Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

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National
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Participant Handbook

Sector
Iron & Steel

Sub-Sector
Steel, Sponge Iron, Ferro Alloy, Re-Roller, Refractory

Occupation
Electrical Maintenance

Reference ID: **ISC/Q1001, Version 1.0**
NSQF Level 3

Fitter - Electrical Assembly

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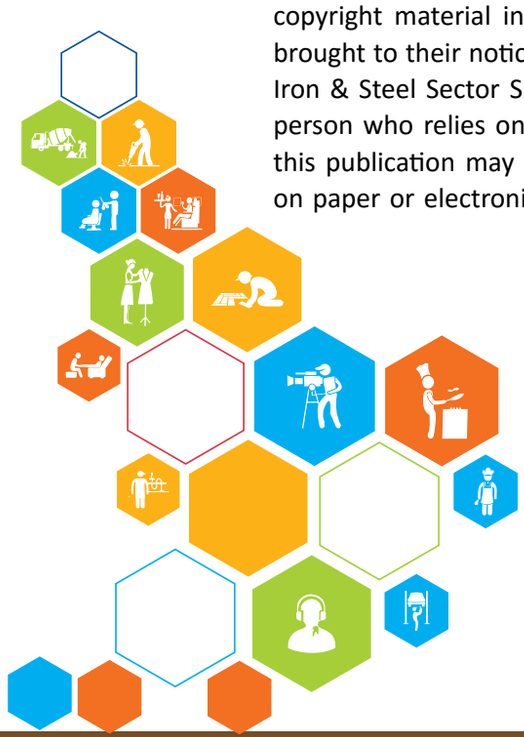

> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

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Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

Iron & Steel Sector Skill Council

for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Fitter - Electrical Assembly'** QP No. **' ISC/Q1001 NSQF Level 3 '**

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Authorised Signatory
Iron & Steel Skill Development Council

Acknowledgements

About this book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP) of Iron & Steel Industry. Each National Occupational (NOS) is covered across the Units.

Fitter is responsible for identifying the operations required to assemble various components of the machine and electrical panel by studying their engineering drawings, fitting different components of the machine to perform assigned task and testing the assembled machine. This book is all about training of operations required to assemble various components of the machine by studying their engineering drawings, fitting different components of the machine and testing the assembled machine under the proper supervision.

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

Symbols Used


Key Learning Outcomes


Steps


Exercise


Tips


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Unit Objectives

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1. Introduction

Unit 1.1- Understanding of Iron & Steel Industry

Unit 1.2- Understanding various types of Iron & Steel Industry

Unit 1.3- Creation of products in Iron & Steel Industry

Key Learning Outcomes

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

1. Discuss about Iron & Steel industry
2. Discuss about development activities in Iron & Steel industry
3. Discuss about employment opportunities in India
4. Know about industry structure
5. Know about Iron & Steel plants in India
6. Know about steel making procedure
7. Know about processes involved in steel making

Unit 1.1: Understanding of Iron & Steel Industry

Unit Objectives

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

1. Understand about Iron & Steel industry
2. Know about of development activities in the industry
3. Know about of opportunities in Iron & Steel Industry in India

1.1.1 Introduction

India comes under the list of world's largest crude steel producer countries. The growth of steel sector in India has been motivated by availability of raw materials like iron ore and cheap labour. Thus, the steel sector is giving an important contribution to India's manufacturing industry.

Now crude steel capacity of India reached 109.85 Million tonnes (MT), with a growth of 7.4 per cent. Production of crude steel grew by 8.9 per cent to 88. 98 MT. Total finished steel production for sale increased by 5.1 per cent to 92.16 MT. Consumption of total finished steel increased 3.9 per cent to 76.99 MT.

India is now producing 7.34 MT of steel. The steel sector in India contributes nearly two per cent of the country's gross domestic product (GDP) and employs over 600,000 people.

1.1.2 Conditions for the growth of Iron and Steel Industries

The favorable conditions for the growth of Iron and Steel sector are:

1. Requirement of large amount of iron ore and coal for production of steel. Therefore establishment of industry is required near iron-ore producing areas or coal producing areas.
2. The factories are generally located near rivers or lakes also because large quantity of water is required to cool the smelt iron.

Other factors affecting the location of the steel plants are:

- availability of cheap labor near the steel plant,
- nearby market, ports, etc.

Huge amount of investment is requisite for setting up of Iron and Steel plants. Though India has enough volume of coal, iron-ore and cheap labor, but requirement of large investment makes it difficult to set up many steel plants.

1.1.3 Development activities in Iron & Steel industry

Investments

In India, Steel industry has seen a number of major investments and developments in past few years.

According to the data, the Indian metallurgical industries attracted Foreign Direct Investments (FDI) of around US$ 8.7 billion.

Some of the major investments in the Indian steel industry are as follows:

- National Mineral Development Corporation (NMDC) invested Rs 40,000 crore to attain mining capacity of 75 million tonnes per annum (MTPA) by FY2018-19 and 100 MTPA by FY2021-22.
- Posco Korea, a multinational Korean steel company, has signed an agreement with Shree Uttam Steel and Power to set up a steel plant in Maharashtra.
- Arcelor-Mittal, made a joint venture with Steel Authority of India Ltd (SAIL) for setting up an automotive steel manufacturing facility in India.
- NMDC made an investment of Rs 18,000 crore for setting up a greenfield 3-million tonne per annum steel mill in Karnataka jointly with the state government.
- JSW Steel planned to make its Karnataka steel plant, largest in India with the capacity of 20 MT by 2022.

Government Initiatives

Indian government is aiming to increase steel production to 300 MT by 2025 in the country.

The Ministry of Steel has announced to invest in expansion of steel plants of SAIL and Rashtriya Ispat Nigam Limited (RINL) in various states to enhance the crude steel production capacity.

The Minister of Steel & Mines has restated assurance of Central Government to support the steel industry for reaching production target of 300 MTPA in 2025.

The Ministry of Steel is facilitating setting up of an industry driven Steel Research and Technology Mission of India (SRTMI) in association with the public and private sector steel companies to spearhead research and development activities in the iron and steel industry at an initial corpus of Rs 200 crore (US$ 31.67 million).

Some of the other recent government initiatives in this sector are as follows:

- Government has planned Special Purpose Vehicles (SPVs) with four iron ore rich states i.e., Karnataka, Jharkhand, Orissa, and Chhattisgarh to set up plants having capacity between 3 to 6 MTPA.
- SAIL plans to invest US$ 23.8 billion for increasing its production to 50 MTPA by 2025. SAIL is currently expanding its capacity from 13 MTPA to 23 MTPA, at an investment of US$ 9.6 billion.
- To increase domestic value addition and improve iron ore availability for domestic steel industry, duty on export of iron ore has been increased to 30 per cent.

1.1.4 Employment opportunities in Iron & Steel industry

The total employment in the steel industry is more than 2 million which includes both direct and indirect employment. Steel companies have contributed to the overall development of economically backward regions like civic, medical, educational and other facilities because most of the Steel plants are established in these areas of the country. Labor requirements at non-executive level are very high, so large number of weaker section of the society get the advantage of employment. Over the past few years, large number of auxiliary industries has also established in the surrounding area of steel plants. This industrialization of backward areas has created more employment opportunities for local unemployed persons.

For past few years, the growth steel industry in India is tremendous and steady, which is supported by many Indian Government initiatives. This momentum of growth in steel industry is definitely a boost for the future growth of Indian steel industry.

Unit 1.2: Understanding various types of Iron & Steel Industry

Unit Objectives

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

1. Understand about Iron & Steel industry structure
2. Know about Iron & Steel plants in India

1.2.1 Industry structure

The Iron and Steel Industry in India is separated into two divisions:

- Integrated producers, and
- Secondary producers

The major producers like Tata Iron and Steel Company Limited (TISCO), Steel Authority of India Limited (SAIL) and Rashtriya Ispat Nigam Limited (RINL) who generate steel by converting iron ore are the **Integrated producers.**

Ispat Industries, Lloyds steel and Essar Steel, produce steel by melting scrap iron are **secondary producers**. These are mainly small steel plants and produce steel in electric furnaces, using scrap and sponge iron. They produce both mild steel and alloy steel of given specifications.

1.2.2 Major Iron and Steel Plants of India

List of Major Iron and Steel producing companies in India

1. Tata Steel (ranked 11th in the world in terms of production of steel)
2. Steel Authority of India (SAIL) – ranked 29th in the world.
3. JSW Steel Limited – ranked 31 in the world.
4. Essar Steel
5. Jindal Steel and Power

6. Mahindra Ugine Steel

Some of the major Iron and Steel Plants of India are as follows:

1. Tata Iron and Steel Company (TISCO):

Fig 1.2.1 TISCO Plant

TISCO is the oldest iron and steel plant of India. It is a private sector enterprise. It was established in 1907 by Jamshedji Tata at Sakchi in Singhbhum district of Jharkhand. It started producing pig iron in 1911 and steel in 1912. The plant initially had capacity of producing 1.21 million tonnes of pig iron and 1.1 million tonnes of steel per annum. This capacity has been enhanced to 3.9 million tonnes of pig iron, 2 million tonnes of ingot steel and 3 million tonnes of saleable steel.

2. Indian Iron and Steel Company (IISCO)

Fig 1.2.2 IISCO Plant

Three plants at Kulti, Hirapur and Burnpur in West Bengal were set up in 1864, 1908 and 1937 respectively. These plants have been merged together and are known as Indian Iron and Steel Company (IISCO). IISCO has annual capacity of producing 10 lakh tonnes of steel. Currently it produces over 4 lakh tonnes of pig iron, more than 3.5 lakh tonnes of crude steel and around 3.8 lakh tonnes of saleable steel.

3. The Visweswaraya Iron and Steel Ltd:

Fig 1.2.3 Visweswaraya Iron and Steel Plant

It was established as Mysore Iron and Steel Company (MISCO) in 1923 by the erstwhile state of Mysore. It is located at Bhadravati on the banks of river Bhadravati in Shimoga district of

Karnataka. This plant was brought under state control in 1962 and was renamed as Visveswaraya Iron and Steel Ltd.. This plant has got a capacity of 1.38 lakh tonnes of steel.

Fig 1.2.4 Bhilai plant

4. Bhilai

Bhilai iron and steel centre was set up in Durg district of Chhattisgarh in 1957. Its initial capacity was 10 lakh tonnes which has been raised to 52 lakh tonnes.

5. Rourkela:

Plant of Hindustan Steel Limited at Rourkela is situated in the Sundargarh district of Orissa. It was set up with the help of the then West German firm, Krupps and Demang. It became operative in 1959

Fig 1.2.5 Rourkela Plant

There are more than 50 iron and steel industries in India their locations are given below in the table that follow

Name	Location	Owner
Tata Iron and Steel Corporation (TISCO)	Jamshedpur, Jharkhand	Tata Steel
Visvesvaraya Iron and Steel Plant	Bhadravati, Karnataka	SAIL
Bhilai Steel Plant	Chhattisgarh	SAIL
Durgapur Steel Plant	Durgapur, West Bengal	SAIL
Bokaro Steel Plant	Jharkhand	SAIL
Chandrapur Ferro Alloy Plant	Chandrapur, Maharashtra	SAIL
IISCO Steel Plant	Asansol, West Bengal	SAIL
Salem Steel Plant	Tamil Nadu	SAIL

Name	Location	Owner
Rourkela Steel Plant	Odisha	SAIL
Vijaynagar Steel Plant	Hospet, Bellary, Karnataka	Jindal Steel and Power
Vishakhpatnam Steel Plant	Vishakhapatnam, Andhra Pradesh	Rashtriya Ispat Nigam

Mini Steel Plants:

In addition to the integrated steel plants, a large number of decentralized secondary units produce steel by using steel scrap/sponge iron as raw material and electric arc furnace and induction furnace for processing. With capacity varying from ten thousand to five lakh tonnes, these are known as mini steel plants. It is easy to construct such plants and their gestation period is short.

Notes

Unit Objectives

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

1. Learn about steel making process
2. Learn about different processes involved in steel making

1.3.1 Steel making procedure

Steel production involves numerous process steps that can be laid out in various combinations depending on product mix, available raw materials and energy supply and investment capital. Key characteristics of the three main processing routes are as following:

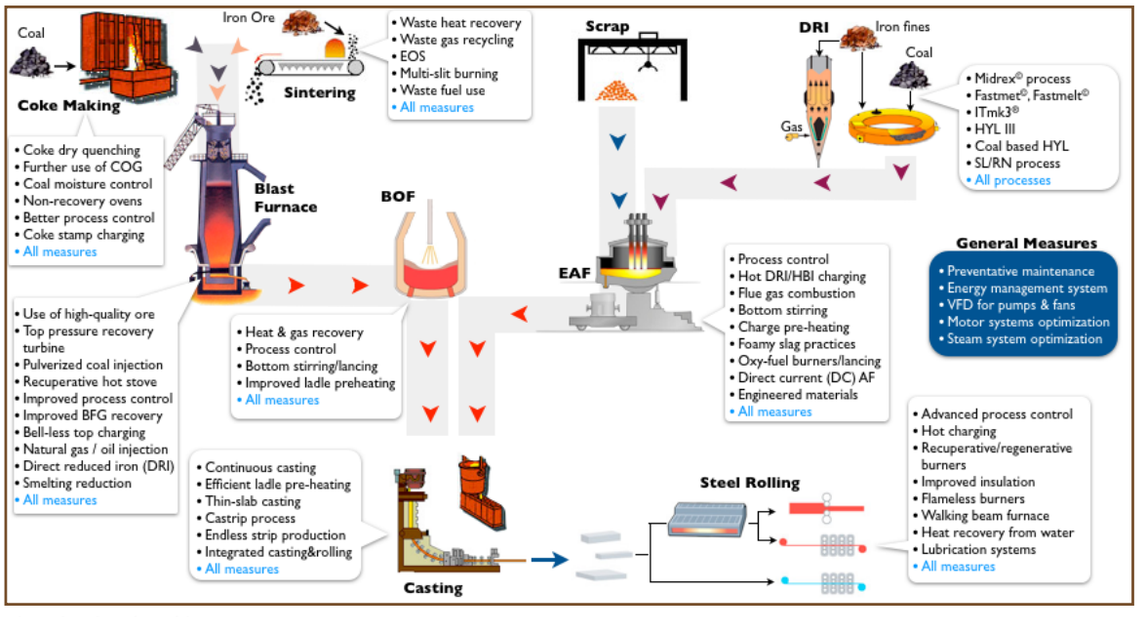

Fig 1.3.1 Steel making process

1. In Basic Oxygen Furnace (BOF)-Blast furnace (BF) route: pig iron is produced by using iron ore (70-100%) and coke in a blast furnace, and then turned into steel in a basic oxygen furnace. This way is extremely energy intensive, because of addition of coke making and sintering operations.
2. Electric Arc Furnace (EAF)-Scrap route: This route is primarily based on iron scrap as the input and has lower energy intensity in comparison with the BF-BOF route because of the

exclusion of coke making and iron making processes;

3. Direct Reduced Iron (DRI)-EAF route: This route is based on iron ore and iron scraps for the input.

1.3.2 Processes involve in steel making

1. Coke Making

Coke is a material with high carbon content and porosity. It has high resistance to breakage and low reactivity with gases, particularly CO2. Coke production is an important part of the integrated iron and steel plants using BF-BOF route, acting as a reducing agent, as a source of thermal energy, and providing physical support for the burden in blast furnace. Coke is produced by heating coking coals up to 1000 to 1200 °C for several hours in coke ovens to drive off volatile compounds and moisture.

2. Basic Oxygen Furnace

Hot metal or liquid iron contains about 4 % carbon and other impurities. In the next stage of steel making iron is converted into steel by reducing its carbon content and other impurities in basic

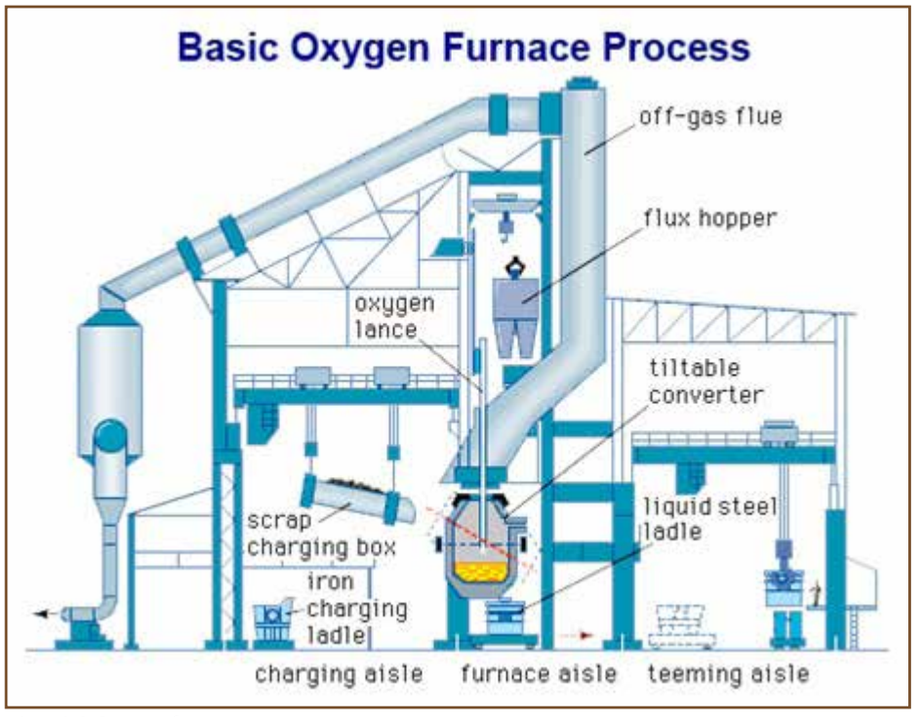

Fig 1.3.2 Oxygen furnace

oxygen furnace (BOF)

3. Electric Arc Furnace

Electric Arc Furnaces (EAFs) are a central part of the production route. They are used to produce carbon steels and alloy steels by recycling of ferrous scrap. In an EAF, scrap is melted and converted into high quality steel by using high-power electric arcs.

The main job of modern EAFs is to convert solid raw materials to liquid crude steel.

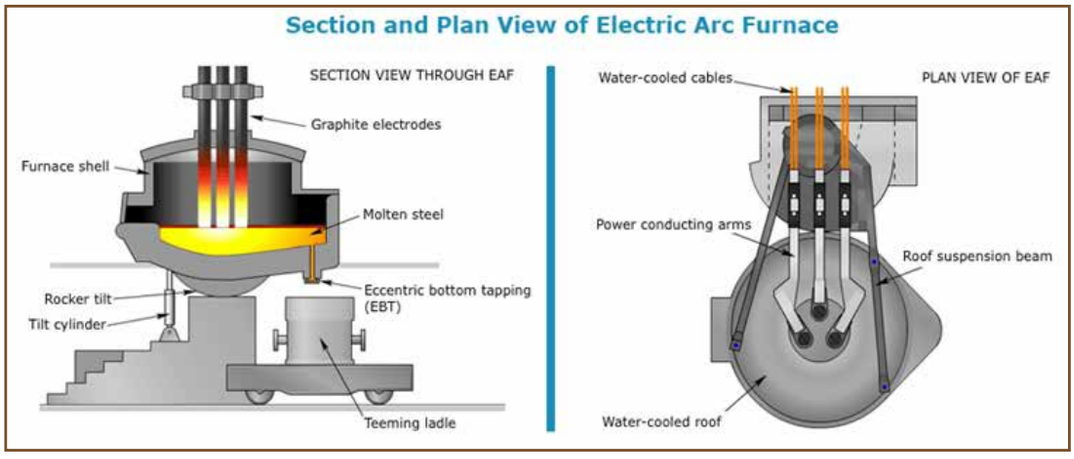

Fig 1.3.3 Electric arc furnace

4. Smelting Reduction

Smelting reduction unit combine processes for the gasification of coal with the melted iron ore. Smelting reduction unit has lower energy intensity than blast furnace.

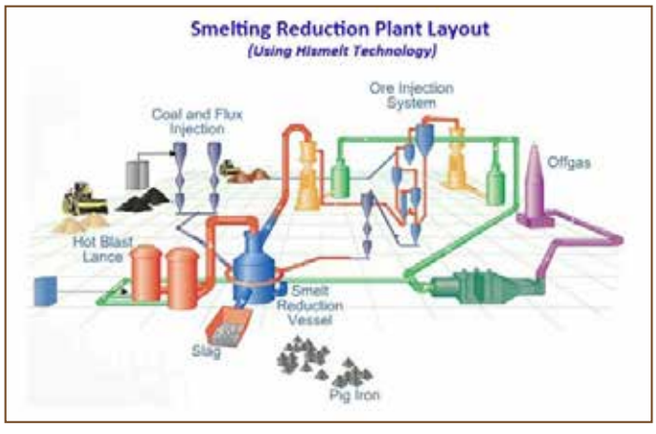

Fig 1.3.4 Smelting reduction plant layout

5. Sinter Plant

Fine particles of iron ore are pre treated before treating them in the blast furnace. This is done in the sinter plant where these are mixed with flux (limestone and dolomite) and heated to form solid pieces called sinter

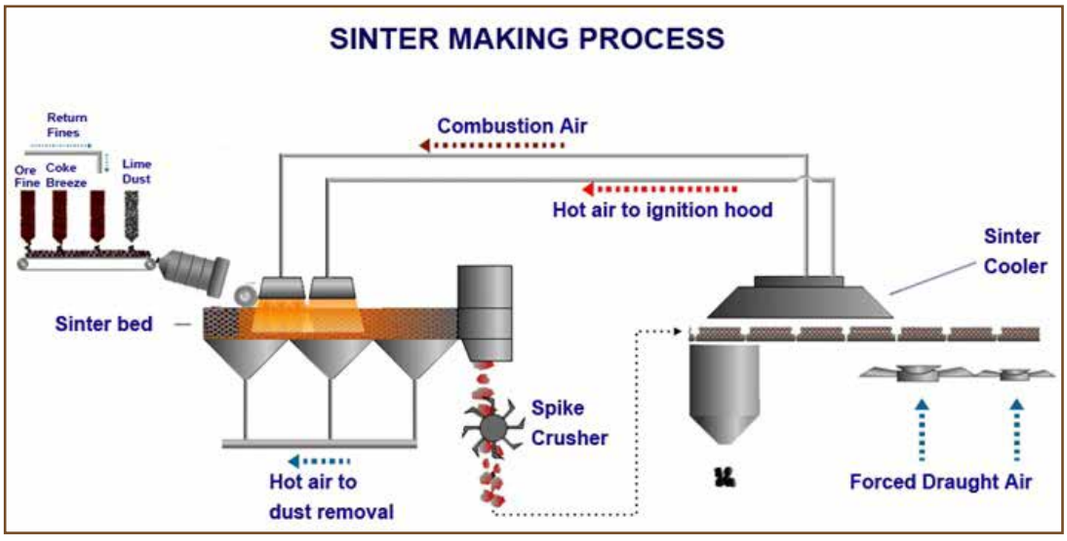

Fig 1.3.5 Sinter making process

6. Casting

A large range of processes required for finishing process are grouped under casting process. During casting, hot metal is turned into intermediary, saleable products. In most mills, casting is performed by casting machines.

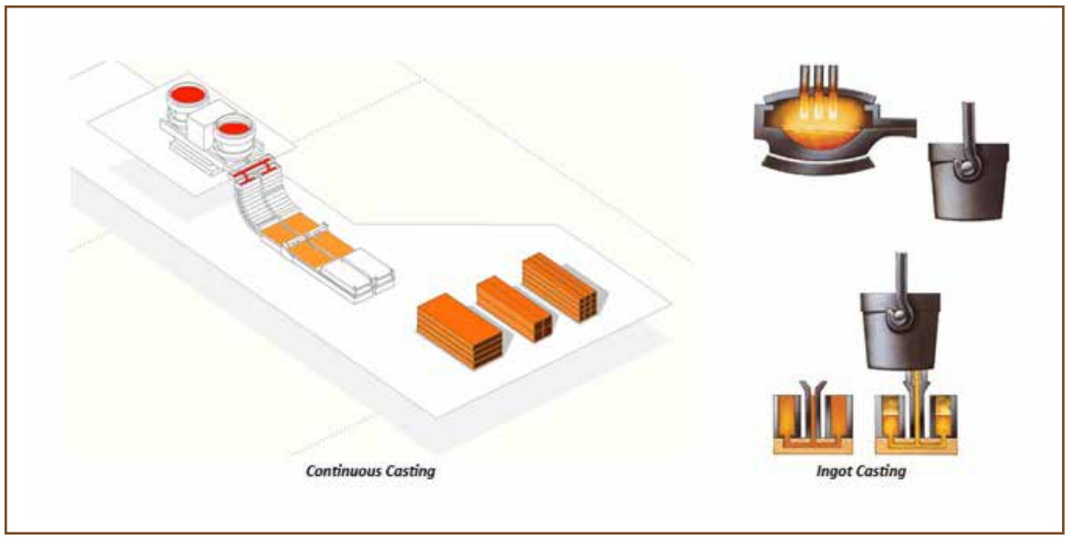

Fig 1.3.6 Steel Casting process

7. Direct Reduced Iron

In DRI, iron ore is reduced in its solid state. It is different than BF process where a liquid metal is formed during reduction. DRI then transformed steel in electric arc furnaces.

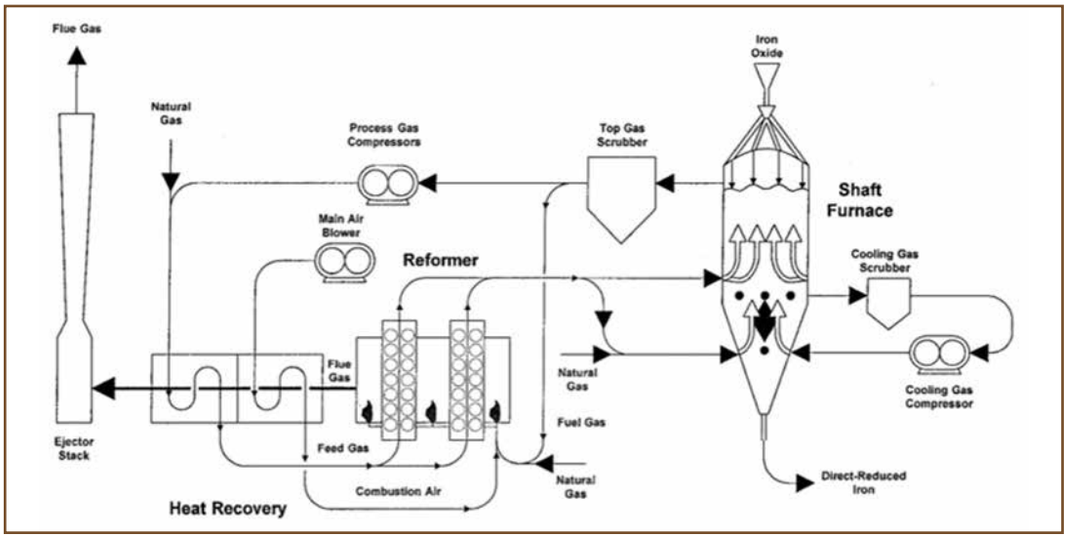

Fig 1.3.7 Iron reducing process

8. Blast furnace system

Iron ores, lumps, sinter, pellet and coke are fed in the blast furnace from top, whereas heated and pressurized air is blown from below, to trigger a series of chemical reaction through which iron is extracted from the iron ore in a hot molten state called hot metal.

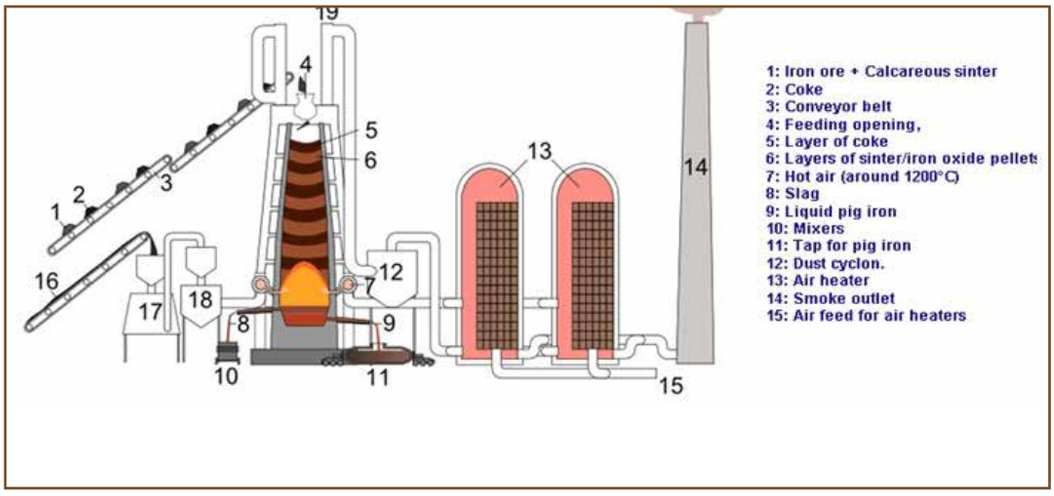

Fig 1.3.8 Blast furnace

9. Rolling Mills

In rolling mills, steel products are given to final dimension and shape by shaping and finishing processes. Iron slabs are heated in furnaces and rolled into final shape in hot or cold rolling mills.

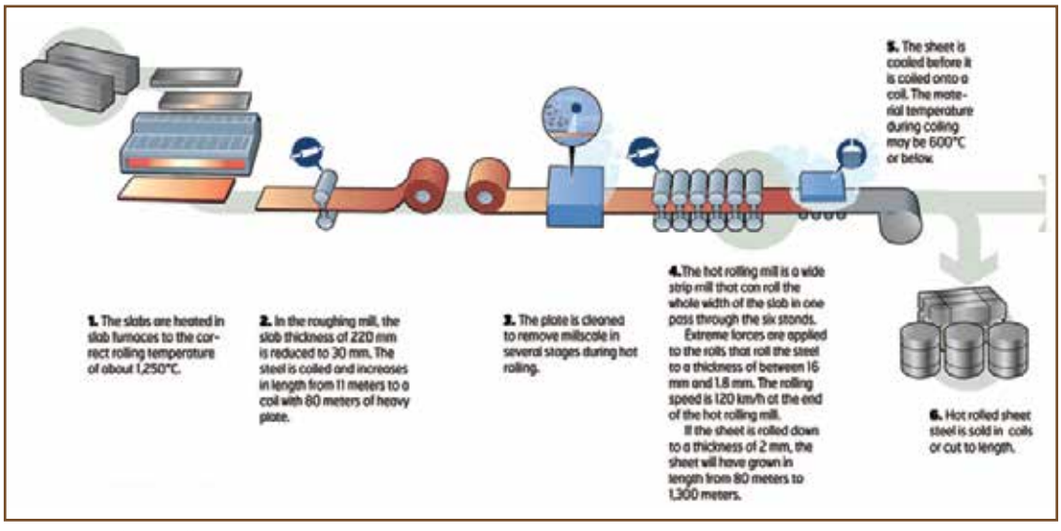

Fig 1.3.9 Rolling mills

Exercise

1. Iron and steel industry is an example of which type of industries?
   a. Basic industries
   b. Consumer industries
   c. Cooperative industries
   d. Joint sector industries

2. Name the marketing body through which all public sectors undertaking marketing their steel

   a. HAIL

   b. SAIL

   c. TATA Steel

   d. MNCC

3. Which is the only private sector iron and steel industrial city in India?

   a. Bhilai

   b. Durgapur

   c. Jamshedpur

   d. Salem

4. How tall, approximately, is a blast furnace?

   a. 40 m

   b. 4 m

   c. 4000 m

   d. 400 m

5. What are the three raw materials used in making iron?

   a. Iron ore, coal and coke

   b. Iron ore, coal and slag

   c. Coal, coke and limestone

   d. Iron ore, coal and limestone

6. What is the name of the process used to make steel from iron?

   a. The Basic Carbon process

   b. The Basic Oxygen process

   c. The Acidic Oxygen process

   d. The Casting process

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2. Occupational, Health and safety (OHAS)

ISC/N0008

Key Learning Outcomes

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

1. Know about Identify safety requirements, procedures, and resources for different areas
2. Know about safe work practices
3. Know about Identify hazards, types of hazards and how to control hazards
4. Know about PPE requirements
5. Know about safe working practices at heights
6. Know about safe working practices at confined spaces
7. Know about protection from fire hazards
8. Know about fire extinguisher and how to use it.
9. Know about first aid procedures

Unit 2.1: Learn occupational health and safety

Unit Objectives

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

1. Know about health and safety requirements in industry
2. Know about essential elements for safety
3. Know about good safety work practices

2.1.1 Safety in Steel plant

Steel plants are an industry of hazardous nature, so the health and safety of workers, equipment and environment are of severe worry in a steel plant. The health and safety of workers is a very important factor in this industry because it affects both social and economic factors of an organization. It is essential for management to understand the advantages of safe working practices and apply those practices at workplace to avoid hazards, production and manpower losses connected with the accidents.

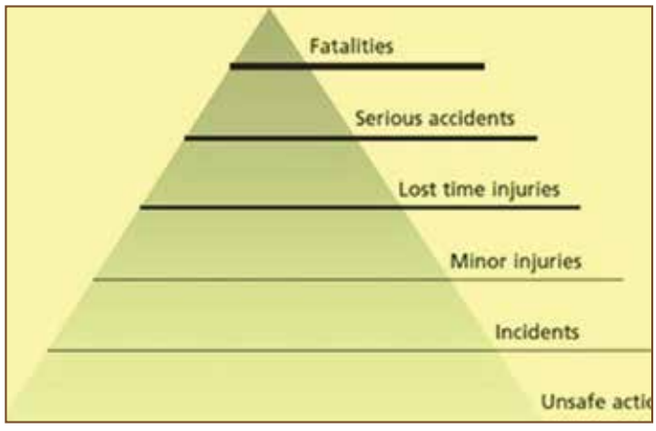

Fig. 2.1.1 The iceberg of accidents

Below shown an iceberg of incidents is showing the nature of various types of accidents. They are unsafe actions, lost time injuries, minor injuries, incidents, serious accidents and fatalities.

Every organization aim for zero accidents at workplace. This is every one's responsibility to make the working environment accident free. By following safe working practices and giving them priority, it is possible to reduce the accidents substantially since safe way of working also provides quality and proficient ways of working. The pyramid of overall goal of zero accidents is shown.

The following three features are vital for advancement of safety in a workshop:

- Situation of environment of work place in terms of plant access, housekeeping, safety and

Fig. 2.1.2 Pyramid of overall goal of zero ofaccidents

safe place of work etc.

- Workers training and ability which assists them to recognize and apply safe systems of work.
- The development of motivational and behavioral influences of employees. This includes identifying unsafe behavior and attitudes by using more direct strategies and to motivate employees.

2.1.2 Essential elements necessary for safety

Essential elements required for execution of safety culture in a steel plant are:

- Safety awareness has to be deep-rooted in the workforce as well as in the top management of the plant also.
- A communication plan, participation and commitment from maximum number of workers show the reality of implementation of safety activities.
- Recognize best safety practices and pass the ideas to fellow workers and senior management.
- Every organization has a suitable and well defined safety structure, which is easy to understand for everyone on the organization.
- There should be some mechanisms in an organization which influence the workers towards their health and safety.

- Management has to conduct training programs for demonstrating how an employee attitude and behavior towards health and safety is an essential part for the growth of career.

2.1.3 Good safety practices

Good safety practices in an organization are:

- Assigning duties to the employees associated with the health and safety department in the steel plant.
- Investigation and reporting of all accidents whether they are small or big.
- Learning about safe working ways by studying the unsafe incidents happened in other steel plants.
- Maintain proper documentation of accidents and incidents occur.
- Conveying of safety investigation results and attained experiences to all employees.
- Conducting safety drills and trainings for the workers.
- Conducting regular safety audits to identify unsafe practices and areas and how to take corrective actions to overcome the issues. Safety audits can help in timely recognition of hazards and risks.

Notes

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Unit 2.2: What is hazard

Unit Objectives

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

1. Know about hazards and different types of hazards
2. Know about, how to identify and control hazards
3. Know about safe working practices

2.2.1 Hazard

A hazard is something that has the potential to cause injury, disease or death in a workplace. A slippery floor could result in someone falling and breaking an ankle. There are a number of aspects to the development of a safe workplace environment:

Fig 2.2.1 Hazard sign

- the development of policies
- the development of consultative processes
- Hazard identification, assessment and control.

Implications from hazards/risks can be accessed through:

- accident/injury reports
- information on risk from chemicals from data sheets
- review of accident/injury statistics
- information from government health and safety agencies
- specific monitoring
- Who is exposed, how much, how might they be affected.

2.2.2 Types of Hazard

Physical hazards

- Dust, noise and vibrations are produced while unloading, preparation and handling

operations of material. The presence of large quantities of dust can also generate hazards:

- Noise from vibrating components and drive mechanism which are not properly maintained may be a problem in mobile equipment.
- Ionize radiations producing devices may be used.

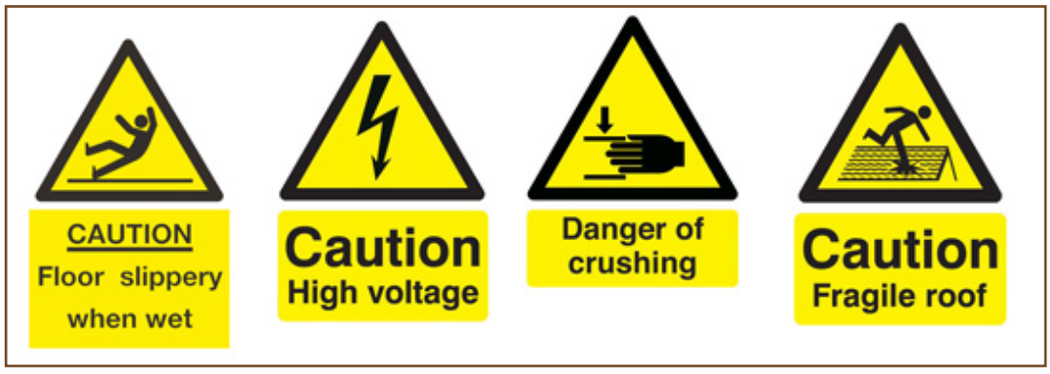


Fig 2.2.2 Physical hazard warning signs

Chemical hazards

- Mineral oil is typically used for operation purposes for bulk density control and dust suppression. When lids and doors are removed during mixing, materials used for sealing leaks in doors and lids can be a worry.
- Refracting ceramic filters and asbestos can be there in the form of insulating materials and gaskets, even though appropriate replacements have been used.

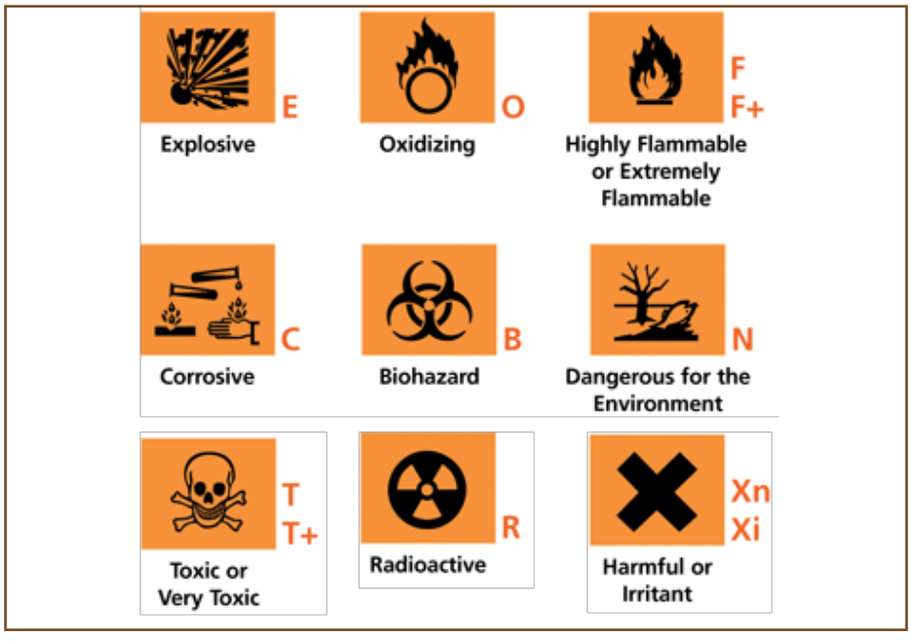


Fig 2.2.3 Chemical hazard warning signs

Mechanical hazards

The common mechanical hazards occur when workers are caught between, struck by, fall from height or fail to lockout equipments.

Fig 2.2.4 Mechanical hazard warning sign

- Rotating parts of machine can catch loose clothing, hands, or hair and cause serious injuries. Uncovered parts of machine fly off, and create risk of eye injuries.
- Skin burns from hot materials and surfaces. Irritation in eyes from dust particles is responsible for less severe injuries.
- Careless use of tools can cause injuries to the eyes, hands, head and limbs.

2.2.3 Hazards in steel plant

A steel plant is full of hazards. For the sake of workers safety in plant, these hazards have to be tackled. Major hazards occur in plant are:

- Road hazards – In steel plant, road hazards are very high because of movement of heavy and heterogeneous traffic on plant. This hazard occurs mainly during the shift change timings of workers.
- Coke oven and sinter plant – Here hazards occur due to dust, heat, chemicals, smoke, fire and explosion etc.
- Blast furnace and steel melting shop – The main hazards occur here due to gas poisoning, heat, slag, dust, moving equipments and vehicles, fire and working at heights.
- Rolling mills – In rolling mills, the hazards occur are moving equipment, heat, suspended loads, splinters and slippery floors.
- Power plant – The main hazards here are working at height, heat vibrations, noise and gas

and steam lines etc.

- Material handling – The main hazards occur due to improper material handling are posture, improper signaling, moving equipment, loads and suspended overhead loads etc.
- Other common hazards which occur in steel plant are electrical hazards, poor illumination, working with improper tools, working in confined space, poor ventilation, loco movements, unmanned crossings, unpreparedness for emergencies and working without PPE, written clearances, and shutdown clearances etc.

Common causes of hazard:

- slips, trips and falls;
- falls from height;
- working in confined spaces
- unguarded machinery;
- exposure to asbestos;
- falling objects;
- moving machinery, on-site transport, forklifts and cranes;
- noise and vibration;
- inhalable agents (gases, dusts and fumes);
- skin contact with chemicals;
- contact with hot metal;
- electrical burns and shock;
- fire and explosion;
- extreme temperatures;
- radiations;
- manual handling;
- insufficient emergency first-aid and rescue facilities;
- ergonomics;
- insufficient accident prevention;

2.2.4 Control measures

To ensure the health and safety, you have to adopt following methods:

- According to instructions, safely carry out assigned tasks and duties and to follow with safety rules and codes of practice.
- If there is any doubt about safety precaution or unsafe practice, consult with the supervisor.
- Wear PPE all the time at workplace.
- Never use unsafe or damaged tool/equipment for work. All equipment and PPE must be placed at correct place after using them.
- Make sure that all safety practices such as protective clothing provided are used and all guards are securely fixed.
- Don't operate any equipment if you are not authorized.
- Report any near-miss, accident or dangerous condition to supervisor.
- Always switch off unattended equipment.
- Follow safety arrangements and safe ways of eliminating hazards.
- Don't do such actions, so that your fellow employees will be in danger.
- Always attend the health and safety training sessions organized by organization.

Material Handling

A Fitter also have to lift and move heavy weight during the job whenever required. He may be required to move the job manually or by using forklift for lifting and moving. Extreme care should be taken while lifting or moving the job so that no damage occurs to the job or plant and also to prevent accidents at work place.

- Lifting and moving the job manually
- Lifting or moving the job using fork lift
- Assist in lifting of heavy job
- Attaching the job to the overhead crane's sling / hook in a proper and balanced manner.

Points to be taken care of while lifting / moving material

- Lift the materials in correct posture.
- Do not try to lift too heavy materials alone.
- Ensure the grip is right so that the job doesn't slip from hand and fall

- Put down the job at the destined place properly.
- Do not throw the job on ground.
- Avoid double handling.
- Take rest breaks during heavy or repetitive work

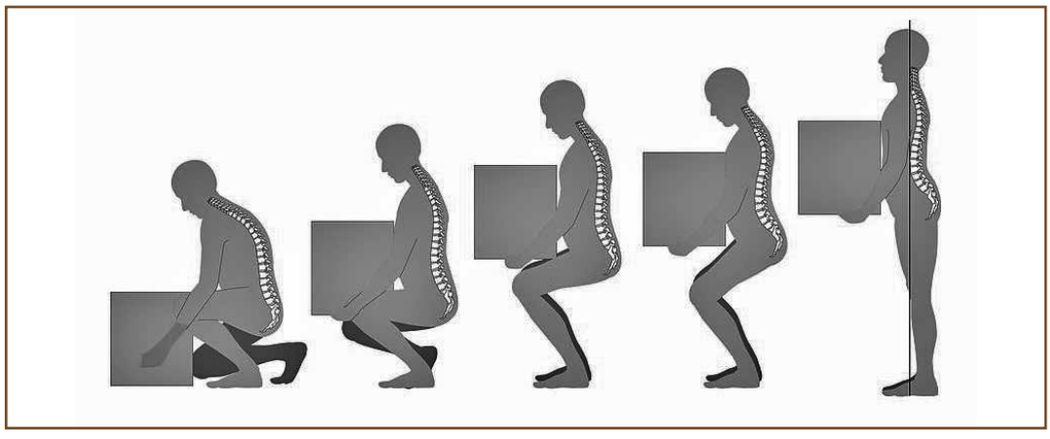


Fig 2.2.5 Body bending movement during manual handling

Material handling equipments Eliminate the need to lift or lower manually by using handling equipments that can assist you. Few types of equipment are:

- Trucks
- Forklifts
- Dollies
- Carts
- Wheelbarrows
- Hoists

Fig 2.2.6 Material handling equipments

Make pushing and pulling of loads easier by using the following:

- carts, hand trucks and dollies and
- handles on loads and mechanical aids,

Wrong handling can cause:

- Strain & sprains
- Neck and back injuries

Fig 2.2.7 Material handling equipments

- Slips falls and crush accidents
- Hernia
- Cuts and bruises
- Occupational overuse syndrome (OOS), also known as repetitive strain injury.

2.2.5 Personal protective equipment (PPE)

Personal protective equipment provides us the last level for controlling hazards. Before using of personal protective equipment, the working requirements of the equipment should be checked to make sure it fulfills the same, verify the required standards, make sure it fits the body shape of the user, be user-friendly and is under regular maintenance and can be switched if required.

Personal Protective Equipment (PPE)

- **Safety helmet**: Safety helmets guard the head from injuries caused by falling objects.
- **Earmuffs, earplugs**: Earmuffs and earplugs protect the ears from injuries by loud noises.
- **Safety belt**: Safety harnesses guard from falling from heights.
- **Goggles**: Goggles protect the eyes from injuries caused by strong light or flying objects.
- **Safety boots**: Safety boots guard the feet from puncture wounds, injuries and slipping.
- **Respirator**: Respirators guard the respiratory system from the attack of poisonous gases, mist, fumes and dust.

Fig 2.2.8 PPE

Notes

Exercise

1. The establishment of a safe workplace is:
   a. Ethically and socially responsible
   b. Not cost effective
   c. A priority in all organizations.
   d. Ethically and socially irresponsible.

2. In a health and safety context, a hazard is:
   a. Anything with the potential to result in an injury or illness.
   b. The likelihood of someone being injured in the workplace.
   c. Anything that could result in a physical injury.
   d. Anything that could result in a psychological injury.

3. Once you have spotted a hazard you must:
   a. Report it to your boss
   b. Leave it as someone else will fix it eventually
   c. Bring your own toolbox to work and fix it yourself
   d. None of the above

4. From the following options, what is the best way to control hazards in the workplace?
   a. Replace the hazard for a less risky option
   b. Eliminate the hazard completely from the workplace
   c. Use personal protective equipment (PPE)
   d. Have rules to help people avoid hurting themselves

5. Identify the Sign

   a. No Entry
   b. No walking in the workplace
   c. No posing allowed
   d. No strolling at this workplace

6. The most common mechanical equipment injuries are to the:
   a. body and arms
   b. hands and fingers
   c. legs and feet
   d. ears and eyes

7. Ear plugs are required to protect……

Unit 2.3: Working at heights and confined spaces

Unit Objectives

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

1. Know about risks of working at heights
2. Know about safety precautions while working at heights
3. Know about risks of working at confined spaces
4. Know about safety precautions while working at confined spaces

2.3.1 Safe working at heights

You have to done many activities at height. Ladders, scaffolds and platforms are examples of equipments used while working at height, but many more activities are there where you have to work at height with limited protection.

These activities may lead to people and objects falling. The reason for this may be an insufficient protection while working.

2.3.1.1 Safe working practices at height

Safe working procedures or ways while working at heights:

Mobile elevated platforms

- Set the platform on plane and solid ground
- Use equipment with stabilizers
- Trained operator should be at ground level.
- While working on platform, don't forget to wear safety harnesses.
- Fix the platform under safe working limits and keep an eye on speed of wind.

Fig 2.3.1 Elevated platforms

Scaffold towers: Scaffold towers should:

- Towers should be put up by trained people.
- It have a height to base dimension ratio which is not more than that 3 to 1 for indoors and 2.5 to 1for outdoors
- For right height to base ratio placed stabilizers if necessary.
- For 2.5 m high or above deployed outriggers or stabilizers
- Firmly locked all the casters before use
- Working platform should be provided ladder access.

Fig 2.3.2 Scaffold tower

- Don't move when the tower is engaged
- Regularly inspect and maintain the tower

Safety lines, harnesses and nets

When no other equipment are reasonably practicable, use safety lines, harnesses and nets such as nets and airbags.

Ladders

Ladders are recommended only when work is of short duration.

They should be:

- assembled at right angle
- fixed and footed
- place the ladder ear the work
- Adequately support the ladder at the base to avoid hitting on vehicles or pedestrians.

Fig 2.3.3 Ladder

Stepladders: Following precautions should be taken when using stepladders:

- Spread them to full extent and then locked it
- Avoid working on top of the stepladder
- Never use the top tread or rear part of the steps for supporting foot
- Only one person has to work on ladder at a time.
- Appropriate and correct grade ladder should be used.

Access equipment

- The risks involved in using access equipment must be provided by hire contractors.
- Regularly inspect and properly maintain all access equipment.
- Person using access equipment must be well trained.
- Take necessary precautions to avoid fall of objects or persons
- Don't try to increase reach by putting ladders on access equipment.

2.3.1.2 Dos and don'ts of working at height

Do….

- Work on ground level, as much as possible.
- Make sure equipment is sufficiently stable, appropriate and strong for the job.
- When working on or near delicate areas, take safeguards
- Always be prepared for protection from falling objects
- make strategy for evacuation in case of emergency and rescue procedures

Don't…

- Overload ladders
- Overreach on ladders or stepladders
- Fix the ladder on weak and uneven surfaces
- Use stepladders or ladders for tough or heavy tasks.

2.3.1.3 Way of using ladder safely

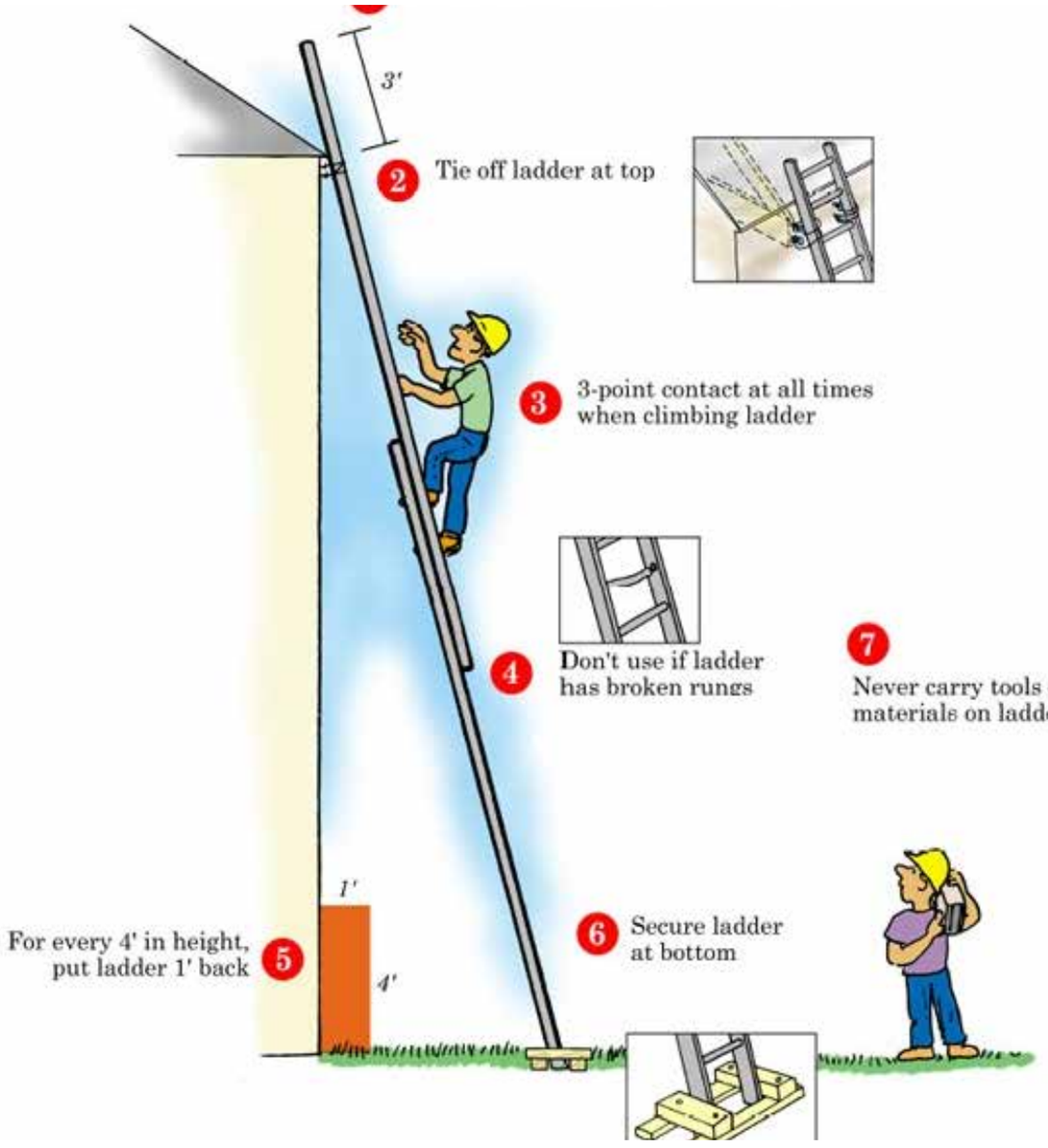


Fig 2.3.4 Steps for using ladder safely

2.3.2 Safe working at Confined spaces

Spaces which are enclosed from all around and risk of death or serious injury from dangerous conditions and hazardous substances is very high, are known as confined spaces. Confined spaces have limited openings, for example:

- storage tanks
- reaction vessels

- sewers
- silos
- enclosed drains
- combustion chambers in furnaces
- vats
- open-topped chambers
- ductwork
- poorly ventilated rooms

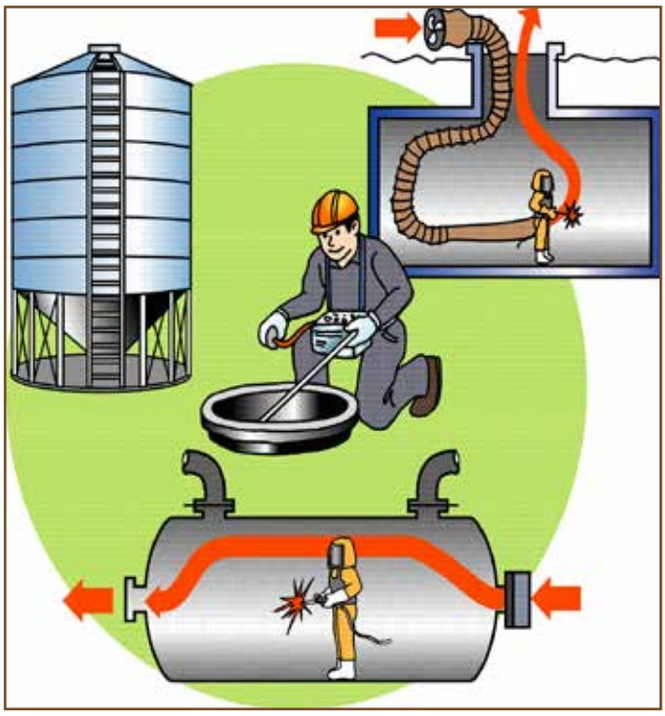


Fig 2.3.5 Confined spaces

2.3.2.1 Dangers at Confined spaces

Dangers can arise in confined spaces because of the following issues.

- **Lack of oxygen**
  - Spaces where reaction between some soils type and oxygen happens in the atmosphere;
  - Reaction of groundwater with limestone produces carbon dioxide;
  - Rust formation inside the vessels and steel tanks.
- **Poisonous gases and fumes**
  - Formation of poisonous gases in sewers and manholes;
  - Leakage of gases and fumes into trenches and pits in a poisonous area.
  - enter tanks or vessels from connecting pipes;
- Fire and explosions due to excess oxygen and flammable vapours.
- Filling of liquids and solids inside the space, when disturbed.
- Hot temperature conditions leading to increase in body temperature dangerously.
- Residues of fumes and vapour left in tanks, vessels etc.

- High concentrations of dust e.g. in flour silos.

Some of the above mentioned situations may already available in the confined space; but some may arise during the work. The other dangers arise during the work being carried out are:

- Special take care of machinery may require like precautions from electric shock and provision of dust removal for a portable grinder;
- Formation of fumes, gases or vapours during welding;
- Restricted entrance of the space; like in a manhole, rescue during an emergency is not easy.

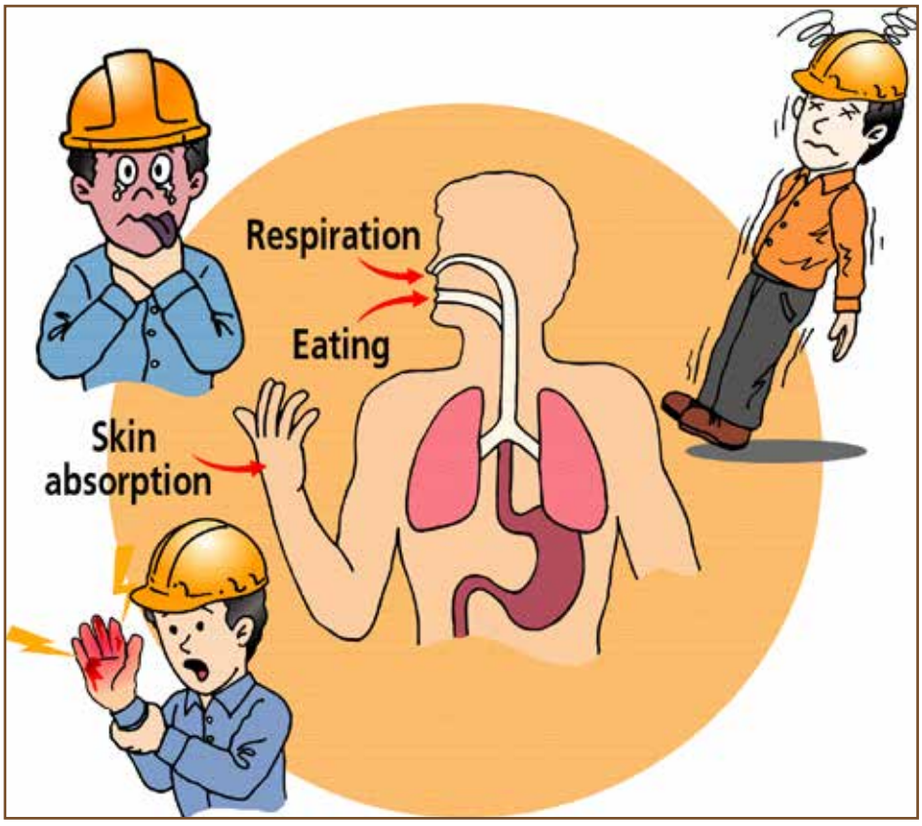


Fig 2.3.6 Dangers in confined spaces

2.3.2.2 Safe systems of work at Confined spaces

If you have to work in a confined space, carry safety systems and equipments for working inside the space. The following checklist is important while working in a confined space.

- **Isolation:** Isolate the electrical and mechanical system of equipments need to be operating in space. In any cases, ensure that isolation done is effective.
- **Cleaning:** Make sure that there is no formation of fumes from residues during the work.
- **Size of entrance:** Entrance size is big enough to permit workers to enter in the space with all the necessary equipment required, and provide ready exit during an emergency.
- **Provision of ventilation:** Ensure that there is proper mechanical ventilation for an adequate supply of fresh air in the confined space. It is very important where portable gas cylinders and diesel fuelled equipment are used.
- **Provision of special tools and lighting:** Use non-sparking tools and protected lighting

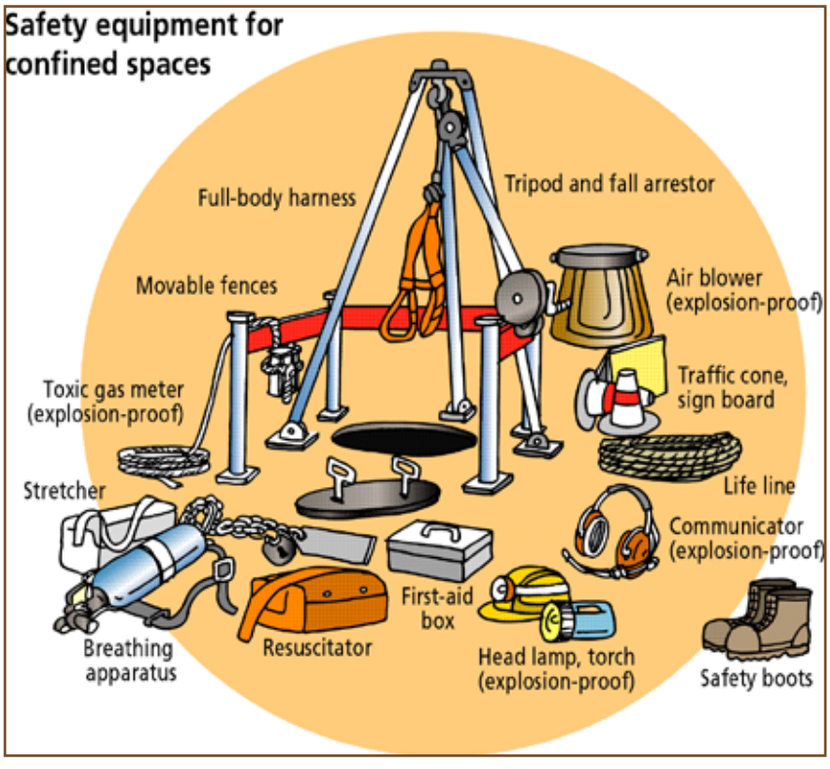


Fig 2.3.7 Dangers in confined spaces

systems to avoid flammable and explosive atmospheres. In confined space like inside metal tanks, appropriate precautions are required for safety from electric shock.

- **Provision of breathing apparatus:** Availability of breathing apparatus, if the air inside the space is not adequate and suitable for breathing because of poisonous fumes, gases or vapours in the space and lack of oxygen.
- **Preparation of emergency arrangements:** Proper emergency arrangements which cover the necessary equipments and practice drills.
- **Provision of rescue harnesses:** Availability of safety harnesses at the point outside the confined space.
- **Emergency procedures:** When situations are not favorable, there can be chance of serious and immediate danger. Effective arrangements like alarm systems and rescue operations during an emergency are essential.

Notes

Unit 2.4: Fire Protection

Unit Objectives

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

1. Know about fire hazards and how to control
2. Know about fire extinguishers

2.4.1 Fire hazard

Fire is one of the most common causes of the accidents in establishments. Fire is defined as a self-sustaining combustion process in which a substance (fuel) combines with oxygen in air to produce immense heat and light. Life and properties are in danger due to fire hazards. Safety systems have a prime object which is fire hazards. These fire safety systems are used to sense or remove the danger of fire hazards.

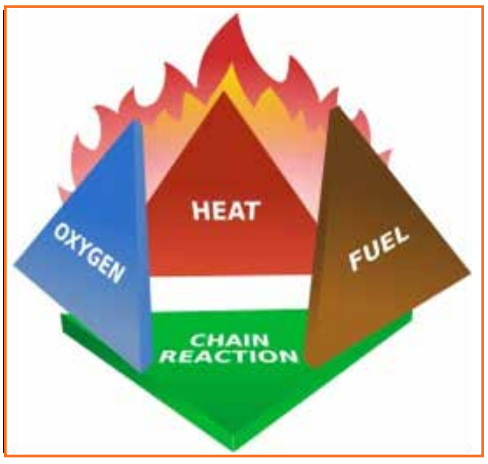


Fig 2.4.1 Fire

Common ways of fire hazards are:

- Flames of all types used for any work
- loose electrical connections, higher loads and old electrical equipment
- Cooking appliances
- Welding, cutting, metal casting works etc.
- Improper storage of tools, equipment and material
- Fireworks, ammunitions and explosives
- Inappropriate storage of flammable materials and chemicals
- Inadequate numbers of emergency exits
- Barrier to reach alarm system and firefighting equipment
- Insufficient availability of fire extinguishers

- No fire detection and alarm system
- Violation of fire safety rules

2.4.2 Types of Fire

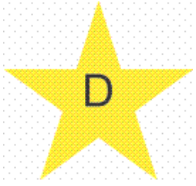
Class of Fire	Description	Mode of Extinguishing	Medium of Extinguishing	Type of Extinguisher
A 	Fire involving solid material (fuel) for combustion like wood, paper, plastics that melt.	Cooling	Water	• Water • Soda-Acid Type • CO_2 Gas Type
B 	Fire involving flammable liquids like petrol, diesel, thinners, cooking oils, paints, wax and plastics that melt	Blanketing	Foam CO_2 , Halon, DCP	• Foam • CO_2 • DCP • Halon Type
C 	Fire caused by electricity equipment	Cutting off electricity supply	Vaporising liquids, dry powder and CO_2	• CO_2 • DCP • Halon • Dry Sand
D 	Fire involving flammable metals like magnesium, titanium	Smothening	Suitable dry powder	• Special DCP extenguisher • Dry Sand • Powered Grephite • Talc and Absestos • Limestone

Table 2.4.1 Types of fire

2.4.3 Fire fighting equipments

1. **Fire Extinguishers**

   It is a portable fire-fighting device formed like a cylinder filled with chemicals. The type of fire extinguisher used depends on the type of fire.

Fig 2.4.2.Fire Extinguisher

2. **Smoke Detectors**

   It is a device fitted on the roof which gets activated by smoke in case of fire. Once activated, it in turn activates fire alarm or water sprinklers.

Fig 2.4.3 Smoke detector

3. **Fire Alarm System**

   It is an alarm system which can be manually or electronically operated / activated in case of outbreak of fire. Usually fire alarm system is connected to smoke detectors and gets activated once smoke detectors are triggered.

Fig 2.4.4 Fire alarm

4. **Fire hydrants**

   There are fire hydrant systems installed in organizations which have outlets and hydrant lines provided at many locations where there are chances of fire hazard.

Fig 2.4.5 Fire hydrant

2.4.4 Fire extinguishers

A fire extinguisher extinguishes or control fires. Nobody uses an out-of-control fire intentionally. To stop the out of control fire expertise of a fire department required.

Common fire extinguishers are:

- **Dry chemical**: These types of fire extinguisher are in powder form. They stops and halts the production of fire supporting by “free-radicals”, accordingly extinguish the fire.
- **Foams**: This type is applied over aspirated or non-aspirated fuels. It forms a seal or foamy blanket over the fuel and stops oxygen to reach near the fuel. Unlike powder type, foam

type fire extinguisher is used to extinguish fires without flashback.

- **Water**: It cools burning material by absorbing heat through the use of air pressurized water. It is successful to extinguish class A fires. Unlike dry chemicals and foams based fire extinguisher it is harmless, inexpensive and easy to clean.
- **Clean agents and carbon dioxide**: These types of extinguisher displace oxygen, control chemical chain reaction and remove heat from fire zone. This extinguisher does not leave any remains after release which is ideal for electronics items and sensitive documents.

Extinguisher		**Type of Fire**				
Color	**Type**	**Solids (Wood, Paper, Cloth)**	**Flammable Liquids Flammable**	**Flammable Gasses Flammable**	**Flammable Equipment**	**Cooking Oil & Fats**
	Water	Yes	No	No	No	No
	Foam	Yes	Yes	No	No	Yes
	Dry Powder	Yes	Yes	Yes	Yes	No
	Carbon Dioxide (CO_2)	No	Yes	No	Yes	Yes

Table 2.4.2.Types of fire extinguisher

2.4.5 Steps for using a fire extinguisher

Fig 2.4.6 Using fire extinguisher

Step 1: **Pull the pin** from the top of the extinguisher for releasing locking mechanism which discharges the extinguisher.

Step 2: **Aim the extinguisher at** the base of the fire not the flame.

Step 3: **Squeeze the lever slowly**. Deliver the extinguishing agent in the extinguisher. When the lever of extinguisher is released, the discharge of extinguishing agent stops.

Step 4: Sweep from side to side. Move the fire extinguisher to and fro by sweeping motion until the fire is under control. Operate the extinguisher from a safe distance. Move towards the fire when it starts to reduce.

2.4.6 Fire drills

Conducting a Fire Drill Includes Exercising the Fire Plan:

a) For separation of fire

- Close doors
- Use automatic sprinkler systems

b) Evacuation of immediate area

- save anyone in danger

c) Evacuation of smoke section

- shift workers through exit doors

Fig 2.4.7 Fire exit

- shift workers to specific areas

d) Prepare building and floors for mass departure

- collect medical records of all fellow workers
- Hearing aids, wheel chairs, walkers etc.

e) Extinguishment of fire

2.4.6.1 Fire drills record

For all required emergency evacuation drills records shall be maintained and shall include the following information:

1. recognize of the person conducting the drill
2. Drill date and time
3. Notification method used
4. Staff members on duty and participating
5. Number of occupants evacuated
6. Special conditions simulated
7. Problems faced
8. Weather conditions when evacuating outside
9. Time required to attain complete evacuation

Fire Drill Report

Facility Name: _____

Address: _____

Date: _____ **Time:** _____ **Shift:** _____
24 Hour Clock

Person conducting the drill: _____
Name & Title

Fire Alarm Activation Method: _____

Drill Location and simulated Conditions: _____

_____

Unusual Conditions: _____
(weather, Remodeling, Temporary exits)

Number of Occupants evacuated: _____ **Total Time of Drill:** _____

Fire Alarm System reset?:_____**Sprinkler System restored?"** _____

Critique: _____

_____

Fire Alarm System tested: _____**Verified by:** _____

Monitoring company received signal at: _____ **Verified by:** _____

Fig 2.4.8 Sample Fire Drill Report

2.4.4 Tips during fire outbreak

s no.	Instruction
1	On noticing a fire, immediately start shouting “fire” at top of your voice. Do not wait for the automatic fire alarms to start ringing.
2	Take a fire extinguisher
3	Use extinguisher as per fire type : - for general fires use water and co2 fire extinguishers - Foam type extinguishers is suited for oil fires - Co2 fire extinguisher is recommended for electrical fires.
4	Switch off all main switches during an electrical fire.
5	Do not try to switch off electrical equipments. Cut the power from the main source.
6	do not panic and alert the building fire department
7	If the fire seems to be dangerous, call the fire brigade immediately.
8	Make sure that the water sprinklers and other fire-fighting equipment have properly started operating.
9	First priority should be to save people. Help others to safely get out of the floor
10	For treating serious burn injuries, it is very important to alert the nearest hospital.

Exercise

1. Assume you conduct a fire drill at work place. Prepare a report in the given format

Unit 2.5: Emergencies, rescue and first aid procedures

Unit Objectives

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

1. Know about basic first aid techniques during electric shock, burns and choking
2. Know about CPR process
3. Know about bandaging process

2.5.1 Free a person from electrocution

If find someone is suffering from electric shock, approach with extreme caution and following first aid steps.

Fig 2.5.1 Saving person from electric shock

Steps

Step 1: **Firstly take** the suffered person away from the electricity source as fast as possible. Turning off the electric supply of machine is the best method for doing this..

Step 2: If this seems impossible, remove the person from electricity source by using a piece of wood or insulating material.

Step 3: **Don't touch the victim getting the electric shock** because you could also get shock too.

Step 4: **After successful executing the victim from the electricity source,** call the ambulance, if victim is unconscious. Give first-aid to victim till the time ambulance is coming.

Step 5: **If victim is conscious** and looking well, monitor its condition, as the results of shock must not be clear immediately.

2.5.2 First aid victims in case of bleeding, burns, choking, electric shock, poisoning etc

For treating shock, burns, bleeding and wounds, electric shock, choking, eye injury, heat stroke, hypothermia, fainting and unconsciousness, use following first-aid techniques:

2.5.2.1 Shock

Cold, weakness, unbalanced breathing, rapid weak pulse, pale or bluish lips and fingernails and nausea are the symptoms of shock.

Steps

Step 1: Don't give anything for eating and drinking to victim.

Step 2: Use blankets or clothes to keep the victim warm.

Step 3: Place the victim's legs on a pillow.

2.5.2.2 Bleeding and Wounds

Steps

Step 1: Cover the wound by a clean cloth and gloved hand; then apply firm and steady pressure on wound for 5 mins at least.

Step 2: Lift up the injured leg or arm above the victim's heart level.

Step 3: Secure the wound by a bandage when bleeding stops. Ensure that bandage is not fixed too tightly—it may stops blood circulation.

Step 4: Check the victim for shock.

2.5.2.3 Burns

Steps

Chemical or Compressed Gas Burns

Step 1: Use a drench hose and emergency shower for at least 15 mins to rinse away all residues of chemicals.

Step 2: Cover the burn by a clean and dry cloth or special dressing for burns.

Step 3: Check the victim for shock.

Fig 2.5.2 Saving person from gas burns

Heat or Electrical Burns

Step 1: Cool burning of skin by water.

Step 2: Place the burned area under cold running water if the skin is not broken and gently compress the wound by hand. Bandage the wound by a dry and clean cloth.

Step 3: If blister appear, don't try to break it.

Step 4: Do not apply ointments or creams.

Step 5: If skin is cracked, or if injuries are severe:

- Do not clean the wound or remove embedded clothing.
- Cover the injury insecurely with a clean, dry cloth.
- Expect shock and treat accordingly.

2.5.2.4 Choking

The patient is talking and getting sufficient air; don't restrict it if he/she tries to cough the obstruction in the throat. If the patient can't talk or not getting enough air, make call on emergency number.

Steps

Step 1: Wrap your arms around the stomach and stand directly behind the victim.

Step 2: Just above the navel and well below the ribs, make a fist by a hand. Place that fist with the thumb and forefinger side toward you.

Step 3: Hold the fist by other hand and pull it rapidly towards you by a slightly upward and inward thrust. If required, repeat it.

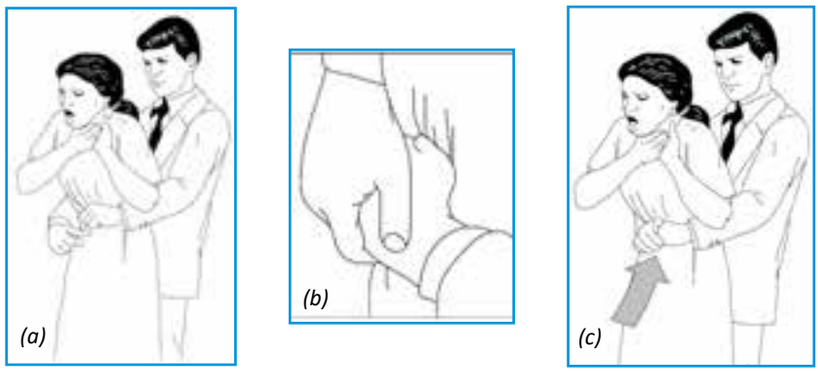


Fig 2.5.3 (a) (b) (c) Saving person from choking

If the patient becomes insentient:

Step 1: Put down the patient on their back.

Step 2: If the object that is obstruct the airway is noticeable, reach a finger into the patient's mouth and try to bend the obstruction out of the patient's throat, being careful not to push the object deeper into the patient airway.

Step 3: Even if this is not successful, attempt rescue breathing.

Step 4: A chest compression (CPR) is more helpful if the victim is still not breathing or moving.

2.5.4 Basic techniques of bandaging

The key points when applying a bandage are:

Fig 2.5.4 Bandaging injured person

Steps

Step 1: Make sure the person is comfortable.

Step 2: Never lean across their body and ensure that you are working from the side of the injury.

Step 3: First clean the wound and apply the antibacterial cream over it.

Step 4: When the bandage is on always remember keep the injured part of the body supported in the position it will be in.

Step 5: Always use right size of bandage.

Step 6: To check the passage easily, don't cover fingers or toes when bandaging a limb.

Step 7: Never wrap the bandage tight, and secure the end by folding it over and binding a knot in the end. Safety pin, adhesive tape, or a bandage clip can be used.

2.5.5 Artificial respiration and the CPR Process

CPR instructions

- Check the Passage - make sure it is harmless for you to help.
- Don't become another patient.

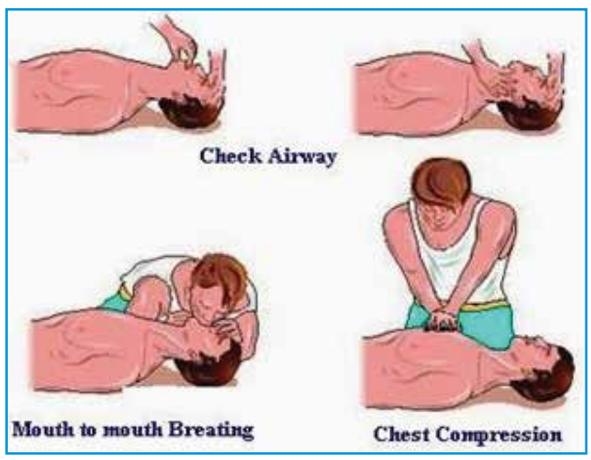


Fig 2.5.5 CPR Process

CPR Steps

Step 1: Check the Victim - tap and shout to get response.

Step 2: Circulation - pump the chest 30 times.

Step 3: At the center of the chest put the heel of one hand and your other hand on top of it. At a rate of 100 per minute (16 compressions in 10 seconds) press chest down 2 inches.

Step 4: Tilt head back, lift chin up to open airway - Airway.

Step 5: Breathing - Tweak nose closed, take a normal breath, cover patient mouth with yours and blow out your breath until you see the chest rise. One breath per 1 second. Again open airway again if chest doesn't rise.

Step 6: Repeat procedure until help arrives or the victim begins breathing.

2.5.6 Correct method to move injured people and others during an emergency

There are situations when you need to carry wounded people to medical help or away from further harm. In these cases, you must consider the number of rescuers you have, the abilities of these rescuers and the condition of the victim that must be moved. This article will discuss several ways to carry an injured person:

Fig 2.5.6 Moving injured person

Steps

Step 1: Stand on either side of the conscious victim. Grab the victim's wrist with the hand closest to the victim's feet on your side.

Step 2: Use your other hand to grasp the clothing on the shoulder nearest to you and pull the victim's arms to help them to a sitting position.

Step 3: Assist the victim to his or her feet and place the arms around your shoulders, if possible.

Step 4: Place your free hand around the person's waist and let him or her set the pace on hobbling out.

Step 5: Help the victim for moving slowly.

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3. 5S & House Keeping

Unit 3.1 – Identification of bottlenecks in functioning of work place

Unit 3.2 – Various methods of housekeeping

ISC/N1004

Key Learning Outcomes

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

1. Know about safety issues at workplace
2. Know about 5S safety management system
3. Know about Housekeeping practices
4. Know about benefits of housekeeping
5. Know about elements of effective housekeeping

Unit 3.1: Identification of bottlenecks in functioning of workplace

Unit Objectives

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

1. Know about safety issues in industry
2. Know about different hazards

3.1.1 Safety issues in workplace

Uncovered wires, exhausted workers, poorly kept equipment. Manufacturing facilities are riddled with risks, both hidden and out in the open. Hazards can result in serious injury or death, if don't know where to begin looking.

The biggest safety worries in any manufacturing setting are:

- **Hearing Protection:** Hearing can be affect by noise is produce by Industrial machines if you are uncovered to the noise on a long basis. The Occupational Safety & Health Administration requires companies to provide hearing guard when noise levels surpass specific levels. Protection required is depends on the sound level and the duration of the contact.
- **Eye Hazards:** 61 percent of eye damages occur in the manufacturing, construction industries and trade a report by the Vision Council reports. Eyes may be injured by dust, metal, concrete and other particles throw by machines. Eyes can burn or irritate by chemical fumes and splashes.
- **Chemical Exposure:** Some employees in manufacturing units work with hazardous chemicals like workers who produce batteries may be exposed to lead in the form of dust or fumes. This can harm nervous, urinary systems and reproductive with lead exposure linked to failures, seizures, coma and death.
- **Mechanical Hazards:** Some employees in manufacturing units work with hazardous chemicals like workers who produce batteries may be exposed to lead in the form of dust or fumes. This can harm nervous, urinary systems and reproductive with lead exposure

linked to failures, seizures, coma and death.

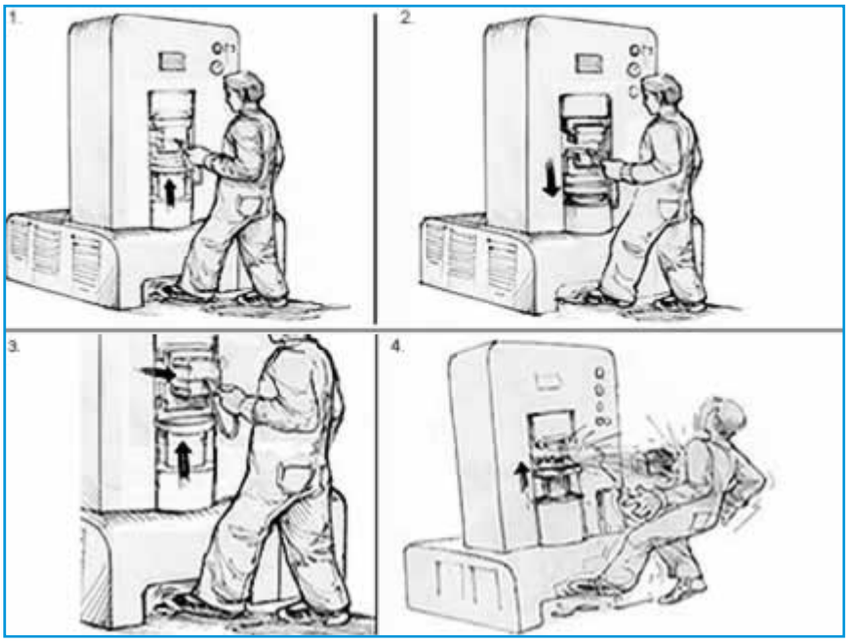

Fig 3.1.1 Mechanical hazard example

- **Fire Hazards:** In manufacturing, heat and flame can produce by the tools and equipment, which cumulative the risk for fires. Employees should aware of where to find fire extinguishers and how to rescue the facility immediately in the event of a serious fire.

Fig 3.1.2 Fire hazard example

- **Carbon monoxide poisoning:** In manufacturing industries, blast furnaces and converters generate huge amount of gases. Once dust has been removed, these gases are used as fuel resources and some are use as raw materials and supplied to chemical plants. Carbon monoxide poisoning can cause by leakage from the top or inside body of blast furnaces and from the plant gas pipelines. Especially during repairs such poisoning occurs during work around blast furnaces.

- **Dust and fumes:** During the manufacturing process, at many points dust and fumes are generated. Dense fumes released during the use of oxygen can cause lung diseases. Contact with silica is also a danger for the workers and cause serious infections and injuries.

Fig 3.1.3 Dust and fumes example

Notes

Unit 3.2: Various methods of housekeeping

Unit Objectives

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

1. Know about 5S Safety system
2. Know about essential elements Housekeeping
3. Know about good housekeeping practices

3.2.1 5S Safety management system

What is 5S?

5S is a fundamental, systematic, basic, approach for quality, productivity and safety improvement. 5S (Japanese Philosophy) is the name of a workplace organization procedure. 5S is created by a list of five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke. 5S system is implemented for organizing the workplace for increasing effectiveness and efficiency by maintaining the area and items, storing the items used, and sustaining the new practices.

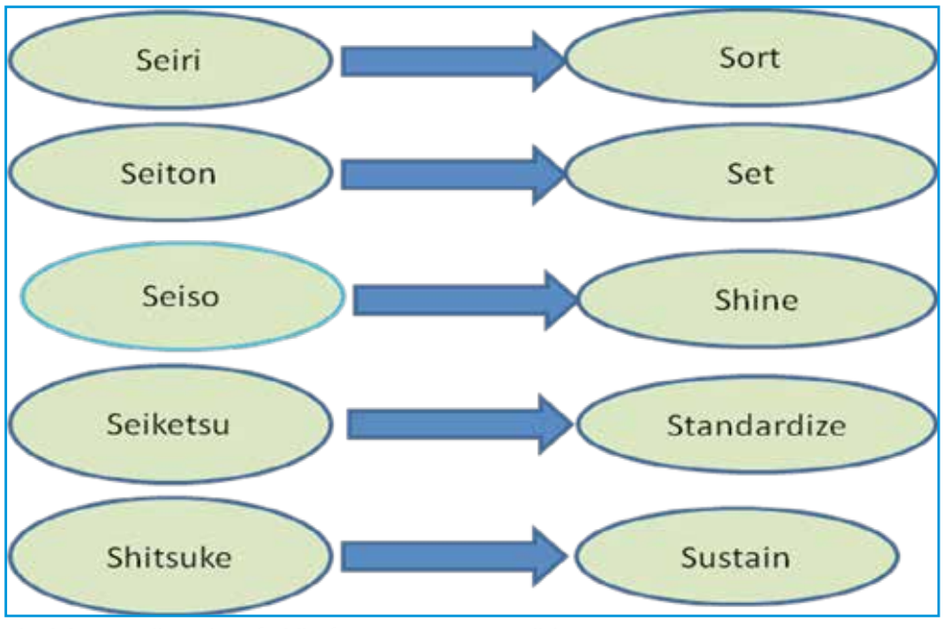

Fig. 3.2.1 Transliteration of 5S list from Japanese to English

Objectives of 5S:

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

Necessity of 5S:

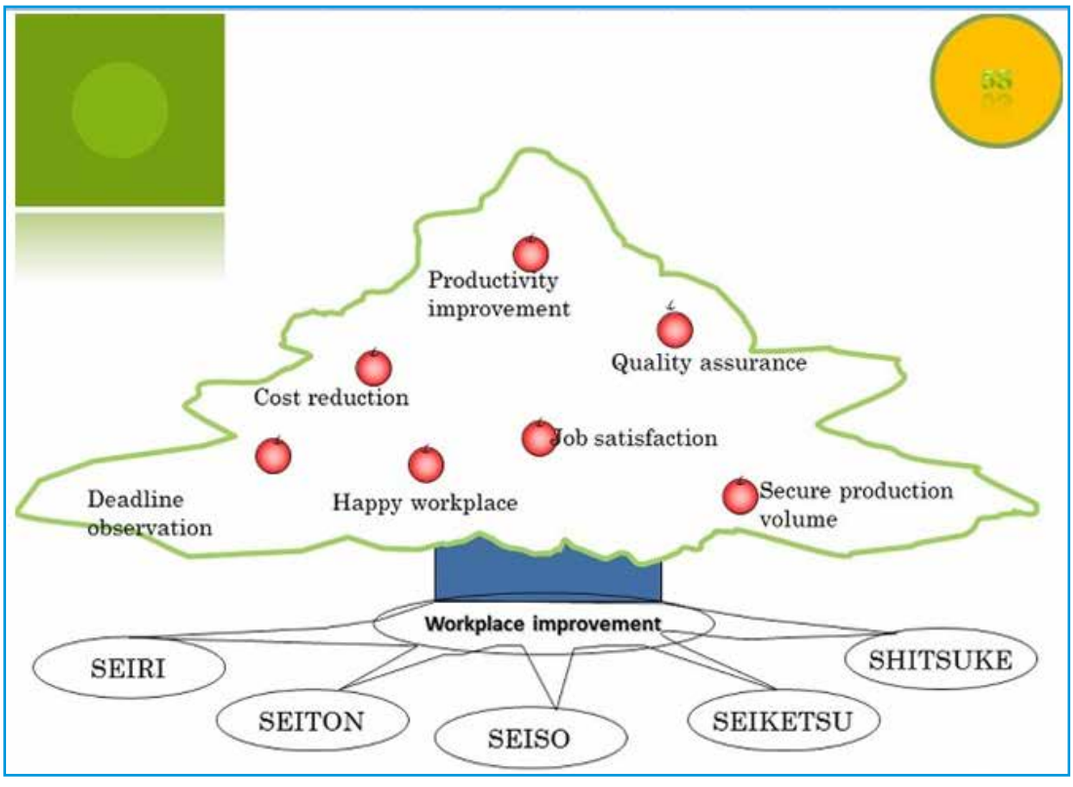

Fig. 3.2.2 Necessity of 5S

Phases of 5S:

Japanese term	English Term	Meaning in Japanese Context
Seiri	Sort	• Dispose off unnecessary items or properly remove. • Do work simply by removing obstructions. • Stop buildup of needless things. • Calculate necessary items for costing and other factors. • Remove all parts not in use. • Separate unwanted items from the workplace. • A skilled supervisor is requiring for checking on regular basis. • Define a red-tagged area to keep unnecessary items. • Waste removal.
Seiton	Set	• For items to be easily available arrange them all properly • By arranging work station in such a way that all tooling / equipment is in close proximity that can avoid loss and misuse of time. • Make simple to identify and pick up essential things • Work on first come and first serve basis method • This makes the workflow easy and smooth • All work should be complete on regular basis
Seiso	Shine	• Workplace should be completely clean and clear • Stop weakening of machinery and equipment • Keep workplace safe • Keep work place clean • If someone isn't familiar to the environment must be able to find problems in 5 seconds within 50 feet.

Phases of 5S:

Seiketsu	Standardize	• Regulate the best practices in the work area. • Keep high standards at workplace organization at all times. • Keep neatness. Keep everything in order and according to its standard. • Everything in its right place. • Every process has a standard.
Shitsuke	Sustain	• To maintain in working order • Also translates as “do without being told” • Regular audits to be perform • Discipline and Training • Goal oriented process is training. Its resulting feedback is necessary monthly

Table. 3.2.1 Phases of 5S

3.2.1.1 Advantages of 5S

- If equipment and tools are properly placed in organized work areas
- Items can be visible very easily.
- It leads to greater workstation efficiency and mass production
- To greater well-being and amplify motivation workplace should be clean and tidy
- Time saving
- Quick recovery
- Minimization in mistakes & accidents
- Increases workspace
- Constant enhancement in work quality
- Smooth working no obstruction

3.2.1.2 5S Audit

Purposes of conducting regular 5S audits are:

- Evaluation of 5S standards for industry
- To fix what is wrong! - note and address non-compliance
- Give a official chance to suggest improvements

The basic steps of audit are:

- Plan for the audit. Divide the workplace into several areas for successful audit reviews.
- Based on the standards set during audit, make a list for every area.

Known problems in each area from the initial 5S audit include:

- Need of repairing machines
- Rack of tool
- Signages on tool racks or storage shelves; cabinets and “keep clear” markings on instruction pages or corridors.
- Equipment and materials which were not cleared instantly.

Three key tasks has to be done during the audit

1. Find out whether known difficulties have been addressed:
    - Lubricants are still leak from this machine?
    - People are not walking under crane, is the warning sign in place?
    - Why outdated drill press is still in the workshop?
2. Look into the standards is being met:
    - Are tools left on work tables?
    - From the tool rack is something missing?
    - Is dirt collecting anywhere?
    - Are safety labels visible and readable?
3. To be noted that what has not yet been standardized – Most imaginative and hard section, it may include seeing what is missing in an area that seems neat:
    - Why is there no sign over the well-ordered stack of work-in-process materials on that shelf?
    - Tools that are not yet labeled

3.2.2 Housekeeping practices

Workplaces hazards can be eliminate by effective housekeeping and complete a job safely and properly. Poor housekeeping and hiding hazards can cause frequent accidents which can cause injuries.

Cleanliness doesn't mean housekeeping. Housekeeping includes keeping work areas tidy and arranged; keep floors free of slip and trip accidents; clearing of waste materials (paper, cardboard) and other fire hazards. It also involves attention on other things like aisle marking, the adequacy of storage facilities and maintenance. Good housekeeping is a basic step for preventing accident and fire hazards.

3.2.2.1 Purpose of workplace housekeeping

Accidents are cause due to poor housekeeping, such as:

- Neat and clean movable objects i.e. stairs and platforms
- Being strike by falling items
- Slipping due to wet, greasy and dirty surface
- Striking due to poorly stacked objects or lost material
- Cutting or tearing of skin of hands or other body parts because of projected nails and wire.

3.2.2.2 Benefits of good housekeeping practices

Efficient housekeeping results in:

- Decrease handling to comfort the materials flow
- Fewer slipping and tripping accidents
- Less fire hazards
- Hazardous substances e.g. dusts, vapors exposures to lower worker
- Better control of tools and materials in managing inventory and supplies
- Equipment's are more cleaned and well maintained.
- Better hygienic conditions for good health
- Space utilization is more efficient
- Reduced property damage due to improvement in preventive maintenance
- Improved efficiency because it is easy to find tools and materials.

3.2.2.3 Elements of an effective housekeeping program

Dust and Dirt Removal

Proper working of exhaust ventilation systems for collection of dirt, dust and chips adequately at workplace. Use vaccum cleaners for cleaning of light dust and dirt. For cleaning walls, ceilings, machinery and other hard to clean places, special fittings are made to clean dust and dirt.

To reduce the amount of air dust, use sweeping compounds or dampen the floor before sweeping

of floor. The dust and dirt that collect in places like piping, shelves, light fixtures, conduits, windows, reflectors, cupboards and lockers may require manual cleaning.

Fig 3.2.3 Dust removal

Surfaces

Cleaning up spilled oil and other liquids at once is important because of poor floor conditions that leading cause of accidents. Accidents may happen by allowing chips, shavings and dust to accumulate. To prevent accumulation regularly cleaning trapping chips, shavings and dust before they reach the floor. Anti-slip flooring is used where areas that cannot be cleaned continuously, such as entrance ways.

Fig 3.2.4 Surface cleaning

Maintain Light Fixtures

Light levels are reducing by dirty light fixtures. Lighting efficiency can improve by clean light fixture.

Aisles and Stairways

Aisles are the passages that allow movement of people, product and materials. Encourage everyone to use stairways so that they do not take shortcuts through hazardous areas.

Always keep aisles and stairways clean and clear. Don't use them for temporary storage of materials.

Fig 3.2.5 Slip warning sign

Spill Control

Spills can be controlled before happening by doing proper maintenance. Clean and maintain machines and equipment regularly or place drip pans and guards where you find oil spills. Clean the spill right away, if found anywhere at the workplace.

Use cleaning chemicals or absorbents for wiping the greasy, oily or other liquid spills.

Tools and Equipment

Tool housekeeping is very important whether it is in the tool room or on the tool rack or on the

bench. For the organized arrangement of tool storage in the tool room and near the work bench, tools require appropriate fittings with locations and labels marked on it. Regularly inspect, repair and clean all tools. If found any damaged or worn tools, remove them and marked as out of service.

Fig 3.2.6 Oil spill cleaning

Maintenance

Tool housekeeping is very important whether it is in the tool room or on the tool rack or on the bench. For the organized arrangement of tool storage in the tool room and near the work bench, tools require appropriate fittings with locations and labels marked on it. Regularly inspect, repair and clean all tools. If found any damaged or worn tools, remove them and marked as out of service.

Fig 3.2.7 Storage of tools

Waste Disposal

Practices the regular collection, grading and sorting of scrap leads to good housekeeping. Separate the materials from waste which can be recycled and reuse.

Fig 3.2.8 Waste management

For systematic waste gathering and disposal, place the bin containers, near the place where waste is generated most.

Storage

Give at least one meter of clear space to stored materials from the spray heads.

Materials should be store away from fire equipment, stairs, aisles, exits, emergency showers, or first aid stations. Clear marking should be there in all storage areas.

Fig 3.2.9 Material storage

Toxic, flammable, combustible, and other hazardous materials should be stored in permitted containers in designated areas that are suitable for the different hazards that they pose. Storage of materials

should meet all necessities specified in the fire codes and the guidelines of environmental and occupational health and safety agencies in your jurisdiction.

Notes

Exercise

1. Prepare a housekeeping checklist of your training center

If housekeeping meets standard then sign (√) or not then sign (x). Also give your comments if not meeting standard

Particulars	Sign	Comments
Aisles • Clean • Well-marked		
Exits and entrances • Clear • Well-marked • Free of ice, snow, water, other obstructions		
Hand and Portable Tools • Properly stored when not in use		
Fire Fighting Equipment • Clearly marked • Accessible		
Floors • Clean • Clear • Well-drained		
Ladders • In good condition • Free of grease/oil • Secure when in use		
Lighting • Adequate		
Machines • Clean • Clear • In good condition		
Signs, Tags • Adequate • Appropriate • Clean		
Stacking and Storage • Aisles clear • Stacks stable, secure • Well labeled • Area clean and clear		
Stairs • Non-slip tread • clean • clear		
Ventilation System • Clean • Clear		
Waste Disposal • Adequate number of bins • Separate and approved containers for oily rags, flammable scraps, etc		

5S Audit Form

Department_____

Completed By_____

Date _____

0 = No compliance	1 = Very little compliance	2 = Some compliance	3 = Significant compliance	4 = Total compliance

Determine what is needed and remove the rest.		0	1	2	3	4	**Comments**
SORT	Have all the necessary items (tools, machines etc.) been removed ?						
	Does the inventory include any part that is not required?						
	All tools and equipment are located in the most convenient location?						
	Do cupboards, storage cabinets and shelves, have been sorted?						
	Is the quarantine area properly managed?						
A place for everything and everything in its place.....no searching		0	1	2	3	4	**Comments**
SET IN ORDER	Are shelves and storage areas clearly defined with location indicators?						
	Are shadow boards and other storage systems used where possible?						
	Are walkways and work areas clearly defined and unobstructed?						
	Are personal belongings stored in lockers provided?						
	Is all safety equipment in place and up to date?						
Cleaning and looking for ways to keep it clean		0	1	2	3	4	**Comments**
SHINE	Floors - Are they kept clean, tidy and in good state of repair?						
	Machines and tools – Are they free from dirt, visible leaks and spillages?						
	Bins - Are they properly maintained and emptied on regular basis?						
	Is anyone responsible for routine inspection/maintenance?						
	Do operators regularly sweep up and clean down machines and tools?						
Make standards obvious and maintained		0	1	2	3	4	**Comments**
STAND ARDISE	Is stock control established, obvious and in use?						
	Is everyone aware of their responsibilities and department flow?						
	Is information to carry out daily routine work clear and in use?						
	Are improvement ideas being generated and regularly acted on?						
	Are the standards for the first 3S's clear and up to date?						
Maintain high standards and constantly seek to improve		0	1	2	3	4	**Comments**
SUSTAIN	Are checklists available and being used?						
	5S board – Is this up to date and regularly reviewed?						
	Have improvement suggestions from last month been acted upon?						
	Training - Is everyone adequately trained?						
	Education – Can everyone in the area explain the 5S?						

2. Do the 5S audit of your training center and fill the form given below

Notes

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4. Basic Principles of Electricity

Unit 4.1- Electricity fundamentals

Unit 4.2- Electrical Circuits and Ohm's Law

ISC/N1001

Key Learning Outcomes

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

1. Discuss about basic electric fundamentals
2. Discuss about how electricity generate
3. Discuss about different sources of electricity generation
4. Know about how current flow in the circuit
5. Know about ohm's law
6. Know about electrical circuit
7. Know about different types of electric circuit

Unit 4.1: Electricity fundamentals

Unit Objectives

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

1. Understanding of electricity and how electricity generate
2. Understanding of conductors, insulators and semiconductors
3. Understanding of how a conductor, conducts electricity
4. Know about different sources of electricity

4.1.1 Electric Fundamentals

The most important system today is the electrical system. Electricity is used by more and more components and systems every year.

- It may be hard for some people to know about electricity because of the following reasons.
- It cannot be visible.
- Output of electricity can be visible.
- It has to be spotted and calculate.
- The test results have to be interpreted.

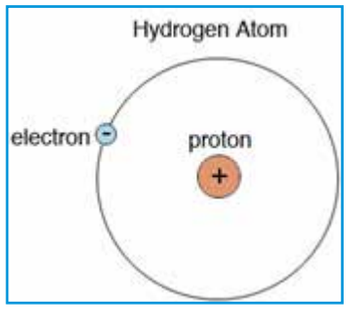

Fig 4.1.1 Nucleus

Electricity

Movement of electrons from one atom to another is called electricity. Nucleus is defined by the dense centre of each atom.

The nucleus covers:

- Protons , have positive charge
- Neutrons , electrically neutral (have no charge)

Electrons are moving around the nucleus in orbits and carries negative charge. An equivalent number of electrons and protons are available in each atom. Type of material and how electricity is conducted can be determined by the no. electrons and protons in the atom. An atom has neutral

charge because an atom consist equal no. of negative-charged electrons and positive-charged protons in it.

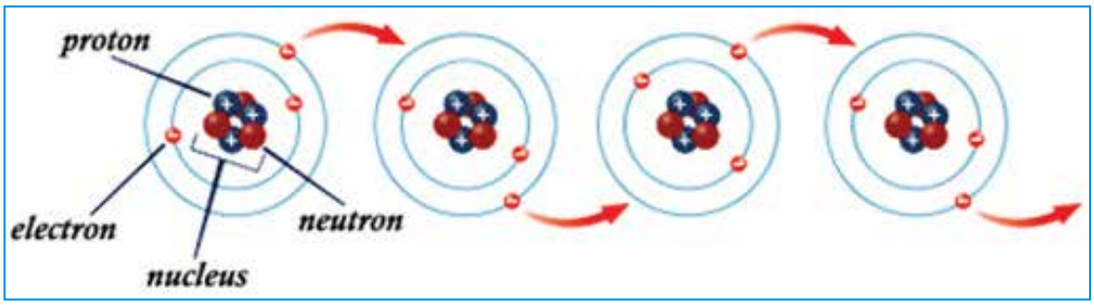

Fig 4.1.2 Movement of atoms in nucleus

4.1.2 Conductors, semiconductors and insulators

Conductors: The materials that allow the flow of electrical current in one or more directions is known as conductor. A common electrical conductor is metal wire. Commonly used conductors include:

- Silver
- Aluminium
- Gold
- Cast iron
- Steel

Fig 4.1.3 metal wire - Conductor

Insulators: It is a material whose interior electric charges doesn't flows easily, and therefore make it almost impossible to conduct an electric current under the influence of an electric field. Examples of insulators include:

- Rubber
- Nylon
- Plastic
- Porcelain
- Fibreglass
- Ceramic

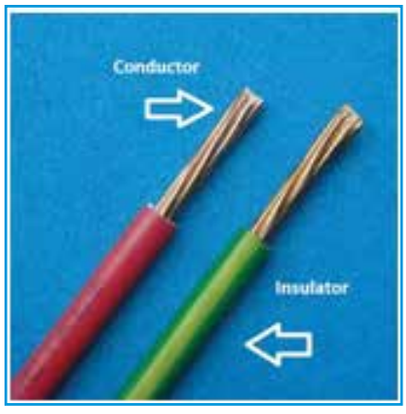

Fig 4.1.4 Insulation wire

Semiconductors: These are hard chemical element or compound which can conduct electricity under some specific situations, this characteristic makes it a nice source for the control of electrical current.

Examples of semiconductors:

- Silicon
- Carbon
- Germanium

Mostly use of semiconductors is in transistors, computers, and other electronic devices

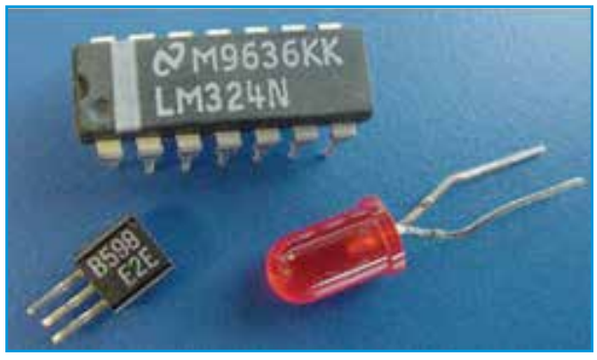

Fig 4.1.5 semiconductors

4.1.3 How Electrons Move Through a Conductor

Current flow

- A flow of electric charge is known as an electric current. This charge is often carried by moving electrons in a wire in electric circuits.
- Ampere is the SI unit for calculating an electric current.

A positive charge (lack of electrons) is located on one end of the conductor and a negative charge (excess of electrons) is placed on the opposite end of the conductor, the following events occur if a source of power, such as a battery, is connected to the ends of a conductor. An imbalance of surplus electrons at one side of the circuit and a lack of electrons at the opposite side of the circuit is required for the flow of current.

- The negative charge will repel the free electrons from the atoms of the conductor,

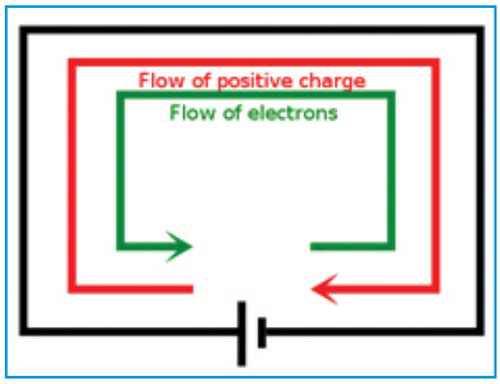

Fig 4.1.6 flow of electrons in a conductor

whereas the positive charge on the opposite end of the conductor will attract electrons.

- As a result of this attraction of opposite charges and repulsion of like charges, electrons will flow through the conductor.

4.1.4 Sources of Electricity

1. **Friction:** When different materials are rubbed together, the friction generates and causes electrons to be transformed from one to the other. Now both materials are in electrically charged state. These charges are not in motion, they deposited on the surface.

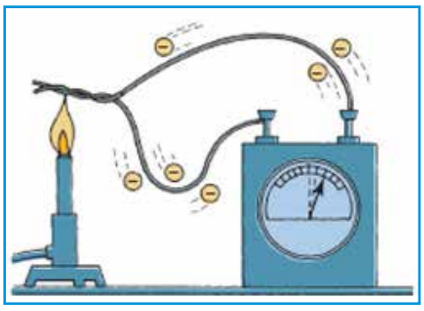

Fig 4.1.7 generation of electricity by heat

2. **Heat:** Thermoelectricity is defined as when pieces of two dissimilar metals are connected together at both ends and one junction is heated then the current permits through the metals.
3. **Light:** The light energy is shifted to the free electrons of the metal when certain metals are exposed to light. This extra energy breaks the electrons free from the surface of the metal. Electrons can then be together and prepared to move in a conductor. Light-measuring devices such as automatic headlamp dimmers and photographic exposure meters used by this photo-electricity.

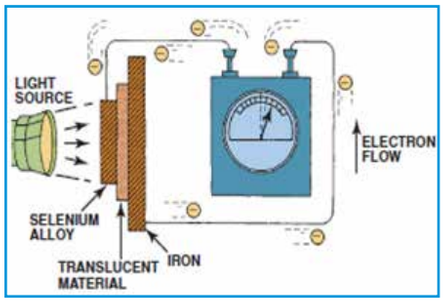

Fig 4.1.8 generation of electricity by light

4. **Chemical:** A change is produced in potential or voltage when two dissimilar materials (usually metals) placed in a conducting and reactive chemical solution. It is the basis of the automotive battery and this principle is called electrochemistry.
5. **Magnetism:** If a conductor is moved through a moving magnetic field or a magnetic field near a conductor, electricity is created. This is the principle of how many automotive

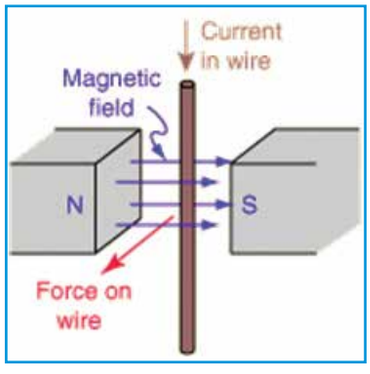

Fig 4.1.9 Magnetism

devices work, including:

- Starter motor
- Alternator
- Ignition coils
- Solenoids and relays

Notes

Unit 4.2: Electrical Circuits and Ohm's Law

Unit Objectives

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

1. Understanding of electrical circuits and parts of a circuit
2. Understanding of Ohm's law
3. Understanding of different types of electrical circuit

4.2.1 Circuits

A circuit is a complete path in which electrons travel from a power source (like battery) through a load like light bulb and then return back to the power source.

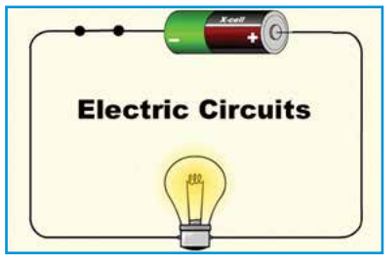

Fig 4.2.1 simple electric circuit

4.2.1.1 Parts of a complete circuit

A complete circuit contains following components:

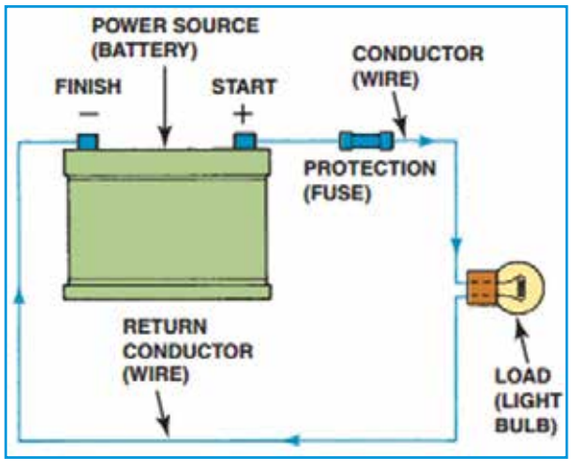

Fig 4.2.2 electric circuit

- A battery is used as a power source
- Electrical circuit protection devices like fuses, circuit breakers, and fusible links are used for the protection from harmful overloads (excessive current flow).
- The flow of current from the power source to the resistance is defined as the power path.
- The electrical load or resistance which changes electrical energy into heat, motion, or light.
- The electrical current from the load back to the power source.
- Switches are used to turn the circuit on and off.

4.2.1.2 Circuit Fault Types

Open circuits: It is a circuit that isn't complete, or lacks continuity, due to a damaged wire.

Following features are of open circuits:

- Through an open circuit no current will flow.
- If there is a break formed in the circuit, and then an open circuit may be created and saves the flow of current.
- The function of a fuse is to blow (open) when the current in the circuit surpasses the fuse rating. To stop any damage to the components or wiring as a outcome of the fault, the fuse will stops flow of current.

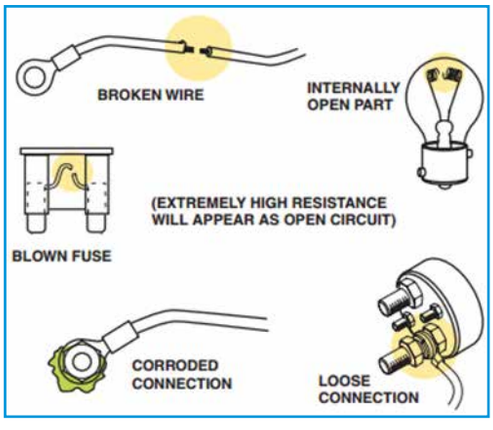

Fig 4.2.3 open circuits

Short-to-voltage: When the power side of one circuit is electrically joined to the power side of another circuit then a short-to-voltage occurs.

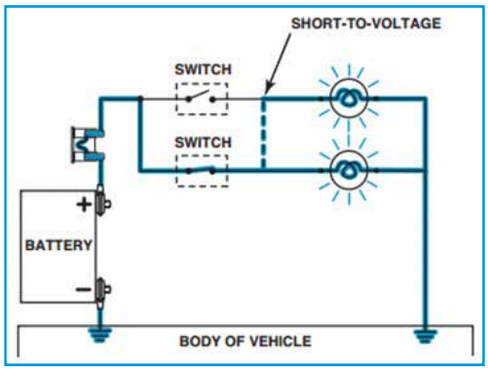

Fig 4.2.4 short circuits

Following are the features of short circuit:

- A complete circuit in which the current generally bypasses some or all of the resistance in the circuit.

- The power side of the circuit is involved.
- A copper-to-copper connection (two power-side wires touching together) is involved.
- A fuse may or may not blow.

4.2.2 Ohm's Law

Ohm's law tell us that a current flowing in a close circuit has a direct relationship with the voltage given to that circuit and is inversely proportional to the resistance of that circuit, provided the temperature and physical condition is constant.

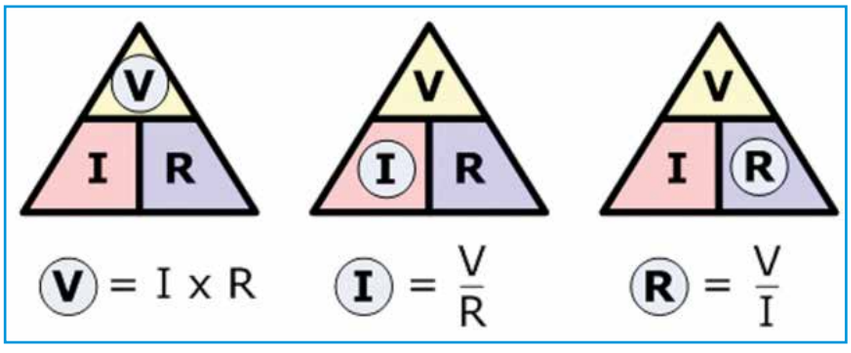

Fig 4.2.5 ohm's law

If, for example, the current (I) is unknown but the voltage (E) and resistance (R) are known, then

Where,

I = Current in amperes (A)

E = Electromotive force (EMF) in volts (V)

R = Resistance in ohms (Ω)

VOLTAGE	RESISTANCE	AMPERAGE
Up	Down	Up
Up	Same	Up
Up	Up	Same
Same	Down	Up
Same	Same	Same
Same	Up	Down
Down	Up	Down
Down	Same	Down

Table 4.2.1 Ohm's law relationship with the three units of electricity

Ohm's law applied to simple circuits

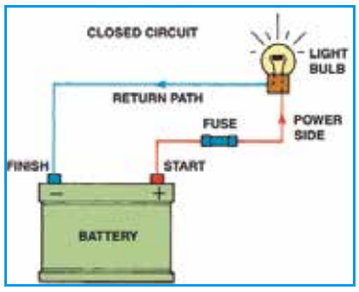

Fig 4.2.6 ohm's law circuit

As shown in the figure below for example, if a battery contains 12 volts is joined to a resistor of 4 ohms, how many amperes will travel through the circuit?

To analyse the number of amperes that will travel through the wires and the resistor by the use of Ohm's law. Remember, the factor (amperes) can be analysed by using Ohm's law if two factors are known.

$$I = \frac{E}{R} = \frac{12\,V}{4\,\Omega} A$$

Here (I) is 3 amperes if voltage (E) is 12 Volts and the resistance (R) 4 ohms.

4.2.3 Types of electric circuit

Series Circuit: A series circuit is a circuit that has multiple loads and a single path to go through. Such as a circuit that is connected with a battery and three light bulbs. First a current has to connect to one load, then the other, and finally it will flow through the last load and back to the battery. The current can be calculated with this

$$I = \frac{V}{R_1 + R_2 + R_3}$$

Parallel Circuit: Like the series circuit, the parallel circuit passes through more than one load. However, the circuit gives the current more than one path to complete the circuit with. Since it has multiple paths, the current will encounter less resistance by moving through all of the paths at the same time. The current in a parallel circuit depends on the different resistances, but a parallel circuit will create less resistance on a current. Using Ohm's law to calculate this, we would take the individual resistances of the loads and use their reciprocals, then add them and divide the voltage by it.

$$I=V\,(R_1+R_2+R_3)$$

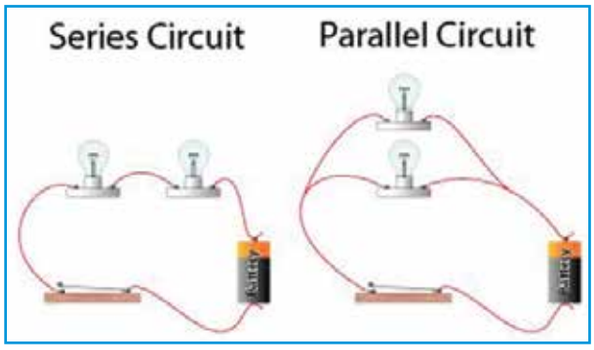

Fig 4.2.7 series circuit and parallel circuit

Series Parallel Circuit: The type of circuit is a combination of both series and parallel. Electric current travels through both circuits.

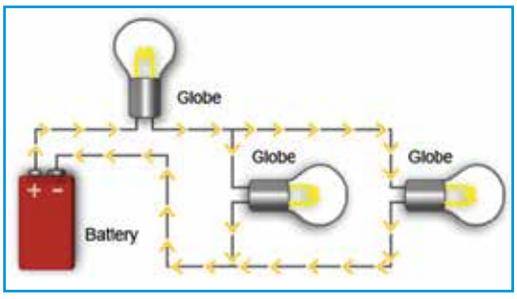

Fig 4.2.8 series-parallel circuit

Notes

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5. Electrical Machines, Hand Tools and Measuring Instruments

Unit 5.1- Recognition of electrical machines and their use

Unit 5.2- Using of tools

Unit 5.3- Using of measuring instrument

Unit 5.4- Diagnosing the common defects of tools

ISC/N1001

Key Learning Outcomes

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

1. Know about different types of machines and their use for fitter-electrician
2. Know about different types of tools require for different works
3. Know about use of hand tools
4. Know about use of measuring instruments
5. Know about how to calibrate instruments
6. Know about how to diagnose defects in tools

Unit 5.1: Recognition of electrical machines and their use

Unit Objectives

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

1. Know about different electrical components require
2. Know about different electrical machines require and their use

5.1.1 Understanding of electrical components

A fitter electrical assembly has to do the in setting-up or repair of electrical connections, getting the tools from store, handling over the tools and help in material handling and cleaning of work place before and after completion of job.

Electrical wiring is required in almost every machine so the utility hand needs to be familiar with basic electrical components and equipments used in electrical fittings.

1. **Cables:** Electric power is transmitted or distributed either by Overhead cables or by underground cables. Different types of electrical cables are used as per the current load that will pass through the cable.

Fig 5.1.1 Electrician equipments

Classification of cables

a) Low tension (LT) cable – up to 1000V

b) High tension (HT) cable – up to 11,000V

c) Super tension (ST) cable – up to 33 KV

d) Extra high tension (EHT) cable – 3 KV to 66 KV

Cable carrier and support

- The wiring cable can't be run or laid on walls without support.
- Hence the wires need to be supported from the main distribution till the terminating product. The systems used to carry, support and run these wires are called cable carriers and support systems. Different systems are adopted for this purpose.

2. **Switching and terminating products**

The major terminating and switching products are house wiring cables normally terminate in:

- Switches (All types)
- Sockets
- Ceiling roses
- Holders and adaptors etc.

All these products have certain common features like insulation bases and covers.

a) **Switches:** Switches are classified as under:

- According to the rating – 6 A, 10 A, 16A
- According to the connection – 1 way, 2 way and intermediate

b) **Sockets:**

- According to the rating: 6A, 10A, 16A, 25A etc.
- According to the connection: 2 pin, 3 pin, 5 pin, multi pin etc.

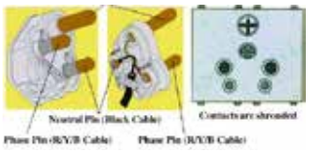
c) **Ceiling Roses:**

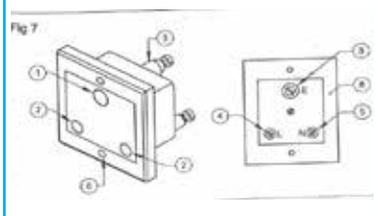
- The wiring from switch terminals is taken to ceiling roses, lamp holders and connectors.
- The ceiling roses are available in two types. These are 2 pin and 3 pin.

d) **Holders and Adaptors:** There are some other terminating products named as holder and adaptors. Different holders are available in the market:

a. Angle Holder b. Batten Holder

c. Pendent Holder d. Screw type / Pin type Holder etc.





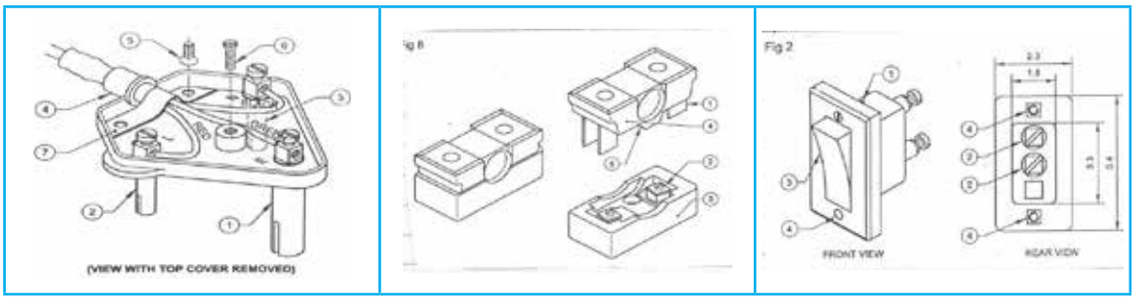


Fig 5.1.2 Holders and adapters

3. **Cut outs**

In electrical distribution, a fuse cut-out is grouping of switch and fuse, which can be utilized in main overhead lines and protects distribution transformers from current surges and overloads. If any fault caused in transformer due to over-current, will melt the fuse and disconnect the transformer from the line. Linemen can open it manually while standing on the ground or by using a long insulating stick.

Fig 5.1.3 Fuses and MCB's

5.1.2 Understanding of electrical machines

A Fitter – Electrical assembly technician has to deal with many electrical machines. In this section, we will know about some common electric machines.

5.1.2.1 Electric motors

An electric motor converts electrical energy into mechanical energy. An electric motor functioning depends upon the interaction between motor magnetic field with winding current.

When an energized rectangular coil is placed in magnetic field, then a torque generates in the coil and rotates the coil continuously. When the coil of the electrical machine rotates, the shaft attached to it rotates and do the mechanical work.

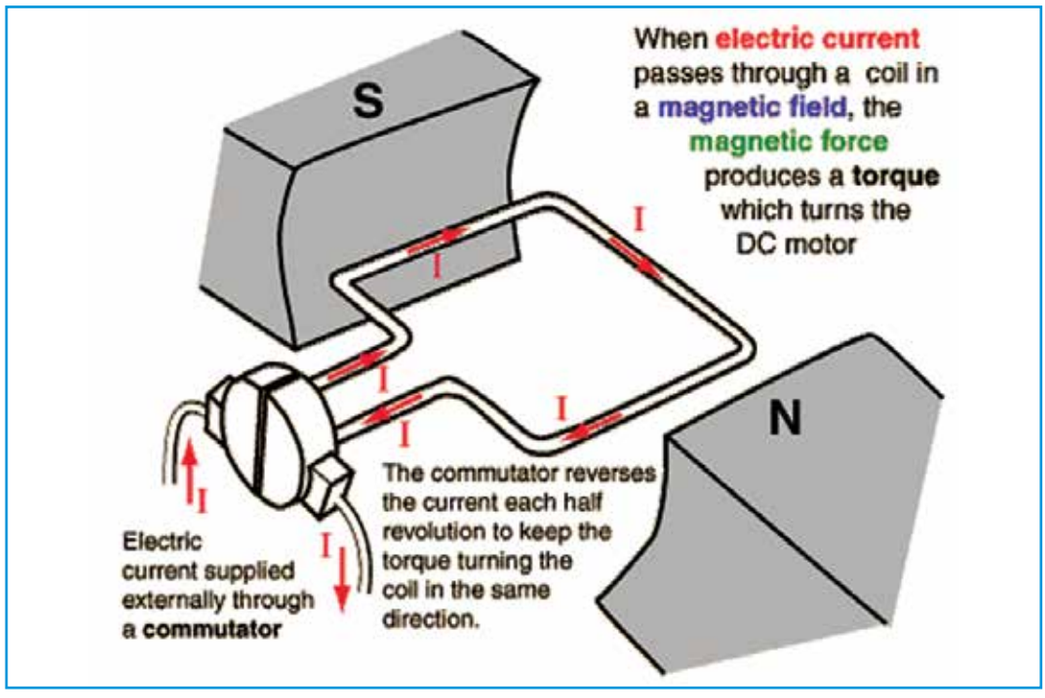


Fig 5.1.4 working principle of electric motor

Construction - Parts of a electric Motor

- **Armature** - An electric motor consists of an insulated copper wire rectangular coil which is wound on a soft iron core and forms the armature. The rectangular coil is placed over an axle and among the cylindrical concave poles of magnet.
- **Commutator** - A commutator reverses the direction of flow of current. Commutator is

- made of copper ring which is split into two parts name as C1 and C2. The copper split rings are insulated from each other and fixed over the motor. Commutator rings in the motor are linked to a battery and the wires from the battery are connected to the brushes which are connected with the rings, not to the rings directly.
- **Brushes** - Brushes are small strips of carbon, which are connected with the commutator split rings. These carbon brushes are joined to the D.C. source and split rings revolve between the brushes.

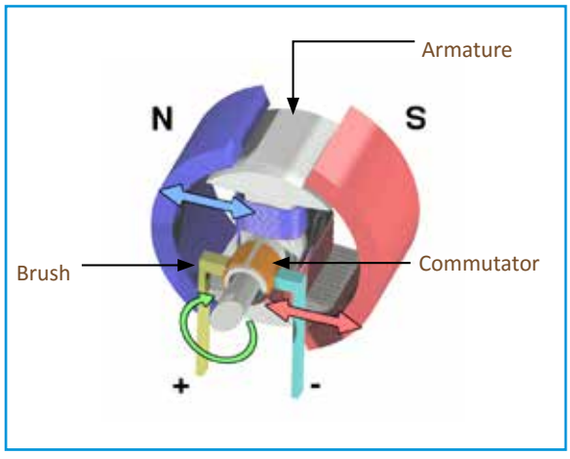


Fig.5.1.5 parts of a electric motor

Working of Motor - Steps

Step 1: When power is supplied to the coil, a magnetic field starts generating in the region of armature. The left side of armature starts moving away from the left magnet and drawn towards the right, this starts the rotation of coil.

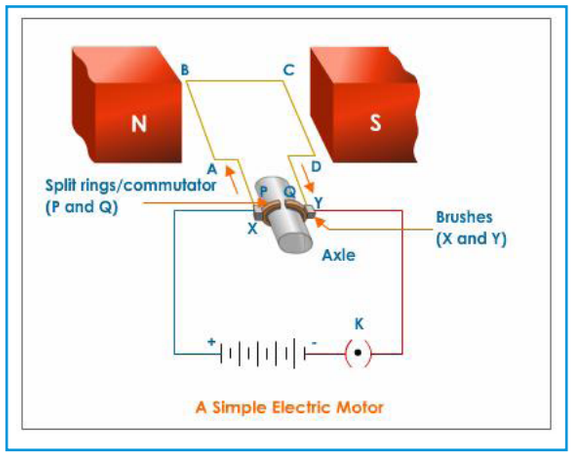


Fig.5.1.6 working of motor

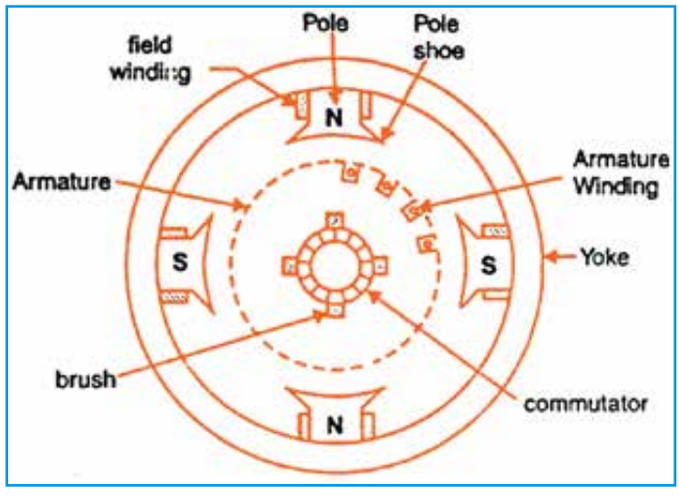
Step 2: The coil turns at an angle of 900, and then brushes lose contact with the commutator. When contact between brush and commutator loose, current stops flowing through the coil, but due to its momentum coil keeps turning.

Step 3: Now, coil turns at an angle of 1800, the sides of the brush get interchanged. Because of this, commutator ring C1 is now in contact with brush B2 and commutator ring C2 is in contact with brush B1. So, current keeps flowing in the similar direction.

5.1.2.2 Electric generators

An electrical generator converts mechanical energy to electrical energy, using electromagnetic induction.

Generators are helpful electrical machines; they provide electrical power during electricity shutdown and avoid disruptions in regular activities at work and home. According to use of generators in different applications, they are available in different physical and electrical configurations.



5.1.7 Main components of a generator

The main components of an electric generator are as follows:

1. **Yoke:** Yoke of DC generator is made of cast iron and serves two functions,
   - It holds the magnetic pole cores of the generator and acts as cover of the generator.
   - It carries the magnetic field flux.
2. **Pole of generator:** The pole coils are wound around the pole core. These are a simple coil of insulated copper wire, which placed over the pole.
3. **Armature of DC generator:** Armature core carries armature winding and provide low reluctance path to the magnetic flux. Since DC generator generates direct current but in the armature current generated is alternating in nature, this is the reason that armature is made of circular laminated sheets and in cylindrical shape.
4. **field winding:** Armature windings are wound over the armature in form of flat rectangular coils.
5. **Commutator:** The commutator is an essential component of dc generator. It collects current coming from armature and pass to the load in form of direct current.
6. **Brushes of generator:** The brushes are made of carbon. There shape is in rectangular block. They collect current from commutator segments.
7. **Bearing:** In small generators, ball bearings are used and in heavy duty dc generator, roller

bearings are used. Always lubricate the bearing properly for smooth operation and longer life of machine.

How does a generator work?

An electric generator converts input mechanical energy into electrical energy as the output.

A generator does not actually generate electrical energy; it uses the mechanical energy supplied to it and forces the movement of electric charges. This flow of electric charges generates electric current which is supplied by the generator.

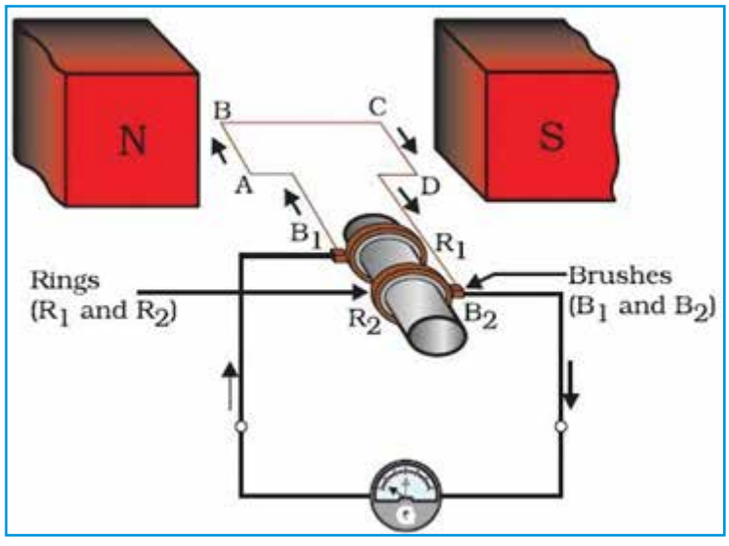


Fig.5.1.8 working of generator

5.1.2.3 Pumps

A pump moves or sucks fluids whether liquid or gas by some mechanical action. Pumps perform mechanical work in form of moving fluid when starts by an electric power.

Basic types of pumps

1. **Vacuum Pumps:** Vacuum pumps expel the gas from a sealed volume of gas leaving partial vacuum behind.

Fig.5.1.9 vaccum pump

2. **Water Pumps:** Water pumps pump water. They pump water from the ground and used in pressure tanks within the location.

Fig.5.1.10 water pump

3. **Trash Pumps:** Trash pumps are used to pump wastewater. They are usually used to pump bathroom waste for disposal.

Fig.5.1.11 trash pump

4. **Hydraulic:** Pumps:These pumps are utilized in hydraulic drive systems. These pumps come in hydrostatic or hydrodynamic type**.**

Fig.5.1.12 hydraulic pump

5.1.2.4 Compressors

Compressors are of two types:

- Gas compressor is a device used to pressurize fluids
- Air compressor is a device used for compressing air to give power to other tools.

Gas compressors

Compressors are similar to pumps; they increase the pressure of a fluid and move the fluid through a pipe. Compressor also reduces the volume of a gas which is compressible in nature

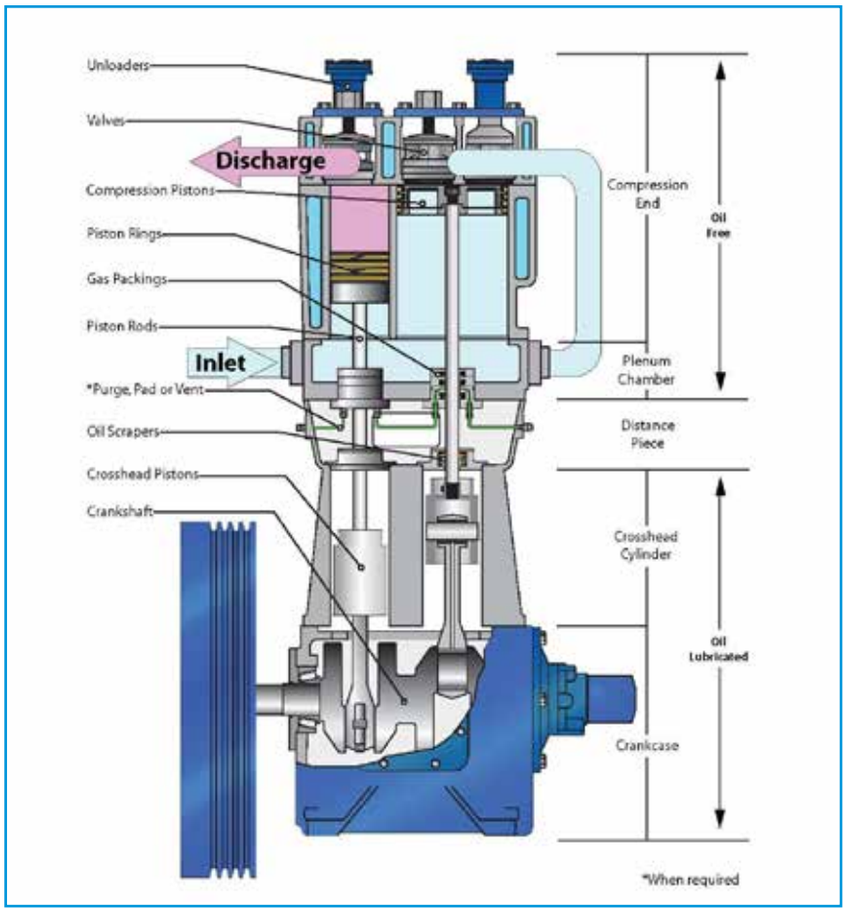


Fig.5.1.13 gas compressor

Gas compressors are used in various applications where either high pressure or lower volumes of gas are required:

- Petroleum refineries, natural gas processing plants and similar big industrial plants.
- Refrigeration and air conditioner use compressors to move heat in refrigerant cycles.
- Gas turbine systems use compressors to compress the intake combustion air.

- Compression of less volume manufactured gases needed to fill up high pressure cylinders for welding, medical and other uses.
- Many industrial and manufacturing processes require compressed air for energizing pneumatic tools.
- Compressed air is also utilized in auto repair workshops to fill up power pneumatic tools and pneumatic tires.

Air compressors

An air compressor converts electric power into potential energy stored in pressurized air. It forces maximum air into a storage tank and this increases the pressure. When pressure of tank attains its upper limit then it stops working. The energy of the compressed air is used in various applications. After utilization, depressurize the tank and when pressure reaches its lower limit, the air compressor starts again and start re-pressurizing the tank.

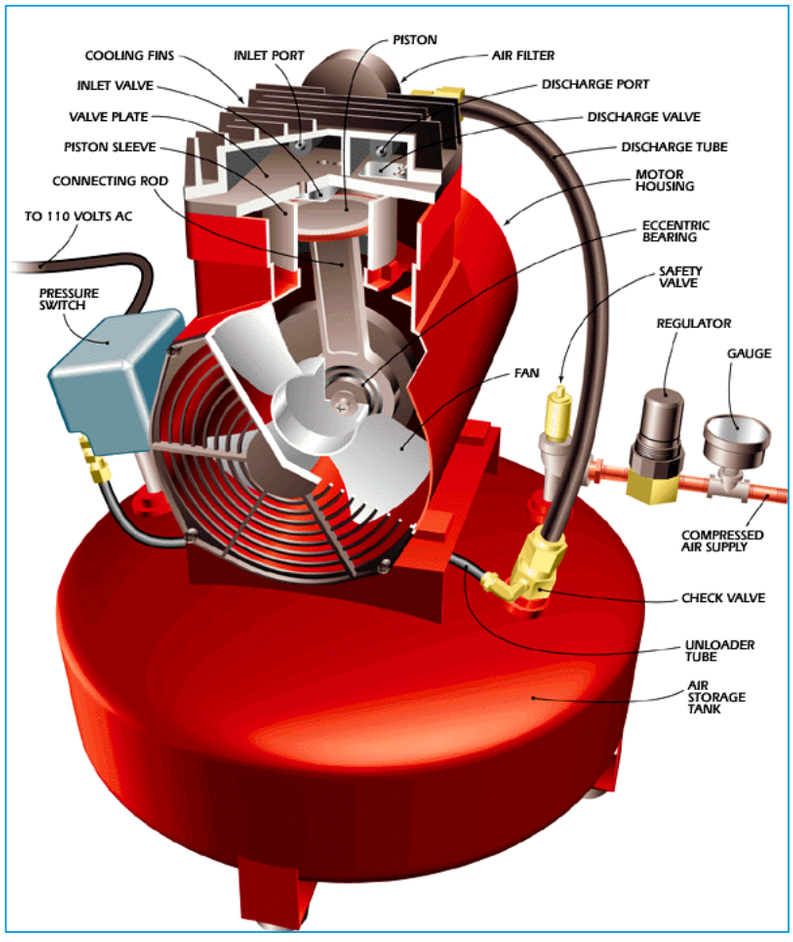


Fig.5.1.14 air compressor

Air compressors are used in various applications:

- It supplies high pressure clean air for filling gas cylinders
- It supplies moderate pressure clean air to immersed surfaces
- It supply moderate pressure clean air for driving pneumatic HVAC control system valves
- Supply moderate pressure air to power pneumatic tools, like jackhammers

5.1.2.5 EOT Cranes

An **overhead crane** is a bridge type of crane mostly found in large scale manufacturing industries. It consists of parallel runways with a traveling bridge. A hoist is lifting part of the crane which travels all along the bridge.

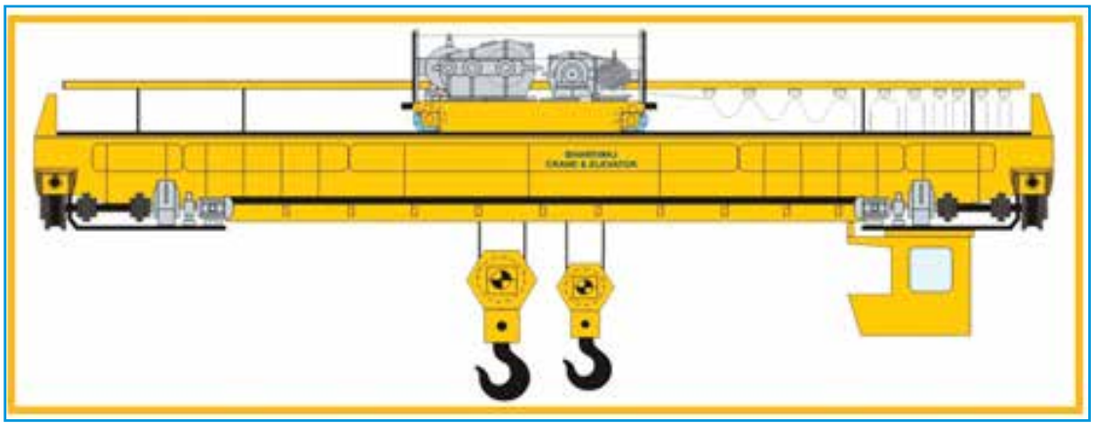


Fig.5.1.15 overhead crane

Operation of crane

1. Before operation, check all parts are lubricated properly and electrical wiring is done according to the electrical wiring diagram.
2. Check that limit switches are cutting off the motor supply in appropriate direction. If they are nit cutting off the supply, make the necessary changes in wiring.
3. Commence lifting the load in stages, start it with load which is not more than 5% of the safe working load & then increase the load in gaps for safe working, till you have reached the full load.

Safe hoisting practices

- Do not load beyond the rated capacity. Overloading can cause the defects and make failure in future.
- Do not use it for handling personnel.
- For signs of wear and damage regularly do the visual inspection of crane.
- Don't utilize hoisting chains or cables as a alternate for slings.
- Stand clear of all loads- If you must travel a load over the heads of other personnel, give ample warning of your intention before you move.
- Use limit switches during emergency conditions. Don't be tripped it during normal operation.
- Make sure that the hoist rises up & lowers down appropriately by operating the push buttons on control ropes.
- Before lifting, always centre the hoist over the load – don't do side pulling or end pulling.
- Do not leave the load suspended in the air unattended.

Applications

- Overhead cranes are usually used in the handling of steel and other metals like aluminium, copper etc. In manufacturing process, till the finished product in the factory, it is lifted by crane.
- In steel plants, pouring of raw material into furnace is done by crane. After metalworking process material is moved by an overhead crane for cooling.
- Lift the finished coils onto trucks and trains by overhead crane.

Notes

Unit 5.2: Using of tools

Unit Objectives

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

1. Know about different hand tools
2. Know about how to use tools properly

5.2.1 Using of tools

TOOL	USAGE	IMAGE
Screwdrivers	Screw driver is a tool used for driving in or removing a screw. To use a screwdriver: • Choose the correct size and tip of the screw driver, so that it fit into fastener's head easily. • If required make a starter hole by drill or pressing the tip into object. • Insert tip of screwdriver into the screw head and turn its handle clockwise direction, then apply pressure over the handle so that tip can inserted into the handle properly. • Continue turning the screwdriver firmly and check that that screw is in straight position while inserting in the material.	

TOOL	USAGE	IMAGE
Pliers • Combination • Slip joint • Side cutters • Long nose	Pliers are used for gripping, twisting and cutting wires. To use pliers :• Determine the type of pliers required. • Make any adjustments if required for slip joint • Adjust locking pliers before using. • Press the handles of plier and close its jaws for holding the object. • To turn the object, rotate the tool as required. • Keep the fingers away from the jaws for safety.	
Hammers • Ball peen hammer • Engineers hammer • Soft faced • Rubber mallet • Dead blow • Brass • Leather	Hammers are used to drive nails, fit parts, forge metal, and break apart objects. To use a hammer: • Select the weight of the hammer appropriate to the fastener to be struck. • Make tight grip at the hammer handle lower half, then swing the hammer slowly and hit the fastener head squarely. • Do not strike your hand by the hammer head or handle. • Wave the hammer with extra power to strike the fastener head. • Continue the process of striking the fastener head to drive it into the material.	

TOOL	USAGE	IMAGE
Hacksaws	A hacksaw is a fine-toothed saw for cutting metal, plastic and wood. To use a hacksaw : • Install a blade by turning the adjuster on the handle or frame until spigots inserted properly in the holes at each end of the blade. • Ensure that blade teeth are pointed in opposite direction from the handle. • Tight the adjuster. • Gently fix object in the vice has to be cut. • Place the saw's central teeth on the object line have to be cut and then make the stroke on the line by pushing the saw. • Continue the cut and ensure that end of the object has been cut by the saw, cannot break due to unsupported weight. • Keep hands away from the blade teeth for safety.	
Files • Flat • Half round • Triangular • Knife edge • Round • Square • Half	Files are used to remove the burrs and sharp edges on the work piece created while sawing and drilling. For finishing a project, use of file is the first step.	
Chisel • Flat Chisel • Side Cut • Cow Mouth • Round Nose • Diamond Point • Cross Cut	Chisel is used for cutting rods, sheet metal and other workpieces of same type. The flat chisel is the used widely. It has a broad cutting edge which is slightly round in shape so that corners of chisel do not stuck inside the metal.	

TOOL	USAGE	IMAGE
Threading Tools • Round Solid Die • Round Split Die • Adjustable Die • Die Nut • Die Plate • Pipe Die • Chaser Die • Acorn Die	The process of creating screw threads is called threading. Taps and dies are the tools for this purpose. A tap is used to cut or form the nuts and this process of cutting or forming threads is called tapping. A die is used to cut or form the bolts and this process is called threading. You can also use both tools to clean up a thread and this process is called chasing. Threading tools comprise taps, thread cutters, thread-milling cutters, threading heads, threading dies and thread cutting abrasive disks.	
Grinding • Hand Grinder • Bench Grinder • Portable Grinder • Wet Grinder • Special Grinder	A grinding machine/grinder, is a tool used for grinding, using an abrasive wheel as the cutting tool. Every teeth of abrasive on the wheel's surface make cuts a on the work piece by shearing process. Grinding is used to finish work pieces to give them high quality of surface and accuracy in shape and dimension.	
Drills	A drill is a tool attached with drill bits for drilling a hole for fastening various materials together with the use of fasteners. Use chuck for gripping the attachment at one end of the drill and then rotated it.	
Scriber	A scriber is a hand tool to mark lines on work pieces, prior to machining and this process is called scribing.	

TOOL	USAGE	IMAGE
Pipe Wrench	The pipe wrench is an adjustable wrench used for turning soft iron pipes and fittings. Its adjustable jaws design permits it to lock in the frame in a way that if any forward pressure applied on the handle it pulls the jaws together. Its teeth are angled in the direction of turn which is digging into soft pipe. Don't use them on hard steel hexagonal nuts because they can damage the nut head. It can also be used to break the bolt.	
Try Square	Try square is a tool used to check and mark right angles in constructional work.	
Divider • Simple Firm Joint Divider • Firm Joint	Dividers are drawing instruments that are used to measure distances, transfer lengths from one drawing to another and draw circles.	
V Block	V-Blocks are precision metalworking jigs usually used to grip round metal rods or pipes during drilling and milling work. They made of a rectangular steel or cast iron block with a 90-degree channel rotated 45-degrees from the sides and form a V-shaped look in the top. A small groove is cut in the bottom of the "V". They have the screw clamps for holding the work.	

TOOL	USAGE	IMAGE
Punch • Dott Punch • Prick Punch • Bell Punch • Hollow Punch • Double end Punch • Center Punch • Solid Punch • Pin Punch	A punch tool is used to assist in drilling. They are the marking tools, used for marking purpose into wood, plastic or metal for marking the area to be drilled. The conventional center punch is used with a hammer to make the groove on the surface.	
Snip • Straight Snip • Bend Snip	Snips are also known as shears and used to cut sheet metal and other tough objects.	
Scraper	Scraper is a single-edged tool used to scrap metal from a surface. It is required where a surface needs to be scratched and to be fit into its mating part.	
Bench vises	Bench vise is used to hold an object and makes the work easier to be performed on it. It is a reliable way to hold a piece of stock in place while working. It has two parallel jaws, one fixed and the other movable can move in and out by a lever.	
Tongs • Flat Open Mouth Tong • Flat Close Mouth Tong • Pick-up Tong • Bolt tong	Tongs are used to grip and lift objects.	

TOOL	USAGE	IMAGE
Wire Brush	Steel wire brushes are used to remove paint, dirt, rust, scratches and small imperfections after completion of work. They can be used on metal, concrete and wood surfaces. They come in many different wire types and sizes. Rigid brushes are used for clearing heavy dirt whereas soft brushes are used to make the surface shinier.	
chain block	Chain hoist is used for lifting heavy items. This handy machinery uses a system of levers and pulleys to hoist things off the ground. It also incorporates a heavy duty chain.	
Regulator • Signal stage Regulator • Double Stage Regulator	Single-stage pressure regulators decrease cylinder pressure in one step. Two-stage pressure regulators decrease cylinder pressure in two steps.	
Pipe Fitting • Pipe Adapters • Bulkhead Fittings • Compression Fittings • Pipe Cap • Pipe Elbow • Pipe Nipples • Pipe Plug • Pipe Wyes • Pipe Fasteners • Pipe Flanges • Pipe Reducer	A fitting is used to connect straight pipe or tubing sections. They come in many different sizes and shapes.	

TOOL	USAGE	IMAGE
Testing Lamps	A testing lamp is used to diagnose and troubleshoot an electrical problem.	
Ampere Meter	It is used to measure electrical current in an appliance. To use it break the circuit and attach the instrument to allow the electrical current to flow through the meter for measuring.	
Volt Meter	Volt meter is used to measure AC or DC voltages of electrical components. Voltmeter is used to measure the voltage available in the circuit.	
Megger • Manual Megger • Electronic Megger	This device is used to measure electrical leakage in wire. It is used for checking the electrical insulation level of electrical machines and devices like motor, generator winding, etc.	
Pump	A pump moves fluids i.e. gases and liquids by some mechanical action. Pumps can be classified into three major groups as per their way of use: displacement, direct lift and gravity pumps.	

Table 5.2.1 Different tools

Exercise

1. Claw peen hammer is used for pounding nails into a work piece or extracting nails from it. True or False?
2. Claw peen hammer is used for pounding nails into a work piece or extracting nails from it. True or False?

   Ans: .....
3. Which hand tool is used to hold small work pieces together during assembly, marking or drilling:

   a. Hammer b. Clamps c. Vernier Calliper d. None of these
4. Toolmaker's clamp is used for holding light work pieces while C-Clamp is used for holding both heavy and light work pieces. True or false?

   Ans: .....
5. Which of these is a main part of a file:

   a. Jaws b. Screw c. Tang d. All of these
6. A ..... cut file is used when large amount of material is to be re-moved, and also for sharpening and smoothing objects.
7. Cross filing is a method of:

   a. Producing a smooth surface

   b. Filling a metal with other material

   c. Removing metal

   d. None of these
8. While using hacksaws, the blade (pitch of the blade) is selected depending on the strength of the material to be cut. True or False?
9. Chisel is a hand tool used for ..... and cutting metal.
10. Chisels can be divided into two main categories:

    a. Hot and Cold Chisels

    b. Long and Short Chisels

    c. Pressure and Force Chisels

    d. None of these
11. Which of these is a main characteristic of a grinding wheel:

    a. Radius b. Wheel Bond c. Wheel Speed d. All of these

Unit 5.3: Using of measuring instrument

Unit Objectives

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

1. Know about different measuring instruments
2. Know about how to use measuring instruments properly

5.3.1 Measurement

Measurement is the comparison of one quantity with standard quantity. Any measurement can be judged by the following values: level of measurement (which includes magnitude), dimensions (units), and uncertainty. Measurements are most commonly made in the SI system, which contains fundamental units like: kilogram, meter, candela, second, ampere, liter and mole.

What is a 'Unit'?

A unit of measurement is a definite magnitude of a physical quantity (length, Mass and Time). Example: 10 liter,200 meter, 20 kg

Commonly used systems of measurements are:

S. No	Unit	Length (L)	Mass (M)	Time (T)
1.	C G S	Centimeter (cm)	Gram (gm)	Second (sec)
2.	F P S	Foot (ft.)	Pound (lb)	Second (sec)
3.	M K S	Meter (m)	Kilogram (Kg)	Second (sec)

Table 5.3.1 Systems of measurements

However, now-a-days SI (International System of Units) is used across the globe as a standard system of measurement. It is an extension of MKS system of measurement.

SI system has 7 fundamental units and 2 supplementary units, there are a number of derived units.

S. No	Measuring	S I Units
1	Length	Meter
2	Mass	Kilogram

3	Time	Second
4	Intensity of Electric current	Ampere
5	Thermodynamic Temperature	Kelvin or degree Celsius
6	Quantity of substance	Mole

Table 5.3.2 Measuring units

Few Derived units in SI system are:

S. No	Physical units	S I Units
1	Area	Sq. mtr
2	Volume	Cu.mtr
3	Speed	m/sec
4	Acceleration	m/sq sec
5	Density	Kg/cu.m
6	Force	Newton
7	Pressure	Pascal

Table 5.3.3 Physical SI Units

5.3.2 Measuring instruments

A measuring instrument is a gadget for measuring a physical amount. In the physical sciences, quality confirmation and engineering, estimation is the movement of getting and contrasting physical amounts of certifiable items and events. Set up standard articles and events are utilized as units, and the procedure of estimation gives a number relating the thing under review and the referenced unit of estimation. Measuring instruments, and formal test strategies which characterize the instrument's utilization, are the methods by which these relations of numbers are gotten. All measuring instruments are liable to shifting degrees of instrument mistake and estimation vulnerability.

Measuring instruments are classified into types:

- **Precision instruments -** Precision Instruments are those which can measure with an accuracy of 0.01mm or more. Example: Vernier Caliper, Micrometer etc.

- **Non precision instruments -** Non precision instruments are used for measurement of parts to a visible line graduation. Example: steel rule.

Least Count:

- The minimum tally of any measuring hardware is the littlest amount that can be measured precisely utilizing that instrument
- Least Count shows the level of precision of estimation that can be accomplished by the measuring instrument
- All measuring instruments utilized as a part of material science have a least count
- Example: LC of Vernier Caliper is 0.02mm

5.3.2.1 Steel Rule

Steel Rule is a flat and thin linear measurement instrument. It is the most commonly used measuring instrument. Steel rule is manufactured from stainless steel. The edges of the rule are accurately ground to form straight edges. Steel rules are available in different sizes like 150 mm, 300 mm and 600 mm. usually; the reading accuracy is around 0.5 mm.

There are different types of rules available. Few commonly used are:

- Engineer's rule
- Folding rule
- Flexible rule
- Hook rule

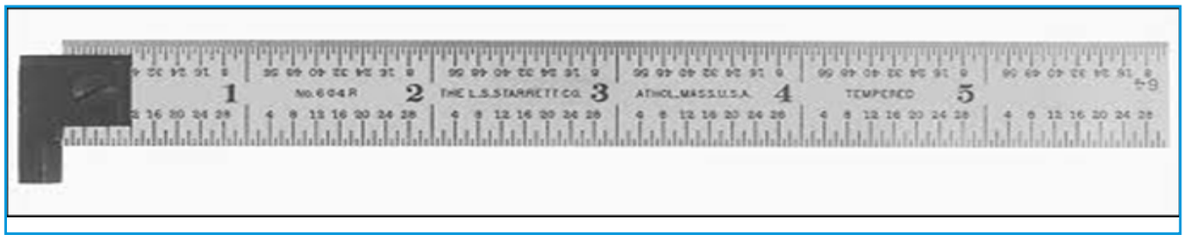


Fig 5.3.1 Engineer's rule

5.3.2.2 Vernier Caliper

A Vernier Caliper is a precision measuring instrument used to measure inside and outside diameter of shafts and thickness of parts having accuracy of 0.02mm.

The vernier calipers measure reading of the distance directly with precision and high accuracy. These calipers consist of calibrated scale with fixed jaw and movable jaw with a pointer.

For using vernier caliper, move the position of the pointer on the scale. At the point where the pointer is between two markings, take the reading on the scale. This is basic caliper; expansion of vernier scale on the instrument gives more exact reading; this is the vernier caliper.

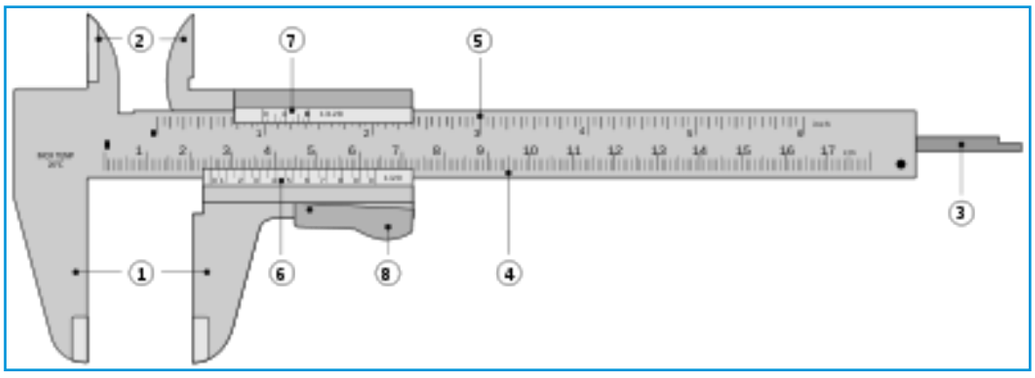


Fig 5.3.2 Vernier caliper

Parts of a vernier caliper:

1. **Outside Jaw** - To measure outer dia. and width of an object.
2. **Inside Jaw** - To measure inner dia.
3. **Depth Probe** - To measure depth of an object.
4. **Main Scale** - Scale set apart in millimeter (mm)
5. **Main Scale** - Scale set apart in inches
6. **Vernier Scale** - Interpolated estimations in millimeter
7. **Vernier Scale** - Interpolated estimations in millimeter
8. **Retainer** - Used to lock movable parts

Least count

The Least Count of a Vernier Caliper can be calculated using the formula

LC = 1 MSD - 1 VSD (Value of one Main Scale Division - Value of one Vernier Scale Division)

1VSD = 49/50 = 0.098 mm

LC = 1 – 0.098 = 0.02 mm

Total Reading (TR) = (MSR) + (CV) X LC

Where,

MSR = Main Scale Reading

CV = Coinciding Vernier Reading

LC = Least Count

Using and Reading a Vernier Calliper

step 1: First loose the locking screw of caliper and check the vernier scale for its proper working by moving the slider and ensure that caliper is reading 0 when closed fully. If you find caliper is not showing 0 reading, then adjust the jaws of caliper till that you get a 0 reading. If it is not adjusting at 0 reading, then add or subtract the correct offset in final reading for getting 0 reading.

step 2: Close the jaws delicately on the object which need to be quantify

step 3: The primary metric scale is perused first and for instance says this demonstrates there are 13 entire divisions before the 0 on the hundredths scale. Thusly, the main number is 13.

step 4: The 'hundredths of mm' scale is then perused. The most ideal approach to do this is to tally the quantity of divisions. This is 21 divisions on the hundredths scale.

step 5: Then 21 is multiplied by 0.02 giving 0.42 as the appropriate response (every division on the hundredths scale is comparable to 0.02mm)

step 5: The 13 and the 0.42 are included to give the last estimation of 13.42mm (the diameter across of the bit of round area steel)

5.3.2.3 Micrometer

A micrometer is a gadget assimilating an aligned screw broadly utilized for exact estimation of segment in mechanical trades and machining. They are used to measure very small distances.

Body parts of a Micrometer

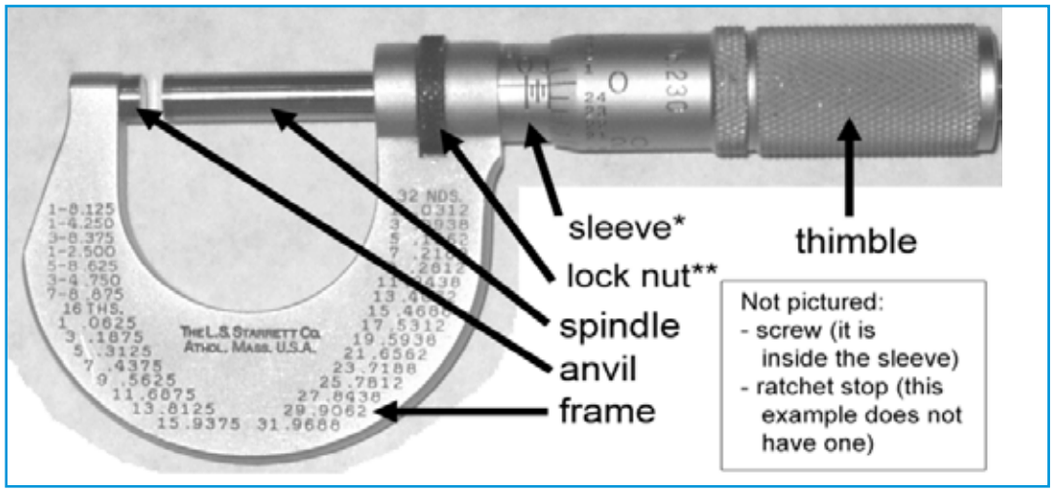


Fig 5.3.3 Micrometer

- **Frame** -The C-formed part that clasp the anvil and barrel in steady connection to each other. It is thick since it needs to limit flexion, magnification, and compression, which can misinterpret the estimation.
- **Anvil** - The gleaming part that the spindle pushes toward, and that the model leans against.
- **Sleeve / barrel / stock** - The stationary cylindrical part with the straight scale on it.
- **Lock nut / lock-ring / thimble lock** - The rough part (or lever) that one can fix to hold the spindle stagnant, for example, when instantly holding a measurement.
- **Screw** It is the main part of instrument, stays inside the barrel.
- **Spindle** -The gleaming round part which pushes the thimble towards anvil.
- **Thimble** - This part turns by the thumb
- **Ratchet stop** -Applied pressure can be limited by the device in the end of the handle by slipping at an aligned torque.

Operating principle:

Micrometers utilize the rule of a screw to expand little separations (that are too little to measure normally) into big rotation of the screw that are sufficiently enormous to read from a scale. The precision of a micrometer gets from the exactness of the string shapes that are at its heart. In few

cases it is a differential screw. The fundamental working standards of a micrometer are as per the following:

1. The measure of turn of a precisely made screw can be directly associated to a specific measure of axial movement (and the other way around), through the steady known as the screw's lead. A screw's lead is the distance it moves ahead axially with one entire turn (360°).
2. With a fitting lead and real diameter of the screw, a given measure of axial movement will be intensified in the consequential circumferential movements.

Least Count of Micrometer Screw Gauge:

LC = Pitch / Number of vernier scale division

LC = 0.5 mm / 50 or 1 mm / 100 = 0.01 mm

Total Reading = Sleeve Reading + Thimble Reading X LC

5.3.2.4 Height Gauge

A digital height gauge is precision measuring device used specifically for measuring height of two points. Advanced electronic (digital) height gauge can be used to carry out different tasks like measuring step heights, internal/external diameters and centre-line distances. The electronic height gauge has a precision of up to 0.0254 mm and claims consistency of ±0.00254 mm. The conventional height gauges are similar to Vernier Callipers, except that the fixed jaw is shaped like a base. The scale is graduated on both sides, one side being graduated for internal measurement. The main scale for external measurement starts at 1 inch. This allows for the combined width of the base and movable jaw, when the jaws are in contact. The gauge can be converted into a form of scribing block (to mark the work piece) by attaching an extension arm, beveled to a sharp edge, to the movable jaw.

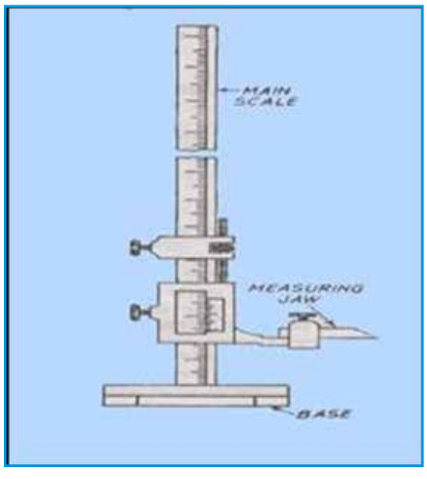


Fig 5.3.4 Height gauge

5.3.2.5 Feeler Gauge

- A feeler gauge is a measuring tool used to measure gap widths. They are used to measure the clearance between two parts
- They are made of number of small steel strips of different thicknesses with measurements marked on each piece
- These devices are used for valve clearances, setting spark plug gaps and ignition point gaps in engines.
- Feeler gauges are generally used for setting spark plug gaps, valve clearances and ignition point gaps in engines
- Feeler gauges are generally available in Metric and Inch Grades

Fig 5.3.5 Feeler guage

5.3.2.6 Dial ndicators

- Instruments use to measure small linear distances is called dial indicator. They are also known as dial gauges.
- The measurement results are displayed on a magnified scale i.e. a dial in the instrument.
- Variation in tolerance of machined part can also be checked by dial indicator.
- It's typical measurement range is 0.25 mm to 300 mm.

Fig 5.3.6 Dial Indicator

5.3.3 Calibration of measuring instruments

Calibration includes establishing and documenting abnormality of the measured value from retraceable, extremely precise standards of inspection. During calibration, known value of

instrument is compared with the measured value under specific conditions.

In calibration, balancing and correction of scale reading is done to correct the deviations found in the instrument, therefore measured value is then adjusted to the known value of instrument. Permanently changes the measuring instrument by adjustment always involves manipulation.

Retraceability of a calibration procedure means that the calibration order is reproducibly documented from the separate device under test. A country's metrological infrastructure defines retrace ability of measurement results.

Why do measuring instruments have to be calibrated?

This must be reviewed to national standards at regular intervals by means of calibration, and if needed adjust, and normally labeled with their calibration status. If it is determined during calibration that the measuring instrument doesn't fulfill the stated requirements, the operating company must examine the validity of before obtained measurement results and apply suitable measures with regard to the measuring instrument itself, as well as all affected products.

Throughout the calibration range of the instrument, calibration of an instrument is checked at several points. The upper and lower limit within which a quantity is measured is defined as the calibration range.

Calibration process

1. It starts with the design of measuring instrument which has to be calibrated.
2. The design of measuring instrument is like that it can hold the calibration process and calibration intervals within tolerance limits.
3. Design with following characteristics improves the life of instrument.
4. Selection of standards is the most visible part in calibration process.
5. The calibrated equipment has to be correct with the working standards.

There are some connections between calibrated device and standards, which can impact the process of calibration. For example, an analog phenomenon is involved in electronic calibrations; the result is directly influence by the impedance of the cable connections.

Exercise

1. Usually, the reading accuracy of steel rules is around 0.5 mm. True or False? Ans:.....
2. Precision is the degree under which repeated measurements under un changed conditions show the same result. True or False? Ans: .....
3. Micrometres use the principle of a ..... to increase small distances (that are too small to measure directly) into large rotations of the screw.
4. What is the least count of a micrometre:

   a. 0.1 mm b. 0.01 mm c. 0.0001 mm d. None of these
5. What is the use of locking screw in a Vernier Calliper:

   a. To read measurement b. To tighten or loosen object held in the jaw

   c. To provide a level surface d. None of these
6. The height gauge can be converted into a form of scribing block (to mark the work piece) by attaching an extension arm to the movable jaw. True or False? Ans: .....

Notes

Unit 5.4: Diagnosing the common defects of tools

Unit Objectives

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

1. Identification of defects in tools

5.4.1 Diagnosing tools for defects

Management has to establish a system to check the condition of tools for any defect or damage on regular basis. If found tools are damaged and are not in a condition of repairing, then discard the complete tool on immediate basis from the work area.

Hand tools should be inspected every time before use. Give special attention to the tool cleanliness.

Blunt cutting edge or deformed working part should be redressed.

Defective tools can do severe and hurting injuries.

If tool is damaged in any way, DO NOT USE IT.

Be aware of problems like:

- Mushroom head wedges and chisels
- Cracked handles
- Worn out jaws of wrenches
- Broken drill bits
- Incomplete tools i.e. files without handles

To ensure safe use of hand tools, remember:

- Double check all tools before using
- Never use a defective tool
- Make sure that all defective tools are repaired before using

Power tools always need skill and complete training of operation regarding its use even these tools are in good condition. Don't use power tools if there is any defect in them.

Check problems like:

- Un-operative guards
- The on/off switch is not working properly
- Insufficient grounding of power tools
- No ground wire (on plug) in tools
- Wrong grinder wheel
- Cracked blade of tool
- Wedged back the guard on power saw

Notes

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Transforming the skill landscape

6. Assembling and Dismantling of Common Machines on the Worksite

Unit 6.1 – Limits, Fits & Tolerances

Unit 6.2 – Understanding the engineering drawings

Unit 6.3 – Prepare equipment to perform the assembling of components

Unit 6.4 – Ensuring material appropriateness for assembly

Unit 6.5 – Proper identification of tools and tackles

Unit 6.6 – Correct handling of tools and tackles

Unit 6.7 – Jointing of components

Unit 6.8 – Machine installation and maintenance

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Key Learning Outcomes

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

1. Know about limits, fits and tolerance
2. Know about basics of engineering drawing
3. Know about how to understand engineering drawing sketches
4. Know about prepare pre-assembly activities
5. Know about identification of appropriate material for starting job work
6. Know about identification of appropriate tools for starting job work
7. Know about correct handling of tools
8. Know about how to perform housekeeping activities before starting the work
9. Know about maintaining safety at workplace

Unit 6.1: Workwise recognition of tools

Unit Objectives

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

1. Understand the basic deviation, tolerance and tolerance grades
2. Understand transition fit, limits and system for limits and fits

6.1.1 Limits

The most extreme and least permissible sizes inside which the actual size of a part lies are called Limits.

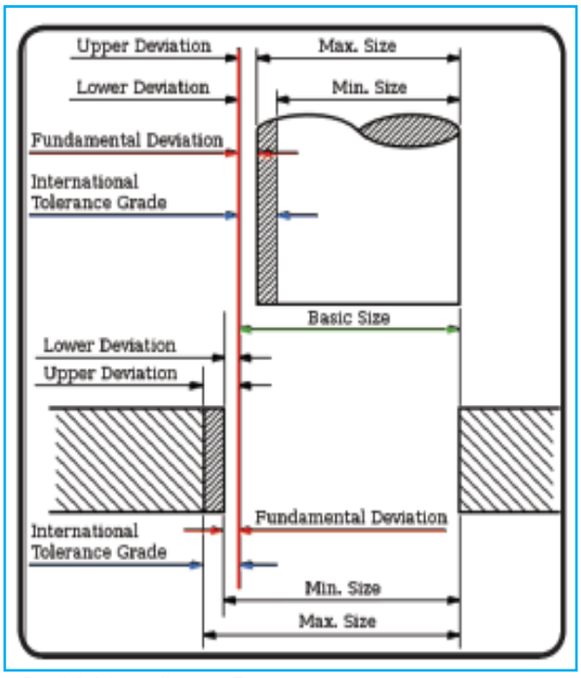


Fig 6.1.1 Limit System Terminology

Terminology of limit systems:

- **Limits of size:** The two maximum allowable sizes of a part between which the actual size should lie. It includes the maximum and least sizes of the part.
- **Nominal size:** Actual size of the component through which it is referred.
- **Basic size:** It is the part of a section in connection to which all points of variation are determined.
- **Zero Line:** It is the line in which places of resistance zones are appeared.
- **Deviation:** Deviation is mathematical difference between highest size and essential size
- **Upper Deviation:** Logarithmic difference between most extreme limit of size and relating fundamental size is upper deviation. It is meant by letters “ES” for a hole and “es” for a shaft.
- **Lower Deviation:** Mathematical distinction between the minimum limit of size and the relating essential size is lower deviation. It is meant by letters “EI” for hole and “ei” for a

shaft.

- **Fundamental Deviation:** It is either upper or lower deviation, which is closest to the zero line for either a shaft or a hole. It settles the position of the resistance zone in connection to the zero line.
- **Allowance:** Allowance is intentional difference between hole measurements and shaft measurement for a fit.

6.1.2 Fits

When two sections are to be collected, the connection resulting because of the difference between their sizes before assembly is known as a fit. A fit might be characterized as the level of tightness and detachment between two mating parts.

A fit is expressed by writing the basic size of the fit first (the basic size which is common to both hole and the shaft), followed by the symbol for the hole and symbol for the shaft. Example: 30 H7/g6

A fit can be divided into three classes:

1. **Clearance**: It is the difference between size of the shaft and extent of the hole (it is constantly positive). Clearance fit is a fit that dependably give clearance. In such a case, resistance zone of hole is above resistance zone of the shaft.
   - Difference between max hole and min shaft is maximum clearance.
   - Difference between mini hole and max clearance is minimum clearance.
2. **Interference:** Difference between span of hole and shaft before get assembly is interference. It is negative. For this situation, shaft is constantly bigger than hole. Here resistance zone of the hole is beneath tolerance zone of shaft.
   - Greatest interference is the arithmetic distinction between min hole and max shaft.
   - Least obstruction is arithmetic difference between max hole and least shaft.
3. **Transition Fit:** It is a fit that some provides clearance and sometime interference.

Standard System of limits and fits

Hole Basis system:- In standard system of limits and fits, when the size of holes is kept constant

and shaft size is varied to get different class of fits, it is known as hole basis system.For hole basis system, fundamental deviation symbol H is chosen. This is so because the lower deviation of hole H is zero. This is known a basic hole.

Shaft Basis System:- In standard system of limits and fits, when the size of shaft is kept con¬stant and hole size is varied to get different class of fits, it is known as shaft basis system. For shaft basis system, fundamental deviation symbol h is chosen. This is so because the lower deviation of shaft h is zero. This is known a basic shaft.

Generally, hole basis system is followed. The reason is that depending on the class of fit, it is always easier to alter the size of shaft because it is external, but it is difficult to alter hole that is internal.

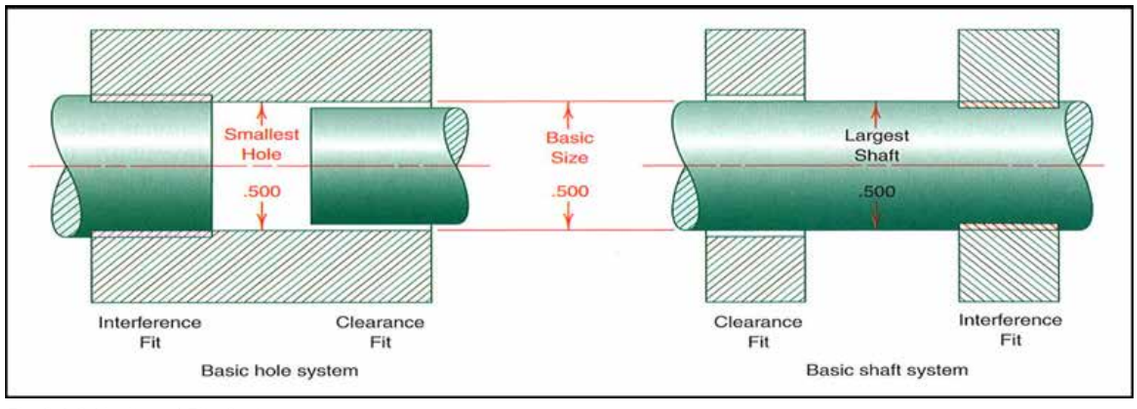


Fig 6.1.2 Limit and Fits System

6.1.3 Tolerances

Tolerance is the difference between maximum limit of size and minimum limit of size. It characterizes the permissible or limits in size variation. It is constantly positive and articulated as a number.

International Tolerance grade: It is standardized measure of difference in size between the segment and fundamental size.

Fundamental Tolerance: It is the grade of tolerance. In Indian Standard System, for both hole and shaft, 18 evaluations of tolerance are symbolized by number images. It is denoted as IT01, IT0, and IT1 to IT16.

Types of Tolerance

1. **Unilateral Tolerance:**
    - Tolerances of a measurement may be one-sided or bilateral.

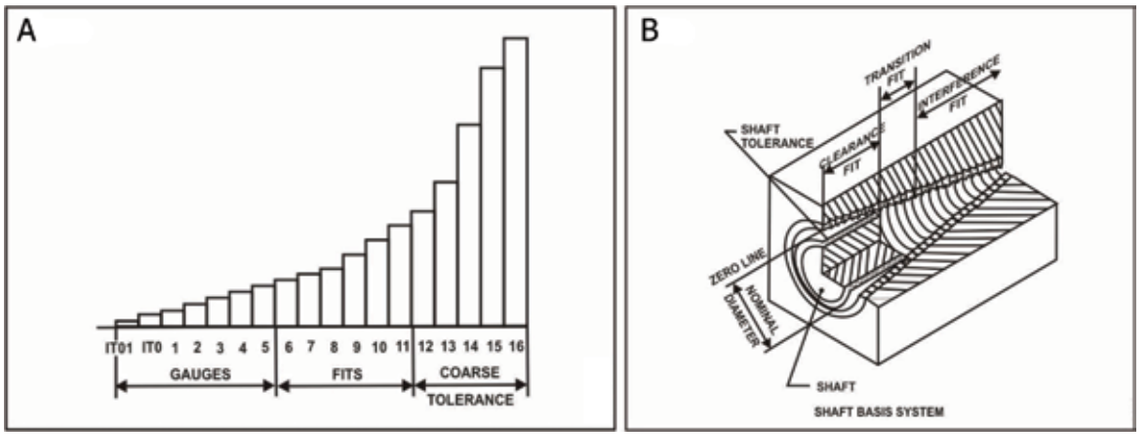


Fig 6.1.3 Fundamental Tolerances

- The tolerances are known as unilateral, when two measurements are on one side of the nominal size.

2. **Bilateral Tolerance:** When two limit measurements are above and beneath apparent size, the tolerances are said to be bilateral or two-sided.

One-sided tolerance, are favored over bilateral in light of the fact that the administrator can machine to the furthest reaches of the shaft (or lower limit of hole) as yet having the entire resistance left to machine to dodge dismissal of parts.

3. **Tolerance Size:** It includes the basic size, the fundamental deviation and grade of tolerance.

Example: 25H7 – tolerance size of a hole whose basic size is 25. The fundamental deviation is represented by symbol H and grade of tolerance by number 7.

Example: In the figure below, the hole is shown as 25 +/- 0.2. It means that 25 mm is the basic dimension and 0.2 +/- is the deviation

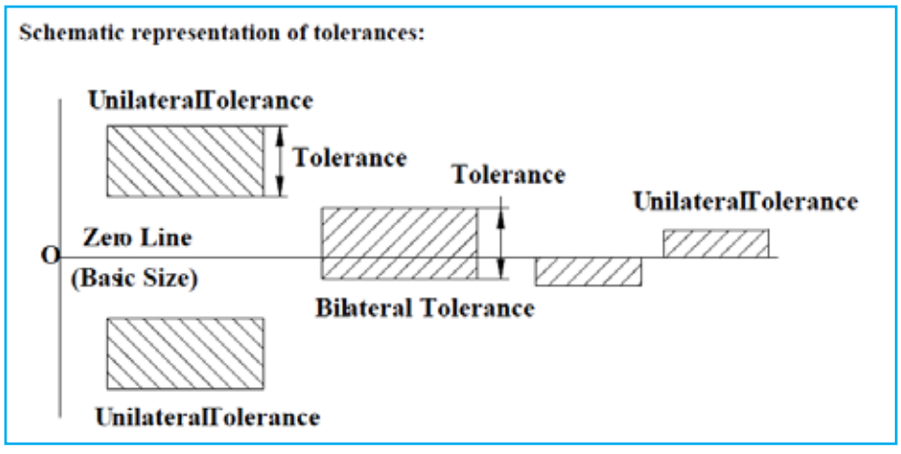


Fig 6.1.4 Schematic representation of tolerances

Most commonly, the deviation is given on the figure. In this example, +/- 0.2 is the deviation of the hole of 25 mm dia. Therefore the acceptable size of its dimension is between,

25 + 0.2 = 25.2 mm

Or 25 – 0.2 = 24.8 mm

25.2 mm is the maximum limit and 24.8 mm is the minimum limit.

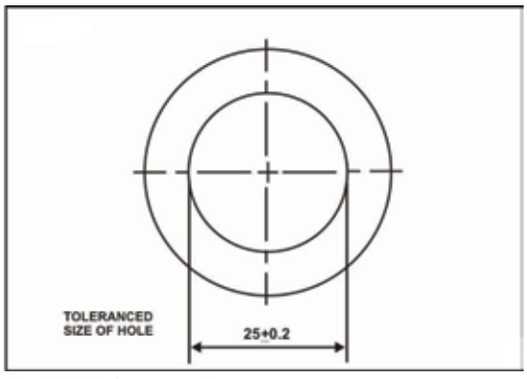


Fig 6.1.5 Tolerances Size

Tolerance is the difference between maximum and minimum limits, here the tolerance is 0.4 mm (25.2 – 24.8)

Exercise

1. Match the following.

Basic size	Difference between minimum possible component size and basic size
Upper Deviation	Nominal diameter of a component
Lower Deviation	Difference between maximum possible component size and basic size

2. Tolerance is the difference between maximum and minimum limit of size. True or False?

   Ans: .....

3. In Indian Standards the number of fundamental deviations is:

   a. 30 b. 25 c. 14 d. 5

4. ..... is the difference between the size of the hole and size of the shaft.

5. In standard system of limits and fits when hole size is kept constant and shaft size is varied, it is known as:

   a. Shaft basis system
   b. Constant System
   c. Hole basis system
   d. None of these

Notes

Unit 6.2: Understanding the engineering drawing

Unit Objectives

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

1. Know about basics of engineering drawing
2. Know about orthographic projection views
3. Know about concept of quadrants
4. Know about engineering standards
5. Know about tools require for engineering drawing

6.2.1 Basic knowledge of engineering rawing

Engineering drawing: It is a graphical language utilized by specialists and other specialized faculty related with this profession. The reason for engineering drawing is to pass on graphically the thoughts and fundamental data for the development or examination of structures, machines or frameworks.

These are point by point technical drawings drawn precisely and accurately. These are line drawings, drawn with the guide of numerical instruments by recording and transmitting the specialized data. They provide accurate and entire explanation of machines or machine components which have to fabricate or manufacture.

- Technical drawings can’t sow the actual view of articles as they appear to the eye.
- Drawings do the utilization of many particular symbols and traditions keeping in mind the end goal to transmit specialized data unmistakably and precisely.
- To learn and accurately translate specialized drawings, you have to familiarize with the essentials of specialized drawing.

6.2.1.1 Presentation of engineering drawing

In basic engineering drawing, orthographic projection method is used. Here in welding industry to communicate technical information through engineering drawing, , we generally use orthographic views (OV) instead of pictorial views.

- OV records the exact shape of objects.s
- OV only shows one side of an object and overall dimensions of two and its two-dimensional (2-D) drawing.
- At least couple of OV is needed to demonstrate the object in 3-D and to illustrate its complete shape.

So, here we are going to only study about orthographic projections.

6.2.1.2 Orthographic projection

Orthographic drawings are the establishment of technical and machine drawings. These drawings generate complete data for development and repair, and in addition exhibit the object in its actual extents i.e. its size and shape. The orthographic projection demonstrates the object like it views from the front, right, left, base, top or back, as per the projections in first-angle or third-angle projection. Third angle orthographic projection is standard projection for every single mechanical drawing.

Orthographic projection is the technique for speaking to the correct state of an object in at least two perspectives, on projection planes commonly at right angle position to each other or by drawing perpendiculars from object to planes.

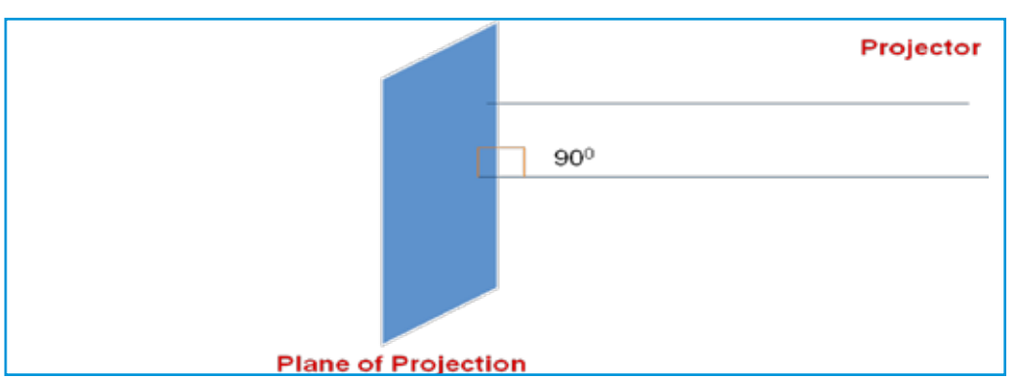


Fig 6.2.1 Plane of projection

One of these perspectives is eluded as top view and represent to the object as it looks from the top-side. Other perspective is known as front view and represents the object as it looks from the front. Last one is assigned as side view, which can be drawn by the data from the top and front perspectives. .

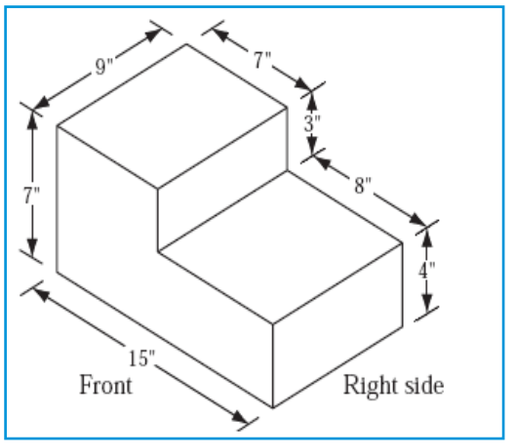


Fig 6.2.2 Slab view

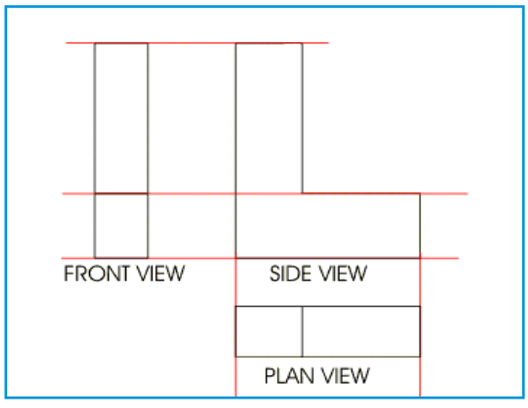


Fig 6.2.3 Different views of slab

View arrangement: Concentrate the course of action of the three perspectives in figure. The front view is the starting point of drawing. Front view is chosen as base view because it highlights the important attributes of the object. The right side view is anticipated straightforwardly to right of the front view. Top view is placed over the front. Subsequent to concentrate each view, attempt to envision or picture the presence of the object.

Principal Plane Line: Drawings are divided into zones. Each zone of drawing carries OV, combine with the symbols and data needed to draw that view. The zones are isolated by principle plane lines which are also known as crossed (90°) development lines. These lines are like a coordinate system. These lines are excluded in completed drawings. Principle plane lines are characterized as shown in fig.

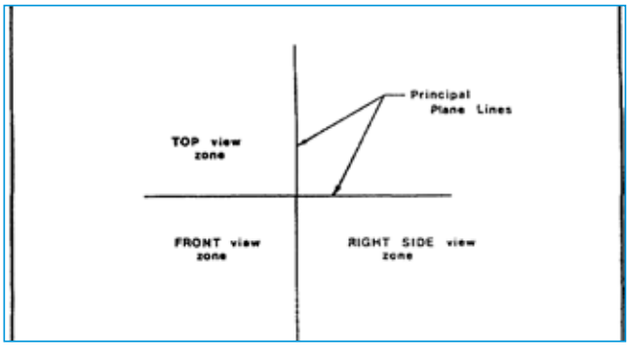


Fig 6.2.4 Principal plane

For example: Orthographic views of a cylinder are

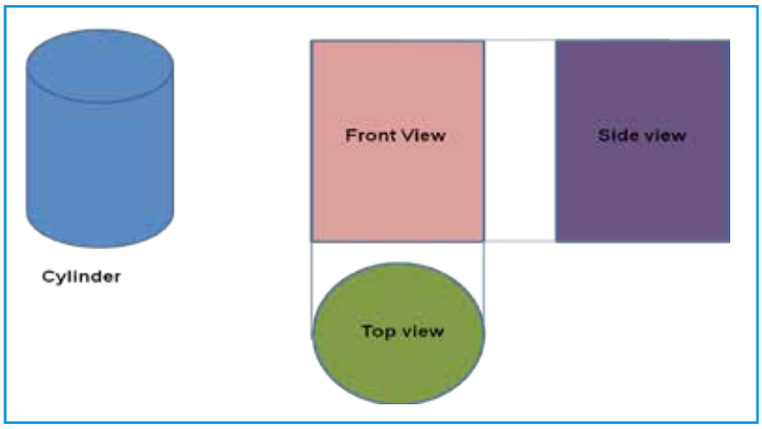


Fig 6.2.5 Orthographic views of cylinder

To understand how to draw these views, first we need to understand the planes of projection and concept of quadrants.

6.2.1.3 Concept of Quadrants

See the projection of cylinder in all the four quadrants as shown

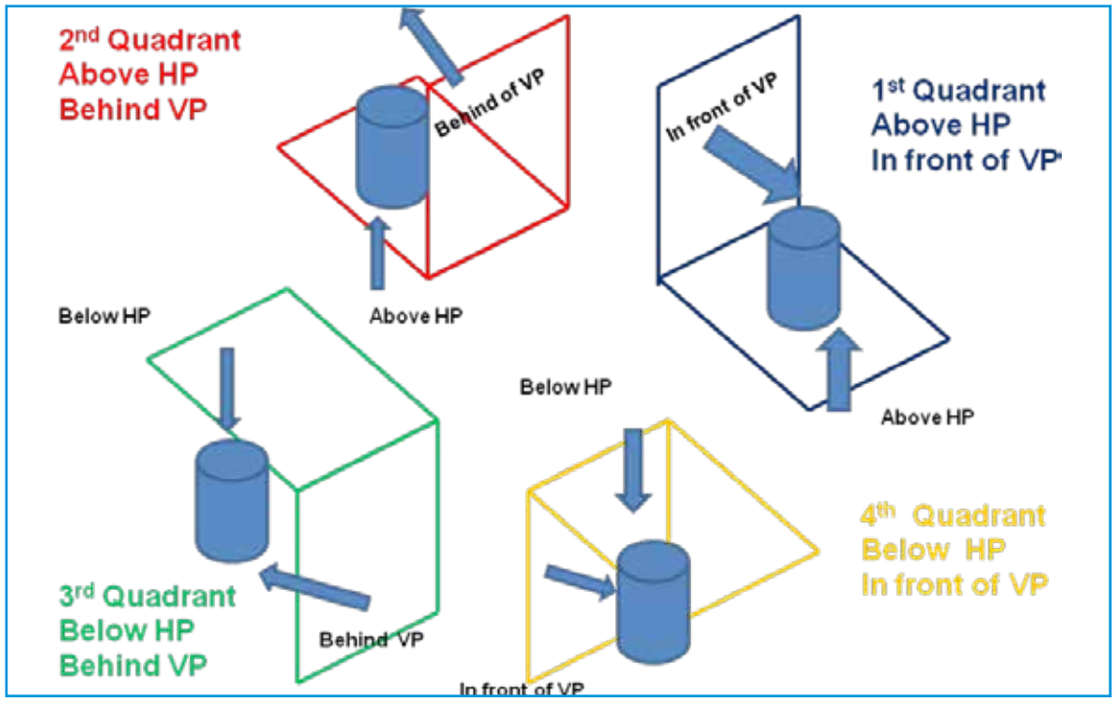


Fig 6.2.6 Projection quadrants

- If we imagine the projection in 1st quadrant, then it is called 1st angle projection.
- If we imagine the projection in 2nd quadrant, then it is called 2nd angle projection.
- If we imagine the projection in 3rd quadrant, then it is called 3rd angle projection.
- If we imagine the projection in 4th quadrant, then it is called 4th angle projection.

For basic engineering drawings two guidelines are regularly being used in orthographic projection; the first angle projection also known as European projection and third angle projection also known as American projection. Perspectives are indistinguishable in both techniques for projection with the exception of their relative positions on the drawing paper. So, let's understand them:

1st angle Projection – Rotation of Planes

In 1st angle projection, the front view is reference VIEW and other views are drawn as "shadows" of that view. For example, the left hand side view is drawn on the right side of front view. So, the top view (plan) is drawn at the base of front view, and so on.

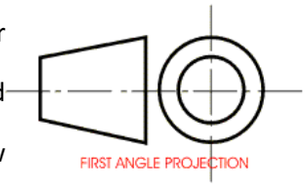


Fig 6.2.7 1st angle projection

Step 1: Rotate the Horizontal Plane Clockwise through 90^0.

Step 2: Rotate the planes clockwise through 90^0 to face the observer.

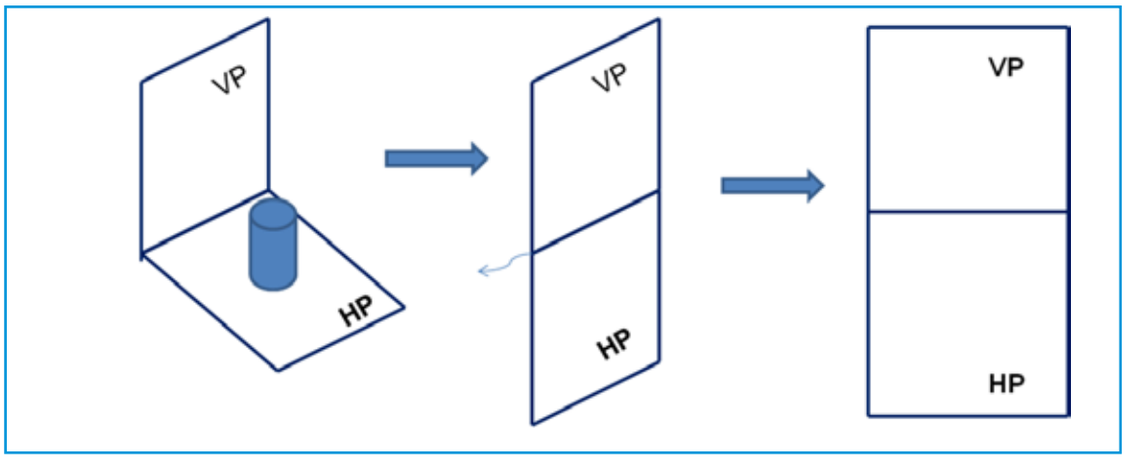


Fig 6.2.8 Rotation of planes in 1st angle projection

3rd angle Projection – Rotation of Planes:

In 3rd angle projection, the front view is the premise (similarly as before) however other views are drawn as "reflections" of font view. In this projection, the left hand side view is drawn on the left hand side of front

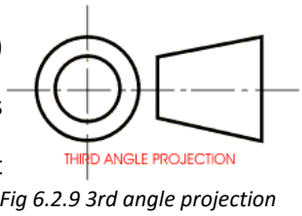


Fig 6.2.9 3rd angle projection

view. Additionally, the top view (plan) is drawn over the front view.

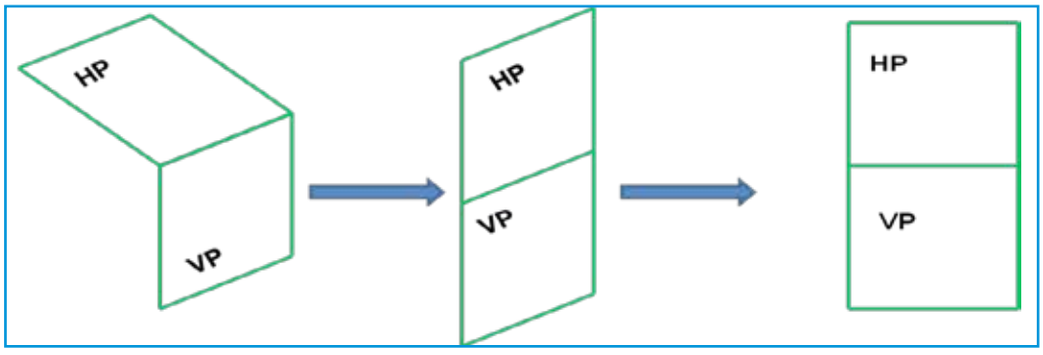
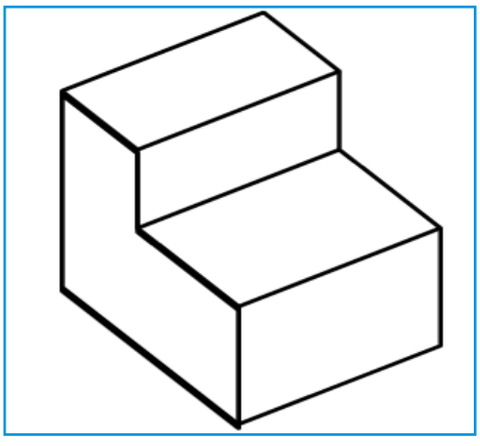


Fig 6.2.10 Rotation of planes in 3rd angle projection

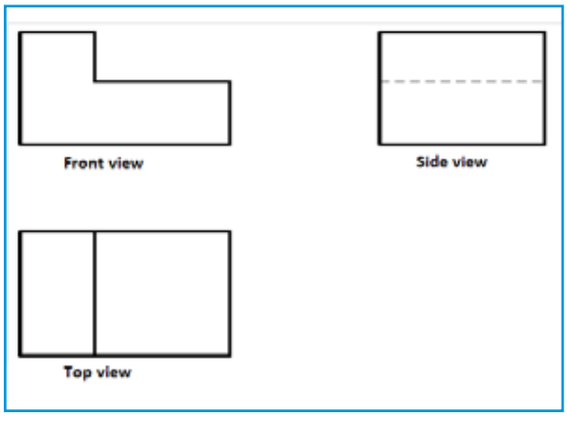
Step 1: Rotate HP through 90^0 in the clockwise direction

Step 2: Rotate the planes through 90^0 in the clockwise direction to face the observer

For example: The Front View (FV), Left Hand Side View (LHSV) and Top View (PLAN) of the given object



In 1^{st} angle projection is:



In 3rd angle projection is:

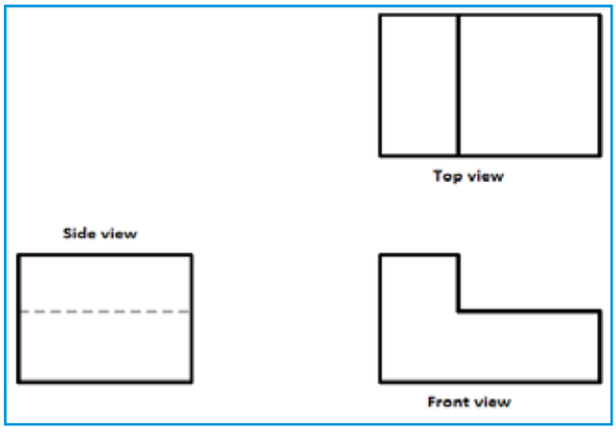


Fig 6.2.11 Orthographic view example in 1st angle and 3rd angle projection

6.2.1.4 Tips for drawing the sketches

For drawing technical drawings, some tips given are:

- **Visualize Object:** Visualize the definite and clear picture of object in mind, and then a decent graphical picture can be created.
- **Determine Views:** The perspectives might possibly be the same with respect to a scale drawing; e.g., the thickness or state of the line can be utilized to draw a view.
- **Determine Size:** Determine the size of sheet of paper for portraying the object. Size of the sheet should be enough to show all details the object, however permit a lot of space for measurements, notes, and particulars.
- **Locate Center Lines:** When going to start drawing, always locate the inside lines of object.
- **Block in Main Outlines:** Check the extents of width to height in drawing. Select one edge of the object as a unit and assess the proportionate lengths of alternate edges.
- **Complete Detail:** Once the primary blueprint is acceptable, fill the points of interest for right extent.
- **Dimension Lines and Arrowheads:** When the state of the object has been drawn completely, then include the measurement arrowheads and lines. Don't make any estimation until the

work is finished.

- **Dimensions:** Now embed the measurements on the drawing. These measurements can be obtained by a steel cable. Take all estimations from completed surfaces.
- **Titles and Notes:** Titles and notes should be embedded together with the date mentioned on sheet.
- **Check:** Make a last check after completing the draw. Do it carefully.

6.2.2 Engineering Drawing Standards

Engineering drawings, being one of the many types of specialized form of exchanging information, need to satisfy some acknowledged guidelines. There are different national, multinational and worldwide principles, however the present pattern in many nations is to follow (receive) the ISO gauges.

What are Drawing Standards?

- Following Standards help in easy understanding of drawings across the country
- Bureau of Indian Standards (BIS) provides the standards for technical drawings
- Examples
  - IS 919 (Part 2) : ISO system of limits and fits
  - IS 10714 : General principle of presentation o technical drawings
  - IS 10718 : Method of dimensioning and tolerance cones on drawing

6.2.2.1 Drawing Sheet Sizes

ISO most prescribed paper sizes for specialized drawings are known as A-FORMATS. Different arrangements, similar to the B-Series, are of lesser significance. In the A-Format arrangement, the biggest size is A0. The extent of an A1 paper is a large portion of the measure of A0 while A2 is a large portion of the span of A1 et cetera. Small sized A design papers (i.e. A5, A6, and so on) are once in a while utilized for specialized drawings.

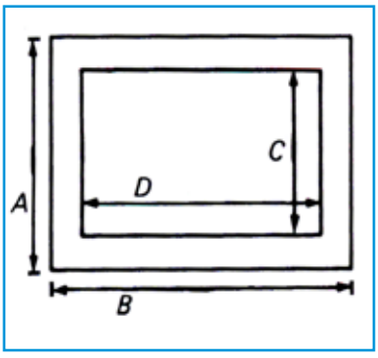


Fig 6.2.12 Drawing sheet

Designation	Size of the Sheet		Size of Frame	
	A (mm)	B(mm)	C(mm)	D(mm)
A0	841	1189	791	1139
A1	594	841	554	804
A2	420	594	380	554
A3	297	420	267	390
A4	210	297	180	267
A5	184	210		

Table 6.2.1 Different drawing sheets sizes

6.2.2.2 Lines

In technical drawings, various type of lines and line styles are used to provide the desired information. These lines differ in thickness and style.

- **Visible** – these are sequential lines used to represent edges which can be seen directly from a specific angle?
- **Hidden** – these lines are used to represent edges which can't be seen directly.
- **Center** – These lines are used to

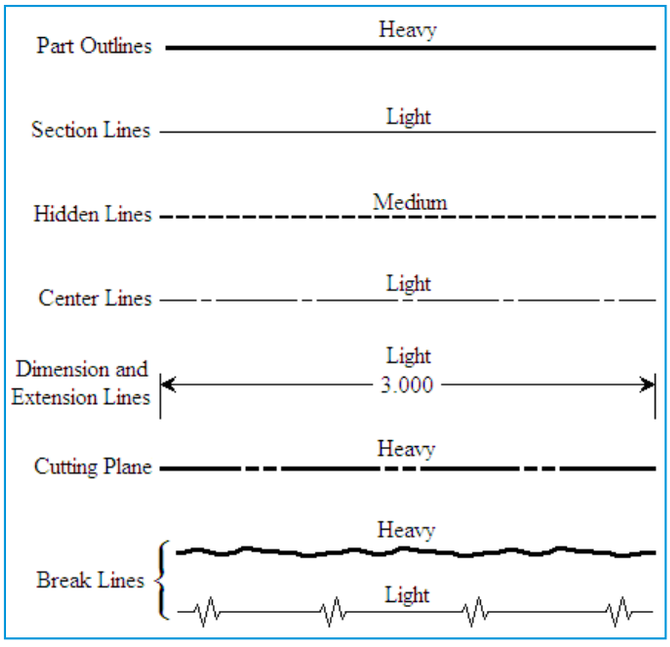


Fig 6.2.13 Different lines used in engineering drawing

represent the axes of circular features. These lines are long and short dashed.

- **Cutting plane** – are lines that used to define sections for section views, these are thin and medium dashed lines, or also thick, long and double short-dashed lines.
- **Section** – These are thin lines, represent section views which results due to cutting of object. These are also known as "cross-hatching."
- **Phantom** –These lines indicates feature or component of the assembly which is not the described part or assembly. These lines are alternately long and double short-dashed thin in shape.

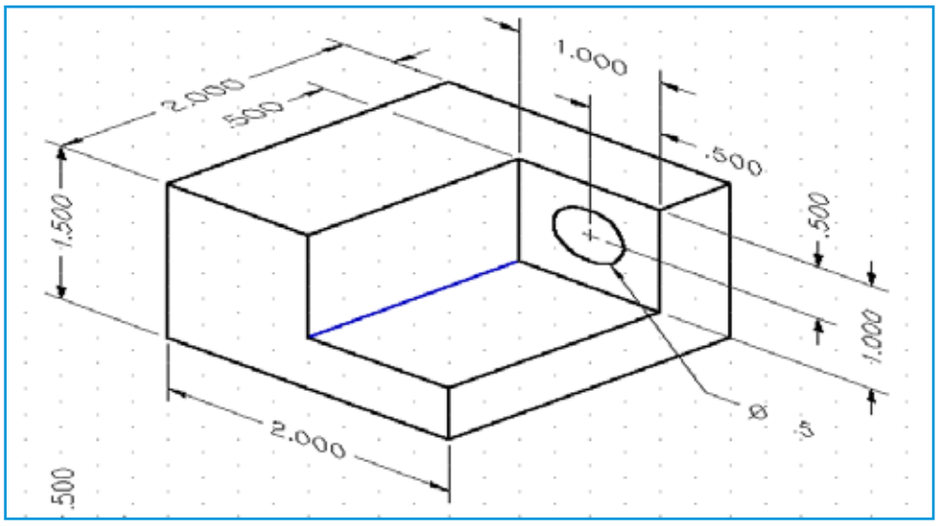
6.2.2.3 Dimensioning

Through the usage of dimensions, the appropriate sizes of features are expressed. Distances might be shown with either of two accepted forms of dimension: ordinate and linear.

- In linear dimensioning, two parallel lines, also known as "extension lines," separated at the distance between two components, which are shown at every element. A line perpendicular to the extension lines, known as "dimension line," is appeared between and ending at the extension lines. The distance is shown in numerical form at the midpoint of the dimension line.
- In ordinate dimensioning, an origin is established between one horizontal and one vertical extension line for the complete object view. The small circles placed at the ends of these lines shows the origin of line. Measurements along the x- and y-axes are shown by these extension lines, with the distances written in numerical form at the ends of these lines.

Exercise

1. Draw the orthographic projections of the solid:



2. In an orthographic projection, projectors are parallel to each other. True or false?

   Ans: .....

3. _____ is a drawing instrument used by draftsmen to draw horizontal lines.

4. Alternatively thick and short double dashed lines used to represent sections.

   Ans: .....

5. Pencils are specified on the European system using H, F and B. What does these stands for?

   H : _____

   F : _____

   B : _____

Unit 6.3: Prepare equipment to perform the assembling of components

Unit Objectives

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

1. Know about pre-assembly activities
2. Know about advantages of pre-assembly activities

6.3.1 Advantages of assembly activities

Before starting the assembling process, workers have to perform certain activities, called pre assembly activities. Pre assembling activities of a structure includes collecting sub-assemblies, material, machines, equipments and tools required for assembly on the work floor where the structure has to be assembled.

Pre assembly activities are necessary to complete the assembly easily and without any troubles.

Advantages of pre assembly activities are:

- Pre arrangement of all the necessities.
- Shorter assembly time.
- Opportunities for good architecture
- Healthy buildings
- Reduced energy consumption
- Cost effective solutions
- Safety in construction
- Increase in the quality of construction.
- Reduction of construction waste

6.3.1.1 Pre-assembly activities

Pre assembly activities includes following activities:

1. **Effectively inspecting material before commencement of work**

Firstly you have to inspect the material according to the job requirements has to be done.

- For assembling the machine, understand the machine assembly blueprints, drawings and other requirements to recognize the sequence of activities.
- Ensure the correct limits, tolerance and fits of equipment components as per the industry norms and standards.

2. **Collecting tools and equipments**

- Identify tools and equipment needed for performing the components assembly.
- Collect tools required during the assembling process
- Ensure that tools match the desired specifications
- Check tools and equipment required for any damage. Ensure that they are in working condition and doesn't require any repairing.
- Report defective and damaged tools and equipment by following the process of escalation matrix.
- Ensure the calibration status of all measuring equipment and instruments
- Prepare machine foundation base according to the job work requirements.
- Utilize braces, clamps, jacks, ropes and bolt straps to grip components in position.

3. **Effectively prepare machines and tools**

- Ensure and check all tools and equipment required during assembly is ready for operation
- Ensure and check the calibration status of all measuring equipment and instruments
- Utilize portable grinder, scraper or hand file for removing rough spots from work piece.
- Check the electrical connections of the equipments.

Unit 6.4: Ensuring material appropriateness for assembly

Unit Objectives

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

1. Know about material need to collect for the assembly

6.4.1 Material readiness for the assembly

Collecting components required to complete a job

- Collect work pieces/ components to be assembled
- Make sure that material required is collect in right capacity
- Visually inspect the workpiece and ensure that work pieces are of preferred quality i.e. free from rust etc.
- Make sure that work pieces are free from contaminants i.e. grease, paint, rust etc.
- Before assembling process, smoothen out the metal work piece.
- Make sure that, there should be no delays caused as a result of inappropriate preparation and failure to recognize problems.

Notes

Unit 6.5: Proper identification of tools and tackles

Unit Objectives

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

1. Know about proper selection of hand tools
2. Know about proper selection of power tools

6.5.1 Selection of tools

- Understand your job work.
- Select the appropriate hand tools required for the job. Ensure that tool handle can fit into the user hands properly; it can't slip out from the hands when using.
- Always use hand tool only for the purpose they are manufacture, never use them for any other work. They are designed according for their purpose i.e. in terms of strength, structure etc. Misuse of tools may lead to any danger or accident.

Fig 6.5.1 Tool box

- Hand tools should be inspected every time before use. Give special attention to the cleanliness of tools. Redress the distorted working parts and sharp cutting edges.
- Check tool body and handle for any crack or damage.
- Check that handle of tool is installed properly.
- Check for any faulty trigger lock or switch.
- Inspect tool for any loose or faulty prongs.

6.5.2 Selection of power hand tools

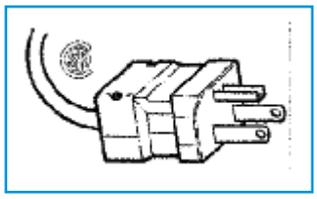


Fig 6.5.2 3-wire electrical cord

- Make sure that you have complete training about the safe operation of tool. Read operator's manual and follow manufacturer's instructions for operating the tool.
- To ensure safety, use manufacturer recommended guard or shield for power tool.

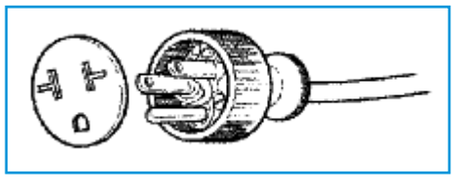


Fig 6.5.3 Safe guarding of plug

- Check power tools should be grounded properly by three-prong plug and powered by a low-voltage transformer. This arrangement save you from the electric shock.
- Always plug the three-pin plug in a properly grounded 3-pole outlet. Use an adapter to put up the two-hole receptacle, attached the adapter wire to a functioning ground. NEVER take out grounding pin from plug.
- Use continuity tester for testing all tools for effective grounding.
- Use that kind of battery, specified by the tool manufacturer for the battery operated power tool.
- Use charger specified by manufacturer for charging the battery.
- Ensure that power tool is turned off or battery is removed, when you complete the work and storing the tool.
- Ensure that no metal parts, screws, nails etc. can come in contact with the terminals of battery; this can short the battery and can cause fire, sparks or burns.

Unit 6.6: Correct handling of tools and tackles

Unit Objectives

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

1. Know about correct handling of hand tools on floor
2. Know about correct handling of power tools on floor

6.6.1 Handling of hand tools

- Use toolbox or a tool-belt at workplace for carrying the hand tools.
- Prevent unauthorized entry in the workplace, to avoid any accident due to slipping of tool handle and working with long handle tool.
- Check workpieces for any metal pieces stick on them before using tools, these metal pieces may damage the hand tools.
- When working at height, take necessary pracautions to avoid slipping of tool from handle.
- Take necessary precautions if working on or near electrical conductors.
- Always operate the tool in correct posture.
- Follow proper procedures when using a hand tool, e.g. for hammering nails use head side of hammer instead of peen side; don't hammer the ends of spanner, use spanners only for screwing nuts and bolts.
- Use suitable PPE, while working with hand tools with sharp corners and edges. Keep the body movement proper when using the tool.
- If flying particles or noise generated during the operation of hand tools, wear proper PPE during the operation.
- Use clamps to secure a workpiece for fix them into a stable position.
- Don't play with the tools, concentrate on job at workplace.

6.6.2 Handling of power hand tools

What should you do while using powered hand tools?

- Wear appropriate PPE when working with power tools
- Turn off the power tool before connecting it to power supply.
- If power cord is too warm or sparking, call the qualified person or main electrician.
- Always disconnect the power supply when making adjustments.
- Before using, check the power cord for any damage. If found defective, tag tool with an "Out of service" tag and replace it instantly.
- When using power tools, keep path clear for their power cords.
- Use bench vice or clamps to hold work piece. This permits you to use both hands for better control of the tool.
- Use only approved extension cords and power requirements of the electric tool which you are using. This saves the power cord from overheating.
- To remove stumbling or tripping hazards, don't hang power cords over aisles or work areas.
- When removing the tool from plug, pull the plug out, not the cord. Pulling the cord may cause wear and tear in cord and can cause the electric shock.
- Follow good housekeeping practices.
- Keep power cords away from sharp edges, water, heat, oil, and moving parts. This can damage the insulation of cord and cause a shock.
- Keep cutting tools like drill bits, etc. clean, sharp and well maintained.
- When tools are not in use, store them in a dry and safe location.

What should you avoid when using powered tools?

- Don't use any power toll till that you are not trained for it and you are not aware about its safety precautions.
- Ensure that tool is switched off before plugging in power socket for avoiding accidental starting. Don't walk with the tool in the work area with the switched on tool.
- Don't avoid the use of ON/OFF switch and always operate the tools by using power cord.
- Don't pull out the power cord of tool from outlet for disconnecting the power supply.
- Do not leave a running tool unattended. Do not leave it until it is turned off and stopped running completely.
- Don't make use of electric tools in wet conditions unless tool is grounded
- Don't use power tools in rain or wet conditions; it gives you an electric shock.
- Stay away with grounded surfaces like refrigerators, pipes etc. when utilizing powered tools; this will reduce the chances of electric shock.
- Don't utilize light duty power cords.
- Don't tie knots on power cords, this can cause electric shock to the operator.
- Don't use the power tools with unprotected cords where workers, mobile equipments, vehicles are moving.
- Ensure that, there are no explosive gases in the area before using the power tools.
- Don't use flammable or toxic solvents for cleaning tools.

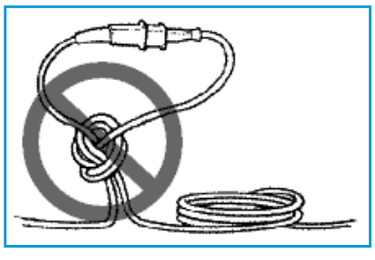


Fig 6.6.1 Wrong handling of wire cord

Notes

Unit 6.7 Jointing of components

Unit Objective

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

1. Know about different assembly jointing methods
2. Know about cable jointing methods

6.7.1 Torque tightening

Torque

It is a measure of how much force acting on an object which causes that object to rotate.

Torque Tightening

It is the application of force on fastener for turning the fastener's nut.

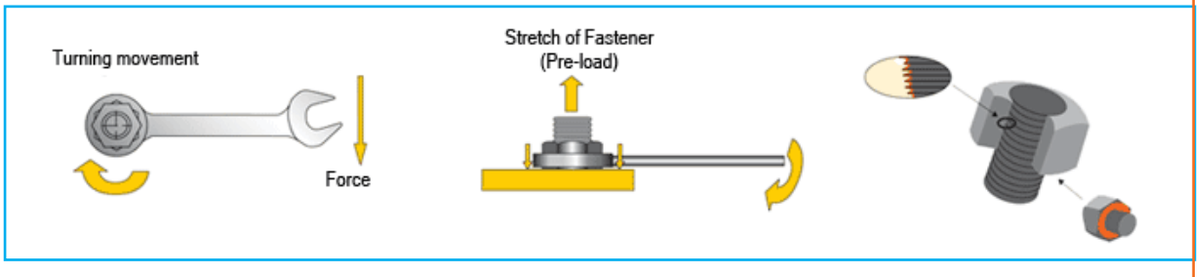


Fig 6.7.1 Torque jointing

Torque Tightening and Preload

The amount of preload created when torquing is largely dependent on the effects of friction.

Principally there are three different "torque components":

- torque for stretching the bolt
- torque required to overcome friction in nut threads and bolt
- torque to overcome friction at the nut face

Torque Procedure

When torquing it is common to tighten only one bolt at a time, this can result in Load Scatter and Point Loading. To avoid this, follow recommended model for apply torque in different stages:

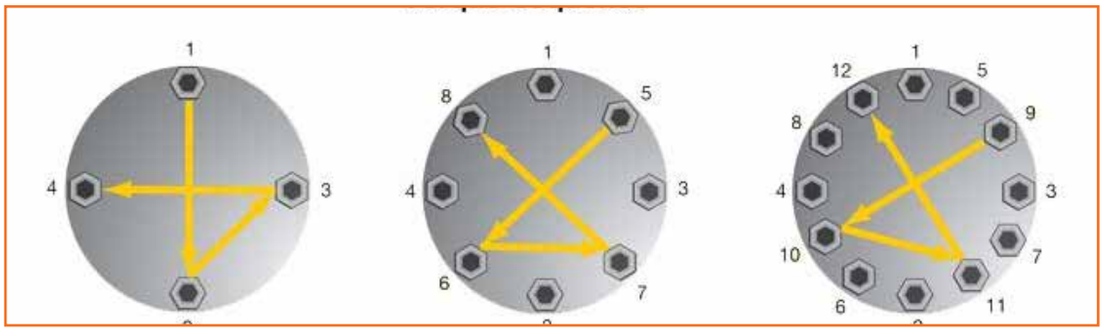


Fig 6.7.2 Torque sequence

Step 1: Tightening by spanner make sure that 2-3 threads expand over nut

Step 2: Tight each bolt to 1/3rd of the final essential torque following the pattern.

Step 3: As shown above, increase the torque to 2/3rd by following the model.

Step 4: Follow the above shown mode and increase the torque to its full limit.

Step 5: Make a final pass on each bolt in clockwise direction from bolt 1.

6.7.2 Thread jointing

This method pertains to the application and assembly of products by sealing threaded joints. When assembling pipes or threaded components, this method can be used by using thread lockers, retainers or thread sealants.

Procedure

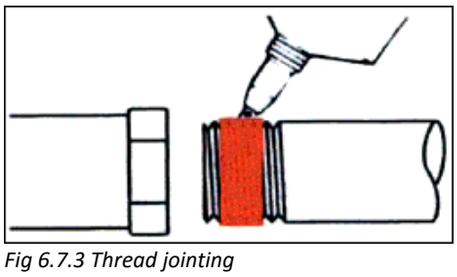


Fig 6.7.3 Thread jointing

For thread jointing of components, apply the sealing compound on the male threads. When applying it on pipes, start from the last two at the end of pipe.

1. Apply the required torque for assembling the joint. Don't over tighten it.
2. Within one hour, assembled parts will be sealed.

6.7.3 Electrical cable jointing

Electrical cable joining can be done by simply twisting the wires and taping of wires. Cable jointing method depends on the various factors i.e. voltage, type of connector, type of cable, type of joint and other factors.

For this method, having appropriate tools and materials is also important. Key factors for ensuring safe and reliable connections are:

Using the proper size of the connector for the particular cable

- Use of appropriate size of connector for a particular cable
- Appropriate tools
- Stripping and clean cuts
- Restoring the insulation, armor and outer-sheath
- Proper technique

Fig 6.7.4 Cables

6.7.3.1 Electrical cable jointing methods

1. Western union splice joint -STEPS

This method of cable jointing is used for small solid cables

Step 1: Remove the insulation

Step 2: Bring the two wires into crossed position, and then twist each wire.

Step 3: Wrap up the end of one wire around the straight end of other wire. Repeat the wrapping more for four or five times for joining the cables.

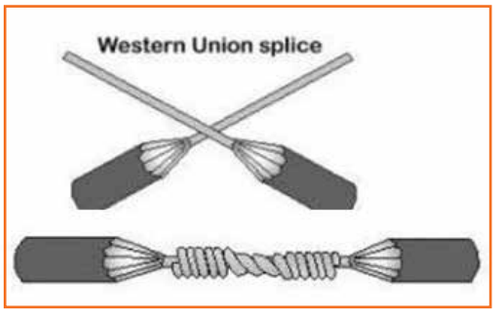


Fig 6.7.5 Western union splice

Step 4: For preventing the cable ends from piecing by the insulation tape; press ends of the wires close to the straight portion of the wire.

Step 5 Insulate the joint using the tape

2. Rattail Joint - STEPS

The rattail joint is usually used in the junction boxes. It connects a branch or multiple circuits in buildings.

To create the joint,

Step 1: Remove the insulation of cable ends has to be joined

Step 2: Twist the wires to create the rattail effect

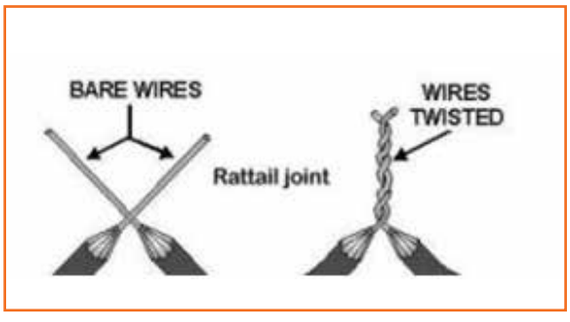


Fig 6.7.6 Rattail joints

3. Fixture joint - STEPS

This type is used for making branch joints of small diameter wire to large diameter conductor, like used in lighting fixtures.

Step 1: Remove the insulation

Step 2 : Wrap fixture wire and branch wire together

Step 3: Bend the branch wire over the completed turns

Step 4: Wrap the remaining fixture wire over the bent branch wire

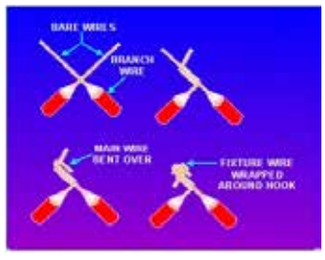


Fig 6.7.7 Fixture joint

Step 5: Do the soldering and taping of the joint for safe and reliable joint.

4. Cable jointing by wire nut and split bolt

Rattail joint can be replaced by wire nut jointing. The wire nut is generally housed in a plastic insulating casing. To make a joint,

Step 1: Strip the conductors

Step 2: Place the conductors into the wire nut

Step 3: Twist the nut

Fig 6.7.8 Nut joint

Notes

Unit Objective

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

1. Know about motor installation
2. Know about motor maintenance

6.8.1 Motor Installation

All personnel involved with electrical equipment, installation, operation or maintenance should be well trained and have complete knowledge of safety practices and principles for completing the work.

Storage: Always lift the motors by eyebolts, never by the shaft. Keep the raising up and lowering down of motor steady, this may damage the bearings. Store the motor proper position in a dry even temperature place, which is free from dust, corrosive smoke, gases if motor has not to be install. Don't store any other object along with the motor. Motors stored for long periods can lose insulation resistance and oxidation of bearings.

Before installation please check that:

1. For any visible damage or crack on electric motor
2. Nameplate for the information related with the motor features and its operation, voltage and power requirements.
3. Keep the ambient temperature between -15°C and +40°C.
4. the relative humidity level is 90%.
5. Check that the IP protection rating is given on the nameplate.

6.8.1.1 Mechanical installation - steps

1. Foundation: Ensure that base for motor is level and free from any vibrations. Generally for 100 HP (75kW) motor, foundation made of concrete is preferred. Selection of motor base largely depends on the building floor capacity or nature of soil, where motor has to install. When constructing the motor base; remember the usage of motor whether will be run on rated full load torque or not.

2. Types of bases

a) Slide Rails

When motor is driven by pulley system, mount the motor on slide rails. The lower part of the pulley belt should be pulling the motor to prevent slippage of belt during motor operation and also prevent the belts to damage bearing shoulders during operation.

The nearest rail to the drive pulley is positioned like that the adjusting bolts are between the motor and the driven machine.

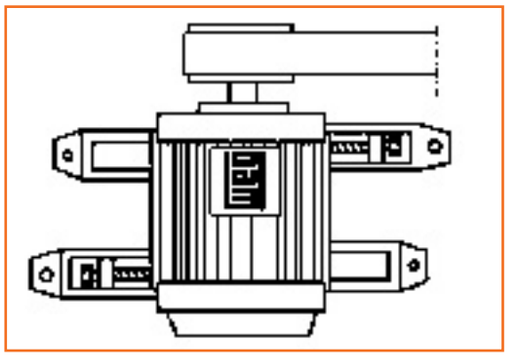


Fig 6.8.1 Slide rail

b) Foundation Studs

In flexible coupling, motor is anchored directly to the base with foundation studs. This type of coupling is very economical and doesn't permit any thrust above the bearings.

Take care that foundation studs should never be painted and nor rusted as both obstruct the bonding of the concrete, and create loose foundation.

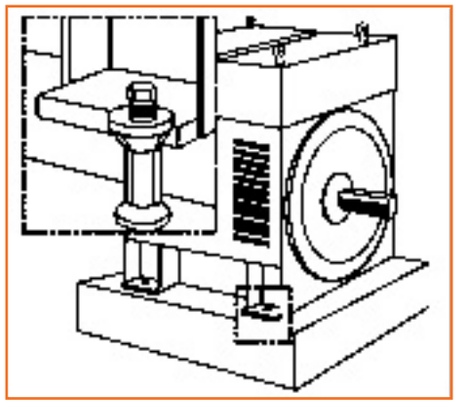


Fig 6.8.2 Foundation Studs

c) Metallic Base

The metallic base saves the motor from any distortion if motor is not secured on a flat foundation.

Metallic base adjusts the height of the motor shaft end with the machine shaft end.

After the base has been levelled, check that studs are tightened, the metal base and studs are

cemented properly.

3. Alignment

In case of direct coupling, align the electric motor accurately with the driven machine. Wrong alignment can cause failure of bearing, vibrations and even shaft rupture.

Take one reading axially and the other radially by dial gauges placed on each coupling half.

4. Coupling

Because of low cost and space, no belt slippage and lower accident risk; direct coupling is recommended always. In speed ratio drives, usually direct coupling is used with a gear box.

Belt coupling is usually used when a speed ratio is required.

Assembly of Pulleys: For assembling of pulleys on shaft ends by keyway and threaded end holes, insert the keyway halfway in the shaft by manual pressure.

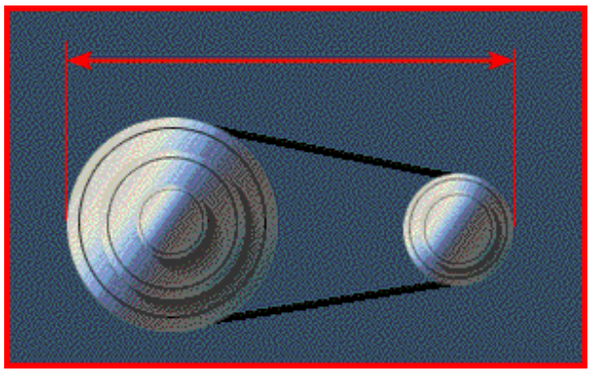


Fig 6.8.3 Pulley Coupling

6.8.1.2 Electrical installation - Steps

1. Wiring:

- As shown in motor circuit diagram, do the motor terminal box wiring to the mains.
- Don't do the motor wiring, if wiring diagram is not available.
- Don't start the motor with unengaged key.
- Before making electrical connections, ensure that motor wires are properly tightened with the terminal block.

  Motor should start quickly and run smoothly, when connected with load and started in appropriate direction of rotation. If motor is not running properly, immediately stop the motor and identify the issue. Probable issues are:

- low voltage
- incorrect motor connections
- too heavy load

Check and measure motor current after few minutes of operation and compare it with the nameplate rating.

2. Grounding:

- The power and GND cables must comply with recognized standards. Cables should be insulated correctly.
- All motors terminal block box and outside motor casing has to be grounded appropriately; mark the GND clamp points with the appropriate symbol.
- Protect the GND cable to avoid slackening.

3. Check direction of rotation of motor before starting it. If it is required change the direction, for three-phase motors simply swap 2 phases.

4. After wiring, reinstall the terminal block cover with its gasket.

5. Before starting motor, check and inspect the operation of brake and braking torque.

6. When motor is running, don't touch the motor's housing as housing temperature can reach more than 50°C.

7. **Adjustment:** There are no adjustable parts in AC motors, but some DC motors has adjustable neutral terminal.

Safety regulations: the electric motor must be installed and operated by qualified personnel who observe the relevant safety regulations; the safety equipment necessary for the prevention of accidents during motor set up and operation must also comply with the requirements of applicable safety regulations.

6.8.2 Motor Maintenance

A well planned maintenance program for electric motors if used correctly can be summed up as: periodical inspection of temperature rise, bearing lubrication insulation levels, wear and irregular checking of fan air flow.

Motor maintenance cycles depend upon the motor type and conditions under which it operates.

6.8.2.1 Cleanliness

Keep the motors clean from debris, dust and oil. Use soft brushes or clean cotton rags for cleaning. Use a jet of compressed air to clean any collected dirt on the fan and cooling fins.

6.8.2.2 Lubrication

Proper lubrication improves life of bearing. Lubrication maintenance includes:

a) Attention to overall condition of bearings;

b) Cleaning;

c) Careful inspection of the bearings.

Lubrication of bearings is must to avoid the contact between the moving parts, and also for protection against corrosion and wear.

Properties of lubricant depreciate with time and mechanical operation. All lubricants will contaminate under working conditions.

For this reason, consumed lubricant needs replacement time to time.

Fig 6.8.4 Lubrication

6.8.2.3 Lubrication intervals

- Applying right quantity of grease is an essential feature of good lubrication.
- For an efficient bearing lubrication, follow the motor manual. If manual is not available, the bearing must be greased up to its half.
- Proper care and cleanliness is essential when performing these activities to avoid penetration of dust into the bearings.

6.8.2.4 Quality and quantity of grease

Correct lubrication is important!

- Grease applied must be correct and in sufficient quantity as both insufficient and excessive greasing are harmful.
- Excessive greasing causes overheating generated by the greater resistance caused on the rotating parts.
- This can cause leakage in the grease, which penetrates the motor and start dripping on motor coils and other components.

- For lubrication of electric motor bearings; lithium based grease is usually recommended because it has good mechanical stability and it is unsolvable in water.

6.8.2.5 Bearing lubrication steps

1. Clean the area, where greasing has to done by clean cotton cloth.
2. If motor is running, use manual grease gun for adding grease until the quantity of grease preferred has been applied.
3. Permit the motor to run, which is adequate to throw out excess of grease. Apply vaseline or oil to protect all machined parts against oxidation.

Stripping of windings - When removing the sealing compound from terminal box, take great care to avoid knocking and denting of enclosure joints and any damage on the motor frame. **Impregnation -** Use appropriate bolts and terminal box with support fitting and non-adhesive varnish for protecting frame threads.

TESTING -Rotate the shaft by hand when checking fastening rings or covers for any drag issues.

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7. Post assembly operations

Unit 7.1 – Testing of material

Unit 7.2 - Ensuring housekeeping and safety on the shop floor

Unit 7.3 – Waste disposal

ISC/N1003

Key Learning Outcomes

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

1. Know about testing of material
2. Know about housekeeping activities after the assembly
3. Know about waste management

Unit 7.1: Testing of material

Unit Objectives

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

1. Know about quality check and testing process

7.1.1 Quality checking of end product

Steps

Step 1: Measure the specifications of the finished part and confirm conformance according to CP/ WI

Step 2: Use measuring devices like gauges, micrometers, vernier callipers and any other measuring equipment for measuring specifications.

Step 3: Perform basic testing and inspection tests for quality check.

Step 4: Note down the observations found during inspection and identify workpieces which are meeting the required standards.

Step 5: Separate the defective pieces into two categorie

- workpieces which can be repaired or modified again
- woekpieces which cannot repair

We will study about inspection tests in next unit

Notes

Unit Objectives

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

1. Performing housekeeping activities on the floor
2. Maintaining safety on the floor

7.2.1 Housekeeping and safety on the floor

Good housekeeping practices are vital for basic workplace safety. To ensure the safety, you need to follow the following housekeeping practices:

1. **Prevent slips and fall:** Slips and falls are the major reason of many nonfatal occupational injuries or illnesses. To avoid slip and fall incidents, follow the following practices:
   - Clean up spills and leakages.
   - Don't store items near and on aisles and exits.
   - Place warning signs near hazardous area.
   - Replace ripped and damaged flooring.
   - Consider installing anti-slip flooring in areas where cleaning is not possible regularly.
   - Use guards and drip pans.
2. **Eliminate fire hazards:** You are answerable for keeping needless combustible materials in the work area. Store the combustible waste in covered bins.
   - Only keep required amount of combustible materials in the work area.
   - Store flammable materials away from ignition sources.
   - Avoid contamination of clothes with flammable liquids. Change clothes if contamination occurs.
   - Keep passage ways and fire doors free of obstructions. Always keep the stairs door closed.
   - Keep materials at least 18 inches away from fire

Fig 7.2.1 Fire exit

extinguishers and automatic sprinklers.

- Always report the hazards in electrical areas.

3. **Control dust:** Vacuuming is the ideal way of cleaning dust. Wash-down by water and sweeping are some other ways of cleaning. Compressed air or steam is also used for cleaning of unreachable or insecure surfaces. Following are some recommendations for cleaning:
   - Minimize flee of dust from ventilation systems.
   - Use filters for dust collection;
   - Minimize dust accumulation
   - Provide admittance to all concealed areas for inspection
   - Check for dirt remains regularly in open and concealed areas
   - Clean dirt remains regularly;
   - Use those cleaning ways which don't create dirt fumes, if ignition sources are present;
   - Use vacuum cleaners for collection of dust;

Fig 7.2.2 Safe storage of liquids

4. **Spills and Liquids:** Leakage in machinery due to the lubricants, overspray, metal filing and water all are commonly found housekeeping problems. For many of these issues; use mats and drip pans to collect leaks for keeping work areas clean, dry and safe, otherwise this makes floor wet and slippery.

   Keep adequate stock of wipers and absorbents in areas where spill problem occurs regularly.

5. **Prevent falling objects:** When storing objects, place heavy objects on lower shelves. Don't place equipment near the edges of shelves.

6. **Clear clutter:** Cardboard, shrink wrap, leftover production materials, broken wooden pallets etc. are general forms of clutter in workshop. These materials can cause safety issues if moving vehicles and workers are walking around them. Disposed of these materials rather than stacked them if not required for any purpose. Empty the trash cans and bins regularly to avoid overflow.

Fig 7.2.3 Safe storage of material

Key factors for good housekeeping are allowing time for routine cleaning after every shift, and cleanup the materials and tools at suitable locations to facilitate their use.

Fig 7.2.4 PPE

7. **Use and inspect personal protective equipment and tools:** Wear recommended PPE like safety shoes and glasses while doing housekeeping activities. Identify the type of PPE required based on the risks associated.

   Regularly inspect, clean and fix tools. If found any damaged tools, remove it from the work area.

Notes

Unit 7.3: Waste Disposal

Unit Objectives

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

1. Know about waste management practices
2. Know about elements of waste management
3. Know about methods of waste management

7.3.1 Waste management

Waste management is gathering, transport, recycling, processing and disposal of waste materials. Waste management is carried by recovering resources from waste materials. It involves waste substances (i.e. gaseous, solid, liquid or radioactive), expert personnel and different methods of management.

Fig. 7.3.1 Waste management

Classification of wastes typically as follows:

- Garbage i.e. decomposable waste
- Rubbish: paper, wood, cloth i.e. combustible in nature and metal, glass, ceramics i.e. non-combustible in nature and non-decomposable wastes
- Ashes
- Sewage-treatment solids: material reserved on settled solids, biomass sludge and sewage-treatment screens
- Industrial wastes: like chemicals, paints etc.
- Mining wastes: slag heaps and coal refuse piles

7.3.2 Elements of a waste management strategy

Good waste management practices involve much more than that disposing of waste legally and properly. Strategy for the management of industrial waste can include the subsequent elements:

- Current waste management procedures and primary audit of wastes produced.
- Risk assessment to find that stowage and handling procedures does not possess any health or environmental risk.
- Identification of options for reuse, waste reduction, recovery assessment and recycling of waste.
- Identification of best practicable environment! There should be an option for dumping of waste and residues.
- Selection of the contractor offering the best service and audit of potential waste management contractors.

7.3.3 Waste management methods

1. Segregation

Fig. 7.3.2 Segregation of waste

Why waste separation using container unit is so necessary because plastics, building materials, glass and waste from the site work could take a really long time period to decompose. This is the reason, thus, it is required to maintain green practices so waste management should be done with proper segregation. Thus we make sure to support you in removing hazardous waste from compostable non-hazardous solid waste, organic waste, recyclable materials and other regulated material.

2. Composting

This waste management process turns waste into organic compounds that you can use to feed plants. In terms of the environment advantages this is actually beneficial technique. Making use of this method, it's easy to turn unsafe organic products into safe compost.

Fig. 7.3.3 Composting waste

3. Burning

If your approach is not towards disposing materials and other wastes, then burning method will be a good approach for you. If waste is bio-degradable or cannot produce hazardous gases after burning, you can burn the waste

Fig. 7.3.4 Burning waste

Exercise

1. Tripping over objects can be reduced by …….
2. Which is not the element of effective housekeeping
   a) Waste disposal
   b) Cleaning
   c) Machining
   d) Spill control

3. Spilled oil can be the cause of an accident. True or False
4. List the benefits of good house-keeping

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8. Carry out Quality checks

Unit 8.1- Quality checks and inspection tests

Unit 8.2- Corrective actions taken and review of their effectiveness

ISC/N1006

Key Learning Outcomes

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

1. Know about importance of quality checks
2. Know about different inspection tests
3. Know about corrective measures taken after quality checks

Unit 8.1: Quality checks and inspection tests

Unit Objectives

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

1. Know about importance of quality checks
2. Know about different types of inspection tests

8.1.1 Importance of quality checks

Fig.8.1.1 quality check

Quality can be described as fulfillment of customer requisites and specifications defect free. A product can be marked as a high quality if it is operating as per the expectations and is consistent. Quality control refers to actions which make sure that the items produced/manufactured are satisfying the maximum possible quality.

Each production series commence with inputs which are in turn transformed by a procedure into a more desirable output or product. Production inputs to each production process are as:

- man (person executing or controlling the process);
- machine (equipment or machinery used in the execution of the process);
- material (raw materials or parts required in the process);
- methods (actions and series used to perform the process); and
- Information (work instructions, data, and sensor readings that guide process execution).

Fig.8.1.2 productivity graph

In every process too much variations and errors each process can lead to non compliance, with three unwanted consequences:

a) Scrapped or exhausted resources;

b) Corrupted process throughput;

c) "Contamination" from unnoticed noncompliance leading to dip in the value of product to the customer.

The goal of quality control in every production system is to

a) Get rid of noncompliance and their outcome

b) Eradicate rework and washed out resources,

c) Attain these objectives at the minimum feasible cost and

d) Get less rejections

How to achieve Quality Standards?

- Understand the end objective of the product
- Strictly follow manufacturing process
- Set the machine parameter correctly
- Understand crucial check points
- Align yourself with the latest technology

8.1.2 Quality checks and inspection tests

Testing Techniques:

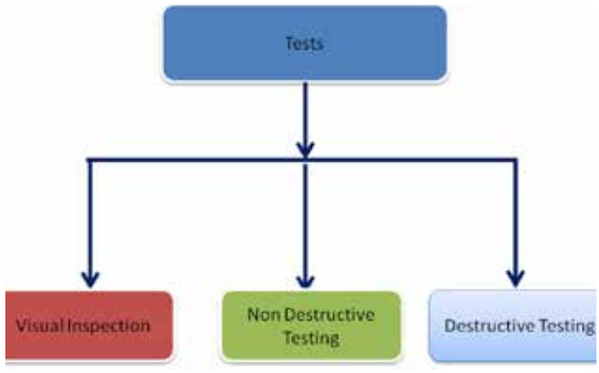

Fig.8.1.3 testing techniques

8.1.2.1 Visual inspection

A visual examination scrutinize bead form, width and thickness; also any defect such as undercut, overlap, cracks, pits, and slag inclusions in the surfaces of product.

This test is simple and inexpensive. Therefore, it is commonly applied to all tools, equipments and machines.

Fig.8.1.4 visual inspection

8.1.2.2 Destructive tests

Destructive tests aim to examine the mechanical, chemical, and metallurgical properties by breaking, deforming, or chemically processing test specimens. Destructive teats further classified into following tests:

a) Tensile Test:

This test is used for determining the Tensile Strength, Yield point and reduction in Area

- The piece to be tested is clamped in a tensile Testing Machine
- The Load (Force) is applied along the axis
- The load (Force) is applied till the specimen is broken
- The readings are plotted on a graph

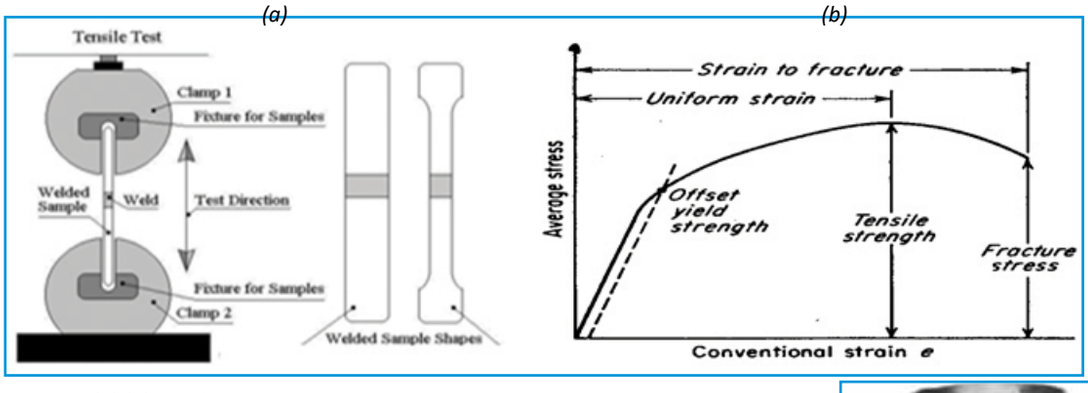

Fig.8.1.5 (a) (b) tensile strength test

b) Bend Test: Bend tests examine the ductility of metals and whether they contain defects or not.

Fig.8.1.6 bend test

c) Impact Test:

- Impact Test is conducted to determine the resistance to impact loads or shock loads.

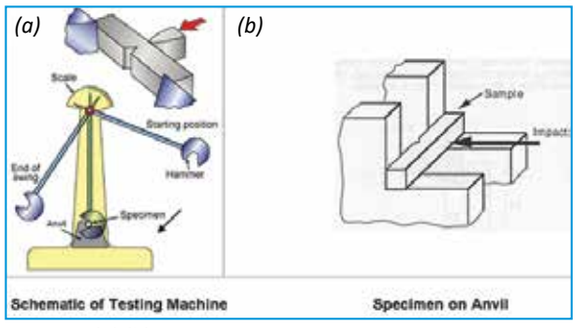

Fig.8.1.7 (a) (b) impact test

- Two types of Impact Testing Machines are used (Izod and Charpy)

- The distance through which the specimen moves after breaking is measured on a scale
- The longer the distance ,the less impact resistance the specimen has

d) Hardness test

The hardness test is performed to ensure if the metal is hard enough or not to stand firm mechanical wearing, depending on the handling.

Fig.8.1.8 hardness test

8.1.2.3 Non-destructive tests

To guaranty the quality of structure, it is indispensable to know what defects may or may not exist. Destructive tests are conducted for test specimens, not for a product. It is important to examine the soundness of assembly without breaking them. For this purpose, nondestructive tests are conducted.

Nondestructive tests can detect defects by utilizing radiation, ultrasonic waves, electricity, magnetism, or light. Some of the non-destructive tests are:

1. **Radiographic test:** When an accelerated electron hits a target of heavy metal, the radiation emanates. This radiation is a kind of electromagnetic wave; and the shorter the wavelength, the stronger its penetrative capacity. A method to detect defects inside the component utilizing this penetrable capacity is called the X-ray test.
2. **Ultrasonic test (UT):** The ultrasonic test is a detection method which causes an inaudible, short sonic wave of 0.5-15 MHZ

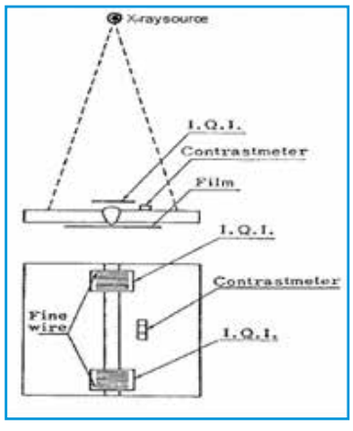

Fig.8.1.9 radiographic test

(megahertz) to penetrate the object to be tested. The ultrasonic wave is reflected from an internal defect or uneven layer.

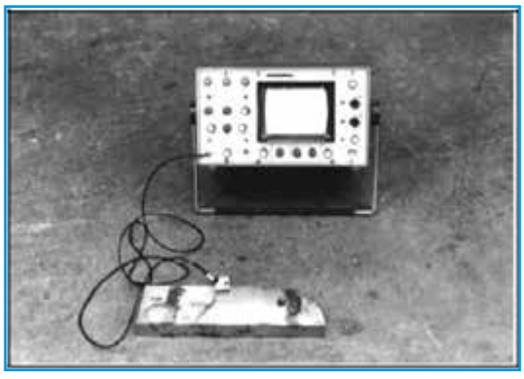

Fig.8.1.10 ultrasonic test

Raw material inspection

- Check manufacturer's written certification that all material meets appropriate.
- Visually inspect all rolls of goods for defects, contaminants and edge regularity.
- All defects or impurities will be cleared from the roll before doing the fabrication into panels or rejection of the roll.
- Measure the thickness of each roll of material at the beginning and end.

Raw material testing:

- Visually check or inspect the surface uniformity of the material. Check for dust or any contaminants.
- By using micrometer, measure and inspect the thickness of material as per the job drawing requirements.
- Use tensile testing machine to check the tensile strength of the material.

Machine and equipments testing

- Visually check the machine and equipments for any damages.
- Use destructive tests to check the physical properties of equipments.
- Use non-destructive tests to identify the faults and defects in the machine and equipments.
- After testing tag the equipment with its part number or transaction number.
- Fill the inspection log sheet for keeping the information in future use.

Tools and measuring instruments testing

- Visually check the tools and instruments for any damages.
- Use destructive tests to check the physical properties of tolls and instruments.
- Manually operate and check the tools are working properly or not.

- Check the accuracy of measuring instruments by comparing the zero reading of instruments with the standard industrial measurement reading.
- Fill the inspection log sheet for keeping the information in future use.

Electrical connections testing

- Test the electrical connections of the various power operated equipments.
- Do the earthing or ground resistance testing of the equipments by using earth testers and megger.
- Check the electrical connections e.g. phase wire, neutral wire and ground wire visually or by using neon tester and test lamp.
- If found any defect in connection wire replace it, otherwise it may give you a severe shock or damage the equipment.
- After completing the operation always switch-off the equipment power, otherwise it can become risk for serious accidents or hazards.
- Fill the inspection log sheet for keeping the information in future use.

Exercise

1. Quality checks don't include inspection of raw material. True or False

2. Which is not a input for the production

   a) Machine (b) Tools (c) Man (d) None

3. Less rejections can be done by .....

4. Destructive tests examines the

   a) Mechanical properties

   b) Chemical properties

   c) Metallurgical properties

   d) All of these

5. Destructive tests checks the……

6. Bend test examines the resistance and hardness of material. True or False

7. Earthing can be checked by using

   a) Height gauge (b) Neon tester (c) Megger (d) None

Notes

Unit 8.2: Corrective actions taken and review of their effectiveness

Unit Objectives

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

1. Get the understanding of how to take the corrective actions
2. Get the understanding of how to review and report the corrective actions effectiveness to the management

8.2.1 Corrective measures taken after inspection

After performing certain inspection and testing methods, if any defect or fault identify in the machine, equipments and tools, corrective actions has to be taken for resolving the issues.

Correction action is implemented to address:

- the root cause(s) of the incident,
- Prevents recurrence of similar, future events.

Corrective actions taken are:

- If raw material is found inappropriate, change and get the appropriate material required according to the job design requirements.
- If raw material is found dirty or contaminated, clean it with the prescribed cleaners.
- If tools are found faulty or damaged, check:
  - Tool has to be discontinued or repaired.
  - If found fault can be repaired, then repair the faulty part
  - Always lubricate the tools after using and keep them in designated place.
  - Fill the inspection log report and give all the information about repairing of tool.
- If measuring instruments are found inaccurate, calibrate them and again check the accuracy for correct measurement. Always lubricate the measuring instruments for keeping them accurate and operational.
- If machine and equipments found damage or faulty:

- Check whether defects or faults can be repaired or not.
- If repairable then inform the supervisor and do the repairing process.
- If not, then inform the management for discontinuing the machine.
- Fill the log report and give all the information about repairing of equipment.

8.2.2 Effectiveness review analysis of corrective actions

After taking the remedial actions for repairing the tools and equipments, after some time if it is found the same tool and equipment is showing the same problem, detected earlier, then review of corrective actions has to be done to identify the correct action or other issue. For review of effectiveness of corrective actions following points has to be checked or taken into account:

a) Does the corrective action address the root cause?

b) Does the corrective action prevent recurrence of similar conditions due to similar causes?

c) Has the corrective action been implemented as intended?

d) Does the corrective action demonstrate endurance and sustainability?

e) Has the corrective action introduced negative unintended consequences?

f) Has the corrective action improved the program/process performance?

After getting the information, inform or submit the report to the management for taking suitable action for rectifying the issues and problems.

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9.Reporting and Documentation

Unit 9.1 – Documentation for health and safety

Unit 9.2 - Documentation of defects

ISC/N1005

Key Learning Outcome

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

1. Know about reporting and documentation requirements
2. Know about accident reporting
3. Know about reporting of defective tools

Unit 9.1: Documentation for health and safety

Unit Objectives

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

1. Know about accident and incident reporting
2. Know about how to write reports properly
3. Know about how to escalate the issues properly

9.1.1 Accidents and incidents reporting

It is of utmost importance to inform about the accidents and incidence straightaway, irrespective of the impact of it. Even if there is minor injury or no harm to anyone and you believe it is not worth reporting, still documentation is needed of the incidence.

Reporting and documentation is necessary for several reasons:

- Reporting helps in rectifying the situations and avoiding such future incidents.
- If any occurrence leads to the loss of time or a long term leave and the affected needs to claim compensation, a proper documentation helps in receiving the appropriate approval.
- For legal reasons, the accidents leading to the fatal injuries or even to the demise of a worker must be reported.
- Any major accidents that includes the disintegration of a building or a major structure failure, bridge, tower, crane, hoist, temporary construction support system or any excavation an incident that includes the major release of dangerous material.

Your responsibility requires you to be aware of potential hazards and correct reporting processes. If you notice a potentially hazardous situation, it is important that you report it immediately to management and fill out the appropriate forms.

Hazard reports can take a number of different forms:

- the standard hazard report used by workers for all hazards
- reports of infections
- near-miss incident reports
- reports of damage and faulty tools, equipments and machines
- routine inspection reports
- Behavior incident reports.

9.1.2 Filling reports and documents properly

In completing the documentation effectively, follow the established pro-forma. It is important to make sure that regardless of reporting format, all information is recorded in a manner that is:

- written in proper language
- correct
- timely
- According to organization reporting protocols.

The following suggestions will assist you in accurately completing appropriate reports:

- Use pen, not pencil.
- Do not use erasers or liquid paper. If you need to make a correction, put a line through the word or phrase and write the correction above it. Initial and date the change.
- Be thorough. Write down everything that is important.
- Write your notes as soon as practicable after the incident. Most critical incident reports will specify a time by which the documentation is to be completed.
- Remember that case notes or incident reports may be required in the legal arena. In determining the validity of information, the courts discriminate between facts and opinions. 'Facts' are what is directly observed.
- Use it with particularly important information.
- Be legible

- In describing an event, be clear, organized and sequential. Write down what happened in the order it happened.
- If you have any concerns about the process of documentation, discuss this with management.
- Ensure the report is dated and signed after each entry.

We have looked at a number of aspects of accident/incident reporting, from what we need to report, e.g. equipment difficulties, damage or malfunction to recording to recording forms required, e.g. incident reports, fault reports, accident and prevention reports.Write your notes as soon as practicable after the incident. Most critical incident reports will specify a time by which the documentation is to be completed.

- Remember that case notes or incident reports may be required in the legal arena. In determining the validity of information, the courts discriminate between facts and opinions. 'Facts' are what is directly observed.
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- If you have any concerns about the process of documentation, discuss this with management.
- Ensure the report is dated and signed after each entry.

We have looked at a number of aspects of accident/incident reporting, from what we need to report, e.g. equipment difficulties, damage or malfunction to recording to recording forms required, e.g. incident reports, fault reports, accident and prevention reports.

Exercise

1. Assume you got an accident at work place on your knees. File a report and inform the management about the accident.

2. What is important in an accident investigation?

   a. Only to interview the victim.

   b. To clear up the site of the accident as quickly as possible in order to prevent new accidents.

   c. To collect all facts and information at the location of the accident.

   d. None of these

3. What is an important area for attention if an on-site investigation is conducted after an accident?

   a. That the documents present at the site are retrieved.

   b. That this investigation be conducted before the government's Health and Safety Inspection Service is informed.

   c. That the areas for improvement are discussed with the site's owner.

   d. None of these

Unit 9.2: Documentation of defects

Unit Objectives

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

1. Know about reporting of faulty and damage tools

9.2.1 Reporting of faulty and damage tools

Like accident or incident reporting, reporting of faulty and damaged machine, tools and equipments is also necessary. To reduce the chances of accident or any damage it is very important. Any damaged, faulty or malfunctioning tools, equipment should be immediately withdrawn from use and addressed according to organizational policies and procedures. In general, this may require you to report the damage or fault to management, take action to ensure that you or other workers are not injured or harmed by the equipment by tagging or labeling it with a hazard sign, and/or removing the equipment from the area. You should have to check the following details before doing reporting or providing any repair suggestions:

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

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

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

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10. Problem identification & escalation

Unit 10.1 - Risk Management

Unit 10.2 - Escalation Matrix

ISC/N1007

Key Learning Outcomes

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

1. Know about identification of problem
2. Know about risk management process
3. Know about escalation matrix and problem escalation process

Unit 10.1: Documentation for health and safety

Unit Objectives

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

1. Know about risk management process
2. Know about inspecting controlling and controlling the problems

10.1.1 Risk management process

To identify problems and suggesting improvements or remedies, you have to follow the specific procedure of risk management. Risk Management consists of methodical steps for handling hazards in the workplace. The steps include:

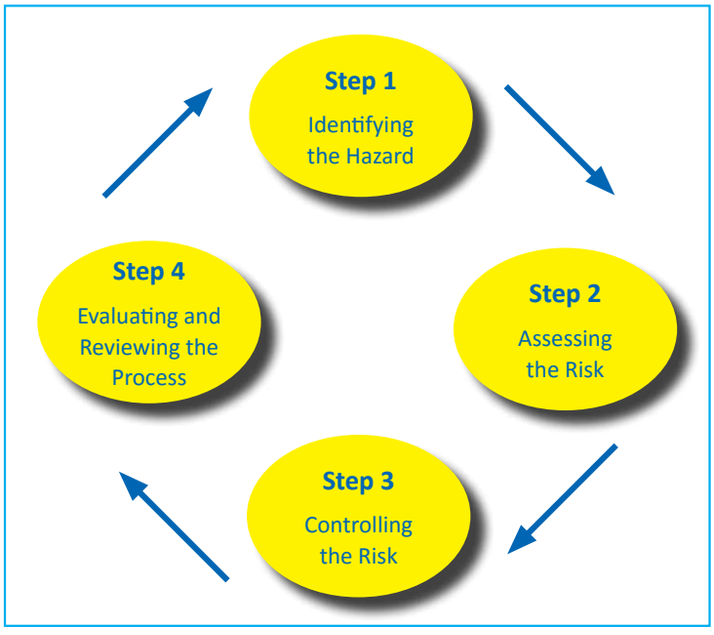


Fig. 10.1.1 Risk Management process

Steps:

Step 1: **Identifying** any anticipated problem – Anything that could lead to any harm to any person in the work place, e.g. machine moving, poisonous chemicals, and jobs requiring physical interference.

Step 2: **Evaluating** the issues – Assessing the problem on the basis of their impact, e.g. can it cause a severe injury, sickness or fatality and how likely is this to take place?

Step 3: **Control** the problem or if it's not feasible, controlling the threat arising out of the problem – putting in to practice such strategies that can eradicate or manage the problem, e.g. designing the equipments differently, putting in machine guards at place, using harmless chemicals, placing heavy objects lifting equipments to reduce manual weight lifting or PPE or inform to supervisor or seniors.

Step 4: **Analyzing** risk evaluation - to keep a check on control measures and adding better control measures. Also need to discover secure ways of doing things.ways of doing things.

Notes

Unit 10.2: Escalation matrix

Unit Objectives

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

1. Know about problem management process
2. Know about escalation matrix

10.2.1 Escalation matrix

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

Problem management process

1. Identify problems as described earlier
2. Logging problems – Log the complaint report to the concerned person via email or procedure specified by organization.
3. Categorize problems – categorize the problems into hazards, accidents, faulty tools or equipments and general problems.
4. Prioritization of problem – prioritize the problem according to its impact or severity into high, low, moderate and critical.
5. Initially diagnosis the problem and collect data and information regarding that.
6. Escalate the problem to the management through the escalation procedure.
7. Review the remedial action taken by the management to resolve the situation
8. If found any problem again, then notify the management again about the problem and also suggest the remedial action required for it.
9. Close the complaint after solution of problem.

Escalation matrix is a complaint logging system (complaint box) allows you to specify multiple user contacts to be notified in the event of issues. By using escalation matrix you can notify the right

people at the right time about critical alerts irrespective of the business hours. The escalation matrix is time zone specific and it is available 24X7. The key features of escalation matrix are as follows.

- The escalation levels are based on schedules.
- The service is available 24X7 and schedules are allocated accordingly.
- The schedules are time zone specific.
- A matrix can be defined at multiple levels ranging from senior management to lower management.

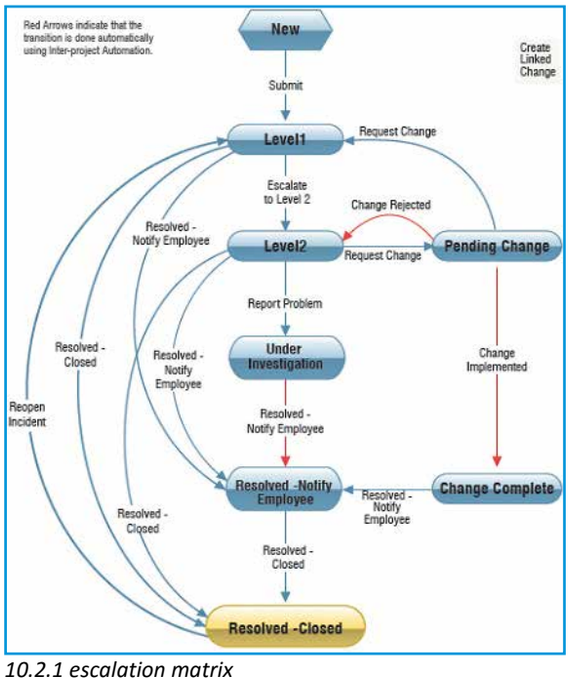
This implies that you can now have exclusive user groups notified of issues depending on device roles or locations or issue types.

10.2.2 How does escalation matrix work

How does escalation matrix work for Complaints?

In escalation matrix, complaints severity can be assigned into different levels, Level 1 and can be escalated to next levels. These next levels, say are called Level 2 and Level 3 respectively. Administrators can assign Level 1, Level 2 and Level 3 departments.

Once the Level 1, Level 2 and Level 3 departments are defined, here is the how this works:



10.2.1 escalation matrix

Steps:

Step 1: Complaint of a given category will by default be assigned and notified by email to the Level 1 department of that category.

Step 2: It defines which an issue has to be raised to whom and within which time frame.

Step 3: If the complaint is not resolved within X number of days (X is the time defined for Level 1 department to resolve the issue), the complaint will be escalated to Level 2 department.

Step 4: If the complaint is not resolved within Y number of days (Y is the time defined for Level 2 department to resolve the issue), the complaint will be escalated to Level 3 department.

At every escalation, L1/L2/L3 owners can receive notifications.

This is the process of escalating the issues to your supervisor to your senior management. If you will get any issues, you have to lodge the complaint according to the complaint box system followed by your organization.

Concerns and complaints may be received by any member of staff. It is important that they are dealt with promptly and effectively by following the organizational policies and procedures.

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11. Work Effectively with Others

Unit 11.1- Appropriate communication with superiors, peers and others as applicable at work place

Unit 11.2- Appropriate behavior and etiquette at work place

ISC/N0009

Key Learning Outcomes

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

1. Know about effective communication with colleagues
2. Know about how to give respect to colleagues
3. Know about how to make a positive impression
4. Know how to cooperate with colleagues
5. Know about workplace etiquettes
6. Know how to be work space savvy

Unit 11.1: Appropriate communication with superiors, peers and others as applicable at work place

Unit Objectives

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

1. Know about how to communicate effectively with colleagues
2. Know about effective communication

11.1.1 Communicate with others properly

What will be the reaction of yours when people say a largely about you. The success of the organization depends on each colleague.

- For success of organization learn your co-workers' names and learn them quickly because people loves hear their names.
- It doesn't matter a person is more or less significant because of his/her designation. Always use to speak to every person you work with or pass in the lobby. You should respect every employee.
- Self-assessment: Make your own assessment how you behave your supervisor(s), subordinates, and peers. Would the changes in the dealings, if seen by others, put you in negative list? If so, find where the unevenness, and start the procedure of reworking the relationship active.
- Share about your personal life is your choice with employees but always be careful. May cause a negative impact because of yours openness. Didn't shows interest or ask people to share their personal lives with you. This makes people uncomfortable in the job.
- Always respect other people's personal space. Different people having different personal space than your own.

Usually, what you say is not important, how you are saying matters. Accurate communication is very important whether you are communicating in spoken or written way.

11.1.2 Effective communication with colleagues

To communicate better with your colleagues at work place here are some ways:

- **Listen actively:** This shows that what your team mates have to say and that you should respect them and you're interested. Few things you need to follow: Listen to them carefully, positioning your body towards people, and look at them directly. Never interrupt them while they're speaking. If you listen to them closely and wait for them to finish speaking you'll only be able to understand what people are trying to speak. After listening you can ask questions to clarify any issues. When anyone talking to you doesn't email or text.
- **Face to face talk and Speak with pleasure:** To avoid any misunderstandings with your team mates should speak with pleasure. To understand your colleague point of view and feelings a face to face communication helps with building trust and openness.
- **Offer constructive criticism**:While giving feedback, don't involve personal feelings and make sure your team mates fully understands what you are try to telling them. If someone did a great job, offer positive support and give them upgrading tips without being unkind or dominant.
- **Build and earn trust:**Trust and respect play an important role for effective communication to occur. To build faith with your team mates, it's significant that you act steadily and with honesty. Clear communicate, collaboratively and confidentially with them while showing the respect to earn their faith. To create trust and understand with your colleagues, the clear and concise communication should be there.

Fig 11.1.1 Team work

- **Get personal but don't be too casual:** Colleagues personal lives should be discuss during breaks or after work to know better by talking. This helps to build faith. Don't get too casual in your discussions, especially in the work place, as it may cause the other people uncomfortable.
- **Tell them how what you're communicating is relevant to them:** For relevant communication it related to what the other person wants, doubts or needs. First find out how what you'll

say or write is pertinent to your team mates and then exPush them. If your communication is certainly relevant to them, then it will keep them listening to or reading.

- **Keep spoken and written communications short, simple and direct:** Limited time is constraints so don't think your team mates to listen to and read everything that you're trying to tell them. Try not to giving those complicated descriptions and endorsements with the expectation they will know everything straight away. Short, simple and direct communications is the best way to exPush.

Notes

Unit 11.2: Appropriate behaviour and etiquette at work place

Unit Objectives

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

1. Know about organization policies and procedures
2. Know about workplace etiquettes

11.2.1 Follow organization policies and procedures

Organization policies and procedures while working with colleagues:

- Never use abusive words with the colleagues
- Follow work etiquettes
- Never share secret or confidential information with your colleagues
- Help your colleague in case of emergency or difficult situations
- Coach your colleagues in case of problems and about organization policies and procedures.
- Communicate with them properly.

11.2.2 Workplace etiquettes

In the business world the way you present yourself to others tells capacities about you. Seconds of meeting will decide first imPushions about others. Present yourself professional after you're hired for a job.

Important tips that help to succeed on the work place:

Make a positive impression

To improve overall image and confidence a good imPushion on the work place play an important role.

- At the beginning of your first day, meet each of your team mates.
- Always make eye contact, turn towards them and listen attentively with co-workers if they are speaking to you.
- NEVER assume you can wear casual clothing to work, always verify and follow the employer's office dress code.

Fig 11.2.1 Workplace etiquettes

- Bag or purse and the belongings you carry in them must say something about your personality. Disordered items may diminish from the image you would like to present.
- In a first time meeting with someone, smile and shake hands palm to palm with a gentle control.
- Always alert and ready to contribute to the company and avoid sleepiness which can cause a negative effect in the workplace.
- Always be on time each day. Avoid your personal items away and ready to start workday.
- Kindness and courtesy is the most important factor which always counts!

Work space savvy

You can spend more working hours at your job than in home.

- Work station should be professional and well-ordered with suitable private touches! It reflects good impression on the team mates.
- Always give respect to others' space whether it is a cubicle or office so not just walk in; you should knock or make your presence gently known. Always invite team mates if they have a few minutes to talk. Wait until you are invited to sit down don't assume greeting of your presence is an invitation to sit down.
- An important phone call could be damage by you so don't interrupt people on the phone.
- Bound personal calls, if your work spaces don't have a door.
- Always ask your superior when and where it is suitable to use your phone in office.
- Try not to use ear buds or headphones to listen to music while at job.
- Smells and noise from food can be distracting others so avoid food consumption to a minimum.

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12. Employability & Entrepreneurship Skills

Key Learning Outcomes 

At the end of this unit, you 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. Understand 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
12. Understand 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 how to maintain a positive attitude
15. Discuss the role of attitude in self-analysis
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
32. Identify the basic parts of a computer
33. Identify the basic parts of a keyboard
34. Recall basic computer terminology
35. Recall basic computer terminology

36. Recall the functions of basic computer keys
37. Discuss the main applications of MS Office
38. Discuss the benefits of Microsoft Outlook
39. Discuss the different types of e-commerce
40. List the benefits of e-commerce for retailers and customers
41. Discuss how the Digital India campaign will help boost e-commerce in India
42. Explain how you will sell a product or service on an e-commerce platform
43. Discuss the importance of saving money
44. Discuss the benefits of saving money
45. Discuss the main types of bank accounts
46. Describe the process of opening a bank account
47. Differentiate between fixed and variable costs
48. Describe the main types of investment options
49. Describe the different types of insurance products
50. Describe the different types of taxes
51. Discuss the uses of online banking
52. Discuss the main types of electronic funds transfers
53. Discuss the steps to prepare for an interview
54. Discuss the steps to create an effective Resume
55. Discuss the most frequently asked interview questions
56. Discuss how to answer the most frequently asked interview questions
57. Discuss basic workplace terminology
58. Discuss the concept of entrepreneurship
59. Discuss the importance of entrepreneurship
60. Describe the characteristics of an entrepreneur
61. Describe the different types of enterprises
62. List the qualities of an effective leader
63. Discuss the benefits of effective leadership
64. List the traits of an effective team
65. Discuss the importance of listening effectively
66. Discuss how to listen effectively
67. Discuss the importance of speaking effectively
68. Discuss how to speak effectively
69. Discuss how to solve problems
70. List important problem solving traits

71. Discuss ways to assess problem solving skills
72. Discuss the importance of negotiation
73. Discuss how to negotiate
74. Discuss how to identify new business opportunities
75. Discuss how to identify business opportunities within your business
76. Understand the meaning of entrepreneur
77. Describe the different types of entrepreneurs
78. List the characteristics of entrepreneurs
79. Recall entrepreneur success stories
80. Discuss the entrepreneurial process
81. Describe the entrepreneurship ecosystem
82. Discuss the government's role in the entrepreneurship ecosystem
83. Discuss the current entrepreneurship ecosystem in India
84. Understand the purpose of the Make in India campaign
85. Discuss the relationship between entrepreneurship and risk appetite
86. Discuss the relationship between entrepreneurship and resilience
87. Describe the characteristics of a resilient entrepreneur
88. Discuss how to deal with failure
89. Discuss how market research is carried out
90. Describe the 4 Ps of marketing
91. Discuss the importance of idea generation
92. Recall basic business terminology
93. Discuss the need for CRM
94. Discuss the benefits of CRM
95. Discuss the need for networking
96. Discuss the benefits of networking
97. Understand the importance of setting goals
98. Differentiate between short-term, medium-term and long-term goals
99. Discuss how to write a business plan
100. Explain the financial planning process
101. Discuss ways to manage your risk
102. Describe the procedure and formalities for applying for bank finance
103. Discuss how to manage your own enterprise
104. List important questions that every entrepreneur should ask before starting an enterprise

UNIT 12.1: Personal Strengths & Value Systems

Unit Objectives

At the end of this unit, you 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. Understand 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. Understand 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 how to maintain a positive attitude
15. Discuss the role of attitude in self-analysis
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
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21. List the characteristics of highly creative people
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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

12.1.1 Health, Habits, Hygiene: What is Health

As per the World Health Organization (WHO), health is a "State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." This means being healthy does not simply mean not being unhealthy – it also means you need to be at peace emotionally, and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough. You also need to think about whether you are feeling calm, relaxed and happy.

Common Health Issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough, Cold, Sore Throat
- Difficulty Sleeping
- Obesity

Tips to Prevent Health Issues

Taking measures to prevent ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Cutting back on unhealthy and sugary foods
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day, 4-5 times a week
- Taking vaccinations when required
- Practicing yoga exercises and meditation

How many of these health standards do you follow? Tick the ones that apply to you.

1. Get minimum 7-8 hours of sleep every night. ☐
2. Avoid checking email first thing in the morning and right before you go to bed at night. ☐
3. Don't skip meals – eat regular meals at correct meal times. ☐
4. Read a little bit every single day. ☐
5. Eat more home cooked food than junk food. ☐

6. Stand more than you sit. ☐
7. Drink a glass of water first thing in the morning and have at least 8 glasses of water through the day. ☐
8. Go to the doctor and dentist for regular checkups. ☐
9. Exercise for 30 minutes at least 5 days a week. ☐
10. Avoid consuming lots of aerated beverages. ☐

What is Hygiene?

As per the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean, so that you reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed and dustbins are not overflowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches, and prevent the growth of fungus and other bacteria, which could spread disease.

How many of these health standards do you follow? Tick the ones that apply to you.

1. Have a bath or shower every day with soap – and wash your hair with shampoo 2-3 times a week. ☐
2. Wear a fresh pair of clean undergarments every day. ☐
3. Brush your teeth in the morning and before going to bed. ☐
4. Cut your fingernails and toenails regularly. ☐
5. Wash your hands with soap after going to the toilet. ☐
6. Use an anti-perspirant deodorant on your underarms if you sweat a lot. ☐
7. Wash your hands with soap before cooking or eating. ☐
8. Stay home when you are sick, so other people don't catch what you have. ☐
9. Wash dirty clothes with laundry soap before wearing them again. ☐
10. Cover your nose with a tissue/your hand when coughing or sneezing. ☐

See how healthy and hygienic you are, by giving yourself 1 point for every ticked statement!

Then take a look at what your score means.

Your Score

0-7/20: You need to work a lot harder to stay fit and fine! Make it a point to practice good habits daily and see how much better you feel!

7-14/20: Not bad, but there is scope for improvement! Try and add a few more good habits to your daily routine.

14-20/20: Great job! Keep up the good work! Your body and mind thank you!

Swachh Bharat Abhiyan

We have already discussed the importance of following good hygiene and health practices for ourselves. But, it is not enough for us to be healthy and hygienic. We must also extend this standard to our homes, our immediate surroundings and to our country as a whole.

The 'Swachh Bharat Abhiyan' (Clean India Mission) launched by Prime Minister Shri Narendra Modi on 2nd October 2014, believes in doing exactly this. The aim of this mission is to clean the streets and roads of India and raise the overall level of cleanliness. Currently this mission covers 4,041 cities and towns across the country. Millions of our people have taken the pledge for a clean India. You should take the pledge too, and do everything possible to keep our country clean!

What are Habits?

A habit is a behaviour that is repeated frequently. All of us have good habits and bad habits. Keep in mind the phrase by John Dryden: "We first make our habits, and then our habits make us." This is why it is so important that you make good habits a way of life, and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude
- Making exercise a part of your daily routine
- Reading motivational and inspirational stories
- Smiling! Make it a habit to smile as often as possible
- Making time for family and friends
- Going to bed early and waking up early

Some bad habits that you should quit immediately are:

- Skipping breakfast
- Snacking frequently even when you are not hungry
- Eating too much fattening and sugary food
- Smoking, drinking alcohol and doing drugs
- Spending more money than you can afford
- Worrying about unimportant issues
- Staying up late and waking up late

Tips

- Following healthy and hygienic practices every day will make you feel good mentally and physically.
- Hygiene is two-thirds of health – so good hygiene will help you stay strong and healthy!

12.1.2: Safety: Tips to Design a Safe Workplace

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

Non-Negotiable Employee Safety Habits

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Take rest breaks during the day and some time off from work during the week

Tips

- Be aware of what emergency number to call at the time of a workplace emergency
- Practice evacuation drills regularly to avoid chaotic evacuations

12.1.3 Self Analysis – Attitude, Achievement Motivation: What is Self-Analysis

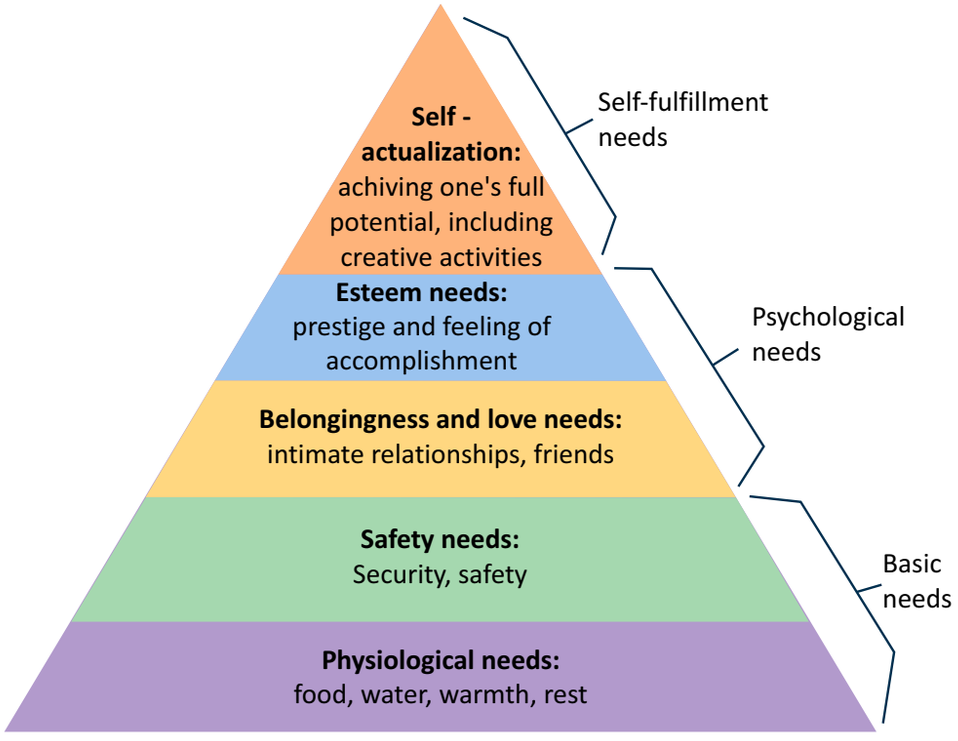
To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by taking a deep look at what motivates you, what your attitude is like, and what your strengths and weaknesses are.

What is Motivation?

Very simply put, motivation is your reason for acting or behaving in a certain manner. It is important to understand that not everyone is motivated by the same desires – people are motivated by many, many different things. We can understand this better by looking at Maslow's Hierarchy of Needs.

Maslow's Hierarchy of Needs

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from very basic needs (called physiological needs) to more important needs that are required for self-growth (called self-actualization needs). Between the physiological and self-actualization needs are three other needs – safety needs, belongingness and love needs, and esteem needs. These needs are usually shown as a pyramid with five levels and are known as Maslow's Hierarchy of Needs.



As you can see from the pyramid, the lowest level depicts the most basic needs. Maslow believed that our behaviour is motivated by our basic needs, until those needs are met. Once they are fulfilled, we move to the next level and are motived by the next level of needs. Let's understand this better with an example.

Rupa comes from a very poor family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs – her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behaviour will then be motivated by her need for security and safety. Once these new needs are met, Rupa will once again move to the next level, and be motivated by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs – her esteem needs, after which she will move up to the fifth and last level of needs – the desire to achieve her full potential.

Understanding Achievement Motivation

We now know that people are motivated by basic, psychological and self-fulfillment needs. However, certain people are also motivated by the achievement of highly challenging accomplishments. This is known as Achievement Motivation, or 'need for achievement'.

The level of motivation achievement in a person differs from individual to individual. It is important that entrepreneurs have a high level of achievement motivation – a deep desire to accomplish something important and unique. It is equally important that they hire people who are also highly motivated by challenges and success.

What Motivates You?

What are the things that really motivate you? List down five things that really motivate you.

Remember to answer honestly!

I am motivated by:

Characteristics of Entrepreneurs with Achievement Motivation

Entrepreneurs with achievement motivation can be described as follows:

- Unafraid to take risks for personal accomplishment
- Love being challenged
- Future-oriented
- Flexible and adaptive
- Value negative feedback more than positive feedback
- Very persistent when it comes to achieving goals
- Extremely courageous
- Highly creative and innovative
- Restless - constantly looking to achieve more
- Feel personally responsible for solving problems

Think about it:

- How many of these traits do you have?
- Can you think of entrepreneurs who display these traits?

How to Cultivate a Positive Attitude

The good news is attitude is a choice. So it is possible to improve, control and change our attitude, if we decide we want to! The following tips help foster a positive mindset:

- Remember that you control your attitude, not the other way around
- Devote at least 15 minutes a day towards reading, watching or listening to something positive
- Avoid negative people who only complain and stop complaining yourself
- Expand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself, in your life, and in others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

What is Attitude?

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your tendency (positive or negative), to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

"The only disability in life is a bad attitude."

When you start a business, you are sure to encounter a wide variety of emotions, from difficult times and failures to good times and successes. Your attitude is what will see you through the tough times and guide you towards success. Attitude is also infectious. It affects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace while a negative attitude is likely to result in the demotivation of your people.

What Are Your Strengths and Weaknesses?

Another way to analyze yourself is by honestly identifying your strengths and weaknesses. This will help you use your strengths to your best advantage and reduce your weaknesses.

Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

Strengths	Weaknesses

Tips

- Achievement motivation can be learned.
- Don’t be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

12.1.4 Honesty & Work Ethics: What is Honesty?

Honesty is the quality of being fair and truthful. It means speaking and acting in a manner that inspires trust. A person who is described as honest is seen as truthful and sincere, and as someone who isn't deceitful or devious and doesn't steal or cheat. There are two dimensions of honesty – one is honesty in communication and the other is honesty in conduct.

Honesty is an extremely important trait because it results in peace of mind and builds relationships that are based on trust. Being dishonest, on the other hand, results in anxiety and leads to relationships full of distrust and conflict.

Qualities of Honest People

Honest individuals have certain distinct characteristics. Some common qualities among honest people are:

1. They don't worry about what others think of them. They believe in being themselves – they don't bother about whether they are liked or disliked for their personalities.
2. They stand up for their beliefs. They won't think twice about giving their honest opinion, even if they are aware that their point of view lies with the minority.
3. They are think skinned. This means they are not affected by others judging them harshly for their honest opinions.
4. They forge trusting, meaningful and healthy friendships. Honest people usually surround themselves with honest friends. They have faith that their friends will be truthful and upfront with them at all times.

They are trusted by their peers. They are seen as people who can be counted on for truthful and objective feedback and advice.

- Honesty and employees: When entrepreneurs build honest relationships with their employees, it leads to more transparency in the workplace, which results in higher work performance and better results.
- Honesty and investors: For entrepreneurs, being honest with investors means not only sharing strengths but also candidly disclosing current and potential weaknesses, problem areas and solution strategies. Keep in mind that investors have a lot of experience with startups and are aware that all new companies have problems. Claiming that everything is perfectly fine and running smoothly is a red flag for most investors.
- Honesty with oneself: The consequences of being dishonest with oneself can lead to dire results, especially in the case of entrepreneurs. For entrepreneurs to succeed, it is critical that they remain realistic about their situation at all times, and accurately judge every aspect of their enterprise for what it truly is.

Importance of Honesty in Entrepreneurs

One of the most important characteristics of entrepreneurs is honesty. When entrepreneurs are honest with their customers, employees and investors, it shows that they respect those that they work with. It is also important that entrepreneurs remain honest with themselves. Let's look at how being honest would lead to great benefits for entrepreneurs.

- Honesty and customers: When entrepreneurs are honest with their customers it leads to stronger relationships, which in turn results in business growth and a stronger customer network.

What are Work Ethics?

Being ethical in the workplace means displaying values like honesty, integrity and respect in all your decisions and communications. It means not displaying negative qualities like lying, cheating and stealing.

Workplace ethics play a big role in the profitability of a company. It is as crucial to an enterprise as high morale and teamwork. This is why most companies lay down specific workplace ethic guidelines that must compulsorily be followed by their employees. These guidelines are typically outlined in a company's employee handbook.

Elements of a Strong Work Ethic

An entrepreneur must display strong work ethics, as well as hire only those individuals who believe in and display the same level of ethical behavior in the workplace. Some elements of a strong work ethic are:

- **Professionalism**: This involves everything from how you present yourself in a corporate setting to the manner in which you treat others in the workplace.
- **Respectfulness**: This means remaining poised and diplomatic regardless of how stressful or volatile a situation is.
- **Dependability**: This means always keeping your word, whether it's arriving on time for a meeting or delivering work on time.
- **Dedication**: This means refusing to quit until the designated work is done, and completing the work at the highest possible level of excellence.
- **Determination**: This means embracing obstacles as challenges rather than letting them stop you, and pushing ahead with purpose and resilience to get the desired results.
- **Accountability**: This means taking responsibility for your actions and the consequences of your actions, and not making excuses for your mistakes.
- **Humility**: This means acknowledging everyone's efforts and had work, and sharing the credit for accomplishments.

How to Foster a Good Work Ethic

As an entrepreneur, it is important that you clearly define the kind of behaviour that you expect from each and every team member in the workplace. You should make it clear that you expect employees to display positive work ethics like:

- **Honesty**: All work assigned to a person should be done with complete honesty, without any deceit or lies.
- **Good attitude**: All team members should be optimistic, energetic, and positive.
- **Reliability**: Employees should show up where they are supposed to be, when they are supposed to be there.
- **Good work habits**: Employees should always be well groomed, never use inappropriate language, conduct themselves professionally at all times, etc.
- **Initiative**: Doing the bare minimum is not enough. Every team member needs to be proactive and show initiative.
- **Trustworthiness**: Trust is non-negotiable. If an employee cannot be trusted, it's time to let that employee go.

- **Respect**: Employees need to respect the company, the law, their work, their colleagues and themselves.
- **Integrity**: Each and every team member should be completely ethical and must display above board behaviour at all times.
- **Efficiency**: Efficient employees help a company grow while inefficient employees result in a waste of time and resources.

Tips 

- Don't get angry when someone tells you the truth and you don't like what you hear.
- Always be willing to accept responsibility for your mistakes.

12.1.5 Creativity & Innovation : What is Creativity

Creativity means thinking outside the box. It means viewing things in new ways or from different perspectives, and then converting these ideas into reality. Creativity involves two parts: thinking and producing. Simply having an idea makes you imaginative, not creative. However, having an idea and acting on it makes you creative.

Characteristics of Highly Creative People

Some characteristics of creative people are:

- They are imaginative and playful
- They see issues from different angles
- They notice small details
- They have very little tolerance for boredom
- They detest rules and routine
- They love to daydream
- They are very curious

What is Innovation?

There are many different definitions of innovation. In simple terms, innovation means turning an idea into a solution that adds value. It can also mean adding value by implementing a new product, service or process, or significantly improving on an existing product, service or process.

Characteristics of Highly Innovative People

Some characteristics of highly innovative people are:

- They embrace doing things differently
- They don't believe in taking shortcuts
- They are not afraid to be unconventional
- They are highly proactive and persistent
- They are organized, cautious and risk-averse

Tips

- Take regular breaks from your creative work to recharge yourself and gain fresh perspective.
- Build prototypes frequently, test them out, get feedback, and make the required changes.

12.1.6 Time Management: What is Time Management?

Time management is the process organizing your time, and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).

Effective time management leads to an efficient work output, even when you are faced with tight deadlines and high pressure situations. On the other hand, not managing your time effectively results in inefficient output and increases stress and anxiety.

Benefits of Time Management

Time management can lead to huge benefits like:

- Greater productivity
- Better professional reputation
- Higher chances for career advancement
- Higher efficiency
- Reduced stress
- Greater opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Substandard work quality
- Stalled career
- Inefficient work output
- Poor professional reputation
- Increase in stress and anxiety

Traits of Effective Time Managers

Some traits of effective time managers are:

- They begin projects early
- They set daily objectives
- They modify plans if required, to achieve better results
- They are flexible and open-minded
- They inform people in advance if their help will be required
- They know how to say no
- They break tasks into steps with specific deadlines
- They continually review long term goals
- They think of alternate solutions if and when required
- They ask for help when required
- They create backup plans

Effective Time Management Techniques

You can manage your time better by putting into practice certain time management techniques. Some helpful tips are:

- Plan out your day as well as plan for interruptions. Give yourself at least 30 minutes to figure out your time plan. In your plan, schedule some time for interruptions.
- Put up a “Do Not Disturb” sign when you absolutely have to complete a certain amount of work.
- Close your mind to all distractions. Train yourself to ignore ringing phones, don’t reply to chat messages and disconnect from social media sites.

- Delegate your work. This will not only help your work get done faster, but will also show you the unique skills and abilities of those around you.
- Stop procrastinating. Remind yourself that procrastination typically arises due to the fear of failure or the belief that you cannot do things as perfectly as you wish to do them.
- Prioritize. List each task to be completed in order of its urgency or importance level. Then focus on completing each task, one by one.
- Maintain a log of your work activities. Analyze the log to help you understand how efficient you are, and how much time is wasted every day.
  Create time management goals to reduce time wastage.

Tips

- Always complete the most important tasks first.
- Get at least 7 – 8 hours of sleep every day.
- Start your day early.
- Don’t waste too much time on small, unimportant details.
- Set a time limit for every task that you will undertake.
- Give yourself some time to unwind between tasks.

12.1.7 Anger Management: What is Anger Management

Anger management is the process of:

1. Learning to recognize the signs that you, or someone else, is becoming angry
2. Taking the best course of action to calm down the situation in a positive way

Anger management does not mean suppressing anger.

Importance of Anger Management

Anger is a perfectly normal human emotion. In fact, when managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us act inappropriately and can lead to us saying or doing things that we will likely later regret.
Extreme anger can:

- **Hurt you physically:** It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.
- **Hurt you mentally**: It can cloud your thinking and lead to stress, depression and mental health issues.
- **Hurt your career**: It can result in alienating your colleagues, bosses, clients and lead to the loss of respect.
- **Hurt your relationships**: It makes it hard for your family and friends to trust you, be honest with you and feel comfortable around you.
  This is why anger management, or managing anger appropriately, is so important.

Anger Management Strategies

Here are some strategies that can help you control your anger:

Strategy 1: Relaxation

Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings. Try this simple breathing exercise:

1. Take a deep breath from your diaphragm (don't breathe from your chest)
2. Visualize your breath coming up from your stomach
3. Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing deeply while repeating the word)
4. Picture a relaxing moment (this can be from your memory or your imagination)

Follow this relaxation technique daily, especially when you realize that you're starting to feel angry.

Strategy 2: Cognitive Restructuring

Cognitive restructuring means changing the manner in which you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens, force yourself to replace your angry thoughts with more logical ones. For instance, instead of thinking 'Everything is ruined' change your mindset and tell yourself 'It's not the end of the world and getting angry won't solve this'.

Strategy 3: Problem Solving

Getting angry about a problem that you cannot control is a perfectly natural response. Sometimes, try as you may, there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem, and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation, but that you will not blame yourself if you don't get the solution you desire.

Strategy 4: Better Communication

When you're angry, it is very easy to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting, and think carefully about what you want to say, before saying it. Avoid saying the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding.

Strategy 5: Changing Your Environment

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings. Make an active decision to schedule some personal time for yourself, especially on days that are very hectic and stressful. Having even a brief amount of quiet or alone time is sure to help calm you down.

Tips for Anger Management

- The following tips will help you keep your anger in check:
- Take some time to collect your thoughts before you speak out in anger.
- Express the reason for your anger in an assertive, but non-confrontational manner once you have calmed down.
- Do some form of physical exercise like running or walking briskly when you feel yourself getting angry.
- Make short breaks part of your daily routine, especially during days that are stressful. Focus on how to solve a problem that's making you angry, rather than focusing on the fact that the problem is making you angry.

Tips

- Try to forgive those who anger you, rather than hold a grudge against them.
- Avoid using sarcasm and hurling insults. Instead, try and explain the reason for your frustration in a polite and mature manner.

12.1.8 Stress Management: What is Stress

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as a stress. It is important to note that stress can be good and bad. While good stress keeps us going, negative stress undermines our mental and physical health. This is why it is so important to manage negative stress effectively.

Causes of Stress

Stress can be caused by internal and external factors.

Internal causes of stress

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All in or all out attitude

External causes of stress

- Major life changes
- Difficulties with relationships
- Having too much to do
- Difficulties at work or in school
- Financial difficulties
- Worrying about one's children and/or family

Symptoms of Stress

Stress can manifest itself in numerous ways. Take a look at the cognitive, emotional, physical and behavioral symptoms of stress.

Cognitive Symptoms	Emotional Symptoms
• Memory problems	• Depression
• Concentration issues	• Agitation
• Lack of judgement	• Irritability
• Pessimism	• Loneliness
• Anxiety	• Anxiety
• Constant worrying	• Anger

Physical Symptoms	Behavioral Symptoms
• Aches and pain	• Increase or decrease in appetite
• Diarrhea or constipation	• Over sleeping or not sleeping enough
• Nausea	• Withdrawing socially
• Dizziness	• Ignoring responsibilities
• Chest pain and/or rapid heartbeat	• Consumption of alcohol or cigarettes
• Frequent cold or flu like feelings	• Nervous habits like nail biting, pacing etc.

Tips to Manage Stress

The following tips can help you manage your stress better:

- Note down the different ways in which you can handle the various sources of your stress.
- Remember that you cannot control everything, but you can control how you respond.
- Discuss your feelings, opinions and beliefs rather than reacting angrily, defensively or passively.
- Practice relaxation techniques like meditation, yoga or tai chi when you start feeling stressed.
- Devote a part of your day towards exercise.
- Eat healthy foods like fruits and vegetables. Avoid unhealthy foods especially those containing large amounts of sugar.
- Plan your day so that you can manage your time better, with less stress.
- Say no to people and things when required.
- Schedule time to pursue your hobbies and interests.
- Ensure you get at least 7-8 hours of sleep.
- Reduce your caffeine intake.
- Increase the time spent with family and friends.

Tips

- Force yourself to smile even if you feel stressed. Smiling makes us feel relaxed and happy.
- Stop yourself from feeling and thinking like a victim. Change your attiude and focus on being proactive.

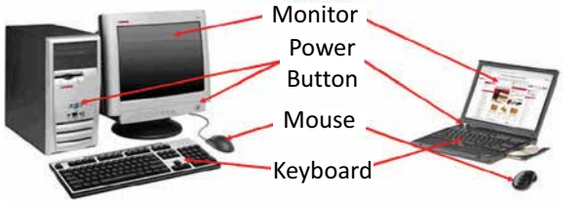
12.2. Digital Literacy: A Recap

Unit Objectives

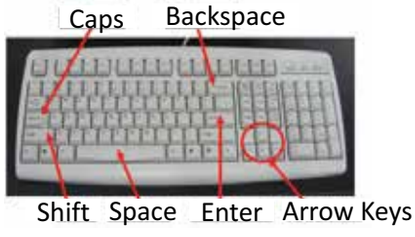
At the end of this unit, you will be able to:

1. Identify the basic parts of a computer
2. Identify the basic parts of a keyboard
3. Recall basic computer terminology
4. Recall basic computer terminology
5. Recall the functions of basic computer keys
6. Discuss the main applications of MS Office
7. Discuss the benefits of Microsoft Outlook
8. Discuss the different types of e-commerce
9. List the benefits of e-commerce for retailers and customers
10. Discuss how the Digital India campaign will help boost e-commerce in India
11. Describe how you will sell a product or service on an e-commerce platform

12.2.1 Computer and Internet basics: Basic Parts of a Computer



Basic Parts of a Keyboard



Basic Parts of a Computer

- **Central Processing Unit (CPU)**: The brain of the computer. It interprets and carries out program instructions.
- **Hard Drive**: A device that stores large amounts of data.
- **Monitor**: The device that contains the computer screen where the information is visually displayed.
- **Desktop**: The first screen displayed after the operating system loads.
- **Background**: The image that fills the background of the desktop.

Basic Parts of a Computer

- **Mouse**: A hand-held device used to point to items on the monitor.
- **Speakers**: Devices that enable you to hear sound from the computer.
- **Printer**: A device that converts output from a computer into printed paper documents.
- **Icon**: A small picture or image that visually represents something on your computer.
- **Cursor**: An arrow which indicates where you are positioned on the screen.
- **Program Menu**: A list of programs on your computer that can be accessed from the Start menu.
- **Taskbar**: The horizontal bar at the bottom of the computer screen that lists applications that are currently in use.
- **Recycle Bin**: A temporary storage for deleted files.

Basic Internet Terms

- **The Internet**: Avast, international collection of computer networks that transfers information.
- **The World Wide Web**: A system that lets you access information on the Internet.
- **Website**: A location on the World Wide Web (and Internet) that contains information about a specific topic.
- **Homepage**: Provides information about a website and directs you to other pages on that website.
- **Link/Hyperlink**: A highlighted or underlined icon, graphic, or text that takes you to another file or object.
- **Web Address/URL**: The address for a website.
- **Address Box**: A box in the browser window where you can type in a web address.

Basic Computer Keys

- **Arrow Keys**: Press these keys to move your cursor.
- **Space bar**: Adds a space.
- **Enter/Return**: Moves your cursor to a new line.
- **Shift**: Press this key if you want to type a capital letter or the upper symbol of a key.
- **Caps Lock**: Press this key if you want all the letters you type to be capital letters. Press it again to revert back to typing lowercase letters.
- **Backspace**: Deletes everything to the left of your cursor.

Tips 

- When visiting a .com address, there no need to type http:// or even www. Just type the name of the website and then press Ctrl + Enter. (Example: Type 'apple' and press Ctrl + Enter to go to www.apple.com)
- Press the Ctrl key and press the + or - to increase and decrease the size of text.
- Press F5 or Ctrl + R to refresh or reload a web page.

12.2.2 MS Office and Email: About MS Office

MS Office or Microsoft Office is a suite of computer programs developed by Microsoft. Although meant for all users, it offers different versions that cater specifically to students, home users and business users. All the programs are compatible with both, Windows and Macintosh.

Most Popular Office Products

Some of the most popular and universally used MS Office applications are:

- **Microsoft Word**: Allows users to type text and add images to a document.
- **Microsoft Excel**: Allows users to enter data into a spreadsheet and create calculations and graphs.
- **Microsoft PowerPoint**: Allows users to add text, pictures and media and create slideshows and presentations.
- **Microsoft Outlook**: Allows users to send and receive email.
- **Microsoft OneNote**: Allows users to make drawings and notes with the feel of a pen on paper.
- **Microsoft Access**: Allows users to store data over many tables.

Why Choose Microsoft Outlook

A popular email management choice especially in the workplace, Microsoft Outlook also includes an address book, notebook, web browser and calendar. Some major benefits of this program are:

- **Integrated search function**: You can use keywords to search for data across all Outlook programs.
- **Enhanced security**: Your email is safe from hackers, junk mail and phishing website email.
- **Email syncing**: Sync your mail with your calendar, contact list, notes in One Note and…your phone!
- **Offline access to email**: No Internet? No problem! Write emails offline and send them when you're connected again.

Tips

- Press Ctrl+R as a shortcut method to reply to email.
- Set your desktop notifications only for very important emails.
- Flag messages quickly by selecting messages and hitting the Insert key.
- Save frequently sent emails as a template to reuse again and again.
- Conveniently save important emails as files.

12.2.3 E-Commerce: What is E-Commerce

E-commerce is the buying or selling of goods and services, or the transmitting of money or data, electronically on the internet. E-Commerce is the short form for "electronic commerce."

Examples of E-Commerce

Some examples of e-commerce are:

- Online shopping
- Online auctions
- Online ticketing
- Electronic payments
- Internet banking

Types of E-Commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

- **Business to Business (B2B)**: Both the transacting parties are businesses.
- **Business to Consumer (B2C)**: Businesses sell electronically to end-consumers.
- **Consumer to Consumer (C2C):** Consumers come together to buy, sell or trade items to other consumers.
- **Consumer-to-Business (C2B)**: Consumers make products or services available for purchase to companies looking for exactly those services or products.
- **Business-to-Administration (B2A)**: Online transactions conducted between companies and public administration.
- **Consumer-to-Administration (C2A)**: Online transactions conducted between individuals and public administration.

Benefits of E-Commerce

The e-commerce business provides some benefits for retailers and customers.

Benefits for retailers:

- Establishes an online presence
- Reduces operational costs by removing overhead costs
- Increases brand awareness through the use of good keywords
- Increases sales by removing geographical and time constraints

Benefits for customers:

- Offers a wider range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Enables consumers to perform price comparisons

Digital India Campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015, with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the e-commerce industry.

Currently, the majority of online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help deliver internet to remote corners of the country. This will help the e-commerce market to enter India's tier 4 towns and rural areas.

E-Commerce Activity

Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

Tips

- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

12.3: Money Matters

Unit Objectives

At the end of this unit, you 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 transfers

12.3.1 Personal Finance – Why to Save: Importance of Saving

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving money will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for an emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

Benefits of Saving

Inculcating the habit of saving leads to a vast number of benefits. Saving helps you:

- **Become financially independent**: When you have enough money saved up to feel secure you can start making your choices, from taking a vacation whenever you want, to switching careers or starting your own business.
- **Invest in yourself through education**: Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher paying jobs.
- **Get out of debt**: Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills that have accumulated over time.
- **Be prepared for surprise expenses** : Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs, without feeling financially stressed.
- **Pay for emergencies**: Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

- **Afford large purchases and achieve major goals:** Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.
- **Retire**: The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

Tips 

- Break your spending habit. Try not spending on one expensive item per week, and put the money that you would have spent into your savings.
- Decide that you will not buy anything on certain days or weeks and stick to your word.

12.3.2 Types of Bank Accounts, Opening a Bank Account: Types of Bank Accounts

In India, banks offer four main types of bank accounts. These are:

- Current Accounts
- Savings Accounts
- Recurring Deposit Accounts
- Fixed Deposit Accounts

Current Accounts

Current accounts offer the most liquid deposits and thus, are best suited for businessmen and companies. As these accounts are not meant for investments and savings, there is no imposed limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such accounts.

Savings Accounts

Savings accounts are meant to promote savings, and are therefore the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

Recurring Deposit Accounts

Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month, but are unable to invest a large sum at one time. Such account holders deposit a small, fixed amount every month for a pre-determined period (minimum 6 months). Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.

Fixed Deposit Accounts

Fixed Deposit accounts, also called FD accounts, are ideal for those who wish to deposit their savings for a long term in return for a high rate of interest. The rate of interest offered depends on the amount deposited and the time period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period of time. The money can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

Opening a Bank Account

Opening a bank account is quite a simple process. Take a look at the steps to open an account of your own:

Step 1: Fill in the Account Opening Form

This form requires you to provide the following information:

- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement (hard copy/email)
- Details of your initial deposit (cash/cheque)
- Manner of operating your account (online/mobile banking/traditional via cheque, slip books)

Ensure that you sign wherever required on the form.

Step 2: Affix your Photograph

Stick a recent photograph of yourself in the allotted space on the form.

Step 3: Provide your Know Your Customer (KYC) Details

KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual needs to submit certain approved documents with respect to photo identity (ID) and address proof. Some Officially Valid Documents (OVDs) are:

- Passport
- Driving License
- Voters' Identity Card
- PAN Card
- UIDAI (Aadhaar) Card

Step 4: Submit All your Documents

Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed and your account has been opened!

Tips

- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for online banking – it's convenient!
- Keep an eye on your bank balance.

12.3.3 Costs: Fixed vs Variable: What are Fixed and Variable Costs

Fixed costs and variable costs together make up a company's total cost. These are the two types of costs that companies have to bear when producing goods and services.

A fixed cost does not change with the volume of goods or services a company produces. It always remains the same.

A variable cost, on the other hand, increases and decreases depending on the volume of goods and services produced. In other words, it varies with the amount produced.

Differences Between Fixed and Variable Costs

Let's take a look at some of the main differences between fixed and variable costs:

Criteria	Fixed Costs	Variable Costs
Meaning	A cost that stays the same, regardless of the output produced.	A cost that changes when the
Nature	Time related.	Volume related.
Incurred	Incurred irrespective of units being produced.	Incurred only when units are produced.
Unit cost	Inversely proportional to the number of units produced.	Remains the same, per unit.
Examples	Depreciation, rent, salary, insurance, tax etc.	Material consumed, wages, commission on sales, packing expenses, etc.

Tips

- When trying to determine whether a cost is fixed or variable, simply ask the following question: Will the particular cost change if the company stopped its production activities? If the answer is no, then it is a fixed cost. If the answer is yes, then it is probably a variable cost.

12.3.4 Investment, Insurance and Taxes:

Investment

Investment means that money is spent today with the aim of reaping financial gains at a future time. The main types of investment options are as follows:

- **Bonds:** Bonds are instruments used by public and private companies to raise large sums of money – too large to be borrowed from a bank. These bonds are then issued in the public market and are bought by lenders.
- **Stocks:** Stocks or equity are shares that are issued by companies and are bought by the general public.
- **Small Savings Schemes:** Small Savings Schemes are tools meant to save money in small amounts. Some popular schemes are the Employees Provident Fund, Sukanya Samriddhi Scheme and National Pension Scheme.
- **Mutual Funds:** Mutual Funds are professionally managed financial instruments that invest money in different securities on behalf of investors.
- **Fixed Deposits:** A fixed amount of money is kept aside with a financial institution for a fixed amount of time in return for interest on the money.
- **Real Estate:** Loans are taken from banks to purchase real estate, which is then leased or sold with the aim of making a profit on the appreciated property price.
- **Hedge Funds:** Hedge funds invest in both financial derivatives and/or publicly traded securities.
- **Private Equity:** Private Equity is trading in the shares of an operating company that is not publicly listed and whose shares are not available on the stock market.
- **Venture Capital:** Venture Capital involves investing substantial capital in a budding company in return for stocks in that company.

Insurance

There are two types of insurance – Life Insurance and Non-Life or General Insurance.

Life Insurance

Life Insurance deals with all insurance covering human life.

Life Insurance Products

The main life insurance products are:

- **Term Insurance:** This is the simplest and cheapest form of insurance. It offers financial protection for a specified tenure, say 15 to 20 years. In the case of your death, your family is paid the sum assured. In the case of your surviving the term, the insurer pays nothing.
- **Endowment Policy:** This offers the dual benefit of insurance and investment. Part of the premium is allocated towards the sum assured, while the remaining premium gets invested in equity and debt. It pays a lump sum amount after the specified duration or on the death of the policyholder, whichever is earlier.
- **Unit-Linked Insurance Plan (ULIP):** Here part of the premium is spent on the life cover, while the remaining amount is invested in equity and debt. It helps develop a regular saving habit.

- **Money Back Life Insurance:**While the policyholder is alive, periodic payments of the partial survival benefits are made during the policy tenure. On the death of the insured, the insurance company pays the full sum assured along with survival benefits.
- **Whole Life Insurance:** It offers the dual benefit of insurance and investment. It offers insurance cover for the whole life of the person or up to 100 years whichever is earlier.

General Insurance

General Insurance deals with all insurance covering assets like animals, agricultural crops, goods, factories, cars and so on.

General Insurance Products

The main general insurance products are:

- **Motor Insurance:** This can be divided into Four Wheeler Insurance and Two Wheeler Insurance.
- **Health Insurance:** The main types of health insurance are individual health insurance, family floater health insurance, comprehensive health insurance and critical illness insurance.
- **Travel Insurance:** This can be categorised into Individual Travel Policy, Family Travel Policy, Student Travel Insurance and Senior Citizen Health Insurance.
- **Home Insurance:** This protects the house and its contents from risk.
- **Marine Insurance:** This insurance covers goods, freight, cargo etc. against loss or damage during transit by rail, road, sea and/or air.

Taxes

There are two types of taxes – Direct Taxes and Indirect Taxes.

Direct Tax

Direct taxes are levied directly on an entity or a person and are non-transferrable.

Some examples of Direct Taxes are:

- **Income Tax:** This tax is levied on your earning in a financial year. It is applicable to both, individuals and companies.
- **Capital Gains Tax:** This tax is payable whenever you receive a sizable amount of money. It is usually of two types – short term capital gains from investments held for less than 36 months and long term capital gains from investments held for longer than 36 months.
- **Securities Transaction Tax:** This tax is added to the price of a share. It is levied every time you buy or sell shares.
- **Perquisite Tax:** This tax is levied is on perks that have been acquired by a company or used by an employee.
- **Corporate Tax:** Corporate tax is paid by companies from the revenue they earn.

Indirect Tax

Indirect taxes are levied on goods or services.

Some examples of Indirect Taxes are:

- **Sales Tax:** Sales Tax is levied on the sale of a product.

- **Service Tax:** Service Tax is added to services provided in India.
- **Value Added Tax:** Value Added Tax is levied at the discretion of the state government. The tax is levied on goods sold in the state. The tax amount is decided by the state.
- **Customs Duty & Octroi:** Customs Duty is a charge that is applied on purchases that are imported from another country. Octroi is levied on goods that cross state borders within India.
- **Excise Duty:** Excise Duty is levied on all goods manufactured or produced in India.

Tips

- Think about how quickly you need your money back and pick an investment option accordingly.
- Ensure that you are buying the right type of insurance policy for yourself.
- Remember, not paying taxes can result in penalties ranging from fines to imprisonment.

12.3.5 Online Banking, NEFT, RTGS etc.: What is Online Banking

Internet or online banking allows account holders to access their account from a laptop at any location. In this way, instructions can be issued. To access an account, account holders simply need to use their unique customer ID number and password.

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of cheques
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

Electronic Funds Transfers

Electronic funds transfer is a convenient way of transferring money from the comfort of one's own home, using integrated banking tools like internet and mobile banking.

Transferring funds via an electronic gateway is extremely convenient. With the help of online banking, you can choose to:

- Transfer funds into your own accounts of the same bank.
- Transfer funds into different accounts of the same bank.
- Transfer funds into accounts in different banks, using NEFT.
- Transfer funds into other bank accounts using RTGS.
- Transfer funds into various accounts using IMPS.

NEFT

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. NEFT can be used by individuals, firms and corporate organizations to transfer funds between accounts.

In order to transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before you can transfer funds through NEFT, you will need to register the beneficiary who will be receiving the funds. In order to complete this registration, you will require the following

- Recipient's name
- Recipient's account number
- Recipient's bank's name
- Recipient's bank's IFSC code

RTGS

RTGS stands for Real Time Gross Settlement. This is a real time funds transfer system which enables you to transfer funds from one bank to another, in real time or on a gross basis. The transferred amount is immediately deducted from the account of one bank, and instantly credited to the other bank's account. The RTGS payment gateway is maintained by the Reserve Bank of India. The transactions between banks are made electronically.

RTGS can be used by individuals, companies and firms to transfer large sums of money. Before remitting funds through RTGS, you will need to add the beneficiary and his bank account details via your online banking account. In order to complete this registration, you will require the following information:

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Beneficiary's bank's IFSC code

IMPS

IMPS stands for Immediate Payment Service. This is a real-time, inter-bank, electronic funds transfer system used to transfer money instantly within banks across India. IMPS enables users to make instant electronic transfer payments using mobile phones through both, Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week. The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

To transfer money through IMPS, the you need to:

- Register for IMPS with your bank
- Receive a Mobile Money Identifier (MMID) from the bank
- Receive a MPIN from the bank

Once you have both these, you can login or make a request through SMS to transfer a particular amount to a beneficiary.

For the beneficiary to receive the transferred money, he must:

1. Link his mobile number with his respective account
2. Receive the MMID from the bank

In order to initiate a money transfer through IMPS, you will need to enter the following information:

1. The beneficiary's mobile number
2. The beneficiary's MMID
3. The transfer amount
4. Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number, for future reference.

Differences Between NEFT, RTGS & IMPS

Criteria	NEFT	RTGS	IMPS
Settlement	Done in batches	Real-time	Real-time
Full form	National Electronic Fund Transfer	Real Time Gross Settlement	Immediate Payment Service
Timings on Monday – Friday	8:00 am – 6:30 pm	9:00 am – 4:30 pm	24x7
Timings on Saturday	8:00 am – 1:00 pm	9:00 am – 1:30 pm	24x7
Minimum amount of money transfer limit	₹1	₹2 lacs	₹1
Maximum amount of money transfer limit	₹10 lacs	₹10 lacs per day	₹2 lacs
Maximum charges as per RBI	Upto 10,000 – ₹2.5 above 10,000 – 1 lac – ₹5 above 1 – 2 lacs – ₹15 above 2 – 5 lacs – ₹25 above 5 – 10 lacs – ₹25	above 2 – 5 lacs – ₹25 above 5 – 10 lacs – ₹50	Upto 10,000 – ₹5 above 10,000 – 1 lac – ₹5 above 1 – 2 lacs – ₹15

Tips

- Never click on any links in any e-mail message to access your online banking website.
- You will never be asked for your credit or debit card details while using online banking.
- Change your online banking password regularly.

12.4. Preparing for Employment & Self Employment

Unit Objectives

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

1. Discuss the steps 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. Discuss basic workplace terminology

12.4.1 Interview Preparation: How to Prepare for an Interview

The success of your getting the job that you want depends largely on how well your interview for that job goes. Therefore, before you go in for your interview, it is important that you prepare for it with a fair amount of research and planning. Take a look at the steps to follow in order to be well prepared for an interview:

1. **Research the organization that you are having the interview with.**
   - Studying the company beforehand will help you be more prepared at the time of the interview. Your knowledge of the organization will help you answer questions at the time of the interview, and will leave you looking and feeling more confident. This is sure to make you stand out from other, not as well informed, candidates.
   - Look for background information on the company. Ty and find an overview of the company and its industry profile.
   - Visit the company website to get a good idea of what the company does. A company website offers a wealth of important information. Read and understand the company's mission statement. Pay attention to the company's products/services and client list. Read through any press releases to get an idea of the company's projected growth and stability.
   - Note down any questions that you have after your research has been completed.
2. **Think about whether your skills and qualifications match the job requirements.**
   - Carefully read through and analyze the job description.
   - Make a note of the knowledge, skills and abilities required to fulfill the job requirements.
   - Take a look at the organization hierarchy. Figure out where the position you are applying for fits into this hierarchy.
3. **Go through the most typical interview questions asked, and prepare your responses.**
   - Remember, in most interviews a mix of resume-based, behavioral and case study questions are asked.
   - Think about the kind of answers you would like to provide to typical questions asked in these three areas.
   - Practice these answers until you can express them confidently and clearly.

4. **Plan your attire for the interview.**
   - It is always safest to opt for formal business attire, unless expressly informed to dress in business casual (in which case you should use your best judgement).
   - Ensure that your clothes are clean and well-ironed. Pick neutral colours – nothing too bright or flashy.
   - The shoes you wear should match your clothes, and should be clean and suitable for an interview.
   - Remember, your aim is to leave everyone you meet with the impression that you are a professional and highly efficient person.
5. **Ensure that you have packed everything that you may require during the interview.**
   - Carry a few copies of your resume. Use a good quality paper for your resume print outs.
   - Always take along a notepad and a pen.
   - Take along any information you may need to refer to, in order to fill out an application form.
   - Carry a few samples of your work, if relevant.
6. **Remember the importance of non-verbal communication.**
   - Practice projecting confidence. Remind yourself to smile and make eye contact. Practice giving a firm handshake.
   - Keep in mind the importance of posture. Practice sitting up straight. Train yourself to stop nervous gestures like fidgeting and foot-tapping.
   - Practice keeping your reactions in check. Remember, your facial expressions provide a good insight into your true feelings. Practice projecting a positive image.
7. **Make a list of questions to end the interview with.**
   - Most interviews will end with the interviewer(s) asking if you have any questions. This is your chance to show that you have done your research and are interested in learning more about the company.
   - If the interviewer does not ask you this question, you can inform him/her that you have some queries that you would like to discuss. This is the time for you to refer to the notes you made while studying the company.
   - Some good questions to ask at this point are:
     - What do you consider the most important criteria for success in this job?
     - How will my performance be evaluated?
     - What are the opportunities for advancement?
     - What are the next steps in the hiring process?
   - Remember, never ask for information that is easily available on the company website.

Tips

- Ask insightful and probing questions.
- When communicating, use effective forms of body language like smiling, making eye contact, and actively listening and nodding. Don't slouch, play with nearby items, fidget, chew gum, or mumble.

12.4.2 Preparing an Effective Resume: How to Create an Effective Resume

A resume is a formal document that lists a candidate's work experience, education and skills. A good resume gives a potential employer enough information to believe the applicant is worth interviewing. That's why it is so important to create a résumé that is effective. Take a look at the steps to create an effective resume:

Step 1: Write the Address Section

The Address section occupies the top of your resume. It includes information like your name, address, phone number and e-mail address. Insert a bold line under the section to separate it from rest of your resume.

Example:

Jasmine Watts
Breach Candy, Mumbai – India
Contact No: +91 2223678270
Email: jasmine.watts@gmail.com

Step 2: Add the Profile Summary Section

This part of your resume should list your overall experiences, achievements, awards, certifications and strengths. You can make your summary as short as 2-3 bullet points or as long as 8-10 bullet points.

Example:

Profile Summary

- A Content Writer graduated from University of Strathclyde having 6 years of experience in writing website copy.
- Core expertise lies in content creation for e-learning courses, specifically for the K-12 segment.

Step 3: Include Your Educational Qualifications

When listing your academic records, first list your highest degree. Then add the second highest qualification under the highest one and so on. To provide a clear and accurate picture of your educational background, it is critical that include information on your position, rank, percentage or CPI for every degree or certification that you have listed.

If you have done any certifications and trainings, you can add a Trainings & Certifications section under your Educational Qualifications section.

Example:

Educational Qualifications

- Masters in International Management (2007) from Columbia University with 8.8 CPI.
- Bachelor of Management Studies (2004) from Mumbai University with 87% marks.
- 10+2 with Math, Stats (2001) from Maharashtra Board with 91% marks.
- High School (1999) from Maharashtra Board with 93% marks.

Step 4: List Your Technical Skills

When listing your technical skills, start with the skills that you are most confident about. Then add the skills that you do not have as good a command over. It is perfectly acceptable to include just one skill, if you feel that particular skill adds tremendous value to your résumé. If you do not have any technical skills, you can omit this step.

Example:

Technical Skills

- Flash
- Photoshop

Step 5: Insert Your Academic Project Experience

List down all the important projects that you have worked on. Include the following information in this section:

- Project title
- Organization
- Platform used
- Contribution
- Description

Example:

Academic Projects

Project Title: Different Communication Skills

Organization: True Blue Solutions

Platform used: Articulate

Contribution: Content writing and graphic visualization

Description: Development of storyboards for corporate induction & training programs

Step 6: List Your Strengths

This is where you list all your major strengths. This section should be in the form of a bulleted list.

Example:

Strengths

- Excellent oral, written and presentation skills
- Action-oriented and result-focused
- Great time management skills

Step 7: List Your Extracurricular Activities

It is very important to show that you have diverse interests and that your life consists of more than academics. Including your extracurricular activities can give you an added edge over other candidates who have similar academic scores and project experiences. This section should be in the form of a bulleted list.

Example:

Extracurricular Activities

- Member of the Debate Club
- Played tennis at a national level
- Won first prize in the All India Camel Contest, 2010

Step 8: Write Your Personal Details

The last section of your résumé must include the following personal information:

- Date of birth
- Nationality
- Gender & marital status
- Languages known

Example:

Personal Details

- Date of birth: 25th May, 1981
- Gender & marital status: Female, Single
- Nationality: Indian
- Languages known: English, Hindi, Tamil, French

Tips

- Keep your resume file name short, simple and informational.
- Make sure the resume is neat and free from typing errors.
- Always create your resume on plain white paper.

12.4.3 Interview FAQs

Take a look at some of the most frequently asked interview questions, and some helpful tips on how to answer them.

Q1. Can you tell me a little about yourself?

Tips to answer:

- Don't provide your full employment or personal history.
- Offer 2-3 specific experiences that you feel are most valuable and relevant.
- Conclude with how those experiences have made you perfect for this specific role.

Q2. How did you hear about the position?

Tips to answer:

- Tell the interviewer how you heard about the job – whether it was through a friend (name the friend), event or article (name them) or a job portal (say which one).
- Explain what excites you about the position and what in particular caught your eye about this role.

Q3. What do you know about the company?

Tips to answer:

- Don't recite the company's About Us page.
- Show that you understand and care about the company's goals.
- Explain why you believe in the company's mission and values.

Q4. Why do you want this job?

Tips to answer:

- Show that you are passionate about the job.
- Identify why the role is a great fit for you.
- Explain why you love the company.

Q5. Why should we hire you?

Tips to answer:

- Prove through your words that you can not only do the work, but can definitely deliver excellent results.
- Explain why you would be a great fit with the team and work culture.
- Explain why you should be chosen over any other candidate.

Q6. What are your greatest professional strengths?

Tips to answer:

- Be honest – share some of your real strengths, rather than give answers that you think sound good.
- Offer examples of specific strengths that are relevant to the position you are applying for.
- Provide examples of how you've demonstrated these strengths.

Q7. What do you consider to be your weaknesses?

Tips to answer:

- The purpose of this question is to gauge your self-awareness and honesty.
- Give an example of a trait that you struggle with, but that you're working on to improve.

Q8. What are your salary requirements?

Tips to answer:

- Do your research beforehand and find out the typical salary range for the job you are applying for.
- Figure out where you lie on the pay scale based on your experience, education, and skills.
- Be flexible. Tell the interviewer that you know your skills are valuable, but that you want the job and are willing to negotiate.

Q9. What do you like to do outside of work?

Tips to answer:

- The purpose of this question is to see if you will fit in with the company culture.
- Be honest – open up and share activities and hobbies that interest and excite you.

Q10. If you were an animal, which one would you want to be?

Tips to answer:

- The purpose of this question is to see if you are able to think on your feet.
- There's no wrong answer – but to make a great impression try to bring out your strengths or personality traits through your answer.

Q11: What do you think we could do better or differently?

Tips to answer:

- The purpose of this question is to see if you have done your research on the company, and to test whether you can think critically and come up with new ideas.
- Suggest new ideas. Show how your interests and expertise would help you execute these ideas.

Q12: Do you have any questions for us?

Tips to answer:

- Do not ask questions to which the answers can be easily found on the company website or through a quick online search.
- Ask intelligent questions that show your ability to think critically.

Tips

- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

12.4.4 Work Readiness – Terms & Terminologies: Basic Workplace Terminology

Every employee should be well versed in the following terms:

- **Annual leave:** Paid vacation leave given by employers to employees.
- **Background Check:** A method used by employers to verify the accuracy of the information provided by potential candidates.
- **Benefits:** A part of an employee's compensation package.
- **Breaks:** Short periods of rest taken by employees during working hours.
- **Compensation Package:** The combination of salary and benefits that an employer provides to his/her employees.
- **Compensatory Time (Comp Time):** Time off in lieu of pay.
- **Contract Employee:** An employee who works for one organization that sells said employee's services to another company, either on a project or time basis.
- **Contract of Employment:** When an employee is offered work in exchange for wages or salary, and accepts the offer made by the employer, a contract of employment exists.
- **Corporate Culture:** The beliefs and values shared by all the members of a company, and imparted from one generation of employees to another.
- **Counter Offer/Counter Proposal:** A negotiation technique used by potential candidates to increase the amount of salary offered by a company.
- **Cover Letter:** A letter that accompanies a candidate's resume. It emphasizes the important points in the candidate's resume and provides real examples that prove the candidate's ability to perform the expected job role.
- **Curriculum Vitae (CV)/Resume:** A summary of a candidate's achievements, educational background, work experience, skills and strengths.
- **Declining Letter:** A letter sent by an employee to an employer, turning down the job offer made by the employer to the employee.
- **Deductions:** Amounts subtracted from an employee's pay and listed on the employee's pay slip.
- **Discrimination:** The act of treating one person not as favourably as another person.
- **Employee:** A person who works for another person in exchange for payment.
- **Employee Training:** A workshop or in-house training that an employee is asked to attend by his or her superior, for the benefit of the employer.
- **Employment Gaps:** Periods of unemployed time between jobs.
- **Fixed-Term Contract:** A contract of employment which gets terminated on an agreed-upon date.
- **Follow-Up:** The act of contacting a potential employer after a candidate has submitted his or her resume.
- **Freelancer/Consultant/Independent Contractor:** A person who works for him or herself and pitches for temporary jobs and projects with different employers.
- **Holiday**: Paid time-off from work.
- **Hourly Rate**: The amount of salary or wages paid for 60 minutes of work.

- **Internship**: A job opportunity offered by an employer to a potential employee, called an intern, to work at the employer's company for a fixed, limited time period.
- **Interview**: A conversation between a potential employee and a representative of an employer, in order to determine if the potential employee should be hired.
- **Job Application**: A form which asks for a candidate's information like the candidate's name, address, contact details and work experience. The purpose of a candidate submitting a job application, is to show that candidate's interest in working for a particular company.
- **Job Offer**: An offer of employment made by an employer to a potential employee.
- **Job Search Agent**: A program that enables candidates to search for employment opportunities by selecting criteria listed in the program, for job vacancies.
- **Lay Off**: A lay off occurs when an employee is temporarily let go from his or her job, due to the employer not having any work for that employee.
- **Leave**: Formal permission given to an employee, by his or her employer, to take a leave of absence from work.
- **Letter of Acceptance**: A letter given by an employer to an employee, confirming the offer of employment made by the employer, as well as the conditions of the offer.
- **Letter of Agreement**: A letter that outlines the terms of employment.
- **Letter of Recommendation**: A letter written for the purpose of validating the work skills of a person.
- **Maternity Leave**: Leave taken from work by women who are pregnant, or who have just given birth.
- **Mentor**: A person who is employed at a higher level than you, who offers you advice and guides you in your career.
- **Minimum wage**: The minimum wage amount paid on an hourly basis.
- **Notice**: An announcement made by an employee or an employer, stating that the employment contract will end on a particular date.
- **Offer of Employment**: An offer made by an employer to a prospective employee that contains important information pertaining to the job being offered, like the starting date, salary, working conditions etc.
- **Open-Ended Contract**: A contract of employment that continues till the employer or employee terminates it.
- **Overqualified**: A person who is not suited for a particular job because he or she has too many years of work experience, or a level of education that is much higher than required for the job, or is currently or was previously too highly paid.
- **Part-Time Worker**: An employee who works for fewer hours than the standard number of hours normally worked.
- **Paternity Leave**: Leave granted to a man who has recently become a father.
- **Recruiters/Headhunters/Executive Search Firms**: Professionals who are paid by employers to search for people to fill particular positions.
- **Resigning/Resignations**: When an employee formally informs his or her employer that he or she is quitting his or her job.
- **Self-Employed**: A person who has his or her own business and does not work in the capacity of an employee.
- **Time Sheet**: A form that is submitted to an employer, by an employee, that contains the number of hours worked every day by the employee.

12.5. Understanding Entrepreneurship

Unit Objectives

1. At the end of this unit, you will be able to:
2. Discuss the concept of entrepreneurship
3. Discuss the importance of entrepreneurship
4. Describe the characteristics of an entrepreneur
5. Describe the different types of enterprises
6. List the qualities of an effective leader
7. Discuss the benefits of effective leadership
8. List the traits of an effective team
9. Discuss the importance of listening effectively
10. Discuss how to listen effectively
11. Discuss the importance of speaking effectively
12. Discuss how to speak effectively
13. Discuss how to solve problems
14. List important problem solving traits
15. Discuss ways to assess problem solving skills
16. Discuss the importance of negotiation
17. Discuss how to negotiate
18. Discuss how to identify new business opportunities
19. Discuss how to identify business opportunities within your business
20. Understand the meaning of entrepreneur
21. Describe the different types of entrepreneurs
22. List the characteristics of entrepreneurs
23. Recall entrepreneur success stories
24. Discuss the entrepreneurial process
25. Describe the entrepreneurship ecosystem
26. Discuss the government's role in the entrepreneurship ecosystem
27. Discuss the current entrepreneurship ecosystem in India
28. Understand the purpose of the Make in India campaign
29. Discuss the relationship between entrepreneurship and risk appetite
30. Discuss the relationship between entrepreneurship and resilience
31. Describe the characteristics of a resilient entrepreneur
32. Discuss how to deal with failure

12.5.1 Concept Introduction, (Characteristic of an Entrepreneur, types of firms / types of enterprises): Entrepreneurs and Entrepreneurship

Anyone who is determined to start a business, no matter what the risk, is an entrepreneur. Entrepreneurs run their own start-up, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. The aim of an entrepreneur is to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

Importance of Entrepreneurship

Entrepreneurship is very important for the following reasons:

1. It results in the creation of new organizations
2. It brings creativity into the marketplace
3. It leads to improved standards of living
4. It helps develop the economy of a country

Characteristics of Entrepreneurs

All successful entrepreneurs have certain characteristics in common.

They are all:

- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also have a tendency to:

- Have a high risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

Examples of Famous Entrepreneurs

Some famous entrepreneurs are:

- Bill Gates (Founder of Microsoft)
- Steve Jobs (Co-founder of Apple)
- Mark Zuckerberg (Founder of Facebook)
- Pierre Omidyar (Founder of eBay)

Types of Enterprises

As an entrepreneur in India, you can own and run any of the following types of enterprises:

Sole Proprietorship

In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form with respect to legal formalities. The business and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses - the liability of the entrepreneur is unlimited.

Partnership

A partnership firm is formed by two or more people. The owners of the enterprise are called partners. A partnership deed must be signed by all the partners. The firm and its partners have no separate legal existence. The profits are shared by the partners. With respect to losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when any one of the partners dies, retires, claims bankruptcy or goes insane.

Limited Liability Partnership (LLP)

In a Limited Liability Partnership or LLP, the partners of the firm enjoy perpetual existence as well as the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

Tips

- Learn from others' failures.
- Be certain that this is what you want.
- Search for a problem to solve, rather than look for a problem to attach to your idea.

12.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means se翮 ng an example for others to follow. Se翮 ng a good example means not asking someone to do something that you wouldn't willingly want to do yourself. Leadership is about figuring out what to do in order to win as a team, and as a company.

Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.

Leadership Qualities That All Entrepreneurs Need

Building a successful enterprise is only possible if the entrepreneur in charge possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:

1. **Pragmatism**: This means having the ability to highlight all obstacles and challenges, in order to resolve issues and reduce risks.
2. **Humility**: This means admi翮 ng to mistakes often and early, and being quick to take responsibility for your actions. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
3. **Flexibility**: It is critical for a good leader to be very flexible and quickly adapt to change. It is equally critical to know when to adapt and when not to.
4. **Authenticity**: This means showing both, your strengths and your weaknesses. It means being human and showing others that you are human.
5. **Reinvention**: This means refreshing or changing your leadership style when necessary. To do this, it's important to learn where your leadership gaps lie and find out what resources are required to close them.
6. **Awareness**: This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

Benefits of Effective Leadership

Effective leadership results in numerous benefits. Great leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

Teamwork and Teams

Teamwork occurs when the people in a workplace combine their individual skills to pursue a common goal. Effective teams are made up of individuals who work together to achieve this common goal. A great team is one who holds themselves accountable for the end result.

Importance of Teamwork in Entrepreneurial Success

For an entrepreneurial leader, building an effective team is critical to the success of a venture. An entrepreneur must ensure that the team he builds possesses certain crucial qualities, traits and characteristics. An effective team is one which has:

1. **Unity of purpose:** All the team members should clearly understand and be equally committed to the purpose, vision and goals of the team.
2. **Great communication skills:** Team members should have the ability to express their concerns, ask questions and use diagrams, and charts to convey complex information.
3. **The ability to collaborate:** Every member should feel entitled to provide regular feedback on new ideas.
4. **Initiative:** The team should consist of proactive individuals. The members should have the enthusiasm to come up with new ideas, improve existing ideas, and conduct their own research.
5. **Visionary members:** The team should have the ability to anticipate problems and act on these potential problem before they turn into real problems.
6. **Great adaptability skills:** The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
7. **Excellent organizational skills:** The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

Tips

- Don't get too attached to your original idea. Allow it to evolve and change.
- Be aware of your weaknesses and build a team that will complement your shortfalls.
- Hiring the right people is not enough. You need to promote or incentivize your most talented people to keep them motivated.
- Earn your team's respect.

12.5.3 Communication Skills: Listening & Speaking: The Importance of Listening Effectively

Listening is the ability to correctly receive and understand messages during the process of communication. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the message becoming frustrated or irritated.

It's very important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that. To listen, one requires focus. It means not only paying attention to the story, but also focusing on how the story is relayed, the way language and voice is used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand both, verbal and non-verbal cues.

How to Listen Effectively

To listen effectively you should:

- Stop talking
- Stop interrupting
- Focus completely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very, very patient
- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

How to Listen Effectively

How successfully a message gets conveyed depends entirely on how effectively you are able to get it through. An effective speaker is one who enunciates properly, pronounces words correctly, chooses the right words and speaks at a pace that is easily understandable. Besides this, the words spoken out loud need to match the gestures, tone and body language used.

What you say, and the tone in which you say it, results in numerous perceptions being formed. A person who speaks hesitantly may be perceived as having low self-esteem or lacking in knowledge of the discussed topic. Those with a quiet voice may very well be labelled as shy. And those who speak in commanding tones with high levels of clarity, are usually considered to be extremely confident. This makes speaking a very critical communication skill.

How to Speak Effectively

To speak effectively you should:

- Incorporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times.
- Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural in any way.
- Use precise and specific words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.
- Be brief. Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that the majority of the audience will have no difficulty understanding.
- Use visual aids like slides or a whiteboard.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

Tips

- If you're finding it difficult to focus on what someone is saying, try repeating their words in your head.
- Always maintain eye contact with the person that you are communicating with, when speaking as well as listening. This conveys and also encourages interest in the conversation.

12.5.4 Problem Solving & Negotiation skills: What is a Problem?

As per The Concise Oxford Dictionary (1995), a problem is, "A doubtful or difficult matter requiring a solution"

All problems contain two elements:

1. Goals 2. Obstacles

The aim of problem solving is to recognize the obstacles and remove them in order to achieve the goals.

How to Solve Problems

Solving a problem requires a level of rational thinking. Here are some logical steps to follow when faced with an issue:

Step 1: Identify the problem

Step 2: Study the problem in detail

Step 3: List all possible solutions

Step 4: Select the best solution

Step 5: Implement the chosen solution

Step 6: Check that the problem has really been solved

Important Traits for Problem Solving

Highly developed problem solving skills are critical for both, business owners and their employees. The following personality traits play a big role in how effectively problems are solved:

- Being open minded
- Being proactive
- Having a positive attitude
- Asking the right questions
- Not panicking
- Focusing on the right problem

How to Assess for Problem Solving Skills

As an entrepreneur, it would be a good idea to assess the level of problem solving skills of potential candidates before hiring them. Some ways to assess this skill are through:

1. **Application forms**: Ask for proof of the candidate's problem solving skills in the application form.
2. **Psychometric tests**: Give potential candidates logical reasoning and critical thinking tests and see how they fare.
3. **Interviews**: Create hypothetical problematic situations or raise ethical questions and see how the candidates respond.
4. **Technical questions**: Give candidates examples of real life problems and evaluate their thought process.

What is Negotiation?

Negotiation is a method used to settle differences. The aim of negotiation is to resolve differences through a compromise or agreement while avoiding disputes. Without negotiation, conflicts are likely to lead to resentment between people. Good negotiation skills help satisfy both parties and go a long way towards developing strong relationships.

Why Negotiate

Starting a business requires many, many negotiations. Some negotiations are small while others are critical enough to make or break a startup. Negotiation also plays a big role inside the workplace. As an entrepreneur, you need to know not only know how to negotiate yourself, but also how to train employees in the art of negotiation.

How to Negotiate

Take a look at some steps to help you negotiate:

Step 1: Pre-Negotiation Preparation	Agree on where to meet to discuss the problem, decide who all will be present and set a time limit for the discussion.
Step 2: Discuss the Problem	This involves asking questions, listening to the other side, putting your views forward and clarifying doubts.
Step 3: Clarify the Objective	Ensure that both parties want to solve the same problem and reach the same goal.
Step 4: Aim for a Win-Win Outcome	Try your best to be open minded when negotiating. Compromise and offer alternate solutions to reach an outcome where both parties win.
Step 5: Clearly Define the Agreement	When an agreement has been reached, the details of the agreement should be crystal clear to both sides, with no scope for misunderstandings.
Step 6: Implement the Agreed Upon Solution	Agree on a course of action to set the solution in motion

Tips

- Know exactly what you want before you work towards getting it
- Give more importance to listening and thinking, than speaking
- Focus on building a relationship rather than winning
- Remember that your people skills will affect the outcome
- Know when to walk away – sometimes reaching an agreement may not be possible

12.5.5 Business Opportunities Identification: Entrepreneurs and Opportunities

"The entrepreneur always searches for change, responds to it and exploits it as an opportunity."

Peter Drucker

The ability to identify business opportunities is an essential characteristic of an entrepreneur.

What is an Opportunity?

The word opportunity suggests a good chance or a favourable situation to do something offered by circumstances.

A business opportunity means a good or favourable change available to run a specific business in a given environment, at a given point of time.

Common Questions Faced by Entrepreneurs

A critical question that all entrepreneurs face is how to go about finding the business opportunity that is right for them.

Some common questions that entrepreneurs constantly think about are:

- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprise select an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked elsewhere?

It is therefore extremely important that entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

When is an Idea an Opportunity?

An idea is an opportunity when:

- It creates or adds value to a customer
- It solves a significant problem, removes a pain point or meets a demand
- Has a robust market and profit margin
- Is a good fit with the founder and management team at the right time and place

Factors to Consider When Looking for Opportunities

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trends
- Changes in political support
- Shift in target audience

Ways to Identify New Business Opportunities

1. Identify Market Inefficiencies

   When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies.

2. Remove Key Hassles

   Rather than create a new product or service, you can innovatively improve a product, service or process.

3. Create Something New

   Think about how you can create a new experience for customers, based on existing business models.

4. Pick a Growing Sector/Industry

   Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same.

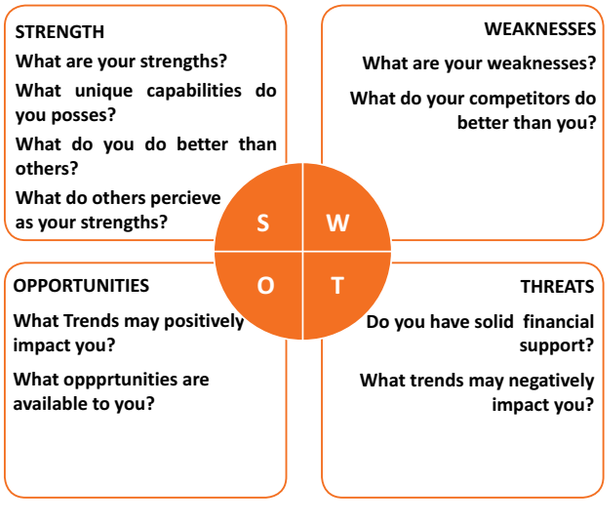
5. Think About Product Differentiation

   If you already have a product in mind, think about ways to set it apart from the existing ones.

Ways to Identify Business Opportunities Within Your Business

1. SWOT Analysis

   An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. SWOT analysis framework:



Consider the following when looking for business opportunities:

By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities that you can exploit, as well as manage and eliminate threats that could derail your success.

2. Establishing Your USP

Establish your USP and position yourself as different from your competitors. Identify why customers should buy from you and promote that reason.

Opportunity Analysis

Once you have identified an opportunity, you need to analyze it.
To analyze an opportunity, you must:

- Focus on the idea
- Focus on the market of the idea
- Talk to industry leaders in the same space as the idea
- Talk to players in the same space as the idea

Tips

- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

12.5.6 Entrepreneurship Support Eco - System: What is an Entrepreneur?

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

Types of Entrepreneurs

There are four main types of entrepreneurs:

1. **The Traditional Entrepreneur**: This type of entrepreneur usually has some kind of skill – they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before they begin their own business in a similar field.
2. **The Growth Potential Entrepreneur**: The desire of this type of entrepreneur is to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to eventually sell their enterprise for a nice profit. Such entrepreneurs usually have a science or technical background.
3. **The Project-Oriented Entrepreneur**: This type of entrepreneur generally has a background in the Arts or psychology. Their enterprises tend to be focus on something that they are very passionate about.
4. **The Lifestyle Entrepreneur**: This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy, rather than making lots of money.

Characteristics of an Entrepreneur

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle each and every task
- They have excellent business skills – they know how to evaluate their cash flow, sales and revenue
- They are willing to take great risks
- They are very proactive – this means they are willing to do the work themselves, rather than wait for someone else to do it
- They have a vision – they are able to see the big picture
- They are flexible and open-minded
- They are good at making decisions

Entrepreneur Success Stories

Dhiru Bhai Ambani

Dhirubhai Ambani began his entrepreneurial career by selling "bhajias" to pilgrims in Mount Girnar on weekends. At 16, he moved to Yemen where he worked as a gas-station attendant, and as a clerk in an oil company. He returned to India with Rs. 50,000 and started a textile trading company. Reliance went on to become the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

Dr. Karsanbhai Patel

Karsanbhai Patel made detergent powder in the backyard of his house. He sold his product door-to-door and offered a money back guarantee with every pack that was sold. He charged Rs. 3 per kg when the cheapest detergent at that time was Rs.13 per kg. Dr. Patel eventually started Nirma which became a whole new segment in the Indian domestic detergent market.

The Entrepreneurial Process

Let's take a look at the stages of the entrepreneurial process.

Stage 1: Idea Generation. The entrepreneurial process begins with an idea that has been thought of by the entrepreneur. The idea is a problem that has the potential to be solved.

Stage 2: Germination or Recognition. In this stage a possible solution to the identified problem is thought of.

Stage 3: Preparation or Rationalization. The problem is studied further and research is done to find out how others have tried to solve the same problem.

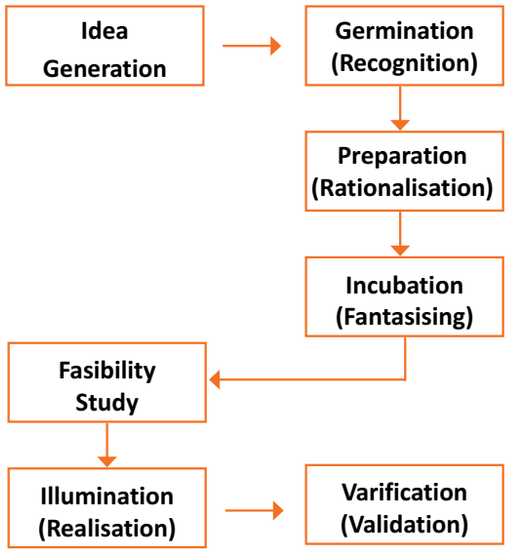
Stage 4: Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.

Stage 5: Feasibility Study: The next step is the creation of a feasibility study to determine if the idea will make a profit and if it should be seen through.

Stage 6: Illumination or Realization. This is when all uncertain areas suddenly become clear. The entrepreneur feels confident that his idea has merit.

Stage 7: Verification or Validation. In this final stage, the idea is verified to see if it works and if it is useful.

Take a look at the diagram below to get a better idea of this process.



What is an Entrepreneur?

The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or 'ecosystem' made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs' efforts.

An entrepreneurship ecosystem comprises of the following six domains:

1. **Favourable Culture:** This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur.
2. **Facilitating Policies & Leadership:** This includes regulatory framework incentives and existence of public research institutes.
3. **Financing Options:** Angel financing, venture capitalists and micro loans would be good examples of this.
4. **Human Capital:** This refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmes, etc.
5. **Conducive Markets for Products & Services:** This refers to an existence or scope of existence of a market for the product/service.
6. **Institutional & Infrastructural Support:** This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmes.

These domains indicate whether there is a strong entrepreneurship support ecosystem and what actions should the government put in place to further encourage this ecosystem. The six domains and their various elements have been graphically depicted.

Early Customers

- Early adopters for proof-of-concept
- Expertise in productizing
- Reference customer
- First reviews
- Distribution channels

Leadership

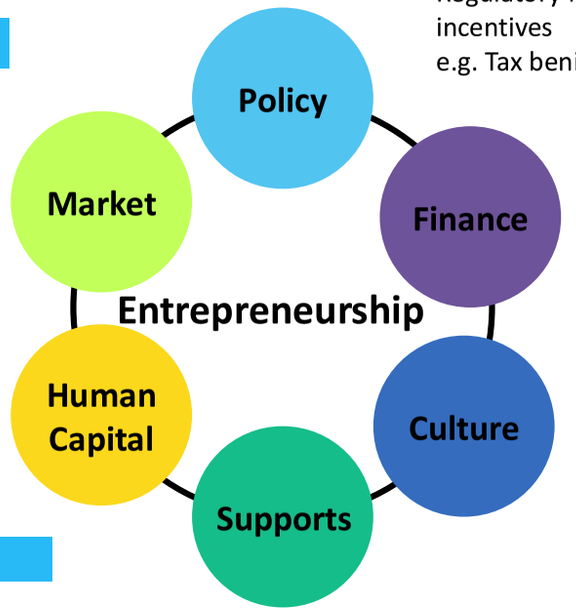
- Unequivocal support
- Social legitimacy
- Open door for advocate
- Entrepreneurship strategy
- urgency, crisis and challenge

Government

- Institutions
  e.g. Investment, support
- Financial support
  e.g. for R&D, jump start funds
  Regulatory framework
  incentives
  e.g. Tax benifits
- Research institutes
- Venture-friendly legislation
- e.g. Bankruptcy, contract enforcement, property rights, and labour

Networks

- Entrepreneure's networks
- Diaspora networks
- Multinational corporations



Financial Capital

- Micro-loans
- Angel investors, friends and family
- Zero-stage venture capital
- Venture capital funds
- Private equity
- Public capital markets
- Debt

Labour

- Skilled and unskilled
- Serial entrepreneures
- Later generation family

Success Stories

- Visible successes
- Wealth generation for founders
- International reputation

Educational Institutions

- General degrees (professional and academic)
- Specific entrepreneurship training

Societal norms

- Tolerance of risk, mistakes, failure
- Innovation, creativity, experimentation
- Social status of entrepreneur
- Wealth creation
- Ambition, drive, hunger

Infrastructure

- Telecommunications
- Transportation & logistics
- Energy
- Zones, incubation centers, clusters

Non-Government Institution

- Entrepreneurship promotion in non-profits
- Conferences
- Business plan contests
- Entrepreneur- friendly association

Support Professions

- Legal
- Accounting
- Investment bankers

Every entrepreneurship support ecosystem is unique and all the elements of the ecosystem are interdependent. Although every region's entrepreneurship ecosystem can be broadly described by the above features, each ecosystem is the result of the hundred elements interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (largely) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. It is imperative that the entrepreneurship ecosystem incentives are formulated to be self-liquidating, hence focusing on sustainability of the environment.

Government's Role in the Entrepreneurship Ecosystem

Encouraging new ventures is a major focus for policymakers. Governments across the world are recognizing that new businesses flourish in distinctive types of supportive environments. Policymakers should study the scenario and take into account the following points whilst they formulate policies and regulations that enable successful entrepreneurship support ecosystems.

1. Policymakers should avoid regulations that discourage new entrants and work towards building efficient methods for business startups. Policies and regulations that favour existing, dominant firms over entrepreneurial ventures, restrict competition and obstruct entry for new companies.
2. Instead of developing policies conceptually intended to correct market failures, policymakers should interact with entrepreneurs and understand the challenges faced by them. The feedback should be used to develop policies that incite idea exploration, product development and increased rates of deal flow.
3. Entrepreneurial supporters should create a database that enables identifying who the participants in the ecosystem are and how they are connected. These ecosystem maps are useful tools in developing engagement strategies.
4. Disruptions are unavoidable in economic and social life. However, it's important to note that economic disruption gives rise to entrepreneurial opportunities. Architects of the entrepreneurship ecosystems (entrepreneurs, mentors, policymakers and consumers,) should anticipate these dips, thus capitalizing on the opportunities they create.

The need for effective strategies to enable local entrepreneurship support ecosystems is a practical one. Better understanding of the actual ecosystems provides a framework within which policy makers can ask relevant questions, envisage more efficient approaches, and assess ensuing outcomes.

Snapshot of the Entrepreneurship Ecosystem in India

Entrepreneurship has earned a newfound respect in India. Many Indians, with exposure to the world of business, who traditionally would have opted for a job, are setting up their own ventures. Many elements of the entrepreneurship ecosystem are beginning to come together. For example, increase in venture capitalists, government schemes and incubators, academia industry linkages, and emerging clusters and support to rural economy. All these initiatives are effective but there is a need to scale up and enrich the ecosystem further in the following ways:

1. We need to review our attitude towards failures and accept them as learning experiences.
2. We must encourage the educated to become entrepreneurs and provide students in schools and colleges with entrepreneurship skills.

3. Universities, research labs and the government need to play the role of enablers in the entrepreneurship support ecosystem.
4. Policymakers need to focus on reducing the obstacles such as corruption, red tape and bureaucracy.
5. We need to improve our legal systems and court international venture capital firms and bring them to India.
6. We must devise policies and methods to reach the secondary and tertiary towns in India, where people do not have access to the same resources available in the cities.

Today, there is a huge opportunity in this country to introduce innovative solutions that are capable of scaling up, and collaborating within the ecosystem as well as enriching it.

Make in India Campaign

Every entrepreneur has certain needs. Some of their important needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to easily partner with other firms

The Make in India campaign, launched by Prime Minister Modi aims to satisfy all these needs of young, aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the ideas of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

Tips

- Research the existing market, network with other entrepreneurs, venture capitalists, angel investors, and thoroughly review the policies in place to enable your entrepreneurship.
- Failure is a stepping stone and not the end of the road. Review yours and your peers' errors and correct them in your future venture.
- Be proactive in your ecosystem. Identify the key features of your ecosystem and enrich them to ensure self-sustainability of your entrepreneurship support ecosystem.

12.5.7 Risk Appetite & Resilience: Entrepreneurship and Risk

Entrepreneurs are inherently risk takers. They are path-makers not path-takers. Unlike a normal, cautious person, an entrepreneur would not think twice about quitting his job (his sole income) and taking a risk on himself and his idea.

An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong and unforeseen events may arise. He knows that after dealing with numerous problems, success is still not guaranteed. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk-appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

What is Risk Appetite?

Risk appetite is defined as the extent to which a company is equipped to take risk, in order to achieve its objectives. Essentially, it refers to the balance, struck by the company, between possible profits and the hazards caused by changes in the environment (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses as well. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach their objectives.

The levels of risk appetite can be broadly categorized as “low”, “medium” and “high.” The company’s entrepreneur(s) have to evaluate all potential alternatives and select the option most likely to succeed. Companies have varying levels of risk appetites for different objectives. The levels depend on:

- The type of industry
- Market pressures
- Company objectives

For example, a startup with a revolutionary concept will have a very high risk appetite. The startup can afford short term failures before it achieves longer term success. This type of appetite will not remain constant and will be adjusted to account for the present circumstances of the company.

Risk Appetite Statement

Companies have to define and articulate their risk appetite in sync with decisions made about their objectives and opportunities. The point of having a risk appetite statement is to have a framework that clearly states the acceptance and management of risk in business. It sets risk taking limits within the company. The risk appetite statement should convey the following:

- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- How much risk to accept in all the risk categories.
- The desired tradeoff between risk and reward.
- Measures of risk and methods of examining and regulating risk exposures.

Entrepreneurship and Resilience

Entrepreneurs are characterized by a set of qualities known as resilience. These qualities play an especially large role in the early stages of developing an enterprise. Risk resilience is an extremely valuable characteristic as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

What is Entrepreneurial Resilience?

Resilience is used to describe individuals who have the ability to overcome setbacks related to their life and career aspirations. A resilient person is someone who is capable of easily and quickly recovering from setbacks. For the entrepreneur, resilience is a critical trait. Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- By accepting that change is a part of life
- By viewing obstacles as something that can be overcome

Characteristics of a Resilient Entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A strong internal sense of control
- Strong social connections
- Skill to learn from setbacks
- Ability to look at the bigger picture
- Ability to diversify and expand
- Survivor attitude
- Cash-flow conscious habits
- Attention to detail

Tips

- Cultivate a great network of clients, suppliers, peers, friends and family. This will not only help you promote your business, but will also help you learn, identify new opportunities and stay tuned to changes in the market.
- Don’t dwell on setbacks. Focus on what the you need to do next to get moving again.
- While you should try and curtail expenses, ensure that it is not at the cost of your growth.

12.5.8 Success & Failures: Understanding Successes and Failures in Entrepreneurship

Shyam is a famous entrepreneur, known for his success story. But what most people don't know, is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is really about, straight from an entrepreneur who has both, failed and succeeded.

Interviewer: Shyam, I have heard that entrepreneurs are great risk-takers who are never afraid of failing. Is this true?

Shyam: Ha ha, no of course it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic. But the truth is, fear is a very normal and valid human reaction, especially when you are planning to start your own business! In fact, my biggest fear was the fear of failing. The reality is, entrepreneurs fail as much as they succeed. The trick is to not allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

Interviewer: What, according to you, is the reason that entrepreneurs fail?

Shyam: Well, there is no one single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons. You could fail because you have allowed your fear of failure to defeat you. You could fail because you are unwilling to delegate (distribute) work. As the saying goes, "You can do anything, but not everything!" You could fail because you gave up too easily – maybe you were not persistent enough. You could fail because you were focusing your energy on small, insignificant tasks and ignoring the tasks that were most important. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price… and many more reasons!

Interviewer: As an entrepreneur, how do you feel failure should be looked at?

Shyam: I believe we should all look at failure as an asset, rather than as something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying, and wondering 'what if' is far worse than trying and actually failing.

Interviewer: How did you feel when you failed for the first time?

Shyam: I was completely heartbroken! It was a very painful experience. But the good news is, you do recover from the failure. And with every subsequent failure, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed, rather than as an obstacle that you cannot overcome. You will start to realize that failure has many benefits.

Interviewer: Can you tell us about some of the benefits of failing?

Shyam: One of the benefits that I have experienced personally from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before. Failure can make you a lot stronger. It also helps keep your ego in control.

Interviewer: What advice would you give entrepreneurs who are about to start their own enterprises?

Shyam: I would tell them to do their research and ensure that their product is something that is actually wanted by customers. I'd tell them to pick their partners and employees very wisely and cautiously. I'd tell them that it's very important to be aggressive – push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money.

I would tell them to create long term goals and put a plan in action to achieve that goal. I would tell them to build a product that is truly unique. Be very careful and ensure that you are not copying another startup. Lastly, I'd tell them that it's very important that they find the right investors.

Interviewer: That's some really helpful advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

Tips

- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps – don't make decisions hastily.

12.6: Preparing to be an Entrepreneur

Unit Objectives

At the end of this unit, you 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. Understand 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 your own enterprise
16. List important questions that every entrepreneur should ask before starting an enterprise

12.6.1 Market Study / The 4 Ps of Marketing / Importance of an IDEA: Understanding Market Research

Market research is the process of gathering, analyzing and interpreting market information on a product or service that is being sold in that market. It also includes information on:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

- Primary information. This is research collected by yourself or by someone hired by you.
- Secondary information. This is research that already exists and is out there for you to find and use.

Primary research

Primary research can be of two types:

- Exploratory: This is open-ended and usually involves detailed, unstructured interviews.
- Specific: This is precise and involves structured, formal interviews. Conducting specific research is the more expensive than conducting exploratory research.

Secondary research

Secondary research uses outside information. Some common secondary sources are:

- Public sources: These are usually free and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- Commercial sources: These offer valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- Educational institutions: These offer a wealth of information. Examples are colleges, universities, technical institutes etc.

The 4 Ps of Marketing

The 4 Ps of marketing are Product, Price, Promotion and Place. Let's look at each of these 4 Ps in detail.

Product

A product can be:

- A tangible good
- An intangible service

Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.

Some questions to ask yourself are:

- What does the customer want from the product/service?
- What needs does it satisfy?
- Are there any more features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- What should it be called?
- How is it different from similar products?
- How much will it cost to produce?
- Can it be sold at a profit?

Price

Once all the elements of Product have been established, the Price factor needs to be considered.

The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.

Some questions to ask yourself are:

- What is the value of the product/service to customers?
- Do local products/services have established price points?
- Is the customer price sensitive?
- Should discounts be offered?
- How is your price compared to that of your competitors?

Promotion

Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.

Some questions to ask yourself are:

- Where should you promote your product or service?
- What is the best medium to use to reach your target audience?
- When would be the best time to promote your product?
- How are your competitors promoting their products?

Place

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

- Will your product or service be looked for in a physical store, online or both?
- What should you do to access the most appropriate distribution channels?
- Will you require a sales force?
- Where are your competitors offering their products or services?
- Should you follow in your competitors' footsteps?
- Should you do something different from your competitors?

Importance of an IDEA

Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish or extremely complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas, out for fear of being ridiculed. However, if are an entrepreneur and want to remain competitive and innovative, you need to bring your ideas out into the light.

Some ways to do this are by:

- Establishing a culture of brainstorming where you invite all interested parties to contribute
- Discussing ideas out loud so that people can add their ideas, views, opinions to them
- Being open minded and not limiting your ideas, even if the idea who have seems ridiculous
- Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date

Tips

- Keep in mind that good ideas do not always have to be unique.
- Remember that timing plays a huge role in determining the success of your idea.
- Situations and circumstances will always change, so be flexible and adapt your idea accordingly.

12.6.2 Business Entity Concepts: Basic Business Terminology

If your aim is to start and run a business, it is crucial that you have a good understanding of basic business terms. Every entrepreneur should be well versed in the following terms:

- Accounting: A systematic method of recording and reporting financial transactions.
- Accounts payable: Money owed by a company to its creditors.
- Accounts Receivable: The amount a company is owed by its clients.
- Assets: The value of everything a company owns and uses to conduct its business.
- Balance Sheet: A snapshot of a company's assets, liabilities and owner's equity at a given moment.
- Bottom Line: The total amount a business has earned or lost at the end of a month.
- Business: An organization that operates with the aim of making a profit.
- Business to Business (B2B): A business that sells goods or services to another business.
- Business to Consumer (B2C): A business that sells goods or services directly to the end user.
- Capital: The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity.
- Cash Flow: The overall movement of funds through a business each month, including income and expenses.
- Cash Flow Statement: A statement showing the money that entered and exited a business during a specific period of time.
- Contract: A formal agreement to do work for pay.
- Depreciation: The degrading value of an asset over time.
- Expense: The costs that a business incurs through its operations.
- Finance: The management and allocation of money and other assets.
- Financial Report: A comprehensive account of a business' transactions and expenses.
- Fixed Cost: A one-time expense.
- Income Statement (Profit and Loss Statement): Shows the profitability of a business during a period of time.
- Liabilities: The value of what a business owes to someone else.
- Marketing: The process of promoting, selling and distributing a product or service.
- Net Income/Profit: Revenues minus expenses.
- Net Worth: The total value of a business.
- Payback Period: The amount of time it takes to recover the initial investment of a business.
- Profit Margin: The ratio of profit, divided by revenue, displayed as a percentage.
- Return on Investment (ROI): The amount of money a business gets as return from an investment.

- Revenue: The total amount of income before expenses are subtracted.
- Sales Prospect: A potential customer.
- Supplier: A provider of supplies to a business.
- Target Market: A specific group of customers at which a company's products and services are aimed.
- Valuation: An estimate of the overall worth of the business.
- Variable Cost: Expenses that change in proportion to the activity of a business.
- Working Capital: Calculated as current assets minus current liabilities.

12.6.3 CRM & Networking: What is CRM?

CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

The Need for CRM

The better a company can manage its relationships with its customers, the higher the chances of the company's success. For any entrepreneur, the ability to successfully retain existing customers and expand the enterprise is paramount. This is why IT systems that focus on addressing the problems of dealing with customers on a daily basis are becoming more and more in demand.

Customer needs change over time, and technology can make it easier to understand what customers really want. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required, so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

Benefits of CRM

CRM has a number of important benefits:

- It helps improve relations with existing customers which can lead to:
  - Increased sales
  - Identification of customer needs
  - Cross-selling of products
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

6.3.4 What is Networking?

In business, networking means leveraging your business and personal connections in order to bring in a regular supply of new business. This marketing method is effective as well as low cost. It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions, or can take place via phone, email, and social and business networking websites.

6.3.5 The Need for Networking

Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking results in greater communication and a stronger presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs.

Business networking events held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds but they all have a common goal in mind – they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

Benefits of Networking

Networking offers numerous benefits for entrepreneurs. Some of the major benefits are:

- Getting high quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people
- Increased self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

Tips

- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

12.6.4 Business Plan: Why Set Goals

Setting goals is important because it gives you long-term vision and short-term motivation. Goals can be short term, medium term and long term.

Short-Term Goals

- These are specific goals for the immediate future.

Example: Repairing a machine that has failed.

Medium-Term Goals

- These goals are built on your short term goals.
- They do not need to be as specific as your short term goals.

Example: Arranging for a service contract to ensure that your machines don't fail again.

Long-Term Goals

These goals require time and planning.

They usually take a year or more to achieve.

Example: Planning your expenses so you can buy new machinery

Why Create a Business Plan

A business plan is a tool for understanding how your business is put together. It can be used to monitor progress, foster accountable and control the fate of the business. It usually offers a 3-5 year projection and outlines the plan that the company intends to follow to grow its revenues. A business plan is also a very important tool for getting the interest of key employees or future investors.

A business plan typically comprises of eight elements.

Elements of a Business Plan

Executive Summary

The executive summary follows the title page. The summary should clearly state your desires as the business owner in a short and businesslike way. It is an overview of your business and your plans. Ideally this should not be more than 1-2 pages.

Your Executive Summary should include:

- The Mission Statement: Explain what your business is all about.

  Example: Nike's Mission Statement

  Nike's mission statement is "To bring inspiration and innovation to every athlete in the world."
- Company Information: Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- Growth Highlights: Mention examples of company growth. Use graphs and charts where possible.
- Your Products/Services: Describe the products or services provided.
- Financial Information: Provide details on current bank and investors.
- Summarize future plans: Describe where you see your business in the future.

Business Description

The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- The ways in which your products and services meet these needs
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

Market Analysis

The market analysis section usually follows the business description. The aim of this section is to showcase your industry and market knowledge. This is also the section where you should lay down your research findings and conclusions.

Your Market Analysis should include:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market
- The amount of market share you want to capture
- Your pricing structure
- Your competitive analysis
- Any regulatory requirements

Organization & Management

This section should come immediately after the Market Analysis.

Your Organization & Management section should include:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people
- The incentives that you offer

Service or Product Line

The next section is the service or product line section. This is where you describe your service or product, and stress on their benefits to potential and current customers. Explain in detail why your product of choice will fulfill the needs of your target audience.

Your Service or Product Line section should include:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

Marketing & Sales

Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business.

Your Marketing section should include the following strategies:

- **Market penetration strategy**: This strategy focuses on selling your existing products or services in existing markets, in order to increase your market share.
- **Growth strategy**: This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term.
- **Channels of distribution strategy**: These can be wholesalers, retailers, distributers and even the internet.
- **Communication strategy**: These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, webpages, illustrations).

Your Sales section should include the following information:

- **A salesforce strategy**: This strategy focuses on increasing the revenue of the enterprise.
- **A breakdown of your sales activities**: This means detailing out how you intend to sell your products or services – will you sell it offline or online, how many units do you intend to sell, what price do you plan to sell each unit at, etc.

Funding Request

This section is specifically for those who require funding for their venture.

The Funding Request section should include the following information:

- How much funding you currently require.
- How much funding you will require over the next five years. This will depend on your long-term goals.
- The type of funding you want and how you plan to use it. Do you want funding that can be used only for a specific purpose, or funding that can be used for any kind of requirement?
- Strategic plans for the future. This will involve detailing out your long-term plans – what these plans are and how much money you will require to put these plans in motions.
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records, right from the moment your enterprise started, to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement which lists your company's revenues, expenses and net income for the year, your tax returns (usually for the last three years) and your cash flow budget which lists the cash that came in, the cash that went out and states whether you had a cash deficit (negative balance) or surplus (positive balance) at the end of each month.

Financial Planning

Before you begin building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

Step 1: Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.

Step 2: Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers and any other financial records.

Step 3: Calculate your net worth. This means figure out what you own (assets like your house, bank accounts, investments etc.), and then subtract what you owe (liabilities like loans, pending credit card amounts etc.) the amount you are left with is your net worth.

Step 4: Make a spending plan. This means write down in detail where your money will come from, and where it will go.

Step 5: Build an emergency fund. A good emergency fund contains enough money to cover at least 6 months' worth of expenses.

Step 6: Set up your insurance. Insurance provides long term financial security and protects you against risk.

Risk Management

As an entrepreneur, it is critical that you evaluate the risks involved with the type of enterprise that you want to start, before you begin setting up your company. Once you have identified potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar business and find out about their risks and how they were minimized.
- Evaluate current market trends and find out if similar products or services that launched a while ago are still being well received by the public.
- Think about whether you really have the required expertise to launch your product or service.
- Examine your finances and see if you have enough income to start your enterprise.
- Be aware of the current state of the economy, consider how the economy may change over time, and think about how your enterprise will be affected by any of those changes.
- Create a detailed business plan.

Tips

- Ensure all the important elements are covered in your plan.
- Scrutinize the numbers thoroughly.
- Be concise and realistic.
- Be conservative in your approach and your projections.
- Use visuals like charts, graphs and images wherever possible.

12.6.5 Procedure and Formalities for Bank Finance: The Need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for startups. With numerous funding options available, entrepreneurs need to take a close look at which funding methodology works best for them. In India, banks are one of the largest funders of startups, offering funding to thousands of startups every year.

What Information Should Entrepreneurs Offer Banks for Funding?

When approaching a bank, entrepreneurs must have a clear idea of the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behaviour of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials, financial situation and guarantees or collaterals that can be offered.

General Credentials

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- Letter(s) of Introduction: This letter should be written by a respected business person who knows you well enough to introduce you. The aim of this letter is set across your achievements and vouch for your character and integrity.
- Your Profile: This is basically your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements.
- Business Brochure: A business brochure typically provides information on company products, clients, how long the business has been running for etc.
- Bank and Other References: If you have an account with another bank, providing those bank references is a good idea.
- Proof of Company Ownership or Registration: In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required.

Financial Situation

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

Guarantees or Collaterals

Usually banks will refuse to grant you a loan without security. You can offer assets which the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc. are also considered to be security for loans.

The Lending Criteria of Banks

Your request for funding will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate shareholders' funds
- Adequate security
- Experience in business
- Good reputation

The Procedure

To apply for funding the following procedure will need to be followed.

1. Submit your application form and all other required documents to the bank.
2. The bank will carefully assess your credit worthiness and assign ratings by analyzing your business information with respect to parameters like management, financial, operational and industry information as well as past loan performance.
3. The bank will make a decision as to whether or not you should be given funding.

Tips 

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

12.6.6 Enterprise Management - An Overview: How to Manage Your Enterprise

To manage your enterprise effectively you need to look at many different aspects, right from managing the day-to-day activities to figuring out how to handle a large scale event. Let's take a look at some simple steps to manage your company effectively.

Step 1: Use your leadership skills and ask for advice when required.

Let's take the example of Ramu, an entrepreneur who has recently started his own enterprise. Ramu has good leadership skills – he is honest, communicates well, knows how to delegate work etc. These leadership skills definitely help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations that he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing to mentor him. Another solution is for Ramu to use his networking skills so that he can connect with managers from other organizations, who can give him advice on how to handle such situations.

Step 2: Divide your work amongst others – realize that you cannot handle everything yourself.

Even the most skilled manager in the world will not be able to manage every single task that an enterprise will demand of him. A smart manager needs to realize that the key to managing his enterprise lies in his dividing all his work between those around him. This is known as delegation. However, delegating is not enough. A manager must delegate effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To delegate effectively, you can start by making two lists. One list should contain the things that you know you need to handle yourself. The second list should contain the things that you are confident can be given to others to manage and handle. Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others. The problem with this is, the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the tasks to. This will leave you with very little time to finish your own work.

Step 3: Hire the right people for the job.

Hiring the right people goes a long way towards effectively managing your enterprise. To hire the best people suited for the job, you need to be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will be handling your money. Create a detailed job description for each role that you want filled and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you

put down every expectation that you have from your employees. All these actions will help ensure that the right people are approached for running your enterprise.

Step 4: Motivate your employees and train them well.

Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being motivated involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also motivate them by telling them about how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility that will increase their motivation.

Besides motivating your people, your employees should be constantly trained in new practices and technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

Step 5: Train your people to handle your customers well.

Your employees need to be well-versed in the art of customer management. This means they should be able to understand what their customers want, and also know how to satisfy their needs. For them to truly understand this, they need to see how you deal effectively with customers. This is called leading by example. Show them how you sincerely listen to your clients and the efforts that you put into understand their requirements. Let them listen to the type of questions that you ask your clients so they understand which questions are appropriate.

Step 6: Market your enterprise effectively.

Use all your skills and the skills of your employees to market your enterprise in an effective manner. You can also hire a marketing agency if you feel you need help in this area.

Now that you know what is required to run your enterprise effectively, put these steps into play, and see how much easier managing your enterprise becomes!

Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

12.6.7. 20 Questions to Ask Yourself Before Considering Entrepreneurship

1. Why am I starting a business?
2. What problem am I solving?
3. Have others attempted to solve this problem before? Did they succeed or fail?
4. Do I have a mentor[1] or industry expert that I can call on?
5. Who is my ideal customer[2]?
6. Who are my competitors[3]?
7. What makes my business idea different from other business ideas?
8. What are the key features of my product or service?
9. Have I done a SWOT[4] analysis?
10. What is the size of the market that will buy my product or service?
11. What would it take to build a minimum viable product[5] to test the market?
12. How much money do I need to get started?
13. Will I need to get a loan?
14. How soon will my products or services be available?
15. When will I break even[6] or make a profit?
16. How will those who invest in my idea make a profit?
17. How should I set up the legal structure[7] of my business?
18. What taxes[8] will I need to pay?
19. What kind of insurance[9] will I need?
20. Have I reached out to potential customers for feedback?

Tips

- It is very important to validate your business ideas before you invest significant time, money and resources into it.
- The more questions you ask yourself, the more prepared you will be to handle to highs and lows of starting an enterprise.

Footnotes:

1. A mentor is a trusted and experienced person who is willing to coach and guide you.
2. A customer is someone who buys goods and/or services.
3. A competitor is a person or company that sells products and/or services similar to your products and/or services.
4. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. To conduct a SWOT analysis of your company, you need to list down all the strengths and weaknesses of your company, the opportunities that are present for your company and the threats faced by your company.

5. A minimum viable product is a product that has the fewest possible features, that can be sold to customers, for the purpose of getting feedback from customers on the product.
6. A company is said to break even when the profits of the company are equal to the costs.
7. The legal structure could be a sole proprietorship, partnership or limited liability partnership.
8. There are two types of taxes – direct taxes payable by a person or a company, or indirect taxes charged on goods and/or services.
9. There are two types of insurance – life insurance and general insurance. Life insurance covers human life while general insurance covers assets like animals, goods, cars etc.

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