

Skilling is building a better India.

If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi Prime Minister of India



## Acknowledgements -

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CEO

#### - About this Book

Construction industry is the second largest employer in India. As one of the leading avenues for employment in the country, the role played by this industry in the economic development of India is pivotal. However, despite its vast potential, the construction Industry faces a key challenge of shortage of skilled manpower. This hampers the progress of the industry, as the quality of constructed structure is poor and most projects failed to get completed within timelines.

There is a vast difference between the required skill and available skills of workers in the industry today. To reduce the skill gap, appropriate skilling of workforce needs to be carried out. This will not only empower the worker but also benefit the construction industry in terms of quality and productivity.

This Participant book is developed to impart training for the skill and knowledge required to work as a Bar bending & still fixer in construction industry. It is designed based on Bar bending & still fixer Qualification Pack under the National skill qualification framework. It comprises of the following NOS/topics.

- Read and understand routine drawings I sketches and Bar Bending Schedule
- Use hand and power tools for cutting and bending of reinforcement
- Prepare, fabricate, place and fix reinforcement for RCC structures
- Work effectively in a team to deliver desired results at the workplace
- Plan and organize work to meet expected outcomes
- · Work according to personal health, safety and environment protocol at construction site

This book is designed conSidering the lower educational background of the construction worker. Therefore, special efforts have been made to explain the concept required for the job mostly through photos and illustrations.

## **Symbols Used**



Key Learning Outcomes



Steps



Time



Tips



Note



Unit Objectives

## **Table of Contents**

S.No	Modules and Units	Page No
1.	Introduction	1
	Unit 1.1 – Overview of construction industry in India	3
	Unit 1.2 – Major occupation in construction sector	7
	Unit 1.3 – Bar bender & steel fixer as a job role	11
	Unit 1.4 – Training for bar bender & steel fixer	16
2.	Generic mathematical skills	19
	Unit 2.1 – Unit conversion and measurement	21
	Unit 2.2 – Basic geometrical shapes and its properties	25
	Unit 2.3 – Pythagoras theorem and its application	33
3.	Personal health, safety and environment protocol followed at construction site (CON/N9001)	37
	Unit 3.1 – Importance of safety	39
	Unit 3.2 – Types of hazards at site	42
	Unit 3.3 – Personal health & safety for Bar bending & steel fixer	56
	Unit 3.4 – Accidents and incident reporting	64
	Unit 3.5 – Commonly used techniques for safe disposal to waste on site	66
4.	Bar bending drawings and schedule (CON/N0204)	71
	Unit 4.1 – Bar bending drawings	73
	Unit 4.2 – Bar bending schedule (BBS)	101
5.	Bar cutting and bending (CON/N0205)	107
	Unit 5.1 – Reinforcement bars	109
	Unit 5.2 – Tools and machines required	114
	Unit 5.3 – Measuring instruments required	128
	Unit 5.4 – Reinforcement cutting and bending	130
	Unit 5.5 – Storage and handling of bars	135
6.	Prepare, place and fix reinforcement for RCC structures (CON/N0206)	139



#### **Participant Handbook**

	Unit 6.1- Tying and fixing RCC structural elements	141
	Unit 6.2 - Insertion sequence of RCC elements	158
	Unit 6.3 - Prefabricated cage	174
<b>7.</b>	Basics of concreting and shuttering works (CON/N0206)	179
	Unit 7.1- Shuttering works	181
	Unit 7.2 - Concreting works	191
8.	Working Effectively in a Team (CON/8001)	197
	Unit 8.1- Effective communication with others	199
	Unit 8.2 - Working in a team	207
9.	Plan and Organise Work to Meet Expected Outcomes (CON/8002)	211
	Unit 9.1- Prioritise work activities to achieve desired results	213
	Unit 9.2 - Organising resources	217
10.	Employability & Entrepreneurship Skills	221
	Unit 10.1- Personal Strengths & Value Systems	225
	Unit 10.2 - Digital Literacy: A Recap	244
	Unit 10.3 - Money Matters	250
	Unit 10.4- Preparing for Employment & Self Employment	261
	Unit 10.5 - Understanding Entrepreneurship	270
	Unit 10.6 - Preparing to be an Entrepreneur	292
	Glossary required for Bar bending & still fixer job roles	313











## 1. Introduction

Unit 1.1 – Overview of construction industry in India

Unit 1.2 – Major occupation in construction sector

Unit 1.3 – Bar bending & steel fixing as an occupation

Unit 1.4 – Training for bar bending and steel fixing



## **Key Learning Outcomes**



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

- 1. Understand broadly the construction activities in India;
- 2. Compare real estate & infrastructure and rural construction;
- 3. Know about major occupations in construction sector;
- 4. Understand few job roles under each occupation;
- 5. Know about role and duties of a bar bender and steel fixer;
- 6. Know about personal and professional attributes under the bar bender and steel fixer occupation;
- 7. List OP and NOS details of bar bender and steel fixer programme;
- 8. Know about career path as a bar bender and steel fixer;
- 9. Understand the purpose of training;
- 10. Know about mode and duration of training program; and
- 11. Understand the benefits of training skill card & certification.

## **UNIT 1.1: Overview Of Construction Industry In India**

## Unit Objectives | ◎



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

- 1. Understand broadly the construction activities in India; and
- Differentiate between real estate & infrastructure and rural construction.

#### 1.1.1 Introduction -

Construction industry helps in developing and enhancing economic sector as well as aids in the development of the country. Construction activity plays an important role in country's infrastructure and industrial development. Construction refers to building of different structures such as hospitals, schools, townships, offices, and houses and other buildings (including water supply, sewerage, and drainage), highways, roads, ports, railway tracks, dams etc. If we are covering a wide spectrum, construction activity becomes the basic input for socio-economic development.

Construction is the second largest employment generating sector in India after agriculture. This sector comprises of small, medium and large industries or companies which are involved in different types of projects. This creates a diverse requirement of work force.

Construction industry is broadly divided into two major sub-sectors:-

- 1. Real estate & infrastructure construction; and
- 2. Rural construction

#### 1.1.1.1 Real Estate & Infrastructure Construction

Urban area inhabitants form only 30% of Indian population. As per estimates by the government of India, development in urban India is expected to rise at an astonishing rate of 38%. Indian Urban Infrastructure and Services, which was constructed during the British rule, is inapt at satisfactory dealing with such requirement. It is estimated that a venture of INR (Rs.) 43, 55,000 crores is required for urban development over the next 20 years. Out of this, the requirement for construction of urban roads is almost 45%.

As per the Twelfth Five Year Plan Article, private sources are expected to invest 48% based on several national policy initiatives introduced to reinstate investor confidence. To hasten up the growth of urban development across the country, the government has taken various actions and has assigned almost INR (Rs.) 13,400 crores under Jawaharlal Nehru National Urban Renewal

Mission (JNNURM). For Small and Medium towns the government has also initiated the Urban Infrastructure Development Scheme with an investment of INR (Rs.) 6,700 crores to cater to structural needs of small towns and cities.



Fig 1.1.1: Township construction

Fig 1.1.2: Bridge construction

#### Government initiatives under urban development

With the help of 'City Challenge Competition', Smart Cities, under 100 Smart Cities Mission, will be selected
through the linking of financing and capability to attain multidimensional objectives of city infrastructure
growth like passable and potable water source, hygiene and solid waste management, well-organized
and efficient public transportation, affordable housing for the deprived, power distribution, strong IT
connectivity, especially e-governance and inhabitants contribution, care and security of people, health
and education and maintainable city environment.





Fig 1.1.3: Building construction site

Fig 1.1.4: Industrial Building construction site

 SBM (Swachh Bharat Mission) aims at the elimination of open defecation, scientific Municipal Solid Waste Management, eradication of manual scavenging, to effect behavioral change regarding healthy sanitation practices. Expansion of heritage cities aimed at the enhancement in quality of life with a singular focus on hygiene, refuge, tourism, heritage renewal and livelihoods retaining the city ethos.

#### 1.1.1.2 Rural Construction -

**Rural Construction:** This sub-sector aims at the constructional requirements of rural India and cor.struction of rural households, warehouses, village roads etc.





Fig 1.1.5: Rural roads

Fig 1.1.6: Rural house

**Rural infrastructure** is not only an important element of rural expansion but also a significant element in ensuring any sustainable poverty reduction plan. The appropriate expansion of infrastructure in rural zones improves the rural financial system and quality of life. It encourages augmented agricultural profits, satisfactory employment etc.

#### Government initiatives under rural development

- Bharat Nirman initiative aims at rural connectivity. More than 6 lakh villages are located across varied topographical lands in India e.g. coastal, mountainous, back water areas, tribal pockets, plain, hilly, deserts, swamps etc.
- The main focus of Bharat Nirman is construction of rural housing. The government has to develop houses for the rural society.
- · Pradhan Mantri Gram Sadak Yojna (PMGSY) provides one and only road connectivity to each village.
- Technology handover from workroom to land by disseminating of information on Cost Effective and Environment Friendly (CEEF) buildings in rural and urban zones.
- Enhancement and upgradation of skills of the workforce.
- Creation of a pool of qualified rural/urban construction workforce for construction of various services.

## **Exercise**



- 1. Pradhan Mantri Gram Sadak Yojna (PMGSY) addresses need of
  - A. Urban construction development
  - B. Rural construction development
  - C. Urban slum dwellers and homeless
  - D. All of the above

2.	Write full form of JNNURM
3.	List the initiatives taken by government for rural infrastructure development

- 4. Rajiv Awas Yojana (RAY) is for
  - A. Provide houses for rural BPL population
  - B. Provide houses for slum dwellers
  - C. Provide housing finance for rural poor
  - D. Provide housing finance to those not covered by Indira Awas Yojana
- 5. Which of the following are the major programmes operated for rural infrastructure development by the Ministry of Rural Development?
  - A. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)
  - B. National Rural Livelihood Mission (NRLM)
  - C. Indira Awas Yojana (IAY)
  - D. National Social Assistance Programme (NSAP)

### **UNIT 1.2: Major Occupation In Construction Sector**

## Unit Objectives



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

- 1. Know about major occupations in construction sector; and
- 2. Understand few job roles under each occupation.

## 1.2.1 Major Occupations In Construction Sector -

Following occupations are very common in most of the construction projects:

1. Masonry: Masonry involves the work to use mortar for fixing constituents like brick, stone, block or others to build walls and buildings.

#### The basic objectives of masonry work include:

- Building of structure by laying material such as bricks, blocks, tiles and other construction materials, and bonding them by mortar
- Constructing, altering, repairing and maintaining walls, sidewalks, street curbs, floors, sink counters, partitions, manholes, and other related structures or surfaces.
- Carry out structural finishes like tiling, grit wash, cement wash, POP, plastering, stone cladding etc. on finished masonry surface to impart an aesthetic appeal to the finished structure.



Fig 1.2.1: Brick work



Fig 1.2.2: Plastering work

Few job roles under masonry occupation are:-

- Helper Mason
- ii. Assistant Mason

- iii. General Mason;
- iv. Mason Tiling;
- v. Mason Concrete;
- vi. Mason marble, granite & stone; and
- vii. Mason Special Finishing
- viii. Mason Form Finishes & Special concrete.
- 2. Bar Bending and Fixing: Bar bending and Steel Fixing involves works like shifting, straightening, cutting, bending and placing of the reinforcement bars in order to assemble cage/mesh according to given working structural drawing or specifications.

Few job roles under bar bending occupation are:-



Fig 1.2.1: Brick work

Fig 1.2.4: Bar bending

- i. Helper bar bender & steel fixer;
- ii. Assistant bar bender & steel fixer;
- iii. Bar bender & steel fixer; and
- iv. Reinforcement fitter.
- **3. Shuttering Carpentry:** Shuttering Carpentry involves the use of timber boards or metal plates to create a temporary structure for casting of concrete. These timber boards or metal plates are placed, positioned and fixed using rods and stakes known as false work. After



Fig 1.2.5: Conventional form work

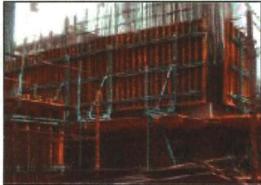


Fig 1.2.6: System formwark

fixing these boards or plates in designated area, concrete can be dispensed within these fixed molds. These molds contain the concrete in its place till it sets, thereby generating a hard, smooth structure.

Few job roles under shuttering carpentry occupation are:-

- i. Helper shuttering carpenter;
- ii. Assistant shuttering carpenter;
- iii. Shuttering carpenter system; and
- iv. Shuttering carpenter conventional.
- **4. Scaffolding:** Scaffolding works involve creation of temporary support structure for providing support to workman during construction process.

It is use as a platform to carryon construction works and keep tools and materials.

Few job roles under scaffolding occupation are:-

- i. Assistant scaffold system; and;
- ii. Assistant scaffold conventional.;
- iii. Scaffolder-System
- iv. Scaffolder-Conventional.
- v. Chargehand Scaffolding -System
- vi. Foreman Scaffolding



Fig 1.2.7: Scaffolding work

- **5. Fabrication:** Fabrication is the process of construction of an item from raw materials using cutting, bending assembling process, instead of creating it from ready to use components or parts. It involves various tasks
  - such as cutting & heating, welding followed by final assembly of welded, sand-blasted, primed, painted components. Key part of this process is also the initial phases of grinding, drilling and surface preparation, essential for fabrication.

Few job roles under Fabrication occupation are:-

- i. Grinder Construction;
- ii. Construction fitter;
- iii. Construction welder;
- iv. Fabricator; and
- v. Plasma cutter.



Fig 1.2.8: Welding

**6. Rigging:** Rigging is a set of actions used for moving, lifting and transferring objects by scheming and fitting various components and equipment. A team of riggers designs and installs the lifting or rolling equipment needed to raise, roll, slide or lift objects such as with a crane.

Few job roles under rigging occupation are:-

- i. Khalasi;
- ii. Rigger structural erection;
- iii. Rigger precast erection; and
- iv. Rigger piling.



Fig 1.2.9: Rigging work at site

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1.	List down major occupations of construction industry.
2.	Scaffolding work is related to fixing of timber boards for temporary structure. True or false
3.	A mason general repair and maintain walls by using mortar and cement. True or false
4.	A bar bender only cuts and bends the rebars. True or false
5.	is the process of construction of an item from raw materials using cutting, bending assembling process.

#### **UNIT 1.3: Bar Bender And Steel Fixer As A Job Role**

## Unit Objectives ♥



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

- 1. Know role and duties of a bar bender and steel fixer;
- 2. Know personal and professional attributes under the bar bender and steel fixer occupation;
- 3. List OP and NOS details of bar bender and steel fixer programme; and
- 4. Know about career path as a bar bender and steel fixer

#### 1.3.1 Role Of A Bar Bender And Steel Fixer

A bar bender and steel fixer works on the reinforcement steel used for reinforced cement concrete works. They perform a wide range of activities relating to straightening, cutting, bending and placing reinforcement as per working structural drawings. The role of bar bender and steel fixer is further detailed as:



- A bar bender & fixer should be able to identify types of bars, read drawings
- Fig 1.3.1: Bar bending and steel fixing work
- & prepare schedule, fabricate using hand and power tools, store, transport and fix reinforcement in position in formwork in readiness for concrete pears.
- He has to deal with his assistants; his colleagues and tradesmen with related skills and has to coordinate with the activities of the other tradesmen also.
- He should have proficiency in use of different tools, knowledge of commonly used construction material, ability to identify quality of rebars.

#### 1.3.2 Duties Of-A Bar Bender And Steel Fixer

At any construction site, the bar bender and steel fixer plays a vital role as follows:

- 1. Read drawing & bar bending schedules;
- 2. Identifies the types and grades of reinforcement to be used;

- Calculate from drawings and BBS, the cut length, bending diameters etc.;
- Estimate the quantity of material used in day to day work;
- Correlates the sequence of reinforcement placing with fixing of inserts, sleeves, conduits and anchor;
- 6. Identifies and uses correct ties on structure;
- 7. Estimate the time requirement of a particular job;
- 8. Aims to minimize wastage;
- Cut & bend reinforcement exactly as per requirement of the bar bending schedules;
- Ensure that bent bars of the same type are bundled together and tagged for identification;
- Ties and fastens bundled bars to ensure they remain in position whether horizontal or vertical;
- 12. Ensuring stacking & storing of steel tidily and safely;
- 13. Execute the bar bending works as per standard procedure;
- 14. Work safely at all times using ladders, scaffolds, and safety belts;
- 15. Ensure housekeeping at workplace.



Fig 1.3.2: Bar bending work



Fig 1.3.3: Bar bending work

## 1.3.3 Personal Attributes For Job Role Of Bar Bending

A bar bender and steel fixer in addition to his skills should also possess certain soft skills and personal attributes such as:

- Ability to work in a well-organized and accurate manner;
- Awareness of safety issues ,especially when working at heights;
- Ability to work as a part of team;
- A good level of fitness;
- Awareness of personal hygiene;
- Hard working and reliable;
- · Courteous and dedicated;
- Good Communication Skills.

## 1.3.4 QP And NOS Details For Bar Bender And Steel Fixer

Qualification Pack (QP) comprises of a group of National Occupational Standards (NOS's) which describes the desired outcomes in order to successfully perform the function and the knowledge required for the same.

The National Skills Qualifications Framework (NSQF) provides the description of professional and functional knowledge and skill along with the responsibility that a person must display for any given competency level. The NSQF describes a total of 10 levels, level 1 being entry level the least complex and level 10 being the top most level.

This programme is based on qualification pack called bar bender & steel fixer. The qualification pack for bar bender & steel fixer is placed at level 4 in the National skill qualification framework or NSQF. The qualification pack code for bar bender & steel fixer is CON/Q0203. Under bar bender & steel fixer QP there are six no of NOS which detail the functions to be performed at work site by Bar bender.

NOS CODE	Major Function/Task	
CON/N0204 Read and understand routine drawings / sketches and Bar Bending Schedule		
CON/N020S	Use hand and power tools for cutting and bending of reinforcement	
CON/N0206	Prepare, fabricate, place and fix reinforcement for RCC structures	
CON/N800l Work effectively in a team to deliver desired results at the workplace		
CON/N8002 Plan and organize work to meet expected outcomes		
CON/N900I	Work according to personal health, safety and environment protocol at construction site	

## 1.3.5 Bar Bending & Steel Fixer Details Of Education& Qualification

#### Career map for bar bender and steel fixer

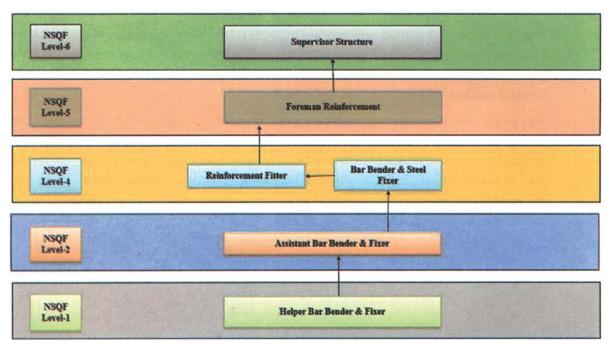


Fig 1.3.3: Career progression for bar bending and steel fixing occupation

Education and experience requirements for a current recommended job role			
Job role	Education	Experience	
Bar bender and steel fixer	Preferably 5th standard	2 years site experience as a certified assistant bar bender & steel fixer	

Education and experience requirements for further career progression		
Job role	Education	Experience
Reinforcement fitter	Preferably 8th standard	2 years site experience as a certified bar bender & steel fixer

These are preferred and issued for the benefit of the students but not mandatory.

- Ex	kercise 🔣 ———————————————————————————————————
1.	List the duties of bar bender at construction site.
2.	List all NOS codes and details of bar bender and steel fixer QP.
3.	A mason general repair and maintain walls by using mortar and cement. True or false
4.	Minimum industry experience requirement for a level 4 bar bender and steel fixer job role is
5.	Draw the career growth map of a bar bender and steel fixer

## **UNIT 1.4: Training For Bar Bender And Steel Fixer**

## - Unit Objectives 🏻 🎯



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

- 1. Understand the purpose of training;
- 2. Know about mode and duration of training program; and
- 3. Understand the benefits of training skill card & certification.

## 1.4.1 Mode And Duration Of Training

The training program is based upon the qualification pack of bar bender and steel fixer. This is a NSQF level 4 qualification in the occupation of bar bending and steel fixing in the sub sector of real estate and infrastructure construction. This implies that after passing this course you shall be a qualified NSQF level 4 workman who has the required skill set to find work in the real estate and infrastructure projects. The mode of the training is:

- Classroom sessions
- Practical sessions



Fig 1.4.1: Classroom session

Fig 1.4.2: Practical session

The standard duration of this training program is 400 Hrs. of which 320 Hrs is devote to hands on training and the rest 80 Hrs on theoretical learning.

## 1.4.2 Benefits After Training

The training program will enable an individual to:-

Measure and mark on rebars

- Cut, bend and place rebars at required location
- Plan and organize work and work effectively in a team;
- Understand the safety practices; and
- Communicate effectively.

#### 1.4.3 Skill Card And Certification

After successful completion of training and passing the assessment you will be issued a certificate. This will get you an employment as a bar bender and steel fixer in construction companies or independently. This certificate will help you to get job and earn better wages than an untrained person.

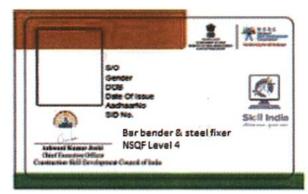




Fig 1.4.4: Skill card



Fig 1.4.5: Skill certificate

Exe	ercise 🔳 ———————————————————————————————————
1.	List the benefits of skill card and training certificate.
2.	What is the full form of PMKVY?
3.	What are the benefits of this training course?
4.	List down your expectations from this training.









# 2. Generic Mathematical Skills

Unit 2.1 – Unit conversion and measurement

Unit 2.2 – Basic geometrical shapes and its properties

Unit 2.3 – Pythagoras theorem and its application



## Key learning Outcomes 🙄



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

- 1. Explain brief on metric system of measurement;
- 2. Explain briefly inch system of measurement;
- 3. Perform basic arithmetic calculations;
- 4. Know about basic geometrical shapes;
- Calculate area, volume and perimeter of different shapes;
- Know about Pythagoras theorem;
- 7. Perform basic calculations using Pythagoras theorem.
- Calculate problems using trigonometric functions.

## **UNIT 3.1: Basics of Pharmaceutical Science and Chemistry**

## Unit Objectives | ◎



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

- 1. Explain brief on metric system of measurement; and
- 2. Understanding inch system of measurement.

## 2.1.1 Different System of Measurement -

#### There are two systems of measurement used are:

- Metric MKS system; and
- Inch/FPS system.

Metric System		Inch System	
1.	It is based on meter as the standard unit of measurement.	1.	It is based on the foot as the standard unit of measurement.
2.	A meter contains 10 equal parts called decimeter.	2.	A foot is divided into 12 similar parts called inches.
3.	Decimeter is divided into 10 parts called centimeters and centimeter	3.	Inch system does not have decimal based benefit of the Metric System.
	is divided into 10 parts called millimeters.	4.	Fractions of foot cannot be written as decimal inches.
4.	Most usually used system of measurement in the world.	5.	Forexample, in the metric system 5 millimeters = 0.5 centimeters = 0.05 decimeters = 0.005 meters. But 5 inches = 0.416667 which is feet = 0.138889 yards and so on.

Table 2.1.1: Metric system and Inch system

#### 2.1.2 Metric system

This system is much easier. It consists of a series of basic units corresponding to mass, distance and volume and utilizes prefixes to denote multiples of unit being used.

Basic Unit	Measuring
Metre/meter	Distance
Kilogram	Mass
Litre/liter	Volume

Table 2.1.2: Basic metric system units

#### The prefixes and what they mean are:

Prefix	Symbol	Number	
Giga-	G	1,000,000,000	
Mega-	М	1,000,000	
Kilo-	K	1,000	
Hecto	н	100	
Deca-	D	10	
(none)		1	
Deci-	D	0.1	
Centi-	С	0.01	
Milli-	М	0.001	

Table 2.1.3: Metric system units prefix and their meaning

## - 2.1.3 Inch system -

#### Length or distance

Lengths and distances are measured in inches, feet, yards and miles:

12 inches = 1 foot

3 feet = 1 yard

1760 yards = 1 mile

## 2.1.4 Conversion between metric and inch systems -

There are various approximations used for conversion of units. For example:

- 1 meter is approximately equal to 1 yard.
- 1 mile is approximately equal to 1.5 KM's and a KM is approximately equal to 2/3 of a mile.
- 2 pounds (Ib) make up IKg.)

Weight, mass, length, volume, and temperature used for measurement conversions.

Metric to Impe	Metric to Imperial Conversion chart			
Convert	То	Multiply by:		
Kilometers	Miles	0.62		
Kilometers	Feet	3280.8		
Meters	Feet	3.28		
Centimeters	Inches	0.39		
Millimeters	Inches	0.039		
Liters	Quarts	1.057		
Liters	Gallons	0.264		
Milliliters	Ounces	0.0338		
Celsius	Fahrenheit	(Temperature (C) + 32)*9/5		
Kilogram	Tons	0.0011		
Kilogram	Pounds	2.2046		
Grams	Ounces	0.035		
Grams	Pounds	0.002205		
Milligrams	Ounces	0.000035		

Table 2.1.4: Conversion from metric to imperial system

Imperial to Metric Conversion chart			
Convert To Multiply by:			
Fahrenheit	Celsius (Temperature (F) - 32)*5/9		
Inches Meters 0.0254			

Inches	Centimeters	2.54
Inches	Millimeters	25.40
Feet	Meters	0.30
Yards	Meters	0.91
Yards	Kilometers	0.00091
Miles	Kilometers	1.61
Tons	Kilograms	907.18

Table 2.1.5: Conversion from imperial to metric system

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1.	What is	the	standard	unit for	length?
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- a) Meter
- b) Inch
- c) Kilometer d) Centimeter
- 2. The Metric System is also called as:
  - a) CGS

- b) MKS system c) SI d) None of the above

## **UNIT 2.2:** Basic geometrical shapes and its properties

## Unit Objectives



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

- 1. Perform basic arithmetic calculations;
- 2. Know about basic geometrical shapes; and
- 3. Calculate area, volume and perimeter of different shapes.

#### 2.1.1 Basic mathematical calculations

The same thing can be explain by the use of basic mathematics:

Symbol	Words Used	
+	Addition, Plus, Sum, Increase	
-	Subtraction, Minus, Less, Decrease, Difference, Deduct	
×	Multiplication, Product	
÷	Division, Quotient	

Table 2.2.1: Basic mathematical symbols and formations

#### Addition

... To make a new total by bringing two or more numbers (or things) together.

"Addends" are the numbers which are to be added together:

$$8 + 3 = 11$$

#### **Subtraction**

... involves taking one digit away from another digit.

$$8 - 3 = 5$$

#### Multiplication

.... (In its simplest form) repeated addition.

Below we see 3+3+3 (three 3s) make 9:

$$6 \times 3 = 18$$

We can also multiply by fractions or a decimal, which is also repetitive addition:

Example:  $3.5 \times 5 = 17.5$ 

which is 3.5 lots of 5, or 5 lots of 3.5

#### **Division**

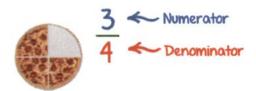
... is splitting into equivalent parts or groups. Division is the result of "fair sharing".

It has its own singular words to remember.

For example, take the simple query of dividing 22 by 5. By 2 left over and the answer is 4. See the important words:

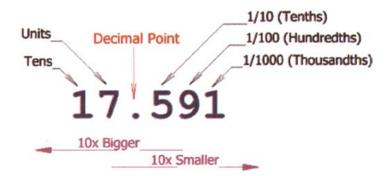
Which is the same as:

**Fraction** is part of a whole.



It is written with the lowest portion (the denominator) telling how many parts the whole is separated into, and the top portion (the numerator) telling how many portion we have.

A Decimal Point contain in a Decimal Number.



Part of per 100 is called a Percentage. The symbol is %

Example: 25 per 100 is called 25% (25% of this pattern is green)

Average (Mean) is the total divided by the sum.

We analyze the average by adding up all the figure and then split by how many figure.

Example: What is the average of 9,2, 12 and 57

Add up all the values: 9 + 2 + 12 + 5 = 28

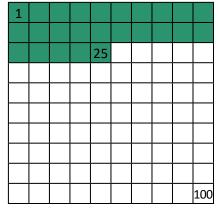


Fig 2.2.1: Part percentage

How many values are required to divide (there are four of them): 28 + 4 = 7

50 the average is 7

## 2.2.2 Area, volume and perimeter of geometrical shapes

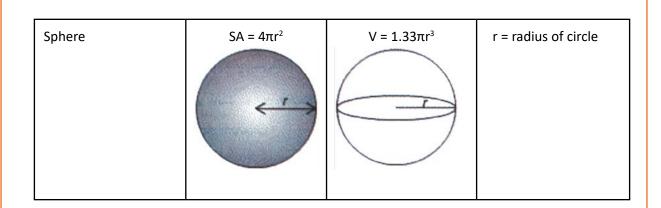
	Perimeter	cm	m	ft.
Units	Area	cm <sup>2</sup>	m²	5q. ft
	Volume	cm <sup>3</sup>	m³	Cub. ft

Table 2.2.2: Area, volume and perimeter units

Polygon/ Circle	Perimeter(P)	Area(A)	Sides
Triangle	P = b + c + d	A = 1/2ab	a=altitude b=base c,d=sides
Trapezoid	P = b1 + b2 + c + d  b <sub>2</sub> c  b <sub>1</sub>	Area = 1/2a(b1 + b2)  b <sub>2</sub> b <sub>1</sub>	a= altitude bl,b2=base c,d=sides
Parallelogram	P= 2b + 2c	Area = b x h	a= altitude b=base c= side
Rhombus	P = 4s	A= a x s	a= altitude s=side

Rectangle	P = 21 + 2w	A = I × w	
	w	W	1=length w=width
Square	P = 4s	$A = s^2$	s= side length
Regular polygon  pentagon has five sides hexagon has six sides heptagon has seven sides octagon has eight sides nonagon has nine sides decagon has ten sides	F = ns  S  P=5s  P=6s  P=7s  P=8s  P=9s  P=10s	A= 0.5a × n × s  S  A = 2.5 a × s  A = 3.0 a × s  A = 3.5 a × s  A = 4.0 a × s  A = 4.5 a × s  A = 5.0 a × s	a = length s = side length n = No. of sides n = 5 n = 6 n = 7 n = 8 n = 9 n = 10

Circle	$C = Circumference$ $C = \pi'd$ $d$	A = Area $A = \pi r^2$ $r$	r=radius d= Diameter
Geometric Shape	Surface Area	Volume	Sides
Cube	A = 2B + Ph $SA = 2(S^2) + (4s)s = 6s^2$	Volume = Bh Volume = S³	s = side length B = area of the base P = perimeter of the base h = height
Cylinder	SA = $2(\pi r^2) + (2\pi r)h$	$V = Bh$ $V = \pi r^2 h$	B = area of base P = perimeter of base r = radius of circle h = height
Cone	$SA = \pi r^2 + \pi rs$	V = 0.33 Bh V = 0.33 πr2h	B = area of base r = radius of circle h = height s=slant height



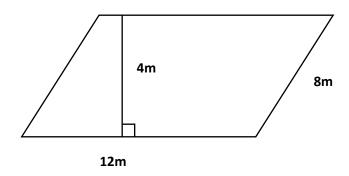
# **Exercise**



- 1.  $6 \times 111 3 \times 111$  are equal to:
  - a) 222
- b) 333
- c) 444
- d) 555

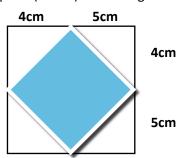
- 2. 15% of R560 15% of R500 is:
  - a) R9
- b) R12
- c) R11
- d) RiO
- 3. A rectangular field is 40m long and 30m wide. Perimeter of rectangular field is
  - a) 200m<sup>2</sup>
- b) 180m<sup>2</sup>
- c) 160m<sup>2</sup>
- d) 140m<sup>2</sup>

4. What is the area of the parallelogram?



- a) 38m<sup>2</sup>
- b) 42m<sup>2</sup>
- c) 48m<sup>2</sup>
- d) 54m<sup>2</sup>

- 5. By converting 80.2km² into hectare, answer will be
  - a) 0.08020ha
- b) 8020ha
- c) 802ha
- d) 0.802ha
- 6. The area of the shaded square (in cm<sup>2</sup>) in the diagram below is:



- a) 20
- b) 36
- c) 41
- d) 61

# **UNIT 2.3: Pythagoras theorem and its application**

# Unit Objectives 6



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

- 1. Know about Pythagoras theorem; and
- 2. Perform basic calculations using Pythagoras theorem.

# 2.3.1 Pythagoras theorem

According to Pythagoras's theorem, the total of the squares of two edges of a right triangle is equivalent to the square of the hypotenuse. If one side of right triangle is a, the other part is band hypotenuse is given by c, then as per pythagoras's theorem a2 + b2 = c2

The length of one part of a right triangle can be calculated if the length of the other two parts of triangle is known.

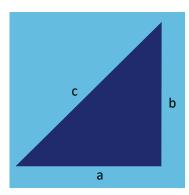


Fig 2.3.1: Right angle triangle

# 2.3.2 Applications of Pythagoras theorem

## Finding the length of the Hypotenuse

a2+b2=c2 Pythagorean Theorem

52+122=c2 Substitute known values for a and b

(25+144)=c2 Simplify

169=c2 Combine like terms

\I169=\Ic2

13 = c

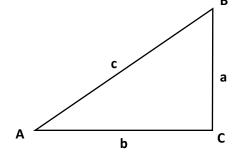


Fig 2.3.2: Hypotenuse length measurement

Pythagoras Theorem is used to find the length of the hypotenuse of a right triangle, if the length of the other two sides of a right triangle is known. In other words, if we know the lengths of a and b, we can find c.

## Finding side Length

To find the side length of a right triangle's if we are given measurements for the hypotenuse and the one side we can also use the Pythagorean Theorem. Consider the right triangle below:

$a^2+b^2=c^2$	Pythagorean Theorem
$a^2+6^2=7^2$	Substitute known values for b a
a <sup>2</sup> +36=49	Simplify
a <sup>2</sup> +36-36=49-36	Isolate the term
a <sup>2</sup> =13	
a=V13	Take square root of both side
a=3.61	√13 is approximately 3.61

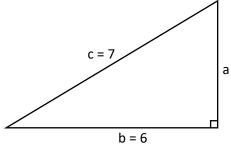


Fig 2.3.3: Right angle triangle leg measurement

# Solving for the Length of the Diagonal

Find the length of the diagonal of a rectangle that is 8 centimeters (cm) long and 5 cm wide. Let x be the unknown length of the diagonal:

So

$$x^2 = 5^2 + 8^2$$
  
= 25 + 64  
= 89  
 $x = \sqrt{89}$ 

Thus

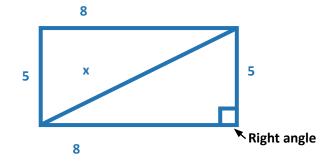


Fig 2.3.4: Right angle triangle

# 2.3.3 3-4-5 Method —

## **Method for Squaring Corners**

3-4-5 method is used as a method for squaring corners.

## Introduction to 3-4-5 rule

The 3-4-5 rule is based on the Pythagorean Theorem. The sum of the squares of the lengths of the legs of a right triangle ("A and "B" in the triangle shown below) is equal to the square of the length of the hypotenuse ("(").

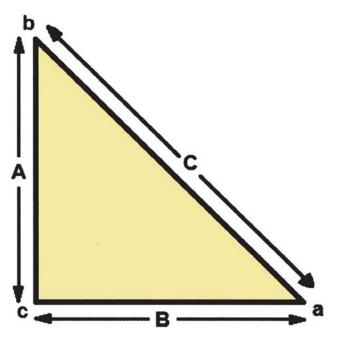


Fig 2.3.5: Right angle triangle

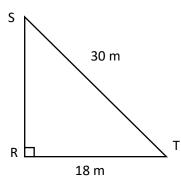
Application of 3-4-5 rule to layout a wall.

- On one side of corner measure 3'-0' and make a mark
- On the op-posite side of the corner measure 4'-0' and make a mark
- Measure between the two marks when this distance equals 5'-0' the two walls are 90 degrees to each other (i.e. square).
- For larger layouts any multiple of the 3-4-5 rule can be used (i.e. 6-8-10 etc.)

# **Exercise**



1. Triangle RST is a right triangle. The length of RS is:



- a) 26m
- b) 24m
- c) 22m
- d) 21m
- 2. Lengths of sides of triangle are x cm,(x + 1) cm and (x + 2) cm, value of x when triangle is right angled is
  - A. 5cm
  - B. 4cm
  - C. 3cm
  - D. 6cm
- 3. A triangle whose sides are 15cm, 36cm, and 39cm is
  - A. Right angled
  - B. Equilateral
  - C. isosceles
  - D. none of above
- 4. The Pythagorean Theorem is represented with the equation:
  - A. one half of the product of base times height
  - B. squared plus be squared equals c squared
  - C. times b equals c
  - D. plus b equals c









# 3. Personal health, safety & environment protocol followed at construction site

Unit 3.1 – Importance of safety at construction site

Unit 3.2 – General safety at site

Unit 3.3 – Safety Relevant to bar bending & steel fixing Job Role

Unit 3.4 – Accidents and incident reporting

Unit 3.5 – Housekeeping and waste disposal on site



# **Key Learning Outcomes**



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

- 1. Learn about health and safety requirements in industry;
- 2. Know about essential elements for safety;
- 3. Learn about good safety work practices;
- 4. List the types of hazards involved in construction sites;
- 5. Follow safety measures and actions to be taken under emergency situation;
- 6. Describe the uses of fire extinguishers;
- 7. Explain how to classify fire and fire extinguishers;
- 8. Explain how safety drills are conducted;
- 9. Know about safe working practices;
- 10. Know about PPE;
- 11. Know about safety precautions while working at heights;
- 12. Know about accident and incident reporting;
- 13. Know about housekeeping practices; and
- 14. Know about waste management

# **UNIT 3.1: Importance of safety at construction site**

# - Unit Objectives | ©



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

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

# 3.1.1 Safety in Construction site -

The health, safety and protection of employees, equipment and the environment are of serious concern in every industry of hazardous nature. The health and safety of employees is crucial since it affects both economic and social factors.

The nature of various types of accidents is shown by an iceberg of incidents (Fig 3.1.1).

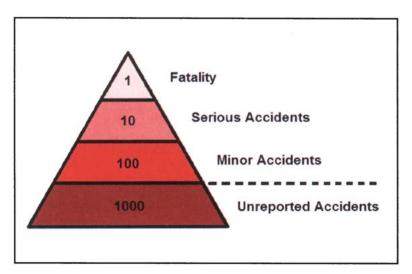


Fig 3.1.1: The iceberg of accidents

- Fatality: A disaster resulting in death.
- Serious accidents: An accident that causes someone to die or endure serious injuries.
- Minor accidents: An accident that causes minor injuries and pains in the body.
- Unreported accidents: An accident which is not reported to management or ignored.

# **3.1.2** Essential Elements Necessary for Safety

Essential elements which are necessary for implementation of safety culture are:

- Safety consciousness among the top management.
- Communication plan and a participatory way of working from the employees.
- Best practices in safety
- Safety organization structure, which is well defined by the management and well understood by everyone.
- Training programs

# **3.1.3 Good Safety Practices**

Good safety practices include the following:



Fig 3.1.2: Good safety practice

- Avoiding unsafe behavior and motivating others to follow safety measures;
- Take note of emergency exits, evacuation points and follow all emergency evacuation measures;
- Keep the site hygienic and maintain proper housekeeping at site;
- Participating in emergency safety drills, safety meetings and refresher safety training programs which include discussion on various investigated accidents;
- Wearing personal protective gears while working at construction site.

# **Exercise**



- 1. A hazard is....
  - A. The likelihood of a substance person, activity or process to cause harm.
  - B. The probability of a substance person, activity or process to cause harm.
  - C. The potential of a substance person, activity or process to cause harm.
  - D. The prospect of a substance person, activity or process to cause harm.
- 2. A risk is....
  - A. The ability of a substance person, activity or process to cause harm.
  - B. The likelihood of a substance person, activity or process to cause harm.
  - C. The potential of a substance person, activity or process to cause harm.
  - D. The prospect of a substance person, activity or process to cause harm.
- 3. Which of the following does not form part of an employer's common law duty to take care?
  - A. Safe work premises.
  - B. Competent fellow employees.
  - C. Reasonable salaries.
  - D. Safe work equipment.
- 4. The following is (are) physical hazard
  - A. Falls
  - B. Electricity
  - C. Inhalation
  - D. All of the above
- 5. Way of protecting individuals' well-being of health is classified as
  - A. safety
  - B. health
  - C. adverse situation
  - D. security

# **UNIT 3.2: General safety at site**

# - Unit Objectives | ©



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

- 1. List the types of hazards involved in construction sites;
- Discuss the safety control measures and actions to be taken under emergency situation;
- Describe the uses of fire extinguishers;
- 4. Explain how to classify fire and fire extinguishers; and
- Explain how safety drills are conducted.

# - 3.2.1 Hazard

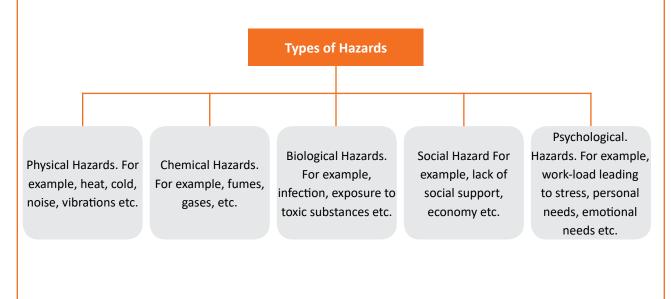
A hazard is something that has the potential to cause injury, disease or death at a workplace. A slippery floor could cause somebodies fall causing injury.

There are a number of aspects to the development of a safe workplace environment:

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

## **Types of Hazards**

Hazards for construction workers can be classified into:



## Occupational hazards at a construction site can be categorised into two types:

Occupational accidents: Accidents that take place due to lack of safety measures. These accidents may be fatal. Some of the occupational hazards at construction site are listed below:

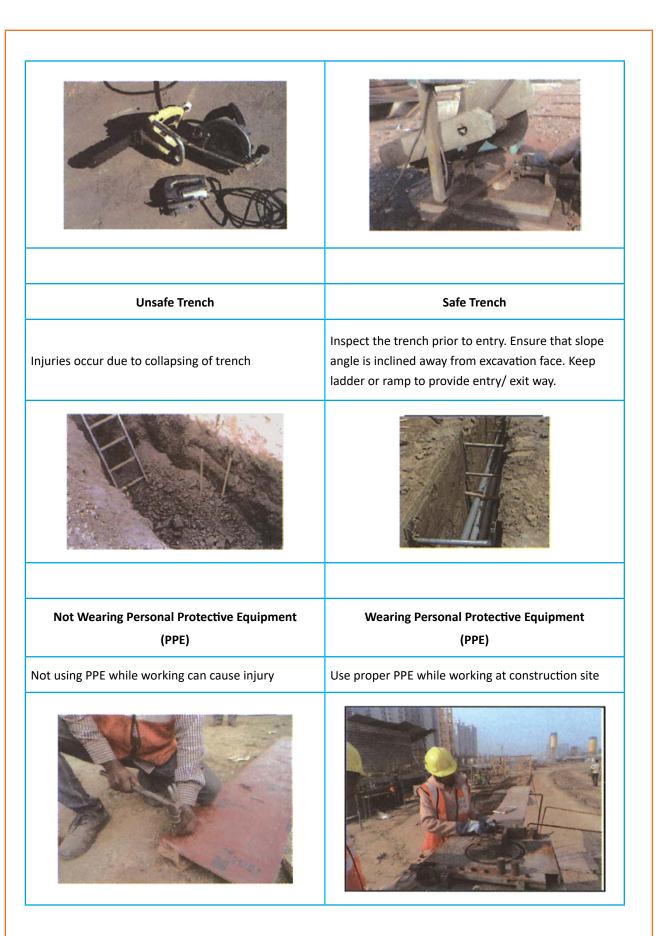
## For example:

- 1. Injury or cuts by tools and equipment
- 2. Slips and Falls by ladders or unsafe slippery workplace
- 3. Bad lighting arrangement at site
- 4. Lack of proper ventilation
- 5. Use of improper PPE
- 6. Use of improper tools and equipment
- 7. Unexpected atmospheric conditions
- 8. Falling from a height
- 9. Fire
- 10. Unsafe or damaged scaffold
- 11. Electric shock
- 12. Accident resulting from not wearing PPE
- 13. Bites from insects or poisonous snakes at site
- 14. Accidents involving heavy vehicles at site
- 15. Poor housekeeping
- 16. No overhead protection
- 17. No installation of safety net
- 18. Incorrect ways of waste disposal
- 19. Unsafe excavation site
- 20. Incorrect methods lifting, loading and transportation.

# 3.2.2 Hazards at construction site

## Some of the hazards at a construction site and their preventive measures:

Hazards at Construction site	Preventive Measures
Damaged Tools and Equipment	Safe Tools and Equipment
Injury or cuts by up maintained tools and aguinment	Ensure proper maintenance of tools and equipment
Injury or cuts by un maintained tools and equipment	and check for any defects



# Awareness to avoid Spillage & Slip Injury due to spillage Spillage on floor may cause slip, trip, fire and other Workers must avoid any unsafe act which may lead to spillage or cause an injury or accident thereoff accident, **Poor Lighting Arrangement** Illuminated workplace Dimly lit areas Keep workplace Illuminated and airy Falling from height **Wearing Safety Harness** Wear safety harness while working at height Not using safety harness may lead to fall from height

Fire Due to Unsafe Practices	Awareness to avoid Spillage & Slip
Exposure to damaged wires, electrical cords, may lead to fire hazard.	Replace worn out or damaged wires or cords promptly. Ensure that the extension cords and electrical devices are grounded.
Unsafe Scaffold or Ladder	Use of safe ladder/ scaffold
Unsafe ladder or scaffold mat be rusted, broken or may not have passed safety inspection. Use of such a ladder/scaffold may cause injury due to fall of man or material.	Always use the scaffold or ladder that has cleared safety inspection and is not damaged or rusted.
Electrical Shocks	Use Safety equipment





# Poor Housekeeping

Scattered tools and equipments on the floor, passages or stairways may lead to small accidents.

## **Good Housekeeping**

Arrange and store the material at proper place to avoid falls and trips.





## **Lack of Safety Measures**

Danger of object falling from height

## **Follow Safety Measures**

Use safety net as a protection aganist object falling from height





# 3.2.3 Common hazard signs



Fig 3.2.1: Common hazard signs

# 3.2.4 Dealing With Emergency Situations

Emergency safety measures helps us to minimise the suffering of the workers and economic losses that results due to emergencies.

Construction site needs emergency plans to be executed for the safety of the men and material. Special procedures are needed for emergencies such as injuries, explosion, natural calamities like flood and earthquake, fire outbreak, social unrest, poisoning, electrocution, chemical spills and release of radioactivity.

As a bar bender at a construction site, you may have to encounter emergency situation at any time.

Neither they should be ignored nor should you panic. In case of an emergency,

- stay calm;
- · do not panic;
- ensure people around you also stay calm
- Inform your immediate supervisor so that the victim receives first aid, or if you need to stay with the victim delegate someone to call your supervisor or call emergency services at site;

- Safeguard the area so that the further losses are in control like shut down equipment, divert workers, put the fire out, etc.
- Safeguard accident place, take care that workers are relieved. Ensure no life is in danger and prevent further damage.

If you are asked to report the case to your supervisor, you should provide detailed information about:

- day, date, time, location of the accident/emergency;
- name of the workers and their job titles (if you know them);
- what led to the accident/emergency;
- names of workers who witnessed the accident/emergency;
- conditions around the area where the aCcident/emergency took place;
- whether the victim(s) had worn PPE at the time of accident/emergency;
- injuries that occurred;
- first aid or any other treatment given to the victim(s);
- damage caused to the worker or the equipment that the worker was using.



Fig 3.2.2: Dealing with emergency situation

# **3.2.5** Classification of Fire and Fire Extinguishers

At a construction site, fire may be caused by:

- 1. heating of metal;
- 2. electrical heating or short circuits;
- 3. loose fires caused by welding or smoking;
- 4. ignition of combustible material;
- 5. chemical fires;
- 6. lack of proper housekeeping and/or accumulation of waste.

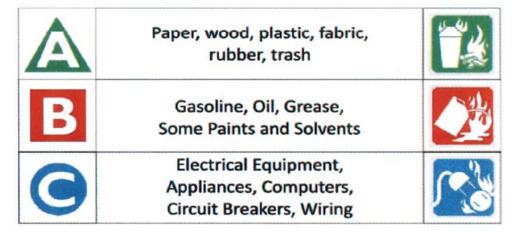
## **Tips to Deal with Fire**

- Keep the work area clean.
- Containers with remnants of flammable materials must be filled with water.
- Never wear inflammable material like nylon at work.
- Ensure there are no unattended cables or wires lying around the work area.
- Avoid using power tools near combustible materials.
- All time Keep an eye on sparks and metals falling off at all times.
- Immediately report about any emergency situation that may cause fire to your senior at work.

## In Case of Fire

- Douse the fire, if it is small, with a fire extinguisher.
- If the fire is big and growing, call the fire brigade.
- Move towards the fire exit. Take coworkers along.
- Ensure there is no panic in and around the area.
- All time Keep an eye on sparks and metals falling off at all times.
- Immediately report about any emergency situation that may cause fire to your senior at work.

## **Types of Fire**

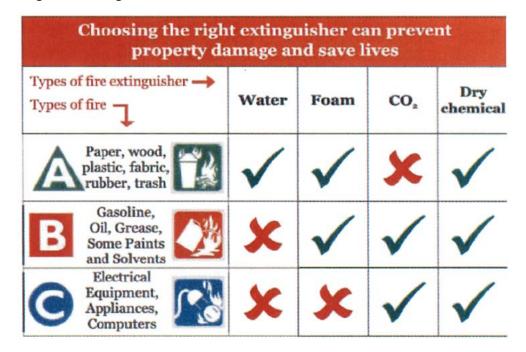


## **Types of Fire Extinguishers**



Fig 3.2.3: Types of fire extinguisher

## Using the Right Fire Extinguisher



# Method of Using a Fire Extinguisher



Fig 3.2.4: How to use fire extinguisher

# Precautions 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:  • General Fire :- Water & Co2 fire extinguishers  • Oil Fires: - Foam extinguishers  • Electrical Fires :- Co2 Fire extinguishers.	
4	Make sure supply is off from the mains in case of electrical fire.	
S	Cut the power from the main source instead of switching off electrical equipment.	
6	7 If fire seems to be going haywire call the fire brigade immediately.  Make sure that all the equipment related to fire fighting and water sprinklers have started.	
7		
8		
9	First priority should be to save people. Help others to safely get out of the floor	
10	The nearest hospital should be alerted regarding the fire outbreak so that they are prepared to treat serious burn injuries	

# 3.2.6 Tool Box talks and Safety Drills —

## Tool box talk

- Toolbox meetings are informal safety meeting conducted at construction site prior to commencement of work.
- Toolbox meetings are conducted for exchange of information regarding hazards/controls, incidents/ accidents, work processes and company procedures.
- Toolbox meetings need to be conducted for 10-15 minutes on regular basis.
- Toolbox meetings are shorter than safety meetings.
- The rate of occurrence of such meetings depends on the strength of the team & size and nature of hazardous activities at workplace.
- The nature of hazardous activity decides whether meeting is required daily or weekly/fortnightly.

## **Importance of Toolbox Talks**

- Helps in informing workers about company norms and changes in norms.
- Useful for finding out new hazards and reviewing the existing hazards.
- Useful for preparing/evaluating hazard controls.
- Useful for discussing/evaluating accident and incident data.
- Ensures effective communication between teams.
- Helps in preparing/analyzing work processes.

Safety drills are conducted at regular intervals at construction site to keep workmen aware of the emergency situations. Safety drills are situations where a fake emergency is announced. Workmen are asked to follow the emergency evacuation plan, prescribed by the organization. This helps in familiarizing workmen with emergency situation and act according to the plan. As part of the safety drill, workmen are expected to:



Fig 3.2.5: Toolbox Talks





Fig 3.2.6: Demonstration on fire fighting

- Raise the alarm by smashing the glass cover of the nearest break-glass alarm unit.
- Keep calm and ensure no one around panics.
- Turn off all electrical apparatus except lights.
- If possible, close doors around the fire area to stop it from spreading.
- Follow proper evacuation procedures. Leave building/site immediately.
- If it's dark and smoky, get down on your hands and knees and crawl to the nearest exit by counting the number of the door.
- If possible hold onto your nose with a wet towel or handkerchief;
- Be aware of the hot exit door and watch out for the thick smoke in the staircase;
- If the staircase is free from smoke, walk down by following the directional signs and handrails;
- Gather at the designated assembly point.

# **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. What is first aid?
  - a. Completing a primary survey
  - b. The first help given to the victim of an accident
  - c. Assessing a victim's vital signs
  - d. Treating a victim for shock



# **UNIT 3.3: Safety Relevant to Mason Tiling Job Role**

# Unit Objectives | <sup>©</sup>



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

- Know about safe working practices;
- Know about PPE; and
- 3. Know about safety precautions while working at heights.

# - 3.3.1 Safe Working Practices

Safe working practices should be adopted while working at construction site. This will avoid many hazards, which can lead to injuries, illness and even fitalities of workers.

## To prevent injury due to falling from height

- Use harness with safety line when working at height.
- Install and preserve perimeter protection.
- Floor openings should be labelled, covered and secured.
- Use the correct ladder for the task.
- Scaffold should be erected on firm and level ground.
- Walkways should be properly fixed and should be useable.
- Ensure that there is no obstruction or oil spills on the walkways.



Fig 3.3.1: Safe working practice

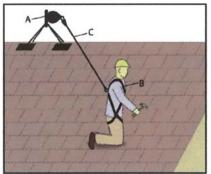


Fig 3.3.2: Safety working procedure at height





## To prevent injury due to collision/confinement

- Don't work in an area where you can get stuck between moving and stationary objects.
- It is advisable to wear high visibility clothes near equipment/ vehicles.

# · Mi

Fig 3.3.3: Preventing struck-by

## To Prevent Electrocutions

- Locate and identify utilities prior commencement of work.
- Maintain a safe distance from power lines and be aware about safe distance requirements.
- Only use those portable electric tools which are grounded or double insulated.
- Worn out, damaged or dilapidated electrical cords or cables should be swiftly changed.
- cables should be swiftly changed.Ensure all electrical tools and equipments are in safe

working conditions and are inspected periodically.



Fig 3.3.4: Preventing electrocution

- Always use protective systems designed for protection from contact with electrical energy.
- Always check and recheck to confirm that the ladders, scaffolds, equipments or materials are not kept within 10 feet of electrical power lines.

## Safe use of electrical tools and machinery

- Regular maintenance is required to keep tools in good conditions
- Appropriate tool should be used for the job.
- Inspect each tool for any damage before use and if found damaged, do not use it.
- Use tools as per the manufacturers' instructions.
- Correct Personal protective equipment should be used properly.
- Never carry a tool by the cord or hose.
- Cords and hoses should be kept away from heat, oil and sharp edges.
- Detach the tools when
  - 1. Not using
  - 2. Before servicing
  - 3. Changing accessories such as blades, bits and cutters.
- Secure work with clamps or a vise, resulting in freeing of hands to operate the tool.
- Avoid any accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.

- Take good care of the tools and keep them clean and sharp for best performance.
- Good balance and grip should be maintained while operating power tools.
- Wear proper kit for the task. Loose-fitting clothes, ties, or jewelry can be caught in moving parts.
- Eliminate all damaged portable electric tools from use and mark them: "Do Not Use."
- Safety guards must never be detached when a tool is being used.





Fig 3.3.5: Rebar cutting by power saw

Fig 3.3.6: Operating bar bending machine

## Safe use of tools while working with metal or sharp material

- Metal pieces should not be gripped tightly as light grip prevents cuts and bruises.
- Don't place your fingers along the raw edge.
- While using a cutting tool, cutter should be placed deep in the cut as you move along.
- Wear PPE for protection.
- Don't sweep the leftovers of metals in to the trash with your hands. A stiff cardboard or brush should be used to sweep the metal scrap.
- Don't rush with the things, take time and you will be less likely to get injured.
- Work with sufficient light.



Fig 3.3.7: Cutting metal sheet

# 3.3.2 Personal Protective Equipment (PPE)

Personal protective equipment are safety equipment which protect a person against hazards. Prior to using a personal protective equipment, it should be ensured that the equipment satisfies the working requirements, is as per required standards, conforms to body shape of user, is user-friendly, and is regularly maintained.

## **Personal Protective Equipment**

### **Ear Protection**

- Ensure selected ear protectors gives sufficient protection at least lowers the level of noise around you to below 85 db.
- Protectors should be selected based on the working environment considering how comfortable and hygenic they are.



Fig. 3.3.8: Workmen wearing PPE



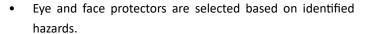
Fig. 3.3.9: Ear plugs

## **Fall protection**

- Workers should have knowledge of potential hazards aganist falling, how to protect themselves and what fall protection measures are required for safety.
- If you are using personal fall arrest systems, check it before wearing, ensure that all components are in good working condition and that the harness properly fits into your body.

## **Eye and Face Protection**

Safety glasses or face shields should be worn to avoid injury to the eye
during the various operation like cutting, grinding, nailing, working
with concrete and/or harmful chemicals and flying particles.



 Safety glasses or face shields should also be worn while working on energized electrical systems or when exposed to electrical hazards.

Fig. 3.3.10: Harness belt

## **Foot Protection**

- Construction workers should wear slip and punctureresistant shoes or boots.
- Safety footwear will provide protection of toes from falling objects and safety while working around heavy equipment.



Fig. 3.3.11: Eye shields and goggles



Fig. 3.3.12: Safety boots

## **Hand Protection**

- For hand protection wear gloves of appropriate size.
- Types of gloves used:
  - 1. Heavy-duty rubber gloves for concrete work
  - 2. Welding gloves while welding
  - 3. Insulated gloves and sleeves when exposed to electrical hazards

Fig. 3.3.13: Hand gloves

## **Head Protection**

- Helmets are used for head protection against falling objects, bumping head against objects and accidental head contact with electrical hazards.
- It is advisable to inspect helmets regularly for damage. In case the helmet is subjected to heavy blow or electrical shock, it should be immedieately replaced.

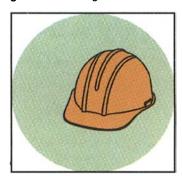


Fig. 3.3.14: Safety helment

# PPE and hazards protection measures associated with bar bending & steel fixer work

Protection	PPE	Hazard Protection Measure
Ear protection		Ear plugs are used to protect ear from damage due to noise generated at counstruction site
Eye protection		Safety goggles should be worn at all times to protect eyes against flying particles during cutting and grinding.

Fall protection	Use safety belt to avoid trip and fall while working at height
Foot protection	Protection of feet from injuries and strains due to fall of heavy materials, injuries from protruding objects at site.
Hand protection	Thick gloves provide protection to fingers and palms as well as make handling of equipment easy.
Head Protection	Helmet is used for head protection against falling objects, bumping of head against objects

Table 3.3.1: PPE for bar bending & steel fixer

# 3.3.3 Safe Way of Using Ladder -

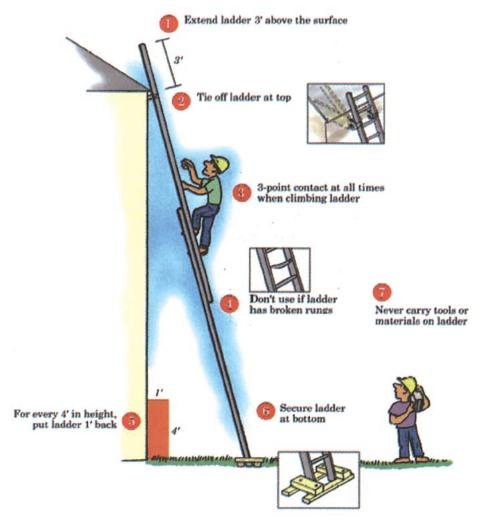


Fig. 3.3.15: Safe way of using ladder

# **Exercise**



- 1. Ear plugs are required to protect.....
- 2. You have been given a dust mask to protect against hazardous fumes. What should you do?
  - (a) Do the job but work quickly
  - (b) Do not start work until you have the correct Respiratory Protective Equipment
  - (c) Start work but take a break now and again
  - (d) Wear a second dust mask on top of the first one

3.	If you	drop your safety helmet from height on to a hard surface, you should:
	(a)	Repair any cracks then carryon wearing it
	(b)	Make sure there are no cracks then carryon wearing it
	(c)	Work without a safety helmet until you can get a new one
	(d)	Stop work and get a new safety helmet
Material handling consists of movement of material from		
4.	(a)	one machine to another
	(b)	one shop to another shop
	(c)	stores to shop
	(d)	all of the above
5.	If you	are working above height and over water, what Personal Protection Equipment would you require?
	(a)	A harness, lanyard and a life jacket
	(b)	A harness, goggles and a life jacket
	(c)	Goggles, life jacket and a safety net
	(d)	None of the above
6.	Whic	h is the cause of electric fire.
	(a)	Loose connection
	(b)	over loading the wires
	(c)	Electric short circuit
	(d)	All the above

# **UNIT 3.4: Reporting Accidents**

# - Unit Objectives 🏻 🎯



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

- 1. Know about accident and incident reporting; and
- Know about how to write reports properly.

# - 3.4.1 Reporting Accidents

Any accident whether minor or major needs to be reported immediately. All accidents must be documented even if there is minor injury or there is no sign of initial injury.

Reporting and documentation is necessary for the following reasons:

- Reporting helps in rectifying the situation and helps in the prevention offuture occurrences.
- It helps in claiming compensation/approval incase injury causes long term absence from work or leads to death of a person.
- Any accident resulting in a serious injury or death of a worker must be reported for legal purposes.

As a personal responsibility one should 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 as per the organizational procedures.

Concerned reporting authority for reporting the accidents in sequence:



- For minor injuries or any accident first inform the supervisor.
- The supervisor inform the health and safety inspector.
- For fatal accidents report to health and safety inspector or senior management as per organizational procedures and policies.

## Immediately report to your supervisor If:

- Tools / machines are in unsafe condition.
- Machines are not working properly.
- PPE are not available.
- An employee is not using PPE.
- If you find that someone is operating machine in an incorrect manner.
- Tools and tackles are not stored appropriately.
- Electrical fittings are not properly connected and insulated.
- Hazardous materials are not kept at designated place with proper marking.

Unsafe working practices by others should not effects your safety and productivity and vice versa

# – Exercise 📃 ———



None of these

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 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.	

# **UNIT 3.5: Housekeeping and waste disposal on site**

# - Unit Objectives 🏻 🎯



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

- 1. Know about housekeeping practices; and
- 2. Know about waste management.

# 3.5.1 housekeeping Practices

Workplaces hazards can be reduced by effective housekeeping, thus helping in safe and proper completion of a job. Poor housekeeping result's in frequent accidents.

Housekeeping doesn't mean only cleanliness. Housekeeping includes keeping work areas tidy and organized; keeping floors/walkway tidy to avoid accident; safe disposal of waste materials (paper, cardboard) and prevention of fire hazards.

Housekeeping is a continuous process and requires participation of everyone at site. Good housekeeping prevents accidents and illnesses from occurring while working at construction site.

# 3.5.2 Purpose of Workplace Housekeeping

Proper housekeeping is essential for avoiding accidents measurely follwing types of accidents by proper housekeeping:

- Injury due to falling objects.
- Tripping over loose objects/debris on stairs, floor and walkways.
- Slipping on wet, greasy floor.
- Cutting or tearing of skin due to protruding nails



Fig 3.5.1: Housekeeping

# 3.5.3 Elements of an Effective house Keeping

**Dust and Dirt Removal** 

Use proper exhaust ventilation systems for removal of dust/dirt from workplace.

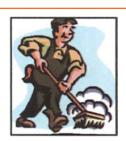


Fig 3.5.1: Dirt cleaning

Wet floor before sweeping.

## **Uses of Aisles and Stairways**

- Ensure and encourage people to use stairways
- Shortcut through hazardous areas to be avoided.

#### **Spill Control**

Ensure machines and equipment are cleaned regularly and maintained periodcially. Place drip pans and guards in places where oil spiils can occur. Ensure spill is cleaned right away.



Fig 3.5.3: Spill cleaning

## **Tools and Equipment**

Tools and equipments should be placed in the tool room, tool rack, and yard or on the bench appropritaley. Tools should be held with appropriate fixtures on marked locations, should be labeled to ensure organized arrangement. Placing and storing of tools at the designated place is very important.



Fig 3.5.4: Tool storage

## **Waste Disposal**

Good housekeeping requires regular collection of waste, grading and sorting of scrap. Segregation of recyclable materials from waste

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



Fig 3.5.5: Waste management

## Storage

Provide at least one meter of clear space for storing materials from the sprinkler heads.

Materials should be stored away from fire equipment, stairs, aisles, exits, emergency showers, or first aid stations. Clear markings should be provided in storage areas.



Fig 3.5.6: Material storage

## 3.5.4 Housekeeping at Site

- Clear gangways, stairways, passageways and access ways such that their is no obstraction in movement.
- Safely secure loose material.
- Pay special attention not to scatter tools, hoses, extension cords, materials, or debris to avoid tripping at workplace.
- Tools, materials, and equipment should be secured safely to avoid displacement which may cause accidents.



Fig 3.5.7: Housekeeping at site

- Provide access ways inside and outside building, storage yards and other places. Always clear the debris
  and scrap.
- Detach or hammer in or curve over any protruding nails on floorboards, scrap boards, planks and timbers.

## 3.5.5 Safe Disposal of Waste

Construction waste includes building materials such as nails, bricks, mortar, cables wires, insulation, wood and concrete. It also includes materials like debris, tree stumps, and rubble.

Construction waste may contain materials that are hazardous or harmful to environment, health and safety of the workers such as lead, asbestos etc. For example, when wires are burned in open it releases fumes that are toxic in nature. A toxic substance means any chemical or mixture that may be harmful to human health if inhaled, swallowed, or absorbed by skin.



Fig 3.5.8: Construction waste

In order to avoid damage to health, safety and environment, construction waste material should be reduced, reused and recycled. Materials that cannot be used should be disposed and managed in a right manner.

Bar bending & steel fixer should inform the supervisor about the waste accumulated at the site to seek guidance for appropriate ways of reuse, recycle and disposal.

#### For example,

- Debris, rubble, concrete can be recycled or used for landfills
- Concrete, mortar, bricks can be recycled for construction work.



Fig 3.5.9: Segregation of construction waste

1. Packaging waste, wood can be reused or recycled.

Construction waste can be classified into the following types:

- 1. Wood: Plywood or sawdust
- 2. Masonry: brick, concrete, mortar
- 3. Plastic: plumbing pipes, PVC, plastic sheets
- 4. Cardboard: Cardboard packaging material
- 5. Electrical: wires, cables and other material
- 6. Other such as Paper, fibreglass etc.

This waste needs to be disposed of in a suitable environmental friendly way.



Fig 3.5.10: Disposal of construction waste 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. Which is not a benefit of housekeeping?
  - (a) Reduce the waste of searching
  - (b) Reduced set-up times
  - (c) Increased productivity
  - (d) Improved machine dependability
- 5. The most serious environmental effect posed by hazardous wastes is
  - (a) air pollution.
  - (b) contamination of groundwater.
  - (c) increased use of land for landfills.
  - (d) destruction of habitat.
- 6. In a health and safety context, a hazard is:
  - (a) Anything that could result in a psychological injury.
  - (b) Anything with the potential to result in an injury or illness.
  - (c) The likelihood of someone being injured in the workplace.
  - (d) Anything that could result in a physical injury.









# 4. Bar Bending Drawings And Schedule

Unit 4.1 – Bar bending drawings

Unit 4.2 – Bar bending schedule (BBS)



# - Key learning Outcomes 👸



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

- 1. Discuss about reinforcement drawings;
- 2. Discuss about bar bending schedule (BB5);
- 3. Interpret the information provided in BB5; and
- 4. Interpret the information provided in reinforcement drawings.

# **UNIT 4.1: Reinforcement Drawings**

# Unit Objectives | ©



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

- 1. Discuss about reinforcement drawings; and
- 2. Know about how to read the drawings.

## **4.1.1 Reinforcement Drawings**

Construction drawings: A construction drawing is a pictorial2D representation of the various details of the structure that is being constructed. It provides many vital details required for execution of construction works. A construction drawing consists of the following parts:

- 1. **Elevation**: this drawing shows how the structure looks in the real life.
- 2. Plan: shows the location of various structural elements and their dimensions
- 3. Sections: at critical locations sections are cut in order to show the complicate details or details that cannot be shown in plan or elevation.

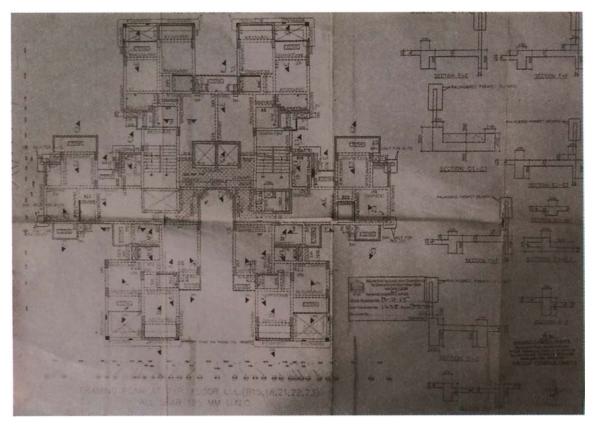


Fig 4.1.1: Illustration O/ Construction drawings used in sites

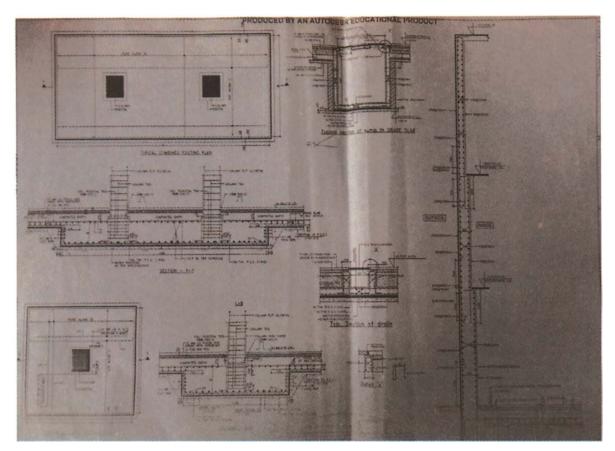


Fig 4.1.1: Illustration of Construction drawings used in sites

## **Reinforcement drawings:**

Reinforcement drawing is a specific type of construction drawing that shows detailing of the reinforcement, their shape, size & placing patterns.

The following details are mentioned in the reinforcement drawings:

- type of reinforcing steel to be used
- diameter and length of reinforcement
- spacing of different type of reinforcement
- bar mark and number of the reinforcement bars;
- shape and position of the reinforcement bars;
- distance between the bars
- overlap length at joints;
- reinforcement cover.

## 2.1.4 Conversion between metric and inch systems

Reinforcement drawings serve various purposes to different people. e.g. for a designer they act as a convenient way of demonstrating the required specifications while the same serves as a guide and reference for a site engineer.

In a similar way, drawings serve the following purpose for a bar bender and steel fixer:

- 1. For identifying the location and position of work
- 2. For identifying the dimensions of the cage to be prepared
- 3. For identifying the material requirements, thereby helping in material waste reduction
- 4. To understand the reinforcement requirements in terms of spacing number, weight etc.

## **4.1.3 Understanding Reinforcement Drawings**

The drawing shows the reinforcement cage for a two way slab of (4500x460x5460 mm). The depth of the slab is 150 mm with a clear cover of 20 mm. Additionally Torsion reinforcement of 0 is provided at all the corners to prevent uplift of slab due to bending moment. Further following details are to be understood from the drawing.

## **Explanation of drawing:**

1. 6 - # 16:  $\emptyset$  6 bars of 16 mm dia are to be placed at the top and bottom layers in both directions at each other

Function: 6 bars to be placed in 1030mm. c/c distance= 1030/6 = 170 mm.

2. 8  $\emptyset$  @180 c/c: 8 mm dia bars are to be placed at c/c distance of 180 mm then no. of bars along longer direction = 4000/180 + 1 = 24 nos.

No. of bars in shorter direction = 5000/180 + 1 = 29 nos.

- 3. **Bar diameter:** Bar diameter is the rebar required of given diameter.
- 4. Width of wall: In the figure, 230 mm shows the width of wall.
- 5. Total span length of bottom bar: In the figure,

```
length of longer bar = 5000 + 2x230 - 2x20 = 5420 \text{ mm}
```

length of shorter bar = 4000 + 2x230 - 2x20 = 4420 mm

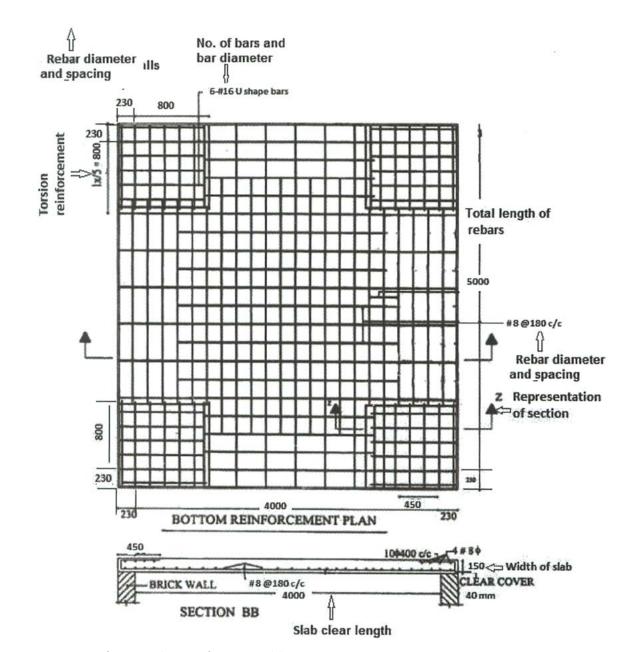


Fig 4.1.2: Reinforcement drawing of a two way slab

Indication	Example		
Numerical bar mark (if available - not available in the above image)	3		
Number of bars	6		
Bar diameter, in millimeters	#16 or (2)16		
Spacing, in millimeters	180		
Position in the component or construction part (if available)	Т		
Shape code of reinforcement bar (if available)	13		
Indication for the example: 3-6 #16—180—T—13			

Table 4.1.1: Marking explanation on reinforcement drawing

## 4.1.4 Cover To Reinforcement

Cover to reinforcement is required to protect the rebar from corrosion and to provide resistance against fire. The thickness of cover depends on environmental conditions and type of structural member. Then you need to know how much cover to provide to reinforcement.

This will be required while calculating the length of the bar.

Length of the bar will be (Total Length of the span - cover on both the sides).

• For shear stirrups, nominal cover is 30 mm for moderate exposure conditions and 20 mm for mild exposure conditions.

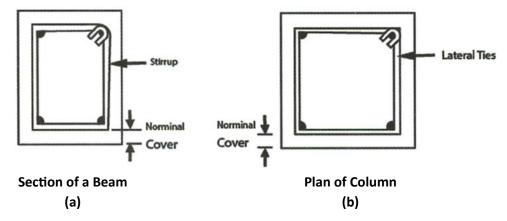


Fig 4.1.3: Reinforcement cover

 Nominal cover to ties and helical reinforcement for column must not be less than 40 mm and nor less than the longitudinal bar diameter. • Minimum cover for footings is 50 mm.

Nominal cover to meet durability requirements							
Exposure Nominal concrete cover in mm not less than							
Mild	20						
Moderate	30						
Severe	45						
Very severe	50						
Extreme	75						

Table 4.1.2: Nominal cover values

## Standard hooks and bends

The anchorage is usually given in the form of hooks and bends. Hooks are usually given for plain bars in tension.

As shown standard hooks and bends always be conventional to the specifications:

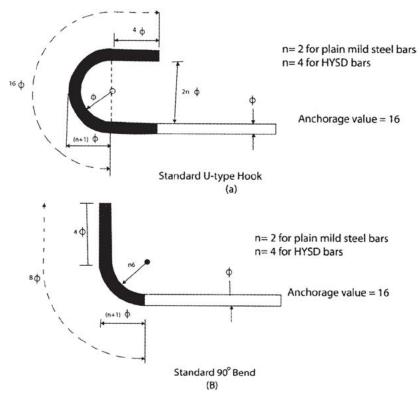


Fig 4.1.4: Standard hooks

## **Calculation for length of bars**

Important points need to remember for calculating length of bars:

- 1. Covers may be assumed as given below:
  - a) Beam/slabs: Assuming mild exposure conditions
    - i. In beams, clear cover for stirrups is 20 mm.
    - ii. At the end of each bar, clear cover is 20 mm.
    - iii. For main bars parallel to shorter span, clear cover is 20 mm.

#### b) Columns and footings

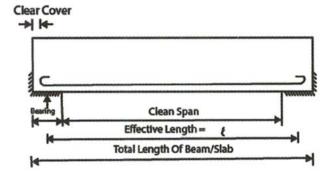
- i. For lateral ties/spiral reinforcement, clear cover is 40 mm.
- ii. For footings, clear cover is 50 mm.
- 2. Development length of bars in tension depends on grade of concrete and grade of steel. If nothing is given, assume that bar is made of M20 concrete and Fe415 steel.
- 3. If nothing is given, assume deformed bars are used.
- 4. If mild steel bars are given, assume hook is at the end of the main bar and no hook is at the anchor bar.
- 5. Main bars in beam/slabs/footings are assumed to have anchorage ahead of center of support
  - = Half bearing clear cover

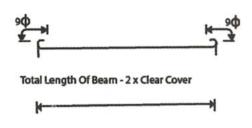
Calculation for beams and slabs

a) Straight bars

When mild steel bars are used:

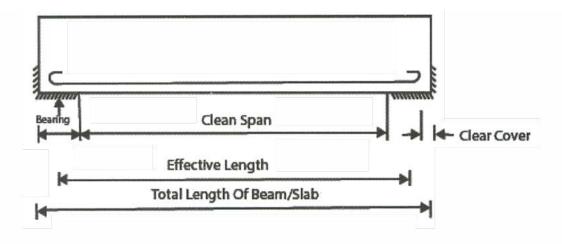
Length of bar = Total length of beam/slab - 2xCover + 2x9 Ø





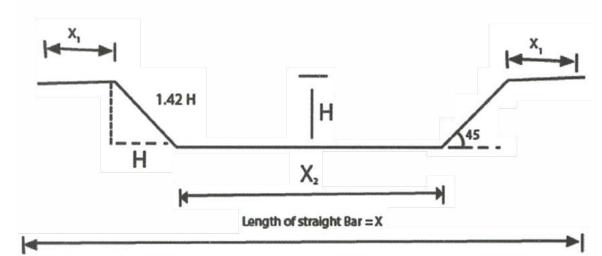
When deformed bars are used:

Length of bar = Total length of beam/slab - 2xCover



## b) Bent up bars

Length of bent up bar = Length of straight bar + 2 x 0.42 H



$$X_1 = \frac{1}{7} + \frac{\text{One Bearing}}{2} - \text{Clear cover} - H$$

$$X_1 = \frac{x-2H}{2}$$

$$X_2 = x - 2 (x_1 + H)$$

For beams:  $H = D - 2 \times Clear + 2 \times Clear$ 

For slabs:  $H = D - 2 \times Clear + Cover - Dia. of bent-up bar$ 

c) Stirrups for beams

Length of bar for one stirrup = 2(A + E) + 16xdia. of bar for stirrups

A = D - 2XClear cover - 2xdia. Of bar for stirrup

E = b - 2XClear cover - 2xdia. Of bar for stirrup

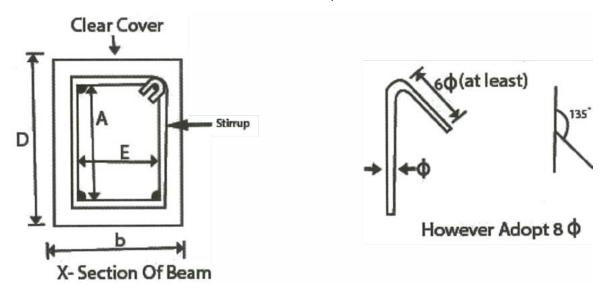


Fig 4.1.5: Stirrups

## Symbols for drawing conventions of concrete reinforcements

Symbols and abbreviations use in RCC drawing are:

- 1. Symbols relating to Cross-Sectional Shape and Size of Reinforcement:
  - a)  $\emptyset$  for plain round bar or diameter of plain round bar;
  - b) for plain, square bar or side of plain square bar
  - c) # for deformed bar

## 2. Symbols relating Shape of the Bar along its Lengths

Alt	Alternate bar				
Bt	Bent bar				
В	Bottom bar				
Min	Minimum				
Max	Maximum				
St	Straight bar				
Stp	Straight bar				
Ct	Column tie				
Т	Top bar				

**Table 4.1.3:** Symbols relating to bar shape

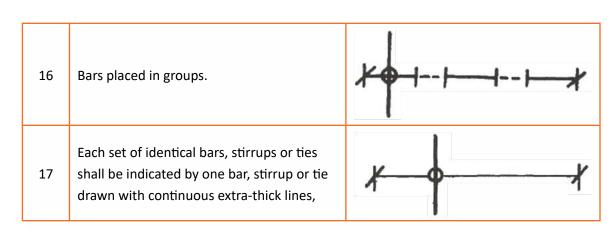
## 3. Symbols Relating to Various Structural Members

3m or B	Beams				
CVI	Column(s)				
Fg	Footing(s)				
GR	Girders				
JT	Joint(s)				
LB	Lintel beam(s)				
Stp	stirrup				
Sb or S	Slab(s)				
WL	Longitudinal Wall				

**Table 4.1.4:** Symbols relating to structural members

## Representation and drawing conventions of concrete reinforcements

No.	Description	Representation
1	Concrete line (thin)	
2	Unexposed concrete or masonry wall line (thin)	
3	Reinforcement (thick)	
4	Reinforcement in a different layer (thick).	
5	Section of a reinforcing bar	•
6	Centre line	
7	Dimension line	<b>+</b>
8	Concrete beam framing into column which extends through floor	=======================================
9	Bar shown bent at right angle to the paper	
10	Bar with hooks	
11	Bar with 90° bends	
12	Level mark in elevation	+
13	Level mark in plan	<del>-</del>
14	All the types of stirrups or ties	
15	Two-way reinforcement shall be shown in section.	$\leftarrow$



**Table 4.1.5:** Representation and drawing conventions of con crete reinforcements

# **4.1.5 Computations Made From Layout** -

Consider a beam of clear length of 4m, 300mm wide by 450mm depth. It consists of 2-12 diameter bars at top, and 2-16 diameter and 1-12 diameter bars at the bottom. Diameter of stirrup is 8mm spaced at 180mm center to center. Clear cover to reinforcement provided is 40mm.

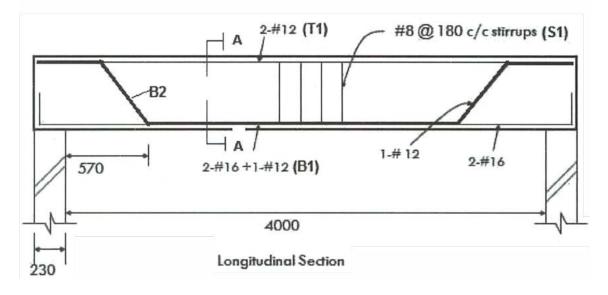


Fig 4.1.6: RCC Beam Reinforcement Details

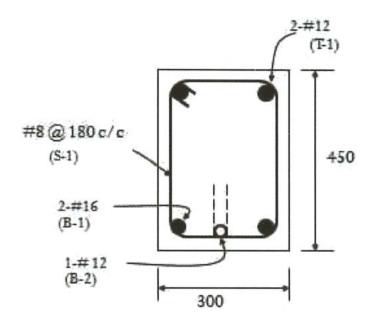


Fig 4.1.7: RCC Beam Reinforcement Details

Here,

Bl is the 2 bottom bars of 16 mm ¢

B2 is 1 bent bars of 12 mm diameter

TI is a bar of diameter 12mm and no. of bars is 2

SI is stirrup having diameter 8mm and spacing from center is 180 c/c

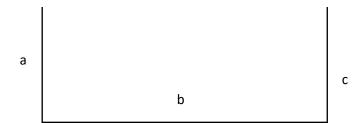
Covers to reinforcement is 40 mm

## **Deduction for bends**

When the rebar is put through the process of bending, rebar is deformed and stretched around the bend. As this happens there is a deduction in length of rebar. The Bend Deduction is defined as the material you will have to remove from the total length of your rebar.

For 45 degree bend, deduction for bend is ld.

For 90 degree bend, deduction for bend is 2d.



So if there are two perpendicular bends like the figure shown above, you need to deduct (2\*2\*dia.) i.e. 4 times diameter of the rod.

Once you get cutting length, you multiply it with number of bars. You'll get the TOTAL LENGTH.

Cutting length = Length of the member - Deduction for bends.

Length of the member = a + b + c in the image above.

Length of a + b + c = clear distance of beam + 2x wall thickness - 2x cover of reinforcement + 2x bend length

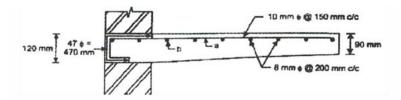
So, for above given diagram for B1 and B2

#### **Calculation:**

Now we will calculate the cutting length of reinforcement based on shapes of reinforcement required for reinforced concrete beam in above example.

We will start with bottom reinforcement, B1.

Bar shape of B1 is as shown below:



Length of B1 = clear distance of beam + 2 x wall thickness - 2 x cover of reinforcement + 2 x bend length

Bend length =  $6 \times 16 = 96 \text{ mm}$ 

Bend length is calculated as 6 x diameter of bar for reinforcement

Length of  $B1 = 4000 + 2 \times 230 - 2 \times 40 + 2 \times 96 = 4572$ mm

Length of bar B2 is calculated based on shape of this bar. This bar bends up near the support as shown below:



**Length of bar B2:** 
$$A + B + C = 4000 + 2 \times 230 - 2 \times 40 + (I.414xH - H)$$

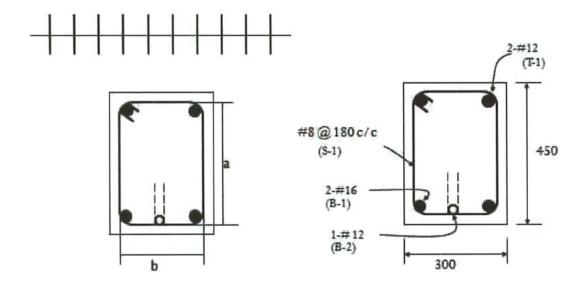
$$H = 450 - 2 \times 40 - 2 \times 12 - 2 \times 12/2 = 334$$
mm

**B2** = 
$$4000 + 2 \times 230 - 2 \times 40 + (1.414 \times 334 - 334) = 4518.3 = 4520mm$$

**Length of Bar T1** = clear distance of beam + 2 x wall thickness - 2 x cover of reinforcement

## **Length of Stirrups SI:**

Stirrups are spaced at 180mm center to center. Stirrups are provided between walls or support for a beam.



No. of stirrups required for given beam = 
$$\frac{4000}{180}$$
 +1 = 24

Length a = 
$$450 - 2 \times 40 - 8 = 362$$
mm

Length b = 
$$300 - 2 \times 40 - 8 = 212$$
mm

Therefore length of 1 stirrup S1 =  $2 \times (212 + 362 + 90) = 1328 \text{ mm}$ 

Where, 90mm is the minimum hook length.

## Thus we have from above calculation

No.	Bar Mark	Bar dia (mm)	No. of bars	Length (mm) of 1 bar	Weight of bars (kg)	Bar Shape
1	B1	16	2	4572	14.5	4380
2	В2	12	1	4520	4.02	358 472 2860
3	T1	12	2	4380	7.80	4380
4	<b>S1</b>	8	24	1330	12.6	362

## Example 1

A simply supported RCC beam has the following data:

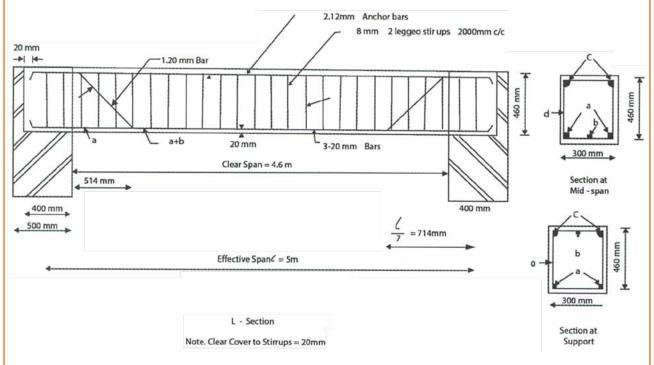


Fig 4.1.8: Reinforcement Details of a A simply supported RCC beam

Size of beam = 300 mm x 460 mm

Clear span = 4.6 m

Bearing on walls = 400 mm, Thickness of walls = 500 mm

Main reinforcement = 3-20 mm  $\emptyset$  bars (out of which one bar is bent up at 514 mm from the inner surface of support)

Stirrups = 8 mm Ø 2 legged @ 200 mm clc

Anchor bars = 2-12 mm Ø bars

Calculate total length of bars

#### Answer:

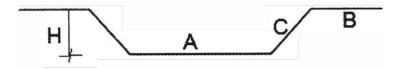
Bar shape of B1 is as shown below:

**Length of 81** = clear distance of beam + 2x wall thickness - 2x cover of reinforcement

Bend length = 
$$6 \times 20 = 120 \text{ mm}$$

Length of B1 = 
$$4600 + 2 \times 400 - 2 \times 20 = 5360 \text{ mm}$$

Length of bar B2 is calculated based on shape of this bar. This bar bends up near the support as shown below:



**Length of bar 82:**  $A + B + C = Length of straight bar + 2 \times 0.42H$ 

$$H = 460 - 2 \times 20 - 2 \times 8 - 20 = 384$$
mm

**Length of anchor bar T1** = clear distance of beam + 2x wall thickness - 2x cover of reinforcement =  $4600 + 2 \times 400 - 2 \times 20 = 5360$ mm

## **Length of Stirrups SI:**

Stirrups are spaced at 200mm center to center. Stirrups are provided between walls or support for a beam.

No. of stirrups required for given beam = no. of spaces + 1

= Beam effective length/spacing of stirrups + 1

Length a =  $460 - 2 \times 20 - 12 = 408 \text{ mm}$ 

Length b =  $300 - 2 \times 20 - 12 = 248mm$ 

Therefore length of 1 stirrup S1 = 2 x (408 + 248 + 16x8) = 1568 mm

## Example 2

A simply supported RCC cantilever beam has the following data:

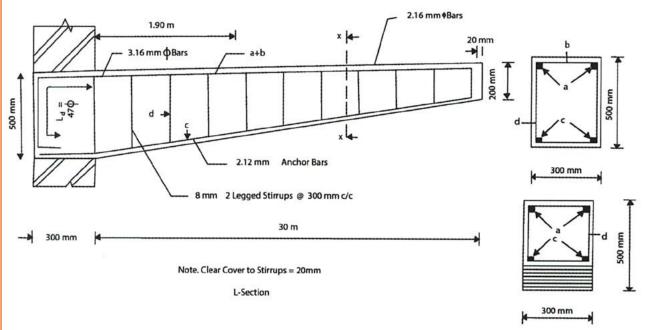


Fig 4.1.9: Reinforcement Details of a simply supported RCC cantilever beam

Size of beam

At fixed end = 300 mm x 500 mm

At free end = 300 mm x 200 mm

Thickness of walls = 300 mm

Main reinforcement = 3-16 mm  $\emptyset$  bars (out of which one bar is curtailed at 1.90 m from fixed end)

Stirrups = 8 mm Ø 2 legged @ 300 mm c/c

Anchor bars = 2-12 mm Ø bars

Calculate length of bars

#### Answer:

Length of bar (reaching upto free end) = Overhang of cantilever clear cover + Ld

(Assuming M20 concrete and Fe 415 steel, Ld =  $47\emptyset$ 

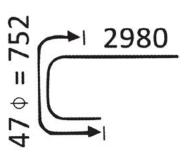
Length of curtailed bar = 1900 + Ld = 1900 + 47x16 = 2652 mm

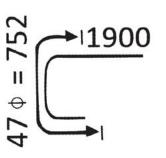
No. of stirrups = Overhang of cantilever/spacing of stirrups + 1

$$= 3000/300 + 1 = 11$$

Length of bar required for stirrup = 
$$2[(300 - 2x20 - 2x8) + (500 + 300/2 - 2x20 - 2x8)] + 16x8$$

= 1304 mm





## Example 3

A square column with isolated footing has the following data:

Size of column = 300mm x 300mm

Depth below G.L. = 1m

Plinth level = 30cm above G.L.

Height of ceiling above plinth level = 3.5 m

Column reinforcement:

Main bars =  $4-25 \text{ mm } \emptyset$ 

Lateral ties =  $8 \text{ mm } \emptyset @ 300 \text{ mm c/c}$ 

Footing details:

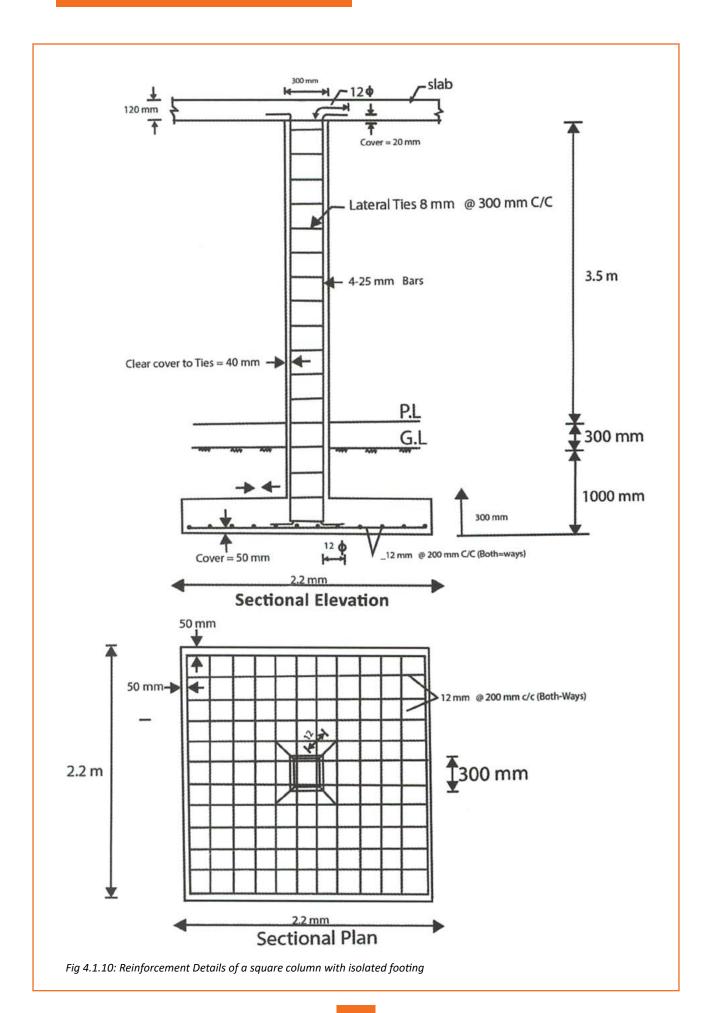
Size of footing =  $2.2 \text{ m} \times 2.2 \text{ m}$ 

Thickness of footing = 300 mm

Reinforcement = 12 mm  $\emptyset$  @ 200 mm c/c both ways

Assume that main bars of column are going into 120 mm thick slab

Calculate length of bars



## **Answer**

Length of longitudinal bar =  $(3500 + 300 + 1000) - 50 - 2 \times dia$ . of bar of footing + 12 x dia. of longitudinal bar

$$= 4800 - 50 - 2 \times 12 + 16 \times 25 = 5126 \text{ mm}$$

Number of lateral ties (links) =  $(3500 + 300 + 1000) - (50 + 2 \times 12)/300 + 1 = 17$ 

Length of bar for one link = 2[(300 - 2x40 - 2x8) + (300 - 2x40 - 2x8)] + 16x8

= 944 mm

Length of footing bar = 2200 - 2x50 = 2100 mm

No. of bars in one direction = 2100/200 + 1 = 12

Total no. of bars (in both ways) = 12 + 12 = 24

## Example 4

A circular column with isolated footing has the following data:

Diameter of circular column = 400mm

Depth below G.L. = 0.90

Plinth level = 0.25 m above G.L.

Height of column = 3.2 m

Column reinforcement:

Longitudinal steel (main steel) = 6-16 mm 0 bars

Lateral ties = 6 mm  $\emptyset$  @ 240 mm c/c

Footing details:

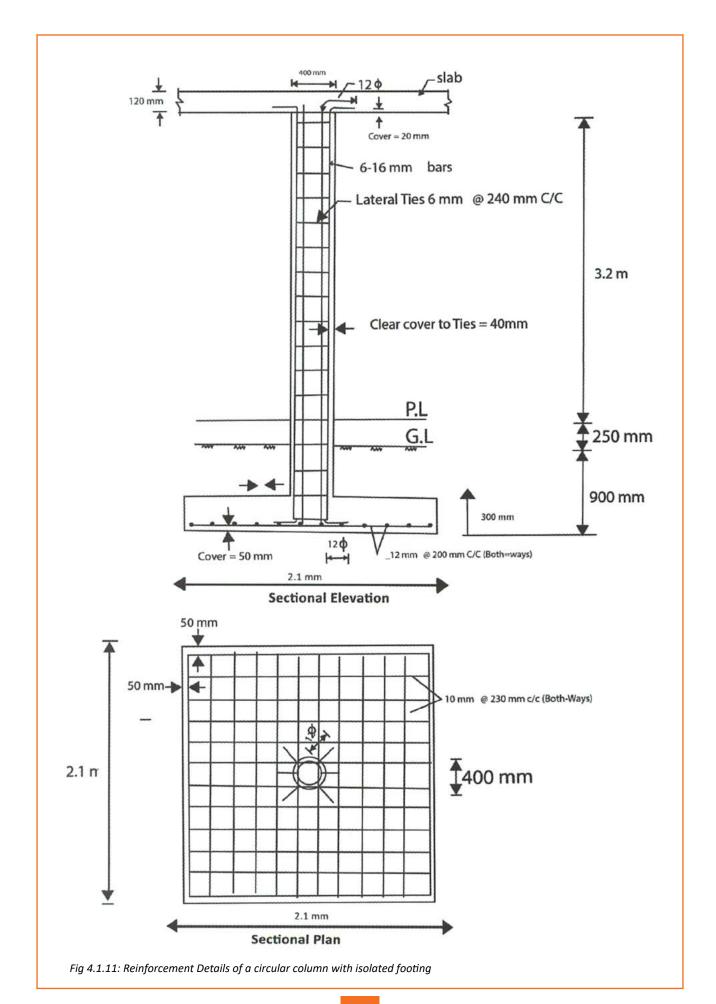
Size of footing = 2.1 m x 2.1 m

Thickness of footing = 30 cm

Reinforcement = 10 mm  $\emptyset$  @ 230 mm c/c both ways

Assume that main bars of column are going into 120 mm thick slab

Calculate length of bars



## Answer

Length of longitudinal bar =  $(3200 + 250 + 900) - 50 - 2 \times dia$ . of bar of footing + 12 x dia. of longitudinal bar

$$= 4350 - 50 - 2 \times 10 + 16 \times 16 = 4586 \text{ mm}$$

Number of lateral ties (links) =  $(3200 + 250 + 900) - (50 + 2 \times 10)/240 + 1 = 19$ 

Length of bar for one link =  $\pi$  (400 – 2x40 – 2x6) + 16x6 = 1063 mm

Length of footing bar = 2100 - 2x50 = 2000 mm

No. of bars in one direction = 2000/230 + 1 = 10

Total no. of bars (in both ways) = 10 + 10 = 20

## Example 5

A one way slab has the following data:

Room size =  $4m \times 6 m$ 

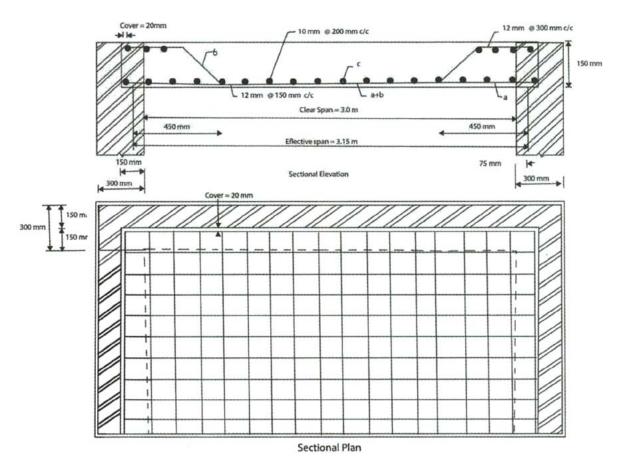


Fig 4.1.12: Reinforcement Details of a one way slab

Thickness of slab = 150 mm

Bearing on walls = 150 mm

Wall thickness = 300 mm

Reinforcement:

Main bars = 12 mm  $\emptyset$  bars @ 150 mm clc with alternate bars bent up at 0.45 m from center of bearing

Distribution steel = 10 mm Ø bars @ 200 mm clc

Calculate length of bars

#### **Answer**

Bar shape of B1 is as shown below:

**Length of B1** = clear distance of slab + 2x slab thickness – 2x cover of reinforcement

Length of bar B2 is calculated based on shape of this bar. This bar bends up near the support as shown below:



**Length of bar B2:**  $A + B + C = Length of straight bar + 2 \times 0.42H$ 

H = D - 2 x clear cover – dia. of bent-up bar

$$= 150 - 2 \times 20 - 12 = 98$$
mm

B2 = 3260 + 2x0.42x98 = 3342mm

**Length of distribution steel** = 3260 +3000 = 6260 mm

## Example 6

A cantilever slab having an overhang of 1.2 m has the following data:

Main bars = 10 mm Ø bars @ 150 mm clc

Distribution steel = 8 mm Ø bars @ 200 mm clc

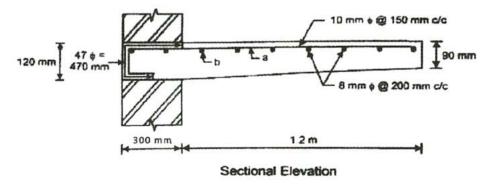
Thickness of slab at fixed end = 120 mm

Thickness of slab at free end = 90 mm

Wall thickness = 300 mm

Length of slab = 2.5 m

Calculate length of bars



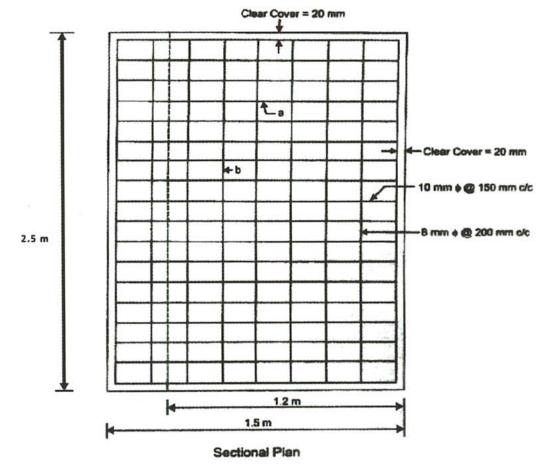


Fig 4.1.13: Reinforcement Details of a cantilever slab having an overhang

Answer

Length of main bar = Overhang of cantilever - clear cover

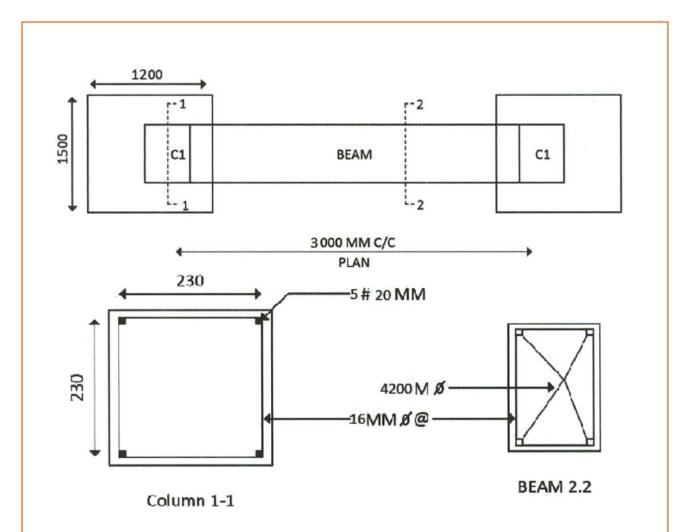
(Assuming M20 concrete and Fe 415 steel, Ld =  $47\emptyset$ 

Length of distribution bars = 2500 + 2x20 = 2460 mm

# **Exercise**



- 1. How many views are available in drawing space?
  - a) 4
  - b) 6
  - c) 8
  - d) 10
- 2. Which object should be selected to get bend shapes?
  - a) Object with rebars
  - b) Object without rebars
  - c) Rebars
  - d) BBS
- 3. Consider a beam and column assembly 340mm wide by 480mm depth. Clear cover to reinforcement provided is 40mm. Stirrup spacing is 1800 mm/cc



As per the information provided make appropriate entries in the table given below.

No.	Bar Mark	Bar dia (mm)	No. of bars	Length (mm) of 1 bar	Weight of bars (kg)	Bar Shape

Notes —	

# **UNIT 4.2: Bar Bending Schedule (BBS)**

# – Unit Objectives 🎯



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

- 1. Discuss about bar bending schedule (BBS)
- 2. Know about how to understand BBS

## 4.2.1 Bar Bending Schedule (BBS) —

Bar bending schedule is very important for a bar bender. It is prepared by the site engineer or supervisor who is executing the construction works.

Bar bending schedule (or schedule of bars) is a list of reinforcement bars, with reference to a given RCC work item, and is presented in a tabular form for easy visual reference. It includes the details of the following:

- Diameter diameter of rebar
- shape of bending shape of rebar bend
- length of each bent and straight portions
- angles of bending,
- total length of each bar and
- number of each type of bar

The BBS has following advantage:

- 1. Identification of material becomes convenient
- 2. Calculated cut length is available
- 3. Shape dimensions and bends are readily available
- 4. Helps in reduction of wastage

Apart from the above BBS also assists in estimation of quantities required.

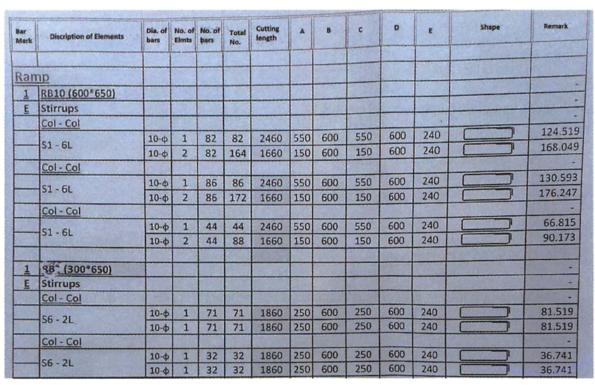


Fig 4.2.1: Bar bending schedule example

## 4.2.2 Understanding Bar Bending Schedule (BBS) -

The bar bender should be able to read and understand the BBS else it won't be possible for him to cut the length and size of various diameter of bars being used in a structure.

Zone	Grid A	Length: Width: Thickness	12 9 1.5	m	volume of Cone.:	162	m³						
S.No.	Face	Position	Layer	Dia.(mm)	Spacing (m)	Length of bar(m)	Extend	No. of Bars	Total Length (m)	Ut.Wt. (KE/m)	Welgth (ka)	Weight kg/m³	Bar shape
1	Far Face	longitudinal	FF2	32	0.3	12	9	31	372	6.31	2347.37	14.49	

Fig 4.2.2: Bar bending schedule table

There are total 14 columns in the table. Let's understand how the above table works:

- 1. Serial number.
- 2. Face You can keep any nomenclature you want to. Since the slab, which we considered has both top and bottom reinforcement to avoid further confusion we gave top layer as near face and bottom layer as far face.
- 3. Position Same explanation for point no. 2 is valid for this point too. There are types of direction in the slab, we considered namely longitudinal and transverse.

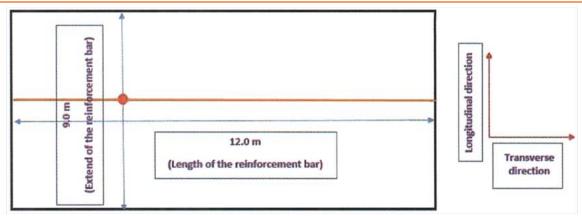


Fig 4.2.3: Different type of bar direction

- 4. Layer There can be more than a single layer of reinforcement. So, giving different names to different layers helps you a lot.
- 5. Diameter of the bar as mentioned in reinforcement drawings.
- 6. Spacing between the bars
- 7. Length of the bar in the direction of the bar you considered. For example the length of bar in my case is along the longitudinal direction.
- 8. Extend of the bar is the distance/length for which the bar is extended with its uniform spacing in perpendicular direction.
- 9. No. of bars (Extend of bars length/Spacing) + 1.
- 10. Total length No. of bars x Length of the bar.
- 11. Unit weight Density x Volume of the bar.
- 12. Weight (Kg) Unit weight x Total length.
- 13. Weight (Kg / m³) Weight (Kg) / Volume of slab
- 14. Rebar shape: Now, visualize the **shapes of bars** that need to be used.

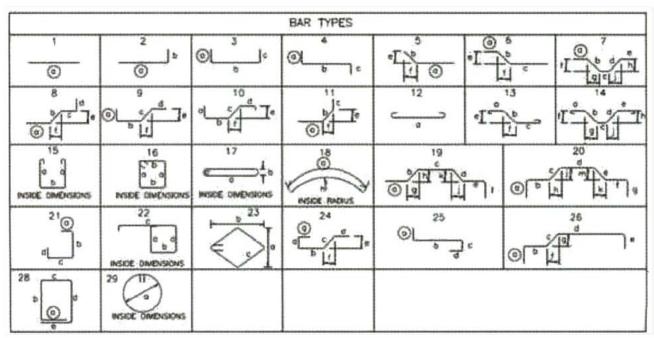


Fig 4.2.4: Shapes of bars

#### Computations of bends from BBS

Figure depicts the shape and proportions of hooks and bends in the reinforcement bars - these are standard proportions that are adhered to:

- a) Length of one hook = (4d) + [(4d+d)]- where, (4d+d) refers to the curved portion = 9d.
- b) The additional length (Ia) that is introduced in the simple, straight end-to-end length of a reinforcement bar due to being bent up at  $\theta^{\circ}$  say 30° to 60°, but it is generally 45°) =  $I_1 I_2 = I_3$

Where, 
$$\frac{D}{l_2} = \tan \theta$$
; and  $\frac{D}{l_1} = \sin \theta$ 

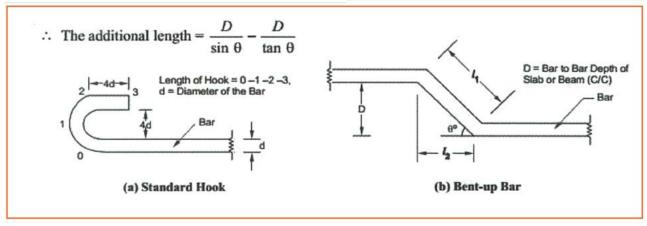


Fig 4.2.5: Hooks and bends in reinforcement

Giving different values  $\theta$  (= 30°, 45° and 60°, to respectively), we get different values of  $I_a$ , as tabulated below:

SI. No.	θ°	$\frac{D}{\sin \theta}$	D tan θ	Additional Length of Bent- up Bar, Ia
1	30°	D	D	0.27 D
		0.5	0.5733	
2	45°	D 0.707	D 1.0	$0.414 D \approx 0.42 D$ (0.42 D is generally the value that is adopted)
3	60°	D 0.866	D 1.732	$0.577 D \approx 0.58 D$ (0.58 D is usually adopted)

Fig 4.2.6: Length calculations for various angles

Figure presents the procedure to arrive at the length of hooks and the total length of a given steel reinforcement.

Details of bar shape	Length of hooks	Total length of rebar
Diameter [Straight bar] 4dT	9d For both hooks = 2*9d	l + 18d
Bent-up at one end only, $x = \frac{1}{4} \text{ to } \frac{1}{6}$ $D = \text{Vertical distance (C/C) between bars}$	For both hooks = 2*9d	I + 18d + 0.42D
Double bent-up bar $x = \left(\frac{1}{4} \text{ to } \frac{1}{6}\right)I$	For both hooks = 2*9d	I + 18d + 2*0.42D
Overlap of bars  40 d to 45 d  (Joint)	For both hooks = 2*9d	Overlap length at joint (40d to 45d) + 18d
11-12	One hook height is 14d	I <sub>1</sub> + 2I <sub>2</sub> + 28d
11-12	For both hooks 24d	2(I <sub>1</sub> + I <sub>2</sub> ) + 24d

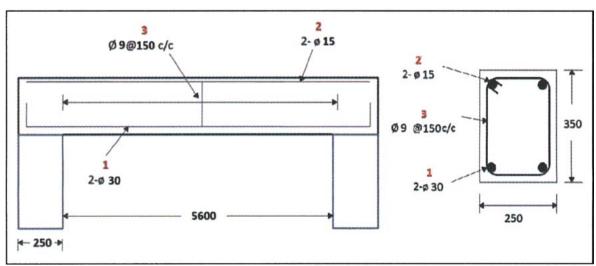
 Table 4.2.1:
 length calculation for bent up bars

# **Exercise**



1. Write the definition of Bar length, layer, face and position in Bar bending schedule (BBS)

2.



Prepare the Bar bending schedule and fill the table given below on basis of the above given data.

No.	Bar Mark	Bar dia (mm)	No. of bars	Length (mm) of 1 bar	Weight of bars (kg)	Bar Shape

- 3. Density x Volume of the bar = \_\_\_\_\_
- 4. Weight (Kg) = \_\_\_\_\_ x Total length.









# 5. Bar Cutting And Bending

Unit 5.1 – Reinforcement bars

Unit 5.2 – Tools and machines required

Unit 5.3 – Measuring instruments required

Unit 5.4 – Reinforcement cutting and bending

Unit 5.5 – Storage and handling of bars



CON/N0205

# **Key Learning Outcomes**



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

- 1. Know about rebars
- 2. Know about classification of rebars
- 3. Calculate and mark cutting and bending length on the rebars
- 4. Discuss about bar bending tools
- 5. Discuss about measuring instruments required
- 6. Discuss about bar cutting machines
- 7. Carry out bar bending using different methods
- 8. Perform different methods of bar cutting
- 9. Know about storage of rebars
- 10. Know about handling of rebars

## **UNIT 5.1: Reinforcement Bars**

## - Unit Objectives | $^{\textcircled{0}}$



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

- 1. Know about rebars
- Know about classification of rebars
- 3. Calculate diameter and unit weight of bars

## - 5.1.1 Reinforcement Bars ————

Reinforcement bars or rebars are different types of steel bars used as strengthening agent in the reinforced concrete structure. The surface of the rebar has a pattern so as to ensure proper bonding with concrete.

Uses of steel reinforcement:

- Rebars improves the durability of the structure.
- Rebars are used for providing resistance to cracking and stress.
- Rebar is also used to hold other steel bars in the correct position.



Fig 5.1.1: Reinforcement bars

## 5.1.2 Types Of Reinforcement Bars –

#### Based on material rebars are classified as:

- Mild steel and medium tensile bars conforming to IS 432 (Part I): Mild steel bars are simple rods of steel without any pattern or twist on their surface.
- b) High strength deformed steel bars HSDS conforming to IS 1786 have ribs on the surface by which increased bond strength can be obtained
- c) Hard drawn steel wire fabric conforming to IS 1566
- Structural steel conforming to Grade A of IS 2062
- Thermo-mechanically treated (TMT) Bars.

# - 5.1.3 Unit Weight of Steel Bars

Unit weight or specific weight of material can be defined as weight per unit volume of the material. The code 1786-2008 clearly states the mass per meter of steel bars for various nominal diameters as under.

S.No	Diameter of rebar inmm	Unit weight
1	4	0.099
2	5	0.154
3	6	0.222
4	7	0.302
5	8	0.395
6	10	0.617
7	12	0.888
8	16	1.579
9	18	1.999
10	20	2.467
11	22	2.985
12	25	3.855
13	28	4.836
14	32	6.316
15	36	7.994
16	40	9.869

17	45	12.490
18	50	15.420

Table 5.1.1: unit weight of steel bars

## 5.1.4 General Precautions For Use of Steel Bars In Reinforcement-

General precautions for steel bars in reinforcement

- Steel bars should be clear from impurities and foreign materials like dust, rust, loose mills etc.
- Rebars should be stored such that they are protected from distortion corrosion and deterioration.
- Oil based cleaning agents should not be used for cleaning rebars.
- The bar is bent according to the size and shape and as per drawings.
- Care should be taken that during the placing and compacting of concrete, the position of the rebars should not get altered.
- Care should be taken to provide proper cover to rebars as per sketches, drawings or instructions from seniors

Some other important points to be remembered are as given below:

1. **Identification of Rebars:** Identifying the rebar is an important function and adequate care is taken while identifying the rebars. Identification marks are given on rebars by the man ufactu rer

Bar bender & steel fixer should use the material issued to him by his supervisors.

#### 2. Assembly of reinforcement:

- As far as possible full length bars should be used.
- Bars shall be bent correctly to the size and shape as given in the detailed drawing.
- Overlap bars should not touch each other and be kept apart by 25 mm or 11/4 times the maximum size of coarse aggregate whichever is greater.
- The lapping of rebars shall be staggered with not more than 50 % overlapping at any given cross section.

#### **Bonds and Hooks Forming End A.nchorages:**

(a) U-Type Hook

For u type hooks in end anchorages, the bend should be of semicircular shape having diameter equal to 4 times the diameter of rebar.

#### (b) Bends

For bends that are anchorages for mild steel bars the diameter of bend should be equal to 2 times the diameter of the rebar and the length ahead the bend should be equal to 4 times the diameter of rebars.

**Anchoring bars in tension:** Hooks should be provided for plain bars in tension. Deformed bars can be used without end anchorages provided appropriate development length is ensured. The development lengths of bar will be determined as per IS: 456. This will be available on reinforcement drawings

**Anchoring bars in compression:** The anchorage length of straight bar in compression shall be equal to development length of bars in compression. This is determined as per IS: 456. All details are available on reinforcement drawings

#### Binders, stirrups, links etc.:

• In case of binders, stirrups, links etc. the straight portion beyond the curve at the end shall be not less than eight times and nominal size of bar.

#### Welding of Bars:

As an alternative for overlapping the rebars, the rebars can be welded at the location as per the
approved specifications and instruction from superiors.

#### Placing rebars in position:

- Reinforcement bars should be placed in position as per drawing. Any & all crossing bars should be tied at all intersection using 2 strands of wire.
- Tack welding if approved can be used instead of binding.
- For maintaining cover to rebars cement mortar blocks of specified depth should be used. To avoid sagging in double reinforced components, chairs, spacers and or support bars should be used to maintain appropriate depth
- For vertical bars templates of required dimension and tied in case of walls & columns.

Tolerance on Placing of Reinforcement: The tolerances limit for placing of rebars will be as follows.

- 1. for effective depth, more than 200 mm +15 mm tolerance in spacing is acceptable
- 2. for effective depth, 200 mm or less + 10 mm tolerance in spacing is acceptable.

#### 4. Cover to reinforcement:

Cover: The minimum nominal cover to meet durability requirements shall be as under:-

Environmental conditions	Nominal concrete cover should not be less than (in mm)
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

Table 5.1.2: Cover to reinforcements

## **Exercise**



- 1. Which type of bar reinforcement is more corrosion resistant, an epoxy-coated bars, stainless steel bars or galvanized bars?
- 2. The surface of HSDS bars is .....
- 3. Mild steel bars are used for ......
- 4. TMT bars are more stronger than HSDS bars. True or False

# **UNIT 5.2: Tools And Machines Required**

# Unit Objectives



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

- 1. Discuss about hand and power tools required;
- 2. Know about how to use hand and power tools properly; and
- 3. Operate bar cutting and bending machines.x

# – 5.2.1 Hand Tools Required -

Tool	Image	Use
Hacksaw		Hacksaws are used to cut the rebars.
Chisel		Chisel is used to cut the rebar with the help of hammer.
Hammer		Hammer is used to strike overthe chisel to cut the rebar.
Bending lever		Bending lever is used to bend the rebar manually.

## **5.1.2 Types Of Reinforcement Bars**

#### Hacksaws are the most commonly used handsaws.

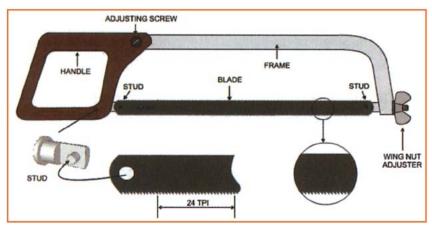


Fig 5.2.1: Hacksaw

Parts of a hacksaw: Hacksaw frame and blade are the most common parts of hacksaw.

- Hacksaw frame: frames are usually made adjustable through adjusting screws to allow using different sizes of blades.
- Hacksaw Blades: Blades are the cutting edges. These are available in the following standard sizes 230mm, 250mm and 300mm.

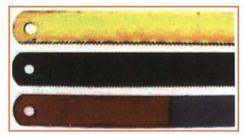


Fig 5.2.2: Hacksaw blades

#### Selecting criteria of hacksaw

Hacksaws are selected on the bases of material of blade, hardness of blade, length and pitch of the blade, set of teeth.

- Hardening there are 2 types of blades:
  - 1. hard
  - 2. flexible

The hard blade is brittle and does not twist; it is thus preferred by skilled users. The flexible blade on other hand and twist and is preferred by new users.

- Material Usually the saw blade is supplied with High Carbon Steel (HCS). These blades harden due to
  the heat produced during cutting and thus can break when used to cut very hard materials
- **Pitch** Pitch refers to number of teeth in 25 mm of the blade length. Based on pitch there are 3 types of blades:
  - 1. Coarse blade it has 18 teeth in 25 mm this blade is used for soft and thick material

- 2. Medium Blade it has 24 teeth in 25 mm. it is suitable to use on steel pipes
- Fine Blade it has 32 teeth in 25 mm and it should be used for cutting thin metal sheet
- Length The length of the blade is determined by the distance between the outside edges of the holes, which fit over the pegs.
- Set of Teeth Set refers to the sideways bending of the teeth which makes the width of the slot or cut by the blades greater than the width of the blade.

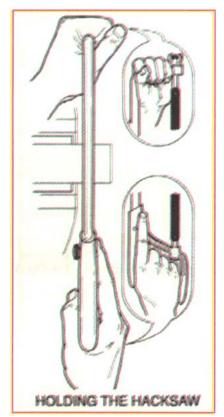
## Cutting with a Hacksaw - Steps 4

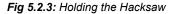


Step 1: Holding the Hacksaw: while using a hacksaw it is necessary to hold it with both hands, this allows the person to move the blade without twisting or bending it. The hacksaw should always be kept upright in order to avoid injuries caused due to blade.

#### Step 2: Stance

- The person should take a comfortable position behind the rebar, as cutting requires application of force; the feet should be firmly planted on ground or any horizontal surface.
- The body of the individual cutting the rebar should move to and fro along with the motion of the blade. Further, it should be noted that the strong hand should be kept close to the body with the forearm parallel to the blade.





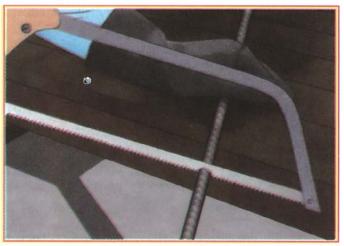


Fig 5.2.4: Cutting by hacksaw

## 5.2.1.2 Chisels -

Chisels are tools that can be used for chipping or cutting metal. Chisels are made from a good grade tool steel and have a hardened cutting edge and beveled head.

Chisels are forged to the shape and size required, then hardened and tempered.

The **cutting chisel** is mainly used in construction site. It is in some ways similar to the flat chisel, but has only one bevel at the cutting end. It is used for chipping places unsuitable for a flat chisel.



Fig 5.2.5: Chisels

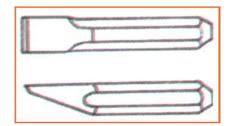


Fig 5.2.6: Cutting chisel

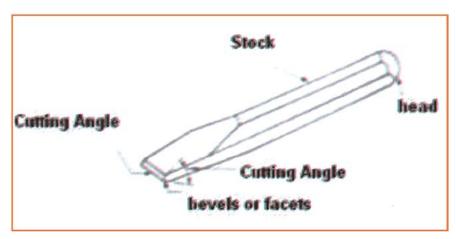


Fig 5.2.7: Cutting angles oj chisels

#### **Using chisel**

- 1. Hold the chisel between the U-shaped holder.
- After marking is done, place the rebar on a hard flat surface. Place and hold the chisel on the mark.
- 3. Strike the chisel on its head using a hammer.



Fig 5.2.8: Cutting rebar by chisel

## 5.2.1.3 Hammers -

Hammer is widely used by bar benders and steel fixers. Hammers are used to impart force to materials to change the shape or size of the materials. There are many types of hammers, however a bar bender mostly uses a sledge hammer for cutting of rebars.

A sledge hammer has a large and flat head that allows for imparting larger force.

#### Parts of a sledge hammer

- Handle: Handles are long extensions perpendicular to the head which act as a means to hold the head for striking. These are usually made of wood.
- Head: The top portion of the hammer which imparts force on materials. This is usually made from metal
- Face: The striking face is what makes contact with a material or object.

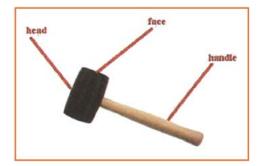


Fig 5.2.9: Hammer

#### **Selecting the Correct Hammer**

Criteria for selection of a hammer are the weight of the head of the hammer. The selection criteria are simple. If one wants to apply large force with less accuracy heads of larger size or weights are used, whereas if one needs to apply small force with larger accuracy a head with less/ small weight is used.

Three important features of a hammer are: -

- The length and shape of the handle
  - o The handle should be perpendicular to the head.
  - o The shape is important because it depends upon power which should go with each hammer blow.
- The shape and contour of the face
  - o Marking off hammers usually have a flat face with slightly rounded edges
  - o Hard hammers and sledge hammers usually have a convex face so that they will not mark the plate very much.

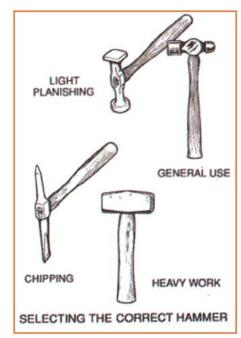


Fig 5.2.10: Selecting the correct Hammer

#### **Using hammer**

Whenever a hammer is used care should be taken that full face of the hammer is used for impact. Following is helpful in doing the same:

- Do not hold the hammer too close to the head.
- Hold the handle with the fingers underneath and the thumb along side or on top of the handle.
   The thumb should rest on the handle and never overlap the fingers.
- Try to hit the object with the full force of the hammer.

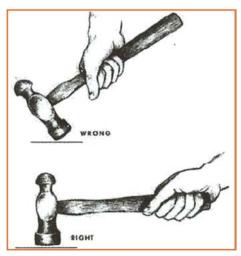


Fig 5.2.11: Use of Hammer

## 5.2.1.4 Bar Bending Lever —

For bending rebars in place and for bending rebars of smaller diameter a bending lever is used. It is a simple hand tool, having a hickey or jaw attached to a long handle.

The steps involved in using the rebar are listed below

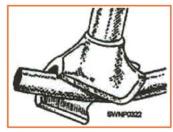


Fig 5.2.12: Bar bending lever





Fig 5.2.13: Different type of Bar bending lever

#### Using bending lever

- 1. Measure and mark the rebar at the desired length.
- 2. Set the rebar in lever jaws with the mark.
- 3. Set the end of your leverage pipe at the mark for the desired length.

4. Exert pressure on the lever to bend the rebar. Keep the pressure on until you get the desired angle.

# $^{-}$ 5.2.2 Power Tools And Machines Required -

Measuring instrument	Image	Use
Bar cutting machine		A bar cutting machine is used to cut the rebars.
Angle grinder		An angle grinder is used to cut the rebars.
Power saw		A power saw is used to cut the rebars.
Bar bending machine		A bar bending machine is use to bend the rebars.

# **5.2.2.1** Bar Shearing And Cutting Machine

Bar shearing & cutting machine is a mechanical device that is employed to cut rebars of higher diameters like 36 mm, 42 mm, 52 mm or above. However, it can also be used to cut multiple number of rebars of smaller diameter like 10mm, or 16mm dia.

#### Advantages of bar shearing and cutting machine

- These are easy to operate.
- Increase the productivity of cutting at site.
- It performs cut with high precision





Fig 5.2.14: Bar cutting machines

#### Operation of bar cutting machine

- Start the power of the machine
- Insert the rebar in the slot
- Press the lever and cut the rebar
- If you want to cut multiple bars together, check the machine specification and place that much no. of bars as instructed in manufacturer's manual.





Fig 5.2.15: Cutting rebar by bar cutting machine

#### Precautions taken during rebar cutting

- Always wear long sleeve shirts, gloves, and safety glasses when cutting any type of steel.
- Read the specifications of machine properly
- Check the machine operation and parts properly before start cutting the rebars.
- Do not cut rebar of diameter and strength, over the specification of machine.

## **5.2.2.1** Bar Shearing And Cutting Machine

Angle grinder is a grinding cum cutting machine. It utilizes a sharp rotary blade to cut through rebars. It is used to cut thorough small & medium diameter bars & mild steel bars.

#### Selection of angle grinder

- Angle grinder can be selected on the basis of the wheel speed i.e. around 3000 rpm
- Grinding wheel for cutting rebar is masonary or diamond blade.

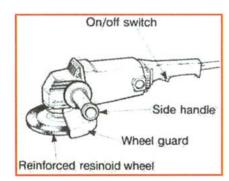


Fig 5.2.16: Angle Grinder

#### **Grinding machines operation**

#### Operation

- 1. place the rebar firmly.
- The stance of the operator should be comfortable and he/ she must have a clear view of the rebar he/she is cutting.
- 3. Turn on the power.
- 4. Idle run the grinder for about 1 minute before cutting the rebar.
- 5. Point the grinder downwards when starting it up. Hold it firmly, because of a possible "kick-back".
- 6. Use the teeths of the wheel when cutting.
- 7. If the wheel is vibrating, then it must be replaced or the bearing of the shaft is to be replaced if it is damaged.



Fig 5.2.17: Angle Grinder

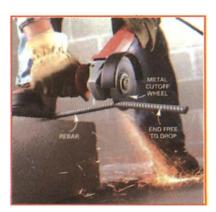


Fig 5.2.18: Cutting rebar by angle grinder

- 8. shut off the power and do not leave until the wheel has come to a complete stop.
- 9. Clean the work area when finished using the grinder.

#### Reasons of break down

- Power failure
- Motor failure
- Wheel breakage only use masonry or diamond blade for steel rods cutting.

## **5.2.2.1** Bar Shearing And Cutting Machine –

A power saw is another way to cut rebars and is really essential when cutting large numbers of rebars.

#### When selecting a Power Saw:

- Check:
  - o The wattage of the motor, generally the higher the hetter
- Be aware that they are available for different voltages, normally 110 or 230v AC.
- It should have:
  - o A Blade Guard
  - o Overload Protection
  - o A Diamond Blade



Fig 5.2.19: Power Saw

A rebar cut ting power saw blade should never be used to cut anything - you run the risk of damaging the expensive blade.

#### Operation of power saw

- 1. Select proper blade,
- 2. Adjust the sole plate to obtain proper height and bevel for the job,
- 3. Plug the saw into an electrical outlet,
- 4. Hold the blade above the marking on the rebar,
- 5. Press the safety switch, then press the trigger switch.
- 6. Slowly follow the cut mark.

7. When nearly done, make sure the end of the rebar being cut is held and will not splinter due to the unsupported weight.



Fig 5.2.20: Cutting rebar by power saw

#### Reasons of break down

- Power failure
- Motor failure
- Wheel breakage only use masonry or diamond blade for steel rods cutting.

#### Precautions while using power saw

- 1. Wear PPE before start the operation.
- 2. Rebar should be placed firmly and strongly below the cutter.
- 3. Before starting, you must check the blade is installed correctly, the cutter should be free of cracks.
- 4. After the start, the first air operation, check the transmission parts and bearings in normal operation only after the operation.
- 5. Do not cut rebar of diameter and strength, over the specification of machine.
- 6. The rebar has been cut, stacked neatly against the incision prominent, mistakenly kicked cuts.
- 7. After the job, steel brush to remove debris cutter between the machine cleaning and maintenance performed.

## **5.2.2.4** Bar Bending Machine

Bar bending machine is a power driven, durable fast and cost effective machine, used for bending reinforcement bars.

## **Features of machine**

- The automatic angle selection permits precise bend at a preset angle making it one step bending process for various forms of bends and stirrups.
- This is easy to use machine can be easily operated by Bar Bender & Steel fixer.
- It is cost effective, save labour work.

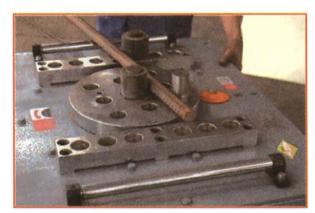


Fig 5.2.21: Bar bending machine

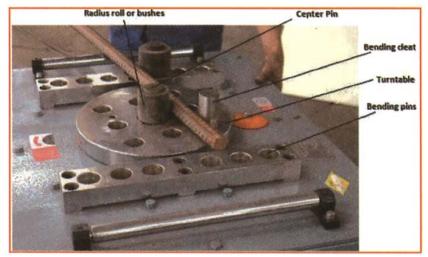


Fig 5.2.22: Parts of bor bending machine

#### Parts of a bar bending machine

- 1. Turntable
- 2. Center pin
- 3. Bending cleat
- 4. Radius roll
- 5. Bending pins

#### Operation of machine

- 1. Bar bending machine turntable contains mandrels.
- 2. Before starting the bending work ensure that turntable is at start point.

- 3. Place the rebar between the cleat slide upright and the radius roll.
- 4. The end of the rebar extends to a specified distance from the cleat slide.
- Adjust the cleat slide such that it touches the rebar. At this point tighten the locking screw.
- Move the positioner slide bar until the roller contacts the rebar and tightens the Thandle.



- 7. Set the desired angle 'of bend on the graduated control rod. This is done by placing the trigger pin of the rear adjustable stop in the hole corresponding to the angle of bend.
- 8. Move the bending lever to the bend position.
- 9. The lever will stay in the bending position until the bend is completed.
- 10. To remove the rebar from the machine apply a small reverse pressure to the lever until the bar releases from the radius roll.

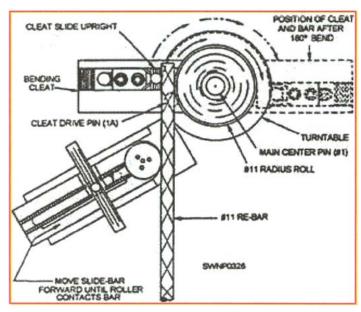


Fig 5.2.24: Bending rebar by bar bending machine

# – Exercise 🗒 –



1.	Bar bending machine is provided with an angle measuring disc of 240 degrees at the top
2.	Bushes on the bar bending machine performs the work of
3.	A screwdriver can also be used as a chisel.
	(a) True
	(b) False
4.	This tool has a sharp metal point for marking on wood, metal and plastic:
	(a) scriber
	(b) center pu nch
	(c) file
	(d) cold chisel
5.	What tooth forms can saw blades have?
	(a) Curved tooth
	(b) Blind tooth
	(c) Union tooth
	(d) Angular tooth
6.	While using hacksaws, the blade (pitch of the blade) is selected depending on the strength of the material to be cut. True or False?
7.	Which abrasive has the highest degree of hardness?
	(a) Corundum
	(b) Silicon carbide
	(c) Boron nitride
	(d) Diamond

# **UNIT 5.3: Measuring Instruments Required**

## Unit Objectives | ⑥



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

- 1. Discuss about measuring instruments required
- 2. Know about how to use measuring instruments properly

# **5.3.1** Measuring Instruments Required –

Measuring instrument	Image	Use	
Steel rule	The second secon	It is use to measurement and marking of rebar length.	
Tape rule		It is use to measurement and marking of rebar length.	

## 5.3.1.3 Steel Rule -

Used for measuring lengths to a moderate degree of accuracy. Graduations on the ruler are usually millimeters and half millimeters. To be accurate, the rule must be in good condition with flat, straight and true edges.

#### **Practical uses:**

- Measure and mark the length of the rebar
- guide to scribe or draw a straight line
- straight edge to test the accuracy of a flat surface
- Scale for setting dividers and other marking tools.



Fig 5.3.1: Steel Rule

## **5.3.1.4 Tape Rule**

This is the most basic tool used for measuring the required length of reinforcement bars. these are available in various materials like ribbon of cloth, plastic, fibre glass, or metal strip and different lengths.

Fig 5.3.2: Tape Rule

#### **Practical uses:**

- Measure and mark the length of the rebar
- Scale for setting dividers and other marking tools.

#### How to measure using a tape rule

- 1. Place the open end of the tape at one end of the rebar.
- 2. Hold the open end in position & pull back the tape.
- 3. The tape is to be pulled back till it shows the desired reading.
- 4. At such point ensure that tape is stretched & open end is still in position

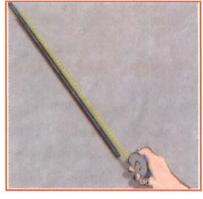


Fig 5.3.3: Measuring rebar by tape rule

5. Mark the rebar at the point of required dimension & release the open end the tape to complete the measurement

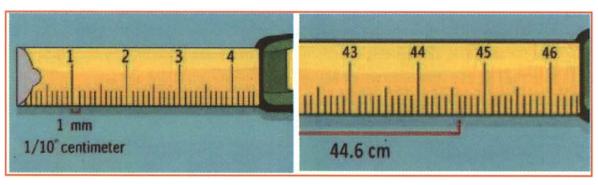


Fig 5.3.4: Measure using a tape rule

## **Exercise**



- 1. Usually, the reading accuracy of steel rules is around 0.5 mm. True or False?
- 2. A measuring tape can measure length more than
  - a) meter
- b) inch
- c) foot
- d) centimeter
- 3. A meter rule can measure a maximum length of
  - a) 0.5 meter
- b) 1 meter
- c) 1.5 meter
- d) 2 meter

## **UNIT 5.4: Reinforcement Cutting And Bending**

# Unit Objectives | @



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

- 1. Cut the rebar as per requirement; and
- Bend the rebar.

## **5.4.1** Rebar Cutting And Bending Procedure

Rebars are available in standard size of 12m length when they are delivered at site. To use these rebars, they must be cut to required length and then bent to required shape. We have already discussed how cutting length and bending computations are made in previous chapter. We have also read about the tools and equipment required for bending works. Now, let us understand the procedures for using these tools and equipment to obtain the desired shape and size.

However, it is important to mention here that the safety is the most important parameter that needs to be strictly followed. This makes it the first step towards completion of any given task and thus for all cutting and bending operations and other works performed by Bar Bender and Steel Fixer the first step shall be to wear PPEs and avoid unsafe conditions and acts

This can be properly understood by the following flow chart:

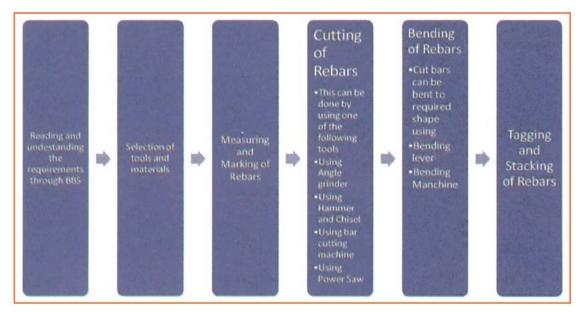


Fig 5.4.1: procedure of reinforcement works

The flow chart is explained step wise in the subsequent sections of this chapter. However as mentioned the step 1, 2 and 3 are already explained in detail in chapter 4 and previous units of this chapter, thus we shall start with step 4 in this unit.

# - 5.4.2 Cutting Rebar ———

As shown in the flowchart, there are different methods to cut rebar, these are elaborated in the following sub sections as

- 1. Cutting rebar using by Grinder
- 2. Cutting rebar using Hammer and Chisel
- 3. Cutting rebar using Bar Cutting Machine
- 4. Cutting rebar using Power Saw

#### I. <u>Cutting using grinder:</u>

- Ensure that the selected grinder is properly functioning and is as compatible with job requirement.
- Start the grinder and cut the bar
  - o Start the grinder & allow it to rotate ideally.
  - o Bring the wheel in contact with the bar at the mark from where bar is to be cut.
  - o Oscillate the grinder at cut mark so that the blade cuts the rebar.



Fig 5.4.2: Cutting rebar by grinder



#### II. Cutting using hammer and chisel:

- Place the rebar on a hard, flat surface like an anvil.
- Hold the chisel on marking.

- Cut the rod by striking hammer over the chisel repeatedly.
- Once the bar is more than half cut use hacksaw or bending lever to cut the bar completely.





Fig 5.4.3: Cutting rebar by using hammer and chisel

#### III. Cutting using bar cutting machine:

- Switch on the bar cutting machine.
- As per the diameter and the capacity of the cutting machine, place the rebars in insertion slot (e.g. 6-7 rebars of 6 mm diameter to 1 rebar of 20 mm diameter).
- The bars should be placed such that the cut mark is exactly under the cutting blade.
- Use the lever to cut the rebar.



Fig 5.4.4: Operating bar cutting machine

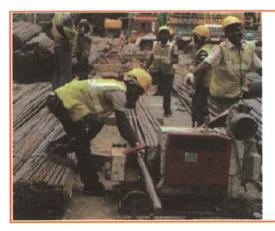




Fig 5.4.5: Cutting rebar by bar cutting machine

## IV. <u>Cutting using bar power saw:</u>

- Place the rebar below the cutting blade such that the cut mark is exactly below the blade.
- Turn on the power saw and let the blade rotate idly.

- Lower the blade using handle.
- Ensure that the rebar is held in position from both ends to avoid rebound.



Fig 5.4.6: Cutting rebar by power saw

## **5.4.2** Bending of Rebars -

The rebars that are cut to required size may need to be bent as per the requirement or instructions.

The various bends have been explained in the earlier chapter. There are two methods of bending rebars these are explained as under:

- 1. Bending rebar using lever
  - Place the rebar on the bench and pull the rebar through the bending pins,
  - The bar should be placed such that the mark for bending is properly aligned within the bending pins.
  - Place the bending lever at the end of the bar and exert force horizontally such that the bar is bent in required direction.



Fig 5.4.7: Bar bending by bending lever

- 2. Bending rebar using bending machine
  - Select and use correct mandrels.
  - Place the rebars in the machine.
  - Using proper lever get the bar in position.
  - Once the bend mark reaches the mandrel start the bending of rebars.



Fig 5.4.8: Operating bar bending by bending machine





Fig 5.4.9: Bending rebar by bending machine

The last step in cutting and bending the rebars is tagging and storing of bars, this is explained in detail in the next unit.

## **UNIT 5.5: Storage, Stacking And Handling Of Rebars**

## **Unit Objectives**



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

- 1. Know about storage of rebars; and
- 2. Know about handling of rebars.

## **5.5.1 Storage And Stacking Of Rebars**

Safety and lifespan of any RCC structure are solely dependent on the properties of the good quality steel rebars and cement. Proper storing and handling of rebars are important factors. Improper handling of these reinforcement bars may result in damages.

Rebars at the construction site have to go through a number of procedures, starting from unloading, hoisting; stacking; cutting; bending; fabrication. In many cases, improper storing and handling of the steel rebar end up damaging the steel rebar.

Some tips for proper storage and stacking of rebars:

- Rebars should be stored in clean & dry location after coating them with cement wash or covering with plastic sheets in order to prevent distortion, corrosion, scaling and rusting of rebars.
- In case of long time storage or storage in coastal areas, reinforcement bars should be stacked at least 200 mm above ground level.
- Timber supports should be provided to rebars in order to avoid sagging of rebars.
- All material should be properly segregated and stacked with proper tags on each bundle.
- Bars of different types, sizes and lengths should be stored separately to facilitate issues in required sizes and lengths without cutting from standard lengths.
- Tag lines should be used to control the load in handling reinforcing bars when a crane is used.
- Heavy steel sections and bundles of reinforcing bars should be lifted and carried with the help of slings and tackles.







Fig 5.5.1: Storing of rebars

Fig 5.5.2: Taging of rebars

Fig 5.5.3: Stacking of rebars

## **5.5.2 Tagging Of Rebars**

Tagging is a process in which bars of similar size and shape are segregated, collected, tied together & stacked.

Each of such stack is marked with a tag that denotes various specification of the rebars such as diameter, lot number, location of placing etc.

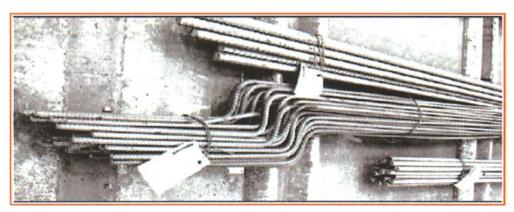


Fig 5.5.4: Taging of rebars

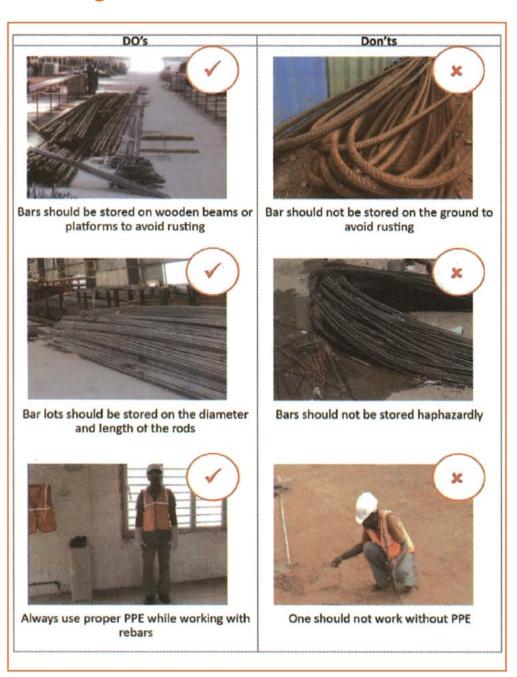
## 5.5.3 Housekeeping -

Housekeeping is the process of cleaning & maintaining clean workspace in order to avoid loss of material, equipment & consumables. It also helps in keeping the workplace. Safe and avoid risk of injury etc. Good housekeeping practices include:

- All walkways and paths should be kept clean and free from any obstruction.
- All material, equipment or consumable should be properly stacked during the working stage and duly returned to stores (if applicable) after the work is completed.
- Tools, materials, and equipment subject to displacement or falling should be adequately secured.

- All debries and other materials should be cleared from workspace after the work is complete. However, proper pathways and ergonomic principles are to be applied while clearing the workspace.
- Protruding nails in scrap boards, planks, and timbers should be removed, hammered in, or bent over flush with the wood.

## 5.5.4 Handling Of Rebars -



Tab 5.5.1: Do's and Dont's while storing, stacking and handling

- Avoid treating the rebar roughly.
- Use normal handing tools and machines, such as slings, bare chains.
- Using plastic, stainless steel wire or synthetic straps when strapping.
- Avoid re bend, reshape and straighten bent bars
- If bending and re-bending are unavoidable, ensure bending radius is not less than 40 AND 60 respectively for MS and Tor bars.
- After complete fabrication bundle them with identification tags.
- Use tractor trailer for internal shifting of reinforcement in the project area.

## **Exercise**



1. The bars shall be covered with plastic sheets to avoid contact with moisture.

True False

2. Scrap should not be stored separately in the steel yard.

True False

3. The steel yards should be adequately illuminated so that tags and sign boards are easily available.

True False

- 4. .....should be stored on wooden beams or platforms to avoid rusting.
- 5. Bar lots should be stored on the ...... of the rods.









# 6. Prepare, Place And Fix Reinforcement For RCC Structures

Unit 6.1 – Tying and fixing RCC structural elements

Unit 6.2 – Insertion sequence of RCC elements

Unit 6.3 – Prefabricated cages



# Key learning Outcomes [



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

- 1. Discuss about various RCC structural elements;
- Discuss about RCC columns;
- 3. Discuss about footings;
- 4. Know about design detailing and types of staircases;
- Know about tolerance limits of RRC work;
- Perform assembling of beam and column;
- 7. Perform assembling of slab;
- Know about installation of prefabricated cages;
- Know about rebar splicing;
- 10. Perform lap splicing;
- 11. Know about mechanical splicing;
- 12. Know about reinforcement cover;
- 13. Know about rebar spacer;
- 14. Know about rebar chair.

# **UNIT 6.1: Tying And Fixing RCC Structural Elements**

# Unit Objectives | ©



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

- 1. Know about rebar splicing;
- 2. Perform lap splicing;
- 3. Know about mechanical splicing;
- 4. Know about different types of mechanical couplers;
- Know about reinforcement cover;
- Know about rebar spacer;
- 7. Know about rebar chair;
- Know about tolerance limits of RRC work.

# 6.1.1 Tying Rebars —

Rebars must be tied together to remain in a desired arrangement. Tying is a means of keeping laps or splices in place.

Tying rebar is generally done with the help of a metal hooking tool, or a simple pair of pliers that can also cut the wire tie if necessary. Each tool allows the bending, pulling and twisting of the thin wire ties to be accomplished as quickly and efficiently as possible.





Fig 6.1.1: Tying of rebars

General procedure for tying rebar by wire - steps



#### Step 1 - Position wire

- The wire tie is passed diagonally behind the crossover point of two sections of rebar.
- The ends are then pulled forwards so the wire tie forms a U-shaped loop around the rebar.



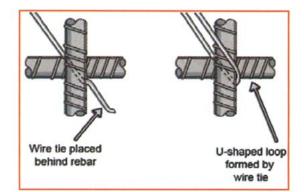


Fig 6.1.2: Position of wire

#### Step 2 - Twist wire

- Take hold of the U-shaped wire tie with the pliers and pull it tight around the back of the rebar.
- Then rotate the pliers so they twist the wire. Rotate the pliers several times to tie the wire tightly around the rebar.



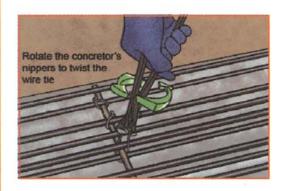


Fig 6.1.3: Twisting wire

#### Step 3 - Cut wire

- Squeeze down further on the handles of the pliers so they cut through the wire you are using.
- This should leave a neat wire tie around the rebar.

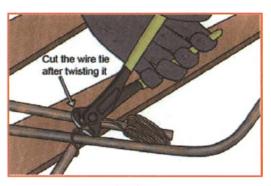


Fig 6.1.4: Cutting wire by plier

#### Types of ties

- Snap or simple tie:
  - It is the type of tie most often used for horizontal surfaces, such as floor slabs.

- o To tie a simple knot, the wire is wrapped diagonally around once the crossing bar and the ends of wire meet at the top.
- o Both the open ends are twisted together until they tightly wrapped around the bars.
- o Finally, the loose ends are cut off.

# 2 grand

Fig 6.1.5: Snap or simple tie

#### Wall tie:

- o The wall tie is made by taking one and one-half turns around the vertical bar, then one turn diagonally around the intersection.
- o The two ends are twisted together until the connection is tight, then the excess is cut off.
- o The wall tie is used on light vertical mats of steel.
- o It is used to tie horizontal members to vertical supports in a way that prevents them from sliding down.

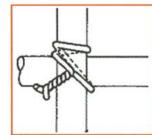


Fig 6.1.6: Wall tie

#### • Double-strand single tie:

- o It is favored in some localities and is especially used for heavy work
- o The double-strand tie is a variation of the simple tie. It uses two strands of wire for tying instead of one as used in a simple tie.

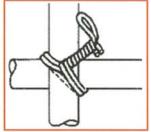


Fig 6.1.7: Double-strand single tie

o Procedure of tying is similar to simple tie method.

#### • Saddle tie:

- o The wires of the saddle tiebegin by passing behind the rear bar
- o then across the front bar staying parallel to the bar.
- o then pass it behind the rear bar again, back around the front bar on the opposite side.

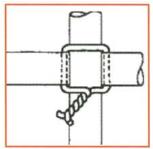


Fig 6.1.8: Saddle tie

- o The ends are then twisted together and cut off.
- o Sometimes called the "U" tie, this is just a bit more complicated than the others.

#### • Saddle tie with twist:

- o The saddle tie with twist is a variation of the saddle tie.
- o The tie wire is carried completely around one of the bars,

- o then squarely across and halfway around the other, either side of the crossing bars,
- o and finally brought together and twisted either squarely or diagonally across.
- o The saddle tie with twist is used for heavy mats that are to be lifted by crane.

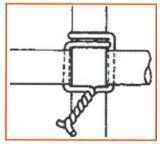


Fig 6.1.9: Saddle tie with twist

- Cross or figure-eight tie:
  - o The cross or figure-eight tie has the advantage of causing little or no twist in the bars.
  - o These are made by pulling the wire around the rear bar,
  - o Then diagonally across the front bar,
  - o Then back around the rear bar,
  - o Then diagonally in the opposite direction across the front bar, and

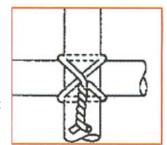


Fig 6.1.10: Cross or figure-eight tie

- o then twisting back around the beginning wire.
- o Then cut the wire feeding off the reel, and bend the cut ends back towards the tie so no sharp ends project from the tie.
- o It is a very secure tie for vertical reinforcement.

#### **Tips**

- Buy quality tools if you plan to do a lot of rebar tying.
- Double check the rebar placement drawings.
- Keep rebar stored properly to prevent rusting.

# - 6.1.2 Rebar Splicing

When the length of reinforcement bar has to be extended in reinforced concrete structural member splicing is used to join two reinforcement bars to transfer the force from one bar to the joining bar.





Fig 6.1.11: Rebar splicing

Where more than one-half of the bars are spliced at a section, special precaution shall be taken, such as

- Increasing the length of lap;
- Closely-spaced stirrups around the length of the splice.

Rebar splicing can be done in two ways

- 1. Lap splicing
- 2. Mechanical splicing

# **6.1.2** Rebar Splicing

**Lap:** A lap is made when two pieces of rebar are overlapped to create a continuous line of rebar.

Lap splicing: The lap splice is created by overlapping two pieces of rebar, then wiring them together whether the bars spaced apart or in contact with each other. It is the predominant Fig 6.1.12: Lap splicing method used for splicing reinforcing bars.



Lap splicing is done by tying the laps of rebar by wire. As we discussed in previous session, follow the procedure for tying the overlapped rebars for making the lap splice.



Fig 6.1.13: Lap splicing

On the most critical aspect of a lap splice is the overlap length. The length of the lap varies depend on the rebar grade, size and concrete grade.

#### The important points to be noted while providing lap splices in reinforcement bars:

- 1. Laps in reinforcement should always be staggered.
- 2. The distance between laps should not be less than 1.3 times the lap length of the bars.
- 3. The bars to be lapped should be provided either vertically one above the other or horizontally one beside the other.
- 4. The total lap length of bars including bends, hooks etc. should not be less than 30 times the diameter of the bar of the full development length Ld as calculated, whichever is greater.
- 5. Lap splicing of reinforcement bar more than 36mm in diameter should be avoided. In such case bars have to be lapped then they should be welded.
- 6. When bundled bars are to be spliced by lapping, one reinforcement bar at a time is to be spliced and the splicing should be staggered.

#### Types of lapped steel reinforcement

#### Trench mesh laps

Where trench mashes are joined end to end, they need to be overlapped by at least 500 mm. Where they overlap at T or L intersections the overlap should be the width of the trench mesh.

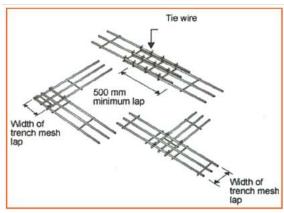


Fig 6.1.14: Trench mesh laps

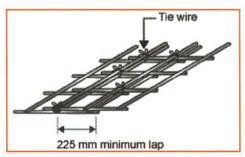


Fig 6.1.15: Square mesh lap

#### Square mesh lap

Square mesh lap has to be overlapped by at least 225 mm.

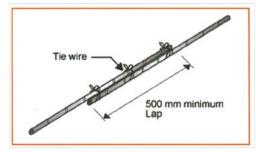


Fig 6.1.16: Rein/orcing bar lap

#### **Reinforcing bar lap**

Reinforcing bar laps need to be overlapped by at least 500 mm.

# **6.1.2.2** Mechanical Lapping

Mechanical splices/couplers are used to join lengths of rebar together. Mechanical splices/ Couplers are designed to splice the same or different diameter bars where one bar is free to move and can be rotated.

Using mechanical couplers offers various advantages over the conventional method of overlapping of reinforcement bars. Some of the reasons are as follows:



Fig 6.1.17: Mechanical lapping

Spliced rebar performs like continuous reinforcement due to mechanical joint, unlike lapping which has complete dependency on concrete. This eliminates errors due to providing wrong lap length, reduction of concrete grade, concrete deterioration over time or due to sudden impact which causes reduction in lap joint strength.



Fig 6.1.18: Mechanical caupler

- Steel wastage is reduced significantly. Using couplers saves lap length steel.
- Steel congestion is reduced due to elimination of laps. This also aides in proper flow of concrete in the critical zones and hence improves the quality of the overall structure.
- It is possible to easily verify joint strength in case of couplers as compared to lap splices where the testing is cumbersome and not regulated.

#### **Types of couplers**

The various types of mechanical splices available include:

#### 1. Coupler for Thread-Deformed Bar

This coupler requires the bars to be threaded and tightened together in coupler.



Fig 6.1.19: Thread-Deformed Bar

#### 2. Grout-Filled Coupling Sleeve

The coupling sleeve is filled with a cementbased, non-shrink, high-early strength grout. Reinforcing bars to be spliced are inserted into the sleeve.



Fig 6.1.20: Grout-Filled Coupling Sleeve

#### 3. Threaded Sleeve

This coupler is a combination of above 2 couplers. One end is threaded while the other end has to be grouted.



Fig 6.1.21: Threaded Sleeve

#### 4. Coupling Sleeve with Double Wedge

This coupling sleeve consists of an iron sleeve with two internal wedges. Two series of conepointed screws are provided to hold the bars in position. Each reinforcing bar extends out Fig 6.1.22: Coupling Sleeve with Double Wedge of the sleeve by approximately one bar diameter.



#### 5. Taper-Threaded Coupler

This is a mechanical splice consisting of a taper threaded coupler that joins bars with matching tapered threads.

#### 6. Coupling Sleeve with Shear Bolt/Wedge

Designed primarily for splicing smaller bars, the coupling sleeve is oval in cross-section. A wedge is used to hold the bars in position.



Fig 6.1.23: Taper-Threaded Coupler



Fig 6.1.24: Coupling Sleeve with Shear Bolt/Wedge

# 6.1.3 Staggering Of Laps

Staggering is method of arranging the rebars in such an order that the laps in the reinforcement have some distance between them (in the cross section). Staggering of lap/splices is done, basically for two reasons:

- to reduce reinforcement congestion in locations where there is a relatively heavy amount of reinforcement,

Fig 6.1.25: Staggering of lap/splices

- such as in a lower story column of a multi-story building, and
- to reduce a concentration of bond stresses at the bar ends of the lap splices.

Staggering of splices is the longitudinal spacing offset of the spliced bars. When considering the longitudinal stagger arrangement of lap splices, there are three basic options, as shown:

- A. no stagger,
- B. stagger with zero gap, and
- C. stagger with a (positive) gap.

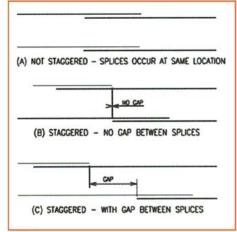


Fig 6.1.26: Arrangement of stagger laps

#### Arrangement of lapped joints

- Laps between bars should be staggered and should not be located in area of high stress.
- Laps at any section should be arranged symmetrically and parallel to the outer face of the

member.

#### **Example of staggering**

Atthe location of the lap in reinforcement the stress in one reinforcement is transferred to other through. This makes the concrete suceptable to crack at the said location. Considering that no staggering is made all the laps in reinforcement are at the same location in the cross section. The stress included in the concrete to avoid risk of cracking and allowing smooth concreting

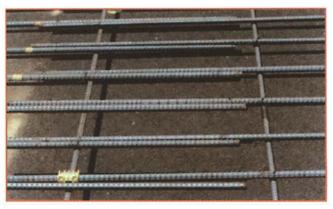


Fig 6.1.27: Example of staggering

reinforcement can be staggered in below shown 2 patterns.

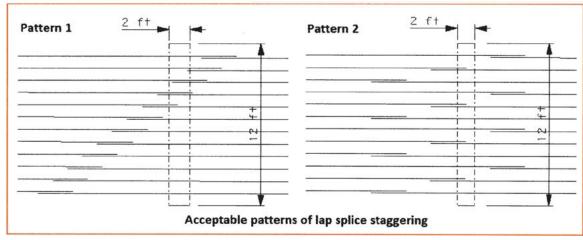


Fig 6.1.28: Acceptable pattern of lap splice staggering

#### **6.1.4 Cover Block**

Cover blocks are used to maintain a specified distance between the rebar and the shuttering.



Fig 6.1.29: A typical cover blocks



Fig 6.1.30: Placement of cover blocks

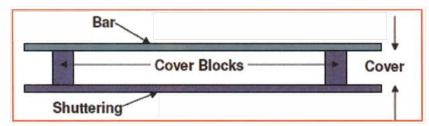


Fig 6.1.31: Cover blocks

#### Use of cover blocks

 When doing RCC work it is important to embed the steel in the concrete (also known as cover) so that the rebar doesn't corrode and to provide fire protection to the rebar, this is achieved by placing cover blocks of required sizes between rebar and shutter boards.



Fig 6.1.32: Effect of inadequate cover

• If we don't provide the recommended cover the rebar will corrode with time and will ultimately result in premature failure of the structure.

The concrete cover must have a minimum thickness for these reasons:

- To protect the steel reinforcement bars from environmental effects and corrosion;
- 2. Provides a time lag in cases of fire.
- Ensures that concrete completely encircles rebar allowing complete bond to develop.
- 4. Allows the rebar to assume position and act as designed.



Fig 6.1.33: Concrete cover placement below rebars

In general and if not mentioned otherwise following cover to reinforcements are used for different structural components.

Application	Cover (in mm)
▶ Slab	▶ 20mm
▶ Beam	▶ 25mm
► Column	▶ 40mm
► Foundation	▶ 50mm

Fig 6.1.34: Typical covers recommended

# **6.1.5** Rebar Spacer

A rebar spacer is essentially a reinforcement bar placed along with main rebars to hold the rebars at a correct spacing.



Fig 6.1.35: Rebar spacer

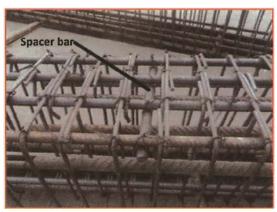


Fig 6.1.36: Rebar spacer

#### These are used for the following reasons

- 1. To avoid Congestion while concreting
- 2. To maintain the gap between two different layers spacer bar is used in perpendicular direction to the respective main reinforcement.
- 3. It keeps the bars and links in their exact place

The following shall apply for spacing of bars:

- a) The horizontal distance between two parallel main reinforcement bars shall usually be not less than the greatest of the following:
  - 1. The diameter of the bar if the diameters are equal.
  - 2. The diameter of the larger bar if the diameters are unequal and
  - 3. 5 mm more than the nominal maximum size of coarse aggregate.
- b) Where there are two or more rows of bars, the bars shall be vertically in line and the minimum vertical distance between the bars shall be15mm, two-thirds the nominal maximum size of aggregate or the maximum size of bars, whichever is greater.

To ensure that these parameters from the IS codes are met reinforcement spacers are used.

#### 6.1.6 Rebar Chair -

Rebar chairs are used to maintain required depth between the top and bottom reinforcement.

Generally, steel rebar chairs are used at construction site.

- Chairs shall be designed to take manual and mechanical loads during slab casting chair is meant to maintain spacing between two meshes of slab top and bottom.
- Chair shall not be touching to shuttering or sheathing.

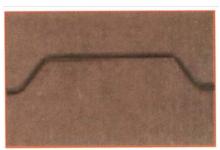




Fig 6.1.37: Rebar chair

#### There are some other types of bar chairs available are:

1. Plastic barchairs-these chairs are specifically used forfoundation and plinth works. These have a flat base and support one bar.



Fig 6.1.38: Plastic bar chairs

2. Trench mesh supports - These chairs are used for supporting multiple bars in cages for slabs.



Fig 6.1.39: Trench mesh supports

3. Clipfast plastic bar chairs - Plastic bar chairs are used for bar and mesh reinforcement these chairs chip into the reinforcement and hold the bar in position, they can be used in vertical and top cover applications.



Fig 6.1.40: Clip!ast plastic bar chairs

4. Plastic tipped wire bar chairs - These bar chairs are for suspended slab and beam reinforcement being cast on timber or metal forms. The chair is made of wire and each leg is plastic tipped.



**Fig 6.1.41:** Plastic tipped wire bar chairs

# **6.1.7 Tolerance Limits Of RCC Work** -

Tolerances are the permissible deviations from the actual work requirement. These are provided to counter the many variables involved in construction works without compromise of the structure. The variables mentioned above include a wide range of parameters such as variation in quality of materials, workmanship, environmental conditions etc.

Tolerances include the variation in following aspects:

- permissible range of variation in a dimension of an object
- permissible variation of an object in some characteristic such as hardness, density, or size
- permissible deviation from plan alignment, location or grade

Tolerances as applicable to RCC structures in various parameters are collated from various Indian standards and compiled below as:

S.no	RCC structures	Tolerance limits			
1	Where the position is not controlled by the minimum design cover				
1.1	The position of the ends of a main bar	50mm			
1.2	The spacing of parallel bars in a slab or wall	spacing of fitmentsIO% of specified spacing or 15 mm, whichever is greater			
2	Tolerance in Reinforcement	Tolerance limit			
2.1	For effective depth D < = 200mm	+- 10mm			
2.2	Effective depth D > 200mm	+- 15mm			
2.3	Cover to reinforcement	+- 10mm			
2.4	Maximum freefall of concrete	1.50 m height.			
3	Tolerance on diameter in length				
3.1	0-25 mm	+- 0.5%			
3.2	25-35 mm	+- 0.6%			
3.3	35-50 mm	+- 0.8%			
4	Tolerance on weight per meter				
4.1	0-10 mm	+-7%			
4.2	10-16 mm	+- 5%			
4.3	16 mm and above	+- 3%			
5	Tolerance in steel placement	Tolerance limit			
5.1	Cutting to length	+- 1 inch			
5.2	Hooked bars length	+-12.7 mm for #7 or smaller bars +- 25.4 mm for bars larger than #7			
5.3	Truss bars overall length	+-12.7 mm for #7 or smaller bars +- 25.4 mm for bars larger than #7			
5.4	Tension bars in beams or walls	+-9.5 mm for #8 or smaller bars and +- 12.7 mm for bars larger than #8 bars			

5.5	Lap and splice location	+- 25.4 mm Minimum 304.8 mm splice length	
5.6	Spacing	Minimum distance between bars +- 6.35 mm. In uniform spacing (from theoretical location), +- 50.8 mm.	
5.7	Minimum cover	minus 9.5 mm for #8 or smaller bars and minus 12.7 mm for bars larger than #8 bars	

Table 6.1.1 Tolerance limit of reinforcement

# **Exercise**



- 1. The minimum cover to ties and spirals should not be less than
  - a) ISmm
  - b) 20mm
  - c) 2Smm
  - d) SOmm
- 2. The cover to the main reinforced may be reduced up to one third of the specified cover but not less than
  - a) Smm
  - b) IOmm
  - c) 7mm
  - d) ISmm
- 3. Pick up the correct statement regarding columns.
  - a) In helically reinforced column, the minimum number of longitudinal reinforcement should be six
  - b) The minimum of longitudinal bars provided in rectangular and circular columns are 4 and 6 respectively.
  - c) The cross sectional area of longitudinal reinforcement, should not be less than 0.8% nor more than 4% of its gross sectional area.

	d) All the above
4.	The minimum horizontal distance between two parallel main reinforcing bars, is
	a) the diameter of the longer bar if their diameters are unequal
	b) greatest value of the above
	c) the diameter of the bar if their diameters are same
	d) 5 mm more than nominal maximum size of the coarse aggregate
5.	All reinforcement should be free from
	a) loose mill scales
	b) loose rust
	c) paints
	d) all the above

Notes 📋 —		

# **UNIT 6.2: Insertion Sequence Of RCC Elements**

# - Unit Objectives | ◎



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

- 1. Discuss about various RCC structural elements
- 2. Discuss about RCC slabs
- 3. Discuss about RCC beams
- 4. Discuss about RCC columns
- 5. Discuss about footings
- 6. Discuss about RCC walls
- 7. Discuss about staircases
- 8. Insertion and fixing sequence of RCC elements

# **6.2.1** Reinforced Concrete Cement (RCC) -

Concrete is strong in co m pression but weak in forces steel is added to concrete. Concrete and steel together makes it reinforced cement concrete (RCC) RCC is proportional mixture of cement. sand & aggregates embedded with steel with water & admixtures added hardness over time to form stone like product.

Fig: 6.2.1 RCC works

#### **Advantages of reinforced concrete**

- RCC is strong in both compression & tension making it suitable for most types of construction activities.
- It has better resistance to fire than steel and capable of resisting fire for a longer time.
- It has long service life with low maintenance cost.
- In some types of structures, such as dams, piers and footings, it is the most economical construction material.
- It can be cast to take the shape required
- It yields rigid members with minimum apparent deflection.

• By using steel, cross sectional dimensions of structural members can be reduced e.g. in lower floor columns.

#### Disadvantages of reinforced concrete

- · It needs mixing, casting and curing, all of which affect the final strength of concrete
- The cost of the forms used to cast concrete is relatively high

## 6.2.2 RCC Structural Elements -

RCC structural elements comprise the following:

- Footing
- Column
- Beam
- Slab
- Wall
- Staircase

These are explained in details in the following sub sections

#### 6.2.2.1 Foundations –

Foundations are the base on which entire structure is built. These are the lowermost part of the structure and are built on the hard ground. They transfer the entire weight of the building to ground. There are different two types of foundations.

- 1. Shallow Foundations e.g. Raft, pile, isolated combined etc.
- 2. Deep Foundations e.g. pile foundation, well foundation

As a part of this course we shall discuss only isolated footing and raft foundation:

#### Isolated footings

As the name suggest isolated footings transfers the load from a single column to ground. This type of foundations are used when the load form the building is not too large, when the building is to be constructed on hard ground or when the columns are placed far from each other. The isolated footing can be of various shapes, pad footing, step footing, slope (trapezoidal footing).



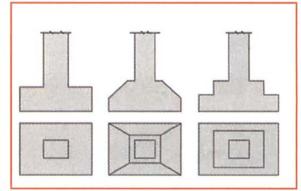


Fig: 6.2.2 Isolated footings

A raft or mat foundation is continuous slab of reinforced cement concrete, covering the entire area of the bottom of the structure, it is used in places where the soil quality is poor and cannot support the weight of the building, when a number of columns and walls are to constructed close to each other or when the weight of the building is too large. Normally, the raft is constructed directly on the ground but under exceptional circumstances, like when the quality



Fig: 6.2.3 Raft Foundation

of soil is exceptionally poor, piles may be constructed underneath the raft as a part of the raft.



Fig: 6.2.4 Raft Foundation

# **6.2.2.2 RCC Column**

A column is a vertical member constructed from reinforced cement concrete to transfer the weight of the slab, through beams to foundations.



Fig 6.2.5: RCC Column

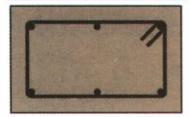
# **Types of Columns**

Columns can be classified bases on its Shape:

• Rectangle



• Circular







# **6.2.2.2 RCC Column**

Beams are horizontal structural members usually made from RCC. These members rest on the columns, the transfer the weight of the slab to the columns on which they rest.



Fig. 6.2.6 Beam Reinforcement

There are different types of beams based on the functions and location of the beams, these are

1. **Simply supported beams:** These are most common types of beams having single span and having no anchorage to at support.

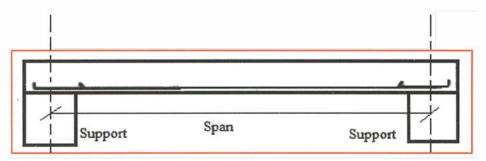


Fig. 6.2.7 Simply supported Beam

2. **Continuous beams:** These beams have multiple spans i.e. these beams rest on more than two columns

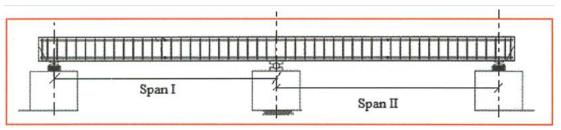


Fig. 6.2.8 Continuous Beam

3. Cantilever beams: these beams are supported only at one end; the other end is left projecting without support.

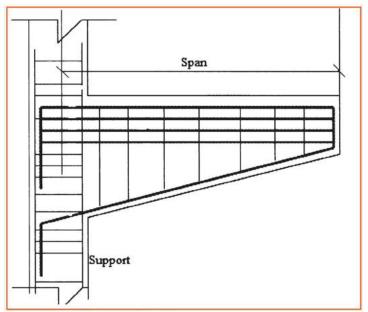


Fig. 6.2.10 Reinforcement for Slab

## 6.2.2.4 RCC Slab -

Slabs are horizontal elements in building floors and roof. The depth of the slab is usually very small relatively to its length and width.

- RCC Slabs whose thickness ranges from 10 to 50 em are most often used for the construction of floors and ceilings.
- In high rises buildings and skyscrapers, thinner, pre-cast concrete slabs are slung between the steel frames to form the floors and ceilings on each level.



Fig. 6.2.10 Reinforcement for Slab

#### **Types of Solid RCC Slab**

RCC slab can be ribbed slab, flat slab, solid slab, continuous slab, simply supported slab etc. RCC solid slabs are three types depending on design criteria:

- **One-way slab**: One way slab is supported on two opposite side only thus structural action is only in one direction.
- **Two-way slab**: Two way slabs are the slabs that are supported on four sides and the ratio of longer span (I) to shorter span (b) is less than 2.
- Cantilever slab: Projected slab from one support.

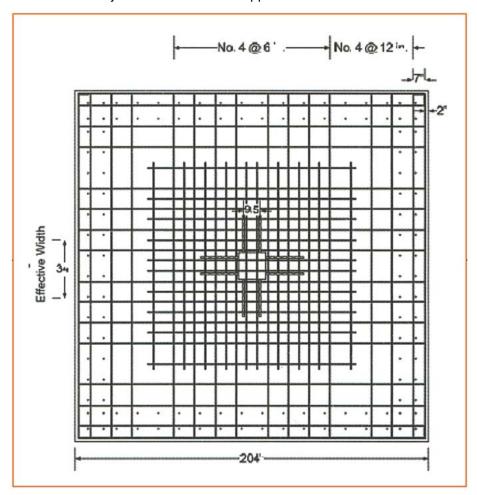


Fig. 6.2.11 Slab drawing

## 6.2.2.5 RCC Wall -

RCC Walls are important structural elements in high-rise buildings. Their function in a building is to help take care of horizontal forces on buildings like wind and earthquake loads, or to act as retaining wall to hold earth or water.

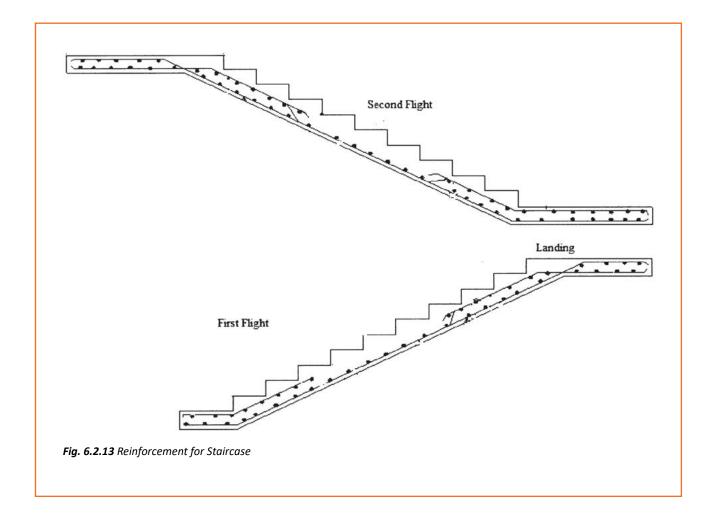


Fig. 6.2.12 Reinforcement for RCC wall

#### **6.2.2.6 Staircase** -

Staircases provide means of movement from one floor to another in a structure. Staircases consist of a number of steps with landings at suitable intervals to provide comfort and safety for the users. There are different types of staircases like:

- 1. straight-flight stairs,
- 2. quarter-turn stairs,
- 3. half-turn stairs,
- 4. branching stairs, and
- 5. geometrical stairs.



# **6.2.3 Insertion And Fixing Sequence Of Various**Strutural Elements

Up till the previous chapter we have studied the fabrication of rebars i.e. cutting, bending and storing of rebars. In the subsequent units we shall discuss the fixing sequence of different structural elements, it should however be noted that while describing this sequence it is assumed that

- 1. all rebar fabrication activities are completed
- 2. all shuttering and layout activities are completed
- 3. pee works in foundation are completed

# **6.2.3.1** Insertion And Fixing Sequence of Footing

Following sequence is adopted while placing reinforcement for isolated footing:

- Identify the layout point for the footing.
- As per the drawing, from the outermost point of the footing leave instructed cover to locate the point for first rebar.
- From the point of first rebar mark the location of rebar on ground from the spacing provided (this is rebar in x direction).



Fig. 6.2.14 Reinforcement for isolated footing

- Place the fabricated rebar in x direction as per the spacing marked
- Now on the corner rebars mark the spacing for rebar to be placed on top, (this is rebars in y direction).
- Identify the location of vertical bars and place accordingly.
- Now tie the rebars.

If top reinforcement is to be provided, then

- Place chairs of suitable height as per the instructions of seniors or as per requirement
- Carryout out the above procedure in reverse i.e. first place the rebar in y direction and then in x direction

# 6.2.3.2 Insertion And Fixing Sequence of Column And Wall

For placing bars for columns it is important to note that the rebars have to be vertically placed and should be continuous. This is almost impossible as the max length of rebar is 12 m and height of the column may be more or less than that. In such cases lapping plays a very important role.

Following points should be kept in mind for lapping of rebars in columns:

- Lapping in alternate bars should come at same height.
- Lapping should not be done at the junction of beam and column.

Lapping should be at mid height of a column

Following sequence is adopted while placing reinforcement for columns:

- Identify the numbers and diameter of rebars from the BBS.
- Check the spacing of rebars.
- Ensure that lapping is done as per above points.
- Mark the spacing for stirrupsj links on rehars
- Place and tie rebars at marked spacing.



Fig. 6.2.15 Staggered lapping in column



Fig. 6.2.16 Reinforcement work on column

# **6.2.3.3** Insertion And Fixing Sequence Of Beam

Once the column rebars are placed, following sequence is adopted while placing reinforcement for beams:

- Identify the location of the beam and confirm the depth of the beam.
- Mark the depth of the beam without the cover on the columns in which the beams are to be placed.
- Tie the bottom bars on the columns and mark the position of stirrups on the same.
- Insert stirrups and tie the same at proper intervals.
- Insert top reinforcement and tie stirrups.
- Place cover blocks.
- Remove the tie at the columns and lower the beam into shutter.





Fig. 6.2.17 Reinforcement work in beam

# **6.2.3.4 Insertion And Fixing Sequence of Slab**

The placing and tying sequence of the slab is very similar to that of a footing

Following sequence is adopted while placing reinforcement for slabs:

- Note the spacing required for placing the bars from the drawings.
- Mark the spacing on the bars before placing the bars,
- Place the bars as per markings and reconfirm from instruction and drawings.
- First place the bottom bars of the reinforcement.
- Start placing the rebars from the corner and place the next rebar besides it as per the marking.

- Tie the rebar by binding wire.
- Place the rebar chair below the rebars.
- Now place the upper bars and tie with the binding wires.

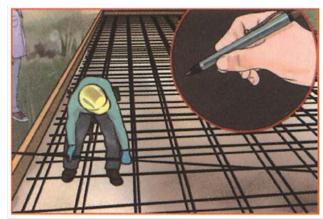


Fig. 6.2.18 Placing rebar





Fig. 6.2.19 Reinforcement work for slab

# **6.2.3.5** Insertion And Fixing Sequence Of Staircase

Following sequence is adopted while placing reinforcement for staircase:

A staircase consist of 2 flights of stairs, both the flights are casted together thus, rebar work for both has to be done together

- On the landing slab, the bottom reinforcement L1 is placed; it is extended onto the waist slab as top rebar.
- Rebars in y directions are marked, placed and tied.
- Chairs are placed at proper location.
- Bottom Bar MI is the bottom bar of the floor slab is extended to landing; this is the main bar of the waist slab as shown in figure given below.
- This bar is extended to the top of landing.

- Markings to be carried out for extra bars.
- Extra bars to be placed and tied as per markings.
- Top bar from the floor slab M2 is extended to the length specified in the drawings onto the waist slab.
- Extra bars are placed with help of chairs.
- Similar procedure is followed for the second flight.

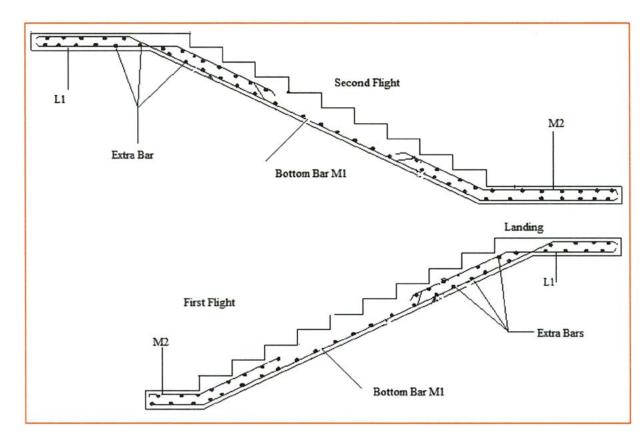


Fig. 6.2.20 Reinforcement work for staircase

It is important to note that placing cover block and ensuring proper margins for covers is provided is an integral part of the work and sequence.

This has to be properly done as per the instructions recived from superiors.

# **Exercise**



- 1. The main reason for providing number of reinforcing bars at a support in simply supported beam is to resist in that zone
  - a) compressive stress
  - b) shear stress
  - c) bond stress
  - d) tensile stress
- 2. The maximum reinforcement in a column is
  - a) 2%
  - b) 4%
  - c) 6%
  - d) 8%
- 3. For a longitudinal reinforcing bar in a column, the minimum cover is
  - a) 15mm
  - b) 25mm
  - c) 30mm
  - d) 40mm
- 4. Fill the columns: Tolerance limits of the RCC structures

Structure	Tolerance Limit
Slab	
Column	
footing	
Beam	

Notes 🗐 —		
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# **UNIT 6.3: Prefabricated Cages**

# Unit Objectives ♥



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

- 1. Know about prefabricated cages
- 2. Know about installation of prefabricated cages

# **6.3.1 Prefabricated Cages** -

Many times it is not possible to the reinforcement at deserted locations at site. It may also be required that due to structural requirements reinforcement should have no deviations or have zero tolerances. In such case rebars are placed and tied at some location to form mesh or cages and the then transported to desired locations. This method of reinforcement working is called prefabricated cage system. The prefabricated cages can be factory made or can be assemble at yard or site. Below diagram shows the various locations at which precast cage can be used.

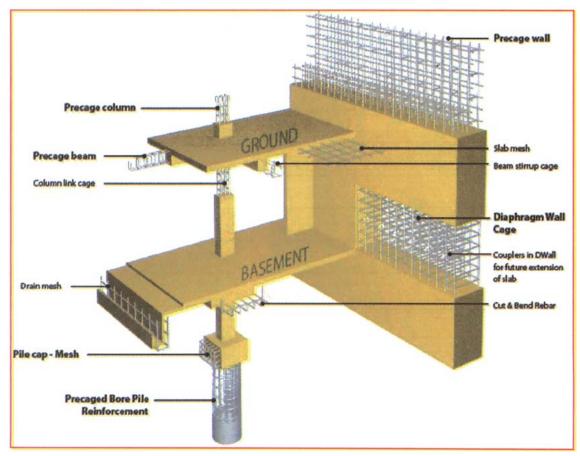
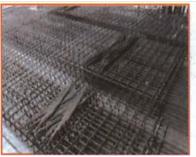


Fig 6.3.1: Prefabricated Cage System







Diaphragm Wall

Column Cage

Beam Cage







Core Cage

**Bored Pile Cage** 

Micro Pile Cage

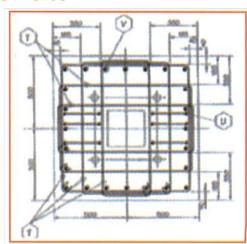
Fig 6.3.2: Prefabricated reinforcement cages

## Benefits of prefabricated cages are:

- Supports constructions with skill gaps
- Faster and correct placement of reinforcement on site
- Eliminates steel losses on site
- Saves labor
- Saves time on maintaining contract programme

# **6.3.2 Fabrication ·Of A Steel Cage On Site**

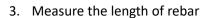
- 1. Refer drawing, specification and instructions;
  - Confirm the location of member.
  - Refer BBS / drawings/ instructions etc.
     regarding the bending requirements
  - Obtain instructions regarding process to be followed



**Fig 6.3.3:** Reinforcement drawing of column & footing

## 2. Collect the tools and materials

- Check whether available cut pieces can be used instead of cutting a new bar
- Confirm the size of bar before cutting.
- Ensure that bars are straight.
- Identify tools and materials required based on the instructed



- Identify the bar length requirements from the BBS.
- Take the tape rule and measure the length of rebar following the standard procedure.
- Take the chalk or marker and mark the point on the rebar.
- Reconfirm the markings before cutting the bars

## 4. Cut the rebar

 Select the cutting tool i.e. hacksaw, power grinder and cut the rebar of required specification as per the BBS/ drawing/ specifications/ instructions.

## 5. Bend the rebar as per appropriate

- Bend rebars using bending lever (manual bending) or bending machine (mechanical bending).
- Prepare required number of bent bars, stirrups etc and stack then as per standard procedure.
- Make the required specification stirrups, chairs, dowels as per the BBS.



Fig 6.3.4: Selection of Tools and materials



Fig 6.3.5: Marking of cutting Length



Fig 6.3.6: Cutting rebar



Fig 6.3.7: Bending rebar

## 6. Assemble the rebars

- Note the spacing required for placing the bars from the drawings
- Mark the spacing on the bars before placing the bars
- Place the bars as per markings and reconfirm from instruction and drawings.

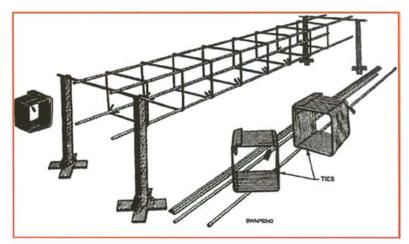


Fig 6.3.8: Assembling of rebars

## 7. Tie the rebars

- As per the requirement cut the binding wire
- Tie the reinforcement using appropriate tie following standard procedure.

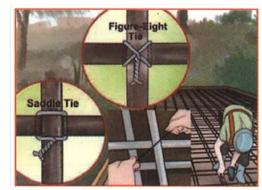


Fig 6.3.9: Tying rebar

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# 7. Basics of Concreting And Shuttering Works

Unit 7.1 – Shuttering works

Unit 7.2 – Concreting works



# **Key Learning Outcomes**



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

- 1. Discuss about shuttering;
- 2. Discuss about types of shuttering;
- 3. Know about precautions taken during shuttering works;
- 4. Know about removal of shuttering;
- 5. Discuss about concrete; and
- 6. Know about concreting process.

# **UNIT 7.1: Shuttering Works**

# Unit Objectives 6



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

- 1. Discuss about shuttering;
- 2. Discuss about types of shuttering;
- Know about precautions taken during shuttering works; and
- 4. 4. Know about removal of shuttering.

# 7.1.1 Shuttering

Shuttering activity is a part of formwork, which supports the molding surfaces for example column sides, beam sides, slab side, wall side etc.

**Shutter** is a combination of temporary mold and supports that are created from wood or steel so as to provide appropriate/ required shape to the green concrete.

The work of shuttering is done by shuttering carpenters who work on wood or metal to produce the molds of desired shape and dimensions



Fig 7.1.1: Shuttering

# 7.1.2 Types of Shuttering ———

## Shuttering systems can be broadly classified into 2 categories

- ConventionalshutterIng
- System shuttering

## **Conventional shuttering**

This refers to the use of traditional technique & material to prepare shutters and erect framework, generally the material used are bamboos & ballies, pipes & couplers. This system of shuttering is usually used for small works.



Fig 7.1.2: Conventional shuttering

## **System shuttering**

The term system shuttering refers to a collection of modern systems that have a very wide range of application and differentiate from the conventional shuttering. Following are included in the preview of system shuttering.

- 1. Mivan system
- 2. Doka system
- 3. Jump system
- 4. Slip form system
- 5. Aluform system etc.



Fig 7.1.3: System shuttering

## Difference between conventional and system shuttering

## 1. Based on Material Used

- In conventional formwork, timber and plywood are generally used materials in making shutters panels
- In System formwork, plywood, steel and aluminium are generally used materials in making shutters panels



Fig 7.1.4: Timber in conventional form work



Fig 7.1.5: Steel and Aluminium in system form work

- **2. Time consumption:** In Conventional Formwork it is very time consuming for large structures. System framework is designed for speed and efficiency.
- **3. Lifespan of Formworks:** Plywood Conventional formwork has relatively shorter life span then System formwork because in this aluminum and steel are used as material.
- **4. Depends on labour cost:** In conventional formwork labour cost are less as compared to System formwork where labour costs are higher than the cost for procuring reusable formwork.
- **5. Flexibility Factor:** Conventional formwork is more flexible to use whereas System

1. framework has no flexibility.

## Advantages of system formwork over conventional formwork

- By going in for system formwork, substantial savings are possible by faster return on investments.
- System formwork labour costs are high.
- System framework is designed for speed and efficiency.
- Life span of system formwork is more.

# - 7.1.3 Shuttering Process Obtaining instruction/specification from drawings Identification, selection and collection of **Preparatory Works** required materials Cleaning of shutter panels Fixing Assembling and dismantling Bracing Dismantling Quality check Quality checks Storing Housekeeping & Waste disposal Waste Disposal Fig 7.1.6: Shuttering work process flow

Each of these points is described in details in following sub section.

# 7.1.3.1 Shuttering Assembly Process

## **Preparatory works**

For shuttering works, a shuttering carpenter has to do some preparatory works:

**1. Drawings and instructions:** First collect and understand the shuttering drawing, to understand the job properly.

2. Collection of tools and materials: For shuttering work below mentioned hand tools, power tools and measuring instruments required. Selection of shuttering boards can be done on the basis of type of shuttering whether it is of plywood or steel.



Fig 7.1.7: Shutter panne/s

## **Preparatory works**

Tool	Image	Use		
Hacksaw		Hacksaws are used to cut the formwork.		
Chisel		Chisel is used to cut the plywood with the help of hammer.		
Hammer	ST. Control of the co	Hammer is used to strike over the chisel to cut the plywood.		

Hand Drill	A hand drill is a fastening tool used to secure screws or bolts		
Circular saw	Circular saw is a hand held power saw, a basic tool in a carpenter, builder, or home renovator's tool kit		
Power saw	A power saw is used to cut the metal shutters.		
Planar machine	The planer is a machine tool designed to produce plane and flat surface on a workpiece which is too large or too heavy.		

## Measuring instruments required

Measuring instrument	Image	Use		
Spirit level	THE PHATE	A spirit level is generally used to check the vertical and horizontal accuracy of the rebar structur e.		
Plumb bob		A plumb bob is generally used to check the vertical accuracy of the rebar structure.		
Steel rule	The same of the sa	It is use to measurement and marking of rebar length.		
Tape rule		It is use to measurement and marking of rebar length.		
Engineers square		Consists of a metal blade set at 90 degrees to a solid metal block (the stock).		

## **Cleaning of panels**

- The formwork should be cleaned of all rubbish particularly the sawdust savings & chippings etc.
- Before placing, the face of formwork in contact with concrete shall be cleaned & treated with release agent like raw linseed oil or soft soap solution as to prevent the conc. getting struck to the formwork.

Fig 7.1.B: Cleaning of panels

## Assembling and dismantling

- Check the size of shuttering as per drawing.
- Plywood sheets fabricated with adequate battens and stiffeners is used for making of shuttering.

- To check the correctness of dimensions the diagonal should be checked and shuttering should be properly aligned.
- With the help of adjustable steel props plumb formwork both ways and securely support. Plumb bob is used to check the verticality of column.
- For good quality shuttering it should be strong enough to take the pressure of fresh concrete and didn't change its position during concreting.
- Make sure that the props are safe secure to the fformwork
   and the floor, and should be easily adjustable for pushing and
   pulling operational. The recommended angle of propping to the floor is 45 degree.
- Formwork should be properly support to props or it should be at its position while pouring the concrete. It should not move horizontally or vertically during concreting.
- To avoid bulging clamps should be fixed at O.GOm interval. To
  prevent the leakage of slurry it should be sealed by any filling
  material so that the gaps in the column shutter remove.
- Make sure that cover block used for casting has the same or above grade as of concrete. They are not broken and properly positioned.



Fig 7.1.10: Plumb checking of column

Minimum 24 hours are recommended for de-shuttering of formwork.



Fig 7.1.11: Shuttering prop angle



Fig 7.1.12: Cover Block

## Dismantling of shutter

- 1. Panel puller is used for removing the wall panels.
- According to the environment and type of concrete an appropriate time should be given for the stripping of formwork panels.
- Dismantle of the formwork panels of the wall and column section can be done usually after 12 hours. However, this process shall subject to approval of the project structural

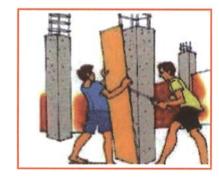


Fig 7.1.13: Dismantling of shutter panels

engineer/site supervisor after taking into consideration the grade of concrete used, additional props

stand ordered etc.

- 4. Always ensure that the wall section panels are removed first followed by the column section.
- To prevent any damages to the formwork panels and also finish surface of the concrete whichever possible ensure that formwork panels are removed systematically.
- Ensure that no workers are facing the pin and wedges when removing using hammer for safety reason.



Fig 7.1.14: Dismantling of Shutter panne/s

- 7. Ensure that the pin and wedges are collected and placed in containers which are to be removed in order to minimize material loss and replacement cost.
- 8. The dismantle formwork panels shall be transferred to the next level/floor for subsequent assembly process while the slab opening or staircase areas in an orderly manner and to the appropriate section/ area immediately.
- 9. Numbering is to be done on the formwork panels and it is also recommended for color identification scheme to be implemented, to ease the transportation of panels to the various sections / areas of one level/floor to the subsequent level/floor.
- 10. Properly clean and apply the form release agent to protect the surface of the formworks before reuse.
- 11. For the external wall section, the starter blocks (kickers) on the upper portion of the floor level shall remain intact to support and align the next level/floor of formwork panels that are going to be assembled.
- 12. Without damaging the concrete structure the formwork panels shall be removed.

## **Quality check**

- 1. Process for carrying out quality checks for shuttering works
  - Confirm compliance with design requirements as specified on the drawings and specifications.

- Setting out, line and level to be confirmed.
- Condition of forms Ensure forms are fit for purpose, sealed around edges where required and shutter release agent applied prior to fixing of reinforcement.
- Workmanship of shuttered areas (especially with reference to gaps where grout leakage may occur).
- Confirm adequate support especially with regard to the holding down and bracing of circular voids.
- Removal of formwork Ensure methods for removal of formwork are such that no damage occurs to the freshly cast concrete.
- Chamfers on exposed surfaces should be formed using new materials and be adequately secured in position during concreting.
- Kickers should be formed and cast monolithically with foundation concrete.
- Height of kickers to be between 75 and IOOmm.
- The kickers should be of the grade of concrete of the element above.
- At horizontal construction joints ensure the existing concrete surface is free from all grit and loose material prior to casting.

## Housekeeping and waste disposal

## 1. Storing

- Clean forms with stiff brush and clean cold water. Use scrapers only as a last resort.
- Keep forms well oiled to prevent delamination
   of plywood or rusting of steel and always oil the edges.
- Any formwork with steel components should be stored in the dry.
- Avoid direct sunlight on timber forms.
- Store clear of the ground without twist or bend, and keep free of dirt.
- 2. Waste disposal: Dispose of waste after completion of removal of shutters. Waste may be of:
  - Wood: Plywood or sawdust
  - Cardboard: Cardboard packaging material
  - Electrical: wires, cables and other material
  - Other such as Paper, fiberglass etc.

This waste needs to be disposed of in a suitable environmental friendly way.



Fig 7.1.15: Storing of shutter panel

# **Exercise**



- 1. A tool used for removing material from a surface.
  - a) nail set
  - b) level
  - c) scraper
  - d) hack saw
- 2. A sharp-pointed tool for marking wood or metal.
  - a) hack saw
  - b) back saw
  - c) scraper
  - d) scratch awl
- 3. An L-shaped tool used to mark or measure materials and check for uniformity and "square".
  - a) carpenter's square
  - b) surveyor's tape
  - c) speed square
  - d) try square
- 4. Explain the difference between tradition and conventional shuttering.
- 5. Explain the procedure fixing and bracing of shutter panels.

# **UNIT 7.2: Concreting Works**

# - Unit Objectives 🏻 🏻 🌣



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

- 1. Discuss about concrete
- 2. Know about concreting process

# - 7.1.1 Shuttering

Cement is a crystalline calcium compound which has hydraulic properties. Cements are hydraulic as they have the ability to set and harden with excess water through a chemical process.

A few points should be taken into account while checking the condition of cement

- 1. Date of packing: cement bag should not be more than 90 days
- **2. Color:** It should be greenish gray in color

Fig 7.2.1: Cement

- 3. Grade: The most important part in determining the best quality cement is to check for its grade. 33 grade, 43 grade, and 53 grade are the three grades of OPC used in India. The 33 grade cement means that the compressive strength of the cement is 33N/mm2 when tested as per Indian Standards under standard conditions.
- 4. Hardness: Take some cement, prepare paste, and place on a plate giving a square shape. When it is immersed slowly into a bucket of water, ensure that it does not lose the shape and that it hardens after 24 hours
- 5. Impurities: Throw a small quantity of cement in a bucket of water, the cement should float for a few minutes before it sinks. The immediate sinking of cement indicates the presence of impurities
- 6. Smoothness: Take a pinch of cement in your hands and rub between the fingers, it should give a smooth finish.
- 7. There should be no lumps or dust in the cement

# - 7.2.2 Concreting

Concrete is a proportional mixture of cement, water and aggregate.

When prepared it is a semi-solid state which allows it to be more easy to use, this is called green concrete. However, over a period of time the concrete hardens to form a stone like hard material

this is hardened concrete and the time taken for hardening of concrete is called as setting time.

The process of batching, mixing placing and curing of concrete is called concreting. Preparation of concrete at site consist of the following detailed steps.



Fig 7.2.2: Placing concrete cement on site

# - 7.2.3 Concreting Process

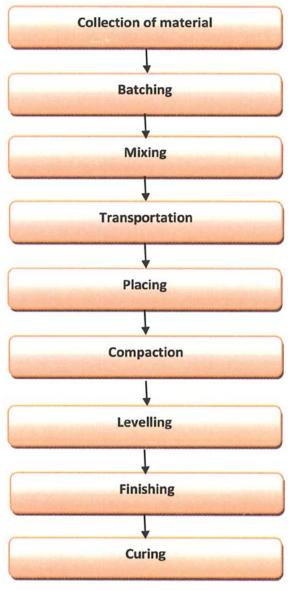


Fig 7.2.3: Concreting work process flow

## Material for concreting

The first and most important step in the concrete process is to determine the ingredients that will make up the concrete.

These are collected and stacked near the place where the mixing will be done.

## **Batching**

All ingredients in the concrete have a specific proportion that is pre determined or specially designed by engineers. During the batching stage of concreting it is ensured that the ingredients are added in required proportions only.

All ingredients are measured and placed together in a heap (manual mixing) or poured into the mechanical mixer.

## Mixing

During this stage the cement, sand and course aggregate and other admixtures (if any) are mixed in a dry state; after



Fig 7.2.4: Material for concreting



Fig 7.2.5: Machine mixing

the dry mix is uniform then water is added according to the requirement. The wet mixture is mixed until it is uniform.

## **Transportation of concrete**

Depending upon the site conditions and requirements the concrete can be transported manually, mechanically or by combination of both. There are many modes of transportation as shown below:

- 1. Wheelbarrow or motorized buggy
- 2. Truck mixer
- 3. Bucket or steel skip
- 4. Chute
- 5. Belt conveyor
- 6. Concrete pump



Fig 7.2.6: Transportation of concrete on wheel barrow



Fig 7.2.7: Transportation of concrete by trucks

## **Placing of concrete**

After reaching the desired location, the concrete is poured into the shuttering form that is specifically constructed of the required dimension and size. The poured concrete is then spread uniformly across the shutters. This is called as placing of concrete.



Fig 7.2.8: Placing of concrete

## Compaction

Once the concrete is in place, it should be compacted to remove large air voids developed during placement and to make sure that the concrete has flowed into all of the corners and nooks of the formwork.

The two most common methods of compaction are vibration and roller compacting.



Fig 7.2.9: Compaction

## Leveling

All the structural members have a specific dimensions including depth.

Once the concrete is place and compacted it is important to ensure that the depth of the structure is maintained uniformly throughout the structure. This is achieved by spreading the concrete to desired level.

## **Finishing**

Finishing refers to any final treatment of the concrete



Fig 7.2.10: Leveling

surface after it has been levelled to achieve the desired properties. Floating and troweling is a process of compacting and smoothing the surface which is performed as the concrete is starting to harden.

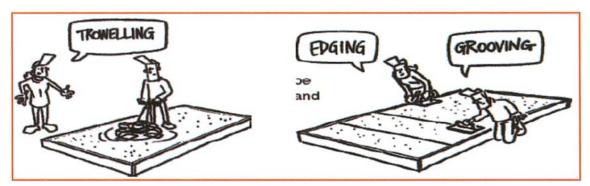


Fig 7.2.11: Finishing

## Curing

After the finishing work on concrete surface is completed; it should be cured to gain strength.

Curing refers to the procedure of providing water to concrete for performing chemical reactions through which it attains strength. The most common way of doing this is by pouring water through various means like ponding, sprinkling etc. however in some conditions where water is not available in plenty, chemicals and coating are used to cure concrete with less quantity of water.



Fig 7.2.12: Curing

## **Exercise**



- 1. The number of grades of concrete mixes, is
  - A. 3
  - B. 4
  - C. 5
  - D. 6
- 2. After casting, an ordinary cement concrete on drying
  - A. expands
  - B. mix
  - C. shrinks
  - D. none of these.

3	. Р	roper proportioning of concrete, ensures
	Д	. desired strength and workability
	В	. water tightness of the structure
	C	. resistance to water
	C	all the above.
	_	
4	. (	uring
	Д	. reduces the shrinkage of concrete
	В	. preserves the properties of concrete
	C	. prevents the loss of water by evaporation
	C	. all of the above.
5	. V	hile compacting the concrete by a mechanical vibrator, the slump should not exceed
	Д	. 2.5 cm
	В	. 5.0 cm
	C	. 7.5 cm
	D	. 10 cm
6	. т	he commonly used material in the manufacture of cement is
_		. sand stone
	В	
	C	
	C	. graphite.









# 8. Working Effectively In A Team

Unit 8.1 – Effective communication with others

Unit 8.2 – Working in a team



# Key Learning Outcomes 👸

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

- Know about effective communication skills;
- 2. Know about oral and written communication;
- 3. Know about how to communicate others at workplace;
- 4. Know about working as a team; and
- Know about supporting colleagues at working; 5.

# **UNIT 8.1: Effective Communication With Others**

# - Unit Objectives | ©



## Towards the end of this segment, you will be able to:

- Know about effective communication skills
- 2. Know about oral and written communication
- 3. Know about how to communicate others at workplace.

## 8.1.1 Communication

Communication is a vital part of everyday lives. Whenever interact with people individually or in groups, there is communication taking place. This brings us to a very important question, what exactly is communication?

## What is communication?

Communication is about the sharing and distribution of information .. It is only effective when the message from sender is fully understood by the receiver.x

## **Communication process:**

The communication process can be explained using the following flow chart.

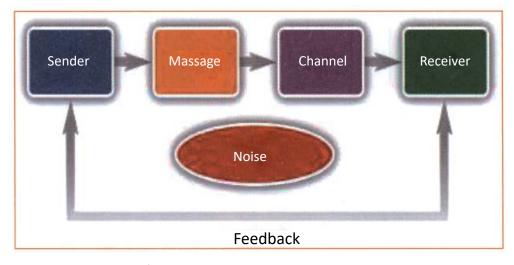


Fig 8.1.1: Communication process

- For any type of communication to have a purpose, it should involve at least 2 individuals one sending the information and other receiving it.
- The sender will forward the information in form of a message, (a message is a written, oral or recorded piece of information) A message can be anything ranging from sentences we speak, our expressions, to drawings and instruction sheets that we receive.

- The channel is the mode through which the receiver will receive the message.
   For E.g. if we are sending the message via e-mail then email is the channel of communication.
- It is important to mention here that the interpretation of message is completely dependent on the receiver. This means that if the message contains conflicting or contradicting information, in such case the

convey a clear and precise message



contradicting information, in such case the Fig 8.1.2: Communication between two workers information becomes dependent on the interpretation of receiver. Thus, it is important to

 Feedback is given by the receiver to the sender. This helps to understand whether the information received has been interpreted accurately or whether further clarification is required.

# 8.1.1.1 Types Of Communication

## There are various means and ways to communicate, a few of them have been listed below:

- a letter, note, card, memo, list, diary entry, email, text message, social media
- a conversation (in English or other language)
- body language, facial expressions, crossing your arms or legs, leaning forward or back
- the use of signs, graphs, pictures or charts
- pointing to something, waving, putting your hand up
- Tapping someone on the shoulder to gain their attention.

## The modes of communication can be broadly classified into three types

- 1. Verbal communication
- 2. Nonverbal communication
- 3. Written communication

## **Verbal communication**

Verbal communication refers to messages and information transferred orally. This can be in form of instructions, telephonic conversations, face to face conversations etc. Effective oral communication requires a person to have a clear voice and idea of the topic of communication. For Example:

To take or give orders on a job site, a worker must communicate with others effectively. When he speaks, others must be able to understand what he is saying and apply the information he is conveying to their work. He must be able to talk with people from different backgrounds and education levels. This requires the skill to communicate to a person's level of understanding without being condescending or insulting.





Fig 8.1.3: Verbal communication

## Non verbal communication

Non-verbal communication is a term that describes the medium of communication we use in order to enhance our verbal communication. Non-verbal communication includes body language, gestures, facial expression, eye contact, signboard, safety rules, safety tags, sketches and even photographs.

Often, people will pay more attention to non-verbal messages than what someone is saying, particularly if the two are contradictory, e.g. a person is making positive comments, but wears a frown and has their arms crossed, suggesting defiance. We need to be aware of our own non-verbal behavior, since we can often communicate things unintentionally

## Non-verbal behavior when dealing with others

Being aware that your client's body language can assist enormously in understanding what is really being said beyond the level of the words spoken. It is important to be cautious of interpreting body language on the basis of a single gesture. Ensure your body language gives the message that you are friendly and open to suggestions.

Take a look at the table following, which shows body language examples that project a positive or negative stance.

Positive body language includes	Negative body language includes
<ul> <li>looking at the other person's face</li> <li>making frequent eye contact</li> <li>nodding and smiling as other person speaks your arms</li> <li>uncrossing your arms</li> <li>having open hand gestures</li> <li>relax fingers and hands</li> <li>if standing, turn towards the other person</li> <li>sitting with your legs uncrossed</li> <li>leaning slightly towards the other person</li> <li>sitting when the other person sits, standing when the other person stands</li> <li>maintaining a relaxed posture</li> </ul>	<ul> <li>avoiding looking at the other person at all</li> <li>avoiding the other person's eyes or staring aggressivelyrepeatedly licking your lips or clearing your throat</li> <li>repeatedly licking your lips or clearing your throat</li> <li>keeping your arms folded</li> <li>clasping your hands tightly together</li> <li>banging the table or pointing at another person</li> <li>sitting with your legs crossed particularly if you swing one leg</li> <li>leaning away from the other person</li> <li>striding around the room disregarding the other person's body language</li> </ul>

Table 8.1.1: Difference between positive and negative body language

## **Written Communication**

Written communication refers to the mode of communication in which messages are transferred through written mode. This can be in the form of SMS or through other messaging applications, E-mails, Letters etc. Effective written communication requires a person to have a good command of the language and vocabulary, further the person should be able to read and write in the required dialect.

# 8.1.2 Communication Skills



Fig 8.1.4: Oral communication

Strong and effective speaking and listening skills are required to ensure that audience understands clearly what is being spoken about by the communicator. In order to have an effective communication, two-way communication and dialogue are recommended. Besides

having the physical strength and hands-on aptitude required by the specific job, a successful construction worker needs good communication skills to convey abstract ideas or thoughts between his colleagues.

Bar bender has to possess strong oral communication skills, as he/she has to interact with coworkers and supervisors for various routine activities.

## **Listening Skills**

The ability to listen and follow instructions is an important part of a construction worker's life. If a worker has to know how to complete his/her tasks then he/she should have good listening skills. The lack of listening skills can put the worker out of a job. In the absence of clarity, a bar bender should ask questions to complete his/her job successfully.

### Reading

Reading also plays a role in construction as the bar bender read drawings that describe how the job must be completed. A bar bender must be able to effectively read and interpret the drawings to know how to meet engineer or code specifications. Without reading skills, a bar bender cannot complete the work he/she is assigned.

## Vocabulary

A bar bender needs to have a working knowledge of the vocabulary associated with his/her particular job. He/she should know and understand the proper names of tools, processes, methods and techniques used by the construction trade in which he/she is performing the job.

## **Written Skills**

Construction workers need good written communication skills because of the communication technology available in the field. If bar bender receives directions or information in the field through instruction sheets, hand sketches, he should be able to interpret these to survive. A successful bar bender masters written communication skills to mteract with supervisors via these means. This requires accurate spelling, grammar and punctuation skills to communicate ideas clearly and succinctly.

## **8.1.3 Communication With Others**

## Effective approaches to communicate in the Workplace

- One on One: People reciprocate well to a one on one communication. It is essential to establish eye contact during such communication to ensure it is meaningful and impactful.
- 2. Be Confidence and Serious: It is essential that during conveying a message, a person displays confidence and conveys seriousness so that the conversation makes an impact. Team members may treat information with disdain if you are not serious.
- 3. Use Simple Words: In order to have a meaningful and effective communication with your sub-ordinates and seniors, it is devisable to use simple words which could be easily understood. Use of difficult words may cause misunderstandings and waste of time and effort.
- **4. Visuals:** Use visuals for better comprehension so that workers are able to not just hear the message but can also see it.
- **5. Be a good listener:** In order to communicate effectively, be a good listener too. Encourage team members to share their views and communicate openly.
- 6. Use effective Body Language: Body language plays an important role in communicating with the team members. It is advisable to smile, make eye contact, shake hands and sit/stand up right to have effective body language.
- 7. Maintain Appropriate Tone of Voice: While communicating your messages, use appropriate tone of voice to avoid misunderstandings.
- **8.** Avoid Unnecessary Repetition: It is advisable to repeat instructions/messages only in case it is not clearly understood by team members.
- Create a Receptive Atmosphere: Avoid tense environment as communication in a tense environment is usually misunderstood and



Fig 8.1.5: Communicating with others on site



Fig 8.1. 6: Listening skills



Fig 8.1. 7: Visual communication



Fig 8.1.8: Listening skills

message conveyed might not be retained well.

- **10. Be Humorous:** Calm down an unfriendly and tense atmosphere by being humorous at times. It is a proven highly effective method of relieving tension.
- 11. Be Articulate: Communicating in a simple, clear and precise manner will make easier to your team members to understand your message. When communicating with your team members do not mumble words or speak too quickly. It will not give clarity of the subject to the listener. It also shows a lack of confidence on your part. Mumbling displays lack of confidence and reduces clarity of the subject to the listener.
- **12. Encourage Feedback:** Communication is a two way process. The process is complete only when the feedback is received. It shows that the message is well understood by the listener or the receiver.
- **13. Be expressive with your Hands:** Use your hands and body to demonstrate your message. This indicates seriousness of content while communicating with the team members.

## 8.1.4 Information To Be Communicated With The Team

It is very important to share information with the team members to avoid delays in the work and to

prevent processes going wrong. Information should be shared within team members and to other teams who are directly or indirectly involved in the work.

Information that need to be shared within a team consist of:

- List of materials required and their availability.
- List of tools and machines required and their availability.
- Quality of the materials available.
- Process details should be shared with team members.



Fig 8.1.9: Communication in the team

- Provide guidance and share related information with colleagues in case of confusion.
- Communicate use of appropriate work technique and method.
- Seek advice whenever required.
- Communicate effectively the issues that may affect the quality of the work.

Right mode of communication and communicating at the appropriate time is the key to build healthy team relationship and to get the tasks completed on time.

# 

Notes 📋			

# **UNIT 8.2: Working in a team**

# - Unit Objectives 🏻 🎯



## Towards the end of this segment, you will be able to:

- Know about working as a team
- Know about supporting colleagues at work place
- Know about how to work in a team 3.

## 8.2.1 Team work

At workplace, you have to handle types of works and obligations. A few works will oblige you to work without anyone else. Many works will require at least two individuals to cooperate to effectively total the work. You are then member of a "Team."

As a construction worker, mason tiling has to work alongside many other people. Mason Tiling requires the support of subordinates for assistance in completion of the task while he/she needs the support of superiors for guidance in completion of the task. This ascertains that tiling work is a group effort rather than an individual effort. This group effort for completing a given task is called team work.

## What is a Team?

**Team:** Teams are groups of people who work together for a common purpose and possess skill sets which are complimentary to each other.

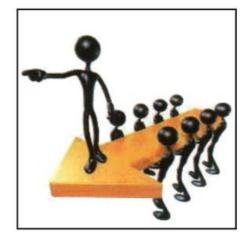


Fig 8.2.1: Team work

To accomplish the goal, it is required that all team members work in unison putting both individual and group effort. For a person who is a new employee, working in a team helps in better training and understanding, thereby increasing the decision making ability and job skills.

## What makes a team "successful"?

Teams which have clear cut goals, a set timeline and undertake responsibility for the outcome are considered successful teams. As a mason tiling, you will be provided with the requirements of each job, time for completion and consequences for not completing the work on time.

Prior to commencement of a job, it is essential to analyze strengths of each member, so that suitability of member for the job can be assessed.

## The issues need to be considered when working in a team:

- Identifying Task requirement identify the task, scope of work and timelines for effective completion of work
- 2. Executing work after receiving the instructions, it is necessary to plan the execution of work. This may include collection of tools and material, following laid out procedures etc.

## As a team member, you are expected to:

- Maintain good relationships with your team members
- Offer support and guidance when needed
- Help determine who does what and when
- Communicate any issues or concerns to the appropriate people
- Play a part in developing a productive and cohesive team



Fig 7.2.2: Characteristics of a team

# **8.2.2** Working well with colleagues

## Treat others with respect and dignity

Working together requires treating each other with mutual respect and valuing their inputs and ideas .This build a trusting foundation for healthy work relationship.

## Manage your emotions

Anger and anxiety are most common emotions observed at the workplace. You must exert a sense of calm and stability to manage your emotions well. This helps improve the work environment even in stressful work situations.

A good method to manage your emotions is to practice relaxation techniques:

- Think positively
- Practice deep breathing
- Listen to relaxing music.



Fig 8.2.3: Working with colleagues

## **Communicate effectively**

To maximise efficiency, effective communication plays an important role in the workplace.

Key components of communication:

- Choice of words
- Tone of voice
- Body language
- Relationships between communicating parties

## **Active listening and Discretionary Speech**

Active listening shows you are genuinely interested in others and it also conveys respect to the speaker. Additionally, saying the right things at the right time is important. In order to do this, you should work towards thinking before you speak.

## Be responsible for your assigned role for the team

Avoid being a lazy member who needs others to make up for his/her inaction. Responsibility in all matters will earn you the respect from your organisation.

## **Acknowledge Contribution**

Appreciation for work done fosters affirmation and validation. A word of thanks or appreciation helps improve the team ethic.

### Make work fun and rewarding

Work should not be boring and repetitive. Adding 'play' to boost innovation at executing tasks at hand can help bring out-of-the-box solutions to problems.

# 8.2.3 What Are The Issues That Should Be Reported?

It is very important to report to the supervisor/ Site Engineer of all the issues that may affect work or quality. Immediate reporting of issues helps the supervisor's/site engineers to get them resolved before they effect the work quality or before any damage is caused to the site / workers. Immediately report to your supervisor If:

- Materials are not available on time.
- Tools / machines are not available on time.
- Machines are not working properly.
- Materials used do not meet the quality standards.
- PPE are not available.

- An employee is not using PPE.
- If you find that someone is doing an operation in wrong way.
- There is some short coming at the work site that may affect the final quality.
- You have any doubt regarding the material/ procedure.
- If your operation is taking more than expected time and effecting the deadline to be met.
- Tools and tackles are not stored properly by the co-workers.
- Electrical fittings are not properly connected and insulated.
- Hazardous materials are not kept at designated place with proper marking.

Problems in your work should not affect others productivity, and problems in others work should not affect your productivity.

# Exercise



- 1. What should team members do to make the team more productive?
- 2. What are the benefits of communicating information with the team members?
- 3. Which of the Following is not a Type of Team?
  - a. Cross Functional
  - b. Virtual
  - c. Problem Solving
  - d. Individual
- 4. Individuals make good decisions much quicker than teams do.

## True or False

- 5. What are habits?
  - a. A habit is a behavior that is repeated frequently.
  - b. A habit is a issue that is repeated once.
  - c. A habit is a behavior that is repeated.
  - d. A habit is a behavior that can't be repeated.
- 6. Why should issues be reported to supervisor?
- 7. Risk is expressed in terms of probability and impact.

True or False









# 9. Plan and organise work to meet expected outcomes

Unit 9.1 – Prioritise work activities to achieve desired results

Unit 9.2 – Organising resources



# - Key Learning Outcomes 💆

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

- 1. learn the importance of time;
- plan activities and schedules; 2.
- learn the importance of targets and time lines set by supervisors;
- prioritise tasks to achieve desired results; 4.
- plan desired resources prior to commencement of work; 5.
- Identify and organise resources prior to commencement of work; 6.
- Organise correct tools and materials for completion of work; and
- Use and engage resources and manpower in appropriate manner. 8.

# **UNIT 9.1: Prioritise Work Activities To Achieve Desired Results**

# - Unit Objectives | ©



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

- 1. Plan activities and schedules;
- 2. prioritise tasks to achieve desired results;
- 3. plan desired resources prior to commencement of work; and
- 4. identify and organise resources prior to commencement of work.

# 9.1.1 Prioritize Work

Steps to organizing ventures that have a lot of moving parts:

1. Listing down daily task: Make a list of your daily activities. Make a list of daily tasks to be completed while considering their priority.

### List of tasks for bar bending work:

- **Understanding layout**
- Selection and collection of tools and materials
- Measurement and marking on rebar
- Rebar cutting and bending
- Rebar placement on surface
- Rebar tying
- Rebar splicing
- 2. Recognising urgent vs. important task: Identify the task that needs immediate attention. Ensure that the work gets completed as planned without missing any commitments or dependency of completion of your work on others.
- 3. Evaluating the value of the task: The important work should be given highest value. Identify which types of task are on top priority over the others. It will help increase your team's efficiency.
- **4. Ordering task by estimating efforts:** Check and

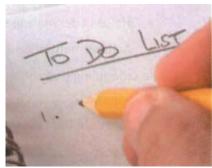


Fig 9.1.1: To-do list

	URGENT	NOT URGENT
IMPORTANT	DO IT NOW	PLAN IT
NOT	DELEGATE	DROP IT

Fig 9.1.2: Identifying priority work

estimate efforts that will go in performing the task. Target to start the task that will require more amount of time.

- **5. Flexibility and adaptability in task completion:** Change is evident. Be flexible and adapt to the priorities that may change.
- **6. Focusing on the priorities:** Prioritise your task by analysing and estimating the efforts and focus on the derived priorities ..



Fig 9.1.3: Priority work

# 9.1.2 Optimizing Work -

**Schedule:** Scheduling means planning an activity to take place at a particular time. Schedule should always be little flexible.

The benefits of scheduling are:

- Helps in increasing efficiency.
- Helps in decreasing stress
- Achievement of desired results as per deadlines.

While scheduling one should remember to:

 Analyse how much time each task will take and schedule the task accordingly.



Fig 9.1.4: work schedule

- Plan in such a way that multiple jobs are not assigned to the same timeline unless planning to multitask.
- It is essential to share the prepared schedule with team members for successful execution of tasks.

**Multitask:** Multitasking means the art of doing multiple tasks at the same time. To multitask efficiently, following things should be taken care:

- Allot time to routine activities before juggling with two or three tasks.
- Combine the correct activities for efficient multitasking.
- Review how multitasking affects performance of tasks.

#### Track the work Progress: The progress of work can be tracked by

- Reviewing work progress at regular intervals.
- Analysing the performance and making amendments to the scheduling of tasks so as to

streamline the plan.

- Finding out the reasons for deviation from the schedule.
- Shuffling the order of tasks to avoid boredom without affecting the sequence.

# 9.1.3 Planning And Organizing Work 🖆

Successful completion of work is possible if you plan and organise your time efficiently. Timely planning will help you to overcome all cliallenges in the way to success

**Step 1: Planning based on scope of work:** Plan work activity as per the identified scope of work like selecting appropriate worker based on a requirement of work.

Step 2: Preparing a check list: List out the activities and further break it into smaller units. This will help you in keeping track and timely completion of a task. It will be possible by assigning the work to the worker and dividing the responsibility.

Step 3: Adhering to the timelines: Complete the work according to the established timelines. Allocate the work as per the completion date and make sure that it gets completed within the timeframe. Updating



Fig 9.1.5: Rebar cutting



Fig 9.1.6: Rebar bending

your calendar as per the end date of the task will help in minimizing the work load.

**Step 4: Creating plan of action:** Charting out action plan and anyalysing possible difficulties will help you keep the task on track. This is possible if you check all the required material in advance for the task as per the plan of action. It also includes arranging for replacement of worker in case of emergency.

**Step 5: Communicating regularly about the updates:** Give clear instructions to the team members of the desired outcome. Update them at regular intervals.

**Step 6: Managing time is a key to success:** Prioritising is essential to reduce stress at work and be more efficient and productive.

#### **Material Planning**

Material planning involves checking the availability of all the raw materials that would be required in the tiling process and to ensure that they are available at the construction site. The basic materials required in bar bending work are:

- Rebars
- Binding wires
- Stirrups
- Rebar cover



Fig 9.1.7: Rebar Stirrups

The bar bender & steel fixer should check with his supervisor that all these are available on the site in the required quantity.

- Quality of the materials is as per the standards
- Material is accessible at the site to minimize the distance to carry and avoid unnecessary delay.
- Stacking and storing as per the guidelines.
- Reporting the material shortage in advance to the super-visors so that it can be arranged in advance.

### Proper material planning helps in:

- Utilising manpower to avoid wastage of time due to unavailability of the material.
- Curtailing the project cost by minimizing delay.
- Achieving the deadlines.
- Reducing the wastage of material due to unavailability of other necessary material.

#### **Work Planning**

- Division of work among the team members
- Assigning . the work as per individual capability Fig 9.1.8: Work planning and skills.



- Allocating sufficient manpower to complete the task as per the work plan
- Providing all the workers necessary tools and equipment required for the work.
- Organising work output so that all the processes are completed without any delay for the other.
- Mentoring and guiding all the workers as and when required.

# **UNIT 9.2: Organising Resources**

# - Unit Objectives | 🎯



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

- Identify and organise resources prior to commencement of work;
- 2. Organise correct tools and materials for completion of work;
- Use and engage resources and manpower in appropriate manner; and 3.
- Organise self, resources, work environment and time efficiently. 4.

# 9.1.1 Prioritize Work

Organising is a process of engaging co-workers and developing a productive relationship amongst them for the purpose of completing a given task. Organising and planning are the two most important factors for efficient and successful job.

#### Organising includes:

- Identification of activities.
- Grouping and classification of activities
- Identification of appropriate tools, equipments and materials before starting work.
- Identification and arranging proper Manpower.
- Assignment of duties to appropriate people.
- Creation and delegation οf responsibilities among co-workers for completion of work.

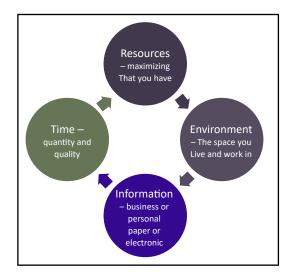


Fig 9.2.1: Resource organization

- Coordination of work among the team and across teams.
- Organising training or providing guidelines to avoid damage of equipments.
- Planning and organising work environment to avoid accidents.
- Organising resources to avoid waste of materials.

### **Benefits of Organising**

#### Being organised helps to

Make better decisions.

- Identify available resources.
- Anticipate needs and problems.
- Get work done accurately by avoiding costly mistakes.
- Be more efficient and productive.
- Complete desired tasks and activities.



Fig 9.2.2: Work of Organisation

#### Monitoring

Monitoring is done to ensure that everything goes according to set rules and timelines

#### **Steps for Monitoring**

- Prioritising work activities & create a work plan for completing own work
- Measuring actual work progress of self and sub ordinates at regular intervals
- Comparing actual work done with the plan and identifying the gaps if any
- Taking corrective measures to rectify the gaps.



Fig 9.2.3: Resource organisation

#### **Optimising use of Resources**

Resources can be used in an optimum way by following the guidelines mentioned below.

- Analyse the capabilities of individuals and the characteristics job requirements
- Match the right people with the right job
- Rotate jobs to avoid boredom
- Rotate people to give them varied experience and training opportunities
- Make provisions for absenteeism

# **Exercise**



- 1. A market survey is important because it tells you:
  - a. How many & what types of people are shopping at a store.
  - b. Tells you what the customer will buy.
  - c. Tells you how much the customer will pay for the product.
  - d. All of the above.
- 2. Steps to prioritizing projects are:
  - a. Collect a list of all your tasks
  - b. Identify urgent vs. important:
  - c. Order tasks by estimated effort
  - d. All of the above
- 3. Scheduling means plan an activity to take place at a particular time. True or False
- 4. Material planning involves checking the availability of all the raw materials that would be required in the concreting process. True or False
- 5. Proper material planning helps in:
  - a. Reducing the project cost by minimizing delay
  - b. Helps in achieving the deadlines.
  - c. Reduces the wastage of material due to unavailability of other necessary material.
  - d. All of the above
- 6. Being organised helps to:
  - a. Make better decisions.
  - b. Anticipate needs and problems.
  - c. Get work done accurately by avoiding costly mistakes.
  - d. All of the above
- 7. The purpose of controlling is to ensure that everything goes as per set guidelines and standards. True or False

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# 10. Employability & Entrepreneurship Skills

Unit 10.1 – Personal Strengths & Value Systems

Unit 10.2 – Digital Literacy: A Recap

Unit 10.3 – Money Matters

Unit 10.4 – Preparing for Employment & Self Employment

Unit 10.5 – Understanding Entrepreneurship

Unit 10.6 – Preparing to be an Entrepreneur



# **Key Learning Outcomes**

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

- 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
- 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 the role of attitude in self-analysis
- 15. Discuss how to maintain a positive attitude
- 16. List your strengths and weaknesses
- 17. Discuss the qualities of honest people
- 18. Describe the importance of honesty in entrepreneurs
- 19. Discuss the elements of a strong work ethic
- 20. Discuss how to foster a good work ethic
- 21. List the characteristics of highly creative people
- 22. List the characteristics of highly innovative people
- 23. Discuss the benefits of time management
- 24. List the traits of effective time managers
- 25. Describe effective time management technique
- 26. Discuss the importance of anger management Describe anger management strategies
- 27. Discuss tips for anger management
- 28. Discuss the causes of stress
- 29. Discuss the symptoms of stress
- 30. Discuss tips for stress management
- 31. Identify the basic parts of a computer
- 32. Identify the basic parts of a keyboard
- 33. Recall basic computer terminology
- 34. Recall basic computer terminology

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

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

# **UNIT 10.1: Personal Strengths & Value Systems**

# - Unit Objectives 🏻 🖔 🖯



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

- Explain the meaning of health
- · List common health issues
- Discuss tips to prevent common health issues
- Explain the meaning of hygiene
- Understand the purpose of Swacch Bharat Abhiyan
- Explain the meaning of habit
- Discuss ways to set up a safe work environment
- Discuss critical safety habits to be followed by employees
- Explain the importance of self-analysis
- Understand motivation with the help of Maslow's Hierarchy of Needs
- Discuss the meaning of achievement motivation
- List the characteristics of entrepreneurs with achievement motivation
- List the different factors that motivate you
- Discuss the role of attitude in self-analysis
- Discuss how to maintain a positive attitude
- List your strengths and weaknesses
- Discuss the qualities of honest people
- Describe the importance of honesty in entrepreneurs
- Discuss the elements of a strong work ethic
- Discuss how to foster a good work ethic
- List the characteristics of highly creative people
- List the characteristics of highly innovative people
- Discuss the benefits of time management
- List the traits of effective time managers
- Describe effective time management technique
- · Discuss the importance of anger management
- Describe anger management strategies
- Discuss tips for anger management
- Discuss the causes of stress
- Discuss the symptoms of stress
- Discuss tips for stress management

# 10.1.1 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 meditatio

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.				
_ <b>W</b>	/hat is Hygiene? ———————————————————————————————————				
he en	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.				
kit ov	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.				
Ho	ow 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.					
Yo	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



- 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!

# 10.1.2: 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



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

# 10.1.3 Self Analysis - Attitude, Achievement Motivation: What is Self-Analysis

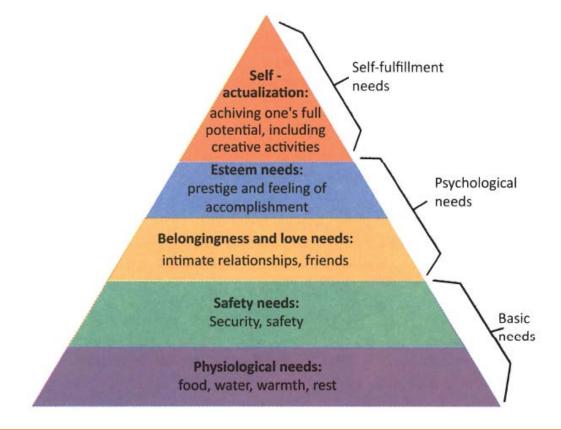
To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within 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



- Achievement motivation can be learned.
- Don't be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

# 10.1.4 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.



- 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.

# 10.1.5 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



- 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.

# 10.1.6 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.



- 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.

# 10.1. 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.



- 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.

# **10.1.8 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
- **External causes of stress**
- Major life changes
- Difficulties with relationships
- Having too much to do

- Pessimism
- Negative self-talk
- All in or all out attitude
- 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		
<ul> <li>Chest pain and/or rapid heartbeat</li> </ul>	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.



- 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 attitude and focus on being proactive.

# 10.2. 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 Explain how you will sell a product or service on an e-commerce platform

# - 10.2.1 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:** A vast, 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.



- 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 FS or Ctrl + R to refresh or reload a web page.

## 10.2.2 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 Power Point: 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 OneNote and ... your phone!
- Offline access to email: No Internet? No problem! Write emails offine and send them when you're connected again.



- 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.

## 10.2.3 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 on line infrastructure and increase internet connectivity, thus boosting the e-commerce industry.

Currently, the majority of on line 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.



- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

## 10.3: 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 on line banking
- 10. Discuss the main types of electronic funds transfers

## **10.3.1** 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.



- 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.

## **10.3.2** 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!



- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for on line banking it's convenient!
- Keep an eye on your bank balance.

## 10.3.3 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 output changes.	
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.

## 10.3.4 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.



- 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.

## 10.3.5 Online Banking, NEFT, RTGS etc.: What is Online Banking

Internet or on line 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 information:

- 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 bank address
- Beneficiary's account number
- 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 on line banking website.
- You will never be asked for your credit or debit card details while using on line banking.
- Change your online banking password regularly.

## 10.4. Preparing for Employment & Self **Employment**

## - Unit Objectives | 🎯



- 1. Discuss the steps to prepare for an interview
- 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
- Discuss basic workplace terminology

## **10.4.1** 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:

#### 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.

#### 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.

#### 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:
  - o What do you consider the most important criteria for success in this job?
  - o How will my performance be evaluated?
  - o What are the opportunities for advancement?
  - o What are the next steps in the hiring process?
- Remember, never ask for information that is easily available on the company website.



- 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.

## 10.4.2 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 resume 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 resume. 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 resume must include the following personal information:

Date of birth

Gender & marital status

Nationality

Languages known

### **Example:**

### **Personal Details**

Date of birth: 25th May, 1981Gender & marital status: Female, Single

• Nationality: Indian

• Languages known: English, Hindi, Tamil, French



- 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.

## 10.4.3 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.



- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

## 10.4.4 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.

## 10.5. Understanding Entrepreneurship

## Unit Objectives 6



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

# 10.5.1 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.



- 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.

## 10.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means setting an example for others to follow. Setting 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 admitting 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.



- 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.

## **10.5.3 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.



- 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.

## 10.5.4 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 problemStep 2: Study the problem in detailStep 3: List all possible solutionsStep 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

Not panicking

Having a positive attitude

• Focusing on the right problem

Asking the right questions

## **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:

<b>Step 1:</b> 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.
<b>Step 2:</b> Discuss the Problem	This involves asking questions, listening to the other side, putting your views forward and clarifying doubts.
<b>Step 3:</b> Clarify the Objective	Ensure that both parties want to solve the same problem and reach the same goal.
<b>Step 4:</b> 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.
<b>Step 5:</b> 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.
<b>Step 6:</b> Implement the Agreed Upon Solution	Agree on a course of action to set the solution in motion



- 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

## 10.5.5 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

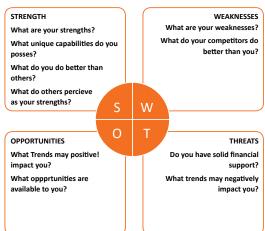
If you already have a product in mind, think about ways to set it apart from the existing ones.

## 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



- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

## **10.5.6 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 Gimar 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.

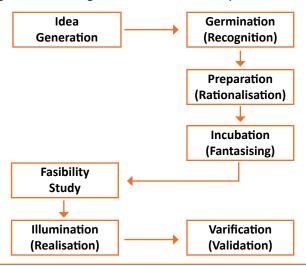
**Stage 4:** Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.

**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

Government Institutions

- Unequivocal support
  - Social legitimacy
- Open door for advocate
- Entrepreneurship strategy
- urgency, crisis and challenge

# Research institutes

Venture-friendly

e.g. for R&D, jump start funds

Regulatory framework

e.g. Tax benifits

incentives

e.g. Investment, support

Financial support

contract enforcement, pro-• e.g. Bankruptcy, legislation

perty rights, and labour

### **Networks**

- Entrepreneure's networks
- Diaspora networks
- Multinational corporations

### Labour

- Skilled and unskilled
- Serial entrepreneures

**Entrepreneurship** 

Later generation family

# Human Capital General degrees (professional and academic)

### nfrastructure

Specific entrepreneurship training

**Educational Institutions** 

- Telecommunications
- Transportation & logistics
- Energy
- Zones, incubation centers, clusters

# **Support Professions**

- Accounting
- Investment bankers

# **Non-Government Institutions**

- Conferences Entrepreneurship promotion in non-profits
- contests

# Financial Capital

Micro-loans

Venture capital funds

 Angel investors, friends and family

Finance

Merket

- Zero-stage venture capital
- Public capital markets

Private equity

Debt

# Financial Capital

- Visible successes
- Wealth generation for founders
- International reputation

## Societal norms

- Tolerance of risk, mistakes, failure
- Innovation, creativity, experimentation
  - Social status of entrepreneur
    - Wealth creation
- Ambition, drive, hunger

· Entrepreneur- friendly association 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.

- 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.
- 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



- 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.

### 10.5. 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



- 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.

### 10.5.8 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!



- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps don't make decisions hastily.

### 10.6: Preparing to be an Entrepreneur

### - Unit Objectives | 🎯



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

- Discuss how market research is carried out
- Describe the 4 Ps of marketing
- 3. Discuss the importance of idea generation
- Recall basic business terminology
- Discuss the need for CRM
- 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

### 10.6.1 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



- 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.

### **10.6.2** 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.

### 10.6.3 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

### 10.3.4 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.

### **10.3.5** 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



- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

### 10.6.4 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 on line, 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.



- 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.

### 10.6.5 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.



- 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.

### **10.6.6 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!



- 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.

### 10.6. 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<sup>1</sup> or industry expert that I can call on?
- 5. Who is my ideal customer<sup>2</sup>?
- 6. Who are my competitors<sup>3</sup>?
- 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 SWOT4 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<sup>5</sup> 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<sup>6</sup> 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<sup>7</sup> of my business?
- 18. What taxes<sup>8</sup> will I need to pay?
- 19. What kind of insurance9 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 compa n y 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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### Glossary Required For Bar Bender & Steel Fixer Job Role

### - Unit Objectives



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

1. Glossary of terms required during bar bender & steel fixer work.

### **Glossary**

**ARCHITECTURAL DRAWINGS**—Drawings which show the general design and form of structures by means of elevations, plans and sections; show the various materials such as brick, concrete, glass, masonry, steel, stone and wood and their dimensions; show fixtures and finishes for ceilings, floor surfaces and walls.

**BAR**—Steel bar used to reinforce concrete. See REINFORCEMENT.

**BAR SPACING**—Distance between parallel reinforcing bars measured from center-to-center of the bars perpendicular to their longitudinal axes.

**BAR SUPPORTS**—Devices of formed wire, plastic or precast concrete, to support, hold, and space reinforcing bars.

**BEAM**—A horizontal structural member supporting loads from a floor or roof system to columns, girders or walls.

**COLUMN**—Vertical structural member supporting a floor beam, girder, or other member, and supporting primarily vertical loads.

**CONCRETE BLOCK BAR SUPPORTS**—Precast concrete blocks, with or without tie wires, used to support reinforcing bars above the ground or to space bars off vertical forms and above horizontal forms. Also known as "dobies."

**CONCRETE COVER**—The distance from the face of the concrete to the reinforcing steel, also referred to as "Fireproofing," "Clearance," or "Concrete Protection."

**CONTACT SPLICE**—A means of splicing reinforcing bars by lap splicing in direct contact. See LAP SPLICE.

**COUPLER**—Threaded device for joining reinforcing bars for the purpose of providing transfer of either axial compression or axial tension or both from one bar to the other.

**CUT-OFF SAW**—A powered saw used to cut reinforcing bars at the job-site.

**DOWEL**—A bar connecting two separately cast sections of concrete. A bar extending from one concrete section into another is said to be doweled into the adjoining section. Examples: column dowels into a column or horizontal wall bars doweled into an adjacent wall section.

**FOOTINGS**—That part of the foundation of a structure which rests on earth.

**GRADE OF REINFORCING BARS**—The means by which an Engineer specifies the strength properties of the reinforcing bar required in each part of a structure.

HICKEY—Hand tool with side opening jaw used in developing leverage for making bends on

reinforcing bars at the jobsite.

**LAP SPLICE**—The overlapping of two reinforcing bars by lap splicing them side by side (in contact or non-contact); similarly the side and end overlap of sheets or rolls of welded wire reinforcement.

**MECHANICAL SPLICE**—The complete assembly of an end-bearing sleeve, a coupler, or a coupling sleeve, and possibly additional materials or parts to accomplish the splicing of reinforcing bars.

**NON-CONTACT SPLICE**—A means of splicing reinforcing bars by lap splicing not in direct contact. See LAP SPLICE.

**PLAN VIEW**—Top view as of any floor, roof, or foundation of a structure.

**REBAR**—Abbreviated term for reinforcing bar.

**REINFORCED CONCRETE**—Concrete containing reinforcing steel positioned so that the two materials act together for increased strength.

**REINFORCEMENT**—Steel bars or wires embedded in concrete and located in such a manner that the steel and the concrete act together in resisting loads.

**SECTION**—Cut away view through a general plan or elevation view to explain details.

**SHEAR REINFORCEMENT**—Reinforcement designed to resist shearing forces; usually; consisting of stirrups bent and located as required.

SLAB—Flat section of floor or roof either on the ground or supported by beams or walls.

**SPLICE**—Connection of one reinforcing bar to another by lap splices (in contact or non contact), mechanical splices, or welded splices; the lap between sheets or rolls of welded wire reinforcement.

**STAGGERED SPLICES**—Splices in reinforcing bars which are not made at the same plane.

**STIRRUPS**—Reinforcing bars or welded wire reinforcement used in beams and girders for shear reinforcement; typically bent into a U-shape or box-shape and placed perpendicular to the longitudinal reinforcing bars.

**STRUCTURAL DRAWINGS**—Drawings which show all framing plans, sections, details and elevations required to construct the structure. For reinforced concrete structures, they include the sizes and general arrangement of all reinforcement from which the Fabricator prepares placing drawings.

**SUPPORT BARS**—Rest on individual high chairs or bar chairs to support top reinforcing bars in slabs or joists, respectively.

**TENSILE STRENGTH**—Maximum stress a material is capable of resisting under axial tension loading.

**TIE**—Reinforcing bars bent to a circular, or to a box-shape and used to hold vertical longitudinal reinforcing bars together in columns and beams.

**TIE BARS**—Reinforcing bars at right angles and tied to main reinforcement to keep it in place; bars extending across a construction joint.

**TIE WIRE**—Wire used to secure intersections of reinforcing bars for the purpose of holding them in place until concreting is completed.

**TOLERANCE**—Allowable variation from a given dimension, quantity or position.

**TRANSVERSE**—At right angles to the long direction of the member (crosswise).

**TRUSS BARS**—Reinforcing bars bent up to act as both top and bottom reinforcement.

**WAFFLE SLAB**—A two-way reinforced concrete joist floor with ribs running in both directions.

**WALES**—Braces to two or more form panels, palings, or studs, usually horizontal. Often incorrectly called "walers."

**WALL**—A vertical structural member which encloses, divides, supports or protects a building or room.

**YIELD STRENGTH**—The load limit to which reinforcing steel will stretch and return to its original length.

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