profit or a loss. The total cost and total revenues are equal.

12. What is the formula used to calculate simple interest?

*$A = P(1 + rt); R = r * 100$*

13. What are the three types of business transactions?

Simple, Complex and Ongoing Transactions

14. The degrading value of an asset over time is known as .

Depreciation

15. What are the two main types of capital?

Debt and Equity

UNIT 6.6.3: CRM & Networking

Unit Objectives

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

- Discuss the need for CRM
- Discuss the benefits of CRM
- Discuss the need for networking
- Discuss the benefits of networking

Resources to be Used

- Participant Handbook

Ask

- Can your business run without customers/buyers?
- Who is the most important entity in any business?

Say

- The key to every success business lies on understanding the customer's expectations and providing excellent customer service.
- Discuss about CRM and its benefits. Refer to the Participant Handbook.
- Providing excellent customer service entails:
 - ♦ Treating your customers with respect.
 - ♦ Be available as per their need/ schedule.
 - ♦ Handling complaints effectively.
 - ♦ Building long lasting relationships.
 - ♦ Collecting regular feedback.
- Handle customer complaints proactively. Ask “what happened”, “why it happened”, “how can it be avoided next time”, etc.
- Collecting feedback from the customers regularly will enable you to improve your good/service.
- “Let's understand it better with the help of some case scenarios. You will be given some cases within your groups. You have to analyse the case scenario that has been given to you and then find an appropriate solution to the problem.”

Do

- Divide the class into four groups of maximum six participants depending on the batch size.
- Give one case study to each group.
- Instruct them to read the case carefully.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem.
- Put down the discussion points (de-brief questions) on the board. Give the class 5-10 minutes to discuss the case and note down their solutions.
- At the end of 10 minutes, the team should present their case solution to the class.

Team Activity

Case Study Analysis

Raju runs a business of wooden furniture. He has a huge list of customers on Facebook and WhatsApp who give him orders regularly. Ankita is one of his old and regular customers. She placed an order for a new chester and TV cabinet via WhatsApp and requested Raju to send them as soon as possible. When the parcel reached Ankita through courier she found that chester was broken and the TV unit was chipped from the bottom. Ankita was heartbroken. It was a complete waste of money. She sent a message to Raju on WhatsApp, expressing her anger and disappointment. Raju might lose an old customer forever if he doesn't satisfy the customer. What should Raju do to retain his customer?

Scenario 2

Rajni runs a boutique shop. She sells suits and sarees. She is one of the most successful designer in her city. Rajni swears that all the clothes in her boutique have unique designs. Smita has to attend her cousin's wedding; she goes to Rajni's boutique to buy a saree. Smita wanted a unique designer saree. Rajni customized a saree for her and sent it over the courier. When Smita had a look at the saree she realised her two friends had the same design sarees. She sent a message to Rajni on WhatsApp, expressing her anger and disappointment. Did Rajni make a false promise? Were her designs copied? What could happen to Rajni's image after this incident? What would you do if you were in Rajni's place?

Scenario 3

Shama is a beautician who offers parlour services to ladies by making home visits. Recently, Shama got her name registered on an e-commerce website. Two days earlier, she got a message from Mrs Sushma. The appointment was fixed for next day, 11:00 am and the remuneration for the services was decided beforehand. When Shama reached there at 10:50 am, Mrs Sushma was not at home. When Shama called her, she asked her to wait for a while. Mrs Sushma reached home at 11:45 am. Meanwhile, Shama had to reschedule her next appointment. After availing Shama's services, Mrs Sushma refused to pay the requisite amount and started finding faults in the services provided by her. Who was at fault in this scenario? What should you do in case the customer behaves unreasonably? What would you do if you were in Shama's place?

Scenario 4

Shailender is the manager of a car showroom. He proactively takes part in all the transactions that happen in his showroom. Vinita wants to buy a new car. She has chosen a car from Shailender's showroom. The salesperson has given her a very good discount and has also promised free service for one year. Vinita goes to the showroom and asks to complete all the formalities to purchase the car. When she sees the final bill she realize that she has not received the promised discount neither was there any mention of the free services. She immediately demands to see the Shailender. When Shailender's head asks how much discount Vinita was promised, he realised the discount will make the sale in loss. The car showroom owner might lose a customer and deal due to false commitments made by his manager. Besides, the customer might tell this to other people, creating a bad name and image for the showroom. If you owned that showroom, how would you have convinced your customer?

Say

- Now, let's discuss the problem and solution with the class.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Present the solution as a role play.
- Post presentation, the other groups may ask questions from the group that has presented.

Do 

- Congratulate each group for the presentation/ role play.
- Ask the audience to applaud for them.
- Keep a check on time. Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Say 

- If your customers are happy with you they will give referrals which will help to grow your business.
- One more way of growing business is 'Networking'.
- Discuss Networking and its benefits. Refer to the Participant Handbook.

Activity **Group Discussion**

- Conduct a group discussion in the class on how they can do networking for their business.

Summarize 

- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of CRM and Networking for entrepreneurs.
- Close the discussion by summarizing the importance of CRM and Networking for entrepreneurs.

UNIT 6.6.4: Business Plan: Why Set Goals?

Unit Objectives

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

- Discuss the importance of setting goals
- Differentiate between short-term, medium-term and long-term goals
- Discuss how to write a business plan
- Explain the financial planning process
- Discuss ways to manage your risk

Resources to be Used

- Participant Handbook
- Chart papers
- Blank papers
- Marker pens
- Ruler

Ask

- Remember we had written SMART Goals in a previous session? Let's try and recall why it is important to set goals?
- While framing SMART goals, we talked about 'T' in SMART, which was 'Time Bound'? What do we mean by time bound goals?
- What time limit did you set for your goal- 3 weeks, 3 years, 10 years?

Say

- Talk about short term, long term and medium term goals, as discussed in the Participant Handbook.

Ask

- As you are planning to become an entrepreneur, you must have thought of an idea for a start-up. What is your business idea?

Do

- Ask few participants to share their business ideas.

Ask

- Have you created a business plan for your business idea?
- Do you think it is important to have a business plan in place? Why/ why not?

Say

- Talk about 'Why Create a Business Plan' as discussed in the Participant Handbook.
- Let's understand it better with the help of an activity.

Team Activity

Writing a business Plan

- This is a group activity.
- Give the groups the required resources such as chart paper and markers.
- This activity is divided into two parts:
 1. Create a business idea
 2. Develop a business plan
- The group will discuss and come up with a new business idea and present their idea to the class.
- In the second part of the activity the group will develop a business plan for the business idea.
- The business plan prepared will be presented by the groups to the class.

MY BUSINESS PLAN
Executive Summary: What is your Mission Statement?
Business Description: What is the nature of your business?
Market Analysis: What is your target market?
Organization and Management: What is your company's organizational structure?
Service or Product Line: What is the lifecycle of your product/ service?
Marketing and Sales: How will you advertise and sell your products?
Funding Request: How much fund is required and from where?

Say

- Teams will need to brainstorm for this part of the activity.
- Use the blank papers for the second part of this activity
- Make your business plan on a chart paper based on the following parameters:
 1. Executive Summary
 2. Business Description
 3. Market Analysis
 4. Organization and Management
 5. Service or Product Line
 6. Marketing and Sales
- Explain each parameter in detail as done in the Participant Handbook.
- Discuss each parameter with the business idea examples of the groups.
- Groups will discuss and develop the business plan for their business idea.

Say 

- Now, let's share our plan with the class.
- Each group will briefly describe the plan to the class.
- Post presentation, the other groups may ask questions to the group who have presented their plan.

Do 

- Congratulate each group for sharing their points.
- Ask the audience to applaud for them.
- Keep a check on time. Tell group to wind up the discussion quickly if they go beyond the given time limit.

Say 

- Along with a business plan, you need to create a financial plan and evaluate the risk involved with your start up.
- Discuss 'Financial Planning' and 'Risk Management' in detail as given in the Participant Handbook.

Summarize 

- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation 

- Keep the business plan format ready in a flipchart to display it during the activity.

UNIT 6.6.5: Procedures and Formalities for Bank Finance

Unit Objectives

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

- Describe the procedure and formalities for applying for bank finance

Resources to be Used

- Participant Handbook
- Bank loan/finance form sample

Ask

- While preparing a business plan in the last session, we discussed financial planning to arrange financial resources for your start-up. Therefore, how will you collect funds to start your business?

Say

- While most entrepreneurs think 'product' is the most difficult thing to decide for a business, start-up capital poses an even a bigger obstacle. Though there are various ways of funding the business, to convince investors to invest money is the most challenging.
- Some of the funding options available in India are:
 - ♦ **Bootstrapping:** Also called self-financing is the easiest way of financing
 - ♦ **Crowd funding:** Funds are collected by consumers pre-ordering or donating for starting the business.
 - ♦ **Angel investors:** Individual or group of investors investing in the company
 - ♦ **Venture capitalists:** Venture capitals are professionally managed funds who invest in companies that have huge potential. They usually invest in a business against equity.
 - ♦ **Bank loans:** The most popular method in India.
 - ♦ **Microfinance Providers or NBFCs**
 - ♦ **Government programmes**
- Let us know discuss the most popular method i.e. bank finance in detail here.

Do

- Discuss the list of documents that are required to apply for a loan like letter of introduction, business brochure, references of other banks, and financial statements.
- Explain the details to be filled in a loan application form.
- Divide the class into groups. Give each group a loan application form.
- Ask the groups to discuss and fill the form.

Summarize

- Close the discussion by summarizing the important documents needed for bank loan.
- Ask the participants if they have any questions related to what they have talked about so far.

Notes for Facilitation



- Checklist of documents is provided as resources for the session.
- You can make some copies and distribute it during the group activity.
- Download sample loan application forms from any nationalised bank's website. Print sufficient copies to circulate it amongst the groups.

CHECKLIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH LOAN APPLICATION (Common for all banks)
1. Audited financial statements of the business concern for the last three years
2. Provisional financial statements for the half – year ended on _____
3. Audited financial statements of associate concern/s for the last three years
4. Copy of QIS II for the previous quarter ended on _____
5. Operational details in Annexure I
6. CMA data for the last three years, estimates for current year and projection for the next year
7. Term loan/DPG requirements in Annexure II
8. List of machinery in respect of machinery offered as security in Annexure III
9. Additional details for export advances furnished in Annexure IV
10. Property statements of all directors/partners/proprietor/guarantors
11. Copies of ITAO of the company for the last three years
12. Copies of ITAOs/WTAOs of the directors/partners/proprietor and guarantors
13. Copies of certificate from banks and financial institutions certifying the latest liability with them
14. Copy of board resolution authorizing the company to apply to your bank for the credit facilities mentioned in application
15. Copy of memorandum and article of association (in case of limited company)/partnership deed (in case of partnership firm)
16. Cash budget for the current year and next year in case of contractors and seasonal industries

UNIT 6.6.6: Enterprise Management – An Overview: How to Manage Your Enterprise?

Unit Objectives

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

- Discuss how to manage their own enterprise

Resources to be Used

- Participant Handbook

Ask

- Having set-up a business, do you think it is possible to do everything on your own?
- Does one require trained persons for help?
- What does management mean?

Say

- Let's have a look at this example:

Kapil had a small business that was beginning to pick up pace. He wanted to expand his business, and therefore employed few more people. One day, as he was walking past Ramesh, one of his new employees, he overheard Ramesh talking rudely to a customer on the phone. This set him thinking. Kapil realised that he should have regular team meetings to motivate his employees and speak with them about any problems they might be facing during work. He should also conduct training sessions on new practices, soft skills, and technology, and develop work ethics manual for managing his enterprise.

Say

- Was Kapil correct in his approach or he should have scolded Ramesh instantly in front of his other employees?
- Discuss “Enterprise Management – An Overview” with the participants as given in the Participant Handbook.

Say

- Let's learn how to effectively manage an enterprise or business through an activity.

Team Activity

Enterprise Management

- This is a group activity.
- Design a matrix listing the topics and key words that are needed to run an enterprise effectively and smoothly.

Activity De-brief

- Have each group present their matrix.
- Encourage participants of the other groups to ask question about each other's presentation.

Do 

- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper and coloured pen.
- Tell the participants that they have to make a matrix they need to fill.
- They have to write the main topics and key words that will help them effectively manage their enterprise.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize 

- Ask the participants what they have learned from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of effective management to run an enterprise as given in the Participant Handbook.

UNIT 6.6.7: 20 Questions to Ask Yourself before Considering Entrepreneurship

Unit Objectives

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

- List the important questions that every entrepreneur should ask before starting an enterprise

Resources to be Used

- Participant Handbook
- Blank sheets of paper
- Pens

Ask

- Why do you want to become an entrepreneur?

Say

- It is very important to know why you want to become an entrepreneur. Your personal goals for becoming an entrepreneur play a key role in the success of your business. Your goals should be clear well before you start your business.
- Apart from the goals, the other aspects of business that you need to bear in mind are the potential problems that you may face to set-up, your areas of interest, and all the other dimensions of the business.
- Let's understand it better with the help of some questions that every entrepreneur should ask before starting their own business.
- Open the Participant Handbook section named '20 Questions to Ask Yourself Before Considering Entrepreneurship'. You have to answer the questions individually.
- Then, we will have a class discussion on all the questions.

Do

- Read out the questions one by one in front of all the participants.
- Participants have to answer all the one by one questions.
- Give the class 10-15 minutes to note down their answers.
- At the end of 15 minutes, open the discussion for all the questions.
- Moderate the discussion by focusing on the relevant points.
- Keep a check on time and don't let the discussion get sabotaged or lose track of time. Ensure all the questions are covered and discussed.

Summarize

- Ask the participants what they have learned from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.

Annexure I

Training Delivery Plan

Training Delivery Plan			
Program Name:	Tower Technician		
Qualification Pack Name & Ref. ID	TEL/Q4100, Version Number 1.0		
Version No.	1.0	Version Update Date	31/08/2016
Pre-requisites to Training (if any)	Preferably equivalent to 10+2		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Acquaint self with facets of preventive and corrective maintenance: Adhere to plans for PM and CM. • Identify importance of site hygiene: Maintain and monitor, DG, PIU, SMPS, battery bank and surrounding area. • Execute operational activities: scrutinize electricity bill, PIU, alarms and fuel • Aggregate potential knowledge and skill to vouchsafe the importance of health and safety: Safeguard compliance of safety regulations, personal protection, fire regulation and environmental condition. • Comprehend and initiate importance of documentation: Maintain checklist, reports, and issues for future reference. 		

Sl. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration
1.1	Introduction	Icebreaker	Get the introduction of the faculty, Introduce themselves with all the fellow students, Build rapport with other students and the trainer.		Interaction within class, Every student to introduce himself/speak, Show video.	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	T-0.5hrs P-0hrs
1.2	Introduction	Objective of the Course	Introduce the Course and job Role, Explain the relevance of the course		Teacher talking in the class, Interaction within class, Show video.	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	T-0.5hrs P-0hrs
1.3	Introduction	Telecom Industry in India	Discuss the evolution and growth of the Telecom industry in India, Talk about the future growth which is expected in the industry.		Class room teaching, Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	

1.4	Introduction	Types of Communication	Clearly understand the definition of telecommunication, talk about wire line and wireless communication, differentiate between wireless and wire line communication		Class room teaching , Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	T - 3hrs P - 0hrs
1.5	Introduction	Types of Cellular Network	Differentiate between 2G, 3G, 4G and 5G networks, Understand the advantages of new technology networks over previous ones		Class room teaching , Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Voice system.	
1.6	Introduction	Component of Cellular Network	Know about the components used in a GSM network, Understand the use of a SIM card in a mobile station, Identify the role of a BTS (Base Transceiver Station) in the mobile communication, Explain how internet traffic flows from a mobile station to IWF (Interworking function) and internet, Discuss the use of various databases and how security is implemented		Class room teaching , Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Projector	
1.7	Introduction	Tower Infrastructure Industry	Highlight the need of a tower infrastructure industry and the investment needed in it, Appreciate the reasons of frequent mergers and acquisitions in this industry, Talk about the major companies in this industry in India, Understand the concept of Infrastructure sharing.		Class room teaching , Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	
1.8	Introduction	Career Progression as Tower Technician	Understand the responsibilities of a tower technician, Get aware of the concept of SLAs which he has to work on, Understand the organizational hierarchy in an tower infrastructure company, Define a growth path for him as a career		Class room teaching , Interaction with class	Classroom, Voice system, Board, Pen, Board/ Pen, Projector.	

2.1	Site Hygiene	Introduction to Components at a Tower Site	Get an overview of various components at a tower site, positioning of these components in the telecom tower, Understand the functioning of each component, know about the tools used.	TEL/N4100	Class room teaching	Take permission to visit a tower site with participants.	T - 6/ P - 0
2.2	Site Hygiene	Tower	Understand the steps involved in identifying a telecom tower site, To describe the civil work for construction of a site, Explain the important points for takeover of the site once it is ready, Differentiate between types of towers used in a telecom networks		Class room teaching and Practical training	Projector, Board, Marker, visit to a towersite	T - 4/ P - 2
2.3	Site Hygiene	Telecom Shelter Unit	Discuss the definition of a shelter, Identify the parts of a shelter, Differentiate between different type of shelters, Understand the usage of a shelter, Explain the structure of PUF panel, Maintain the site hygiene for a shelter site		Class room teaching and Practical training	Projector, Board, Marker, visit to a tower site	T - 2/ P - 4
2.4	Site Hygiene	PIU-Power Interface Unit	Understand the concept of Power Interface unit (PIU), Know the features and functioning of various components of a PIU, Do's and Don'ts of a PIU site, Understand the technical specification of a PIU		Class room teaching and Practical training	PIU which can be opened for demonstration to participants, Tool Kit	T - 2/ P - 2
2.5	Site Hygiene	Battery Bank	Understand the concept of a battery bank, Differentiate between a cell and a battery, Know about the types of batteries used, Understand the working of the Lead Acid Batteries, Differentiate between types of lead Acid Batteries, Selection of right capacity of VRLA battery, Understand the need of the site hygiene for a battery bank, Know about the do's and don'ts of a battery bank		Class room teaching and Practical training	Battery Bank, Hydrometer, Gloves, Distilled water, Funnel, turkey baster, Voltmeter, Ammeter. Battery, SMPS, spanners, Cable and Lugs, Jelly, Projector, Board, Marker Duster	T - 10hrs P - 16hrs

2.6	Site Hygiene	Power Plant/Rectifier Unit	Get an understanding of the SMPS power plant, Know the features and components of SMPS Power Plant, Maintain the Site Hygiene for a power plant.	TEL/N4100	Class room teaching and Practical training	SMPS Power Plant , Battery Bank	T-2hrs P-4hrs
2.7	Site Hygiene	Air Conditionning	Understand the need of AC at a tower site, Demonstrate the knowledge of different types of AC systems, Identify how to provide perfect environment protection at a site, Maintain the site hygiene for air conditioner unit		Class room teaching and Practical training	Air Conditioner Unit, Screw Driver set.	T-2hrs P-4hrs
2.8	Site Hygiene	Fire Extinguisher and Smoke Detectors	Understand the reasons of fire hazards, Timely action to control the fire, See how extension of alarms help in fire safety, Discuss about the sensors used for fire safety		Class room teaching and Practical training	Fire safety equipment, Sensors and alarms	T-2hrs P-2hrs
2.9	Site Hygiene	EB Supply	Know about the three phase power supply from Electricity Board. Explain how this energy coming from EB is measured, State that how electricity flow through a tower site happens, Maintain the Site Hygiene guidelines for the Electricity Board Supply		Class room teaching and Practical training	Electricity meter, connection to electricity board	T-1hrs P-0hrs
2.10	Site Hygiene	Earthing	Discuss why Earthing is important for a site, Demonstrate different Earth pits needed at a site, Identify internal details of the Earth pit, Discuss Internal and External Grounding Bar and its connections, Understand overall Earthing connectivity at a tower site, Understand different types of Earthing, Maintain the Site Hygiene needed for proper Earthing		Class room teaching and Practical training	Multiple ground rods, ground plates, ground loops. Megger, Funnel with Wire mesh, Clamp on test meter, Ground tester	T-10hrs P-16hrs
2.11	Site Hygiene	Aviation Lamp	Understand the Concept and use of Lightning Arrestor and Aviation Lamp, Demonstrate the connectivity details of a Lightning Arrestor, Maintain the Site Hygiene for Lightning Arrestor and Aviation Lamp		Class room teaching	Board, Marker, Projector,	T-1hrs P-0hrs

2.12	Site Hygiene	Diesel Generator	Develop good understanding about Diesel Generator and its components, Demonstrate installation and commissioning check points, Identify the safety measures to be observed while working on a DG, Maintain the Site Hygiene at a Diesel Generator site.		Class room teaching and Practical training	Tool set, A Diesel Generator which can be dismantled, Parts of a Diesel Generator for demonstration ,Automatic Voltage Regulator	T - 10hrs P - 32hrs
2.13	Site Hygiene	Guidelines for First-Aid Facilities	Gain knowledge of the first aid kit and its components		Class room teaching and Practical training	First Aid Specialist team, First Aid Box	T - 2hrs P - 4hrs
3.1	Preventive and Corrective Maintenance	Guideline for Maintenance Activities	Understand the description of the key words used during the maintenance activity, Identify the guidelines which are to be followed while doing the maintenance activity		Class room teaching	Board, Marker, Projector,	T - 2hrs P - 0hrs
3.2	Preventive and Corrective Maintenance	Routine Preventive Maintenance	Explain the daily maintenance activities, Implement the weekly, monthly, quarterly, half yearly and annual maintenance activities, Take up maintenance activities as and when they are required		Class room teaching	Board, Marker, Projector,	T - 3hrs P - 0hrs
3.3	Preventive and Corrective Maintenance	Maintenance of Batteries	Understand the maintenance activities to be performed on a battery bank, Identify the precautions to be taken while handling batteries, Differentiate between system monitoring and troubleshooting while maintenance of a battery bank.	TEL/N4101 & TEL/N4104	Class room and Practical training	battery bank and tool kit for installation, Voltmeter, stickers, Markers, Petroleum Jelly, Cloth, PIU, Ammeter, DC Voltmeter/multimeter, DC Clamp meter, Insulation Tape, blank Test format Printouts, Pen/Pencil.	T - 10hrs P - 30hrs
3.4	Preventive and Corrective Maintenance	Maintenance of Diesel Generator	Know the critical requirements of a DG site, Identify the check points and avoidance of common mistakes that need to be observed while installation of DG, Learn the importance of proper maintenance,		Class room and Practical training	Diesel Generator, DC voltmeter/multimeter, standard toolkit containing tester, screwdriver, plier, insulation Tape etc,	T - 18hrs P - 24hrs

			Follow the general safety instructions while using a DG, Discuss the precautions need to be taken while using an Alternator, Perform the corrective maintenance of a DG.			Vario-us spare parts like air filter element, clean cloth, Oil Filter element, sealing ring, Oil filter wrench, feeler gauge, V belt etc.	
3.5	Preventive and Corrective Maintenance	Maintenance of Diesel Generator	Understand the activities to be performed under preventive maintenance of tower & shelter, make your own beat plan as per your company's guidelines. importance of proper maintenance, Follow the general safety instructions while using a DG, Discuss the precautions need to be taken while using an Alternator, Perform the corrective maintenance of a DG.	TEL/N4101 & TEL/N4104	Class room and Practical training	Visit to a tower site Various spare parts like air filter element, clean cloth, Oil Filter element, sealing ring, Oil filter wrench, feeler gauge, V belt etc.	T - 2hrs P - 4hrs
3.6	Preventive and Corrective Maintenance	Maintenance of AC Plant	Understand the activities to be performed under preventive and corrective maintenance of AC plant, make your own beat plan as per your company's maintenance policy.		Class room and Practical training	AC plant which can be dismantled and reconnected, clean cloth, various spare parts as needed.	T - 2hrs P - 4hrs
3.7	Preventive and Corrective Maintenance	Maintenance of SMPS Power Plant	Understand the reasons of fire hazards, Timely action to control the fire, See how extension of alarms help in fire safety, Discuss about the sensors used for fire safety		Class room teaching and Practical training	Fire safety equipment, Sensors and alarms	T - 2hrs P - 4hrs
3.8	Preventive and Corrective Maintenance	EB Supply	Understand the activities to be performed for preventive and corrective maintenance of the SMPS power plant, make your own beat plan as per your company's maintenance policy, perform practical exercises required to maintain a SMPS power plant.		Class room and Practical training	PIU/ AMF, ACPDB, SMPS Power Unit, DCPDB, Input AC Power, Diesel generator set, Standard Toolkit containing Tester, Screwdriver, Plier, wrench, feeler gauge etc., Clean Cloth, various spare parts as needed.	T - 3hrs P - 4hrs

4.1	Site Management	Introduction to Site Management	Explain the concept and process of site management, understand day to day site management activities like interaction with the electricity board, landlord, fuel filling vendors, other authorities and ensure timely payment of their bills/building healthy relationships with all of them.	TEL/N4102	Class room and Practical training	Projector, Board and marker, slide showing the activities to be performed	T-2hrs P-13hrs
4.2	Site Management	Waste Management at Site	Discuss the concept of waste management, differentiate between types of waste generated at the site ,Identify actions you need to take to dispose off this waste.		Class room and Practical training	Projector, board, marker,	T - 2/ P - 2
4.3	Site Management	Operating Equipment at Site	Understand the procedure to operate various equipment like a DG Set, Fire Extinguisher at site.		Class Room and Practical training	PIU/ AMF, ACPDB, SMPS Power Unit, DCPDB, Input AC Power, Diesel generator set, Standard Toolkit, Clean Cloth, Visit to a tower site.	T - 1/ P - 3
4.4	Site Management	Fault Management System	Understand the Concept and architecture of Network Management and fault management system, Identify the components including the backend system of a fault management system, understand how alarms get routed to various interface.		Class room training	Projector, board and marker, slide showing details to be explained	T - 4hrs P - 4hrs
5.1	Introduction to Task Reporting	Introduction to Task Reporting	Understand the concept and need of Task Reporting, timely report filling and record maintenance of various activities happening at a site.	TEL/N103	Class room training	Projector, board and marker, slide showing details to be explained	T - 1hrs P - 1hrs
5.2	Introduction to Task Reporting	Site Check List	Develop an understanding of reporting formats, structures and SLAs as per company policy, update all information about the site at one place, discuss the format of daily reporting, record all activities at site on daily basis		Class room training	Projector, board and marker, slide showing details to be explained	T - 1hrs P - 1hrs
5.3	Introduction to Task Reporting	Alarm Management Report	Develop an understanding of reporting formats, structures and SLAs of Alarm Management system		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs

5.4	Introduction to Task Reporting	Preventive Maintenance Report	Develop an understanding of reporting formats, structures and SLAs of Acceptance testing reports	TEL/N4103	Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs
5.5	Introduction to Task Reporting	Acceptance Testing Report	Develop an understanding of reporting formats, structures and SLAs of Alarm Management system		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs
5.6	Introduction to Task Reporting	Fuel and Energy Management Report	Develop an understanding of reporting formats, structures and SLAs of Fuel and energy management report		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs
5.7	Introduction to Task Reporting	Outage Anaysis Report	Develop an understanding of reporting formats, structures and SLAs of outage analysis reports		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs
5.8	Introduction to Task Reporting	Outage Management Report	Discuss the reporting formats, structures and SLAs of outage management report		Class room training	Projector, board, marker, slide showing details to be explained	T - 2hrs P - 0hrs
5.9	Introduction to Task Reporting	Site Equipment Data Management	Explain the reporting formats, structures and SLAs of site equipment management reports		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs
5.10	Introduction to Task Reporting	Battery Testing Report	Elaborate various reports used for battery testing and maintenance		Class room training	Projector, board, marker, slide showing details to be explained	T - 1hrs P - 0hrs

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for Tower Technician	
Job Role	Tower Technician
Qualification Pack	TEL/N4100, Version No. 1.0
Sector Skill Council	Telecom

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) will be assigned marks proportional to its importance in NOS. TSSC 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 TSSC.
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 question papers for theory and skill practical part for each candidate at each examination/training center.
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS and 70% pass percentage overall.
6	To pass the Qualification Pack, every trainee should score overall of 70%.

ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	Total Marks	Out Of	MARKS ALLOCATION	
				Theory	Skills Practical
1. TEL/N4100: Site Hygiene	PC.1 Maintain site hygiene of AC, DG, PIU, SMPS and battery bank, as per organization's norm	100	10	10	0
	PC2. Check leakage, rattles and shakes at the tower site		10	5	5
	PC3. Check if installation of fire safety instruments is in place		10	10	0
	PC4. Control fire accident incidents		15	15	0
	PC5. Check the site as per electrical safety norms		20	10	10
	PC6. Check proper floor markings, shadow board display and labels		10	10	0

ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	Total Marks	Out Of	MARKS ALLOCATION	
				Theory	Skills Practical
	PC7. Check diesel consumption and highlight excessive consumption to supervisor		15	15	0
	PC8. Conduct work area audit as per company check lists		5	5	0
	PC9. Maintain checklist of standards laid by the company		5	5	0
	Total		100	85	15
2. TEL/N4101: Preventive Maintenance	PC1. Adhere to PM (preventive maintenance) plan		5	5	0
	PC2. Comply with Beat plan execution, for self		5	5	0
	PC3. Conduct site PM (preventive maintenance)		20	0	20
	PC4. Keep a check on site up-time		5	5	0
	PC5. Perform unique site down PM (preventive maintenance)		15	7	8
	PC6. Perform health check on site like checking engine oil, voltage etc.		15	6	9
	PC7. Check premature ageing of Battery Bank, Diesel Generator, Air Conditioner, PIU and SMPS		15	6	9
	PC8. Monitor outages due to Diesel Generator		5	5	0
	PC9. Close maximum number of complaints registered		5	5	0
	PC10. Provide timely resolutions to trouble tickets raised		5	5	0
	PC11. Comply with preventive maintenance schedule		5	5	0
	Total		100	48	52
3. TEL/N4102 : Site Management	PC1. Monitor reading as per EB (electricity bill) against reading on PIU (power interface unit)	100	10	5	5
	PC2. Timely collect and submit the EB (electricity bill) at the office		5	5	0
	PC3. Check number of alarms active at the site		20	5	15
	PC4. Check site for faulty alarms		20	10	10
	PC5. Attend alarms within the defined SLA		10	5	5
	PC6. Identify the reasons for site lock.		20	10	10
	PC7. Co-ordinate with service providers for quality fuel to be filled		10	10	0
	PC8. Interact with site owners w.r.t. rent, access issues etc.		5	5	0
	Total		100	52	48

ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	Total Marks	Out Of	MARKS ALLOCATION	
				Theory	Skills Practical
TEL/N4103: Task Reporting	PC1. Escalate faults/issues at site to supervisor	100	10	10	0
	PC2. Fill the preventive maintenance checklists/ reports		20	0	20
	PC3. Fill the corrective maintenance checklists/ reports		20	0	20
	PC4. Accurately report diesel filling, electricity bill and DG reading		20	10	10
	PC5. Report any changes in the site or movement of any material		15	10	5
	PC6. Report theft if any from the site location		10	10	6
	PC7. Report movement of tower technicians to supervisor		5	5	0
Total		100	45	55	
5. TEL/N4104: Corrective Maintenance	PC1. Timely identification of the need for corrective maintenance	100	25	10	15
	PC2. Adhere to maintenance plan		10	10	0
	PC3. Effective corrective maintenance on all equipment		35	0	35
	PC4. Escalate faults/issues at site to supervisor		10	10	0
	PC5. Fill the corrective maintenance checklists/reports		10	10	0
	PC6. Close maximum number of faults reported		10	10	0
	Total			100	50

Do



- Explain each Guideline for Assessment in detail
- Explain the score that each trainee needs to obtain
- Recapitulate each NOS one-by-one and take participants through the allocation of marks for Theory and Skills Practical.
- Explain the Allocation of Marks. Explain that they will be assessed on Theory and Skills Practical.
- Explain that for the first NOS, <22> marks are allotted for Theory and <78>for Skills Practical.



Skill India

कौशल भारत - कुशल भारत



सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP



N.S.D.C.
National
Skill Development
Corporation

Transforming the skill landscape



Address: 2nd Floor, Plot No:- 105, Sector 44,

Gurgaon,
Haryana, 122003

Email: tssc@tsscindia.com

Web: www.tsscindia.com

Phone: +91-124 4148029



978-1-111-22222-45-7