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Construction Skill Development Council

Participant Handbook

Sector
Construction

Sub-Sector
Real Estate and Infrastructure Construction

Occupation
Masonry

Reference ID: **CON/Q0104, Version 3.0 NSQF Level 4**

Mason Tiling

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Disclaimer

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

Shri Narendra Modi
Prime Minister of India

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Certificate

COMPLIANCE TO

QUALIFICATION PACK- NATIONAL OCCUPATIONAL STANDARDS

is hearby issued by the

CONSTRUCTION SKILL DEVELOPMENT COUNCIL OF INDIA

for

SKILLING CONTENT:PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/Qualification Pack:'Mason Tiling'

QP No.'CON/Q0104, Version 4.0 NSQF Level 4 '

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Authorised Signatory
(Construction Skill Development Council)

Acknowledgements

This participant's handbook meant for Mason Tiling is a sincere attempt to ensure the availability of all the relevant information to the existing and prospective job holders in this job role. We have compiled the content with inputs from the relevant Subject Matter Experts (SMEs) and industry members to ensure it is the latest and authentic. We express our sincere gratitude to all the SMEs and industry members who have made invaluable contributions to the completion of this participant's handbook.

This handbook will help deliver skill-based training in the Mason Tiling. We hope that it will benefit all the stakeholders, such as participants, trainers, and evaluators. We have made all efforts to ensure the publication meets the current quality standards for the successful delivery of QP/NOS-based training programs. We welcome and appreciate any suggestions for future improvements to this handbook.

About this book

This participant handbook has been designed to serve as a guide for participants who aim to obtain the required knowledge and skills to undertake various activities in the role of a Mason Tiling. Its content has been aligned with the latest Qualification Pack (QP) prepared for the job role. With a qualified trainer's guidance, the participants will be equipped with the following for working efficiently in the job role:

- Knowledge and Understanding: The relevant operational knowledge and understanding to perform the required tasks.
- Performance Criteria: The essential skills through hands-on training to perform the required operations to the applicable quality standards.
- Professional Skills: The Ability to make appropriate operational decisions about the field of work.

The handbook details the relevant activities to be carried out by a Mason Tiling. After studying this handbook, job holders will be adequately skilled in carrying out their duties according to the applicable quality standards. The handbook is aligned with the following National Occupational Standards (NOS) detailed in the latest and approved version of Mason Tiling QP:

- CON/N0115: Lay and fix tiles both horizontally and vertically on wall and floor
- CON/N0116: Apply grouts and sealants for flooring and cladding works
- CON/N8001: Work effectively in a team to deliver desired results at the workplace
- CON/N8002: Plan and organize work to meet expected outcomes
- CON/N9001: Work according to personal health, safety and environment protocols at construction site
- DGT/VSQ/N0102: Employability Skills (60 Hours)

The handbook has been divided into an appropriate number of units and sub-units based on the content of the relevant QP. We hope it will facilitate easy and structured learning for the participants, allowing them to obtain enhanced knowledge and skills.

Symbols Used


Key Learning Outcomes


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Table of Contents

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1. Introduction to the Role of a Mason Tiling

Construction Skill Development Council

Unit 1.1 – Overview of construction industry in India
Unit 1.2 – Major occupation in construction sector
Unit 1.3 – Mason tiling - job role and responsibility
Unit 1.4 – Training for mason tiling

Key Learning Outcomes

By the end of this module, participants will be able to:

1. Understand broadly the construction activities in India
2. Differentiate between 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 mason tiling
6. Know about personal and professional attributes under the mason tiling occupation
7. List QP and NOS details of mason tiling programme
8. Know about career path as a mason tiling
9. Understand the purpose of training
10. Know about mode and duration of training program
11. Understand the benefits of training skill card & certification

UNIT 1.1: Overview of Construction Industry in India

Unit Objectives

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

- 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.

Fig. 1.1.1 Construction Industry

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

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

The real estate sector holds significant global recognition, encompassing housing, retail, hospitality, and commercial sub-sectors. Its growth is closely linked to the expansion of the corporate landscape and the rising demand for office spaces, urban, and semi-urban accommodations. Among the 14 major sectors, the construction industry ranks third, considering its direct, indirect, and induced effects on the economy as a whole.

In India, the real estate sector stands as the second-largest employment generator, trailing only the agriculture sector. There is a strong expectation of increased investment from non-resident Indians (NRIs) in both the short and long terms. Bengaluru is anticipated to be the most favored destination for NRI property investments, followed by Ahmedabad, Pune, Chennai, Goa, Delhi, and Dehradun.

According to the Economic Times Housing Finance Summit, about three houses are built per 1,000 people per year compared with the required construction rate of five houses per 1,000 populations. The current shortage of housing in urban areas is estimated to be ~10 million units. An additional 25 million units of affordable housing are required by 2030 to meet the growth in the country's urban population.

India's urban population is estimated to stand at 675 million in 2035, the second highest behind China's one billion, the U.N. has said in a report, noting that after the COVID-19 pandemic, the global urban population is back on track to grow by another 2.2 billion by 2050.

Fig. 1.1.2 Township Construction

Fig. 1.1.3 Bridge Construction

Government Initiatives under Urban Development

Indian government has undertaken several initiatives under urban development to address the challenges posed by rapid urbanization and to promote sustainable and inclusive growth in cities and towns.

Fig. 1.1.4 Building Construction Site

Fig. 1.1.5 Industrial Building Construction Site

- Smart Cities Mission: Launched in 2015, the Smart Cities Mission aims to develop 100 smart cities across the country. These smart cities are intended to be equipped with advanced infrastructure and technology to enhance quality of life, promote sustainable development, and provide efficient urban services to residents.
- Atal Mission for Rejuvenation and Urban Transformation (AMRUT): The AMRUT scheme was launched in 2015 to focus on providing basic urban infrastructure in cities and towns, such as water supply, sewerage, and urban transportation. The goal is to improve the quality of life for urban residents.
- Pradhan Mantri Awas Yojana (PMAY): This scheme, launched in 2015, aims to provide affordable housing for all by 2022. It consists of two components: Pradhan Mantri Awas Yojana (Urban) for urban areas and Pradhan Mantri Awas Yojana (Gramin) for rural areas.
- Swachh Bharat Mission (Urban): The Swachh Bharat Mission focuses on promoting cleanliness, sanitation, and hygiene in urban areas. It aims to eliminate open defecation, improve solid waste management, & ensure a clean urban environment.
- Heritage City Development and Augmentation Yojana (HRIDAY): This scheme aims to preserve and revitalize the rich cultural heritage of heritage cities in India, making them more livable and tourist-friendly.
- National Urban Livelihoods Mission (DAY-NULM): DAY-NULM was launched to reduce poverty and vulnerability of urban poor households. It provides self-employment opportunities, skill development, and access to credit and capital.

Rural Construction

Rural Construction: This sub-sector aims at the constructional requirements of rural India and construction 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

Indian government has launched various initiatives under rural development to uplift rural areas, improve the living standards of rural communities, and promote inclusive growth. Some of the key government initiatives under rural development include:

- Pradhan Mantri Gram Sadak Yojana (PMGSY): Launched in 2000, PMGSY aims to provide all-weather road connectivity to unconnected rural habitations. The program focuses on improving rural access and connectivity, which has a positive impact on economic development and social integration.
- Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA): MGNREGA, launched in 2005, guarantees 100 days of wage employment to every household in rural areas. It aims to provide livelihood security to rural households and promote rural development through the creation of durable assets and infrastructure.
- Pradhan Mantri Awaas Yojana - Gramin (PMAY-G): Launched in 2016, PMAY-G aims to provide affordable and quality housing to rural households. It focuses on improving the living conditions of the rural poor and providing them with a safe and secure dwelling.
- Swachh Bharat Mission (Gramin): Similar to the urban counterpart, this mission focuses on promoting cleanliness and sanitation in rural areas. It aims to achieve an open defecation-free rural India and improve rural sanitation facilities.

"Bharat Nirman"

"Bharat Nirman" was an initiative launched by the Indian government in 2005 to accelerate rural development and bridge the infrastructure gaps in rural areas.

Fig. 1.1.7 Bharat Gramin Yojna for improving Rural Infrastructure

It aimed to enhance the quality of life and economic opportunities for rural communities by focusing on six key areas:

- Rural Housing: Bharat Nirman aimed to provide affordable housing to the rural poor and ensure that every rural household had access to a safe and secure dwelling.
- Rural Roads: The initiative focused on improving rural connectivity by constructing and upgrading rural roads under the Pradhan Mantri Gram Sadak Yojana (PMGSY). This helped in facilitating easier access to markets, healthcare, and education for rural residents.
- Rural Water Supply: Bharat Nirman aimed to provide safe and sustainable drinking water to rural areas under the National Rural Drinking Water Programme (NRDWP). The goal was to ensure that every rural household had access to potable water.
- Rural Electrification: The initiative sought to electrify all unelectrified villages and provide electricity connections to rural households. The focus was on enhancing rural electrification and promoting energy access in remote areas.
- Rural Telecommunication: Bharat Nirman aimed to extend telecommunication services to rural areas, including mobile and broadband connectivity, to bridge the digital divide and enable access to information and services.
- Irrigation: The initiative sought to increase the irrigation potential in rural areas to enhance agricultural productivity and income. This was done through various schemes and projects promoting water conservation and management.

Bharat Nirman played a significant role in boosting rural development and improving the overall socio-economic conditions in rural India. It brought attention to the importance of infrastructure development in rural areas and contributed to rural empowerment and growth.

Notes

Scan the QR code to watch the video

https://youtu.be/yhjDhav4Pfw

Introduction of Construction Industry

UNIT 1.2: Major Occupation in Construction Sector

Unit Objectives

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

- Know about major occupations in construction sector; and
- 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:

1. Helper Mason
2. Assistant Mason
3. General Mason
4. Mason Tiling
5. Mason Concrete
6. Mason marble, granite & stone; and

7. Mason Special Finishing
8. Mason Form Finishes & Special concrete.

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.

Fig. 1.2.3 Reinforcement bars fixed at site

Fig. 1.2.4 Bar bending

i. Few job roles under bar bending occupation are:
ii. Helper bar bender & steel fixer;
iii. Assistant bar bender & steel fixer;
iv. Bar bender & steel fixer; and
v. Reinforcement fitter.

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

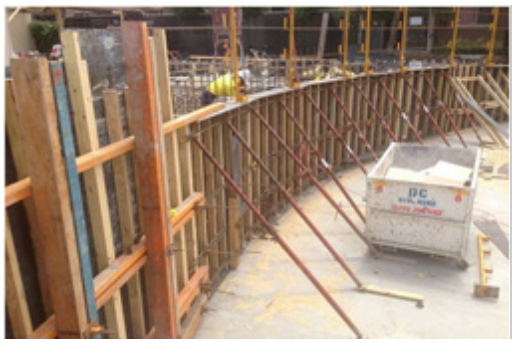


Fig. 1.2.5 Conventional formwork

Fig. 1.2.6 System formwork

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.

Scaffolding: Scaffolding works involve creation of temporary support structure for providing support to workman during construction process. It is use as a platform to carry on construction works and keep tools and materials.

Fig. 1.2.7 Scaffolding work

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

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:

1. Grinder Construction;
2. Construction fitter;
3. Construction welder;
4. Fabricator; and
5. Plasma cutter.

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

Notes

Scan the QR code to watch the video

https://youtu.be/egQDs6cBzVI

Major occupations in construction sector

UNIT 1.3: Mason Tiling - Job Role and Responsibility

Unit Objectives

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

- Know about role and duties of a mason tiling;
- Know about personal and professional attributes under the mason tiling occupation;
- List QP and NOS details of mason tiling programme; and
- Know about career path as a mason tiling.

1.3.1 Role of a Mason Tiling

Mason Tiling is responsible for identifying, cutting, grinding, shaping, laying, fixing and finishing the tiles on floors, walls using appropriate tools and equipment and as per the specified standards, patterns and within dimensional accuracy.

Fig. 1.3.1 Mason Tiling performing the work

As part of the job role, Mason tiling has to perform the following works:

- Measuring and cutting of tile and marble
- Cutting and shaping of tile to fit around corners, obstacles and into odd spaces by using hand and power tools.
- Arrangement of tiles according to design drawings
- Preparing and applying mortar and adhesives
- Installing tile in a planned area
- Applying grout and sealants

- Support team to complete assigned task
- Plan and organise task
- Follow health and safety guidelines while working at construction site

Mason Tiling is expected to perform the following responsibilities while performing the task at work place:

1. Select and use levels, squares and straight edges to align and straighten the tiles.
2. Determine and implement the best layout for a desired pattern of tile.
3. Select and use hand and power tools for cutting and shaping tiles to fit around difficulties, odd spaces and corners.
4. Measure and mark areas to be tiled.
5. Place and fix tiles in place using mortar and trowel.
6. Create a bed for the tiles with the help of brush, trowel and screed and mix, apply, and spread plaster, concrete, mortar, cement, mastic, glue or other adhesives.
7. Lay & fix the tiles as per layout.
8. Finish and dress the joints and wipe excess grout from between tiles using damp sponge.
9. Check the line, level and alignment of tiling work.
10. Follow safety, housekeeping and waste disposal practices at the workplace.
11. Communicate effectively with subordinates and seniors.
12. Plan and organise work to achieve desired outcomes.

Fig. 1.3.2 Performing task with efficiency

1.3.2 Personal attributes for job role of mason tiling

A mason tiling in addition to his technical skills should also possess certain personal qualities as well.

Mason Tiling should:

- 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.

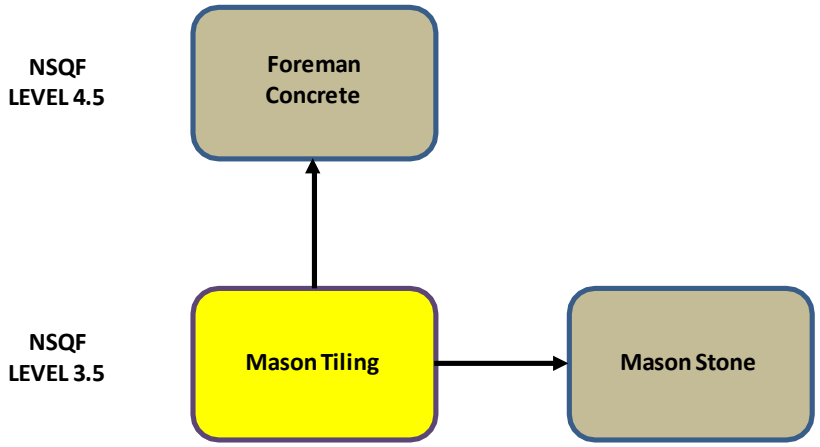
Fig. 1.3.3 Placing tiles on the surface

1.3.3 Career Path for Mason Tiling

A career in tiling is a great option for anyone who enjoys working with their hands, has a keen eye for detail and wants a good amount of variety in their day-to-day work. Tiling is very much a practical career and is best suited to those who prefer their working life to be predominately physical.

Job description generally covers Laying and setting tiles to create decorative wall, mural and floor designs; Cutting and fitting tiles around obstacles and openings using hand and power cutting tools; Preparing, measuring and marking surfaces to be covered; Mixing, applying and spreading cement, glue or other adhesives using hand tools etc.

Career Path:


NSQF
LEVEL 4.5
Foreman
Concrete
NSQF
LEVEL 3.5
Mason Tiling
Mason Stone

Notes

Scan the QR code to watch the video

https://youtu.be/Y5h0hycfbpE

Role of a Mason Tiling

UNIT 1.4: Training for Mason Tiling

Unit Objectives

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

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

1.4.1 Mode and duration of training

The training program is developed to impart specific skills to individuals who wish to work as a Mason Tiling. The training program is based upon qualification pack & National Occupation Standard for Mason tiling.

- Classroom sessions
- Practical sessions

Fig. 1.4.1 Classroom session

Fig. 1.4.2 Practical session

The duration of training is around 400 Hrs including both classroom and practical sessions.

1.4.2 Benefits after training

The training program will enable an individual to:

- Identify, shift and stack various materials, tools and equipment used in tiling works
- Measure and mark tiles
- Perform sorting and cutting of tiles
- Lay & fix tiles on wall and floor as per industry requirement.

- Plan and organize working procedures within a team.
- Communicate effectively
- Work according to personal health, safety and environment protocol at construction site.

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 mason tiling in construction companies or independently. This certificate will help you to get job and earn better wages than an un-certified workmen.

Fig. 1.4.3 Skill card

Fig. 1.4.4 Skill Certificate

Exercise

Answer the following questions.

- Name any three structures constructed with Tiling?
- Name any three tasks a mason tiling is expected to carry out at the construction site?
- Name any three personal attributes a mason tiling should possess?
- What is a growth path?
- Name the two subcategories in construction sector?
- What are the main objectives of Masonry?
- What does shuttering carpenter do?
- What is a scaffold?

Notes

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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

By the end of this module, participants 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;
5. Calculate area, volume and perimeter of different shapes;
6. Know about Pythagoras theorem;
7. Perform basic calculations using Pythagoras theorem.
8. Calculate problems using trigonometric functions.

UNIT 2.1: Unit conversion and Measurement

Unit Objectives

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

- Explain brief on metric system of measurement; and
- 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 is divided into 10 parts called millimeters.	3. Inch system does not have decimal based benefit of the Metric System.
4. Most usually used system of measurement in the world.	4. Fractions of foot cannot be written as decimal inches.
--	5. For example, 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 systemt

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	1,00,00,00,000
Mega-	M	10,00,000
Kilo-	K	1,000
Hecto	H	100
Deca-	D	10
(none)		1
Deci-	D	0.1
Centi-	C	0.01
Milli-	M	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
- 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.
- pounds (lb) make up 1Kg.)

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

Metric to Imperial Conversion chart		
Convert	**To**	**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	25.4
Feet	Meters	0.3
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

Notes

Scan the QR code to watch the video

https://youtu.be/H1xo5UVJKVo

Different System of Measurement

UNIT 2.2: Basic Geometrical Shapes and its Properties

Unit Objectives

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

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

2.2.1 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

It involves taking one digit away from another digit.

$$8 - 3 = 5$$

Multiplication

In its simplest form, it is 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:

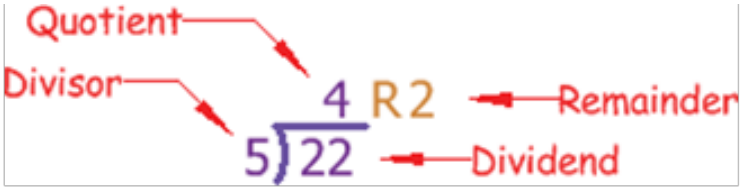
Example: 3.5 × 5 = 17.5

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

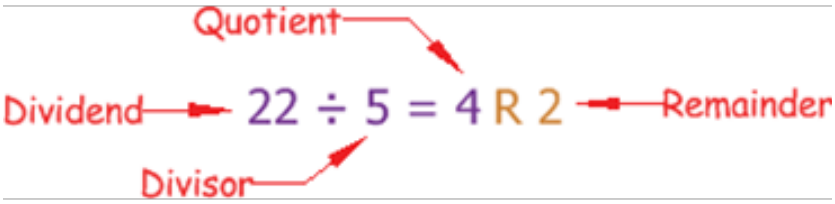
Division

Division is also the splitting into equivalent parts or groups. Division is the result of "fair sharing". It has its own singular words to remember.

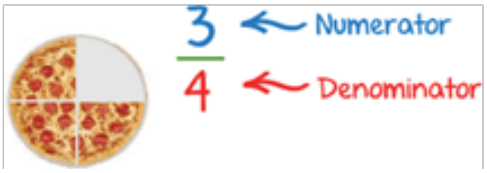
For example, take the simple query of dividing 22 by 5. By 2 left over and the answer is 4. See the important words:



Which is the same as:

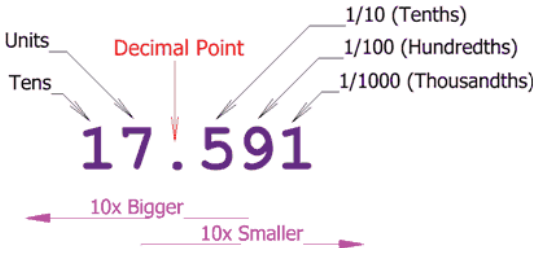


Fraction is part of a whole.



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).

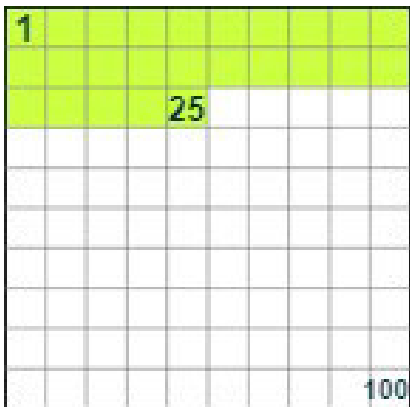


Fig. 2.2.1: Part percentage

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 5?

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

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

So the average is 7.

2.2.2 Basic Geometrical Shapes

The common shapes comprise of square, triangle and rectangle.

Basic Shapes

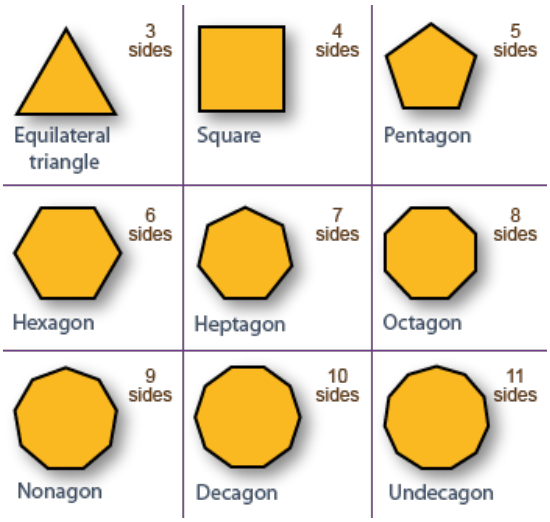


Fig. 2.2.2: Basic shapes

Curved Shapes

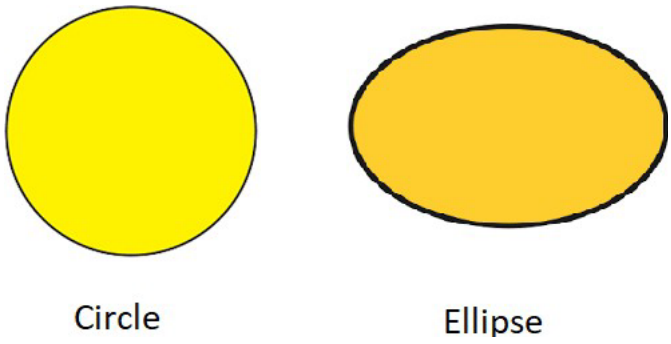


Fig. 2.2.3: Curved shapes

Other Shapes

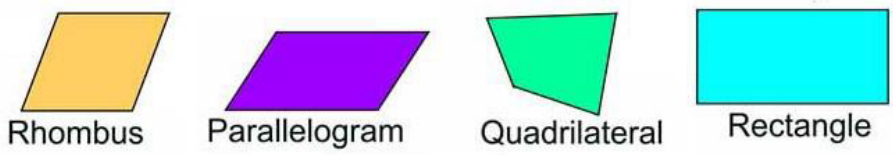
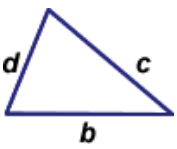
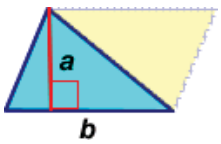
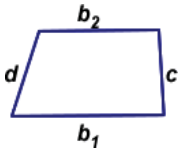
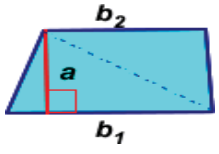


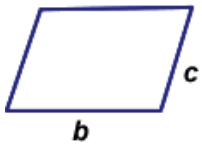
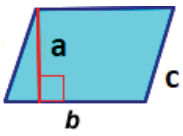
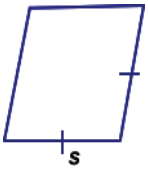
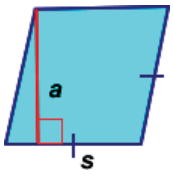
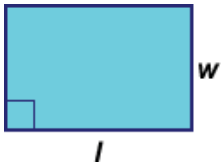
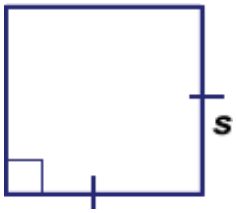
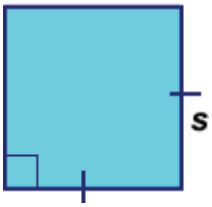
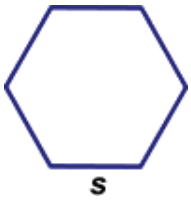
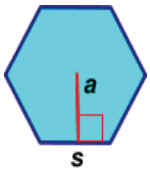
Fig. 2.2.4: Other shapes

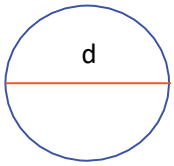
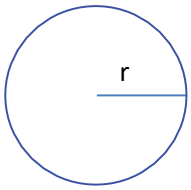
2.2.3 Area, volume and perimeter of geometrical shapes

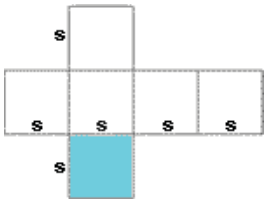
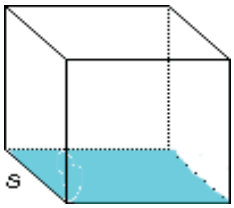
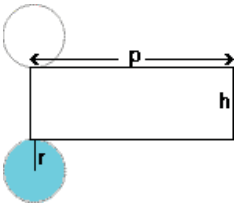
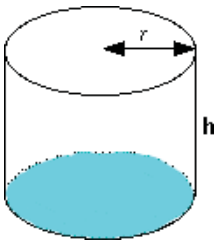
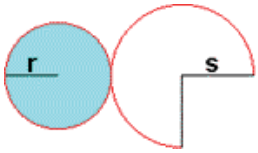
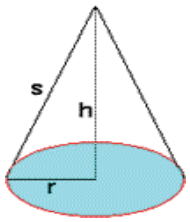
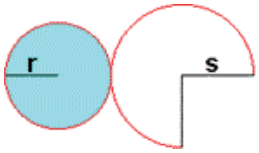
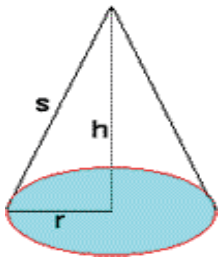
Units	Perimeter	cm	m	ft.
	Area	cm2	m2	Sq. ft
	Volume	cm3	m3	Cub. ft

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 	Area = 1/2a (b1 + b2) 	a= altitude b1, 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 = 2l + 2w 	A = l x w 	l=length w=width
Square	P = 4s 	A= s2 	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	P = ns  P=5s P=6s P=7s P=8s P=9s P=10s	A= 0.5a x n x s  A=2.5 a x s A= 3.0 a x s A= 3.5 a x s A= 4.0 a x s A=4.5 a x s A=5.0 a x 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 = πd 	A = Area A = πr2 	r=radius d= Diameter

Geometric Shape	Surface Area	Volume	Sides
Cube	A = 2B + Ph SA = 2(s2) + (4s)s = 6s2 	Volume = Bh Volume = s3 	s = side length B = area of the base P = perimeter of the base h = height
Cylinder	SA = 2(π r2) + (2πr) h 	V = Bh V = π r2h 	B = area of base P = perimeter of base r = radius of circle h = height
Cone	SA = πr 2 + πrs 	V = 0.33 Bh V = 0.33 πr2h 	B = area of base r = radius of circle h = height s= slant height
Sphere	SA = 4πr2 	V = 1.33πr3 	r = radius of circle

Notes

Scan the QR code to watch the video

https://youtu.be/OhTubw4C0to

Area, volume and perimeter of geometrical shapes

UNIT 2.3: Pythagoras Theorem and its Application

Unit Objectives

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

- Know about Pythagoras theorem; and
- 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 b and 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.

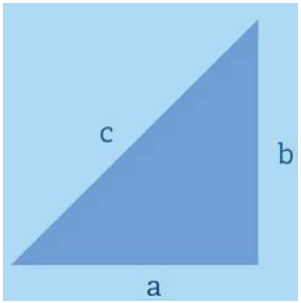


Fig. 2.3.1: Right angle triangle

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

√169 = √c2

13 = c

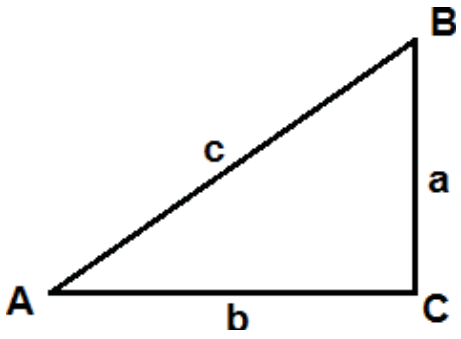


Fig. 2.3.2: Hypotenuse length

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:

a2+b2=c2	Pythagorean Theorem
a2+62=72	Substitute known values for b a
a2+36=49	Simplify
a2+36-36=49-36	Isolate the term
a2=13	
a=√13	Take square root of both side
a=3.61	√13 is approximately 3.61

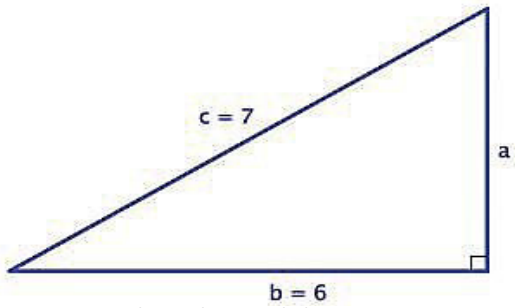


Fig. 2.3.3: Right angle triangle leg measurement

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

x2 = 52 + 82

= 25 + 64

= 89

x = √89

Thus

x ≈ 9.4

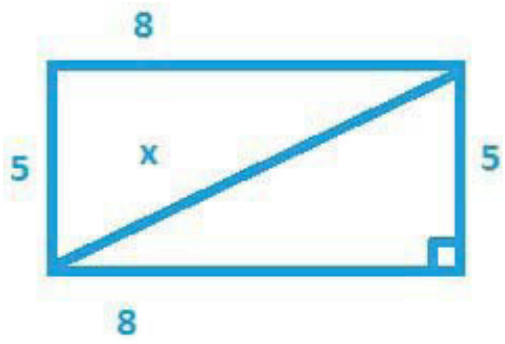


Fig. 2.3.4: Right angle triangle

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 ("C").

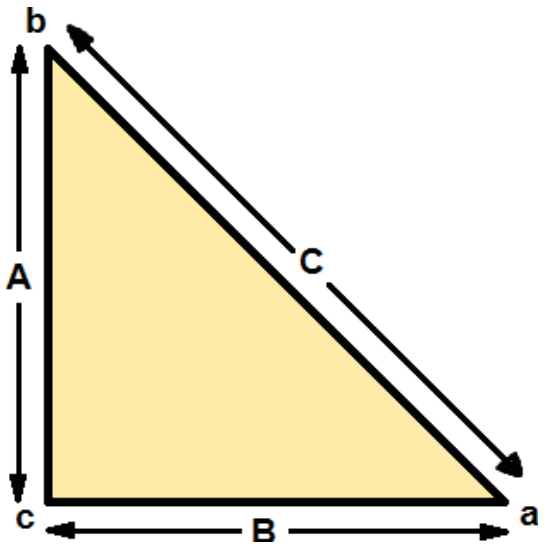


Fig. 2.3.5: Right angle triangle

Application of 3-4-5 rule to lay out a wall:

- On one side of corner measure 3'-0' and make a mark
- On the opposite 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

Answer the following questions.

- Why is it important for a mason tiler to identify different types of shapes?
- How can a mason tiler calculate the perimeter of a square?
- Why is the ability to calculate perimeters crucial for a mason tiler's job?
- Give an example of how a mason tiler might use basic mathematical skills to plan a tiling project.
- In what situations would you encounter these different shapes while working as a mason tiler?

Notes

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3. Tools, Materials and Consumables Required for Mason Tiling

Unit 3.1 – Tools for mason tiling

Unit 3.2 – Material and consumables required

(CON/N0115)

Key Learning Outcomes

By the end of this module, participants will be able to:

1. Understand various types of tiling tools;
2. Know about use of tiling tools;
3. Know about tiles;
4. Know about different types of tiles;
5. Know about consumables required; and
6. Know about storing and stacking of materials and consumables

UNIT 3.1: Tools for Mason Tiling

Unit Objectives

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

- Understand various types of tiling tools; and
- Know about use of tiling tools.

3.1.1 Tools required

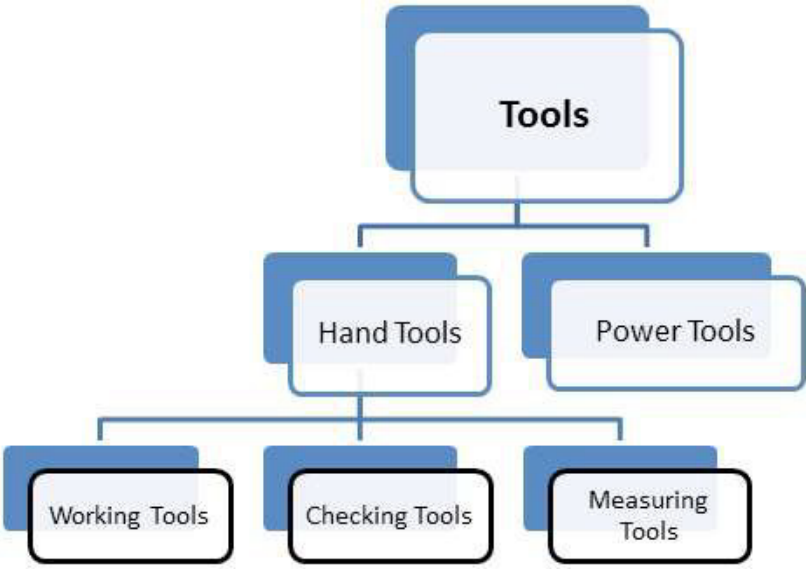
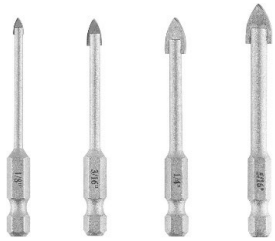


Fig. 3.1.1: Category of tools required

3.1.2 Tools used by Mason tiling

Commonly used tools for mason tiling are given below:

Tool	Image	Use of tool
Tile Scribe		A tile scribe is a tool used to put marking (scribe) on the tile surface so that tile can be broken along the scribe line.

Tile Cutter		Tile cutter helps in cutting large number of tiles along straight lines.
Tile Nippers		Tile nipper is a hand held tool which is used to cut/nip small piece of tile of irregular shape.
Tile Hand Saw		A tile saw is used to cut the tiles in various shapes (specifically along straight lines).
Tile Drill		These are special Carbide-tipped bits used for drilling on tile, mirror & glass.
Tile File		Tile file is used to smoothen rough edges of the tiles and to shape tiles.
Profile Gauge		A profile gauge is used to transfer irregular/ curved shapes on the tiles.

Notched spreader		Notched spreader is used to spread the adhesive over the wall or floor before placing the tile. Notched spreader is mainly used for small scale work.
Tile Trowel		Tile trowel is used to spread adhesive over the wall or floor before placing the tiles. Tile trowel is mainly used for large scale tiling work.
Grouting Spreader		Grout spreader is used to spread grout in the gaps/ space between the tiles.
Grout scraper		Grout scraper is used to remove old/ unwanted grout from the tile joint.
Grout Float		A grout float looks like as trowel but features a rubber base rather than a metal one. By using this tool, you can quickly and easily pick up grout and apply it to a tiled surface.
Pointing Trowel		Pointing trowel is used to fill grout between joints of bricks, stones etc.

Tile Removing Chisel		Tile removing chisel is used to remove tile from the walls or floors in a quick & easy manner with minimum damage.
Spirit level		It is used to check the level of tiled floor and wall surface.
Plumb bob		Plumb bob is used to check the verticality of the wall.
Steel rule		It is used to draw /scribe a straight line. Also used to check accuracy of a flat surfaces. Scale for setting dividers and other marking tools.
Tape rule		For the measurement and marking of tiles tape rule is used.

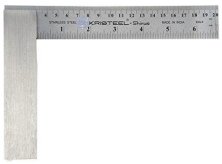
Engineers square		When marking out lines at right-angles to the edge of work. It helps to setting up or testing work for square.

Table. 3.1.1: Tools & equipment required for mason tiling work

Selection Procedure of Hand Tools

- Check and ensure that scribe mark of the tile scribe is straight by using it against a straight edge.
- When buying a Tile Cutter, size of the tile to be cut should be taken into account so that bigger size tiles can be accommodated in the tile cutter.
- There are various designs of tile cutters available in the market but the type most commonly used is 'scribe wheel'. In this cutter tile is placed along the scribe line and scribe wheel is pulled along this tile. The breaking arm is pushed down along the mark to cut the tile along the scribe line.
- Tile handsaw consists of a frame which holds a special tile cutting blade at its end. The distance between blade & the frame should be large enough to adjust a tile being cut. The special tile cutting blade is normally round in section with cutting edges on all sides.
- A drill bit should be selected as per the size of hole.
- Select the measuring instruments based on the requirements
    - Tape rule is used for the measurement of large area.
    - Steel rule is used for measurement of small distance.
    - Spirit level is used for checking the levelling of floor tiles.
    - Plumb bob is used for checking the verticality of wall tiles.
- Trowel is used based on the application of mortar and grout on the floor.

Fig. 3.1.2: Selection of tools as per need

Maintenance of tools

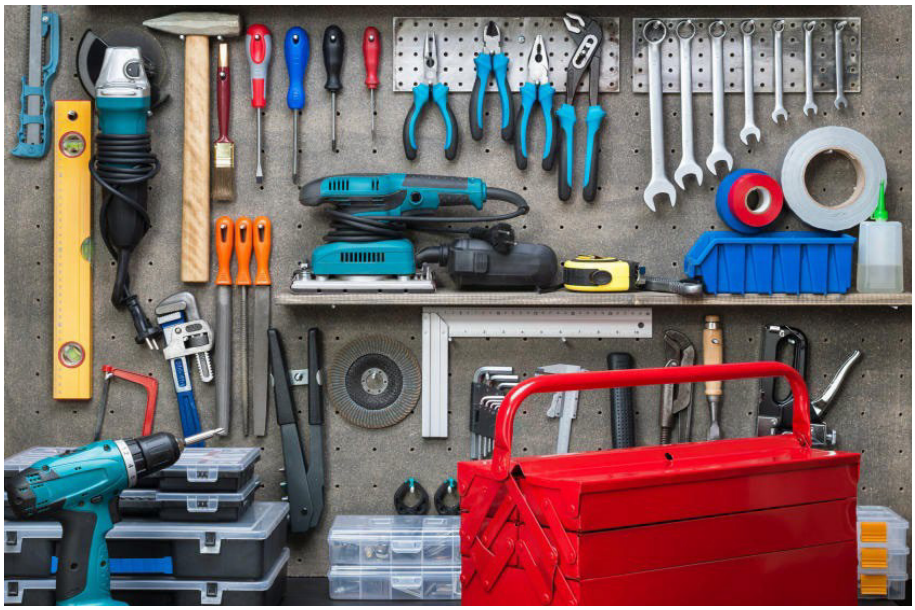


Fig. 3.1.3: Tools maintenance

Inspect the cleanliness

- Before returning tools to store you should clean them.
- Before putting tools into their proper places you should wipe them down with a rag or old towel so that they are free of dust, grease and debris. This helps to look after any damage or defects.
- Tools handles should be free from splinters, breaks and cracks.
- Metal parts on tools shouldn't show any signs of corrosion or rust. If a tool shows any signs of damage, it should be repaired or replaced.
- Cold chisels, log-splitting wedges and other striking tools should be inspected and maintained regularly otherwise they can be very dangerous. As these types of tools are used for repeated striking, the surface of the metal head eventually mushrooms out and spreads to form a lip or ridge around the edge.
- After cleaning, use all-purpose oil to lubricate tools with adjustable parts.
- Ensures handles are comfortable enough to slide your hand along. In case the wood is rough, sand across the grain in a shoe-shine fashion. Finish by sanding along the grain. Apply a coat of oil on the handle so that wood is protected.

Sharpen important components

- Maintain the sharpness of the tool components designed for sharpening, cutting, slicing or chopping.
- Perform routine maintenance on specific parts that need to sustain a particular sharpness so that production quality is not hampered.

Fig. 3.1.4: Using tools in proper manner

Storing and take good care of accessories and parts properly

Routine maintenance is a key to good health of tools. The following are some helpful tips on how to clean and properly store your tools.

- Protect tools from dust, moisture and other situations by storing them properly after use.
- If possible keep tools in their original cases, or place them away in storage drawers or tool chests, preferably in a garage or basement with a moderately controlled climate.
- Organize tools properly to help in easily finding the required tool.
- Ensure regular check-up of tools to avoid any signs of wear or damage.
- Moving parts of tools should be kept lubricated for premium output. It keeps the mechanics of a tool running smoothly and decreases the chance of rust development.
- It keeps the mechanics of a tool running smoothly, it also decreases the chance of rust developing.

3.1.3 Power tools

Tile Power Saw

Tile power saw is a power tool used to cut the tile in a straight line. It is most useful when large number of tiles is being cut. This power tool contains an inbuilt water tank which sprays water on the cutting area

Fig. 3.1.5: Tile power saw

While selecting a Tile Power Saw:

- Check:
  - Motor should be of high wattage and should have a powerful handle
  - Size of table should be large enough to support the cutting edge of the full tile.
- Tile power saw should be able to operate at different voltages.
- It should have:
  - An adjustable guide fence.
  - A Blade Guard
  - A Waterproof Switch
  - Overload Protection
  - A water tank for cooling while blades while cutting tiles.
  - A Diamond Blade

A tile cutting power saw blade should be used to cut specified types of tiles only. If you are using blade for all purpose, then it may damage the blade.

Maintenance tips for power saw

Ensure machine's specific checkpoints are clear to perform good and effective preventive maintenance. Always refer to the power saw's manual to ensure any area requiring regular maintenance hasn't been overlooked. Carry out regular and periodic maintenance to keep the tools durable and operable. Some regular & periodic maintenance check points are:

- Clean chips from blade guides and wipers, band wheels, chip brush and pans, vise jaws, and machine surfaces.
- Inspect regularly the blade guides, blade wipers, blade and chip brush for wear and tear.
- Replace defective parts.
- Check fluid and lubricant being used.

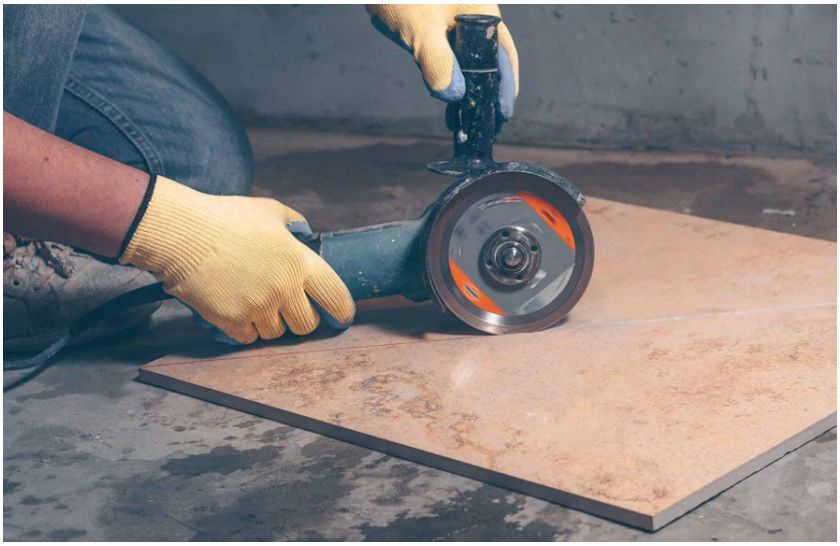


Fig. 3.1.6: Maintenance of power saw

Every Three Months

Regularly clean sawing fluid/lubricant reservoir and screen.

Every Six Months

- Replace filters of hydraulic fluid.
- Clean magnetic plug of hydraulic fluid reservoir.
- Lubricate saw column pivot point.
- Blade guides should be inspected and adjusted.

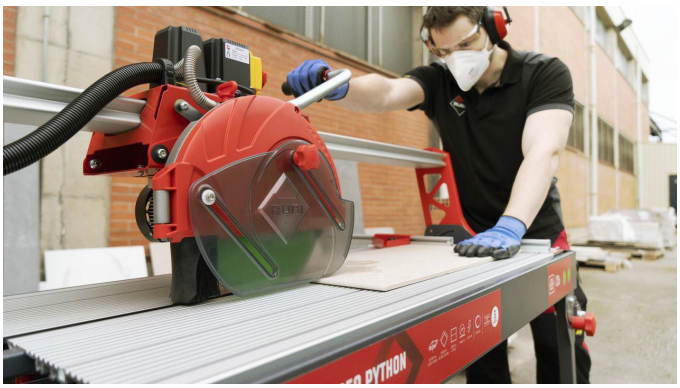


Fig. 3.1.7: Using power saw with safety measures

3.1.4 Materials and Accessories

Name	Image	Use
Sponge		Use a grout sponge to wipe away any excess grout, and clean the surface of the tiles.
Spacers		Tile spacers are small pieces of plastic or rubber that allows you to achieve consistent spacing between tiles when installing on floor or wall
Tile edge trims		Tile trims are used at the corners of the exposed edges of the tiles to protect the edges and give good finish

Table. 3.1.2: Accessories required for mason tiling work

Selection procedure of spacers and tile edge trims

Selection of tile edge trims

There are various types of edge trims but the most commonly used are aluminum edge trims because they are light in weight, durable & easy to install.

Types of tile trims

Trim tiles: They are available in variety of configurations to satisfy the design requirements of any installation. Edge trims with 1 or 2 rounded edges can be used along the perimeters of walls and countertops. Trim tiles can also be used on base tile of a floor.

1. Radius Trim: Radius trim consists of rounded lips which can turns at 90-degree corner at the edge of the tile. The turned edge covers the thickness of the setting bed when the setting bed is raised over the existing wall surface.
2. V-cap edging: V-cap edging provides professional-looking results in any tile installation. The lower leg of the cap takes the place of a separate cut. Both legs of the cap require back-buttering with adhesive.
3. Base tiles: To finish a floor installation base tiles are used. Base tiles which specially cater to this purpose have a coved foot at the base. Bullnose floor tiles are also available. In case of absence of a base tile, field tiles can be cut to be used as trims.
4. Borders and accent tiles: Borders and accent tiles enhance visual appeal of an installation. Border tile is a narrow length tile used for finishing an edge. Accent tiles come in contrasting shape, texture, size and color. They are made of glass.

Selection of spacers

To look your finished product incredibly professional then spacer is tiles used. Spacers have variety of different shapes and sizes.

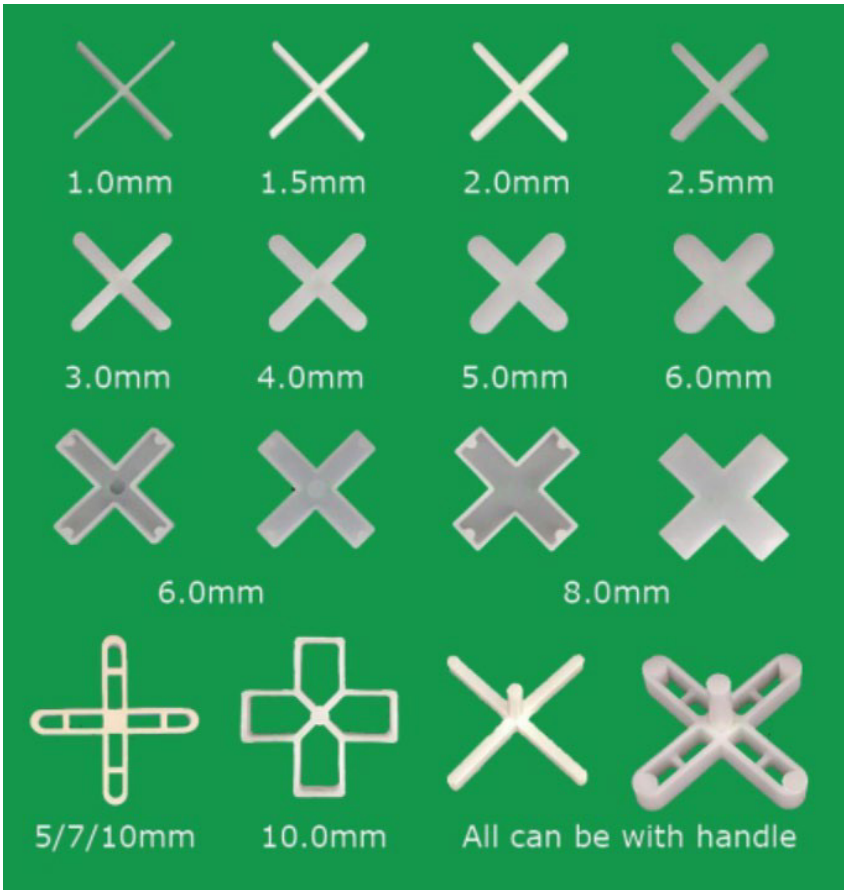


Fig. 3.1.8: Selection of spacers

Some of the main types of tile spacers are:

- 'T' shaped, cross shaped, and horseshoe shaped are few examples and each has its own function.
- For cross shaped flooring spacers 'Checkerboard' like patterns are used and for more irregular, offset patterns 'T' shaped spacers are used.
- For wall installations, horseshoe spacers are perfect because they hold their shape and don't cause grout bulging.
- When it comes to grout lines, everyone likes a different width. For less cleaning and maintenance narrow grout lines are becoming popular. If possible you should consider a narrow tile spacer.
- The size of spacer is decided on a personal preference. Usually for walls, size of spacer is 2 mm & for floors size of spacers is 3 mm.

Fig. 3.1.9: T-shape Spacers

Notes

Scan the QR code to watch the video

https://youtu.be/aJ36AAwgBDg

Tools used by Mason tiling

UNIT 3.2: Materials and Consumables Required

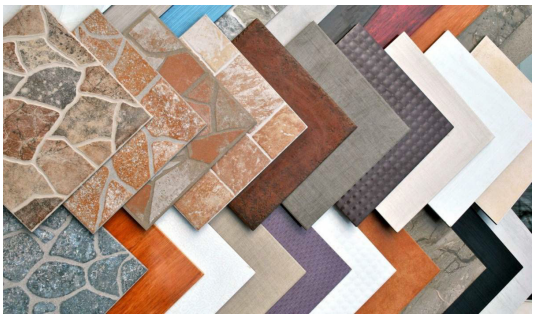
Unit Objectives

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

- Know about tiles;
- Know about different types of tiles;
- Know about consumables required; and
- Know about storing and stacking of materials and consumables.

3.2.1 Material required

Materials required for tiling work are:

Material	Image	Use
Tile		Tile is a hard wearing material made up of ceramic, porcelain, PVC, metal, glass etc. Tiles are generally used to cover floors, roofs & walls.
Adhesive or cement		Tile adhesive is premix self-curing solution used for fixing the tiles, marbles etc.
Sand		Sand is a naturally occurring granular material composed of finely divided rock and mineral particles/river sand.

Grout		Grout is a fluid like mortar used for filling spaces, voids and for sealing joints between tiles
Sealer		Grout sealer is a water-based or solvent based sealant applied over dried grout. It is impermeable to water, oil and acid based contaminants

Table 3.2.1: Materials required for mason tiling work

3.2.2 Selection and specification of materials

Tiles

Tiles are selected and specified based on shape, color and material type.

The main purpose of tiles is to provide covering to walls & floors in the form of simple and complex pattern.

Types of tiles

For residential and commercial applications there are many types of tiles being used. Tiles help in choosing cost- effective and environment friendly flooring choices. Tiles are created from natural clay and often from other (recycled) materials.

1. Ceramic Tile: This tile is commonly used in the offices, stores and homes. There are two types of ceramic tile:
    - Unglazed tiles, are made from clay and then heated.
    - Glazed Ceramic tiles: These have a protective coating on them and are available in varied colors which are created through the glazing process.

Fig. 3.2.1: Ceramic Tile

2. Quarry (Unglazed) Tile: Quarry tile is unglazed ceramic tile.

- This type of tile is low cost & it is the generally used for industrial, residential and commercial tiling applications.
- This type of tile is durable and less prone to scratches and chipping.
- For colder region, freeze-resistant grades of quarry tiles are used
- These tiles are mainly used in kitchens and pathways.

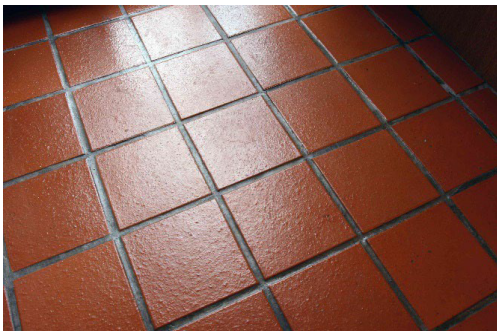


Fig. 3.2.2: Quarry Tile

3. Porcelain Tile: It is a type of ceramic tile manufactured by heating clay at a much higher temperature.

- These tiles are relatively thicker and damp proof.
- These tiles are stain-resistant as these are less permeable to liquid or air.
- The cost of porcelain tile is high.
- These tiles have longer durability due to its high density & hardness.
- These tiles can be used for all types of tile finishes.

Fig. 3.2.3: Porcelain Tile

4. Mosaic Tile: These can be made of ceramic, glass, natural stones etc.

- These are used to create a variety of designs.
- Mosaics tile are smaller in size and used to create variety of patterns.
- These can be used to create unique shapes including regular polygon.
- For quick installation and even spacing, these are also available as paper mounted or mesh mounted.

Fig. 3.2.4: Mosaic Tile

5. Marble Tile: Marble tile is made from natural stone.

- These are used to create a luxurious and unique look.
- These tiles have a lot of color variation and they are made from natural stone.
- These tiles are porous and need to be sealed.

Fig. 3.2.5: Marble Tile

6. Vitrified Tiles: These are manufactured using white clay that is heated over high temperatures. These tiles are solid and non-permeable.

- These types of tiles are used in floors of homes & offices due to their mirror finish look.
- Vitrified tiles offer much better scratch resistance, resistance to acids, better mechanical strength (MOR), resistance to staining, alkalies and chemicals compared to marble or natural granite.

Fig. 3.2.6: Vitrified Tile

7. Terracotta Tiles: These tiles are made up of fired clay and used for indoors or outdoors.

- In comparison to other tiles, these are soft and porous and need to be sealed when being used indoors.
- Since these tiles retain moisture in the open air, these are ideally left uncoated. If these tile are coated, white salts are collected under the sealer.

Fig. 3.2.7: Terracotta Tile

While selecting tiles consider following technical features:

- Water absorption: Water absorption plays an important role. For example, if the tiles absorb higher amount of water then it effects the sustainability of tile for outdoor use.
- Mechanical features: The mechanical features can be calculated on the basis of the bending strength and the breaking stress.
- Surface mechanical features: These are calculated on the running surface of the tile and are related with the wear and deterioration, resistance to scratches due to the handling /moving of hard bodies on its surface and in contact with it.
- Thermo-hygrometric features: The resistance to dampness (“hygrometric”) and specific temperatures (“thermo”) is described by thermal shock, frost resistance and crazing resistance.
- Chemical features: Theses includes resistance to stain, resistance to house hold items, resistance to acids and bases etc. Chemical Stain Resistance involves withstanding compounds such as red aerosol paint, 10% hydrochloric acid, 10% ammonium hydroxide, urine, saturated calcium chloride, 1% soap solution, black stamp pad ink, chewing gum, turpentine, Urea 5%, diesel fuel and motor oil etc., without staining or recolouring.

Tile Adhesive

Tile adhesive has additives which make it stickier and allows more movement. Tiles tend to expand or contract with heat and cold. If we use mortar for fixing tiles, they are likely to pop loose after a while.

- **Cement** – based adhesives: The traditional sand/cement mortar and semi-dry bed methods are alternative methods of tile fixing but these require an experienced fixer's supervision for installation.
- **Rapid-set adhesives:** These are standard adhesives having reduced operation time.
- **Flexible adhesives:** These are used to counter the effects of minor movements and deflections. These are used in more demanding applications which require improved adhesion, waterproofing and/or elasticity. They are mixed with water prior to use and have built in admix.
- **Pourable adhesives:** These are pourable in consistency and are used to butter tiles to get solid bed prior to placing onto the ribbed bed. This ensures no empty spaces are left beneath tiles.
- **Epoxy adhesives:** These are used for full chemical resistant bedding and for fixing of metal surfaces. This consists of two section resin/hardener system.

Fig. 3.2.8: Adhesive for Tiling work

Grout

It is essential to choose correct grout to cut down on maintenance and to complete the tiling work properly. Proper installation and sealing of grout enhances life of tiled surface.

There are various types of grout:

Fig. 3.2.9: Unsanded and sanded Grout

- Non sanded (un-sanded) grout: This grout is commonly known as “wall grout”. It is essentially a grout without the sand.
    - Non-Sanded grout is used on polished marble and ceramic tile with grout joints smaller than 1/8 inch.
    - Non-Sanded grout should be sealed to reduced absorption after installation and to reduce cleaning problems associated with sanded grout.
- Sanded grout: Sanded grout is most commonly used for ceramic tile, stone or any other tile having a larger grout joint.
    - Fine sand is added to sanded grout to prevent too much thinning of joints on curing.
    - Because of this property sanded grout is used for larger grout lines and in majority of tile installations.
    - Please remember: Never use sanded grout on polished marble. It is essential to install polished marble with a grout width smaller than 1/8 inch.

Fig. 3.2.10: Sanded and epoxy grout

- Epoxy grout: It is made up of a resin and a hardener.
    - It is most trusted resistant to chemicals and stains. The new versions of epoxy grout have detergents added to them and are easier to work with them and clean up after wards. The older epoxy grouts were not easy to apply.
    - Epoxy grout is more expensive and water resistant.
    - Epoxy grout has a very long shelf life unlike cement grouts which can survive for a year in the sealed containers. If it is maintained above freezing temperatures can survive for many years.
    - This type of grout is used for more water and stain resistant tiles.

Key part of a proper tile installation is to picking the correct grout and if you choose incorrectly you could face multitude of problems and headaches. Selection and installation of grout is an important part for good completion of tiling works.

Fig. 3.2.11: Proper tile installation

Grout Sealer

There are 2 main types of grout sealer, for membrane forming and penetrating:

- For an unglazed tile, membrane forming sealer is best to use. This sealer doesn't create bond with the glaze. To deal with floor tiles this type of sealant is required. Sealant forms a nonporous membrane which does not that allow moisture to seep into the grout, though this makes it difficult to dry.
- Penetrating sealer is most commonly used and it does not have problem like in membrane forming sealer. To fills up the pores of the grout and to reduces absorption of moisture and stains, silicone or latex composition are applied.

Fig. 3.2.12: Grout sealer

3.2.3 Storing and stacking of materials

Storing and stacking of cement at site

- Building used for storage of cement should be, leak proof and moisture proof.
- There should be less number of windows in the storage building.
- Place the cement bags above the floor (about 150 mm to 200 mm above) on long flat thin piece of wood.
- The floor may comprise of lean cement concrete or two layers of dry bricks laid on well consolidated earth.
- The minimum space between the exterior walls and the stacks should be of 600 mm all-round.
- To reduce circulation of air, stack the cement bags close to each other.
- To avoid the lumping of cement due to pressure more than 10 bags should not be stored one over another.
- The width of the cement bag should not be more than four bags length or 3 meters.
- If the stacking of cement bags is more than 8 bags in height, the stacking should be done alternately in length wise or cross section wise to avoid the risk of falling.
- Placement of stack of the cement bags shall be in such a way so that it is easy to remove them as per the sequence of receiving them.
- Marking of date should be there on each stack of cement bags to show date of receipt of cement and to know the age of cement.
- Water proofing sheets such as polyethylene can be used when it is required to store cement for a long period of time or during the monsoons.
- Cement of different types must be stacked and stored separately.

Fig. 3.2.13: Storing and stacking cement or grout bags

Storing and stacking of grout bags at site

For storing and stacking of grout bags follow the same procedure as discussed above.

Storing and stacking of tiles at site

How to stack tiles is the most important part.If the number of boxes of tiles are less then they can be stored one over another, but if the number of boxes are more ,then the boxes should be stored either in their factory position.

Fig. 3.2.14: Storing and stacking of tiles

If open tile is stored they should be stored vertically or little tilted, but should not be placed flat.

- There is chance of chances of crushing and breaking of tiles under load if they are stacked horizontally. When placed vertically, this pressure is absorbed.
- To decrease the cost of construction the tiles should be stacked near the site.
- The construction work shouldn't be obstructed by stacked tiles. Stacking of tiles should be systematic to facilitate numbering.
- The tiles procured first should be used first.
- 1m is the maximum height of the tile stacks.

Exercise

Answer the following questions.

- What are the essential tools for mason tiling?
- What is the purpose of a tile cutter?
- Why are tile spacers important?
- What is the role of a grout float?
- Why do you need a level for tiling?
- What are the common materials required for mason tiling?
- What are consumables related to tiling?

Notes

Scan the QR code to watch the video

https://youtu.be/qQgh0n10548

Selection and specification of materials

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

4. Laying and Fixing of Tiles

Unit 4.1 – Sketches/layouts in tiling

Unit 4.2 – Cutting of tiles

Unit 4.3 – Horizontal laying and fixing of tiles

Unit 4.4 – Vertical laying and fixing of tiles

(CON/N0115)

UNIT 4.1: Sketches/Layouts in Tiling

Unit Objectives

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

- Read the layout and sketches; and
- Understand informatory signs on the sketches

4.1.1 Layout and Sketches for Tiling Work

The layout/ drawing of the area to be tiled puts all details on paper, making tiling work easier. It reflects the framework of tiled surfaces and the layout of the tile.

Reading and interpreting tile layouts

Types of marking present in sheet:

LEGEND:			
	SS CORNER GUARD		LAMINATE
	BLOCK WALL		TILE - 3 DADOING
	R.C.COLUMN		SKIRTING TILE / GRANITE SEEN IN ELEVATION

Fig. 4.1.1: Types of marking of tiling work layouts

ABBREVATION

FFL	- FINISHED FLOOR LEVEL	PRH	- PAPER ROLL HOLDER
EWC	- EUROPEAN WATER CLOSET	LSD	- LIQUID SOAP DISPENSER
BT	- BIB TAP	JC	- JANITOR CLOSET
PC	- PILLAR COCK	MI	- MIRROR
CSWB	- COUNTER SUNK WASH BASIN		- LVL DROP
UR	- URINAL	℄	- CENTER LINE
BTP	- BOTTLE TRAP	SB	- SWTICH BOARD
DY	- HAND DRYER	R	- REMAINING TILE
HF	- HEALTH FAUCET	PR	- PAPER ROLL DISPENSER

Fig. 4.1.2: Abbreviations used on tiling work layouts

Dimension & symbol description:

	RECESSED FLOOR MAT		1900MM HIGH BLOCK WALL
	BLOCK WALL		TILE-4
	R.C.COLUMN		
	ELEVATION MARKING		
	SECTION MARKING		

TILE	TILE-1 600X600MM	TILE-2 300X300MM	TILE-3 300X300MM	TILE-4
GENTS	SK BLUE GRANITE	BIANCO WHITE	OSCAR BLUE	20MM THK. JET BLACK GRANITE

Fig. 4.1.3: Symbols used on tiling work layouts

4.1.2 Understanding tile and sketches

The layout/ drawing of the area to be tiled puts all details on paper, making tiling work easier. It reflects the framework of tiled surfaces and the layout of the tile.

Reading and interpreting tile layouts

Types of marking present in sheet:

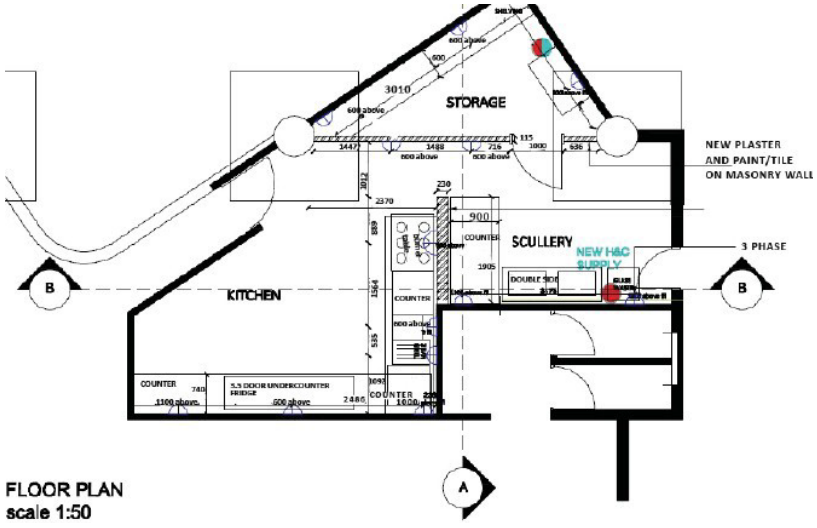


Fig. 4.1.4: Drawing for floor plan area

Layout and section details, a model in sketch up and two renderings of the space

Take two sectional drawings of the tiling area to get a proper understanding of the layout of tiles, tiling details with required finish and materials used in tiling works.

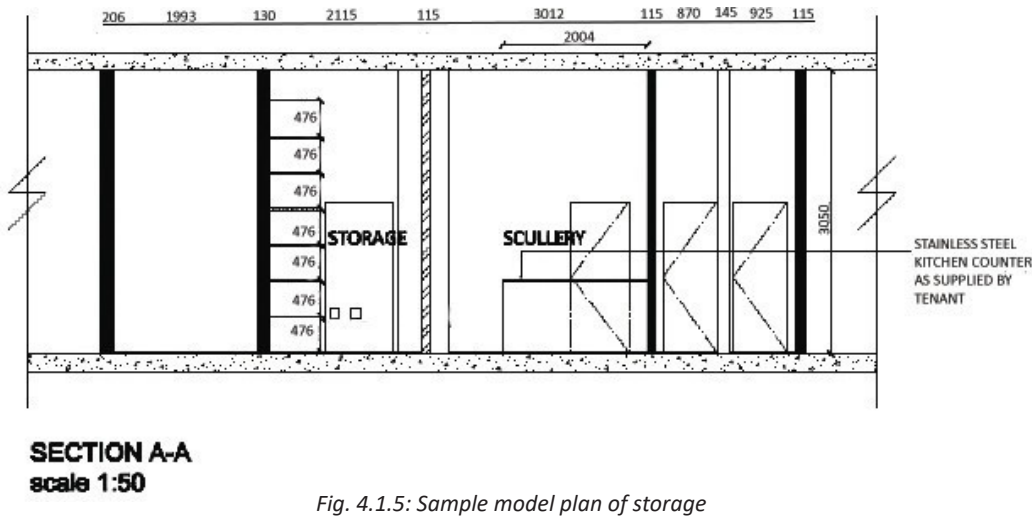


Fig. 4.1.5: Sample model plan of storage

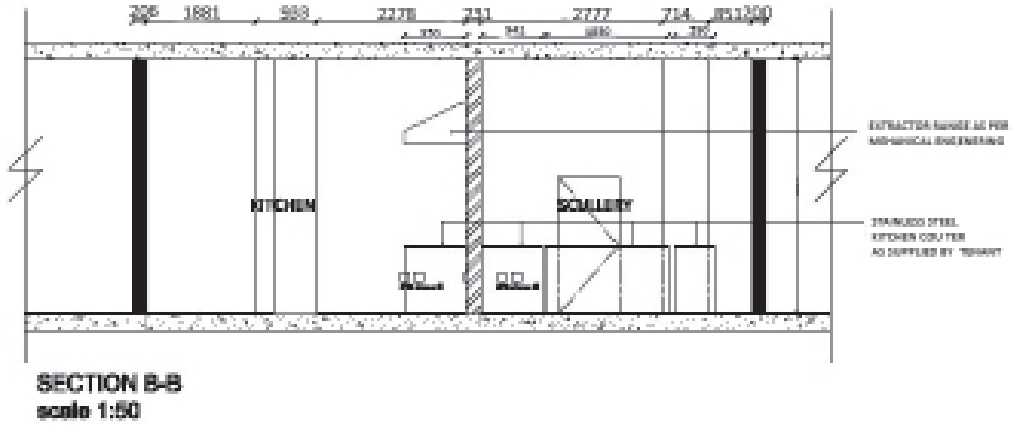


Fig. 4.1.6: Sample model plan of kitchen

In order to estimate the quantity of material required and cost of tiling works, area calculation is carried out using tile layout plan. A tile layout plan indicates the quantity of tiles required, starting point of tiling works and location of soft joints so that tile popping is prevented. It is advisable to use two sectional drawing with the tile layout plan to understand clearly the laying pattern and position of tiles for tiling works.

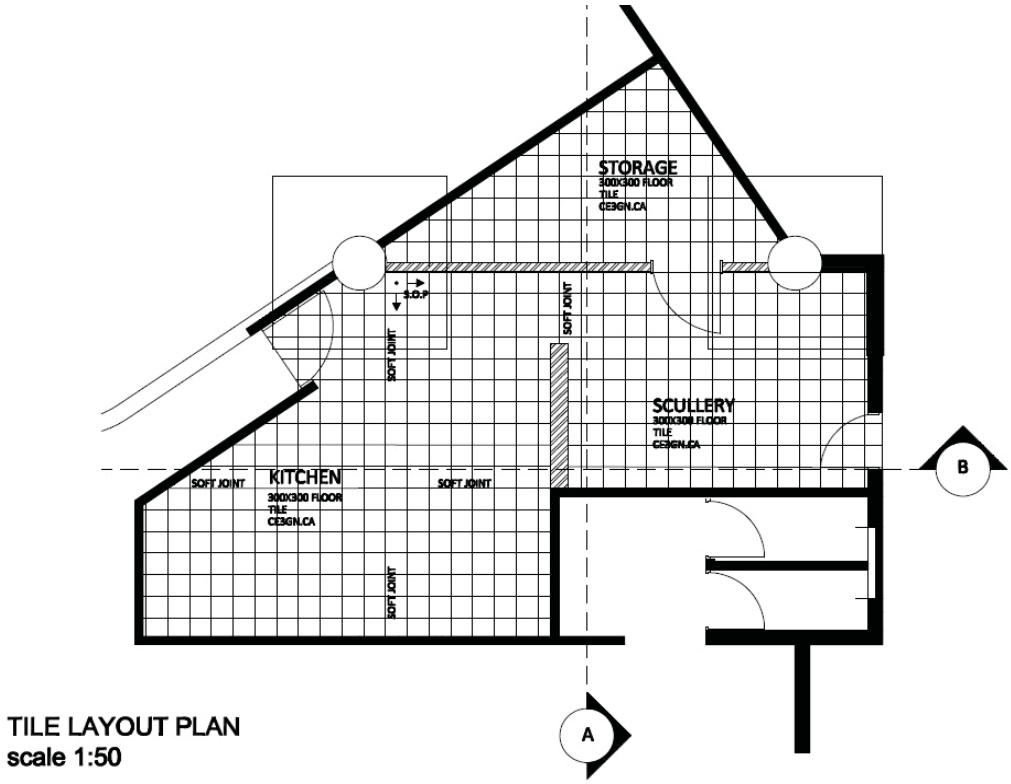


Fig. 4.1.7: Sample tile layout plan of building

Fig. 4.1.8: Sample tile section of building

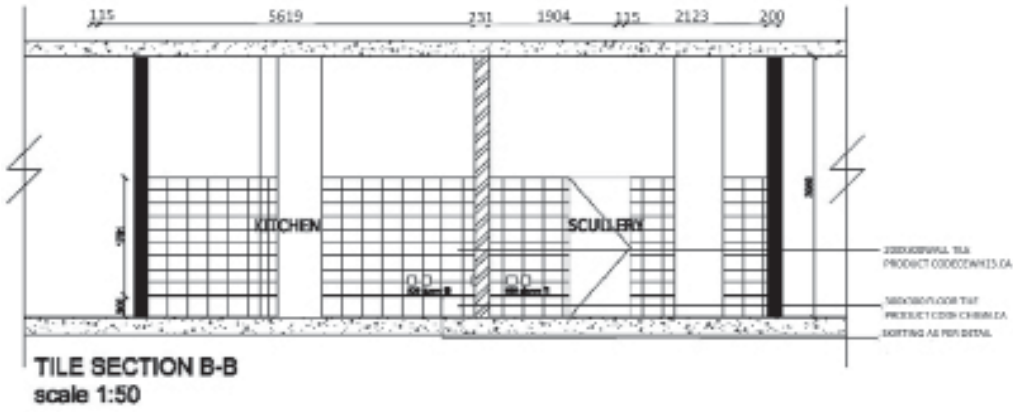


Fig. 4.1.9: Sample tile section view of building

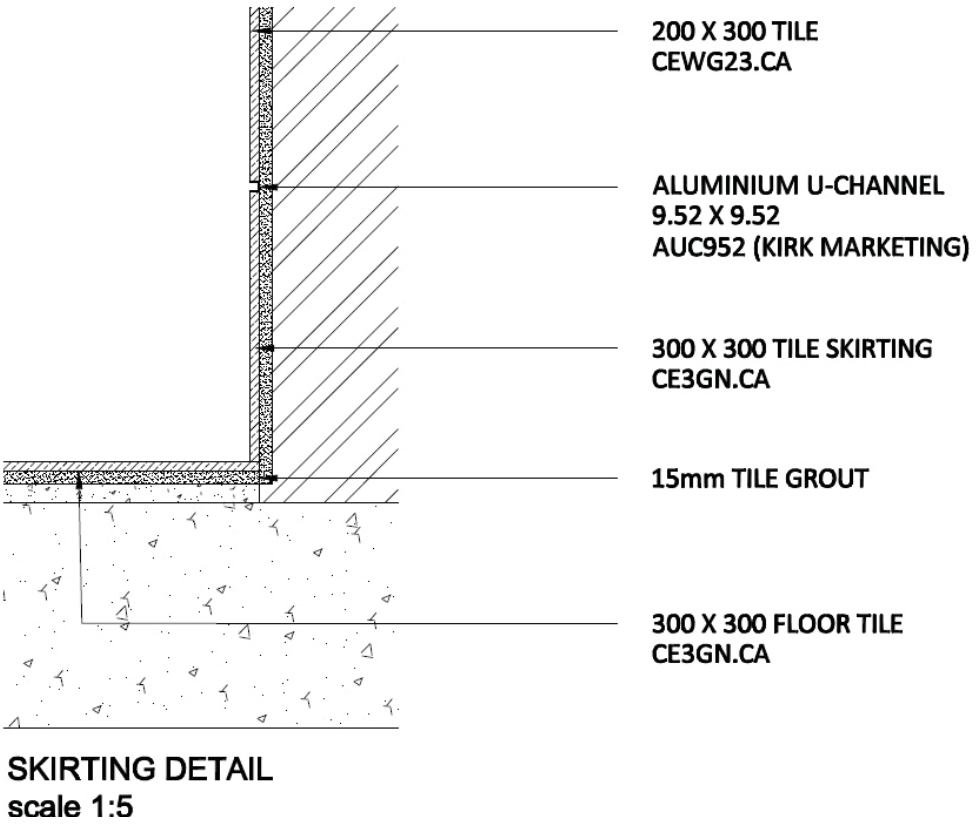


Fig. 4.1.10: Sample skirting detail of building

Notes

Scan the QR code to watch the video

https://youtu.be/dc4lm4qGjy0

Layout and Sketches for Tiling Work

UNIT 4.2: Cutting of Tiles

Unit Objectives

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

- Know about how to identify batch no. and arrow mark on tile;
- Know about tools required for cutting tiles; and
- Perform tile cutting

4.2.1 Identifying batch no. and arrow mark on tile

1. Identifying the batch no. on tile box:

Batch number which indicates the products specific production run details. From batch to batch,

tiles may vary in shade, colour, size and appearance. Many variables occur as a result of variations in ingredients, dyes, temperatures both within the kiln and outside air temperatures etc.

Fig. 4.2.1: Batch no. on the tile box

2. Identify the arrow mark on the back side of the tile.

Arrows on the back of the tile indicate directionality. The arrows are there to ensure that all of the tiles are laid out facing the same direction. This ensures uniform pattern of laying of tiles

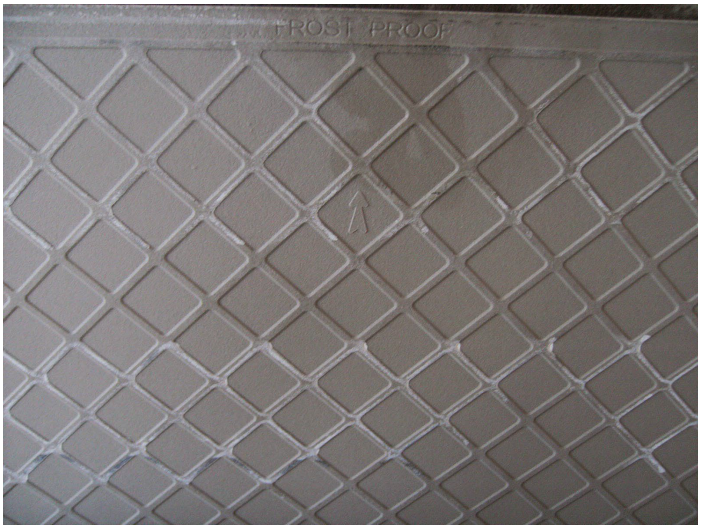


Fig. 4.2.2: Arrow marks on the back side of the tile

Fig. 4.2.3: Direction marks for the tile

4.2.2 Cutting of tile

Manual cutter or electrical wet saw cutter is used for cutting of tiles.

Using manual cutter for cutting tiles

It is not always easy to cut tiles using tile scribe. Therefore, it is recommended that it can be used in combination with a tile snapper. This ensures that tiles are cut with application of little pressure only. Tile snapper cuts tiles using following steps:

Step 1

First, mark the tile you want to cut in the normal way. Then, using a steel rule, run the cutting wheel of the tool along the line, pressing down firmly and to score the glaze.

Fig. 4.2.4: Marking on tile by steel rule

Step 2

Place the tile between the jaws of the tool and align the scribe line with the centre mark. The tile will break into two parts along the scribe line, when the ends of the tiles are pressed firmly.

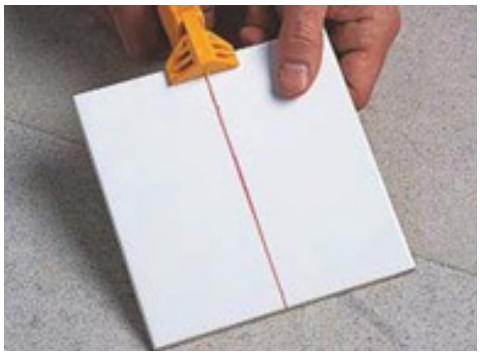


Fig. 4.2.5: Marking centre line on tile

How to make curved cuts in wall tiles

The simplest ways to make curved cuts in wall tiles is by using tile saw. The tile saw consists of a round blade which helps to change direction easily.

Step 1

Take a piece of paper or card as per the tile size and cut it to the shape required. Then lay it over the tile and mark the shape on the face of the tile.

Fig. 4.2.6: Marking curves on tike

Step 2

Clamp your tile securely and cut along the line with a tile saw. Check the cut profile of the tile and make any adjustments with a tile file.

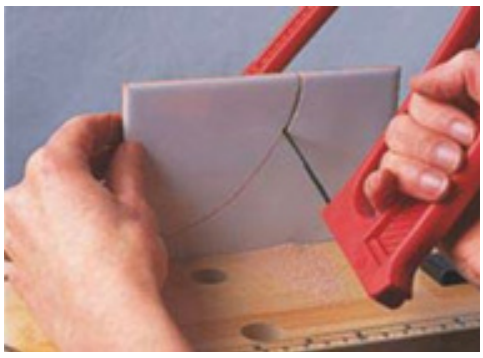


Fig. 4.2.7: Cutting curves on tile

How to use a tile-cutting machine

Tile cutting machine is a hard-wearing lever-action tool having a snapper, and a strong bed which supports the tile. Some machines also have a removable gauge for measuring the tiles, and even make an allowance for a grout gap and tapered cut. Tile-cutting machines are simple to use and cost effective too.

Step 1

Firstly, select the tile you want to cut and carry out marking of the tile. Then put it into the machine, lining up the mark with the tool's guide. In order to bring the scorer into contact with the tile lower the handle, then press down and push the handle forward.

Fig. 4.2.8: Inserting tile in the machine

Step 2

Fit the tile into the slide of the handle, carefully aligning the scored mark with the guide. Then lower the handle until the snapper touch the underneath of the tile.

Fig. 4.2.9: Fitting tile in the machine

Step 3

To break the tile along the cutting line, press down firmly on the handle.

Fig. 4.2.10: Cutting tile by the machine

Cutting tiles by using wet saw

To reduce the risk of breaking of tiles when they are being cut, it is advisable to saw 3/4th of the length of the tile on one side and then rotating the tile around and cutting the remaining length.

Step 1: Aligning tile on the table

- Tile should be placed in such a way that when the layout line is at the blade, the widest part of the tile should be between the blade and the fence. Hands should be kept away from the blade during the cutting.
- Always wear a pair of safety glasses and back the tile away from the blade prior to turning on the saw.
- To check how to position the tile, try setting it up in different positions and use the one that supports the largest section of tile on the table during the cut.

Fig. 4.2.11: Positioning tile on the wet saw

Step 2: Cutting tile

- Use both hands for holding the tile, and then feed it along the fence and into the blade.
- Always put hands away from the blade.
- Push the tile piece between the blade and fence till the time tile completely clears the blade.

Fig. 4.2.12: Cutting tile by wet saw

Tips

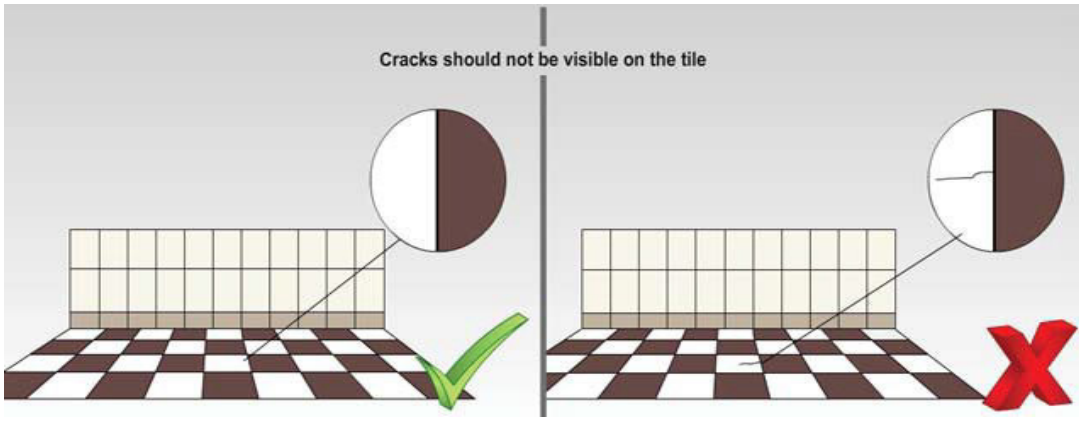


Fig. 4.2.13: Tips ding cutting tile

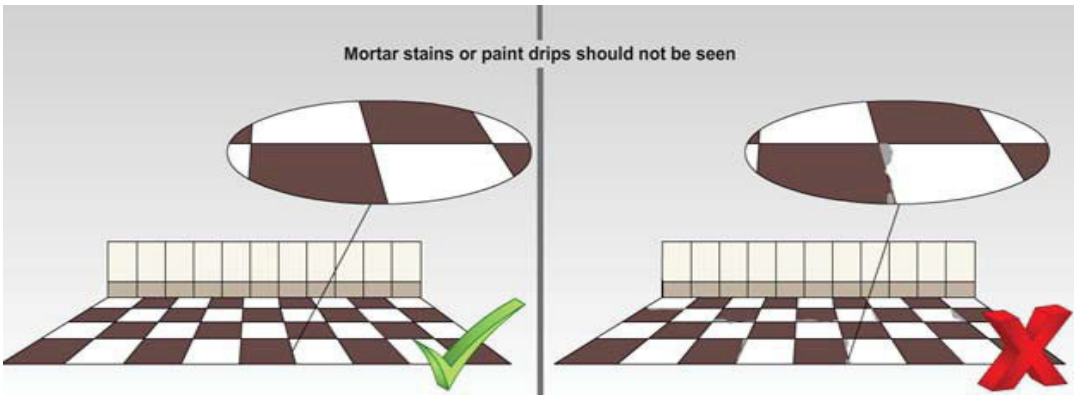


Fig. 4.2.14: Tips for housekeeping work after tile cutting process

- For marble tiles usually 0.16 to 0.32 cm spacers are recommended.
- To ensure proper levelling of floor, use the longest level.
- If the floor slope is more than 1/16 of an inch (0.16 cm) for every 3 feet (0.9 m), then a sub-floor needs to be laid.
- Marble can crack or chip easily so it is advisable to lay it flat.

Warnings

Test for Asbestos should be carried out before removing vinyl tiles, because asbestos releases fibers which are very dangerous for respiratory system.

If it is found positive, take professional help for removing vinyl tiles.

Since the blade of wet saw is very sharp and can be dangerous so be careful while using the wet saw.

4.2.3 Housekeeping practices during tile cutting

Cutting Waste

- To avoid escape of dust and sediment into the storm drain system, do not carry out cutting or fabrication activities in open/outside.
- Take special care for the built-up of dust and sediment in the indoors so as to avoid contamination of outdoor areas.
- Never hose down or wash any sediment or dust off the paved areas.
- In order to minimize storm water contamination, sediment, dust and other pollutants, outdoor areas should be sweeped or vacuumed up.

Fig. 4.2.15: Housekeeping during cutting

Wastewater Management

- Tile waste water should not be disposed into storm drains or ground.
- It is advisable to sweep or direct wastewater to a recycling system and avoid disposing tile cutting waste water into storm drains.

Fig. 4.2.16: Wastewater recycling

Notes

Scan the QR code to watch the video

https://youtu.be/slRU35Kan7E

Cutting of tile

UNIT 4.3: Horizontal Laying and Fixing of Tiles

Unit Objectives

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

- Discuss about surface preparation methods;
- Perform preparation of cement mortar; and
- Perform laying and fixing of tiles horizontally

4.3.1 Surface preparation

Surface preparation is carried out prior to fixing of the tiles. For this the base concrete should be spotless, dry and free of dirt, oil, dust, mortar spatter and development of form release.

Methods of surface preparation:

1. Broom Cleaning - Brooming, air blast or vacuum cleaning is used to remove all surface dirt and other contaminants.

Fig. 4.3.1: Cleaning surface by broom

2. High Pressure Water Blasting -To remove mortar, dirt, eroded and weak concrete, loose concrete and chemical contamination a water blasting at 3500-4500 psi can be used. Water blasting will not remove oil, laitance, grease or sound old coatings. Although water blasting is dust free, it requires good drainage for disposal of large volume of water.

Fig. 4.3.2: High pressure water blasting

3. Acid Etching - Acid etching is used to dissolve the weak surface layer known as laitance thereby opening the pores, allowing penetration of the sealer coat. A solution of muriatic acid is usually used in acid etching. The type of concrete mix and finishing of given concrete will decide the required strength of acid which varies from 2% to 20%.

The acid will cause bubbling of the solution as it etches the surface concrete. Scrub and rinse the dissolved salts after the reaction of acid stops. Repeat the process if required. If the etching action was effective, then the surface will feel like fine sandpaper.

Fig. 4.3.3: Acid etching

Sandblasting - It is the most effective surface preparation method. Here the concrete is light blasted with fine silica sand. The objective of sandblasting is same as acid etching. All form like weak concrete, release agents, dirt, laitance and contamination can be removed with sandblasting. It is more effective on walls and ceilings. However, the only drawback is that It is dust producing and expensive. Sandblasting can't be done in areas containing machinery and equipment or in areas where traffic is heavy and close. Sandblasting is very effective for removing unsound or unwanted old coatings from concrete or masonry surfaces.

Fig. 4.3.4: Sand blasting

4.3.2 Preparation of cement mortar

For fixing tiles, sand cement mortar is used.

For preparation of cement mortar following Ingredients are required:

1. Cement;
2. Sand;
3. Water;
4. Bonding agent

Preparing by using barrel cement mixer

1. **Mix sand & cement.** For mortar mix, you have to mix ingredients in 1:4 ratio. Where in 1 part of cement & 4 part of sand used.

Fig. 4.3.5: Sand and cement

2. **Use the right amount of water.** Add specific amount of clean water to the mortar mix and achieve the consistency of the mortar mix as per requirement. The amount of water added to the mix varies as per the climatic conditions, wetness of sand the variety of blend being utilized.

- Ambient conditions like temperature and humidity should be considered for making mix as thery effects the workability of mix.
- Drier mix will not be workable whereas wetter

Fig. 4.3.6: Mixing of mortar and water

3. **Use the good quality of sand and cement**. Cement bags free from lumps & good in quality/ grade should be used for mortar mix. Course – grade of sand should be used for the mix. sand should be free from dust & sand used for the mix should be as dry as possible for use.

- Sand used for mix should be crushed sand or natural sand. It should be free from clay, silt and fine dust.
- Each brand of tiles may recommend slightly different mixes. But in general, a mix of 1:4 is usually appropriate and effective.

Fig. 4.3.7: Stacking of cement bags

4. Using additive. Additive are added to increase the bonding strength of the tile work. Example: mastic, epoxy etc.

5. Precautions for use of additive in mortar: Adding additive to your mixture will make the mortar set more quickly. Therefore, either work quickly when using additive in mix. The quantity of additive to be added as per the specification & instruction only.

Fig. 4.3.8: Additive for mixing in cement

6. Make mix in accordance with ambient conditions: The mortar will behave differently at different temperature. Quantity of water will decide the effectiveness of mix in cold, humid or wet weather. Prior to application attain the right consistency of the mix.

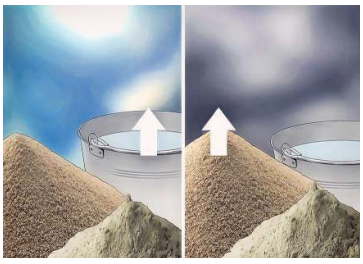


Fig. 4.3.9: Effect of weather on cement mix

7. Obtaining right consistency of mix: Mortar mixed to the right consistency should be able to hold onto a trowel held at right angle. The mix should also be wet enough to work easily and pour in and out of buckets.

Fig. 4.3.10: Checking consistency of mortar

8. Mix in a cold temperature: If weather is cold or nearly freezing then try to add slightly more hot/ warm water to increase the rate of hydration reaction of cement. Always ensure that the finished product must be prevented from freezing until set.

9. Wash the mixer, wheelbarrow and/or buckets. Wash all the mixing equipment before adding dry ingredients, so that mortar will slide easily and reduce wastage. Pour about half the water necessary for the batch into the mixer or tray, and pour some water into the wheelbarrows or buckets.

10. Add the dry ingredients and start mixing. First step of working with power mixer is to turn it on and to get the blades churning and then gently adding dry ingredients. Take special care not to dump them and splatter the water out, or to lose too much of the cement by clouding it.

Fig. 4.3.11: Prior wet mixing wheelbarrow and mixer

11. Prepare the cement mixer and bucket for screed powder mixing.

Fig. 4.3.12: Preparing mixture and bucket

12. Place the Screed premix powder in the cement mixer.

Fig. 4.3.13: Adding cement in mixer

13. Add water to the mixer as per recommended by screed powder manufacturer.

Fig. 4.3.14: Adding water in mixer

14. Prepare & mix the bonding agent while mixing the screed.

Fig. 4.3.15: Moving mortar in bucket

15. While using hand held electric mixer, mix it till a mortar of flow able consistency is obtained.

Fig. 4.3.16: Mixing of mortar by hand mixer

Mixing mortar manually

1. Mortar is a mixture of cement, sand and water in certain proportion. The volume ratio of cement to sand is usually about 1:4.

2. Mix the dry ingredients. Using a small bucket or scoop put 1:4 part of cement & sand into a mixing tub/trough, wheelbarrow, cement mixer or 19 litre bucket. As per the directions on the package add any dry additives and stir the powdered mixture thoroughly.

- As mortar will start to set quickly, so make sure to make mix of only that quantity which can be used in about two hours.

- Additives is added to improve the workability of mortar. Additive makes the mortar more water resistant and reduces the amount of shrinkage upon curing. Additives also helps to prevent the segregation of cement and sand.

3. The mix should be made on a dry and smooth pucca (hard) surface. Soft soil should not be allowed to mix with the mortar.

4. Create a circular heap of the dry mix having a central depression and fill water in the center with the help of bucket.

5. The mixture will absorb water slowly.

6. With the help of spade continue mixing dry mix with the partially wet mix from the other side and add more water from one side.

7. Shift the mix through pans immediately to the work location.

Fig. 4.3.17: Accessories required

Fig. 4.3.18: Materials required

Fig. 4.3.19: Mixing water and ingredients

Fig. 4.3.20: Preparing mortar

4.3.3 Measurement and marking of tile

Measuring up

Measure the length of the area you're going to tile and then divide it by the size (length) of the tile you are going to use.

Then measure the width of the area and then divide by the width of a tile.

To find out the number of tiles needed for tiling work you should round up the number of tiles for length and width, then multiply the two results.

Consider the spaces taken up by doors and windows etc. & then follow the same process for any other areas.

As an allowance for breakages or incorrect cuts add extra 5% for wall tiles or 10% for floor tiles.

Fig. 4.3.21: Measuring and marking on wall

Plan your tile layout first

Planning is most important to tiling work. As proper planning helps to avoid uneven spacing or poor alignment in tiling work. A consistently-sized spacer between tiles helps to make sure tiles are evenly arranged. You could use any object for a spacer such as a matchstick or a plastic spacer; it

Fig. 4.3.22: Marking prior to tile layout

4.3.4 Laying of tile

Floor Tiling		
S. No.	**Method statement**	**Images**
1	Place all tools & tackles near the working location.	
2	Chisel the working area as per requirement.	
3	Clean the working area prior to lay the tiles.	
4	Mark the top level in all round the permanent surfaces (400 mm high) & mark a line over it.	

5	Fix the button mark on the ridge point of the floor area (parallel edge slope 10 mm).	
6	Check button mark level with respect to reference line & align it using rubber mallet & straight edge.	
7	Fix the button mark on the valley point of the floor area (parallel edge slope 20 mm).	
8	Fix the button mark on other location (mid edges) of floor area & align using rubber mallet & spirit level.	
9	Check level of button mark using hilti tool.	

10	Spread the mortar in required thickness and ensure the top level is levelled with the help of straight edge and sprit level.	
11	Place levelling (hilti) tool & mark center line along both axis.	
12	Place spacer at the center of the marking.	
13	Apply adhesive & place the tile.	
14	Use rubber mallet to place the tile exactly.	

15	Place nearby tiles in each quadrant using spacer & make a square.	
16	Now place the tiles on the periphery of the square. (Work from inward to outward direction).	
17	Assess final dimension of the tiled floor.	
18	Assess slope of the tiled floor.	
19	Assess level of the tiled floor using tool.	

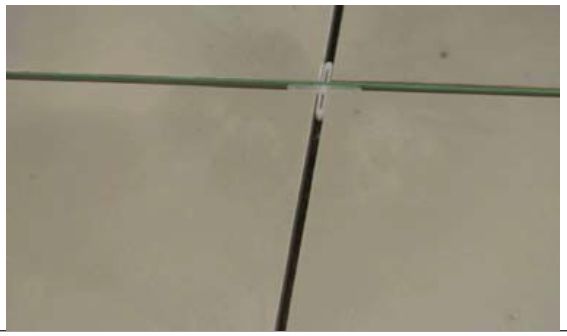
20	Assess tile undulation.	
21	Assess linear line of the tiled floor using line thread.	

Table. 4.3.1: Laying of tile

4.3.5 Installing tile spacers

1. With the help of chalk line & laser level locate the center of the room by creating grid line, so the first tile & spacer can be placed in a straight line.
2. With the help of grid line place, the first tile along the line.
3. After the placement of first tile put a spacer on each corner of the tile.
4. Place the next tile against the spacer of first tile & then put spacer on remaining corner of the new tile.
5. The process will repeat, expanding the wall/floor outwards using the spacers at the edges of each tile to keep a consistent distance between tiles.
6. At the edge of the floor put T shaped spacer. If required, create a “T” spacer by breaking one “leg” off a normal “plus” spacer.

Fig. 4.3.23: Location center of room

Fig. 4.3.24: Placing first tile for reference

Fig. 4.3.25: Placing tile spacers

4.3.6 Installation of tile edge trims on floor

Installation of an aluminium tile edging varies according to the support surface. For installing a metal tile edging on a wall (inside or outside corner) spread the adhesive first and then secure the trim. On the other hand, for installing an aluminium floor tile edging, the procedure is a little more complicated, as it is secured with a couple of screws.

Step 1: Planning

Planning will provide clarity on whether the tile trim is installed at the base or the corner of the wall. Place tile trim on all edges or on the edge where the tile meets another flooring material

Fig. 4.3.26: Metre box for trim cutting

Step 2: Measuring

To check how much linear trim is requiring for tiling work, measure the base and corners on which tile trim is to be installed.

Fig. 4.3.27: Marking on trim

Step 3: Cutting

Trim should always be cut at 45 degree angles at wall edges and bases. To cut the trim, use metre box and clamps to hold the trim firmly in place. Using the channels in the box as a guide cut the trim with a hacksaw or a trim cutter and repeats for the rest of the trim lengths.

Fig. 4.3.28: Drilling holes on surface

Step 4: By using a marker, mark the holes on the concrete floor at every fifteen inches. Use a drill to make the holes on the tile edging.

Fig. 4.3.29: Cleaning surface

Step 5: Masonry drill bits & drill machines are used to drill the holes in the concrete floor. The size of drill bit should be compatible with the dowels and screws. In case of wooden sub floor, you could drive in the screws directly in the joists, without making any pilot holes.

Fig. 4.3.30: Inserting dowels in surface

Step 7: Now insert the plastic dowels into the holes and hit them gently with a mallet. Too much force is not required; otherwise it can damage the dowels.

Step 8: Use screw driver to fasten the screws.

Fig. 4.3.31: Screwing and placing trim edges

Step 9: The aluminium edging are also installed on the other side of the floor. For this, align the tile metal edging properly. By using the hacksaw and the metre box mark the line on the trim and cut it.

Fig. 4.3.32: Installing trim edges

Step 10: The aluminium tile edging is placed in its position by driving in several screws. It is not sufficient to secure the edging just with screws. Therefore, it is advisable to spread a thin layer of adhesive and then lay the edging, making sure it is levelled and aligned.

Step 11: Next, the tile has to be cut in such a way so as to fit into location. To cut a tile, mark a line on the tiles by using a marker and a L-square. You can also use a tile cutter or wet saw to cut the the tiles. Cut and place the tile gently to properly accomplish the task.

Notes

Scan the QR code to watch the video

https://youtu.be/vyt5POG6IdI

Preparation of cement mortar

UNIT 4.4: Vertical Laying and Fixing of Tiles

Unit Objectives

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

- Perform laying and fixing of tiles vertically.

4.4.1 Laying and fixing of tiles on walls/vertical surfaces

S No.	Method statement	Images
1	Clean & chip the wall and wait for it to air-dry completely.	
2	Measure the dimension & mark the level on the wall as per reference.	
3	Install a supporting strip board with the help of tile tracker, below the second last bottom tile course.	

4	Check the level of the supporting board with the help of measuring tape.	
5	Apply adhesive over the tile & place it with reference to button mark.	
6	Now align and placed tile using rubber mallet & plumb bob.	
7	Now place the center line tile & align it with reference to other two tiles.	
8	Now follow the same procedure & place the other tile.	

9	Follow the progressive assessment & check the alignment & verticality of tile work.	
10	Place the remaining tiles on the above courses by following the same pre-set pattern & progressive assessment.	
11	Make a scaffolding arrangement & then place the tile above lintel level.	
12	Check the level & verticality of the tile using spirit level & plumb bob.	
13	Place the other tiles using spacer & align them.	

14	Now place the cut tile & align it.	
15	After completion of above courses remove the supporting strip board/ tile tracker.	
16	Now start placing cut tiles at the bottom most layer of the wall using spacers.	
17	Check the alignment of the wall using spirit level.	
18	Now place the other bottom most layer tiles & align simultaneously.	

19	Assess the dimension of the wall as per assessment standard.	
20	Assess the verticality of the wall as per assessment standard	
21	Assess the alignment of the wall as per assessment standard.	
22	Assess level of the wall using water tube level.	
23	Use a grout float to spread grout over the entire surface of the wall & fill the gaps.	

Table 5.4.1: Laying and fixing of tiles on walls/vertical surfaces

Exercise

Answer the following questions.

- Why is it important to create a layout or sketch before starting a tiling project?
- What tools can you use to create accurate tile layouts or sketches?
- How do you determine the starting point for tiling based on the layout?
- What equipment is commonly used to cut tiles to the required size and shape?
- Explain the basic steps for cutting ceramic tiles using a tile cutter.
- What are the advantages of laying tiles horizontally in a room?
- How do you ensure that the horizontal tile rows are level and evenly spaced during installation?
- When would you choose to lay tiles vertically, and what effect does it create in a space?
- How do you ensure that vertical tiles are straight and aligned properly during installation?

Notes

Scan the QR code to watch the video

https://youtu.be/MwDX-RtU_BI

Laying and fixing of tiles on walls/vertical surfaces

Skill India
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N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

5. Grouting and Curing of Tiles

Unit 5.1 – Grouting of tiles

Unit 5.2 – Curing of tiles

(CON/N0116)

Key Learning Outcomes

By the end of this module, participants will be able to:

1. Discuss about grouting work;
2. Know about procedure of mixing and applying grout;
3. Know about procedure of removing grout;
4. Discuss about curing of tile; and
5. Know about curing technique for tiles.

UNIT 5.1: Grouting of Tiles

Unit Objectives

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

- Discuss about grouting work;
- Know about procedure of mixing and applying grout; and
- Know about procedure of removing grout.

5.1.1 Mixing of grout

Mixing of grout is also very important. The powder grout can be mixed by hand and using a small container and a trowel.

Fig. 5.1.1 Mixing grout by trowel

Fig. 5.1.2 Mixing grout by handheld mixer

Materials and tools required for mixing grout

I. Two buckets (one for mixing grout, one filled with clean water);

II. Grout sponge;

III. Grout float (specially designed grout-smoothing tool);

IV. Grout powder;

V. Water; and

VI. Stirring stick or mixer attachment for drill.

Mixing of grout

1. First, weight the powdered grout after opening the packet.
2. Pour the grout into an empty bucket.
3. Pour water and stir it into the grout powder.
4. Stir continuously and add more grout powder or water as per requirement.
5. Keep stirring until the mixture has 'smooth toothpaste' like consistency without any lumps.
6. Leave the mixture to stand and thicken till you obtain the desired grout consistency.

7. Wait for five minutes and then give the mixture another stir. To check whether it is thick and firm enough, hold up your stirrer.
8. The grout mixture is ready to use only when it hangs from stirrer and doesn't drip.
9. Check grout consistency: Mixing of grout is carried out to achieve the right consistency, without compromising its drying qualities, make the grout mix workable. The correct amount of water plays an important part in mixing grout. A mix is required to be moist and have a firm appearance. Ideally, upon spreading the mixed grout with a rubber float or a cement spatula, it should contain such amount of water that it shouldn't develop a cake- icing like consistency.

Fig. 5.1.3 Checking of grout

5.1.2 Applying grout on joints

Before start grouting, check that mortar is hardened and tile is fixed on the floor.

Step 1: First, remove the tile spacers between tiles.

Step 2: As per the instructions given by the manufacturer, mix the grout with water to obtain paste-like consistency. Never forget to wear rubber gloves and safety glasses when working with grout.

Step 3: Apply the grout diagonally across the joints with the help of rubber grout float, removing as much excess as grout mix as possible.

Fig. 5.1.4 Applying grout on joints

Step 4: Allow the grout to dry for minimum twenty minutes or as per recommendation by the manufacturer.

Step 5: With the help of a sponge wipe the grout lines and allow water to set the grout just below the tile surface. A grout haze remover is used to clean the tile.

Step 6: Avoid traffic for minimum 72 hrs on the floor for allowing the grout to dry.

Step 7: Before applying sealer let the grout dry for the length of time recommended by the manufacturer. The sealer can be applied with a small paintbrush or a sealer applicator. Before the first five minutes clean off any smears. Then let the grout dry for at least 24 hours.

Fig. 5.1.5 Mason tiling at work

5.1.3 Checks after grouting

After grouting, check that no space has been left between the tiles.

Check for excessive grout on the tiles. You're likely to have a "grout haze" covering your tiles after your job is done. To clean up the grout haze – use a dry towel or use a rag to wipe at the haze until it begins to clean off. Look for any damages or cracks in the tiles and if present, rectify it.

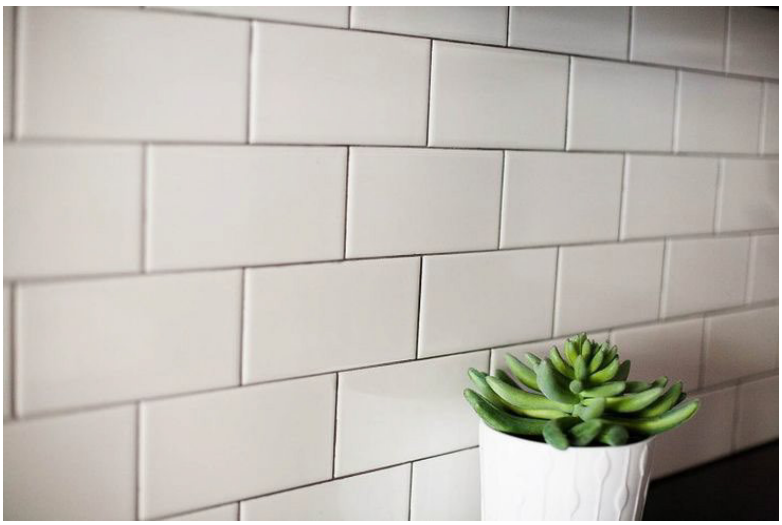

Fig. 5.1.6 Checking for excessive grout on wall

5.1.4 Removing old grout

1. Get the necessary tools. There are a number of tools which can be used to remove the grout.

- The tools which will help you remove grout quickly and with much less effort are called grout removal tools or re-grout tools. These tools are helpful in removing large amount of grout.
- Manual tools can also be used for removing grout. This grout removal tools looks like a small trowel and it is used in case power tools cannot be used.

Fig. 5.1.7 Grout removal tool

2. Make the center incision. Make an incision down the middle of each grout line using a grout saw, preferably with a carbide blade. Do this to all the grout lines that you want to remove.

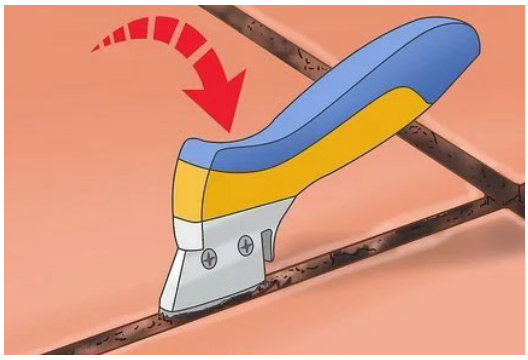

Fig. 5.1.8 Making incision

3. Remove the grout. A grout scraper is used to remove grout from between the pieces of tile, using the incision as a starting point. Insert the triangular tip of the grout scraper into the incision you made with the grout saw. Apply firm pressure and drag the scraper along the grout line about the length of one tile. Lift out the grout scraper, return to the starting point and repeat the process until you have removed all

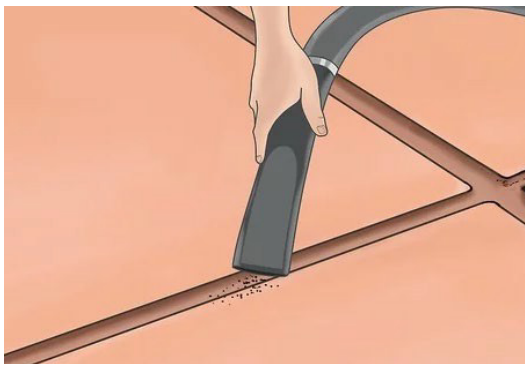

Fig. 5.1.9 Removing grout

4. Finish the edges. Clean up the edges of the tile by chipping out any remaining grout remnants. Hold the chisel so that it is parallel to the floor and the cutting edge of the chisel is touching the edge of the tile. Lightly tap the end of the chisel with the hammer until the grout is loosened. Sweep up the broken pieces of grout from between the crevices using a dust broom.
5. Clean the tile. As grout residue can quickly harden onto the tile surface and making it difficult to remove, cleaning action should be immediately taken up by wiping the tiles. For this, make a solution with half vinegar and half water and spray onto the tile and allow the solution to sit for a couple of minutes before wiping it away with a clean cloth.

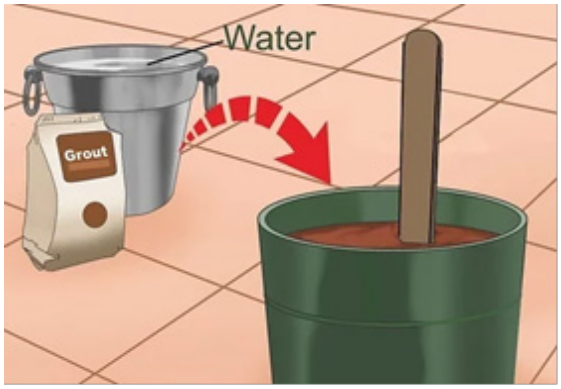

Fig. 5.1.10 Mix the grout powder with water in a large bucket

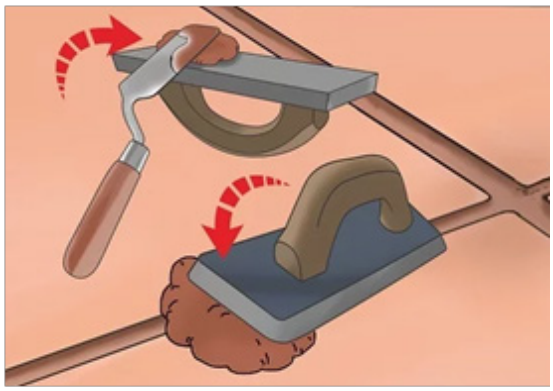

Fig. 5.1.11 Use a grout float to fill the gap with the grout mixture

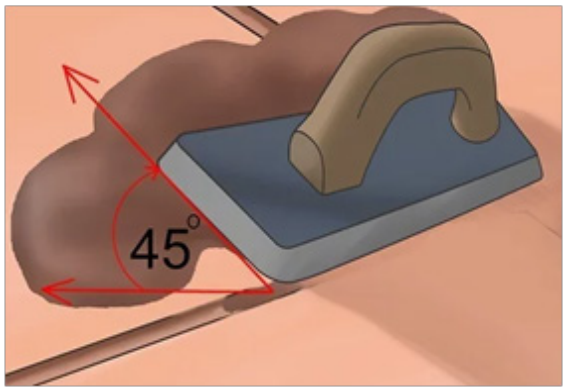

Fig. 5.1.12 Wipe away the excess grout with the edge of the grout float

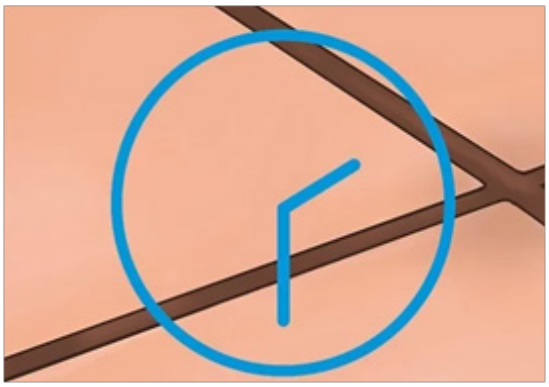

Fig. 5.1.13 Let the grout dry for around 20-30 minutes

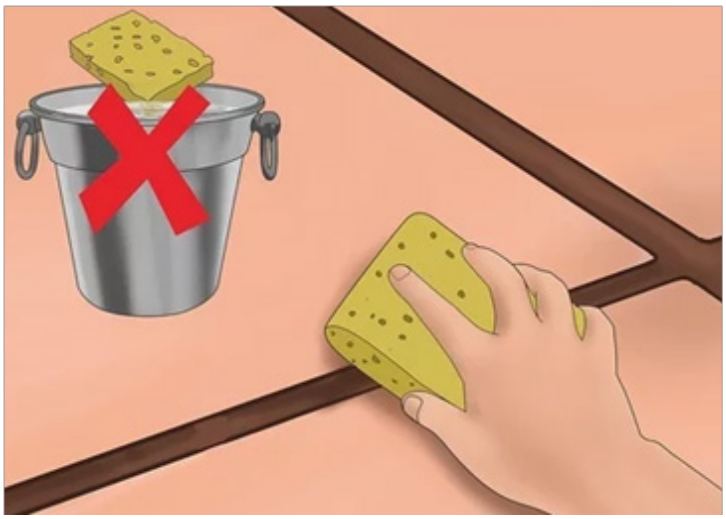

Fig. 5.1.14 Clean off the surrounding tiles with a damp sponge

Notes

Scan the QR code to watch the video

https://youtu.be/SKL0bx3pxNA

Applying grout on joints

UNIT 5.2: Curing of Tiles

Unit Objectives

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

- Discuss about curing of tile; and
- Know about curing technique for tiles.

5.2.1 Curing of tile

Tiling work must be cured for at least 7 to 10 days, and fill the joints with grout and clean them properly after completion of curing period.

Allow the grout to cure as per the product directions for the recommended period of time. For curing, the grouted area should remain dry and get adequate ventilation.

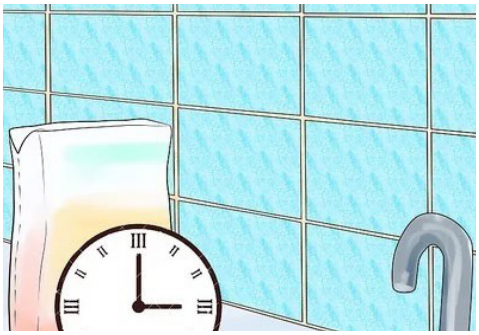

Fig. 5.2.1 Wait for curing of grout

- Some additives may slow down the process of curing of the grout.
- Good wet mopping can be done 1-2 times per day for 3 days. This will ensure the grout is moist and reduce the chance of curing cracks.
- For slow curing of grout, mist it twice a day for 3 days.
- Avoid walking over the surface for 8 to 12 hours to avoid getting debris and dirt into the grout lines.
- Maintain an optimum curing temperature of 50°F and 80°F (10°C to 30°C) of the tile and grout for proper curing.
- Always wear gloves and use eye protection.
- Clean off remaining residues after the grout has cured.

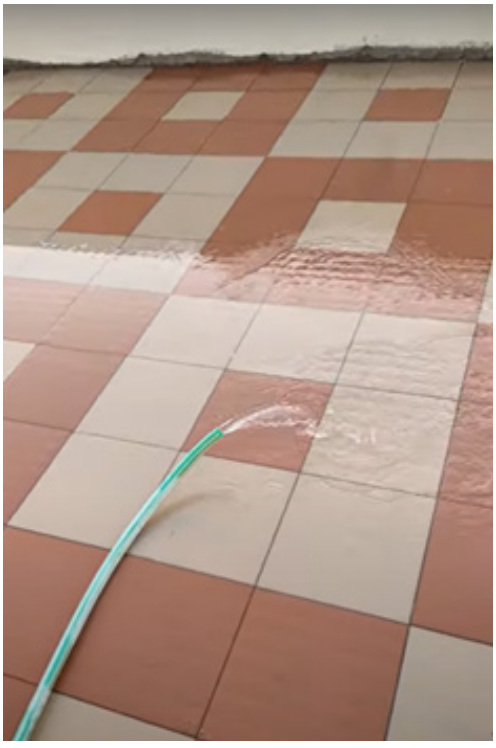

Fig. 5.2.2 Curing of Tiles

Proper curing is critical for ensuring the long-term performance and longevity of the tiled surface.

Fig. 5.2.3 Mopping after curing of grout

Uneven tiles:

It is also possible that the floor or wall itself is uneven causing the tiles to be uneven. Lippage is the most common uneven tile issue – this is when the edge of a tile is slightly higher or lower than the one next to it. This is often caused by the installer choosing the incorrect pattern or offset.

Fig. 5.2.4 Uneven Tiles and Lippage Issue

To avoid lippage and achieve a smooth and professional tiling job, consider the following tips:

- Proper Surface Preparation: Ensure that the surface where the tiles will be installed is clean, level, and free of any debris or irregularities. A flat and smooth surface provides a better foundation for achieving even tile installation.

- Quality Tile Selection: Choose tiles with consistent thickness and edges. Rectified tiles, which have precisely cut edges, are particularly helpful in minimizing lippage.

- Use Tile Leveling Systems: Employ tile leveling systems, such as tile spacers, wedges, or leveling clips, to keep tiles aligned and level during installation. These tools help prevent tiles from sinking or protruding unevenly.

- Offset Layout: Avoid installing tiles in a grid pattern, as it can accentuate lippage. Instead, use an offset or staggered layout, which distributes any slight variations more evenly across the entire installation.

- Proper Tile Adhesive Application: Apply an appropriate amount of tile adhesive and use the correct trowel size to ensure adequate coverage. This prevents tiles from sinking or sticking out due to inconsistent adhesive application.

- Careful Tile Installation: While setting tiles, press them firmly into the adhesive and wiggle slightly to ensure a good bond and even surface. Check regularly with a level or straight edge to maintain uniformity.

- Work in Small Sections: Avoid spreading too much adhesive or installing too many tiles at once. Working in small sections allows better control over tile alignment and prevents the adhesive from drying out before tiles are placed.

- Leveling and Adjustments: If you notice any tiles with significant lippage during the installation, take them out immediately, level the surface, and reapply the tile. It's crucial to address lippage issues promptly.

- Grouting Carefully: When grouting, use the right consistency and avoid over-filling or under-filling grout lines, which can affect the appearance of lippage. Properly clean excess grout before it hardens.

- Allow Sufficient Curing Time: After tiling and grouting, allow ample time for the adhesive and grout to cure before subjecting the area to heavy traffic or additional stress.

By following these tips and being diligent during the tiling process, you can significantly reduce the risk of lippage and achieve a professionally finished tiling job.

Exercise

Answer the following questions.

- What is grouting, and why is it important in tiling?
- How long should you wait before grouting newly installed tiles?
- What type of grout is suitable for outdoor tiling projects?
- How can you ensure a consistent and neat grout line width during the application?
- Why is it essential to wipe off excess grout from the tile surface during the grouting process?
- Define lippage in tiling and explain why it occurs.
- How can you prevent lippage when installing large format tiles?

Notes

Scan the QR code to watch the video

https://youtu.be/ib_EOym9H0g

Uneven tiles

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
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N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

6. Team Work and Effective Communication at Workplace

Construction Skill Development Council

Unit 6.1 – Effective Communication and Teamwork

Unit 6.2 – Working Effectively and Maintaining Discipline at Work

Unit 6.3 – Maintaining Social Diversity at Work

(CON/N8001)

Key Learning Outcomes

By the end of this module, participants will be able to:

1. Importance of interacting and communicating in an effective manner.
2. Ways to support co-workers to execute the project requirements.
3. Ways to practice inclusion at workplace.

Unit 6.1 - Effective Communication and Teamwork

Unit Objectives

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

- Elucidate own roles and responsibilities.
- Explain the importance of effective communication.
- Explain different modes of communication used at the workplace.
- Elucidate the consequence of poor teamwork on project outcomes, timelines, safety at the construction site, etc.
- Demonstrate how to pass on work-related information/requirements clearly to the team members.
- Show how to report any unresolved problem to the supervisor immediately.

6.1.1 Communication at Workplace

The communication process refers to the steps involved in the exchange of information, ideas, thoughts, or messages between individuals or groups. It is a dynamic process that involves a sender, a receiver, a message, and various channels to convey the information effectively. The communication process typically follows these steps:

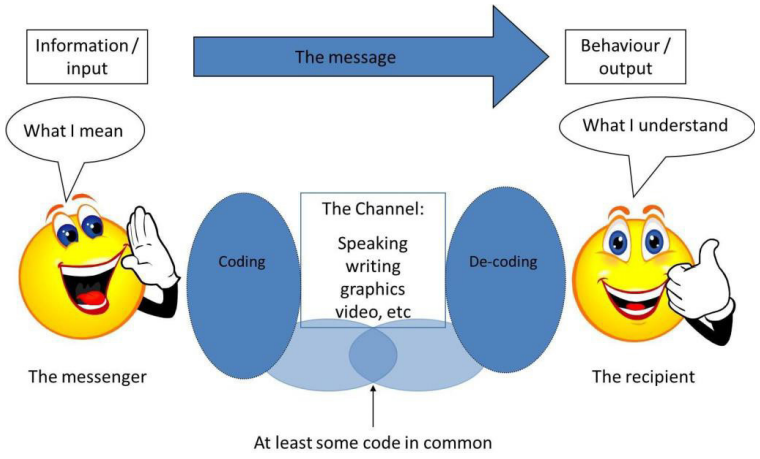

Fig. 6.1.1 Effective Communication – Two-way Process

Sender: The person or entity starting the communication.

Message: The information that the sender wishes to share.

Encoding: Choosing the medium to send a message.

Channel: The medium used to send a message.

- Receiver: The person or entity to whom the message is sent.
- Decoding: Understanding the message received.
- Feedback: The receiver's response to the message.

The 7Cs of communication are essential principles to follow for effective and impactful communication:

- Clear: Be assertive about what needs to be communicated, whether verbally or in writing
- Concise: Use simple words and say only what's needed
- Concrete: Use exact words, phrases, Use facts and figures
- Correct: Use correct spellings, language and grammar
- Coherent: Words should make sense and should be related to the main topic
- Complete: A message should have all the needed information
- Courteous: Be respectful, friendly and honest

Fig. 6.1.2 C's of Communication

6.1.2 Type of Communication at Construction Worksite

Communication at a construction worksite is crucial for ensuring efficiency, safety, and coordination among workers, supervisors, and other stakeholders.

Several types of communication are utilized to facilitate smooth operations and enhance safety at construction sites.

Some common communication methods include:

- **Verbal Communication:** This involves face-to-face conversations, discussions, and instructions between workers, supervisors, and managers on the site. Verbal communication is essential for conveying immediate instructions and clarifications.
- **Hand Signals:** Hand signals are commonly used in noisy construction environments where verbal communication may be difficult. Workers use specific hand gestures to communicate instructions or warnings to each other.

Fig. 6.1.3 Communication at Construction

- **Written Communication:** Written communication includes various documents, such as construction plans, safety guidelines, work permits, and daily progress reports. Written communication helps in conveying detailed information and serves as a reference for all stakeholders.
- **Radios and Walkie-Talkies:** Two-way radios and walkie-talkies are popular communication tools at construction sites, especially for larger projects. They allow instant communication between workers and supervisors across different areas of the site.
- **Visual Communication:** Visual aids, such as signs, symbols, and safety posters, are used to convey important information and warnings. These aids help in reminding workers of safety protocols and hazard awareness.
- **Digital Communication:** Construction sites may use digital communication platforms like mobile apps or messaging services to facilitate real-time communication, share updates, and coordinate tasks.
- **Meetings and Toolbox Talks:** Regular meetings and toolbox talks are conducted to discuss project progress, safety updates, and address any concerns or questions raised by workers.
- **Project Management Software:** Construction companies often use project management software that enables seamless communication between project teams, provides updates, and tracks tasks and schedules.
- **Emergency Communication Systems:** In case of emergencies, construction sites may have emergency communication systems like alarms or sirens to alert workers and initiate evacuation procedures.

Effective communication at construction sites plays a vital role in preventing accidents, minimizing delays, and ensuring the successful completion of projects. It is essential for all team members to be well-versed in the various communication methods used to maintain a safe and productive worksite.

Fig. 6.1.4 Coordination during Construction Work

6.1.3 Adverse Effects of Poor Communication

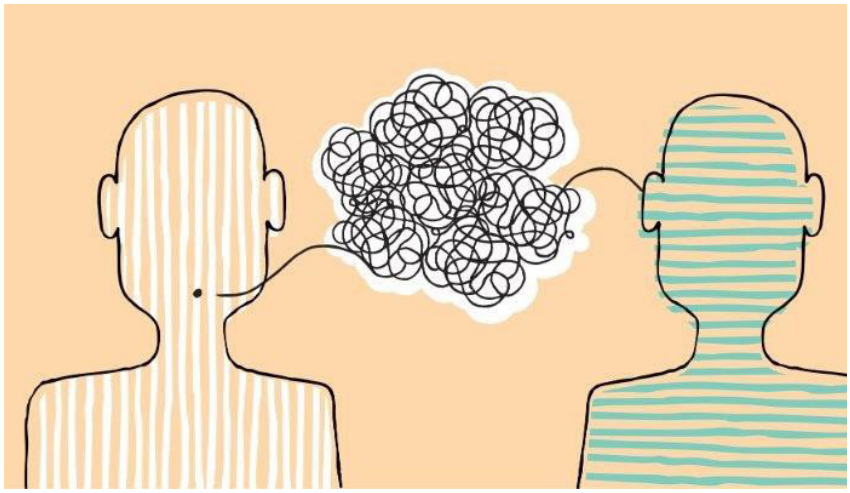

Fig. 6.1.5 Adverse Effects of Poor Communication

Poor communication at a construction workplace can lead to various adverse effects, some of which include:

1. **Safety Risks:** Inadequate communication about safety protocols, hazards, and instructions can increase the risk of accidents and injuries at the construction site.
2. **Misunderstandings:** Miscommunication among workers, supervisors, and managers can lead to misunderstandings about tasks, timelines, and project requirements, resulting in errors and delays.
3. **Inefficiencies:** Poor communication can cause delays in project progress, resource allocation, and decision-making, leading to inefficiencies and increased project costs.
4. **Decreased Productivity:** Lack of clear communication can hinder workers' ability to perform their tasks efficiently, reducing overall productivity at the construction site.
5. **Cost Overruns:** Miscommunication about project budgets, timelines, and scope can lead to cost overruns and financial losses for the construction project.
6. **Quality Issues:** Inadequate communication regarding construction specifications and standards may result in quality issues and subpar workmanship.
7. **Safety Violations:** Poor communication about safety guidelines and procedures may lead to safety violations and non-compliance with safety regulations.
8. **Increased Conflicts:** Communication gaps can create conflicts and tensions among workers and teams, negatively impacting the construction site's working environment.
9. **Lack of Coordination:** Insufficient communication between different construction teams and subcontractors can lead to a lack of coordination, hindering the seamless progress of the project.
10. **Client Dissatisfaction:** Poor communication with clients can lead to misunderstandings, unmet expectations, and client dissatisfaction with the construction project.
11. **Project Delays:** Miscommunication about project timelines and tasks can result in delays, affecting project completion dates and potentially leading to contract disputes.

12. **Reputation Damage:** Repeated instances of poor communication at a construction site can damage the reputation of the construction company, impacting future projects and business opportunities.
13. **Health and Environmental Concerns:** Lack of proper communication about hazardous materials, waste disposal, and environmental regulations can result in health and environmental risks.

To mitigate these adverse effects, construction companies should prioritize effective communication strategies, ensure clear and consistent information flow, and foster a culture of open and transparent communication among all stakeholders involved in the construction project.

6.1.4 Teamwork at Workplace

Teamwork is of utmost importance in various aspects of life, whether it's in the workplace, sports, education, or personal relationships.

Fig. 6.1.6 Teamwork at Workplace

Here are some key reasons highlighting the importance of teamwork:

- **Achievement of Common Goals:** Teamwork brings together individuals with diverse skills and expertise to work collectively towards a shared objective. When team members collaborate effectively, they can accomplish more than what could be achieved individually.
- **Enhanced Creativity and Innovation:** Working in a team allows for the exchange of different perspectives and ideas. This diversity fosters creativity and innovative problem-solving, leading to better solutions and approaches.
- **Improved Productivity:** Team members can divide tasks based on their strengths and expertise, leading to improved efficiency and productivity. This distribution of workload ensures that each aspect of a project is handled by the most suitable team member.

- **Shared Responsibility and Accountability:** In a team, each member has a specific role and responsibility. This sense of accountability motivates individuals to perform their best and take ownership of their contributions.
- **Effective Decision Making:** Teams can pool their knowledge and insights to make well-informed decisions. When diverse viewpoints are considered, the decisions tend to be more balanced and comprehensive.
- **Support and Motivation:** Team members can provide emotional support and motivation to each other, boosting morale during challenging times and celebrating achievements together.
- **Learning and Skill Development:** Teamwork allows individuals to learn from one another, acquire new skills, and improve existing ones. This continuous learning enhances personal and professional growth.
- **Building Trust and Camaraderie:** Effective teamwork strengthens the bond between team members, fostering trust, respect, and camaraderie. This positive team dynamic contributes to a harmonious work environment.
- **Adaptability and Resilience:** Teams are often better equipped to handle changes and uncertainties as they can brainstorm strategies and adapt collectively to new situations.
- **Efficient Problem Solving:** When faced with complex challenges, teamwork enables the pooling of resources and expertise, leading to more comprehensive and efficient problem-solving.
- **Synergy and Performance:** The collective efforts of a high-performing team create a synergy where the overall performance is greater than the sum of individual contributions.
- Improved Work-Life Balance: Effective teamwork can distribute workloads and responsibilities, reducing the burden on individual team members and promoting a better work-life balance.

In conclusion, teamwork is vital for achieving success, fostering innovation, and creating a positive and supportive work culture. Emphasizing the importance of teamwork enables organizations and individuals to harness the full potential of collaboration, leading to remarkable achievements and overall well-being.

6.1.5 The 5Cs of Teamwork

The 5Cs of teamwork are fundamental principles that contribute to effective and successful collaboration within a team. These principles help create a positive team dynamic and foster a cohesive and high-performing group.

Fig. 6.1.7 Effective and Successful Collaboration

The 5Cs of teamwork are:

1. **Co-operation**

   Without cooperation between team members, no group will survive. Cooperation is intimately linked to effective communication and self-assurance. Better communication and a transparent and healthy work environment necessitate some degree of clarity and trust.

2. **Compromise**

   Work relationships are not exempt from the necessity of reaching compromises on particular issues. If our peers' or managers' argument is valid and can contribute to greater performance, we may be required to concur. It is acceptable that not everyone can be on the same page at all times. To manage such circumstances, we must examine the situation and consider potential outcomes.

3. **Communication**

   Considered vital for organising the individual and group efforts of the team. Communication is essential for conflict resolution and problem-solving, and companies must support healthy communication within and between teams. Communication must be open, honest, and timely so that every team member knows what to do and how to do it.

4. **Confidence**

   Team members should have confidence in their skills. The leader must provide the team with a clear and simple explanation of the project, each member's responsibilities, and the final objective. It is essential to remember that confidence does not develop in the blink of an eye. It must be constructed step by step.

5. **Commitment**

The demands and interests of the team take precedence above individual concerns. Every action should contribute to the overall corporate objective.

By embracing the 5Cs of teamwork, teams can cultivate an environment of trust, respect, and collaboration, leading to enhanced performance and achievement of shared objectives.

6.1.6 Consequence of Poor Teamwork

Poor teamwork at a construction site can have significant consequences that impact project outcomes, timelines, safety, and overall project success.

Some of the key consequences of poor teamwork include:

Delayed Project Completion: Lack of effective collaboration and coordination among team members can lead to delays in project progress. When tasks are not properly assigned or synchronized, the project timeline may be extended, resulting in increased costs and client dissatisfaction.

Fig. 6.1.8 Poor Teamwork

Reduced Productivity: Poor teamwork can result in inefficiencies and a decrease in overall productivity. Team members may duplicate efforts, make mistakes due to miscommunication, or lack the support needed to perform their tasks efficiently.

- **Lower Quality Work:** Inadequate teamwork can lead to a decline in the quality of work performed. Without effective collaboration and accountability, errors and defects may go unnoticed, compromising the final deliverables.
- **Increased Rework:** Miscommunication and lack of coordination can result in rework and additional costs. Correcting mistakes and addressing issues that arise due to poor teamwork can be time-consuming and financially burdensome.
- **Safety Hazards:** Construction sites are inherently hazardous environments, and poor teamwork can exacerbate safety risks. When team members fail to communicate effectively or work together safely, it can lead to accidents, injuries, and even fatalities.
- **Conflict and Tension:** Poor teamwork may create a negative work environment characterized by conflict, tension, and lack of trust among team members. This can hamper communication and cooperation, further hindering progress.
- **Budget Overruns:** When teamwork is lacking, projects may experience cost overruns due to inefficiencies, rework, and delays. This can strain the project budget and negatively impact the overall financial performance.
- **Missed Opportunities:** Poor teamwork can result in missed opportunities for innovation, improvement, and optimization. Team members may not leverage their collective expertise and diverse perspectives to identify and capitalize on potential opportunities.
- **Client Dissatisfaction:** Clients expect a well-coordinated and smoothly executed project. Poor teamwork can lead to client dissatisfaction due to missed deadlines, quality issues, and breakdowns in communication.
- **Reputation Damage:** Repeated instances of poor teamwork on construction projects can damage the reputation of the construction company, leading to a loss of trust among clients and stakeholders.

In summary, poor teamwork at a construction site can have serious consequences on project outcomes, timelines, safety, and overall project success. It is essential for construction teams to prioritize effective collaboration, communication, and coordination to mitigate these adverse effects and ensure the successful completion of projects.

Notes

Unit 6.2 - Working Effectively and Maintaining Discipline at Work

Unit Objectives

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

- Explain the importance of creating healthy and cooperative work environment among the gangs of workers.
- Elucidate applicable techniques of work, properties of materials used, tools and tackles used, safety standards that co-workers might need as per the requirement.
- Explain the importance of proper and effective communication and the expected adverse effects in case of failure relating to quality, timeliness, safety, risks at the construction project site.
- Explain the importance and need of supporting co-workers facing problems for the smooth functioning of work.
- Demonstrate ways to hand over the required material, tools, tackles, equipment and work fronts timely to interfacing teams.
- Demonstrate ways to work together with co-workers in a synchronized manner.

6.2.1 Discipline at Work

Discipline at work refers to the adherence to rules, policies, and professional standards within a workplace. It involves employees maintaining a responsible and focused approach to their work duties, following established protocols, and upholding ethical principles.

Here are some key aspects of discipline at work:

1. **Punctuality:** Being punctual is a fundamental aspect of discipline. Employees are expected to arrive at work and meetings on time, ensuring smooth operations and respect for others' time.
2. **Following Policies and Procedures:** Employees must follow the company's policies, procedures, and guidelines related to various aspects of work, such as safety, communication, and data privacy.

Fig. 6.2.1 Discipline at Work

3. **Professional Conduct:** Discipline at work involves maintaining professional conduct and demeanor in all interactions with colleagues, clients, and stakeholders.
4. **Meeting Deadlines:** Adhering to deadlines and delivering work on time is a critical aspect of discipline, as it ensures the timely completion of projects and tasks.
5. **Respect for Authority:** Discipline requires showing respect for supervisors, managers, and leadership, following their directions, and seeking guidance when needed.
6. **Self-Discipline:** Individual employees should possess self-discipline to stay focused on their tasks, avoid distractions, and prioritize their responsibilities.
7. **Quality of Work:** Disciplined employees take pride in their work and strive for excellence, ensuring the delivery of high-quality output.
8. **Compliance with Company Values:** Employees should align their actions with the company's values and ethical standards, promoting a culture of integrity and trust.
9. **Conflict Resolution:** Handling conflicts and disagreements in a respectful and constructive manner is an essential part of discipline, maintaining a harmonious work environment.
10. **Accountability:** Disciplined employees take ownership of their actions, admit mistakes, and work towards rectifying any errors they may make.
11. **Adherence to Dress Code:** Following the organization's dress code and appearance guidelines contributes to maintaining a professional and cohesive image.
12. **Attendance and Leave Management:** Discipline includes managing attendance and leave in accordance with company policies and providing prior notice when taking time off.
13. **Use of Resources:** Disciplined employees use company resources responsibly and efficiently, avoiding wastage and abuse.

Discipline at work is crucial for creating a productive and positive work environment. It fosters a sense of responsibility, reliability, and accountability among employees, leading to improved performance and overall organizational success. Employers should also provide clear expectations, guidance, and support to encourage and reinforce a culture of discipline within the workplace.

6.2.2 Time Management

Time management is not about working harder; rather, it is about working smarter so that employees do not overburden themselves and create unnecessary strain.

By effectively managing their time, employees will meet deadlines, increase their effectiveness, become more productive, and produce superior work.

Fig. 6.2.2 Time Management

By effectively managing their time, employees will meet deadlines, increase their effectiveness, become more productive, and produce superior work. They will also have a higher degree of job satisfaction because they will experience less stress, which will help them advance in their careers and reduce your company's staff turnover.

Time management at construction by workers is essential for ensuring that individual tasks and responsibilities are completed efficiently, contributing to the overall success of the project. Here are some time management tips that construction workers can follow to optimize their productivity:

1. **Daily Planning:** Begin each workday with a clear plan of tasks to be completed. Prioritize the most critical tasks and allocate time accordingly.
2. **Set Goals and Deadlines:** Set specific and achievable goals for each workday or week. Establish personal deadlines for completing tasks to stay focused and motivated.
3. **Minimize Distractions:** Limit distractions during work hours, such as personal phone use or excessive socializing. Stay dedicated to tasks at hand to maximize productivity.
4. **Use Tools and Equipment Efficiently:** Familiarize yourself with the tools and equipment required for each task and use them efficiently to avoid wasted time.
5. **Organize Work Area:** Keep your work area clean and organized. A well-organized workspace minimizes the time spent searching for tools or materials.
6. **Time Tracking:** Track the time spent on each task to identify areas where efficiency can be improved and to better estimate future project timelines.
7. **Collaborate with Team Members:** Communicate and coordinate with other team members effectively to ensure a smooth workflow and prevent delays caused by miscommunication.
8. **Break Tasks into Smaller Steps:** For larger tasks, break them down into smaller, manageable steps. This approach helps in maintaining focus and progress.
9. **Take Short Breaks:** Incorporate short breaks into your workday to recharge and avoid burnout. However, ensure that the breaks are kept within reasonable limits to maintain productivity.
10. **Adapt to Changes:** Construction projects often encounter unforeseen challenges or changes. Be flexible and adaptable to adjust your schedule as needed without compromising quality.
11. **Avoid Multitasking:** Instead of trying to tackle multiple tasks simultaneously, focus on completing one task at a time to ensure better quality and efficiency.
12. **Learn Time-Saving Techniques:** Seek out and learn time-saving techniques specific to your tasks or trade. Efficiency comes with experience and knowledge.

13. **Seek Feedback:** Ask for feedback from supervisors or experienced colleagues on ways to improve your time management skills.
14. **Reflect and Improve:** Regularly assess your time management and productivity. Identify areas for improvement and actively work towards refining your approach.

By implementing these time management practices, construction workers can optimize their work efficiency, meet project deadlines, and contribute to the overall success of the construction project.

6.2.3 Interpersonal Conflicts at Construction by Workers

Interpersonal conflicts among construction workers can arise due to various reasons, and if left unaddressed, they can negatively impact the work environment, team morale, and project progress.

Some common causes of interpersonal conflicts at construction sites include:

- Communication Issues: Miscommunication, misunderstandings, or poor communication skills can lead to conflicts among workers, especially when instructions are unclear or not effectively conveyed.
- Differences in Work Styles: Workers may have different approaches to completing tasks, leading to clashes in how work should be performed.
- Competition for Resources: Limited resources, such as tools, equipment, or materials, can create tensions and conflicts when workers need to share or prioritize their use.
- Personal Differences: Diverse backgrounds, personalities, and work habits can lead to clashes in values, beliefs, and interpersonal dynamics.
- Role Ambiguity: Unclear or overlapping roles and responsibilities can cause conflicts between workers who are unsure about their tasks or areas of authority.
- Working Conditions: Challenging working conditions, tight deadlines, and long hours can contribute to stress and tensions among workers.
- Safety Concerns: Differences in safety practices or attitudes towards safety can lead to conflicts, especially when one worker perceives another's actions as risky.
- Leadership Issues: Conflicts can arise when workers feel their supervisors or managers are not effectively leading or addressing issues.
- Past Conflicts or Grudges: Lingering issues from past conflicts that were not adequately resolved can resurface and escalate over time

Fig. 6.2.3 Interpersonal Conflicts

To manage and resolve interpersonal conflicts at construction sites, the following steps can be taken:

Open Communication: Encourage open and honest communication among workers to address concerns and resolve misunderstandings promptly.

- **Conflict Resolution Training:** Provide conflict resolution training to workers to equip them with skills to address and resolve conflicts constructively.
- **Establish Clear Roles and Expectations:** Clearly define roles, responsibilities, and performance expectations to reduce ambiguity and prevent conflicts.
- **Promote Team Building:** Organize team-building activities to foster better understanding and collaboration among workers.
- **Mediation and Third-Party Intervention:** Utilize mediation or involve a neutral third party to help facilitate discussions and find solutions when conflicts are difficult to resolve within the team.
- **Encourage Respect and Empathy:** Foster a culture of respect and empathy where workers understand and appreciate each other's perspectives and backgrounds.
- **Address Safety Concerns:** Ensure that safety protocols are well-communicated and followed to reduce safety-related conflicts.
- **Regular Feedback and Performance Reviews:** Provide regular feedback and conduct performance reviews to address any performance-related conflicts.

By proactively addressing interpersonal conflicts and promoting a positive work culture, construction teams can maintain a harmonious work environment, improve collaboration, and enhance overall project outcomes.

Fig. 6.2.4 Positive Work Culture

Unit 6.3 - Maintaining Social Diversity at Work

Unit Objectives

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

- Discuss the fundamental concept of gender equality.
- Explain how to recognise and be sensitive to issues of disability culture and gender.
- Discuss legislation, policies, and procedures relating to gender sensitivity and cultural diversity including their impact on the area of operation.
- Demonstrate effective implementation of gender-neutral practices at the workplace.
- Demonstrate ways to address discriminatory and offensive behaviour in a professional manner as per organizational policy.

6.3.1 Gender Sensitivity

Gender sensitivity is the act of being sensitive towards people and their thoughts regarding gender. It ensures that people know the accurate meaning of gender equality, and one's gender should not be given priority over their capabilities.

Women are an important source of labour in many sectors, yet they have limited access to resources and benefits. Women should receive the same benefits and access to resources as men. A business can improve its productivity and quality of work by providing better support and opportunities to women.

Fig. 6.3.1 Gender Equality

Important Terms

Gender Sensitivity-Gender sensitivity is the act of being sensitive to the ways people think about gender.

Gender Equality - It means persons of any gender enjoy equal opportunities, responsibilities, and rights in all areas of life.

Gender Discrimination – It means treating an individual unequally or disadvantageously based on their gender, e.g. paying different wages to men and women for similar or equal job positions.

Fig. 6.3.2 Gender Discrimination

Strategies for Enhancing Gender Equity

To enhance gender equity, one should:

- Follow gender-neutral practices at all levels at work.
- Participate together in decision-making.
- Help in promoting women's participation in different forums.
- Assist women in getting exposure to relevant skills and practices.
- Assist women in capacity building by mentoring, coaching or motivating them, as appropriate.
- Assist in the formation and operation of women support groups.
- Assist in the implementation of women-centric programmes.
- Combine technical training with reproductive health and nutrition for coffee farming households.
- Assist in making a work environment that is healthy, safe, and free from discrimination.

Bridging Gender Differences

Men and women react and communicate very differently. Thus, there are some work differences as both genders have their style and method of handling a situation.

Although, understanding and maturity vary from person to person, even between these genders, based on their knowledge, education, experience, culture, age, and upbringing, as well as how one's brain functions over a thought or problem.

In order to bridge the gap, one should:

- Not categorize all men and women in one way.
- Be aware of the verbal and non-verbal styles of communication of every gender to avoid any miscommunication and work better.
- Be aware of partial behaviour and avoid it.
- Encourage co-workers of different genders to make room by providing space to others.
- Ways to reduce Gender Discrimination
- Effective steps against sexual harassment by the concerned authorities and general public.
- Gender stereotypes are how society expects people to act based on their gender. This can only be reduced by adopting appropriate behaviour and the right attitude.
- Objectification of females must be abolished.

Fig. 6.3.3 Promoting Gender Sensitivity at Workplace

Ways to Promote Gender Sensitivity in the Workplace

- Practices that promote gender diversity should be adopted and promoted.
- All genders should receive equal responsibilities, rights, and privileges.
- All genders should have equal pay for similar or the same job roles/ positions.

- Strict and effective workplace harassment policies should be developed and implemented.
- An open-minded and stress-free work environment should be available to all the employees, irrespective of their gender.
- Women should be encouraged to go ahead in every field of work and assume leadership roles.
- Follow appropriate measures for women's empowerment.
- Men should be taught to be sensitive to women and mindful of their rights.

6.3.2 PwD Sensitivity

Some individuals are born with a disability, while others may become disabled due to an accident, illness or as they get old. People with Disabilities (PwD) may have one or more areas in which their functioning is affected. A disability can affect hearing, sight, communication, breathing, understanding, mobility, balance, and concentration or may include the loss of a limb. A disability may contribute to how a person feels and affect their mental health.

Fig. 6.3.4 Disability-Friendly Workplace

Important Terms

- Persons with Disabilities (PwD) – Persons with Disabilities means a person suffering from not less than 40% of any disability as certified by a medical authority.
- Types of Disability:
  a. Blindness – Visually impaired
  b. Low Vision

c. Leprosy Cured

d. Hearing impairment

e. Locomotor disability

f. Mental retardation

g. Mental illness

PwD Sensitivity

PwD sensitivity promotes empathy, etiquette and equal participation of individuals and organizations while working with individuals with a disability, e.g. sensory, physical or intellectual.

Ways to be PwD Sensitive

To be sensitive to PwD, one should:

- Be respectful to all Persons with Disabilities (PwD) and communicate in a way that reflects PwD sensitivity.
- Always be supportive and kind towards a PwD with their daily chores.
- Be ready to assist a PwD to help them avail of any benefit/ livelihood opportunity/ training or any kind that helps them grow.
- Encourage and try to make things easier and accessible to PwD so that they can work without or with minimum help.
- Protest where feasible and report any wrong act/behaviour against any PwD to the appropriate authority.
- Learn and follow the laws, acts, and policies relevant to PwD.

Appropriate Verbal Communication

As part of appropriate verbal communication with all genders and PwD, one should:

- Talk to all genders and PwD respectfully, maintaining a normal tone of voice with appropriate politeness. It is important to ensure one's tone of voice does not have hints of sarcasm, anger, or unwelcome affection.
- Avoid being too self-conscious concerning the words to use while also ensuring not to use words that imply one's superiority over the other.
- Make no difference between a PwD and their caretaker. Treat PwD like adults and talk to them directly.
- Ask a PwD if they need any assistance instead of assuming they need it and offering assistance spontaneously.

Appropriate Non-verbal Communication

Non-verbal communication is essentially the way someone communicates through their body language. These include:

- **Facial expressions** - The human face is quite expressive, capable of conveying many emotions without using words. Facial expressions must usually be maintained neutral and should change according to the situation, e.g. smile as a gesture of greeting.
- **Body posture and movement** - One should be mindful of how to sit, stand, walk, or hold their head. For example - one should sit and walk straight in a composed manner. The way one moves and carries self, communicates a lot to others. This type of non-verbal communication includes one's posture, bearing, stance, and subtle movements.
- **Gestures** - One should be very careful with their gestures, e.g. waving, pointing, beckoning, or using one's hands while speaking. One should use appropriate and positive gestures to maintain respect for the other person while being aware that a gesture may have different meanings in different cultures.
- **Eye contact** - Eye contact is particularly significant in non-verbal communication. The way someone looks at someone else may communicate many things, such as interest, hostility, affection or attraction. Eye contact is vital for maintaining the flow of conversation and for understanding the other person's interest and response. One should maintain appropriate eye contact, ensuring not to stare or look over the shoulders. To maintain respect, one should sit or stand at the other person's eye level to make eye contact.
- **Touch** - Touch is a very sensitive type of non-verbal communication. Examples are - handshakes, hugs, pat on the back or head, gripping the arm, etc. A firm handshake indicates interest, while a weak handshake indicates the opposite. One should be extra cautious not to touch others inappropriately and avoid touching them inadvertently by maintaining a safe distance.

Rights of PwD

PwD have the right to respect and human dignity. Irrespective of the nature and seriousness of their disabilities, PwD have the same fundamental rights as others, such as:

- Disabled persons have the same civil and political rights as other people
- Disabled persons are entitled to the measures designed to enable them to become as self-dependent as possible
- Disabled persons have the right to economic and social security
- Disabled persons have the right to live with their families or foster parents and participate in all social and creative activities.
- Disabled persons are protected against all exploitation and treatment of discriminatory and abusive nature.

Making Workplace PwD Friendly

- One should not make PwD feel uncomfortable by giving too little or too much attention
- One should use a normal tone while communicating with a PwD and treat them as all others keeping in mind their limitations and type of disability
- Any help should be provided only when asked for by a PwD
- One should help in ensuring the health and well-being of PwD.

Expected Employer Behaviour

Some of the common behavioural traits that employees expect from their employers are:

- Cooperation: No work is successful without cooperation from the employer's side. Cooperation helps to understand the job role better and complete it within the given timeline.
- Polite language: Polite language is always welcomed at work. This is a basic aspect that everybody expects.
- Positive Attitude: Employers with a positive attitude can supervise the work of the employees and act as a helping hand to accomplish the given task. A person with a positive attitude looks at the best qualities in others and helps them gain success.
- Unbiased behaviour: Employers should always remain fair towards all their employees. One should not adopt practices to favour one employee while neglecting or ignoring the other. This might create animosity among co-workers.
- Decent behaviour: The employer should never improperly present oneself before the employee. One should always respect each other's presence and behave accordingly. The employer should not speak or act in a manner that may make the employee feel uneasy, insulted, and insecure

Fig. 6.3.5 Ramp for PwD Persons

Notes

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7. Plan and Organize Work to meet Expected outcomes

Unit 7.1 – Prioritise work activities to achieve desired results

Unit 7.2 – Organising resources

Unit 7.3 – Sequence of work for mason tiling

(CON/N8002)

Key Learning Outcomes

By the end of this module, participants will be able to:

1. Learn the importance of time;
2. Plan activities and schedules;
3. Learn the importance of targets and time lines set by supervisors;
4. Prioritise tasks to achieve desired results;
5. Plan desired resources prior to commencement of work;
6. Identify and organise resources prior to commencement of work;
7. Organise correct tools and materials for completion of work; and
8. Use and engage resources and manpower in appropriate manner.

UNIT 7.1: Prioritise Work Activities to achieve Desired Results

Unit Objectives

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

- Plan activities and schedules
- Prioritise tasks to achieve desired results
- Plan desired resources prior to commencement of work
- Identify and organise resources prior to commencement of work

7.1.1 Setting Objectives

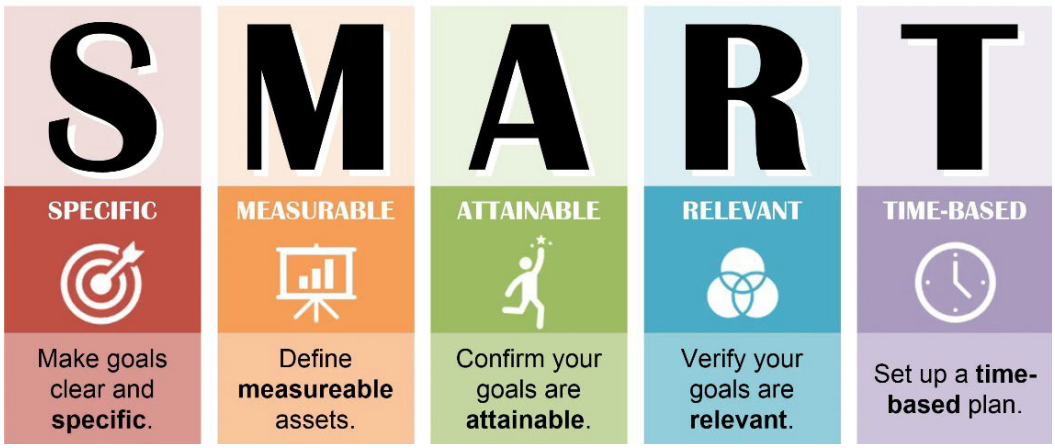

Fig. 7.1.1 SMART Goals

SMART goals are a widely used framework for setting objectives that are Specific, Measurable, Achievable, Relevant, and Time-bound. When applied to masonry and concrete work, SMART goals can help improve project planning, productivity, and overall project success. Here's how SMART goals can be applied in the context of masonry and concrete work:

- Specific: A specific goal is clear, well-defined, and focused on a particular aspect of the tiling worker's job. It answers the questions of what needs to be accomplished and why it is essential. For example: "Improve tile cutting skills to achieve cleaner and more precise cuts."
- Measurable: A measurable goal has tangible criteria for assessing progress and determining whether the objective has been met. It quantifies the outcome, allowing the tiling worker to track their performance. For example: "Successfully cut and install 100 tiles without any wastage."
- Achievable: An achievable goal is realistic and within the tiling worker's capabilities. It considers the available resources, skills, and time. Setting an achievable goal ensures that it is challenging yet attainable. For example: "Attend a tile cutting workshop and practice cutting techniques regularly."

- **Relevant:** A relevant goal aligns with the tiling worker's job responsibilities and contributes to their professional growth and the success of their projects. It is meaningful and ties directly to their work. For example: "Improving tile cutting skills will enhance overall tiling efficiency and the quality of finished projects."
- **Time-bound:** A time-bound goal has a specific deadline for completion. It provides a sense of urgency and accountability, motivating the tiling worker to stay on track and achieve the objective within a set timeframe. For example: "Achieve this goal of improved tile cutting proficiency within the next three months."

By setting SMART goals, a Mason Tiling Worker can focus on specific areas of improvement, track their progress, and strive for excellence in their work.

Examples of other SMART goals for Mason Tiling Workers might include improving grouting techniques, enhancing knowledge of tile materials, increasing efficiency in large-scale projects, or maintaining a spotless safety record throughout the year.

7.1.2 Importance of Quality in Work for Mason Tiling

Quality is a critical aspect that directly impacts the overall success and longevity of a tiling project.

Fig. 7.1.2 Efficiency for Work

Here are some reasons why maintaining high-quality work is essential for mason tiling:

- **Durability and Longevity:** High-quality tiling work ensures that tiles are correctly installed, adhered, and grouted, leading to a durable and long-lasting surface. Properly installed tiles are less likely to crack, chip, or come loose over time.
- **Aesthetics and Appearance:** Quality tiling work enhances the aesthetics and appearance of the finished space. Proper alignment, level surfaces, and uniform grout lines contribute to an attractive and visually appealing result.
- **Safety and Performance:** Well-installed tiles provide a safe and secure surface for walking and other activities. Quality work reduces the risk of tripping hazards and other accidents caused by loose or uneven tiles.
- **Water Resistance:** Quality tiling work with proper sealing and grouting ensures water resistance, especially in areas like bathrooms and kitchens. This prevents water seepage, mold growth, and potential damage to the underlying structure

- **Client Satisfaction:** Delivering high-quality tiling work results in higher client satisfaction. Clients appreciate a finished product that meets their expectations, both aesthetically and functionally.
- **Reduced Maintenance and Repair Costs:** Properly installed tiles with quality workmanship require less frequent repairs and maintenance, leading to cost savings in the long run.
- **Reputation and Referrals:** Quality work enhances the reputation of the mason tiler and the contracting company. Satisfied clients are more likely to recommend the tiler to others, leading to more business opportunities.
- **Compliance with Standards:** Quality work ensures compliance with industry standards and building codes, avoiding potential legal and regulatory issues.
- **Efficiency and Time Savings:** Well-trained mason tilers with a focus on quality work can complete projects more efficiently, reducing delays and meeting project deadlines.
- **Professionalism:** High-quality work reflects the professionalism and expertise of the mason tiler. It demonstrates a commitment to excellence and a dedication to delivering the best results.

Fig. 7.1.3 Importance of Quality in Tiling Work

In conclusion, quality is paramount in mason tiling work for numerous reasons, including durability, aesthetics, safety, client satisfaction, and professional reputation.

Investing in high-quality workmanship and adhering to industry best practices ultimately leads to successful and rewarding tiling projects for both the mason tiler and their clients.

7.1.3 Prioritization of Work

Steps for prioritizing works that have a lot of moving parts:

Fig. 7.1.4 Prioritization of Work

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 tiling work:

   - Selection of tools and material required for tiling
   - Understand layout of tiling work
   - Preparation of surface for tiling
   - Measurement and marking on surface
   - Marking and cutting of tile
   - Preparation of adhesive or mortar
   - Applying adhesive or mortar on surface
   - Placing and fixing tiles on surface
   - Placing and fixing spacers between the tiles
   - Removing spacers after hardening of mortar
   - Preparation of grout
   - Applying grout on floor
   - Curing of grout
   - Applying sealant on grout

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 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.

7.1.4 Optimizing work

Schedule: Scheduling means planning an activity to take place at a particular time. Schedule should always be little flexi ble.

The benefits of scheduling are:

- Helps in increasing efficiency.
- Helps in decreasing stress
- Achievement of desired results as per deadlines.

Fig. 7.1.5 Optimizing Work

While scheduling one should remember to:

- Analyse how much time each task will take and schedule the task accordingly.
- 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.

- 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.

7.1.5 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 challenges 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.

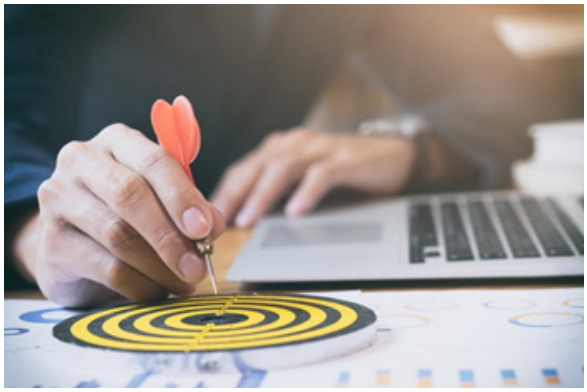

Fig. 7.1.6 Planning and Organizing Work

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 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 analysing 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.

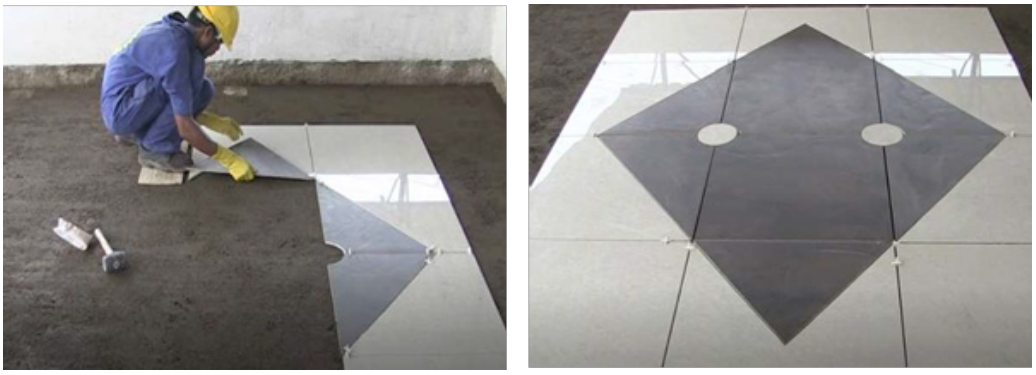

Fig. 7.1.7 Achieving Success in Tiling Work

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 tiling work are:

- Tiles
- Cement
- Aggregates
- Water
- Grout

The mason tiling 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 supervisors 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 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.

Fig. 7.1.8 Material needed for Work

Notes

UNIT 7.2: Organising Resources

Unit Objectives

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

- Identify and organise resources prior to commencement of work
- Organise correct tools and materials for completion of work
- Use and engage resources and manpower in appropriate manner
- Organise self, resources, work environment and time efficiently

7.2.1 Organisation of Resources

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, equipment and materials before starting work
- Identification and arranging proper Manpower.
- Assignment of duties to appropriate people.
- Creation and delegation of responsibilities among co-workers for completion of work.
- Coordination of work among the team and across teams.
- Organising training or providing guidelines to avoid damage of equipment.
- Planning and organising work environment to avoid accidents.
- Organising resources to avoid waste of materials.

Fig. 7.2.1 Organization of required Resources

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.

7.2.2 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. 7.2.2 Monitoring of Work

7.2.3 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

Fig. 7.2.3 Optimising use of Resources

Notes

UNIT 7.3: Sequence of Work for Mason Tiling

Unit Objectives

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

- Know about work sequence of tiling job

7.3.1 Sequence of Work for Mason Tiling

Fig. 7.3.1 Mason Tiling doing tiling Work

1. Selection of tools and material required for tiling
2. Understand layout of tiling work
3. Preparation of surface for tiling
4. Measurement and marking on surface
5. Marking and cutting of tile
6. Preparation of adhesive or mortar
7. Applying adhesive or mortar on surface
8. Placing and fixing tiles on surface
9. Placing and fixing spacers between the tiles
10. Removing spacers after hardening of mortar
11. Preparation of grout
12. Applying grout on floor
13. Curing of grout
14. Applying sealer on grout

7.3.2 Urgency and Importance Assessment

Assess each task based on its urgency (how soon it needs to be completed) and importance (its significance to the overall project). Urgency and importance can be categorized as follows:

- Important and Urgent (Do First): Tasks that are critical and require immediate attention, such as fixing a structural issue that may impact the project's stability or safety.
- Important but Not Urgent (Schedule): Tasks that are essential but can be planned and scheduled for a specific timeframe, such as ordering construction materials in advance.
- Urgent but Not Important (Delegate): Tasks that require prompt action but may not be directly related to the core construction activities, such as administrative paperwork or minor adjustments.
- Not Important and Not Urgent (Eliminate): Tasks that have little impact on the project's success and can be eliminated or postponed if necessary.

Fig. 7.3.2 Urgent versus Importance (Prioritization Matrix)

Exercise

Answer the following questions.

- What do you understand by SMART goal?
- What are the benefits of material planning?
- What is work planning?
- What are the benefits of work planning?
- What are the sequence of work of Mason Tiling?

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8. Work According to Personal Health, Safety & Environment Protocols

Construction Skill Development Council

Unit 8.1 – Hazards and Emergency Situations

Unit 8.2 - Safety Drills, PPEs and Fire Safety

Unit 8.3 - Hygiene and Safe Waste Disposal Practices

Unit 8.4 - Infectious Disease and Its Cure

(CON/N9001)

Unit 8.1 Reinforcement Tools and Equipment

Unit Objectives

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

- Understand the types of hazards at the construction sites and identify the hazards specific to the domain related works.
- Recognize the safety control measures and actions to be taken under emergency situation.
- Know the reporting procedure to the concerned authority in case of emergency situations.

8.1.1 Hazards at Workplace

Hazards versus Risk: A hazard possesses the potential to induce harm, whereas risk pertains to the probability of harm occurring as a result of being exposed to that hazard.

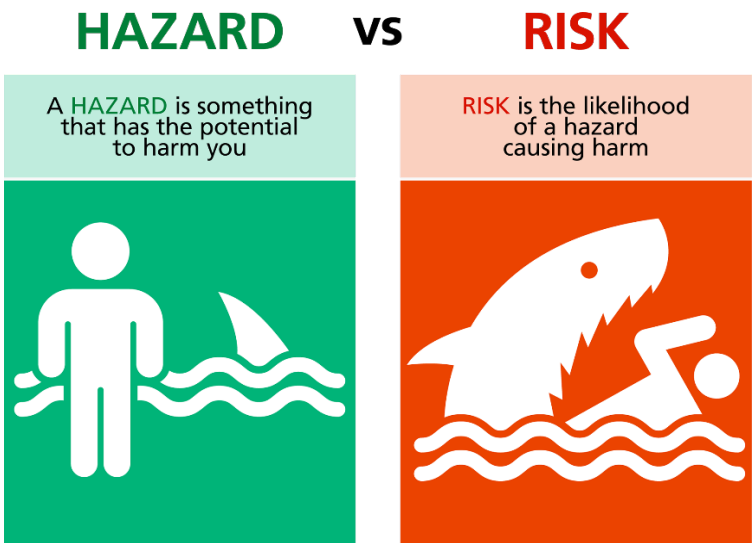

Fig. 8.1.1 Hazards versus Risk

Fig. 8.1.2 Workplace Hazards

Here are some common types of workplace hazards that can be found in various workplaces:

Fig. 8.1.3 Risk Associated with Hazards

- **Physical Hazards:**
  - Slips, trips, and falls
  - Falling objects or materials
  - Contact with moving machinery or equipment
  - Noise and vibration
  - Extreme temperatures (hot or cold)
  - Poor ergonomics leading to musculoskeletal disorders
- **Electrical Hazards:**
  - Electrical shock or electrocution
  - Short circuits or electrical fires
  - Fire and Explosion Hazards:
  - Combustible materials
  - Electrical equipment malfunctions
  - Inadequate fire safety measures
- **Vehicle-Related Hazards:**
  - Accidents involving vehicles or heavy machinery
  - Forklift incidents in warehouses and industrial settings
  - Chemical Hazards:
  - Exposure to toxic or hazardous substances (e.g., chemicals, fumes, gases)
  - Skin contact with irritants or corrosive materials

- Chemical spills or leaks

- **Psychosocial Hazards:**
  - Workplace stress and pressure
  - Bullying or harassment
  - Job insecurity
  - Long working hours and inadequate rest breaks

Identifying and mitigating workplace hazards is essential to ensuring the health and safety of employees. Employers should conduct regular risk assessments and implement appropriate safety measures and training to minimize the risks associated with these hazards.

8.1.2 Hazard Identification and Risk Assessment (HIRA):

Hazard Identification and Risk Assessment (HIRA) is a systematic process used to identify potential hazards in a workplace or any activity and assess the associated risks.

The primary goal of HIRA is to proactively identify and evaluate potential dangers to prevent accidents, injuries, and adverse health effects. It is a fundamental component of occupational health and safety management.

Fig. 8.1.4 Risk Assessment

The HIRA process typically involves the following steps:

- Conduct a comprehensive site survey to identify potential hazards at the construction site.
- Involve workers, supervisors, and safety personnel in the hazard identification process.
- Prioritize hazards based on their severity and likelihood of occurrence.
- Assess the risks associated with each identified hazard, considering potential consequences and exposure frequency.
- Implement appropriate control measures to reduce or eliminate the identified risks.
- Use the hierarchy of controls (elimination, substitution, engineering controls, administrative controls, and PPE) to address hazards effectively.

- Provide necessary training and awareness programs for workers on identified hazards and safety protocols.
- Regularly review and update the hazard identification and risk assessment as the construction progresses.
- Maintain proper documentation of the hazard identification and risk assessment process.
- Foster a culture of safety and encourage workers to report any new hazards or safety concerns.

HIRA is an ongoing process that requires the involvement and cooperation of all stakeholders, including workers, supervisors, safety officers, and management.

It helps create a safer work environment, reduces the likelihood of accidents, and contributes to improved overall occupational health and safety

Fig. 8.1.5 Risk Management Process

Hazards Specific to Domain-Related Works in Construction:

1. Roofing Hazards: Roofers face the risk of falls from heights, especially if proper fall protection measures are not in place.
2. Demolition Hazards: Demolition work involves risks of flying debris, structural collapses, and exposure to hazardous materials.
3. Welding and Cutting Hazards: Welders are exposed to sparks, fumes, and electrical hazards during welding and cutting processes.
4. Crane and Heavy Equipment Hazards: Improper operation of cranes and heavy machinery can lead to struck-by and caught-in accidents.
5. Scaffolding Hazards: Improperly assembled/unstable scaffolding poses fall risks for workers.
6. Concrete and Masonry Hazards: Workers involved in concrete pouring and masonry work face risks of heavy lifting injuries and ergonomic issues.
7. Highway and Roadwork Hazards: Road construction workers are at risk of being struck by vehicles passing through the work zone.
8. Electrical Installation Hazards: Electricians face the dangers of electric shocks and arc flashes during installation and maintenance work.
9. Painting Hazards: Painters may encounter risks from working at heights, using chemicals in paints, and exposure to fumes.
10. Tunneling Hazards: Workers involved in tunnel construction face risks of collapse, flooding, and exposure to harmful gases.

Different domain-related works have their unique risks, and it's essential to tailor safety measures accordingly to ensure a safe work environment for all employees.

8.1.3 Workplace Warning Signs:

Workplace warning signs are essential visual cues used in various environments to convey important information, instructions, or potential hazards.

These signs play a crucial role in promoting safety, providing guidance, and preventing accidents.

Safety signs are essential visual cues used to convey critical safety information and promote safety awareness in various environments.

Safety Signs are generally divided into 4 Categories along with their Colour Codes:

Fig. 8.1.6 Workplace Warning Signs

- Red
- Blue
- Yellow
- Green

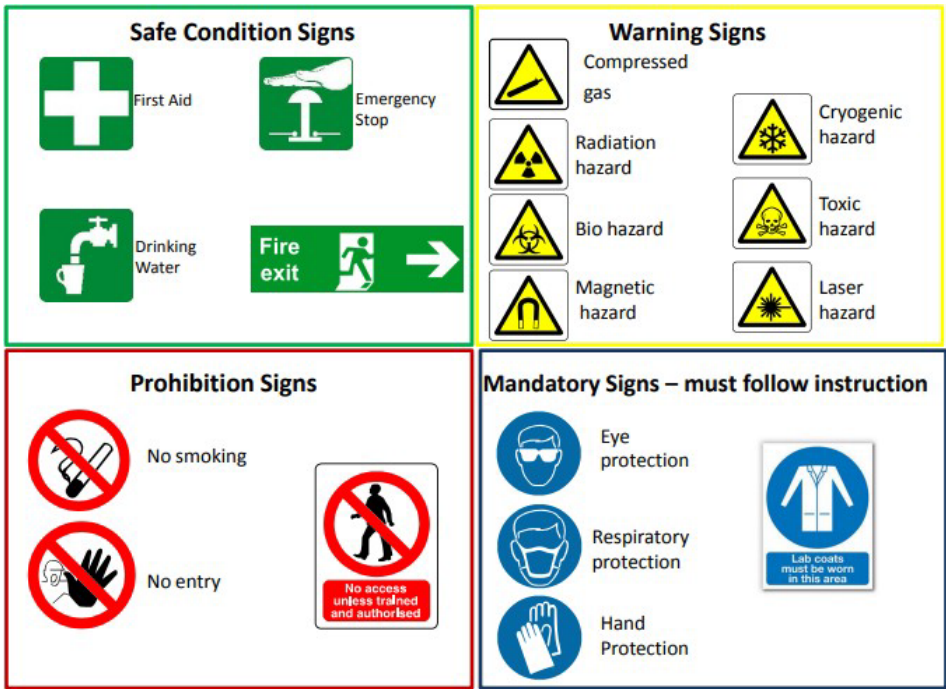

Fig. 8.1.7 Four Types of Safety Signs and their Colour

8.1.4 Emergency Response Plan (ERP)

An Emergency Response Plan (ERP) is a comprehensive document that outlines procedures, protocols, and responsibilities to be followed in the event of emergencies or critical incidents.

The ERP is designed to ensure the safety and well-being of individuals, property, and the environment during emergencies.

Fig. 8.1.8 Emergency Response Plan (ERP)

8.1.5 Reporting Emergency

Reporting procedures in case of emergency situations at a construction site play a crucial role in ensuring the safety of workers and facilitating a swift and coordinated response. The specific reporting procedure may vary depending on the construction site's policies and the type of emergency.

Fig. 8.1.9 Emergency Situations

However, here are general steps to follow when reporting an emergency situation at a construction site in India:

1. **Assess the Situation:** Quickly assess the nature and severity of the emergency while ensuring your safety and the safety of others, if possible.
2. **Activate the Alarm:** If the construction site has an alarm or emergency alert system, activate it to alert other workers and personnel about the emergency.
3. **Call Emergency Services:** Dial the appropriate emergency services number in India, which is 112, to connect to Police, Fire, and Medical emergency services.
4. **Provide Essential Information:** When calling emergency services, provide the operator with the following information:
    - The type of emergency (e.g., fire, collapse, injury).
    - The exact location of the construction site, including the address or nearby landmarks.
    - Any specific hazards or risks present at the site.
    - The number of people involved or injured (if known).
5. **Notify On-Site Personnel:** Inform the on-site supervisor, safety officer, or designated emergency response team members about the emergency.
6. **Follow the Construction Site's Emergency Response Plan:** Comply with the specific reporting procedures outlined in the construction site's Emergency Response Plan. This may involve contacting a specific individual or department responsible for handling emergencies.
7. **Cooperate with Authorities:** Once emergency services arrive at the construction site, cooperate fully with the authorities and follow any instructions provided by them.
8. **Inform Contractors or Site Management:** If the construction site involves multiple contractors or has site management, inform them about the emergency situation.

9. **Document the Incident:** After the emergency has been addressed, document the incident thoroughly, including the details of the emergency, response actions taken, and any injuries or damages incurred.

10. **Review and Improve Procedures:** After the emergency situation has been resolved, review the response and reporting procedures to identify any areas for improvement and make necessary adjustments to the Emergency Response Plan.

It is essential for all personnel working at the construction site to be familiar with the site's specific emergency response procedures and protocols. Regular training, drills, and awareness programs can help ensure that everyone knows how to respond effectively in case of emergencies, reducing the risk of injuries and minimizing damage to property.

Fig. 8.1.10 Reporting Emergency Situations

Notes

Unit 8.2 - Safety Drills, PPEs and Fire Safety

Unit Objectives

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

- Explain the classes of fire and types of fire extinguishers.
- Demonstrate the operating procedure of the fire extinguishers.
- Explain the importance of participation of workers in safety drills.
- List out basic medical tests required for working at construction site.
- Explain the purpose and importance of vertigo test at construction site.
- Explain the types and benefits of basic ergonomic principles, which should be adopted while carrying out specific task at the construction sites.
- Demonstrate use of PPEs as per work requirements.

8.2.1 Fire Triangle & Fire Types

Fire is a chemical reaction that occurs when a substance combines with oxygen and releases heat, light, and various combustion products.

It is a rapid oxidation process that can lead to destructive consequences if not controlled.

The fire triangle is a simple model used to illustrate the three essential components necessary for a fire to occur. These three components must be present simultaneously for a fire to ignite and sustain itself.

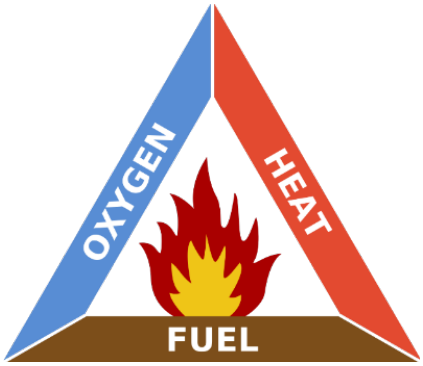

Fig. 8.2.1 Fire Triangle

There are several types of fires, categorized based on the fuel involved. The four main classes of fires are:

A		Ordinary Combustibles	Wood, Paper, Cloth, Etc.
B		Flammable Liquids	Grease, Oil, Paint, Solvents
C		Live Electrical Equipment	Electrical Panel, Motor, Wiring, Etc.
D		Combustible Metal	Magnesium, Aluminum, Etc.
K		Commercial Cooking Equipment	Cooking Oils, Animal Fats, Vegetable Oils

Fig. 8.2.2 Types of Fires

It is essential to use the appropriate extinguishing agents and follow proper fire safety protocols based on the type of fire to ensure effective firefighting and minimize risks to life and property. Fire safety training and understanding the different types of fires are crucial for individuals to respond safely and efficiently in the event of a fire emergency.

8.2.2 Fire Safety

Fire safety is a set of actions aimed at reducing the amount of damage caused by fire.

Fire safety procedures include both those that are used to prevent an uncontrolled fire from starting and those that are used to minimise the spread and impact of a fire after it has started. Developing and implementing fire safety measures in the workplace is not only mandated by law but is also essential for the protection of everyone who may be present in the building during a fire emergency.

Fig. 8.2.3 Fire at Construction Site

The basic Fire Safety Responsibilities are:

- To identify risks on the premises, a fire risk assessment must be carried out.
- Ascertain that fire safety measures are properly installed.
- Prepare for unexpected events.
- Fire safety instructions and training should be provided to the employees.

Prevention of a Workplace Fire:

- Workplace fire drills should be conducted regularly.
- If one has a manual alarm, one should raise it.
- Close the doors and leave the fire-stricken area as soon as possible. Ensure that the evacuation is quick and painless.
- Turn off dangerous machines, and don't stop to get personal items.
- Assemble at a central location. Ascertain that the assembly point is easily accessible to the employees.
- If one's clothing catches fire, one shouldn't rush about it. They should stop, descend on the ground, and roll to smother the flames if their clothes catch fire.

8.2.3 Fire Extinguisher

A fire extinguisher is a portable firefighting device designed to control and extinguish small fires. It is an essential tool for fire safety, allowing individuals to respond quickly to fires before they become unmanageable.

Fire extinguishers work by discharging a firefighting agent onto the fire, either by cooling the fuel, smothering the flames, or interrupting the chemical reaction required for combustion. Each fire extinguisher is specifically designed to combat certain classes of fires.

The most common types of fire extinguishers are:

1. Water Fire Extinguisher (Class A):
    - Suitable for Class A fires involving ordinary combustible materials such as wood, paper, cloth, plastics, and rubber.
2. Foam Fire Extinguisher (Class A and Class B):
    - Effective for Class A fires (ordinary combustibles) and Class B fires (flammable liquids and gases).
3. Dry Powder Fire Extinguisher (Class A, Class B, and Class C):
    - Versatile extinguisher suitable for Class A, B, and C fires.
4. Carbon Dioxide (CO2) Fire Extinguisher (Class B and Class C):
    - Suitable for Class B fires (flammable liquids and gases) and Class C fires (energized electrical equipment).
5. Wet Chemical Fire Extinguisher (Class K):
    - Specifically designed for Class K fires involving cooking oils and fats.

Fig. 8.2.4 Types of Fire Extinguishers

Fire extinguishers should be placed in easily accessible locations throughout buildings, construction sites, vehicles, and other facilities. Regular maintenance, inspection, and employee training on how to use fire extinguishers properly are essential components of fire safety programs. Remember, fire extinguishers are designed for small fires only. For larger fires or situations beyond your control, evacuate the area immediately and call the appropriate emergency services.

Using Fire Extinguisher:

Using a fire extinguisher properly can be instrumental in quickly extinguishing small fires and preventing them from spreading. When using a fire extinguisher, remember the acronym "PASS," which stands for Pull, Aim, Squeeze, and Sweep.

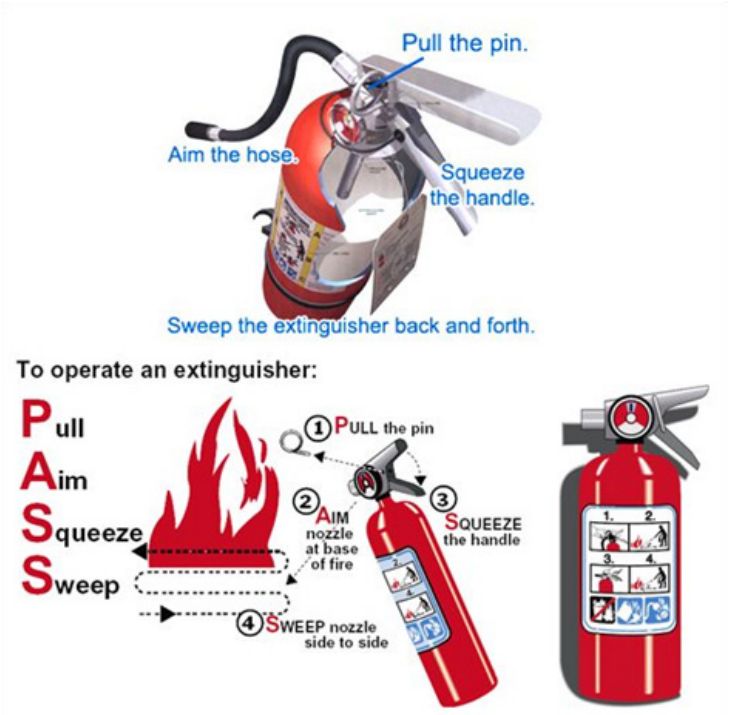

Fig. 8.2.5 Using a Fire Extinguisher

Remember the following important tips:

- Only use a fire extinguisher on small fires that are contained and not spreading rapidly.
- Make sure you are using the right type of fire extinguisher for the specific class of fire (e.g., Class A, B, C, K).
- Always maintain a safe distance from the fire and avoid getting too close to the flames.
- Never turn your back on a fire, and be prepared to evacuate if the fire becomes too large or uncontrollable.
- If the fire does not respond to the extinguisher or starts to grow rapidly, evacuate the area immediately and call the fire department.

8.2.4 Safety Drills and Its Importance for Workers

The participation of workers in safety drills at a construction site is of utmost importance to ensure a safe working environment and reduce the risk of accidents or incidents. Construction sites are inherently hazardous places, and safety drills play a crucial role in preparing workers to respond effectively to emergencies.

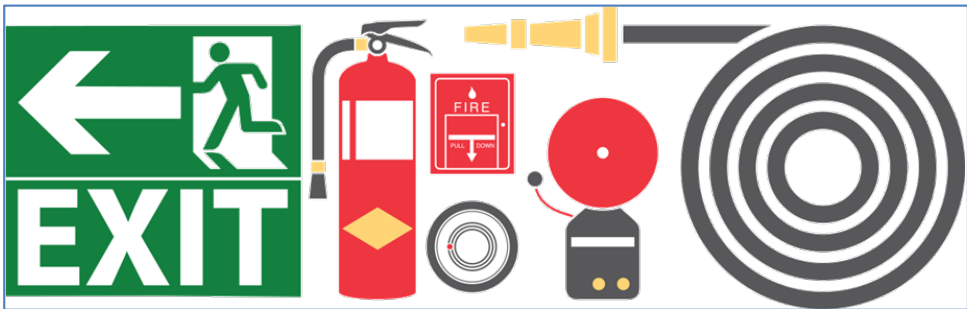

Fig. 8.2.6 Components related to Safety Drill

Here are some specific reasons why worker participation in safety drills is vital in a construction site setting:

1. **Familiarization with Site-Specific Procedures:** Construction sites can have unique layouts and hazards. Safety drills allow workers to become familiar with site-specific emergency procedures, such as evacuation routes, muster points, and the location of emergency equipment.
2. **Practicing Response to Common Construction Hazards:** Safety drills provide an opportunity to practice responding to emergencies related to common construction hazards, such as falls, structural collapses, confined space incidents, and electrical accidents.
3. **Building Muscle Memory for Critical Tasks:** By participating in safety drills, workers develop muscle memory for critical safety tasks, such as donning personal protective equipment (PPE), using fire extinguishers, or performing emergency rescues. Muscle memory helps workers react quickly and instinctively during real emergencies.
4. **Testing Effectiveness of Emergency Plans:** Safety drills allow construction site managers to assess the effectiveness of the site's emergency response plans and identify any gaps or weaknesses that need to be addressed.
5. **Boosting Confidence and Reducing Panic:** Regular participation in safety drills can boost workers' confidence in their ability to handle emergencies, making them less likely to panic and more likely to respond calmly and rationally.
6. **Team Coordination and Communication:** Safety drills encourage teamwork and coordination among workers. It helps them practice effective communication during emergencies, which is essential for a coordinated and efficient response.

7. Compliance with Regulations: Construction sites are subject to various safety regulations and standards. Worker participation in safety drills ensures that the construction site is compliant with safety requirements.
8. Preventing Injuries and Fatalities: The ultimate goal of safety drills is to prevent injuries and save lives. Properly trained and prepared workers are more likely to respond effectively to emergencies, reducing the severity of incidents.
9. Emergency Response Performance Evaluation: Safety drills provide an opportunity to evaluate how well workers respond to emergencies and identify areas that need improvement or additional training.
10. Promoting a Safety Culture: Encouraging worker participation in safety drills sends a strong message about the importance of safety at the construction site. It fosters a safety-first culture and instills a sense of responsibility for safety among all workers.

By actively involving workers in safety drills, construction site management can significantly enhance the site's emergency preparedness, improve response capabilities, and create a safer working environment for everyone involved.

Evacuation:

Evacuation at a construction workplace/site is a crucial aspect of ensuring the safety of all workers and visitors in case of emergencies. Construction sites can be hazardous environments with various potential risks, making preparedness and efficient evacuation procedures essential.

Fig. 8.2.7 Emergency Evacuation

8.2.5 Medical Examination for Construction Workers

The government has mandated that industrial enterprises undertake annual health checkups on their employees. In accordance with the Factories Act of India from 1948, both contractual and permanent employees in manufacturing businesses are required to undergo periodic health examinations. These examinations aim to protect the health and safety of factory workers.

The type of medical examination varies according to an employee's job description or the nature of the industrial process in which he is involved. For instance, if an employee works in the food

business, their hands are routinely inspected for skin disorders. If someone is involved in a hazardous manufacturing process, chest X-rays may be part of the medical checkup.

Consequently, depending on the nature of the production process and the job profile, an employee may be subjected to all standard and specific tests.

In addition, the frequency of medical examinations varies. According to the Maharashtra Plant Rules, for instance, if the factory is involved in the production of lead, workers are inspected once every month.

Medical Check-up Prior to Employment: A young person must have a pre-employment medical examination by a Certifying Surgeon to determine and confirm his fitness to work in a factory, according the Factories Act of 1948. The certificate of fitness is only valid for one year from the date it was issued.

Fig. 8.2.8 Medical Examination for Construction Workers

Medical Examinations for Workers in Hazardous Occupations: According to the Factories Act, a plant that engages in hazardous procedures is required to have its employees examined by a competent medical professional prior to employment and on a recurrent basis thereafter. Workers employed in a "hazardous process" are medically tested once before to employment by a Factory Medical Officer to determine their physical fitness and appropriateness for employment in a hazardous process.

Once every six months, the health status of all workers exposed to occupational health hazards must be determined.

Form 7 is completed, and if the medical findings reveal any abnormality or unsuitability of a person employed in the hazardous process, or if the worker has manifested signs and symptoms of a notifiable disease (as specified in the Third Schedule of the Factories Act), the worker must be removed from the process for health protection and cannot be employed in the same process. Alternatively, if the worker is totally handicapped, he or she will receive appropriate rehabilitation. Only after obtaining a Fitness Certificate from the Certifying Surgeon and Form 7 in accordance with the Factories Act may a withdrawn employee be rehired for the same process.

List of Recommended Medical Tests under the Factories Act:

1. Complete Physical Examination
2. Blood Group, Rh factor
3. Blood CBC, ESR, RBS
4. Urine Test (Routine & Microscopic)
5. Creatinine
6. Electrocardiogram (Computerised ECG)

7. Chest X-Ray (Standard Size)
8. Lung Function Test
9. Vision Test (Screening)
10. Audiometric Test
11. HIV & HBS Tests

8.2.6 Vertigo Test

Vertigo is a symptom, not a condition in and of itself. Vertigo is a sort of dizziness that is frequently described as the sensation that one is spinning or that the world is spinning around them, especially when they alter their position.

Vertigo affects people of all ages. Middle ear pathology is typically the culprit in younger patients. The danger of falls and associated sequelae necessitates a specialised assessment of the elderly. The key to arriving at a diagnosis is distinguishing vertigo from other causes of dizziness or imbalance, as well as distinguishing central causes of vertigo from peripheral causes.

Vertigo is a symptom that is associated with numerous medical disorders. Your doctor may require one or more tests or procedures to better understand your underlying issue. Numerous of these tests require specialised equipment and experienced personnel.

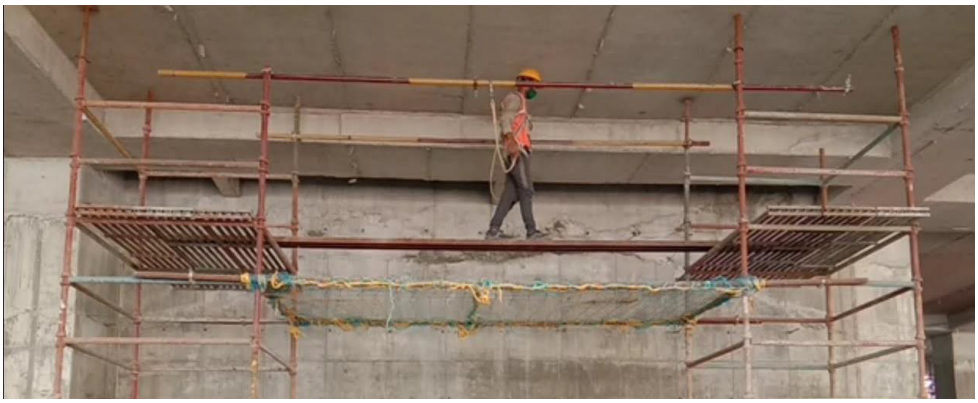

Fig. 8.2.9 Vertigo Test for Construction Workers

Some exams are brief and painless, while others are lengthy and unpleasant Your doctor can recommend the relevant tests for your condition

8.2.7 Basic Ergonomic Principles

Basic ergonomic principles involve designing and arranging workspaces, equipment, and tasks to optimize efficiency, productivity, and worker well-being.

Ergonomics aims to reduce the risk of musculoskeletal disorders (MSDs) and other work-related injuries by ensuring that the work environment fits the worker's capabilities and needs.

Fig. 8.2.10 Basic Ergonomic Principles

Construction sites can be physically demanding and involve various tasks that may lead to musculoskeletal disorders (MSDs) and other injuries if not properly addressed. Here are some basic ergonomic principles to consider at a construction site:

- Proper Lifting Techniques:
  - Train workers in proper lifting techniques to avoid back injuries. Encourage the use of mechanical lifting aids, such as cranes or hoists, for heavy or awkward loads.
- Worksite Organization:
  - Arrange tools, equipment, and materials to minimize excessive reaching or bending.
  - Keep frequently used items within easy reach to reduce unnecessary movement.
- Tool Selection:
  - Provide ergonomic tools with appropriate grips and handles that reduce hand and wrist fatigue.
  - Choose tools that require less force to operate to prevent overexertion.

By applying these basic ergonomic principles at construction sites, employers can create a safer and more comfortable working environment, reduce the risk of work-related injuries, and improve the overall well-being and productivity of construction workers.

8.2.8 First Aid

First aid refers to the immediate and initial care given to an injured or ill person before professional medical help arrives. It is crucial in emergencies to stabilize the injured or sick individual and prevent their condition from worsening.

First aid aims to preserve life, alleviate pain, and promote recovery.

Here are some key points about first aid:

Objectives of First Aid:

- **Preserve Life:** The primary objective of first aid is to assess the situation and provide immediate care to save lives.
- **Prevent Further Harm:** First aid measures aim to prevent the injured person's condition from worsening.
- **Relieve Pain:** First aid techniques can provide pain relief to the injured or ill person.
- **Promote Recovery:** Properly administered first aid can help promote the person's recovery and reduce the severity of injuries or illnesses.

Fig. 8.2.11 First Aid to Injured Person

Common First Aid Procedures:

- Assessment: Assess the situation and the injured or ill person's condition. Ensure your safety and the safety of others.
- CPR (Cardiopulmonary Resuscitation): If the person is not breathing or their heart has stopped, perform CPR to maintain blood flow and provide oxygen.
- Bleeding Control: Apply pressure to stop bleeding from wounds and injuries.
- Wound Care: Clean and dress wounds to prevent infection and aid healing.
- Fracture and Sprain Care: Immobilize fractures and provide support for sprains to prevent further damage.
- Burn Care: Cool burns with running water and cover with a clean, non-stick dressing.
- Choking Response: Perform abdominal thrusts (Heimlich maneuver) on a choking person to clear their airway.
- Seizure Management: Keep the person safe during a seizure and provide comfort afterward.

First Aid Kits:

A well-stocked first aid kit is essential in homes, workplaces, and vehicles. It should contain items such as adhesive bandages, gauze pads, antiseptic wipes, adhesive tape, scissors, tweezers, CPR mask, disposable gloves, and pain relievers, among others.

Note: While first aid can be lifesaving, it is not a substitute for professional medical care. In emergencies, call for professional help (e.g., emergency services) as soon as possible, especially for serious injuries or illnesses.

Fig. 8.2.12 First Aid Kit

It is crucial to receive formal first aid training to effectively administer first aid and respond appropriately in emergency situations. Proper training ensures that you can provide the most appropriate care and support to those in need until professional help arrives.

8.2.9 Ensure Electrical Safety at Construction Sites

Electrical safety is important because hazards such as arc flash and shock can result in death if you are exposed to them.

Fortunately, the likelihood of this occurring is relatively low

However, the control measures that prevent these hazards require careful management, attention to detail and technical competence.

Fig. 8.2.13 Electrical Hazards

- Conduct regular inspections of electrical equipment and wiring to identify any potential hazards or defects.
- Ensure all electrical installations and equipment meet relevant safety standards and codes.
- Provide proper training to construction workers on electrical safety practices and procedures.
- Clearly label electrical panels, switches, and outlets for easy identification.
- Use ground fault circuit interrupters (GFCIs) to protect against electric shock in wet or damp environments.
- Avoid overloading electrical circuits and outlets by distributing loads evenly.
- Keep electrical cords and cables away from heavy machinery, sharp objects, or areas with high foot traffic.
- Store electrical tools and equipment properly when not in use to prevent damage and accidents.
- Use insulated tools and personal protective equipment (PPE) when working with electricity.
- Have a clear emergency plan in place in case of electrical accidents or incidents and ensure workers are familiar with it.

Fig. 8.2.14 Electrical Safety

8.2.10 PPE and Its Importance

Personal Protective Equipment (PPE) plays a crucial role in the construction industry to protect workers from potential hazards and ensure their safety on the job. PPE is designed to shield workers from various risks, such as falling objects, electrical hazards, chemical exposure, noise, and more.

Fig. 8.2.15 PPEs in Construction Industry

Importance of PPE in Construction Industry:

1. Hazard Protection: PPE serves as a barrier between workers and potential workplace hazards, preventing injuries and illnesses.
2. Legal Compliance: Regulatory authorities require the use of appropriate PPE in construction to meet safety standards and comply with regulations.
3. Injury Prevention: PPE can significantly reduce the risk of injuries and accidents, protecting workers' health and well-being.
4. Risk Reduction: PPE mitigates the risk of exposure to harmful substances, noise, dust, and other occupational hazards.
5. Enhanced Productivity: When workers feel safe and protected, their confidence and efficiency increase, leading to improved productivity.

Types of PPE in Construction Industry:

Injury Protection	Description	PPE
Head Injury Protection	Head injuries can occur due to falling or flying objects, stationary objects, or contact with electrical wires. Hard hats provide protection against such injuries by shielding the head. Electrician's hard hat is commonly made of nonconductive plastic. It is accompanied by safety goggles for additional eye protection.	

Foot and Leg Injury Protection	Safety shoes, especially those made of leather, provide essential foot protection. They offer protection against various risks, including falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards. Proper use of safety shoes enhances safety measures for workers in hazardous environments like construction sites.	
Eye and Face Injury Protection	Spectacles and goggles provide protection against hazards like flying fragments, large chips, hot sparks, radiation, and splashes from molten metals. Special helmets or shields offer additional protection for the face and eyes in hazardous environments. Spectacles with side shields and face shields enhance eye safety by preventing exposure to various risks. These protective gears also safeguard against partides, sand, dirt, mists, dust, and glare, promoting overall eye health and safety.	
Protection against Hearing Loss	Hearing protection can be achieved through earplugs or earmuffs. Prolonged exposure to high noise levels can lead to permanent hearing loss, physical strain, and mental stress. Self-forming earplugs made of materials like foam, waxed cotton, or fibreglass wool are commonly used as they offer a good fit. For better fit and protection, workers should be fitted with moulded or prefabricated earplugs by a specialist.	
Hand Injury Protection	Hand protection is crucial for workers exposed to hazardous substances through skin absorption, serious wounds, or thermal burns. Gloves are commonly used as protective gear for hands. Electricians often use leather gloves with rubber inserts when working on electrified circuits. Kevlar gloves are employed when stripping cable with a sharp blade to prevent cuts and injuries.	

Whole Body Protection	Full-body protection is essential for workers to safeguard against heat and radiation hazards. Whole-body PPE includes materials like rubber, leather, synthetics, plastic, fire-retardant wool, and cotton. Maintenance staff working with high-power sources like transformer installations and motor-control centers are often required to wear fire-resistant clothes for added safety.	

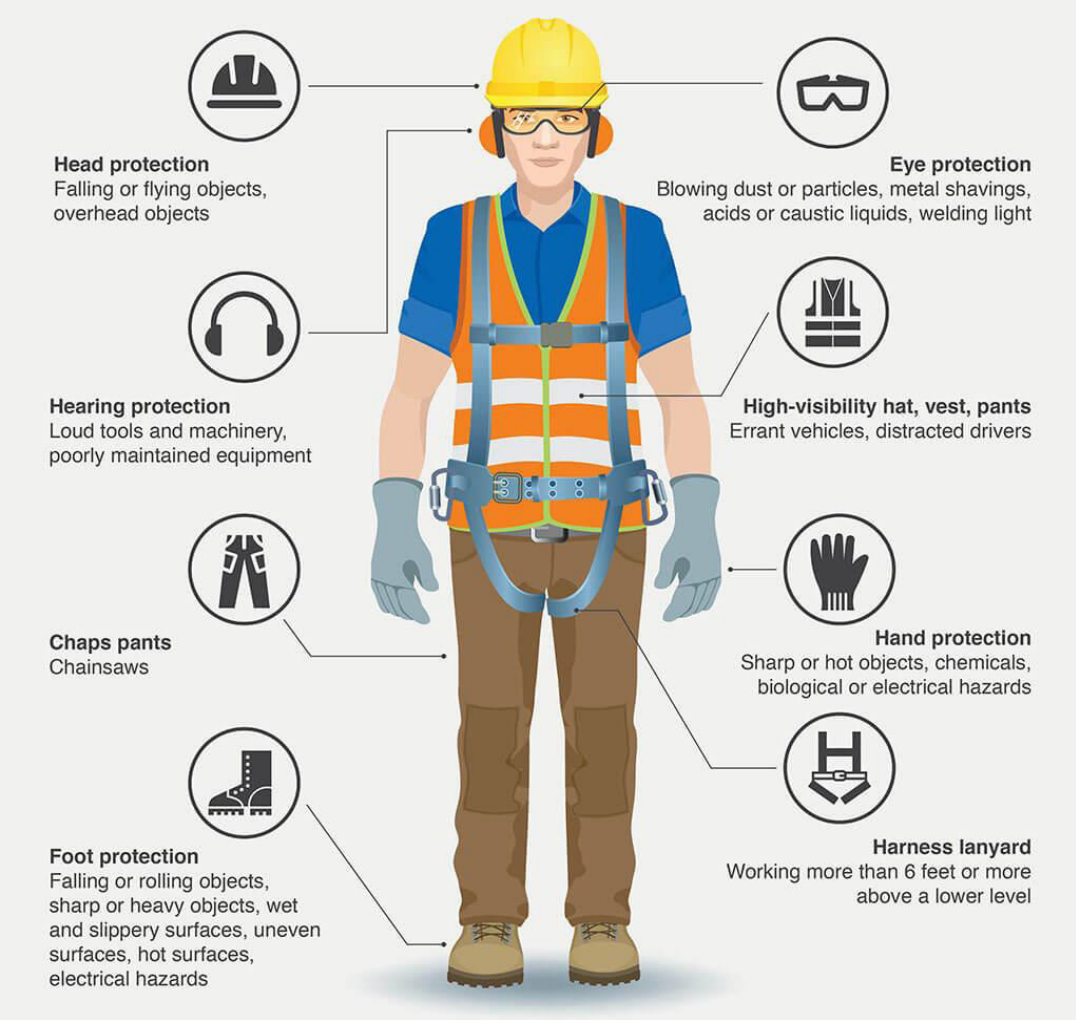

Fig. 8.2.16 A Construction Worker with proper PPEs

Care and Maintenance of PPE:

- Regular Inspection: PPE should be inspected before each use to ensure it is in good condition and free from damage.
- Proper Storage: Store PPE in a clean, dry, and designated area away from direct sunlight and chemical exposure.
- Cleaning: Clean PPE regularly according to the manufacturer's guidelines to maintain its effectiveness.
- Replacement: PPE should be replaced when damaged, worn out, or beyond its usable life as specified by the manufacturer.
- Training: Provide training to workers on the proper use, care, and limitations of PPE.
- Comfort and Fit: Ensure that PPE fits properly and is comfortable for the worker to encourage consistent use.

PPE is essential for protecting workers from harm, but it is also the last line of defence.

Care and Maintenance of Tools & Equipment:

- Regularly inspect tools and equipment for signs of damage or wear.
- Keep tools and equipment clean and free from dirt and debris after each use.
- Store tools and equipment in a dry and secure location, protected from weather elements.
- Follow manufacturer's instructions for battery-operated tools regarding charging and storage.
- Train workers on proper tool usage, care, and maintenance to ensure safe and efficient operation

Notes

Unit 8.3 - Hygiene and Safe Waste Disposal Practices

Unit Objectives

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

- Follow the practices to maintain personal hygiene, workplace hygiene and site/ workplace sanitization
- Understand the importance of housekeeping works
- Keep an eye on safe housekeeping practices
- Understand different types of waste at construction sites and their disposal method
- Know safe waste disposal practices followed at construction site

8.3.1 Personal Hygiene and Cleanliness

Personal hygiene and cleanliness are essential practices that involve maintaining cleanliness and taking care of one's body to prevent the spread of germs, illnesses, and maintain overall well-being. These practices are crucial for promoting good health and preventing the transmission of infectious diseases.

Fig. 8.3.1 Personal Hygiene

Here are some key aspects of personal hygiene and cleanliness:

- **Regular Bathing or Showering:** Regular bathing or showering helps to keep the body clean and remove dirt, sweat, and bacteria from the skin.
- **Handwashing:** Proper handwashing with soap and water is one of the most effective ways to prevent the spread of germs and infections.

- **Oral Hygiene:** Brushing teeth twice a day and flossing regularly help maintain good oral health and prevent dental problems.
- **Trimming Nails:** Keeping nails clean and trimmed prevents the accumulation of dirt and germs under the nails.
- **Hair Care:** Regularly washing and maintaining hair cleanliness can prevent scalp issues and promote healthy hair.
- **Wearing Clean Clothes:** Wearing clean clothes helps prevent the spread of germs and keeps the body fresh.
- **Proper Use of Personal Protective Equipment (PPE):** In certain situations, such as during a pandemic or when handling hazardous materials, using appropriate PPE like masks, gloves, and safety gear is crucial for personal protection and hygiene.
- **Handling Food Safely:** Properly handling, preparing, and storing food helps prevent foodborne illnesses.
- **Cough and Sneezing Etiquette:** Covering the mouth and nose with a tissue or elbow when coughing or sneezing helps prevent the spread of respiratory droplets containing germs.
- **Managing Menstrual Hygiene:** Properly managing menstrual hygiene is essential for women's health and well-being.
- **Cleaning and Disinfecting Surfaces:** Regularly cleaning and disinfecting frequently-touched surfaces, such as doorknobs and handles, helps prevent the spread of germs.
- **Managing Personal Waste:** Properly disposing of waste and using clean and sanitary facilities help prevent the spread of infections.

Maintaining personal hygiene and cleanliness is not only important for individual health but also for public health. It is essential for reducing the risk of contagious diseases and maintaining a hygienic living and working environment. By practicing good personal hygiene and cleanliness, individuals can contribute to a healthier and safer community.

Importance of Informing on Personal Health Issues

The importance of reporting to the designated authority about infectious diseases and injuries are:

- The infectious diseases can spread and affect the health of other workers at the farm.
- The infectious diseases can be spread to the consumers if the bacteria and viruses spread through the produces.
- The injuries should be timely reported and should be taken care of immediately. If not timely reported it may worsen and may cause severe diseases and even death.

Fig. 8.3.2 Infectious Disease

8.3.2 Workplace Cleanliness and Sanitization

Workplace cleanliness and sanitization are crucial for creating a safe, healthy, and productive work environment.

Clean and sanitized workplaces not only reduce the risk of the spread of infections and illnesses but also contribute to employee well-being and morale.

Fig. 8.3.3 Workplace Cleanliness

Here are some important aspects of workplace cleanliness and sanitization:

1. Regular Cleaning Routine: Establish a regular cleaning schedule for the workplace, including workstations, common areas, restrooms, and shared equipment. Cleaning should be done daily or as needed, depending on the nature of the workplace.
2. Surface Disinfection: Regularly disinfect frequently-touched surfaces, such as doorknobs, light switches, keyboards, and shared equipment. Use EPA-approved disinfectants that are effective against viruses and bacteria.
3. Hand Sanitizing Stations: Place hand sanitizing stations at convenient locations throughout the workplace to encourage employees and visitors to maintain hand hygiene.
4. Restroom Hygiene: Maintain clean and well-stocked restrooms with proper sanitation supplies. Regularly clean and disinfect restroom surfaces to prevent the spread of germs.
5. Waste Management: Provide clearly marked waste disposal bins and ensure proper waste segregation. Regularly empty trash bins and dispose of waste appropriately.
6. Kitchen and Break Areas: Maintain cleanliness in kitchen and break areas by regularly cleaning countertops, sinks, and shared appliances. Encourage employees to clean up after themselves.
7. Ventilation and Air Quality: Ensure proper ventilation to improve indoor air quality. Clean air filters regularly to remove dust and allergens from the air.
8. Personal Protective Equipment (PPE): Provide appropriate PPE, such as masks and gloves, for employees when needed, especially during pandemics or when handling hazardous materials.

9. Educate Employees: Educate employees about the importance of workplace cleanliness and hygiene practices. Encourage them to follow hygiene guidelines and protocols.
10. Workplace Signage: Display hygiene-related signage, such as handwashing instructions, cough etiquette, and reminders about cleaning protocols, to reinforce good practices.
11. Cleaning and Sanitization Training: Train cleaning staff and employees responsible for workplace cleanliness on proper cleaning and sanitization techniques and the correct use of disinfectants.
12. Workplace Wellness Initiatives: Implement workplace wellness programs that promote good health and hygiene practices among employees.

By prioritizing workplace cleanliness and sanitization, employers can create a healthier and safer environment for their employees, clients, and visitors. Regular cleaning and sanitation efforts help prevent the spread of infections, reduce absenteeism, and foster a positive work culture focused on employee well-being and productivity.

8.3.3 Implement Good Housekeeping Practices at Construction Site

Implementing good housekeeping practices at a construction site is essential to maintain a safe, organized, and efficient working environment. Proper housekeeping helps prevent accidents, reduces the risk of injuries, and enhances productivity.

Here are some effective ways to promote good housekeeping practices at construction sites:

1. Designate Storage Areas:

Fig. 8.3.4 Designated Areas

Assign specific areas for storing tools, equipment, and materials. Keep these areas organized and ensure that items are returned to their designated places after use.

2. Regular Cleanup:

Fig. 8.3.5 Clean-up Debris and Waste

Schedule regular cleanup sessions throughout the workday to remove debris, waste, and hazards from the construction site. Encourage all workers to participate in keeping the site clean.

3. **Dispose of Waste Properly:** Provide clearly marked waste disposal bins and containers. Train workers to segregate waste materials correctly, including hazardous materials, to ensure safe disposal.

Fig. 8.3.6 Disposing of Waste

4. **Keep Walkways Clear:** Ensure that walkways, access routes, and emergency exits are clear of obstructions at all times. Remove trip hazards and obstacles to prevent accidents.

Fig. 8.3.7 Clear Walkways

5. **Store Flammable Materials Safely:** Store flammable materials, such as fuel, solvents, and gases, in designated storage areas away from potential ignition sources. Follow safety guidelines for their storage and handling.

Fig. 8.3.8 Store Flammable Safely

6. **Prevent Slips, Trips, and Falls:** Regularly inspect the site for slippery surfaces, loose debris, and uneven terrain. Address potential hazards promptly to reduce the risk of slips, trips, and falls.

Fig. 8.3.9 Prevent Hazards

7. **Control Dust and Debris:** Use dust control measures, such as wetting down surfaces, using dust collectors, or providing personal protective equipment (PPE), to reduce airborne dust and debris.

Fig. 8.3.10 Wetting Down Dust

8. **Proper Material Handling:** Train workers on proper material handling techniques to prevent injuries caused by lifting, carrying, or moving heavy objects.

Fig. 8.3.11 Material Handling with Safety

9. **Secure Tools and Equipment:** Ensure that tools and equipment are properly stored, secured, and maintained when not in use. Avoid leaving them unattended or in precarious positions.

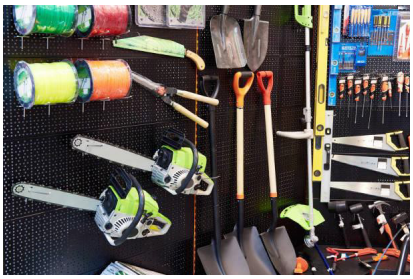

Fig. 8.3.12 Securing Tools & Equipment

10. **Inspect and Maintain Equipment:** Regularly inspect machinery, vehicles, and equipment to identify potential issues or defects. Perform maintenance and repairs promptly to ensure their safe operation.

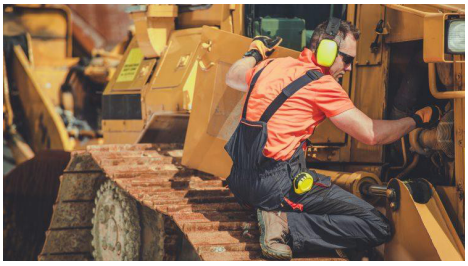

Fig. 83.13 Inspect and Maintain Equipment

Fig. 8.3.14 Good Housekeeping and Safety relevance

Remember that good housekeeping is an ongoing effort and requires the commitment and cooperation of all workers and management. By prioritizing cleanliness and organization at the construction site, you can create a safer and more productive work environment for everyone involved.

8.3.4 Handwashing

Handwashing is a simple yet highly effective practice that involves cleaning one's hands with soap and water to remove dirt, germs, and other harmful microorganisms.

Proper handwashing is one of the most important measures to prevent the spread of infectious diseases, including common colds, flu, gastrointestinal infections, and respiratory illnesses.

Proper Handwashing Technique:

- Wet Hands: Wet your hands with clean, running water (warm or cold).
- Apply Soap: Apply enough soap to cover all hand surfaces.
- Rub Hands Together: Rub your hands palm to palm to create lather. Continue rubbing the backs of your hands, between your fingers, and under your nails.
- Scrub for at least 20 Seconds: Scrub your hands for at least 20 seconds. Singing "Happy Birthday" twice is a useful timer.
- Rinse Thoroughly: Rinse your hands thoroughly under clean, running water.
- Dry Hands: Dry your hands using a clean towel or air dry them. If possible, use a paper towel to turn off the faucet to avoid recontamination.

Fig. 8.3.15 Handwashing

When to Wash Hands:

- Before preparing or eating food
- After using the restroom
- After coughing, sneezing, or blowing your nose
- After touching surfaces in public places
- After handling garbage or waste
- After caring for someone who is sick
- Before and after tending to wounds or injuries

Fig. 8.3.16 Wash Hands Properly

8.3.5 Avoid Bad Habits

Avoiding bad habits like smoking, drinking alcohol, and addiction to tobacco and gutkha is essential for maintaining good health and well-being. These habits can have severe negative impacts on physical health, mental health, and overall quality of life.

Here are some reasons to avoid these habits:

- Understand the health risks associated with smoking, drinking alcohol, and using tobacco and gutkha.
- Seek support from family, friends, or support groups to help quit these habits.
- Replace bad habits with healthier alternatives, such as exercise, hobbies, or mindfulness practices.
- Set specific and achievable goals to gradually reduce and eliminate these habits.
- Avoid triggers or situations that may tempt you to engage in these bad habits.
- Practice stress management techniques to cope with stress without turning to harmful substances.

Fig. 8.3.17 Avoid Bad Habits

- Stay informed about the benefits of quitting and the negative impacts of these habits.
- Use nicotine replacement therapies or medications to aid in quitting smoking.
- Find healthy ways to socialize and relax without relying on alcohol or tobacco.
- Celebrate small milestones and successes in your journey to quit these bad habits.

8.3.6 Waste Types at Construction Sites

Construction sites generate various types of waste during the building process.

Some common types of waste found at construction sites include:

1. Concrete and Bricks Waste: Excess or damaged concrete, bricks, blocks, and precast elements.
2. Wood Waste: Includes timber offcuts, pallets, and packaging materials.
3. Metal Waste: Scrap metal from structural elements, reinforcement bars, and metal packaging.
4. Plastic Waste: Packaging materials, plastic sheets, and pipes.
5. Cardboard and Paper Waste: Packaging materials and documents.
6. Glass Waste: Broken or excess glass from windows, doors, and mirrors.

7. Asphalt Waste: Leftover asphalt from road or pavement construction.
8. Paints and Chemicals: Unused or leftover paints, solvents, adhesives, and other construction chemicals.
9. Electrical Waste: Old or damaged electrical components, cables, and wiring.
10. Insulation Materials: Unused or waste insulation materials.
11. Hazardous Waste: Materials containing asbestos, lead, mercury, or other hazardous substances.
12. Packaging Waste: Cardboard boxes, plastic wraps, and other packaging materials.

Fig. 8.3.18 Construction Wastes

Proper waste management and disposal methods are crucial to handle these various types of waste responsibly and minimize their impact on the environment. Recycling, reusing, and responsible disposal in designated landfills or waste treatment facilities are some of the ways to manage construction site waste effectively.

8.3.7 Waste Management

The collection, disposal, monitoring, and processing of waste materials is known as waste management. These wastes affect living beings' health and the environment. For reducing their effects, they have to be managed properly. The waste is usually in solid, liquid or gaseous form.

- Waste management is important because it decreases waste's impact on the environment, health, and other factors. It can also assist in the reuse or recycling of resources like paper, cans, and glass. The disposal of solid, liquid, gaseous, or dangerous substances is the example of waste management.
- When it comes to trash management, there are numerous factors to consider, including waste disposal, recycling, waste avoidance and reduction, and garbage transportation. Treatment of solid and liquid wastes is part of the waste management process. It also provides a number of recycling options for goods that aren't classified as garbage during the process.

Fig. 8.3.19 Waste Management

8.3.8 Methods of Waste Management

Construction waste management is crucial for reducing environmental impact and promoting sustainable practices in the construction industry. The 5Rs framework offers a systematic approach to managing construction waste, focusing on reducing waste generation and maximizing resource efficiency. The 5Rs stand for: Reduce, Reuse, Recycle, Recover, and Residuals. Here's how each of these methods is applied in construction waste management:

1. **Reduce:**
    - Design for Minimal Waste: Employ design strategies that aim to minimize waste generation during the construction phase. This includes accurate quantity estimation, optimizing material use, and choosing construction methods that generate less waste.
    - Prefabrication: Prefabrication and modular construction techniques can significantly reduce on-site waste by producing components off-site with precise measurements and minimal material wastage.
    - Waste Audits: Conduct waste audits to identify the major sources of waste and implement measures to reduce waste generation.
2. **Reuse:**
    - Salvage and Reuse Materials: Salvage and reuse materials from demolition or renovation activities that are still in good condition and can be repurposed in other projects. This includes

doors, windows, fixtures, and lumber.

- Temporary Structures: Utilize temporary structures and materials that can be disassembled and reused in other projects to reduce waste.

3. **Recycle:**

   - On-Site Recycling: Set up on-site recycling facilities to process construction waste, such as concrete, wood, metal, and plastics, into reusable materials like aggregates, mulch, or recycled content products.
   - Use Recycled Content: Incorporate recycled content materials, such as recycled concrete aggregate or reclaimed wood, in new construction to reduce the demand for virgin resources.

4. **Recover:**

   - Energy Recovery: Some non-recyclable construction waste can be converted into energy through waste-to-energy processes, helping to minimize landfill disposal and generate electricity or heat.
   - Anaerobic Digestion: Organic waste can be processed through anaerobic digestion to produce biogas, which can be used as a renewable energy source.

5. **Residuals Management:**

   - Landfill Diversion: For waste that cannot be reduced, reused, recycled, or recovered, focus on diverting it from landfills and explore alternative disposal methods that have a lower environmental impact.
   - Responsible Disposal: Ensure that waste that ends up in landfills is disposed of responsibly, adhering to local regulations and guidelines.

Fig. 8.3.20 Waste Bin Types and their Colour

By implementing the 5Rs framework, construction companies can minimize waste generation, conserve resources, reduce environmental pollution, and move towards a more sustainable and environmentally friendly approach to construction waste management.

8.3.9 Waste Management on a Construction Site

On the construction site, one must be mindful of how they handle waste and garbage. Having a plan for managing these goods is necessary to protect the safety of both workers and the general public. Here are some waste management strategies:

- Before disposing of them in the dumpster, place any hand tools in containers with lids.
- Place empty paint cans in the trash instead than spilling them down drains or onto pavements.
- Rinse disposable cups and other food containers before placing them in a recycling bin. This will help prevent litter from being blown onto the property during windy or rainy weather.
- Recycle equipment and other metal objects by utilising a magnet or air compressor to remove all non-metal components, such as nails, screws, nuts, bolts, electrical wiring, etc. These are then segregated by category prior to proper recycling.
- Insulation should be disposed of in the garbage as opposed to being poured down drains or onto pavements, as it can clog sewer systems.
- Use a tarp to pile dirt, rocks, bricks, and other heavy things into the bed of a truck before hauling them away when the work is complete. This will make future clean-up easier.
- Instead of discarding excess lumber, wrap it in plastic to prevent it from becoming wet and infected with termites.
- Use a leak-proof container or urn to transfer hazardous liquids away for proper disposal; this will keep the workers and others on-site dry and healthy.
- Regularly cleaning up will reduce the amount of debris.
- Using trash cans with lids to prevent rubbish from falling to the ground.
- On your site, provide workers with safety vests for simple identification and protection from concealed threats such as electrical cables and sharp instruments.
- Ensure that there is a designated space for recyclable materials such as glass, plastic, cardboard, and metal containers so that they may be sorted later

It is necessary to have a plan for waste management on construction sites, which are typically untidy places.

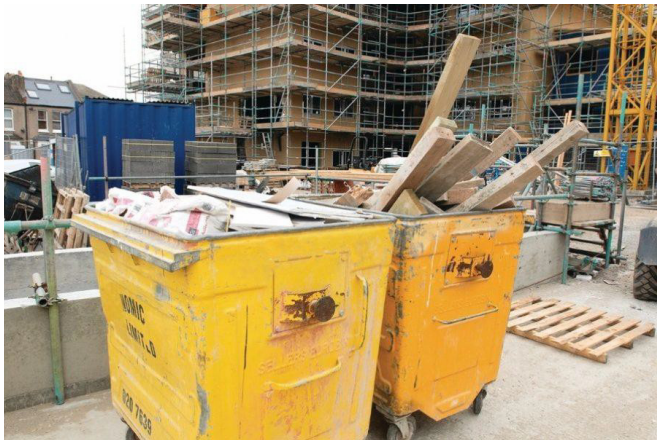

Fig. 8.3.21 Waste Management on a Construction Site

Notes

Unit 8.4 - Infectious Disease and Its Cure

Unit Objectives

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

- Know different types of infectious disease that can spread/ originate at a construction site
- Understand the ways of transmission of the various infectious disease.
- Recognize the methods to check the spread of the infectious disease.
- Understand the symptoms and cure of the various infectious disease.
- Apprehend the procedure to report to the concerned authority regarding the outbreak/ hazard of any infectious disease/ pandemic.

8.4.1 Infectious Diseases

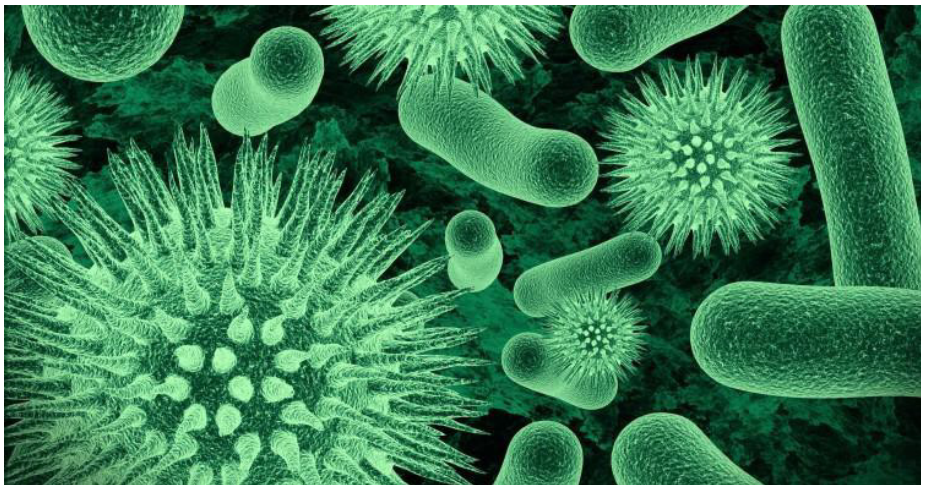

Fig. 8.4.1 Infectious Diseases

Viruses, bacteria, parasites, or fungi can cause infectious diseases. Additionally, uncommon viral disorders known as transmissible spongiform encephalopathies exist (TSEs).

- **Viral infections**
- **Bacterial infections**
- **Fungal infections**
- **Parasitic infections**
- **Transmissible spongiform encephalopathies (TSEs/prion diseases)**

Infectious diseases are extremely common worldwide, but some are more common than others.

Some of the most common infectious diseases are listed here by type.

Common infectious diseases caused by viruses:

- Common cold.
- The flu (influenza).
- COVID-19.
- Stomach flu (gastroenteritis).
- Hepatitis.
- Respiratory syncytial virus (RSV).

Common infectious diseases caused by bacteria:

- Strep throat.
- Salmonella.
- Tuberculosis.
- Whooping cough (pertussis).
- Chlamydia, gonorrhea and other sexually transmitted infections (STIs).
- Urinary tract infections (UTIs).
- E. coli.
- Clostridioides difficile (C. diff).

Common infectious diseases caused by fungi:

- Ringworm (like athlete's foot).
- Fungal nail infections.
- Vaginal candidiasis (vaginal yeast infection).
- Thrush.

Common infectious diseases caused by parasites:

- Giardiasis.
- Toxoplasmosis.
- Hookworms.
- Pinworms.

8.4.2 Prevention of Infectious Diseases

There are numerous simple strategies to minimise the chance of contracting an infectious disease and even prevent certain diseases entirely. While each of them reduces your chance of contracting and transmitting infectious diseases, there is typically no single method that is 100 percent effective. Therefore, it is essential to have several risk-reduction behaviours.

Vaccines

Vaccines lessen the likelihood of contracting an infectious disease by preparing the immune system to recognise and combat dangerous invaders.

Vaccinated individuals may occasionally still get an illness, although their symptoms are typically milder than they would have been without vaccination.

Fig. 8.4.2 Vaccines for Infectious Diseases

Vaccines are available for a number of common infectious diseases, such as:

- **Chickenpox:** Highly contagious viral infection causing itchy skin rash and fever.
- **COVID-19:** Respiratory illness caused by the novel coronavirus, leading to a wide range of symptoms from mild to severe.
- **Diphtheria, tetanus, and whooping cough (whooping cough):** Bacterial infections with symptoms like severe throat inflammation, muscle stiffness, and persistent cough.
- **Hepatitis A:** Liver infection caused by the hepatitis A virus, transmitted through contaminated food and water.
- **Hepatitis B:** Viral infection affecting the liver, transmitted through blood and body fluids, leading to acute or chronic liver disease.
- **Human papillomavirus (HPV):** Common sexually transmitted infection, linked to cervical and other cancers.
- **Influenza:** Viral respiratory infection causing fever, body aches, and respiratory symptoms.
- **Malaria:** Mosquito-borne infectious disease characterized by fever, chills, and flu-like symptoms.
- **Rubella, measles, and rubella:** Viral infections causing rashes, fever, and respiratory symptoms, with potential complications.
- **Polio:** Highly contagious viral infection affecting the nervous system, leading to paralysis in severe cases.
- **Rotavirus:** Common cause of severe diarrhea in young children.
- **Rabies:** Deadly viral disease affecting the nervous system, transmitted through animal bites.
- **Shingles:** Painful viral rash caused by the reactivation of the chickenpox virus.
- **Tuberculosis:** Bacterial infection primarily affecting the lungs, causing persistent cough and fatigue.

- The CDC provides current vaccination recommendations for children, adolescents, and adults. Before you travel, ensure that you have had all of the necessary vaccines for your location.
- Other methods of infectious illness prevention:
- In addition to immunisations and appropriate food handling procedures, you can lower your risk of contracting or transmitting an infectious disease by a few common actions.
- Hands should be washed with soap and water. Before making a meal or eating, after using the restroom, after contact with faeces (human or animal), and after gardening or dealing with dirt, it is essential to wash hands thoroughly.
- When you sneeze or cough, cover your nose and mouth.
- Sanitize regularly touched surfaces in your home and place of business.
- Avoid contact with infectiously ill individuals and the exchange of personal goods with them.
- While suffering from an infectious ailment, you should avoid contact with others.
- Do not drink or swim in potentially contaminated water.
- When sick or as recommended by the CDC, you should wear a mask in public.
- Always use a condom during sexual activity.
- To limit the risk of tick or mosquito bites, apply tick- and mosquito-approved insect repellent, cover as much exposed skin as possible with clothing, and check for ticks after spending time in wooded or grassy areas.

Fig. 8.4.3 Mask and Hand wash during Infectious Disease

8.4.3 General Health Issues and their Symptoms & Cure

General health issues like fever, cough, and cold can affect construction workers, especially when working in diverse weather conditions and exposed to various environmental factors.

Fig. 8.4.4 Symptoms of Fever, Cough and Cold

Here are their symptoms and some recommendations on what construction workers can do to manage these health issues:

Fever:

- Symptoms: Elevated body temperature, chills, body aches, fatigue.
- To-Do:
  - Rest and avoid strenuous physical activity.
  - Stay hydrated by drinking plenty of fluids.
  - Use over-the-counter fever-reducing medications if necessary.
  - Seek medical attention if the fever persists or becomes severe.

- **Cough:**
  - Symptoms: Persistent coughing, irritation in the throat, chest discomfort.
  - To-Do:
    - Avoid exposure to irritants like dust and fumes as much as possible.
    - Stay well-hydrated to soothe the throat.
    - Use a mask or respirator to protect the airways from particles and pollutants.
    - Seek medical advice if the cough worsens or is accompanied by other symptoms.
- Cold:
  - Symptoms: Runny or stuffy nose, sneezing, sore throat, mild body aches.
  - To-Do:
    - Rest and take sufficient breaks to recover.
    - Keep warm and dress appropriately for the weather.
    - Drink warm fluids like soups and herbal teas.
    - Use over-the-counter cold remedies to alleviate symptoms.

General Health Tips for Construction Workers:

- Stay hydrated throughout the day, especially in hot weather.
- Wear appropriate protective gear such as safety shoes, gloves, and helmets.
- Take regular breaks and rest when needed to prevent fatigue.
- Practice proper hand hygiene to reduce the risk of infections.
- Use masks or respirators when working in dusty or polluted environments.
- Eat a balanced diet to maintain overall health and immunity.
- Get regular medical check-ups and vaccinations as recommended.

It's important for construction workers to prioritize their health and safety, as their job often involves physical exertion and exposure to potential health hazards. If any health issue persists or worsens, it is advisable for them to seek medical attention promptly.

8.4.4 Reporting an Outbreak or Hazard of any Infectious Disease or Pandemic

Reporting an outbreak or hazard of any infectious disease or pandemic is crucial for prompt action and preventing further spread of the illness. The specific reporting procedure may vary based on the organization, industry, or country. Here's a general procedure to report such incidents to the concerned authority:

1. Identify the signs and symptoms of the infectious disease or pandemic hazard.
2. Isolate affected individuals to prevent further spread.
3. Inform immediate supervisors or managers about the situation promptly.
4. Contact the appropriate health authorities or public health department.
5. Cooperate with contact tracing efforts and provide necessary information.
6. Implement preventive measures recommended by health authorities.
7. Communicate updates and preventive measures to employees to maintain transparency.

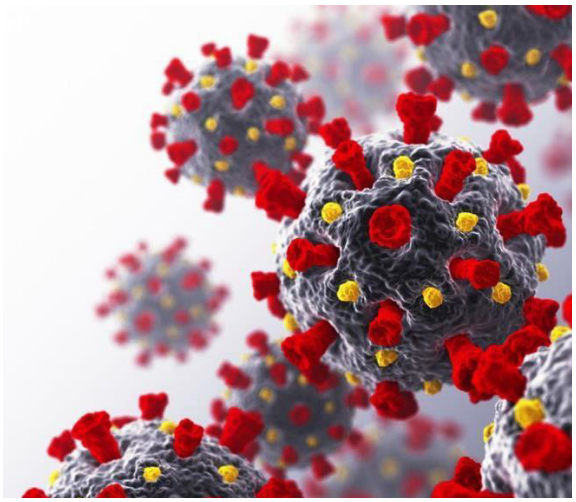

Fig. 8.4.5 Spread of Disease

Remember that reporting an outbreak or hazard of any infectious disease or pandemic promptly is essential for quick containment and mitigation. Cooperate with healthcare professionals, follow their advice, and work together to protect the health and safety of your community and workplace.

Exercise

Answer the following questions.

- Describe the different types of hazards commonly found in the construction industry.
- What are the key steps in handling emergency situations at a construction site, and how should incidents be reported to the concerned authority?
- What are the basic principles of first aid, and how can employees be trained in administering first aid?
- Explain the fire safety measures that should be implemented at a construction site, including fire extinguisher usage and evacuation procedures.
- Why is personal protective equipment (PPE) important in the construction industry, and what are the essential care and maintenance practices for PPE?
- How can good housekeeping practices be effectively implemented at a construction site to improve safety and organization?
- What are safe waste disposal practices that should be followed in the construction industry to protect the environment and prevent health hazards?

Notes

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Annexure

Annexure of QR Codes for Mason Concrete

Chapter Name	Unit Name	Topic Name	URL	QR Code	Page no.
Chapter 1: Introduction to the role of a Mason Tiling	Unit 1.1 – Overview of Construction Industry in India	Introduction of Construction Industry	https://youtu.be/yhjDhav4Pfw	Introduction of Construction Industry	9
	Unit 1.2 – Major Occupation in Construction Sector	Major occupations in construction sector	https://youtu.be/egQDs6cBzVI	Major occupations in construction sector	14
	Unit 1.3 – Mason Tiling - Job Role and Responsibility	Role of a Mason Tiling	https://youtu.be/Y5h0hycfbpE	Role of a Mason Tiling	19
Chapter 2: Generic Mathematical Skills	Unit 2.1 – Unit Conversion and Measurement	Different System of Measurement	https://youtu.be/H1xo5UVJKVo	Different System of Measurement	30
	Unit 2.2 – Basic Geometrical Shapes and Its Properties	Area, volume and perimeter of geometrical shapes	https://youtu.be/OhTubw4C0to	Area, volume and perimeter of geometrical shapes	37

Chapter 3: Tools, Materials and Consumables required for Mason Tiling (CON/N0115)	Unit 3.1 – Tools for Mason Tiling	Tools used by Mason tiling	https://youtu.be/aJ36AAwgBDg	Tools used by Mason tiling	58
	Unit 3.2 – Material and Consumables required	Selection and specification of materials	https://youtu.be/qQgh0n10548	Selection and specification of materials	71
Chapter 4: Laying and Fixing of Tiles (CON/N0115)	Unit 4.1 – Sketches/layouts in Tiling	Layout and Sketches for Tiling Work	https://youtu.be/dc4lm4qGjy0	Layout and Sketches for Tiling Work	79
	Unit 4.2 – Cutting of Tiles	Cutting of tile	https://youtu.be/slRU35Kan7E	Cutting of tile	87
	Unit 4.3 – Horizontal Laying and Fixing of Tiles	Preparation of cement mortar	https://youtu.be/vyt5POG6IdI	Preparation of cement mortar	102
	Unit 4.4 – Vertical Laying and Fixing of Tiles	Laying and fixing of tiles on walls/vertical surfaces	https://youtu.be/MwDX-RtU_BI	Laying and fixing of tiles on walls/vertical surfaces	109

Chapter 5: Grouting and Curing of Tiles (CON/N0116)	Unit 5.1 – Grouting of Tiles	Applying grout on joints	https://youtu.be/SKL0bx3pxNA	Applying grout on joints	118
	Unit 5.2 – Curing of Tiles	Uneven tiles	https://youtu.be/ib_EOym9H0g	Uneven tiles	123

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