









Participant Handbook

Sector Furniture and Fittings

Sub-Sector
Furniture Sales, Installation
& After Sales

Occupation Furniture Installation

Referece ID: FFS/Q2202, Version - 2.0 NSQF Level 2



General Assistant - Furniture & Fittings Installation

This book is prepared by

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

Shri Narendra Modi Prime Minister of India











Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FURNITURE & FITTINGS SKILL COUNCIL

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: 'General Assistant -Furniture & Fittings Installation 'QP No. 'FFS/Q2202, Version - 2.0 NSQF Level 2'

Date of Issuance: 30/09/2021 Valid up to*: 01/10/2024

*Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier) Authorised Signatory (Furniture & Fittings Skill Council)

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The preparation of this manual would not have been possible without the Furniture & Fittings Skill Council (FFSC) Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

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

About the book -

This book is designed for upgrading the knowledge and basic skills to take up the job of 'General Assistant- Furniture and Fittings Installation' in Furniture & Fittings Sector. All the activities carried out by the General Assistant are covered in this course. Upon successful completion of this course, the candidate will be eligible to work as a 'General Assistant- Furniture and Fittings Installer'.

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

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS

- FFS/N2201: Assist in conducting the recce of the worksite
- FFS/N2202: Assist in material management, fabrication, and installation work at the site
- FFS/N8201: Follow health, safety, and greening practices at the worksite
- FFS/N8202: Work effectively with the co-workers, supervisor, and others
- DGT/VSQ/N0101: Employability Skills (30 Hours)

Symbols used in the book -













Unit Objectives

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New Employability Skills Module



Employability Skills (30 hours)













1. Introduction

- Unit 1.1 Introduction to the Training Program
- Unit 1.2. Introduction to Skilling and TVET System
- Unit 1.3. Introduction to Furniture and Fittings Sector
- Unit 1.4. The Roles and Responsibilities of a

General Assistant F&FI



Key Learning Outcomes



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

- 1. Discuss the objectives of the training program.
- 2. Elaborate on the ground rules to be followed during the due course of the training program.
- 3. Discuss the importance of skilling in the ecosystem.
- 4. Describe the role of key players in the TVET system.
- 5. Discuss the objectives and benefits of the Skill India Mission.
- 6. Discuss the role of Occupational Standards in the ecosystem.
- 7. Describe the Interiors, Furniture, and Fittings Industry and its sub-sectors.
- 8. Describe the segments of the furniture industry.
- 9. Elaborate on the Furniture and Fittings Skill Council's (FFSC) role in the skilling domain.
- 10. Discuss the roles and responsibilities of a General Assistant-Furniture and Fittings Installer.
- 11. Describe the attributes required for a General Assistant-Furniture and Fittings Installer.
- 12. Elaborate on the scope for a General Assistant in the Interiors, Furniture, and Fittings Industry.
- 13. Elaborate on the hierarchy of General Assistants in the Furniture Installation Occupation.

UNIT 1.1: Introduction to the Training Program

- Unit Objectives 🧖



After completing this unit, you will be able to:

- 1. Know the overview of the training program
- 2. Know and understand the objectives of the training program
- 3. Know the ground rules for the training program

1.1.1 An Overview of the Training Program

The furniture industry has been growing consistently for quite some time; hence, the demand for carpenters and installers is increasing rapidly. In addition to hard work and dedication, one requires basic training to become an efficient General Assistant-Furniture and Fittings Installer. That is why this training program gets designed to encounter such needs.

This program will help you develop your knowledge and understanding of the following:

- The furniture industry in India
- The job roles and responsibilities of a General Assistant-Furniture and Fittings Installer
- Core professional and technical skills required to perform the General Assistant- Furniture and Fittings Installer duties efficiently
- Different types of wood, wood derivates, and other materials to be used in woodwork
- The hand and power tools to be used in woodwork
- Various hardware, furniture fittings, and accessories used in woodwork
- Site survey and recce operations
- Worksite management and housekeeping practices
- Measuring, marking, cutting, planning, drilling, routing, trimming, and assembly operations
- Technical drawings and process of interpreting job specifications
- Types of furniture
- Furniture-making process
- Maintenance and safety of tools and machines
- Keeping the workplace clean, safe, and secure
- Health and safety practices at the worksite
- Working efficiently with co-workers, supervisors, and others

1.1.2 Objectives of the Training Program -

After completing this training program, you will have the skills to:

- · Work in a workshop as a General Assistant-Furniture and Fittings Installer
- Perform your job efficiently
- Work in a safe and secure manner
- Adhere to safety and security guidelines
- · Comply with all guidelines and policies of the organization/workshop
- Maintain a safe, hygienic, and secure working environment
- · Use and maintain tools and machines appropriately
- Choose the appropriate material and tools required for the job
- Work effectively with various hand and power tools
- · Manage, Handle and store materials, tools & equipment effectively
- · Practice the correct furniture-making method involving traditional woodworking practices
- · Report safety hazards, conditions, or unsafe practices at the workplace
- Maintain professional workplace relationship
- · Demonstrate the right attributes for the job



Fig: Woodworking involving hands on activity

1.1.3 Ground Rules —

All the participants are expected to follow certain ground rules, which will facilitate an efficient learning environment. These rules are:

- · Arrive and start on time
- You are expected to participate in all workshop activities
- Keep your mobile phone switched off or in silent mode
- Follow the timelines; if the break given to the participants is of fifteen minutes, everybody has to be in the training room within the stipulated duration
- Raise all doubts in the class and do not discuss them with your fellow participants
- Listen actively and respect others when they are talking
- Ask questions if you do not understand a given concept
- Use diagnostic skills to identify problems and find possible solutions.

Notes

UNIT 1.2: Introduction to Skilling and TVET System

Unit Objectives



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

- 1. Understand the importance of Skilling, Upskilling, and Reskilling
- 2. Know about the Impact of Skills and the World Skills Competition
- 3. Understand the model of the TVET system in India
- 4. Understand the National Occupational Standards (NOS)
- 5. Know about the relevance of the National Skill Qualification Framework (NSQF)
- 6. Know about the different elements of a Qualification Pack and their significance

1.2.1 Introduction to Skill —

With a rapidly changing job landscape and an accelerated pace of technological innovation and automation, HR managers and leaders have emphasized skilling, upskilling, and reskilling to understand the workforce's critical needs. Employers are looking for candidates who can adapt and thrive in a constantly changing work environment more than ever before.



Fig: Importance of Skill

According to World Economic Forum research, 85 million jobs may experience a tectonic shift in function allocation between man and machine by 2025. Furthermore, 97 million new jobs will likely be created that revolve around the division of labor between man, machine, and algorithm.

1.2.1.1 What is Skilling? _____

A Competency or Skill is the ability to apply knowledge and use know-how to complete tasks and solve problems.

Skills in the NSQF can be viewed as:

- Cognitive involving the use of logical, intuitive, and creative thinking
- **Practical** involving manual dexterity and using methods, materials, tools, and instruments.

Skilling is the process of developing the skills necessary to work with wood or any other material in the woodworking industry, from client interface to project closure. E.g., The basic skill set includes learning the basics of woodworking, such as the types of wood, tools, and techniques used to cut, join, and shape wood. It also involves learning more advanced techniques, such as joinery, carving, and finishing.



1.2.1.2 What is Upskilling? -

Upskilling is the process of improving employees' capabilities to learn new skills within their present job function and perform to the best of their abilities.

The rapid appearance of new technology and changing face of the workplace in the aftermath of the pandemic have increased the demand for upskilling. As technology advances, new skills emerge, and employment requirements shift. As a result, there is an ongoing need to address employees' training and development requirements.



1.2.1.3 What is Reskilling?

Reskilling is the process of acquiring new skills or developing existing ones to adapt to changing demands in the workplace. Reskilling is particularly important in the woodworking industry, where new technology and working methods are constantly being developed.



1.2.1.4 What is Multiskilling?—

Multiskilling is a term used to describe the ability of a worker to perform more than one task or to possess more than one set of skills to create a more efficient and effective workforce. By multiskilling, organizations can reduce costs, increase productivity and create a more flexible, adaptable, and innovative workforce. It also enables employees to become more valuable to the organization due to increased knowledge and skills.

Example: A carpenter in multiskilling would be someone who is able to not only cut, shape, and join wood but also be able to perform tasks such as painting, wallpapering and tiling. This person would be equipped to handle a wide range of carpentry tasks, such as installing cabinets, door frames, and shelving.

1.2.1.5 Reskilling vs Upskilling vs Multiskilling

Adding new skills in different area



- Reduce recruitment cost
- Retain company knowledge and improve time to market
- Improve employees morale
- More versatile employees

Adding the skills to advance in same area

Upskilling

- Increase productivity
- · Retain employees
- Improve productivity and efficiency
- Faster a learning culture

Having skills in more than one area



- Greater job opportunity, collaboration and flexibility.
- Increased job security
- A deeper understanding of the business as a whole
- Reduce costs

1.2.1.6 Identifying the Right Skill Set

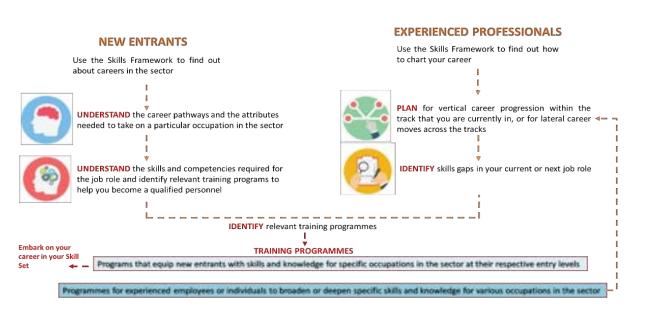


Fig: Pathway for Identifying the right skill set

1.2.2 Power of Skills

Skills are the essential building blocks of success, as they have the power to shape our lives, careers, and relationships. Knowing what skills get required for specific tasks, and honing those skills through practice and dedication, can open up a world of possibilities for us.

Skills play a vital role in the success of a woodworker, as they are essential for creating quality pieces and ensuring satisfaction with the finished product. A skilled woodworker can use various techniques to create a wide range of designs, from simple to intricate. They also have to understand the properties of different types of wood and how they interact with each other.

This knowledge can help them create both aesthetically pleasing and durable pieces. Career Opportunities in Furniture Sector with right skill set In Woodworking Industry, the right skill sets can open different career avenues for an individual involving design, procurement, production, sales, and after-sales operations.

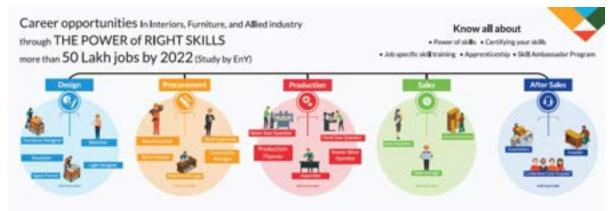


Fig: Career Opportunities in Furniture Sector with right skill set

1.2.2.1 World Skills Competition -

The World Skills Competition is a global event that brings together the best of the best in skills from countries worldwide. The competition has been held every two years since 1950 and is organized by World Skills International. It is the world's largest vocational skills competition, with over 1,200 competitors from over 70 countries participating in over 50 skills categories.



The Power of Skills is evident in the impact of the World Skills Competition. The competition gets designed to promote the importance of technical and vocational training and to identify and recognize the world's best practitioners in their respective fields. Competitors get judged on their ability to carry out a task in their chosen skill area to the highest international standards. The competition also serves as a platform for exchanging knowledge, skills, and best practices while promoting international cooperation and understanding. It also provides motivation and inspiration for those who wish to pursue a career in their respective field of skill.

Carpentry, Joinery, and Cabinet Making are among the most popular trades at the World Skills Competition in the construction domain. These trades are essential for creating furniture, fixtures, and other wooden products. Competitors demonstrate their skills in designing, constructing, and finishing wood products. They also demonstrate their knowledge of woodworking tools and techniques.

The Major Difference between Carpentry, Cabinet Making, and Joinery are: -

A Cabinet Maker specializes in boxy stuff like kitchen cabinets. Lots of sheet goods.

Joinery is defined as frame and panel construction or the joiner's work involving the fabrication and installation of fittings in buildings. A Joiner would make furniture.

A Carpenter does house framing and so on, involving lots of dimensional lumber. A finish carpenter does the final interior touches in a house, like moulding, built-in shelving, etc.



Fig: Cabinet Maker



Fig: Joinery



Fig: Carpentry

1.2.3 Skill India Mission

Skill India Mission is a comprehensive program started in 2015 by Honorable Prime Minister Shri Narendra Modi in response to World Youth Skills Day, which was declared for the first time on July 15, 2015. The project gets created to make India self-reliant.

The initiative attempted to bridge the gap between industry demands and skill requirements by developing industrial and entrepreneurial skills among Indians through various training programs.

1.2.3.1 Objectives of the Skill India Mission -

The main objectives of the initiative includes:

- 1. Bridging the gap between the industry demands and the individual skill requirements for employment generation.
- 2. Creating employment opportunities for the development of young talents.
- 3. Strengthening the Indian youth as a workforce for world markets.

- 4. Building up the competitiveness of Indian businesses.
- 5. Building up true marketplace capabilities rather than mere qualifications.
- 6. Diversifying the skill development program to meet the demands of a dynamic market.
- 7. Training people in areas like real estate, construction, transportation, textile, gemindustry, banking, and tourism where skill development is inadequate.
- 8. Identifying and developing the new sectors that require skill enhancement.

1.2.3.2 Role of Vocational Education in Skill India Mission

The Skill India Mission aims to create a skilled workforce by imparting training to individuals and making them employable. Vocational education is an important part of this mission as it provides individuals with the necessary skills to get employed in various industries. This education equips individuals with the technical knowledge to be employed in various sectors such as information technology, automotive, hospitality, banking, finance, retail, etc.

The Skill India mission also focuses on providing quality education to individuals. Vocational education helps ensure quality education as it allows individuals with the necessary skills and knowledge to be employed in various industries. This ensures that individuals can perform their duties efficiently and effectively in various industries.

1.2.4 Structure of India's Vocational Education System

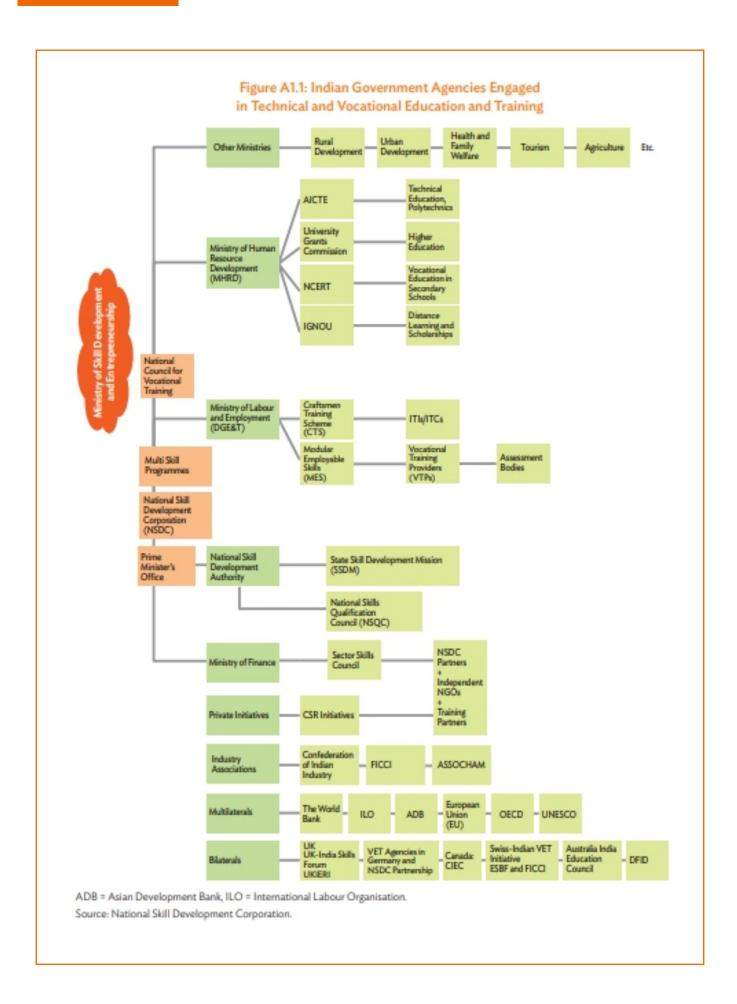
The Indian technical and vocational education (TVET) system is in the early stages of evolution and reform. The TVET system in India develops human resources through a three-tier system:

- (i) Graduate and postgraduate level specialists (e.g., IITs, NITs, and engineering colleges) trained as engineers and technologists;
- (ii) Diploma-level graduates who are trained at polytechnics as technicians and supervisors; and
- (iii) Certificate-level for higher secondary students in the vocational stream and craftspeople trained in ITIs and through formal apprenticeships as semiskilled and skilled workers.

Both national and state governments have a mandate for TVET in India.

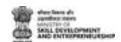
1.2.5 Key Players in India's TVET System

Over the past five years, India has witnessed rapid and significant developments in the skill development landscape. Various institutions have been set up at a national level to scale up skill development efforts being undertaken across the country.



1.2.5.1 Ministry of Skill Development and Entrepreneurship

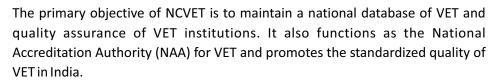
The Ministry of Skill Development and Entrepreneurship (MSDE) is the nodal ministry of the Government of India responsible for coordinating skills training and developing entrepreneurship across the country. The organization was established in 2014 and is headed by the Minister of Skill Development and Entrepreneurship (currently Shri Dharmendra Pradhan).



The MSDE's primary objective is to ensure that India has a skilled workforce that can contribute to the productivity and economic growth of the country.

1.2.5.2 National Council for Vocational Education and Training (NCVET)

The National Council for Vocational Education and Training (NCVET) is an autonomous body established by the Ministry of Skill Development and Entrepreneurship, Government of India. It is the apex body responsible for regulating, monitoring and developing Vocational Education & Training (VET) in India.





1.2.5.3 National Skill Development Corporation

National Skill Development Corporation (NSDC) is an initiative of the Government of India to promote skill development in India. It was set up in 2009 as a public-private partnership (PPP) between the Ministry of Skill Development and Entrepreneurship (MSDE) and private-sector industries.

NSDC aims to create a sustainable ecosystem for skill development by facilitating funding, creating industry partnerships, and providing support to training partners. NSDC has established a network of training partners across India that offer skill-training programs in various sectors. It also provides financial assistance to these training partners to enable them to deliver quality training.



1.2.5.4 Directorate General Training and Employment

The Directorate General of Training (DGT) is a department of the Ministry of Skill Development and Entrepreneurship, Government of India. It is responsible for formulating, implementing, and coordinating policies and programs related to skill development in the country.

The primary objective of the DGT is to provide quality technical and vocational training to youth across the country through ITIs. The DGT works closely with state governments, central ministries, private sector industries, employers, workers, and civil society to ensure the overall development of the nation's workforce.



1.2.5.5 Sector Skills Councils

Sector Skill Councils (SSCs) are industry-led, not-for-profit organizations that are set up to facilitate skill development in specific sectors. They are an integral part of India's National Skill Development Mission and are the primary link between industry and the government regarding skill development initiatives.

SSCs are formed by industry and government representatives responsible for developing skill standards, designing and delivering training programs, and certifying individuals and organizations for quality assurance. They are also responsible for assessing new and existing skill requirements, creating mechanisms for sector-specific certification, and engaging with other stakeholders to identify and address challenges in the sector.



1.2.6. National Skill Qualification Framework

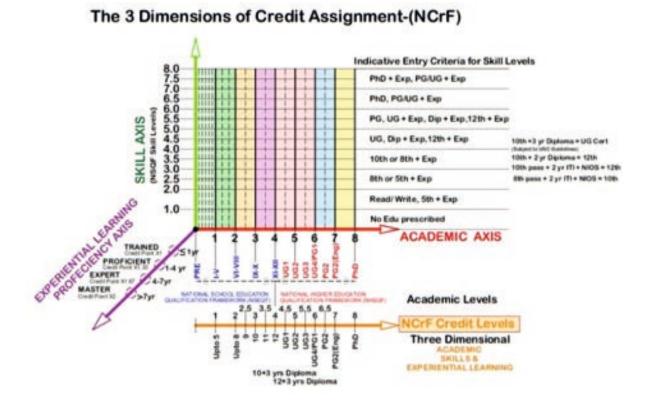


The National Skill Qualification Framework (NSQF) is an initiative launched by the Government of India to standardize and regulate the qualifications for various job roles and skill-based jobs across the country. The framework is designed to provide a platform for institutes to offer quality and recognized qualifications for those seeking employment in the industry.

The NSQF organizes qualifications according to a series of 8-level descriptors covering knowledge, skills, and aptitude. Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are

- (i) process,
- (ii) professional knowledge,
- (iii) professional skill,
- (iv) core skill, and
- (v) responsibility.

The National Credit Framework (NCrF) provides for broad based, multi-disciplinary, holistic education, allowing imaginative and need based curricular structures and enabling creative combinations of subjects and disciplines. The Framework has been built on the strength of existing regulations, guidelines and qualification frameworks of UGC, AICTE, NCVET, NCERT, CBSE & NIOS so that the options for Multiple Entry-Multiple Exit (ME-ME) are accessible and applicable across the higher education, school education and vocational education.



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1.2.7 Occupational Map (OM) -

Occupational mapping is the first step in developing occupational standards for any industry or sector. It entails an industry scan and a process of identification of the different occupations in the various subsectors.

The objective of occupational mapping is to describe the main features and characteristics of an occupation, sector, or subsector. It provides a high-level overview of occupation in terms of the types of job roles, workforce characteristics, key talent trends, and a review of available education and training. This way, occupational mapping enables information on opportunities for career progression in a specific occupation.

The following information will usually be covered in occupational mapping:

- (i) Size and profile of its sector and/or occupation, subsectors, and geographical location of organizations and workers.
- (ii) Types of occupations within the sector and anticipated changes in employment patterns.
- (iii) Links between the sector and/or occupation and other sectors and occupations.
- (iv) Key trends, developments, and drivers within the sector and/or occupation.
- (v) Opportunities for progression and typical career routes.
- (vi) Employers and other key stakeholders.

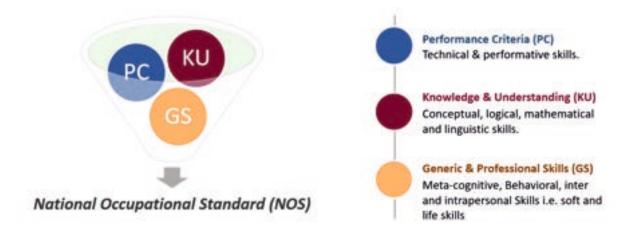


1.2.8 Competency Standard – National Occupational - Standards (NOS)

A NOS is an industry-determined performance specification that sets out the skills, knowledge, and attitudes required to operate effectively in employment.

The NOS is an industry-determined specification of quality performance through

- Performance Criteria (Tasks and Duties)
- Knowledge and Understanding (Cognitive Skills)
- Generic and Professional Skills (Behavioral Skills)



1.2.9 Qualifications and Qualification Packs (QP)

The National Skill Qualifications Framework (NSQF) defines Qualifications as:

"A formal outcome of an assessment and validation process which gets obtained when a competent body determines that an individual has achieved learning outcomes to given standards."



Fig: Structure of a Qualification Pack

A Qualification Pack is an Industry - validated qualification comprised of National Occupational Standards (NOS). Each Qualification Pack (QP) gets aligned to an NSQF Level.

QP comprises the set of occupational standards and the educational, training, and other criteria required to perform a job role.

1.2.9.1 Critical Elements of a Qualification Pack (QP)



Fig: Qualification Pack Cover-General Assistant- F&FI

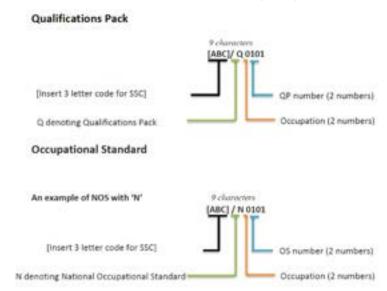


Fig: QP and NOS coding structure

QP and NOS Code

- The SSC allocates these numbers.
- N1 and N2 refer to the subsector as identified in the industry occupational map
- N3 and N4 refer to the allocated sequential number of the QP within the subsector.

Job Description: The description gives a summary of the unit content. This description would be helpful to anyone searching a database to verify that this is the appropriate OS they desire.

Personal Attributes: Personal attributes are the inherent characteristics and personality traits of an individual required to carry out a job role. E.g., being a good listener is a personal attribute but should be able to follow the instructions of the supervisor is a professional attribute. These should be brief: not more than 3-4 lines usually.

Entry Requirements: Specified prior knowledge, skill, and experience, expressed in terms of competency, may include licensing or industry-recognized standards.

Common Cost Norms Category: The training cost pay-outs for each job role are provided as per the Common Cost Norms (CCN), which are amended from time to time.

Credit: The value assigned for the recognition of equivalence in content and learning outcomes between different types of learning and/or qualifications that reduces the amount of learning required to achieve a qualification.

NOS Title: A concise description of the discrete workplace outcome to be achieved by the NOS.

NOS Descriptor: Communicates the content of the unit of NOS and the skill area it addresses. The description succinctly captures what the learner will know and be able to do upon achieving the standard.

Scope: The scope section briefly describes how the unit is practically applied in the industry and in what context(s) the unit may be applied.

Elements: Elements describe in terms of outcomes the significant functions and tasks that make up the NOS. Elements of competency are the basic building blocks of the NOS.

Performance Criteria: Performance criteria specify the key performance indicators or standards when carrying out a task.

Knowledge and Understanding: Knowledge and understanding are statements that together specify the technical, generic, professional, and organization-specific knowledge that an individual needs to perform to the required standard.

Core and Generic Skills: Core or generic skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment.

_	Notes ————————————————————————————————————	

UNIT 1.3: Introduction to Furniture and Fittings Sector

— Unit Objectives 🧖



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

- 1. Discuss an overview of the furniture industry in India
- 2. Assess the critical growth drivers in the furniture industry
- 3. Analyze the market structure of the industry
- 4. Evaluate the employment opportunities in the industry
- 5. Know about the Furniture and Fittings Skill Council
- 6. Understand the role and the critical functions of the Furniture and Fittings Skill Council

1.3.1 What is a Furniture? ——

Furniture is an essential component of any home. It serves various purposes, from providing comfort and storage solutions to helping create a desired aesthetic. Furniture can range from simple pieces such as chairs, tables, and beds, to more intricate and elaborate items such as armoires, dressers, and desks. No matter the type of furniture, each piece is designed to serve a specific purpose, whether to provide a comfortable place to sit or to serve as a decorative element in a room. Furniture is usually made of wood, metal, glass, or plastic and can come in various styles, colors, and sizes. Quality furniture is usually made to last and can be a great investment for homeowners.



Wooden furniture



Cane/Wicker/Ratten furniture



Glass furniture



Metal furniture



Plastic furniture



Concrete furniture

1.3.2 Furniture Industry- A Sunrise sector of India

- India's Interior and Furniture Industry is growing at an unprecedented pace, creating ample opportunities for both the existing workforce and the new aspirants who want to make a successful career.
- Currently, India is the 14th largest market in the world for the Furniture and Fittings sector, as stated by HKTDC Research
- The sector is currently worth US\$ 33 billion and is expected to touch US\$ 67 billion by 2025.
- The sector is mainly driven by rising disposable incomes, changing lifestyles, urbanization, and the need for better living spaces.
- The furniture market is dominated by wood-based furniture, occupying around 80% of the overall market.
- The sector has seen a shift in consumer preferences towards modern furniture with demand for customized and designer furniture rising. This shift is driven by companies increasingly focusing on eco-friendly materials such as bamboo, jute, and recycled wood.
- The sector has also seen an increase in the number of start-ups focusing on providing affordable, custom-designed furniture.
- According to recent reports by KPMG India, the current Furniture & Fittings sector in India comprises the following segments:

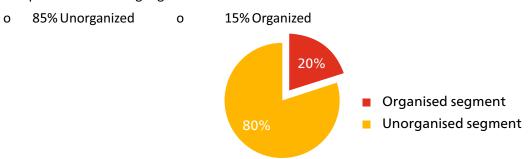


Fig: Furniture fragmentation based on manufacturers

1.3.3 Segmentation of the Furniture Sector _____

The furniture sector is sub-segmented in four ways:

- Product Type
- End-user Type
- Distribution
- Material Type

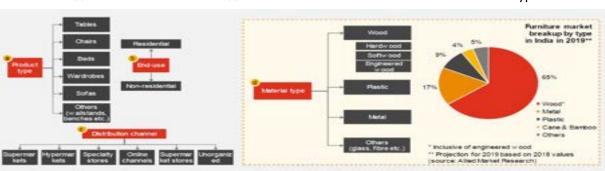


Fig: Furniture Sector Segmentation

1.3.4 Sector Coverage and Occupations

The Interiors, Furniture, and Fittings industry is majorly categorized into the following subsectors:

- 1. Interior Design and Installation
- 2. Furniture Production
- 3. Furniture Installation, Sales, and After Sales
- 4. Allied Sector (Wood, Panels, etc.)

SECTOR COVERAGE KEY ALLIED/ENABLING SECTOR Furniture Designing & Plywood Manufacturing Engineering Interior Products Designing 2. Material Resource Planning & MDF & Particle Board Manufacturing Interior Products Manufacturing Laminate Manufacturing Interior Installation 5. Bamboo Processing Production (Workshop) Production (Machine Shop) 6. Architectural Hardware 6. Upholstery Material Handling Quality Control 9. 10. Packaging 11.

100+ JOB ROLES

Installation, Repairs & Restoration

- Project Manager
- Interior Design Technician
- Furniture Design
 Technicians
- Furniture Setter-out
- Site Surveyor
- Material Resource Planner
- Furniture Commercial Officer
- Furniture Store keepers
- Joiners (structure makers)
- Cabinet Makers
- Metal fabricators

Aluminium & UPVC fabricators

12.

- Bamboo Furniture technicians
- Wicker Weaver
- Wood Machinist
- Wood Work Machine operators
- Panel Work Machine Operators
- CNC Machinist
- CNC Machine operators
- · Surface Preparator

- Surface Finisher
- Tailor Upholstery
- Upholsterer
- · Furniture Handler
- Furniture Assembler
- QC Manager
- Furniture Sales Officers
- Online Sales Experts
- Logistics Coordinators
- Installers
- Carpenters... and more

1.3.5 The Structure of the Indian Furniture Market

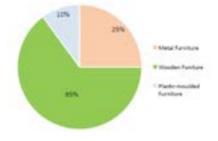
The Demand for Furniture in India

- Demand for furniture in India is expected to grow at 15-20% over the next five years
- The market is turning into an organized segment, and this transition is marked by increasing customer preference for readymade and branded furniture
- With the advent of the Make in India and rapid modernization, preference is tilting towards highend, low-maintenance, quickly installable products, with customization options
- Simple and contemporary designs are preferred over heavy and complex traditional furniture

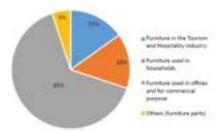


Fig: Key Furniture clusters in India

Indian Furniture – Material-wise Market Share



Indian Furniture – Consumer-wise Market Share

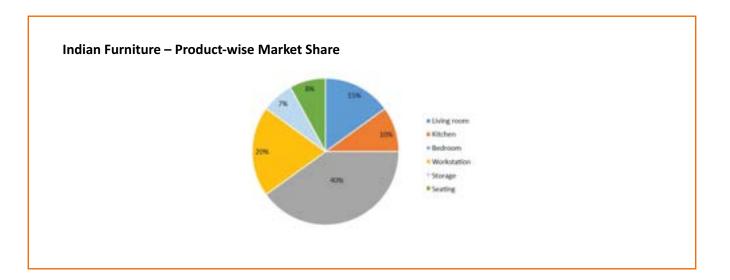


1. The Domestic Furniture Market

- Domestic/home furniture accounts for about 65% of the furniture market
- Manufacturers catering to this segment try differentiating based on design, variety, and price
- The demand for furniture of international standards is limited to the larger cities
- Upper-middle-class families focus on innovation and quality, and the price is not a significant factor for them

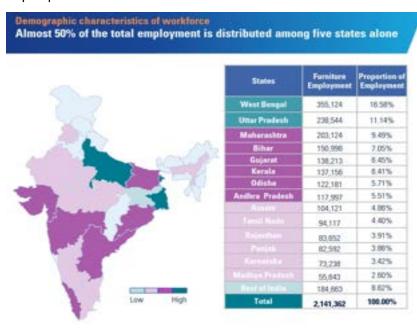
2. The Commercial Furniture Market

- The commercial furniture segment caters to the office space market and the hospitality industry
- The growth of IT and the ITeS segments has provided thrust to the commercial furniture segment
- A significant part of the office furniture market caters to operative desks, seats, and storage cabinets
- In the commercial space, manufacturers focus on building a solid and reliable brand



1.3.6 Employment Opportunities in Indian Furniture Industry _

- The Indian furniture industry manufactures and exports high-quality furniture. This industry offers a wide range of employment opportunities.
- The sector employs about 2.4 million people in India and is one of the largest employers of labor in the country. The furniture industry has a strong base in the country's rural and semi-urban areas and is one of the most important sources of livelihood in those areas.
- The furniture sector in India is expected to witness steady growth in the coming years, providing a
 number of employment opportunities for skilled workers. The industry is also expected to attract
 significant investments from domestic and foreign players, which will further boost the
 employment prospects in the sector.



1.3.7 Furniture and Fittings Skill Council (FFSC)

• The Furniture & Fittings Skill Council (FFSC) is a not-for-profit organization registered under the Societies Registration Act XXI of 1860. The Council has been promoted by CII with financial support from the NSDC under the aegis of the Ministry of Skill Development and Entrepreneurship (MSDE).



• The sector skill council aims to establish an effective and efficient skilling eco-system for development and imparting skills for the Interiors, Furniture, Fittings, and Allied industries to enhance the employability of the Indian workforce nationally & globally.

1.3.7.1 FFSC Structure

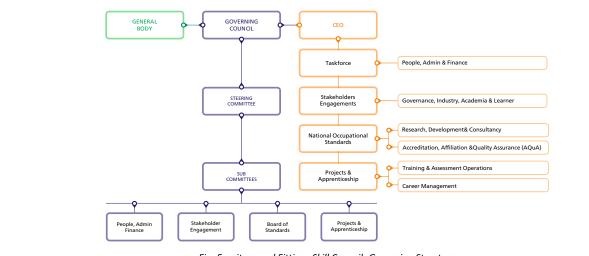


Fig: Furniture and Fittings Skill Council- Governing Structure

1.3.7.2 About the Sector







Wood, Panel, Laminates, Bamboo, Plastic, Architectural Hardware etc.

Fig: Furniture and Fittings Skill Council- Key Sub-sectors

1.3.7.3 Vision —

Become a unified platform for all skilled manpower solutions for the Interiors, Furniture, and Allied industries across the globe.

- 1.3.7.4 Mission ——

Create aspirational value for career opportunities in the Interiors, Furniture, and Allied industries and sustainably generate a skilled taskforce by building a robust skilling eco-system to make India competitive.

1.3.7.5 Key Functions —

FFSC aim to establish an effective & efficient skilling eco-system to enhance the employability of the Indian workforce nationally & globally through below mentioned key functions:



STAKEHOLDER ENGAGEMENT One Nation, One Industry, One Voice : More inclusive council with more sub-sectors and Pan-India outreach





QUALIFICATIONS DEVELOPMENT

One Nation, One Industry, One Standard: Formalise the Job Roles for different types of training





TRAINING INFRA

Industry Led & Supported Model to capitalize on existing physical & social infra with a Business Plan





TRAINING PROJECTS

Design, Facilitate & Monitor: appropriate Training Programs for various categories; (Fee Based, Govt. funded & other)





ASSESSMENT & CERTIFICATION

Build credibility for Skill Certification through quality assessment based output



CAREER MANAGEMENT Manage & match demand & supply using Tech enabled SMIS, LMS and dedicated job portal FFSCT:AJ





WORLD & INDIA
SKILLS COMPETITIONS

Conduct Skill Competitions at various levels to create aspirational value amongst youth for various Job roles



1.3.7.6 FFSC Presence ——

FFSC is playing a fundamental role in building a robust Skill Eco-system for the Interiors, Furniture & Allied industries by bringing the industry partners together, understanding the skill gap, creating appropriate training programs (from industry validation to government approvals & recognition), formalization of the existing workforce via skill certification, and creation of fresh workforce.

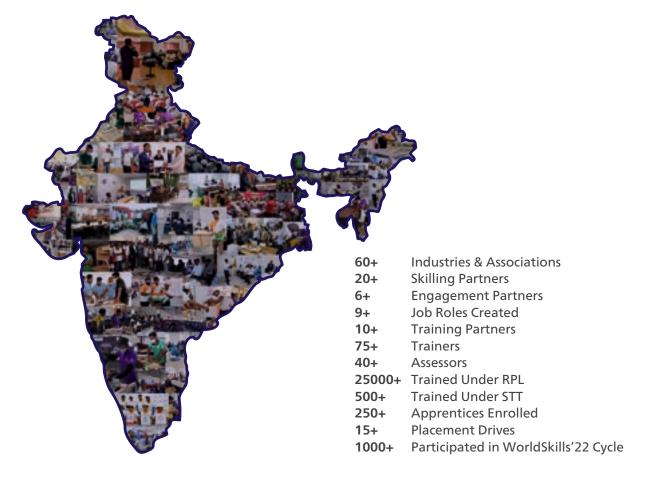


Fig: Furniture and Fittings Skill Council- Geographical Presence (Till 2022)

1.3.7.7 FFSC T:AJ =

FFSC T:AJ is a one-stop solution for skilled manpower for interiors, furniture, and allied industries. The job portal is customized per the industry's Occupation Map (OM) to facilitate properly aggregating job and apprenticeship opportunities.

The portal offers unique features for employers and candidates to provide the ideal solution for demand aggregation and supply matching.

FFSC T:AJ is backed up by the extensive support of FFSC's Career Management team, which helps provide the right solution for the employer and correct career guidance to the candidates.



ONE STOP SOLUTION FOR SKILLED WORKFORCE

Where Training meets Apprenticeship & Jobs

KEY FEATURES OF T:AJ



Exclusive for Our Industry



Industry's Occupational
Map Integration



Verified Data with 20+ Checkpoints



FFSC Team's Support



Data Privacy & Security



25+ Employers participated in beta testing

To Register, Visit: www.ffsctaj.in

— Notes 🗐 —————	

Scan the QR codes to watch the related videos



Introduction to Furniture and Fittings Sector

UNIT 1.4: The Roles and Responsibilities of a General Assistant F&FI

– Unit Objectives 🏻 🥝



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

- 1. Know about installation work
- 2. Know about carpentry work and its importance
- 3. Understand the job role of a General Assistant-Furniture and Fittings Installer
- 4. Understand the responsibilities of a General Assistant-Furniture and Fittings Installer
- 5. Know and understand the essential skills required for the job of a General Assistant- Furniture and Fittings Installer
- 6. Know about the Furniture Installation Career Path and Opportunities
- 7. Know about different NOSs applicable for General Assistant- Furniture and Fittings Installer

1.4.1 Furniture Installation Occupation _____

Furniture installation is a specialized trade that requires both carpentry and installation skills. Furniture installers are responsible for fabricating, assembling, installing, and repairing furniture and fixtures in both commercial and residential settings. This may include delivering, assembling, and installing furniture, fixtures, and equipment and repairing and maintaining them. Installation may involve both indoor and outdoor furniture, depending on the project.

A learner can opt for either carpentry or installation jobs after Level 2- General Assistant training to pursue their career in the furniture installation field and can progress into the vertical ladder based on experience and competencies required for each level.

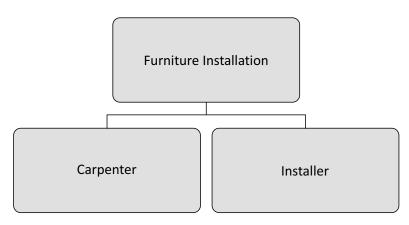


Fig: Furniture Installation Occupation- Career Progression

1.4.2 The Meaning of Installation

Furniture installation refers to assembling, arranging, and setting up furniture in a given space. This may include assembling furniture that has been purchased, rearranging existing furniture, or placing furniture in a new location. Furniture installation also involves ensuring that the furniture is installed correctly and meets safety standards. Furniture installation professionals may also be called upon to advise and guide on the best placement of furniture and accessories to create a desirable living or working space.



Fig: Furniture Installation

-1.4.3 The Meaning of Carpentry

The homes we live in and the furniture we use would not have been made without the skilled trade known as carpentry. Carpentry is the activity or skill of building items from wood, like tables, chairs, beds, windows, doors, cupboards, roofs, flooring, etc. Carpentry involves cutting, shaping, and putting together materials for building houses, offices, and furniture. It is an ancient skill that has evolved in terms of technology by introducing specialized tools, equipment, and material. Wood or timber is the main material used in carpentry, although many other materials are now widely used in carpentry.





Fig: Wooden Carpentry Structure

1.4.4 Types of Carpentry -

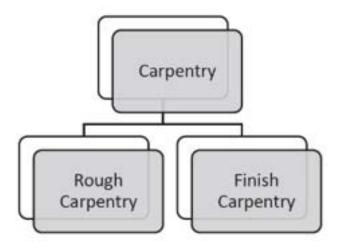


Fig: Types of Carpentry

Rough Carpentry

Rough carpentry is the type of carpentry that does not require a fine finish. This includes making the structural parts of the house that need to be simple, like the posts, rafters and beams, roofing and framing. Rough carpentry does not need finesse because the parts will be covered anyway. Rough carpentry is typically performed outdoors on construction sites.

Finish Carpentry

Finish carpentry, on the other hand, refers to making furniture, inlays, decking, flooring, staircases, making and installing windows and doors, and moldings and trims. As the name suggests, finish carpentry is the work that will be seen from the outside. Since this will be what people see, finish carpenters are expected to make their work as neat, clean, and detailed as possible. Their work is often performed in a workshop, though some finish carpenters travel to construction sites to fit and install trim, cabinets, and other items.







Fig: Finished Carpentry

1.4.5 Job Description of a General Assistant Furniture and Fittings Installer

The General Assistant- Furniture and Fittings Installation is a beginner who assists the on-site team in furniture installation operations. The person is responsible for loading, unloading, and supplying materials, tools, and equipment. The individual maintains the on-site store, keeps the work area clean, and assists in the handover proceedings.



Fig: General Assistant- F&FI

-1.4.6 Personal Attributes Expected for the Job Role

The General Assistant-Furniture and Fittings Installer must have:

- Positive approach toward work
- · Considerably high aptitude, analytical and critical reasoning
- · Ability to perform need-based strenuous activities like shifting, lifting, and pushing heavy objects
- Good attention to minute details
- Good Physical strength
- Ability to stand or sit for a long duration
- "Team player" attitude

-1.4.7 Skills Required for the Job Role $\,-\!-$

Core and Generic Skills:

The user/individual on the job needs to know how to:

- 1. Communicate proficiently in one or more languages, preferably the local language and/or English
- 2. Read company policy documents, information displayed at the worksite, job cards, etc.
- 3. Use the communication systems of the company, e.g., telephone, email, chat, public announcement systems, or hard copy memos/letters
- 4. Effectively communicate with team members and supervisor respectfully as per the protocol of the organization
- 5. Work constructively and collaboratively with others
- 6. Fill up documents about one's role at the worksite (involves attendance, daily work update, etc.)
- 7. Read notes/comments from the supervisor and teams
- 8. Apply domain information/ knowledge and assess day-to-day tasks through experience and observation

- 9. Interpret instructions related to the usage of machines and tools for the fabrication, assembling, and installation of the various products
- 10. Select the optimal process and appropriate tools & equipment to complete the work efficiently
- 11. Use reasoning skills to make appropriate decisions and troubleshoot concerns related to own responsibilities
- 12. Have an inherent ability to learn fast
- 13. Being able to identify and resolve basic issues
- 14. Adhere to time management and trustworthy

Professional Skills:

The individual on the job needs to know and understand:

- 1. The organization structure, purpose & objective, various departments, hierarchy, reporting matrix, code of conduct, etc.
- 2. Various Standard Operating Procedures (SOP) and department-specific processes of the organization
- 3. The products & services provided by the company to clients and its quality standards
- 4. The Key Result Areas (KRA) and their importance in employee performance and growth

Technical Skills:

The individual on the job needs to know and understand:

- 1. Different types of personal protective equipment, such as gloves, goggles, masks, etc., and their uses
- 2. Relevance of health and safety requirements applicable to the work site
- 3. Operational guidelines for using different raw materials, tools, equipment, and hardware fittings, e.g., screws, nails, adhesives, etc.
- 4. Common hazards at the worksite and relevant safety and security procedures / manuals to be followed
- 5. Geo-tagging the survey or recce site using appropriate software
- 6. Waste disposal procedures and guidelines
- 7. The operational procedure to check the serviceability of relevant tools and machines
- 8. Standard hand signals, their interpretations, and applications
- 9. The basics of preparing and interpreting 2D/3D drawings
- 10. The relevant metric system, basic mathematics, and geometry skills
- 11. The basics of measuring tape and its operational guide
- 12. Different causes of errors in the linear measurements, their impact on project measurement, and how to avoid such errors

- 13. Basics of digital and financial literacy
- 14. The various types of material handling equipment, such as trolleys, forklifts, lifters, etc., and their application
- 15. The process, precautions, and body posture to be followed while loading, unloading, and shifting the materials
- 16. Different methods of stacking and storage conditions as per the materials
- 17. The various techniques of batch marking and the importance of maintaining records for traceability
- 18. Proper cleaning of the worksite, tools, and equipment
- 19. The different types of safety materials used at the worksite and their applications
- 20. The usage of power sockets and functionality of the given tool and equipment
- 21. The tools and equipment required as per the fabrication, assembly, and installation process
- 22. Various unpacking methods for each material and furniture parts
- 23. Terminology, pictorial representation, symbols, etc., related to architectural drawings and specifications
- 24. The importance and ways of visual checks required during the various stages of operations

1.4.8 The Responsibilities of a General Assistant- — Furniture and Fittings Installer

Following are the key roles and responsibilities of a General Assistant-Furniture and Fittings Installer

- 1. Load/unload material related to the woodworking project
- 2. Pack/unpack material related to the woodworking project
- 3. Keep all materials related to the woodworking project
- 4. Reading and interpreting AutoCAD and general construction blueprints
- 5. Assist in conducting the recce of the worksite
- 6. Assist Carpenter with Wood and on-site Measurement
- 7. Organise woodworking tools, materials, and equipment
- 8. Sharpen the edges of hand tools and equipment
- 9. Fetch woodworking tools whenever required by Carpenter
- 10. Verify that all woodworking tools are in working condition
- 11. Assist Carpenter in Cutting wooden pieces
- 12. Assist in the Safe functioning of power tools
- 13. Assist Carpenter in the assembly of furniture
- 14. Assist Carpenter in Furniture Finishing
- 15. Clean the furniture

- 16. Clean the workplace
- 17. Check the assembled piece of furniture for defects or damages
- 18. Report any safety hazard or risk at the workplace to the supervisor



Fig: Fabrication Fig: Assembly Fig: Installation

1.4.9 The General Assistant's Workplace

A General Assistant may work indoors or outdoors, depending on their job duties. Rough carpentry activities are done outdoors, while finished carpentry jobs are done in workshops or factories.





Fig: Workplace- Rough Carpentry

A General Assistant- Furniture and fittings installer work on physically demanding tasks. They have to lift heavy materials, and prolonged standing, climbing, bending, and kneeling often is necessary. They often have to climb and stand on ladders. So, they have to be physically fit and strong. Since general assistants use sharp and heavy equipment, they should be safety-conscious and follow workshop safety standards.



Fig: Workplace- Finished Carpentry

1.4.10 Career Path of a General Assistant Furniture and Fittings Installer

There are good job opportunities for trained and skilled General Assistants- Furniture and Fittings Installer. A trained and skilled General Assistant can work independently as a carpenter or installer based on their choices. An experienced Furniture Installer can become an installation supervisor or a project manager after attaining the core competencies required for these levels.

Furniture Installation occupation involving Carpentry and Installation is a hand skill. The more you practice, the more you will be skilled in this art. You require hard work, dedication, determination, and honesty toward your job. Dedication and hard work displayed in your work will prove that you have the necessary passion and drive to succeed at the next level.

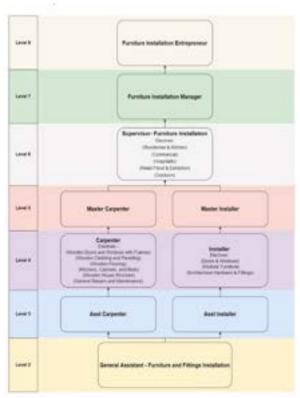


Fig: Career Progression: General Assistant-Furniture and Fittings Installer

1.4.11 Applicable NOSs for General Assistant -**Furniture and Fittings Installation**

NOS 1

NOS Code: FFS/N2201

NOS Name: Assist in conducting the recce

of the worksite NSQF Level: 2

NOS 2

NOS Code: FFS/N2202

NOS Name: Assist in material

management, fabrication, and installation

work at the site NSQF Level: 2

NOS 3

NOS Code: FFS/N8201

NOS Name: Follow health, safety, and

greening practices at the worksite

NSQF Level: 2

NOS 4

NOS Code: FFS/N8202

NOS Name: Work effectively with co-

workers, supervisor, and others

NSQF Level: 2

NOS 5

NOS Code: DGT/VSQ/N0101

NOS Name: Employability Skills (30 Hours)

NSQF Level: 2

Notes 🗐



Unit Exercise _____

Choose the correct answer

- 1. The critical factors to the growth of the Indian furniture industry are:
 - a. Changing lifestyle
- b. Development in real estate
- c. Increased demand for offices
 - d. All of above

2.	2. Which segments demand furniture the most?								
	a.	Office	b.	Hotel					
	C.	Home	d.	Hospital					
3.	Wh	at is the main focus of India's skill	develop	ment initiativ	ves?				
	a.	Improving access to education		b.	Developing a highly skilled workforce				
	c.	Increasing job opportunities		d.	All of the above				
4.	Wh	at is the process of learning an en	tirely nev	w set of skills	to execute a different job?				
	a.	Upskilling		b.	Reskilling				
	C.	ΙΤΙ		d.	Apprenticeship				
5.	Ifa	woodcutter who so far used a sim	ple axe le	earns to use a	n electric axe, the woodcutter is:				
	a.	Reskilling		b.	Career				
	C.	Critical		d.	Upskilling				
6.	Wh	Which of the following forms the core component of a Qualification Pack:							
	a.	Performance Criteria (PC)		b.	Knowledge and Understanding (KU)				
	c.	Generic and Professional Skills (GS)	d.	Allofabove				
7.	Wh	ich segment contributes the majo	ority to th	ne furniture s	egmentation of manufacturers?				
	a.	Organized segment		b.	Unorganized segment				
	C.	Semiorganized segment		d.	None of the above				
8.	Wh	at are the critical functions of the	Furnitur	e and Fittings	s Skill Council (FFSC)?				
	a.	Qualification Development		b.	Training and Infra Development				
	c.	Assessment and Certification		d.	Allofabove				
9.	ΑG	eneral Assistant's job role does no	ot include	e the followin	g:				
	a.	Plane the wood		b.	Coordinate logistics arrangement				
	C.	Read technical drawing		d.	Saw the wood				
10	.Wh	at personal qualities should an ef	ficient G	eneral Assista	ant have?				
	a.	Honesty		b.	Dedication to work				
	C.	Hard work		d.	All of above				













2. Assist in conducting the recce of the worksite

Unit - 2.1. Basic Mathematical Skills

Unit - 2.2. Measurement of wood and worksite

Unit - 2.3. Technical Drawings of the worksite

Unit - 2.4. Conducting Site Survey and recce

operation



Key Learning Outcomes



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

- 1. Know about basic mathematics.
- 2. Do calculations using different methods.
- 3. Identify the different types of basic shapes.
- 4. Calculate the area and perimeter of different shapes.
- 5. Know and understand the measurement system.
- 6. Read the measurement tape in both systems of measurement.
- 7. Measure and mark the wood accurately.
- 8. Calculate the quantity of wood and other material required for making furniture.
- 9. Perform requisite measurements at work.
- 10. Read and interpret technical drawings.
- 11. Know about different standards of worksite drawings.
- 12. Interpret the meaning of different symbols used in the worksite technical drawings.
- 13. Know the procedure and process related to conducting the recce of the worksite.
- 14. Apply the basic measurement techniques to measure the worksite.
- 15. Perform site measurement and recce of the worksite.
- 16. Prepare measurement sheet and site report based on a recce of the worksite.

UNIT 2.1: Basic Mathematical Skills

Unit Objectives 6



After completing this unit, you will be able to:

- 1. Know basic methods of calculation
- 2. Know about the different shapes
- 3. Calculate area and perimeter of different shapes

2.1.1 Importance of mathematics -

As a General Assistant- Furniture and Fittings Installer, you should have basic knowledge of mathematics so that you can do woodworking activities, such as measuring and estimating the materials, or drawing shapes on wood, etc. in an effective way. You will be needing mathematics to -

- Read the technical or working drawings
- Calculate the quantity of materials based on technical drawing
- Understand the measurement systems
- Measure and mark the wood correctly

2.1.2 Methods of calculation

There are many methods used for calculation. Mainly four methods are used the most. They are –

1. Addition

2. Subtraction

3. Multiplication

Examples –

5.3

4. Division

Examples -

Practical



Solve the following sums -

$$80 \div 10$$

$$36 \div 12$$

2.1.3 Basic shapes _

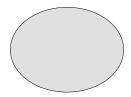
Have you ever noticed that the things, which we see and use everyday, have some shapes. For example, a ruler which you use, or a pencil you write with are straight. Windows and doors are rectangle in shape. Wheel, coins are round.

Let us have a look at some basic shapes –



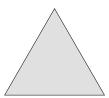
Circle

A circle is a simple closed shape. It is the set of points in a plane that are equidistant from a fixed point (the centre).



Oval

An oval is a closed shape, which is like an ellipse or like the shape of the egg of a hen.



Triangle

A triangle is a closed figure with three sides. The sum of the interior angles in a triangle must be 180° .



Square

A square is a flat shape with four sides. All four sides have equal length and every interior angle is a right angle (90°).



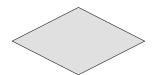
Rectangle

A rectangle is a flat shape with four sides, where every interior angle is a right angle (90°). Opposite sides are parallel and of equal length.



Trapezoid

A trapezoid is a shape with four sides, only two of which are parallel.



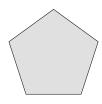
Rhombus or Diamond

A rhombus is a flat shape with four sides. All four sides have equal length, but, unlike a square, all angles are not 90°. Opposite sides are parallel, and opposite angles are equal.



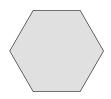
Parallelogram

A Parallelogram is a flat shape with four sides. Opposite sides are parallel and equal in length.



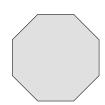
Pentagon

A pentagon is a 5 sided shape with interior angles that add to 540°. When all angles are equal and all sides are equal it is regular pentagon, otherwise it is irregular. Regular pentagons have sides of equal length and interior angles of 108°.



Hexagon

A hexagon is a 6 sided shape with interior angles that add to 720°. When all angles are equal and all sides are equal it is regular hexagon, otherwise it is irregular. Regular hexagons have sides of equal length and interior angles of 120°.



Octagon

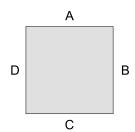
An octagon is a 8 sided shape with interior angles that add to 1080°. When all angles are equal and all sides are equal it is regular octagon, otherwise it is irregular. Regular octagons have sides of equal length and interior angles of 135°.

2.1.4 Calculation of perimeter

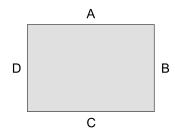
Perimeter -

Perimeter is the distance of the boundary of a two-dimensional figure. Let us see how it is calculated.

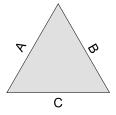
Examples -



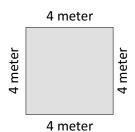
Perimeter = A + B + C + D



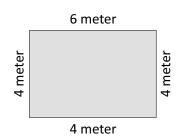
Perimeter = A + B + C + D



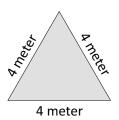
Perimeter = A + B + C



Perimeter = 4 + 4 + 4 + 4



Perimeter = 6 + 4 + 6 + 4 = 20



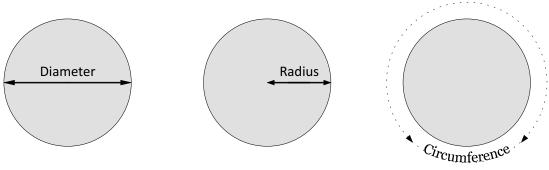
Perimeter = 4 + 4 + 4 = 12

2.1.5 Calculation of circumference ____

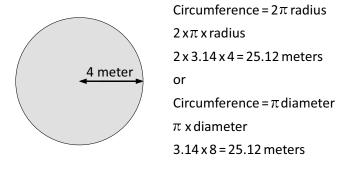
How to calculate circumference of a circle -

Circumference = 2π radius or π diameter

For exact calculation π = 3.14 is used, but for rough estimation π = 3 can be used.

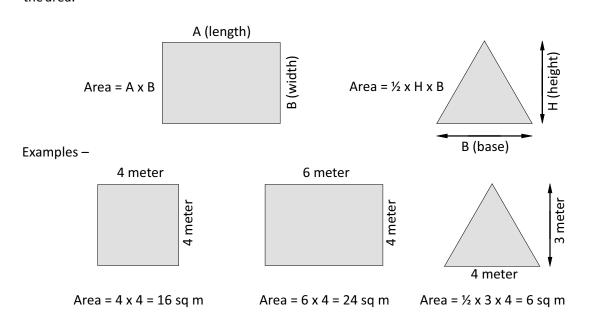


Examples -

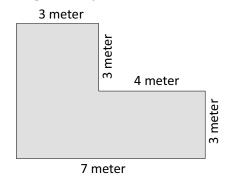


2.1.6 Calculation of area

Area is calculated in square unit, like square feet or square meter. Let us know how to calculate the area.

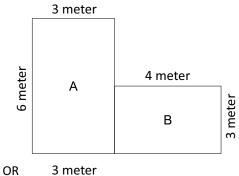


Area of irregular shape -



Area of 'A' = $3 \times 6 = 18 \text{ sq m}$ Area of 'B' = $4 \times 3 = 12 \text{ sq m}$ Total area = 16 + 12 = 30 sq mOR

Area of 'A' = $3 \times 3 = 9 \text{ sq m}$ Area of 'B' = $7 \times 3 = 21 \text{ sq m}$ Total area = 9 + 21 = 30 sq m

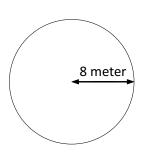


B B 3 meter B 7 meter

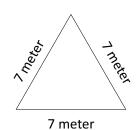
Practica



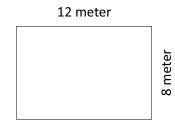
Solve the following sums -



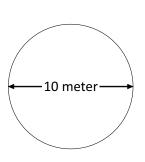
Diameter =



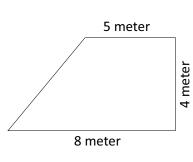
Perimeter =



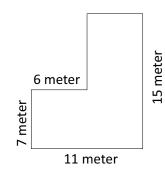
Area =



Radius =



Area =

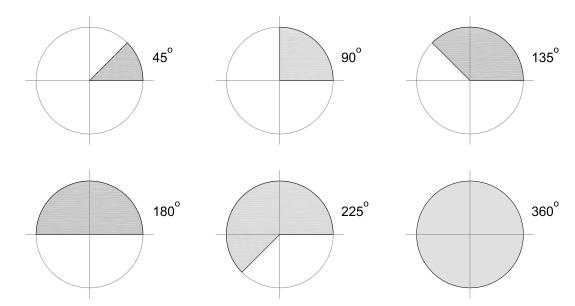


Area =

2.1.7 Angles ____

When two sides meet and make a corner, it is called an angle. Unit of angle measurement is called degree. There are 360 degrees in a complete circle. Right angle means 90 degree and this angle is mostly used in furniture making.

Examples -



Notes				

Scan the QR codes to watch the related videos



Basic Mathematical Skills

UNIT 2.2: Measurement of wood and worksite

- Unit Objectives 🏻 🌀



After completing this unit, you will be able to:

- 1. Know about the importance of measurement
- 2. Know about the different systems of measurement
- 3. Read ruler by using both systems
- 4. Know about the different methods of calculating the quantity of the wood

2.2.1 What is measurement? –

Measurement is the process of obtaining the size, length, amount, or degree of something by using an instrument or device marked in standard units. The values we get by measuring an object become more useful in terms of details. For example, instead of saying that the cabinet is tall, we can specify a measurement and say that the cabinet is 6 feet high.

In woodworking, measuring is not only checking the length, width or thickness of objects but also checking of the shape, like flatness, straightness, roundness or squareness. Measurement is required for checking the accuracy of part made, as well as creating the sketch for making a part.

The Accurate measurement is the basis of good engineering and crafting practice. The accuracy of any measuring device depends on the user as much as on the design of the tool. Measuring tools are also used for inspecting a finished or partly finished product. All measuring tools are precision tools. You must take good care of them to keep them in good shape to maintain accuracy.

2.2.2 Systems of measurement -

There are two systems of measurement:

FPS System or Imperial System

This system is a traditional system used in carpentry. It is based on the English imperial system of measure.

MKS or metric system

This system is an international decimalized system of measurement, first adopted by France in 1791. It is the common system of measuring units used by most countries in the world.

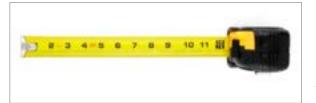
All measuring tools have metric or imperial graduations or a combination of both. One big advantage of the metric scale is that it eliminates the necessity for a range of fractional sizes. Fractions are not used in the metric system.

Unit of measures -

FPS or imperial system	MKS or metric system
Yard	Meter
Foot	Decimeter
Inch	Centimeter
	Millimeter

2.2.3 Reading of a ruler in FPS system -

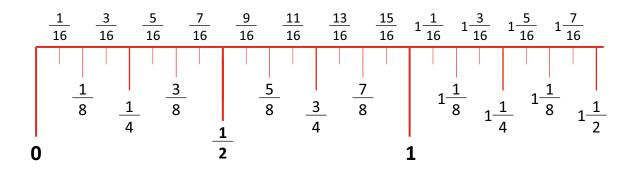
Let us learn how to read a ruler in FPS system. Here is given a picture of a ruler. Look at it carefully. Inch is marked on one side of the ruler, like one inch, two inch, three inch, and so on.



After every twelve inches, foot is marked. Normally, foot is marked in black colour or it has a black circle or square around it.

The inch is divided into 16, 8, 4 and 2, equal segments. These segments are called graduations.

 $\frac{1}{2}$ of an inch is called quarter inch. $\frac{1}{2}$ of an inch is called half inch. Symbol used for foot is (') and for inch is ("), for example 2 feet and 4 inches are written as 2'-4".

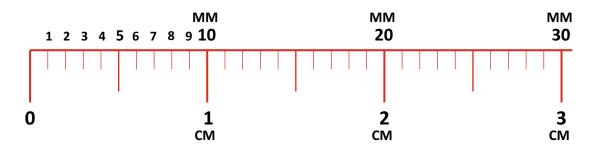


2.2.4 Reading of a ruler in Metric system _



Now, let us read the ruler in metric system. Here is given a picture of a ruler. Look at it carefully. Centimeter is marked on one side of the ruler, like one cm, two cm, three cm, and so on. After 100 centimeters, one meter is marked. Normally, meter is marked in black colour or it has a black circle or

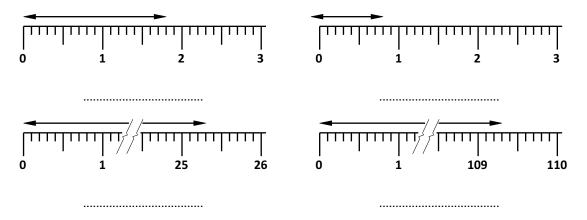
square around it. One centimeter has 10 equal segments. These segments are called millimeters.



Practical



Write the distance between two arrows -



2.2.5 Guide table for unit conversion-

Below is given a table. It will help you to convert the imperial measures into metric measures and from metric measures to imperial measures.

1 foot = 12 inches 1 inch = 25.4 millimeter

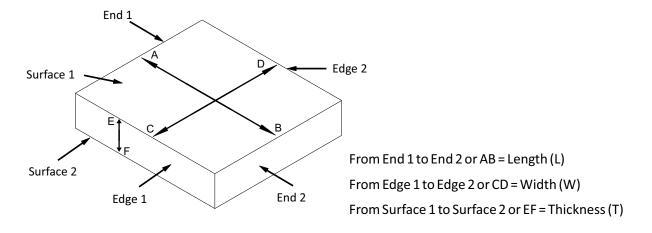
1 meter = 10 decimeters 1 foot = 30.48 centimeters

1 decimeter = 10 centimeters 1 meter = 3.28 feet

1 meter = 100 centimeters 1 meter = 39.37 inches

2.2.6 Measuring the wood _

Let us learn how to measure the wood. A piece of wood has six faces –



2.2.7 Calculating the quantity of the wood -

It is essential to estimate or calculate the quantity of the materials required for making furniture, so that materials can be procured and cost can be estimated. Mainly, there are three methods of measuring the wood.

Running measurement - In this method, the breadth and thickness of the wood is not measured. Only the length is measured. The units of measurement in this method are running foot and running meter.

Square measurement - In this method, the length and breadth of the wood is multiplied. The thickness is not measured. The units of measurement in this method are square foot and square meter.

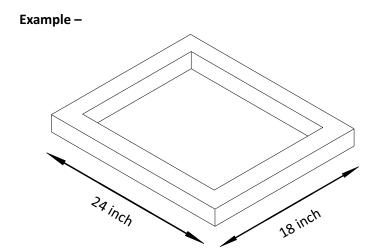
Cubic measurement - In this method, the length, breadth and thickness are multiplied together. The units of this method are cubic meter and cubic foot.

2.2.7.1 Running meter/running foot

In woodwork, frames of door/window are measured in running foot or running meter.

Formula -

Running foot/meter = L + W + L + W



L = 24 inches = 2 feet

W = 18 inches = 1.5 feet

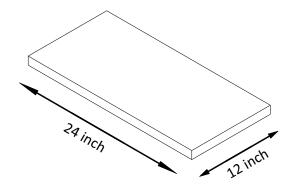
2 + 1.5 + 2 + 1.5 = 7 Running foot

2.2.7.2 Square meter/square foot -

In material, plywood or board are available in sheet form and they have fixed thicknesses. They are estimated in square foot or S.Ft. In furniture or woodwork, door/window, cabinets, cupboards, partitions, glass/mirror are generally measured in S.Ft.

Formula -

Example -



L= 24 inch = 2 Feet

D = 12 inch = 1 Foot

24 inch x 12 inch 144 = 2 S.Ft.

Or

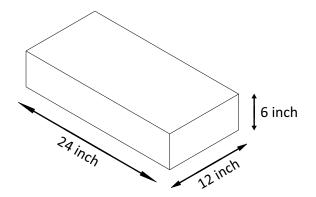
 $2 \operatorname{Feet} \times 1 \operatorname{Foot} = 2 \operatorname{S.Ft.}$

2.2.7.3 Cubic meter/cubic foot

Quantity of the solid wood is always calculated in cubic foot or C.Ft.

Formula-

Example -



T = Thickness in inches

$$T = 6$$
 inches

$$\frac{2 \times 12 \times 6}{144}$$
 = 1 C.Ft.

2.2.8 Measuring Method in Metric (M.K.S) System

The measurement unit in the metric system is measured in millimetre, centimetre and metre. If the measurement of any object is in different units then how will it be calculated? Let's understand the same.

1000 millimetre = 1 metre

100 centimetre = 1 metre

Square measure (square meter) = (length × width)

1.
$$\frac{\text{centimetre}}{100} \times \frac{\text{centimetre}}{100} = \text{Metre Square}$$

2.
$$\frac{\text{centimetre}}{100}$$
 × Metre = Metre Square

3. Metre × Metre = Metre Square

4.
$$\frac{\text{Millimetre}}{100} \times \frac{\text{Millimetre}}{100} = \text{metre square}$$

5.
$$\frac{\text{centimetre}}{100} \times \frac{\text{Millimetre}}{100} = \text{metre square}$$

6.
$$\frac{\text{Millimetre}}{100} \times \text{Metre} = \text{Metre square}$$

Example:

Question-

The length of a door is 2.1 meter and the width is 90 centimetres. So what will be the measurement of the door in square metre?

Answer:

Two measurements are multiplied in square measure.

Therefore, =
$$2.1 \times \frac{90}{100} = 1.89$$
 square metre

Cubic meter (length ×width x Height)

1.
$$\frac{\text{centimetre}}{100} \times \frac{\text{centimetre}}{100} \times \frac{\text{centimetre}}{100} = \text{Cubic metre}$$

2.
$$\frac{\text{centimetre}}{100} \times \frac{\text{centimetre}}{100} \times \text{metre} = \text{Cubic metre}$$

3. Metre × metre × metre = Cubic metre

4.
$$\frac{\text{Millimetre}}{100} \times \frac{\text{Millimetre}}{100} \times \frac{\text{Millimetre}}{100} = \text{Cubic metre}$$

5.
$$\frac{\text{centimetre}}{100} \times \frac{\text{Millimetre}}{100} \times \frac{\text{Millimetre}}{100} = \text{Cubic metre}$$

6.
$$\frac{\text{Millimetre}}{100} \times \text{metre} \times \text{metre} = \text{Cubic metre}$$

7.
$$\frac{\text{Millimetre}}{100} \times \frac{\text{centimetre}}{100} \times \text{metre} = \text{Cubic metre}$$

Example:

Question-

If the length of the wood is 3 meters, width is 12 centimeters and height is 7 centimeters, then what is the measurement of wood in cubic metre?

Answer: Three measurements are multiplied in cubic measurement = length × width × height

Wood length = 3 metre

Wood width = 12 centimeter

Wood height = 7 centimeter

 $= 3 \times \frac{12}{100} \times \frac{7}{100} = 0.0252$ cubic metre

2.2.9 Method of Measurement in British (FPS) System

In the British system, the unit of measurement is in inches and feet, if an object is measured in different units, then its quantity should be calculated as explained below:

12 inches = 1 feet

Square feet (length × width)

1.
$$\frac{\text{inch}}{12} \times \frac{\text{inch}}{12} = \text{Square feet}$$

2.
$$\frac{\text{inch x inch}}{144}$$
 = Square feet

4.
$$\frac{\text{inch}}{12} \times \text{Feet} = \text{Square feet}$$

Example:

Question:

The length of a door is 7 feet and width is 3 feet, then what will be the measure of the door in square feet?

Answer: Two measurements are multiplied in square measurement

Door Measure = Length x Width

Door length = 7 feet

Door width = 3 feet

= 7×3

= 21 square feet

Cubic feet (length × width × height)

2.
$$\frac{\text{inch}}{12} \times \frac{\text{inch}}{12} \times \text{feet} = \text{Cubic feet}$$

3. Inch ×
$$\frac{\text{inch}}{144}$$
 × Feet = Cubic feet

4.
$$\frac{\text{inch}}{12} \times \frac{\text{inch}}{12} \times \frac{\text{inch}}{12} = \text{Cubic feet}$$

5. Inch ×
$$\frac{\text{inch}}{1728}$$
 × Inch = Cubic feet

Example:

Question:

If the length of the wood is 9 feet, width is 5 inches and thickness is 3 inch, then what is the measurement of wood in cubic feet?

Three measurements are multiplied in cubic measurements.

Wood Measure = length × width × height

3 inch

Wood length 9 feet

Wood width 5 inch

> 9 feet \times 5 inch x 3 inch = 0.937 cubic feet

Practical 2



Wood height

Here are given some figures. Estimate the quantity of wood.

Board for table top Wood for table's legs

2.2.10 Measuring Tools and Equipment _____



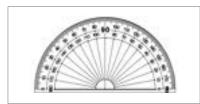
Measuring tape -

- It is an important hand tool for the woodworker.
- It is used to measure big pieces of wood.
- You should have a retractable one that is at least 25 feet long.
 Any longer than that, and you will start having problems getting it to roll back up.
- You should make sure that the "hook" or tab at the end of tape is firmly attached, with no give. When it gets loose, you will have at least 1/8" variation in your measurements. This can add up to some severe accuracy problems in the long run.



Rule-

- Rule is the most common and the best-known piece of measuring equipment, for measuring linear distance.
- Least count for Rule is normally 1 millimeter and 1/8 inch (normally one side has Centimeters and other side has inch scale).



Protractor -

 A protractor is a circular or semicircular tool for measuring an angle or a circle.



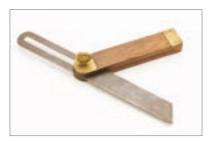
Wing compass -

- It is a two-legged tool and the ends of these legs are pointed.
- It is used to mark arcs and circles etc.
- It is made up of steel.



Vernier Calliper

 Vernier Calliper is in instrument which is used to calculate even 0.01 difference in the wood working.



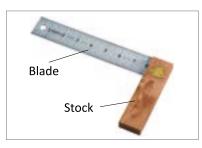
Bevel square -

- It is used to check or move not only the right angle but also different angle.
- It is used to make the layout or move the angles of the dovetail, side rails of the chairs, louvered door, chamfer, etc.



Caliper-

- This tool is required to take indirect measurements.
 Measurements taken by this tool is read on the steel rule or steel tape. They are of two types
 - **1. Outside caliper:** With this caliper, the outside measurement of wood or any object, such as the diameter of the round object, length and width etc. of the flat object is measured. It has rounded end points.
 - **2. Inside caliper:** With the help of this caliper, the internal measurements such as the diameter of the holes, slits etc. are taken. It has two legs, which are twisted outside.



Try square -

- It is a L-shaped tool used to mark or check the right angle (90°) of the wood.
- It is made of steel or wood.
- It has two main parts 1) Blade 2) Stock



Miter square -

It looks like a try square but instead of 90°, the angles of 45° and 135° angle can be measured from this.

_	Notes				

Scan the QR codes to watch the related videos



Measurement & Marking Tools

UNIT 2.3: Technical Drawings of the worksite

- Unit Objectives 🤷



After completing this unit, you will be able to:

- 1. Read and understand the technical drawings
- 2. Know about the standard dimension of furniture
- 3. Make basic sketch of furniture

2.3.1 What is technical drawing? -



A technical drawing is a precise and detailed drawing of an object to be constructed. It is a medium of communication between a furniture designer, or client who conceptualizes the ideas, and a carpenter who is going to make furniture.

Technical drawings give all the information which is required to make any piece of furniture. By following

technical drawings a carpenter can prepare, make and assemble the different pieces of furniture. For example, a drawing of a table tells the length, width and height of the table, joints to be used, hardware, etc. By reading technical drawings you can calculate the quantity of material, estimate the time to complete the job, and the cost.

Technical drawing generally follows very specific rules and guidelines in order to make its intent clear and avoid confusion. There are certain elements which visually communicate different purposes, such as lines, symbols, schedules, etc. Let us study them one by one.

2.3.2 Lines —

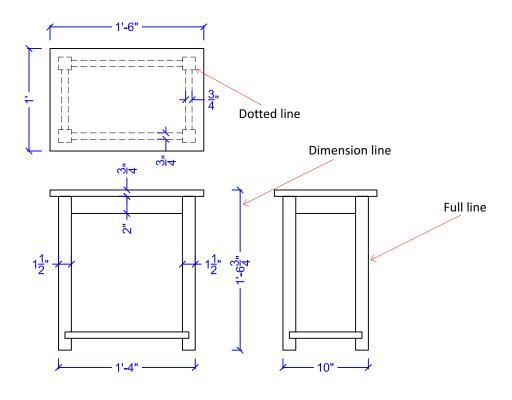
In a technical drawing certain conventional lines are used for a definite purpose. Different types of lines of different thickness are used to make a technical drawing. Some commonly used lines are -

•	Fullline	

_

- Section line
- Centre line
- Dimension line ______
- Extension line

Example -



2.3.3 Symbols -

Certain symbols are also used in technical drawings. There are fixed symbols for door, window, furniture, bathroom fixtures, electrical points, etc.

Some examples –

Kitchen

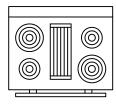


Fig: Cooking range



Fig: Fridge

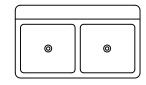
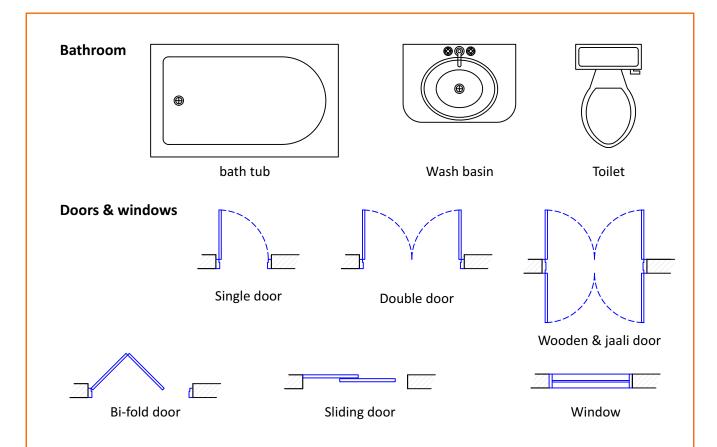
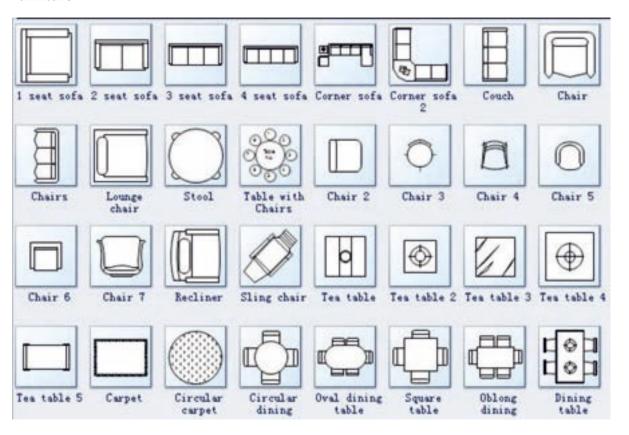


Fig: Sink

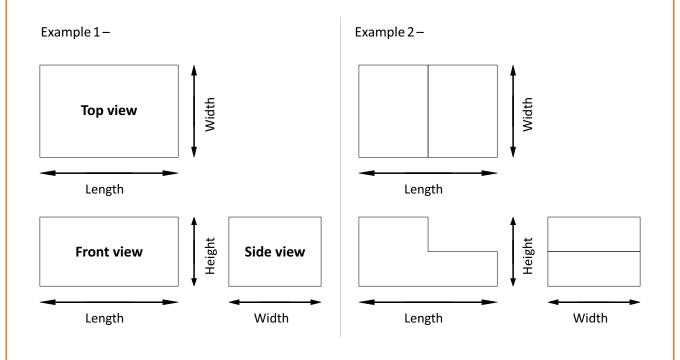


Furniture



2.3.4 Orthographic or working drawings.

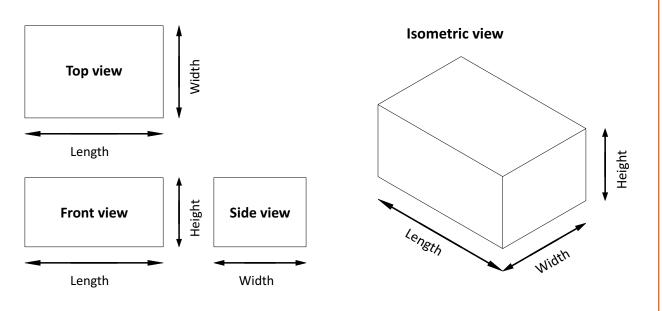
A working drawing has all necessary information required to make the furniture, such as measurements, detailed information about materials and joints. Normally, in a working drawing there are three views – plan or top view, front view and side view. Each view has the measurement written on it.



2.3.5 Isometric drawings -

An isometric drawing is a three-dimensional drawing, where all three sides of furniture are drawn. Vertical lines are drawn straight, whereas horizontal lines are drawn at 30 degree angle.

Example 1-



2.3.6 Floor plans -

Floor plan drawings are used in the woodworking industry to create detailed two-dimensional layouts of a space. These drawings are used to determine the best use of the space and to create a plan for how the space will be used. They provide a visual representation of the room's dimensions and layout, including walls, doors, windows, and other features. Floor plan drawings are used to create a detailed plan for how materials will be placed, the dimensions of each item, and the overall look of the space.

Some floor plans are given below. Study them carefully.

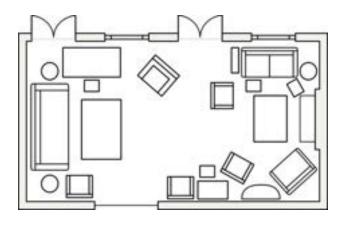


Fig: Drawing room floor plan

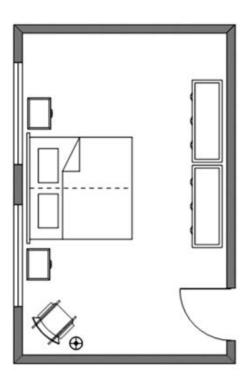


Fig: Bedroom floor plan

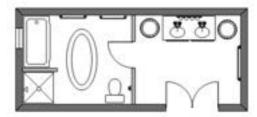


Fig: Bathroom floor plan



Fig: Kitchen floor plan

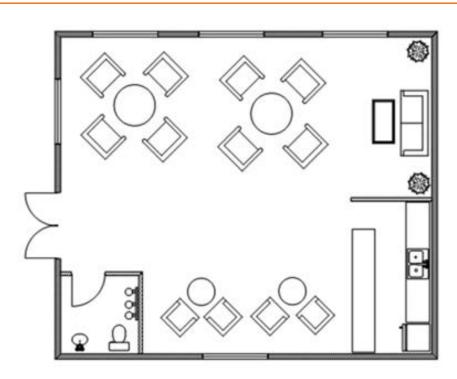


Fig: Coffee shop floor plan

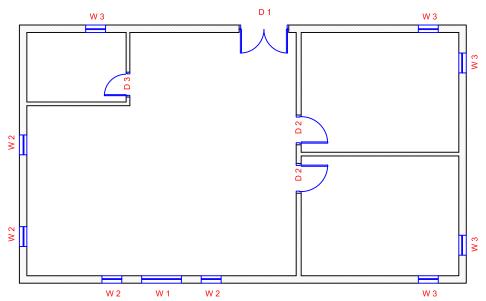


Fig: Office floor plan

2.3.7 Schedules _

A schedule is always given with the floor plan, which helps to take out the sizes and quantities of doors and windows.

Example -



Window Schedule

Window No	Size	Sill ht.	Lnt. ht.
W 1	4'-0" x 6'-0"	1'-0"	7'-0"
W 2	2'-0" x 6'-0"	1'-0"	7′-0″
W 3	2'-0" x 4'-0"	3'-0"	7′-0″

Door Schedule

Door No	Size
D 1	5′-0″ x 7′-0″
D 2	3'-0" x 7'-0"
D 3	2'-6" x 7'-0"

2.3.8 Blueprint -

- A Blueprint is a 2D (two-dimensional) miniature/replica of the actual workpiece prepared by scaling down the actual measurements.
- A Blueprint is a plan which is proportionate with the product to be developed.
- The requisite for reading a Blueprint is interpreting 1st and 3rd angle drawings.
- It comprises the required technical specifications as well as the techniques of preparation.

The essential parts of a Blueprint are:

Elevation View

• Vertical display of one side of the project, from north, south, east or west

- Gives an idea about how the complete structure will look after installation
- Helps in determining the height dimensions

Plan View

- Horizontal display of the proposed job looking down from above
- This view is usually on a horizontal plane 30 inches (75 centimeters) above the floor
- Helps in determining the length and width dimensions

Section View

• A cut-through display, showing how an object will be built

— Notes ————————————————————————————————————

UNIT 2.4: Conducting Site Survey and Recce Operation

– Unit Objectives 🏻 🌀



After completing this unit, you will be able to:

- 1. Understand the difference between site survey and recce
- 2. Know about different types of site surveys and their usage in the furniture sector
- 3. Analyze and select suitable site survey techniques
- 4. Select all the tools and equipment required during a site survey
- 5. List various health and safety considerations while conducting site survey and recce
- 6. Discuss the importance of a measurement sheet during the site survey and recce
- 7. Demonstrate the usage of a measurement sheet during a specified project

2.4.1 What is Surveying? ——

Surveying is measuring and mapping the land and features of a given area. It is a fundamental tool of civil engineering, land development, and construction projects. Surveying involves using specialized equipment to measure distances, angles, and elevations of points on the earth's surface. The data collected is then used to create detailed maps and plans of the surveyed area.

2.4.2 What is Site Survey and Recce? -

Site Survey:

A site survey is a comprehensive assessment of a physical site used to understand the environment within which a project will take place. It is used to identify potential risks and hazards and any existing infrastructure that could impact the project. Site surveys are used to identify the size and configuration of a construction site and can include measurements of the land, utilities, and vegetation.

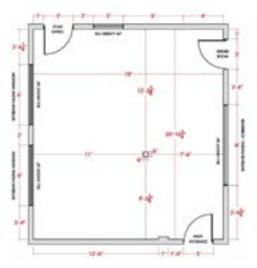


Fig: Site Survey

Recce:

A recce (reconnaissance) is a specific site survey used to assess the area's suitability for a particular purpose. It is often used to assess an area's security and identify potential entry points or threats. A recce may also be used to create a detailed floor plan of the area and identify potential hazards or obstacles for an upcoming project.



Fia: Recce

For example

a site survey may be used to assess the suitability of a construction site for a new office building. The survey may include measurements of the land, existing infrastructure, a review of the local zoning codes, and land use ordinances. A recce may then be performed to assess the area's security, identify potential entry points and assess the risk of health hazards. The survey team may also take detailed measurements of the interior and exterior of the building and note any existing hazardous materials that could potentially impact the construction project.

2.4.3 Difference between Surveying and Site Survey

Surveying and site surveys are two closely related concepts, but there are some important differences between them:

- Surveying is a general term for collecting data about a certain area. This data can include measurements, observations, and other information about the surveyed area. On the other hand, a site survey is a more specific type of surveying that focuses on a particular site, such as a construction site or a proposed development.
- Surveying involves collecting data and mapping features, such as the property's boundaries or the elevation of a location. This data is used to create a map of the area and can be used to create plans,
- diagrams, and other documents. Site survey focuses on a specific location and collects data about a
 particular site. Site survey data includes measurements of the site, such as its boundaries, elevation,
 and other physical features, as well as observations about the site, such as soil type, slope, and
 vegetation.
- Surveying can be done with various instruments, such as a transit, a theodolite, or even a handheld GPS device. Surveying can involve aerial photographs, satellite images, and other remote sensing techniques. Site surveys are often done in preparation for construction projects and can involve a variety of instruments, such as a total station, a level, or a rangefinder.

To summarize, surveying is a general term for collecting data about an area. At the same time, a site survey is a more specific type of surveying focusing on a particular site. Both involve the collection of

data and the mapping of features. Still, a site survey is more focused and usually involves more specialized instruments than those used in general surveying.

2.4.4 Types of Site Surveys

Site Surveying is used in many applications, from construction and engineering to interior designing and furniture installation. Different types of surveying are used depending on the type and complexity of the project, the accuracy needed, and the environment in which the survey is conducted.

1. Topographic Survey:

A topographic survey is a process used to measure land elevations and other features to produce a map of the area. This type of survey is often used in interior design to create a detailed and accurate blueprint of the space. By measuring the topographic features of a room, interior designers can accurately plan out furniture placement, wall and floor designs, and any other features of the space.

Additionally, topographic surveys are also helpful in measuring the size and location of windows and doors, which are essential considerations for the design of any room.

For example, an interior designer might use topographic survey data during the design process to determine the best placement of furniture and other elements within a room. A furniture production company may use topographic survey data to determine the best route for the delivery and installation of the furniture.

2. Boundary Survey:

Boundary surveying is used to determine a piece of land's boundaries accurately. It uses a combination of traditional surveying techniques and GPS receivers to accurately measure a property's boundaries.

This type of survey is commonly used in interior design to ensure that the design of a space does not overlap with the boundary of a neighboring property.

For example, if a designer is creating a design for a living room, they may need to conduct a boundary survey to ensure that the couch and other furniture do not extend beyond the boundary of the lot. Boundary surveys are also helpful in determining the exact size of a space, which can be essential for planning the layout of a room and ensuring that all design elements fit comfortably within the property's boundaries.

3. Hydrographic Survey:

Hydrographic surveying measures the depths below the surface of rivers, lakes, and oceans. This type of surveying is done using specialized instruments to measure the depths of water bodies. Hydrographic surveys are used for various applications, including navigation, engineering, and resource management.

For example, a hydrographic survey can be used to measure the depth and characteristics of a water body to assess if the flooring is suitable for furniture installation. The survey would measure the depth and characteristics of the water body, such as the sediment and current patterns, to determine if the flooring is stable enough to support furniture installation.

4. Geodetic Survey:

A geodetic survey is a form of surveying that uses advanced satellite navigation and positioning systems to accurately measure and map the features of the earth's surface. This type of surveying is used for various applications, such as surveying land boundaries, mapping natural resources, and in the construction industry.

For example, this survey can plan the furniture layout, measure the height and width of doorways, and check the clearance around furniture and other objects. Additionally, a geodetic survey can create a 3D map or model of the space to help visualize the furniture layout. This 3D model can then be used to plan the installation process.

5. Construction Survey:

A construction survey is a procedure used to measure and document the existing conditions of an area, building, or structure. Construction professionals use it to collect data before beginning a project to ensure that it is completed following all applicable regulations.

For example,

- Interior Designing: A construction survey may be used to collect measurements of the existing walls, doors, and windows to create an accurate plan for the layout of the new space.
- Furniture production: A construction survey may be used to measure the exact dimensions of the space in which the furniture will be installed to ensure that the pieces will fit correctly.
- Installation processes: A construction survey may be used to check that the existing walls, floors, and ceilings are structurally sound and that all necessary permits have been obtained for the installation process.

6. Utility Survey:

A utility survey is conducted to map out the location of any existing utility lines, such as gas, electric, water, and sewer lines. The survey will also identify potential or utility conflicts due to the project. For example, in interior designing, a utility site survey may be used to assess the size of a room and the types of furniture that can be comfortably placed within it.

7. Structural Survey:

A structural site survey is a process used to assess the structure of a building to design, construct, and maintain a structure. It involves the collection of measurements, photographs, and other data to

describe the existing building structure and its components accurately. It is used to identify any potential defects or safety hazards related to the structure before any plans are put in place.

For example, an interior designer may perform a structural survey before redesigning a room to determine the structure's current size, shape, and load-bearing capabilities. At the same time, the installation teams may also use a structural survey to ensure that any permanent fixtures or equipment can be installed in the building safely and securely.

8. Environmental Survey:

An environmental survey is conducted to assess the existing environmental conditions on the project site. This may include evaluating the water quality, air quality, and presence of hazardous materials. The survey will also assess any environmental hazards that may be present, such as contamination, hazardous waste, or soil erosion.

It is used in interior designing, furniture production, and installation processes to ensure that the materials used and the design of the space are sustainable and will not cause any environmental harm. For example, a furniture manufacturer may conduct an environmental site survey to ensure that the wood used for the furniture is sourced from a sustainable supplier and is not contributing to deforestation.

2.4.5 Factoring affecting selection of appropriate Site Survey Technique

Choosing the correct type of site survey for a project is essential to ensure the accuracy and quality of the work being done. Several site surveys are available, each suited for different types of projects.

Here are some factors to consider when choosing the right type of survey for a project:

1. The scope and complexity of the project:

More detailed surveys, like topographical or structural surveys, may be necessary for larger, more complex projects. These types of surveys provide detailed information about a site's elevation, slope, and other characteristics.

2. The type of data needed:

Different surveys provide different types of information. For example, a topographical survey provides information about a site's elevation, slope, and other characteristics. In contrast, a hydrographic survey provides information about the location and depth of bodies of water.

3. The budget and timeline for the project:

Different types of surveys have different associated costs and timelines. Simpler surveys like GPS or aerial surveys may be more appropriate for projects with a tighter budget and timeline.

Here are some examples of how different types of surveys can be used in interior design, furniture production, and installation:

- Interior design: A topographical survey can provide information about the slope and elevation of a site, which can be used to determine the design of an interior space.
- Furniture production: A structural survey can provide information about the existing structures on a site, which can be used to create custom furniture pieces or other elements.
- Installation: A GPS survey can provide information about the exact location of objects on a site, which can be used to install furniture pieces or other elements accurately.

2.4.6 Process of Conducting Site Survey -

Here are the steps involved in conducting a site survey and recce for an interior design project:

1. Gather Information:

Before conducting the survey, gathering as much information as possible about the existing space is essential. This includes gathering information about the project's scope, estimated budget, timeline, diagrams, photos, and current plans. It is also essential to understand the layout of the space, including the number of rooms, walls, and architectural features.

2. Create a Measurement Plan:

Once you have gathered all the necessary information, create a plan for measuring the space. This includes a plan for measuring the walls, floors, ceilings, and other elements.

3. Visit the Site:

Once the necessary information has been gathered, it is time to visit the site. During the visit, take note of the measurements, layout, and any existing furniture or fixtures that need to be worked around as per the measurement plan. Also, take photos to help with the design process.

4. Take Photographs and Videos:

It is essential to take photographs and videos of the space during the survey. This will help you to remember details about the space that may not be apparent from measurements alone. It is also essential to take photographs of any existing furniture, fixtures, and décor.

5. Conduct Interviews:

Speaking with the people using the space is essential to understand their needs and preferences better. This will help the designer create a design that meets the needs of the people using the space.

6. Note Design Details:

When conducting the survey, it is essential to take note of any existing design elements, such as colors, patterns, textures, materials, and lighting. This will help inform your design decisions later.

7. Collect Samples:

If possible, bring samples of materials used in the project. This will help the designer better understand how the materials will look in the space.

8. Prepare Templates:

If required, prepare the template of existing infrastructure available on-site for design and production reference.

9. Prepare a Report:

Once the site survey has been completed, it is essential to create a detailed report. This report should include any information gathered during the survey, including measurements, photos, and interviews.

By following these steps, you can ensure that you have all the necessary information to begin your project.

2.4.7 Tools and Equipment

The basic tools and equipment used in conducting site survey and recce are:

1. Measuring tape:

This is essential for taking accurate measurements of the space and furniture. It is important to be as precise as possible when measuring so that the furniture pieces fit perfectly in the designated space.



Fig: Measuring Tape

2. Camera:

A digital camera helps document space, furniture, and fixtures. This can be used for reference later when creating a design plan.



Fig: Camera

3. Level:

A level is used to check the evenness of the walls, floors, and ceiling. This helps ensure that any furniture pieces installed are level, which is essential for aesthetic and practical reasons.



4. Laser measurer:

A laser measurer helps take accurate measurements of long distances.



Fig: Laser Measurer

5. Notepad and pen:

A notebook can record measurements, take notes, and sketch ideas for the design.



Fig: Notepad and Pen

6. Pencil and paper:

Pencil and paper can be used to sketch and record observations.



Fig: Pencil and Paper

7. Calculator:

A calculator performs calculations related to the measurements and design elements.



Fig: Calculator

8. Furniture catalogs:

Furniture catalogs can be used to understand the types of furniture available.



Fig: Furniture Catalog

9. Flashlight:

A flashlight can inspect areas that are difficult to see with natural lighting, such as underneath furniture or tight spaces.



Fig: Flashlight

10. Computer:

A computer helps create a digital version of the design plan.



Fig: Computer

In addition to the tools and equipment listed above, it may also be necessary to use additional items depending on the specific project. For example, a saw, drill, and other tools may be required for a furniture production and installation project.

2.4.8 Potential challenges and limitations in conducting a site survey and recce

Various factors affecting the site survey and recce project are:

- Accessibility: A site survey and recce will not be possible if the area is not accessible. If the area is restricted to the public, then the surveyors will not be able to get the necessary information and measurements.
- **Time Constraints:** A site survey and recce require much time to conduct correctly. It involves measuring, documenting, and analyzing the space for the project. If the surveyors are not given enough time to complete the survey, the results may be incomplete and unreliable.
- **Safety:** Safety is a significant concern when conducting a site survey and recce. If the surveyors are not given adequate safety precautions or are not in an environment that is safe, then the survey results may be compromised.
- **Weather**: can be a significant limitation when conducting a site survey and recce. If the weather is too hot, too cold, raining, or snowing, then the surveyors may not be able to collect accurate readings or measurements.
- **Inaccurate Measurements:** If the measurements taken during the site survey and recce are inaccurate, the entire project may be at risk of being unsuccessful.
- **Unexpected Obstacles:** Obstacles such as furniture, plants, or other objects can block the surveyors from getting the necessary measurements. This can cause the survey to take longer or the results to be inaccurate.
- **Equipment:** If the surveyors are not given the necessary equipment, the results may be unreliable. For example, if the surveyors do not have a laser measurer, they cannot take accurate measurements.
- **Budget:** A site survey and recce can be expensive and time-consuming. If the budget is too small, then the surveyors may not be able to get the necessary information or take the necessary measurements.
- Size of the area: Depending on the area's size and the project's complexity, it can take significant time to survey and measure the area correctly. This can be especially difficult if the large area contains multiple levels.
- **Presence of existing furniture or fixtures:** If the existing furniture or fixtures are not in the desired location, it cannot be easy to survey the area properly. This can be incredibly challenging if the existing furniture or fixtures are difficult to move or are permanently installed.
- Cluttering the workspace: It cannot be easy to accurately survey and measure the area if it is cluttered or has too much activity. This can be especially difficult if the area is used as a workspace or if there are multiple people.

Additionally, if the area is noisy or has a lot of distractions, it can be difficult to survey and measure the area accurately.

2.4.9 Importance of Health and Safety practices during Site _ survey and recce

- Health and safety are paramount during site surveys and recce for various reasons.
- Firstly, the environment in which the survey is conducted may present hazards that could cause severe injury or even death if not appropriately managed. This includes, but is not limited to, potential fall hazards, electrical hazards, hazardous materials, and the presence of wild animals or hazardous weather conditions.
- It is also essential to be aware of the potential for human error. Although experienced professionals typically conduct surveys, mistakes can still be made that could result in serious injury. For example, a surveyor may fail to identify a hazardous area or use faulty safety equipment.
- Furthermore, the presence of workers or other public members in the vicinity of the survey also presents a potential risk. If the survey is taking place in a public place, it is essential to ensure that all safety measures are taken to ensure that no one is in danger.
- When conducting the survey, it is essential to be aware of any hazardous materials, such as
 chemicals or asbestos, that may be present. If they are present, the surveyor must take
 appropriate measures to protect themselves, such as wearing a respirator and protective
 clothing. Additionally, suppose wild animals or dangerous terrain is encountered. In that case, the
 surveyor should ensure their safety by staying in groups and carrying bear spray or other selfdefense equipment.
- Finally, the survey may require specialized tools, such as ladders, measuring tools, or aerial equipment. It is essential that all safety protocols are followed when using such equipment and that the surveyor is familiar with the safety guidelines associated with each type of equipment.

In conclusion, health and safety must be considered when conducting site surveys and recce. This includes paying attention to potential hazards and following all safety protocols associated with the survey and any tools or equipment being used. This will ensure that everyone involved in the survey remains safe and unharmed.

2.4.10 Measurement Sheet

A measurement sheet is a form used to record measurements taken during a project. It is typically used in construction, engineering, manufacturing, and other fields. The measurements can vary depending on the application, including linear and angular measurements, weights, and surface area measurements. Measurement sheets are used to ensure measurements' accuracy and uniformity and create a record for future reference. They are often accompanied by drawings or sketches of the item being measured. Measurement sheets typically include columns for recording the measurement type, units, and value. They may also include additional notes, comments, and other relevant information columns.

2.4.11 Preparing a Measurement Sheet at the worksite

Filling a measurement sheet is a vital part of taking precise measurements and ensuring accuracy in the results.

The steps involved in filling a measurement sheet are as follows:

- 1. **Select the right measurement tool:** Different measuring tools are used to measure different objects or people. Select the appropriate tool depending on the type of measurements you need to take.
- 2. **Set the zero point:** Before taking any measurements, it is essential to set the zero point, which indicates the starting point from where the measurements will be taken.
- 3. **Take the measurements:** Carefully take the necessary measurements once the zero point is established. Make sure to record the measurements in the appropriate fields of the measurement sheet accurately. For measurement accuracy, measure three readings at each length, width, and height for the pre-existing work on-site.
- 4. **Repeat the process:** Repeat the process to measure multiple points.
- 5. **Double-check the results:** After taking all the measurements, double-check the results to ensure they are accurate and correct.
- 6. **Record the results:** Once you are satisfied with the accuracy of the measurements, record the results in the measurement sheet.

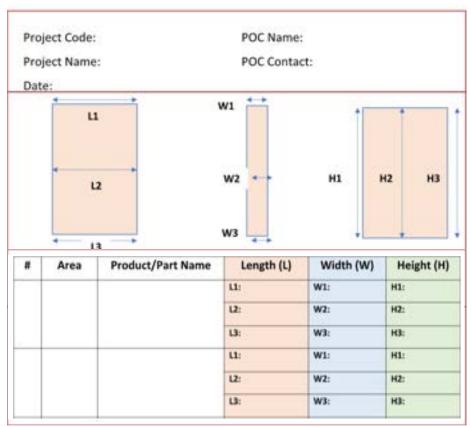


Fig: Sample Measurement Sheet

Notes

- Scan the QR codes to watch the related videos



Site Survey and Recce at on-site

Unit Exercise _____

Choose the correct answer

- 1. Why does a General Assistant need basic knowledge of mathematics?
 - a. To purchase the wood
- b. To read technical drawings
- c. To calculate the quantity of wood
- d. All of above
- 2. How many sides does a square have?
 - a. 6
 - c. 4

- b. 5
- d. 8

3. Identify pentagon.



a. Option 1



c. Option 3



b. Option 2



- d. Option 4
- 4. Which tool is used for measurement purposes?
 - a. Awl

b. Measuring tape

c. French curve

- d. Pincer
- 5. Which type of measurement technique is used to measure only the length of the wood?
 - a. Running measurement
- b. Square measurement

c. Cubic measurement

- d. All of the above
- 6. Do the dotted lines represent the?
 - a. Hidden edges

b. Projection line

c. Centre line

- d. Hatching line
- 7. Which type of technical drawing represents two-dimensional layouts of spaces?
 - a. Assembly Drawing

b. Sectional Drawing

c. Part Drawing

d. Floor Plan

0					
	hop clean and organized can prevenions.	b. Tripping	while conducting a site survey		
	Jects	d. All of the above			
c. Spills		u. All of the above			
9. What is the cr	What is the critical factor affecting the appropriate site survey technique?				
a. The scop	e and complexity of the project	b. The type of data	needed		
c. The budg	get and timeline for the project	d. All of the above			
10. Which of the	following is not a use case of a site	survey?			
a. To gather	r information for a design	b. To record the fin	nal position of the construction		
	ig the location		power requirements		













3. Assist in Material Management at the site

Unit - 3.1. Introduction to Furniture

Unit - 3.2. Technical Drawings of Furniture

Unit - 3.3. Wood and Other Materials

Unit - 3.4. Furniture Fittings and Accessories

Unit - 3.5. Tools, Machines and Equipment

Unit - 3.6. Woodworking Benches



Key Learning Outcomes



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

- 1. Know about different types of furniture.
- 2. Differentiate between different parts of furniture.
- 3. Understand the modular furniture concept and its usage.
- 4. Know about the different components of a modular cabinet.
- 5. Read and interpret a project docket and its supporting documents.
- 6. Understand the drawing projection principles.
- 7. Demonstrate the use of different drawing instruments.
- 8. Perform dimensioning of a technical drawing using various drawing standards.
- 9. Know about the wood and other materials used for woodwork and furniture.
- 10. Know and understand the different types of wood.
- 11. Understand the properties, characteristics, and qualities of wood.
- 12. Know the fasteners, such as nails, screws, and their use.
- 13. Use a suitable adhesive for the correct application.
- 14. Know about different fittings and accessories used in the furniture.
- 15. Know and understand various tools, machines, and equipment used for woodwork.
- 16. Know the functions and usage of woodworking tools, machines, and equipment.
- 17. Operate tools and machines correctly and safely.
- 18. Correctly maintain tools and equipment.
- 19. Know the correct ways of storing woodworking tools and equipment.
- 20. Understand the importance of a woodworking bench.
- 21. Select the appropriate woodworking bench type based on usage.
- 22. Assemble and arrange a modular workbench based on worksite requirements.

UNIT 3.1: Introduction to Furniture

- Unit Objectives 🧖



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

- 1. Know about the furniture and its purpose
- 2. Know about the different types of furniture
- 3. Know about the standard dimensions of a furniture
- 4. List different parts of furniture based on categorization
- 5. Define and explain Modularity
- 6. Recall the characteristics of Modular furniture
- 7. Discuss different layouts of Modular furniture
- 8. Discuss the various parts of a modular cabinet and their functionalities

3.1.1 What is furniture?

Furniture is usually kept in a house or other building to make it suitable or comfortable for living or working in. Furniture serves a variety of different purposes. Furniture supports various human activities such as seating e.g. chairs, stools, tables and sofas, and sleeping e.g. beds. Furniture is also used to hold objects at a convenient height for work, as horizontal surfaces above the ground, such as tables and desks, or to store things e.g. cupboards and shelves. Furniture is also used as accessories for decorative purpose, such as mirrors, fireplaces, paneling, and other items complementary to an interior scheme.

3.1.2 Types of furniture classified by materials



Fig: Wooden furniture



Fig: Cane/Wicker / Ratten furniture



Fig: Glass furniture







Fig: Plastic furniture



Fig: Concrete furniture

3.1.3 Types of furniture classified by its usage

3.1.3.1 Furniture for Seating —











Fig: Bar stoc



Fig: Stool



3.1.3.2 Furniture for Sleeping _____



3.1.3.3 Furniture for Entertainment –











Fig: Chess table

3.1.3.4 Furniture for working_



Fig: Writing/Study table



Fig: Computer table

3.1.3.5 Tables -







Fig: Coffee/Center table



Fig: Nest of tables



Fig: Dining table



Fig: Console table



Fig: End/Side table

3.1.3.6 Furniture for Storing -



Fig: Chest of drawers



Fig: Sideboard



3.1.3.7 Accessories



Fig: Fireplace



Fig: Coat hanger



Fig: Mirror frame



Fig: Grandfather clock

3.1.3.8 Office furniture _____







Fig: Executive table

Fig: Conference table

Fig: Reception table





Fig: Cubicles

3.1.3.9 Other woodwork



Fig: Structure or framework



Fig: Decks



Fig: Doors and windows



Fig: Interior flooring



Staircase and handrail



Ceiling



Pergola



Partition/drywall/wall paneling

3.1.4 Parts of a Furniture

Furniture is an essential part of our home. It comes in many different shapes, sizes, and styles. Understanding the different parts of furniture is essential so you can make the right decisions when purchasing and assembling it.

The main parts of furniture are:

- 1. **Legs:** A piece of furniture's legs provide stability and structure. Legs may be tapered, curved, or straight and are usually made of wood, metal, or plastic.
- 2. **Frames:** The frame of a piece of furniture provides it with its overall shape and structure. Frames are typically made of wood, metal, or plastic and are usually connected to the legs.
- 3. **Tabletops:** Tabletops provide a flat surface for dining, writing, or working activities. Tabletops are typically made of wood, metal, or plastic and may be removable or fixed.
- 4. **Drawers:** Drawers provide storage for items such as utensils, clothes, or books. Drawers are typically made of wood, metal, or plastic and may be adjustable or non-adjustable.

- 5. **Doors:** Doors provide privacy and protection from the elements. Doors are typically made of wood, metal, or plastic and may be hinged or sliding.
- 6. **Seats:** Seats provide comfort and support for sitting. Seats are typically made of wood, metal, or plastic and may be upholstered or non-upholstered.
- 7. **Backs:** Backs provide additional comfort and support for sitting. Backs are typically made of wood, metal, or plastic and may be removable or fixed.
- 8. **Shelves:** Shelves provide additional storage for books, plants, or decorative items. Shelves are typically made of wood, metal, or plastic and may be adjustable or non-adjustable.

The other members include arms, back, supports, rails, etc., which vary in products based on their design specifications and functionality requirements.

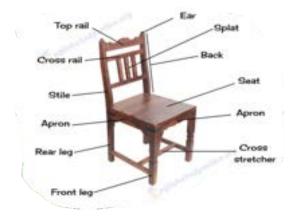


Fig: Dinning Chair



Fig: Dinning Table

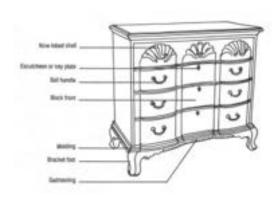


Fig: Dresser

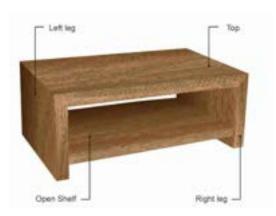


Fig: Coffee Table

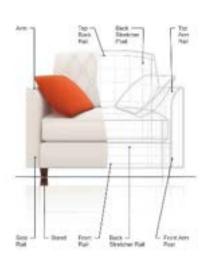


Fig: Upholstered Arm Chair



Fig: Office Chair

3.1.5 Modular Furniture- Defining and Explaining Modularity

Modularity is an approach to designing furniture which involves subdividing a system into numerous small building blocks, or elementary components, commonly known as "modules" or "skids." These elementary modules, building blocks, or skids can be autonomously created for developing various systems.

The procedure in which a system can be broken down or subdivided into modules is called "Functional Allocation." Modular furniture can be assembled from small modules and dismantled into them, thus making repeated assembly and disassembly possible. For re-assembling specific pieces of furniture (say, modular beds), entire sets of modules are available and sold in the market in the form of prefilled packages. Modularity is a popular concept applicable not only in building furniture but also in the following areas:

- Architecture
- Aerodynamics
- Designing and building Heavy Vehicles
- Building Heavy Machinery
- Developing and testing Software using OOPS (Object-oriented Programming System) concept

The most common type of modular furniture includes modular storage units, office furniture, and bedroom furniture.



Fig: Modular Cabinet

3.1.5.1 Types of Modular Furniture _____

- Different types of modular furniture include office furniture, kitchen furniture, and bedroom furniture. The area of usage for modular furniture depends on the type of furniture.
- For example, Office furniture is mainly used in offices, whereas kitchen furniture is used in kitchens. Bedroom furniture is used in bedrooms.

3.1.5.2 Layouts of a Modular Furniture Location

Modular furniture is found in almost all places —schools, colleges, households, or workplaces. Each place has a different set of requirements for furniture. Here, we will discuss five layouts where essential furniture is abundant.

The most common layouts are-

- Bedroom
- · Living Room
- Restroom
- Office
- Kitchen

1. Bedroom

A bedroom consists of different modular furniture, such as:

- Shelf
- Bookcase
- Cabinet
- Sofa
- Almirah
- Drawer
- Chair
- Bed



Fig: Bedroom

2. Living Room

A living room consists of different modular furniture, such as:

- Sofa
- Study desk
- Showcase
- Bookcase

- Chair
- Table
- Drawer
- Cabinet
- TV case
- Shelf

3. Restroom:

A Restroom consists of different modular furniture, such as:

- Towel hanger
- · Cosmetics shelf
- · Wooden floor mat
- · Restroom cabinet



Fig: Living Room



Fig: Restroom

4. Office:

An office room consists of different modular furniture, such as:

- Cabinet
- Cubicle
- Workstation
- Chair
- Kiosk
- Desk
- Almirah
- Drawer
- Partition



Fig: Office Room

5. Kitchen

A kitchen consists of different modular furniture, such as:

- Cup tray
- Cutlery trays
- Kitchen cabinet
- Kitchen drawer
- · Garbage pull-out
- Shelf
- Chair
- Cupboard
- Table



Fig: Kitchen

3.1.5.3 Characteristics of Modular Furniture

- 1. **Flexibility:** Modular furniture is versatile and can be rearranged to suit your changing needs.
- 2. **Cost-effective:** Modular furniture is usually less expensive than traditional, non-modular furniture.
- 3. **Space-saving:** Modular furniture is designed to fit into smaller spaces, making it ideal for tiny homes or apartments.
- 4. **Easy to move:** Modular furniture is lighter and easier to move than traditional furniture, making it ideal for people who move frequently.
- 5. **Durable:** Modular furniture is often made from high-quality materials and is built to last.

3.1.5.4 Different Components of a Modular Cabinet:

There are several different parts to modular furniture, including the base, the frame, the legs, the shelves, the doors, and the drawers. A cabinet is an assembly of various parts or components. The components are -

Top: The top is the uppermost part of a cabinet. It is the upper surface made up of wood. Mostly, the top is protected by a plywood cover.

Bottom: The bottom is a cabinet's lowermost surface or base. The structure of a cabinet is assembled on the base or the bottom. Therefore, the bottom of a cabinet has to be firm enough. The bottom is made of hardwood to make it firm.

Side: The side is the wooden structure fixed to a cabinet's sides. It is interesting to observe that a cabinet without a side is called a shelf.

Back: This is a wooden structure used as the back support of the cabinet. The back of a cabinet prevents dust and keeps the items inside the cabinet clean.

Partition: As the name suggests, partition segregates one sub-assembly from the other. For example, it segregates the drawer from the shelf.

Shelf: A shelf is a wooden structure that looks like a slice of wood used to keep items like books on it.

Drawer: The drawer is another important sub-assembly part. A drawer has different parts as well. A furniture installer should assemble these parts first to construct the drawer. The parts of a drawer are -

- Back
- Sides
- Front
- Handle
- Lock

Shutter:

- The shutter is assembled to the cabinet with the help of hinges.
- The shutter adds security to the cabinet. Different parts, like a lock and handle, are assembled on the shutter at the installation time.
- The number of shutters depends on the size of the cabinet. In small cabinets, one shutter is enough to cover the cabinet space; however, two shutters might be needed if the cabinet is more significant in size.
- A cabinet shutter can be an open outward type or a sliding type. However, open inward is a strict no in the case of cabinets.

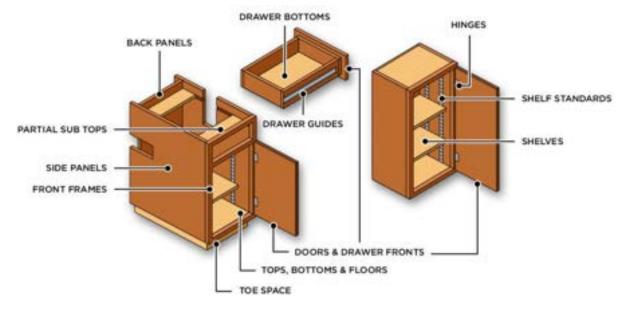


Fig : Components of a Modular Furniture

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Introduction to Modular Furniture

UNIT 3.2: Technical Drawings of Furniture

- Unit Objectives 🧖



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

- Know about Project docket and its role in product designing
- 2. Understand various elements of a project docket
- 3. Understand the basics of technical drawing of a furniture
- 4. Know about the basics of drawing projection concept
- List different types of instruments used to prepare a technical drawing 5.
- 6. Understand the standards used in preparing a technical drawing
- Demonstrate the process of interpreting technical drawings
- Identify the standard dimension of the furniture
- Demonstrate the process of dimensioning on a furniture technical drawing
- 10. Design a basic sketch of the furniture

3.2.1 Project Docket

A project docket file is a document that records the progress of a project throughout its development, from the initial conception to its completion. It is a comprehensive record of all the tasks, decisions, people, and resources involved in a project. It also serves as a communication tool to ensure that all stakeholders know the project's current status. It also serves as a reference document for future projects and can be used to analyze the success of a project.

The project docket file should be updated regularly throughout the project to ensure that all stakeholders are updated with the latest information. It should be kept securely, as it contains confidential information about the project.

3.2.1.1 Elements of a Project Docket

The elements of a project docket file may include the project plan, timeline, budget, risk management plan, communication plan, and other documents related to the project. Additionally, the project docket file should include details of all stakeholders involved, such as the project manager, team members, consultants, vendors, and customers. It should also include details of any meetings, decisions, and project plan changes.

The major elements involved in the file while preparing a project docket for final production order include:

- Final Scope of Work
- Worksite Layout and Plans
- · Final Quotation
- 3D Renders of Space
- The 3D perspective of the Product
- 2D Drawings of the products and spaces
- Part List
- Finishing Matrix
- · Assembly and Installation Drawing

3.2.2 Technical Drawing of a Furniture

A technical drawing of furniture is a precise graphical representation of a piece of furniture created to convey its structure and features, such as a chair, table, or cupboard. Technical drawings are typically used in the furniture design and manufacturing process, allowing the designer or manufacturer to accurately convey the intended design to the customer and the production team.

Technical furniture drawings will typically include the necessary dimensions, angles, and other relevant information to help create the desired product. The technical drawing will also include the specifications for the materials and components used in the construction. It may also include details of the hardware used, such as screws, bolts, and other fasteners.

Technical furniture drawings are essential for any furniture-making process, as they ensure that all design aspects are accurately represented. This ensures that the furniture is made to the highest possible standards and that the finished product meets the customer's expectations.

The technical drawings (of real-world objects) are typically prepared in three stages:

- 1. Sketches
- 2. Hand drafts
- 3. Detail drawings.

Sketches are the simplest and most basic type of drawing. They are typically used to record an idea or concept quickly and are not meant to be used for final design work.

Hand drafts are a more refined version of sketches. They are usually created using drafting software and include more detailed information, such as dimensions and annotations.

Detailed drawings are the most complex and complete type of drawing. They include all of the information from a hand draft, plus additional information such as material specifications and tolerances.

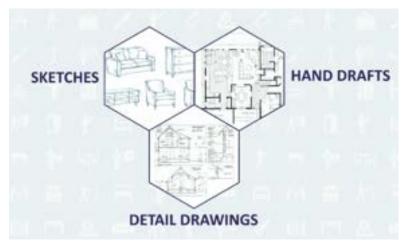


Fig: Representation of a Sketch, Hand Draft and A Detailed Drawing

3.2.3 Drawing projection

Drawing projections are techniques used to represent a three-dimensional object in two dimensions. They are an essential part of technical drawing and are used in engineering, architecture, and other fields for representing and communicating designs. This is done by projecting an object onto a drawing surface.

Let's start with an example. Say we have a cube. To project this cube onto a drawing surface, we draw straight lines through the object's outer surface representing the cube's top, side, and front. This would give us a two-dimensional representation of the cube.

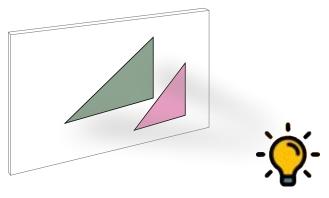


Fig: Representation of a Cube on a projection plane

Before we understand different types of projection, it is essential to know about the role of the reference plane and four quadrants'.

3.2.3.1 REFERENCE PLANE

A reference plane is a two-dimensional plane used to define the orientation of an object. It is used to measure the angle of rotation between two objects or to reference the location of an object in three-dimensional space.

The reference plane is typically identified by three points, with the most commonly used being the origin, the x-axis, and the y-axis.

The origin is the point from which all other points are measured in the plane. The x-axis and y-axis are perpendicular lines that extend from the origin. These two lines define the two dimensions of the reference plane. The x-axis is usually defined as the horizontal line, while the y-axis is usually defined as the vertical line

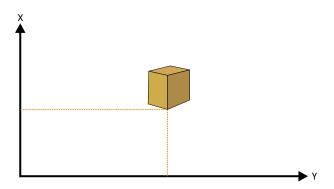


Fig: Representation of a Cube in a reference plane

The reference plane is used to define the orientation of an object in three-dimensional space. By rotating the reference plane, the object's orientation can be changed. By shifting the reference plane, the object's location can be changed.

3.2.3.2 QUADRANT SYSTEM

The Quadrant System is a technical drawing method used to represent a vector's magnitude and direction in a two-dimensional space. It expresses the movement and direction of an object or vector in a two-dimensional space. The system is used in various engineering applications, including robotics, mechanical engineering, and aerospace engineering.

The Quadrant System is based on four 90-degree sectors, or quadrants, formed when two perpendicular axes are drawn on a two-dimensional plane. Each Quadrant represents a different direction in which the vector can move.

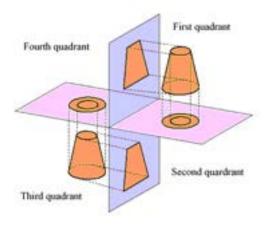


Fig: Quadrant System

The four quadrants are numbered counter-clockwise, starting from the top right. The first Quadrant is at the top right, the second Quadrant is at the bottom right, the third Quadrant is at the bottom left, and the fourth Quadrant is at the top left. Each Quadrant is further divided into four 45-degree segments, each representing a different direction.

The Quadrant System is useful in technical drawing because it allows for an accurate representation of the magnitude and direction of a vector. The system is also useful for plotting points in two-dimensional space and calculating the distance between two points.

3.2.3.3 Types of Projections

Types Of Drawing Projections

- Orthographic Projection
- Axonometric Projection

ORTHOGRAPHIC PROJECTION

This type of drawing creates a two-dimensional representation of a three-dimensional object.

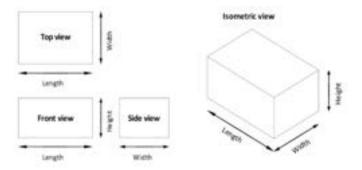


Fig: Orthographic Projection

It shows an object as it would appear if viewed from different directions. The object is drawn as if it were transparent so its sides can be seen. The different sides are then projected onto a flat surface, like a piece of paper. This can be done by using either first-angle projection or third-angle projection.

First Angle Projection

First, Angle Projection is a method of creating an orthographic projection of an object. This projection type is used in engineering drawings based on the European drawing system.

In First Angle Projection, the observer is positioned to the front of the object, and the object views are projected from the front, top, and right sides onto a single plane. This type of projection eliminates the need for multiple planes, which would otherwise be required to represent the object.

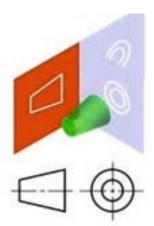


Fig: First Angle Projection

Third Angle Projection

Third Angle Projection is the opposite of First Angle Projection and is used in engineering drawings.

In Third Angle Projection, the observer is positioned at the back of the object, and the views of the object are projected from the back, bottom, and left sides onto a single plane. This projection also eliminates the need for multiple planes, which would otherwise be required to represent the object.

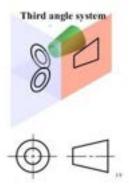


Fig: Third Angle Projection

WHY DON'T WE USE 2ND AND 4TH QUADRANT PROJECTIONS?

Suppose an object is in place in the 2nd Quadrant; its front view would be projected on a vertical profile plane while its top view is projected on the bottom horizontal plane. Now, to represent the projection on a drawing sheet, the horizontal plane needs to be rotated in a clockwise direction, eventually overlapping with the front view.

A similar problem would occur when using projection in the Fourth Quadrant. That explains why not using the 2nd and 4th Quadrants in protection.

AXONOMETRIC PROJECTION

- This type of drawing is used to create a three-dimensional representation of a three-dimensional object.
- The object is projected onto a plane using parallel lines, and the resulting image represents the object that can be viewed from any angle.
- Usually, the three sides of the object, that is top, front, and side view, appear in one drawing.

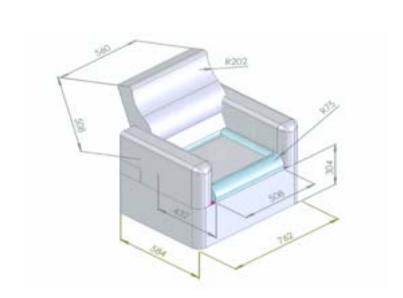


Fig: Axonometric Projection

3.2.4 Drawing Instruments

Before you start furniture designing, you must have all the necessary tools and equipment to perform the task. Some of the necessary and preparatory tools are:

Drafting Table

A drawing board is an invaluable tool for any draftsman. It is rectangular in shape and supported by 2 battens at the bottom, providing an accurate, stable surface on which to draw. It has straight edges at the sides, typically used with a ruler or a T-square to ensure that lines are drawn straight.



Fig: Drafting Table

The standard size of an Indian drawing board ranges from B0 to B4.

Standard size of Drawing boards

Designation	Size (mm)	Designation	Size (mm)
B0	1500×1000	В3	500 × 350
BI	1000 × 700	B4	250 × 350
B2	700 × 500		

Drawing Paper

Drawing paper is the paper on which drawing is to be made. The size of the paper is defined by the Bureau of Indian standards, which varies from A0 to A4. While selecting the size of the drawing paper, make sure that its size is smaller than the size of the drawing board.

N	letric	Architectural Drawing		
Type	Size (mm)	Type	Size (inches)	
A0	841 x 1189	Ε	36 x 48	
A1	594 x 841	D	24 x 36	
A2	420 x 594	С	17 x 22	
А3	297 x 420	В	11 x 17	
A4	210 x 297	Α	8 ½ x 11	

Fig: Standard Paper Sizes

CLIPS

Clips are small fasteners that hold two or more components together. They are used to clamp the drawing sheet with the drawing board securely and tightly. A set of 4 clips are generally in the process.



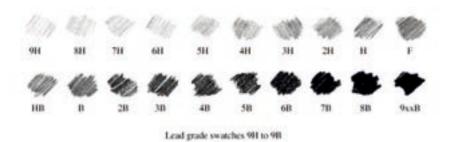
Fig: Drawing Clips

Pencils

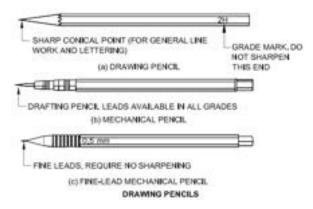
Pencils are the main drawing instruments used to draw lines, circles, arcs, polygons, and others concerning the scale provided.

The grades of pencils range from HB, H1 to H9, and B1 to B9, depending on the line specification requirements.

Some of the pencils are hard, and some of the pencils are smooth. The hard pencils are used to draw the construction lines, and the smooth pencils are used to draw the main lines.



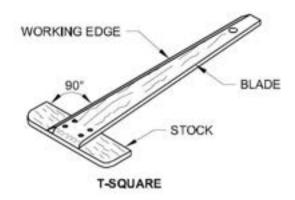
Usually, three types of pencils are used, namely, Drawing pencils, mechanical pencils, and fine lead mechanical pencils



T-Square and Parallel Bar

A T-Square is a guiding tool and consists of 2 parts: the stock and the blade joined together at right angles.

The stock slides at the straight edge of the drawing board while the blade helps draw horizontal lines and parallel lines and guides the set squares, stencils, and others.

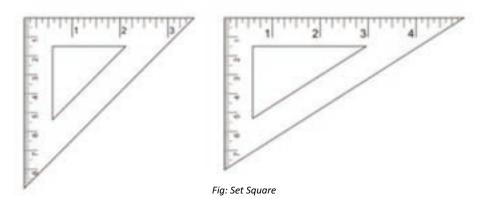


Set Squares

Set squares are rectangular and are generally made of plastic material.

They come in 2 sizes: One with angles of 45, 45, and 90 degrees, while the other has 30, 60, and 90 degrees.

A set square is combined with a t-square to draw horizontal, vertical, or angular lines.



PROTRACTOR

Protractors are used to mark or measure angles between 0 and 180. The center of the bottom line is marked with "O" or "C," from which the angles are measured and can be readable from both ends.

They are semicircular and are made of transparent plastic or celluloid materials.

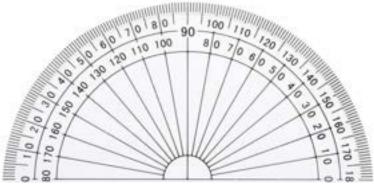
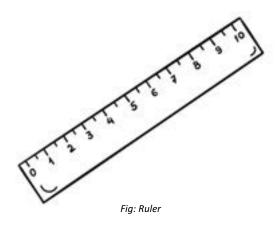


Fig: Protractor

RULER

Rulers are used to make drawings of the objects to proportionate the desired size. It is used to measure distances and create straight lines that are consistent throughout the drawing



Mini Drafter

A mini drafter is a tool used to create technical drawings using a combination of a stylus and a drafting board. It combines a t-square, a set square, scales, and a protractor.

One end of the Drafter is clamped at the left top end of the Drawing board by a screw provided by the Drafter. An adjustable head with a Protractor and a set square with measurements is fitted at the other end of the Drafter. It is used to draw vertical lines, horizontal lines, inclined lines, parallel lines, angles, and perpendicular lines.

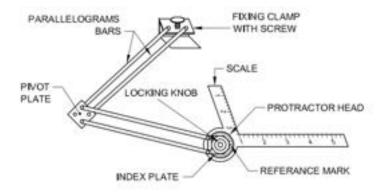


Fig: Mini Drafter

Compass and Attachment

A compass generally consists of two legs. One end has a sharp tip, and the other has a provision for inserting pencil lead.

It is used to draw circles or arcs of circles.

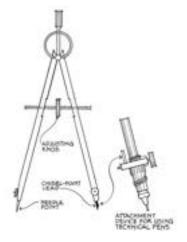


Fig: Compass

FRENCH CURVES

French curves are irregular in cross-section and are used to draw the small arcs and large splines, which were not possible using a drafter.

They are typically made of plastic and come in various shapes and sizes.

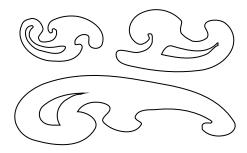


Fig: French Curves

Eraser

Erasers of soft-engineered types are generally used to correct mistakes drawn on paper or lighten lines.

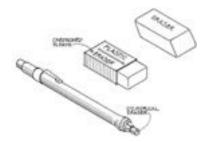


Fig: Eraser

3.2.5 Drawing Standards

A technical drawing comprises different elements like lines, scales, paper sizes, letters, part list, etc., each having defined standard parameters while plotting the object representation.

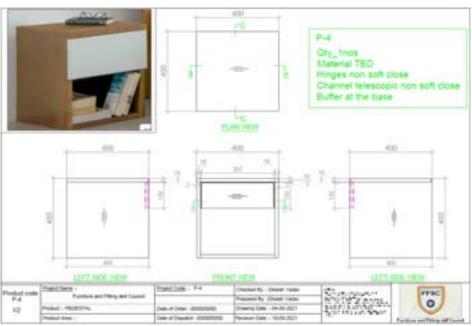


Fig: A drawing representation using drawing standards

3.2.5.1 Lines

In technical drawings, the details of various objects are drawn by different types of lines. Each line has a definite meaning and sense to convey.

Understanding various types of lines used in drawing with their thickness, style of construction and appearance as per BIS and following them meticulously may be considered as The usage of the type of pencil varies based on the type of line to be drawn.

Some commonly used lines are -

- Full line
- Dotted line
- Section line
- Centre line
- Dimension line
- Extension line



Fig: Types of Lines

Example -

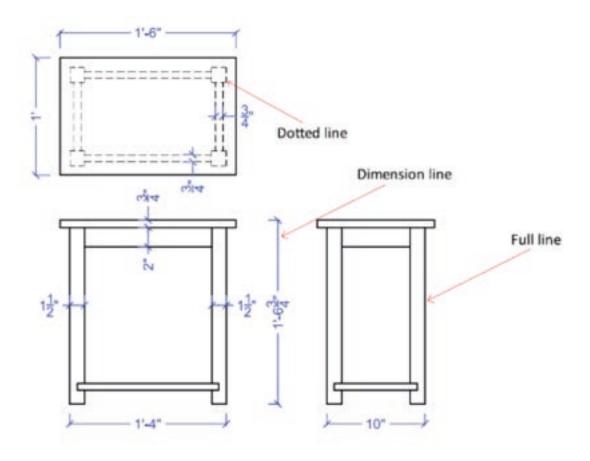


Fig: A representation of an object using different lines

3.2.5.2 Symbols ____

1. Bookcase and Cabinet Symbols

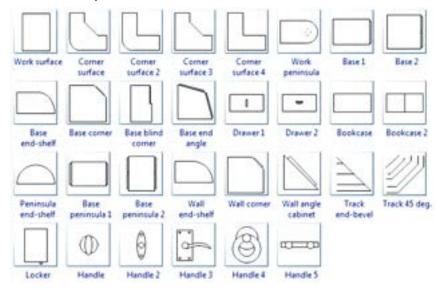
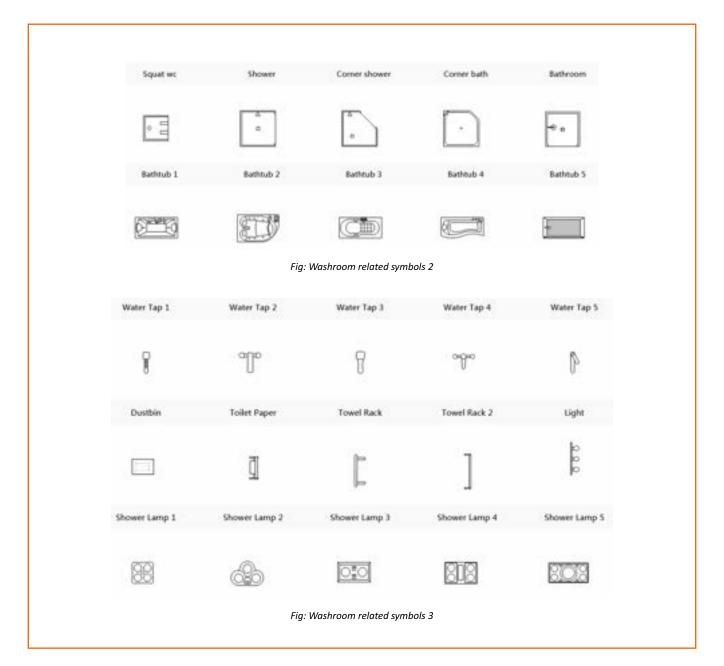


Fig: Bookcase and cabinet symbols

2. Washroom related Symbol



Fig: Washroom related symbols 1



3.2.5.3 Scales

Objects in our daily lives are usually too large or too small to be drawn to their proper size. Because of the disparity between the actual sizes of objects and the sizes of the drawing papers we use, we must prepare drawings that are either smaller or larger than the actual objects using appropriate scales.

The scale of a drawing is the ratio of the object's size on paper to the object's size in real life.

The most common scales used in drawings are 1:1, 1:2, 1:10, and 1:100.

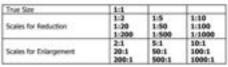


Fig: Standards Drawing Scales

3.2.5.4 Lettering ___

Letter styles are generally classified as Gothic, Roman, Italic, and Text. The letters can be made either freehand or by lettering devices.

There are a few things to remember when lettering in a drawing:

- First, make sure the lettering is legible and easy to read.
- Second, use a consistent font throughout the drawing.
- Third, use clear and concise wording.
- And fourth, use space efficiently.





Fig: Drawing Letters Representation

3.2.5.5 Title Block -

The title block of a drawing is a space at the bottom right corner of the drawing. The Title Blocks are locally standardized but should be designed in such a way that they can be easily understood.

A Title block typically contains the:

- Name of the firm
- Name of the workpiece
- Drawing Code
- Paper format
- Scale of Drawing
- Dimensioning Unit
- Symbols Used
- Date when the drawing was finished
- Name of Draughtsperson
- Supervisor Name

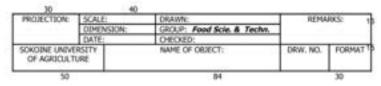


Fig: Title Block

3.2.6 Assembly Drawings -

Assembly drawings are used in the woodworking industry to illustrate the components of a product and how they fit together. Assembly drawings typically include a list of parts, a detailed drawing of the assembly, and the specific measurements used to build the product.

• The parts list is usually located at the top of the drawing and includes all components that make up the assembly. This list identifies the type of material used, the quantity of each part, and the size of each part. It also includes the hardware needed to assemble the product, such as screws and nails.

- The detailed drawing of the assembly is located below the parts list. This drawing provides a visual representation of how the parts fit together. It typically shows the relative size and placement of each part and any additional components, such as hinges or latches.
- The specific measurements used to build the product are typically listed at the bottom of the drawing. These measurements include the width, length, and height of each part and any additional angles or offsets. This information helps the woodworker accurately build the product.

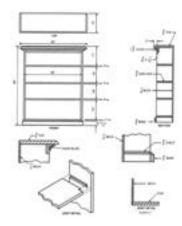


Fig: Assembly drawing of an object

3.2.7 Process of Interpreting 2D / 3D drawings

The job of a Furniture Installer and fabricator is practically impossible without good skills in reading, studying, and interpreting work orders, technical drawings, and blueprints.

Step 1: Determining the view

- The Elevation view must be studied and understood first. This is a representation of the expected outcome of the project. This view indicates the height dimensions of the workpiece.
- The Plan view comes next, indicating the workpiece's length and width dimensions.
- The Section view must be read at last to get a clear idea about the sequence of the parts to be built to obtain the final product.

Step 2: Understand the scale and determine the actual dimensions

- The measurement scale is always precisely proportionate to the final product.
- This proportion is usually a 1:2 ratio
- The Engineering Scale is used, which incorporates a ratio where one has to follow multiples of 10.

Step 3: Reading the Title Block

This indicates the context in which the drawing must be perceived. The Title block provides information about the following:

- General tolerances
- Projection details for the item, component to be manufactured
- The scale used in the drawing
- Status of the drawing (Preliminary, Approved, etc.)
- Name of the component or assembly

- · Contact details of the drawing owner
- Mass
- · Units used in the drawing
- Sheet number and number of sheets

Step 4: Reading the Notes

- The notes should lie outside the Title Block.
- The information provided by the notes is preferred to that provided by the Title Block; hence, the Notes supersede the Title Block information.
- In conflicts, the Notes are considered correct over the Title Block.

Step 5: Reading the Work Order or the Bill of Materials

- The Work Order provides the requisite details of the assignment and the requirements of the final product.
- The Bill of Materials is a list of the components and the corresponding quantities that make up the general assembly of the manufactured item.
- The BOM is usually tabulated on the first page of the Blueprint / Drawing.

Step 6: Understanding the differences between the various Lines and interpreting them

- Visible lines indicate an edge is visible in the relevant view
- Hidden lines indicate the edge is behind a face
- Phantom lines indicate edges of structure that are relevant but not included in the drawing
- Phantom lines could also mean a tangent line (where a curve starts or ends)
- Center lines indicate the geometric center of the assembly

Step 7: Understand and interpret the projections, sections, and details

- View the drawing itself, regardless of the dimensions, trying to visualize how and what the assembly looks like in 3D.
- Use the sections and details as a starting point, and you will soon realize that the details and sections have been created to highlight essential components or features.
- With the aid of the BOM / Work Order, find the components in the drawing to understand each component's role.
- Find out the notes that have arrows pointing toward the assembly. This information is extremely vital to the assembly and its functionality.
- Use the dimensions in the drawing to comprehend the component / Assembly / Final product size.

Step 8: Understanding Allowances

- Allowance is the minimum clearance (positive allowance) or maximum interference (negative allowance) between parts of an Assembly.
- While preparing Blueprints and technical drawings, a high degree of diligence is implemented to incorporate Allowances, thus ensuring "Zero Wastage."
- This helps reduce the Cost of Production per unit and increase the assignment's productivity.

Step 9: Interpreting Work instructions

- Instructions and specifications provided to the Furniture Installer must not be read casually.
- Instead, all sections and preferably every word must be read and understood diligently.
- This helps the Furniture Installer and the other team members to fully understand and interpret the client's requirements and the specifications of the workpiece or job.
- This is an essential step in the project / assignment since it eliminates the chances of miscommunication.

3.2.8 DIMENSIONING

- When creating technical drawings, dimensioning is the process of adding labels to a drawing that specify the various parts' lengths, widths, depths, and diameters.
- It expresses the quantity, adds value, and denotes the relationship between the drawing's components.
- Dimensioning should be done so that a person reading the drawing will know the size of the various parts and be able to create them to the proper specifications.



Fig: Dimensioning of an Object

3.2.8.1 DIMENSIONING SYSTEM

The dimensioning system is a system by which we can determine the dimensions of an object. The three most common methods of dimensioning are:

1. The English System:

It uses inches and feet as its units of measurement.

2. The Metric System:

It is the most commonly used in the world and uses centimeters and meters as its units of measurement.

3. The American System:

It uses both inches and centimeters as its units of measurement.

3.2.8.2 PROCESS OF DIMENSIONING

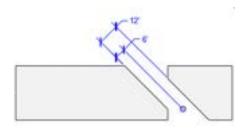


Fig: Process of Dimensioning

- 1. Determine which system you will use.
- 2. Take measurements of the object.
- 3. Choose a scale at which to draw your object.
- 4. Draw your object to scale with all the features of an object.
- 5. Label the dimensions.
- 6. Add any necessary notes.

Notes				

Scan the QR codes to watch the related videos



Introduction to Technical Drawing



Drawing Instruments

UNIT 3.3: Wood and Other Materials

- Unit Objectives 🏻 🏻



After completing this unit, you will be able to:

- 1. Know about the properties of wood
- 2. Know about the types, natural characteristics of wood
- 3. Know about the different grain patterns of wood
- 4. Know about different types of hardwood and softwood, their characteristics and qualities
- 5. Know about plywood, boards and other materials used for carpentry projects
- 6. Know about the different method of sawing

3.3.1 Wood – the most popular material used for furniture -



Wood is a natural material which has always been a popular choice for making furniture. It is one of the most commonly used materials in wood carpentry projects, and almost any type of wood can be used to build furniture.

Many varieties of wood are available, and each one has its own properties, unique characteristics and qualities. The type of wood determines the beauty and strength of the finished piece.

3.3.2 Structure of wood -

Wood is produced by trees. The cross section of a tree shows the following features in succession from the outside to the center:

- (1) Bark and cambium layer
- (2) Wood (sapwood and heartwood)
- (3) Pith, the small central core

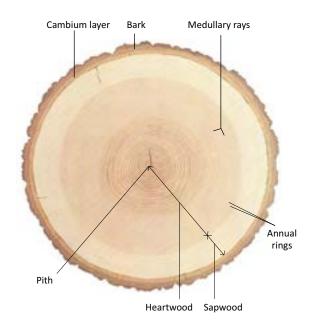
The pith and bark are excluded from finished timber. Only sapwood and heartwood is used as finished timber. Sapwood is lighter in colour than heartwood.

Annual rings

Most species produce annual growth rings. The growth rings, when exposed by conventional methods of sawing, provide the grain or characteristic pattern of the wood.

Medullary rays

Medullary rays extend radially from the pith of the log toward the circumference. They produce the flake effect in quartersawn timber.



3.3.3 Types of wood

The wood produced by trees are divided into two botanical classes –

- Hardwood
- Softwood

This botanical classification is sometimes confusing, because there is no direct correlation between it and the hardness or softness of the wood. Generally, hardwoods are more dense than softwoods, but some hardwoods are softer than many softwoods.

Both hardwood and softwood are used for everything from structural to decorative. Both are extremely popular within the furniture industry.

Hardwood

Most furniture carpenters love to work with hardwoods. The variety of colors, textures, and grain patterns makes beautiful and interesting-looking furniture.

Hardwoods come from broad-leaved trees (deciduous trees that drop their leaves every year and produce seeds). Hardwood trees are very slow growing trees, this tends to make them produce dense wood. That is why items made from hardwoods are more likely to withstand years of wear and tear. Hard woods are usually much darker in colour. Hardwoods have lovely, attractive grains and are used for making fine and high-quality furniture, decks, flooring, and decorative woodwork. Hardwoods are

usually expensive woods. Examples of hardwoods include alder, balsa, beech, hickory, mahogany, maple, oak, teak, and walnut.

Softwood

Softwoods are not weaker than hardwoods. Softwoods are easier to work with than hardwoods. Softwoods come from conifer tress (trees that have needles and do not produce seeds). Softwoods are usually lighter in colour. Softwoods often come from very tall, straight trees, and are better suited for construction work in the form of planks, poles, and so on. Because most coniferous trees grow fast and straight, softwoods are generally less expensive than hardwoods. Examples of softwoods include pine, spruce, cedar, fir, and larch.

3.3.4 Natural characteristics of wood -

Wood is the product of nature which has numerous color hues, grain patterns and other natural characteristics. Color and grain patterns are the primary factors influencing the appearance of wood. Other characteristics such as stains, burls, and insect damage also have an effect. All are variable, not only in different commercial groups of wood, but within a given species, log, or board.

The natural causes of color variation within a species are influenced by many factors. Soil types, minerals, water levels, available sunlight, temperature, and genetic composition, all contribute to color variation. Grain variation, like color variation, is also influenced by many factors. They include tree size, growth rate, climate changes, site conditions, genetics, bird, insect, and fire damage.

Some common natural grain patterns –



Burl grain

Burl grain is common in most species and is also known as curly grain, burly grain, fiddleback or figure wood. Burl grain is a swirl or twist in the wood that occurs near a knot but does not contain a knot over 1/8" in diameter.



Tiger stripe/Cross fire

This unique grain pattern is also called zebrawood. It is a distorted grain pattern that in certain light resembles the stripes of a tiger. It is common in red and white oak, and maple. Tiger stripe is most often found along with burl grain. Wood with this grain characteristic is often quite dense.

Ray flecking

Ray flecking is visible in hardwood species that are quartersawn and have rays. Red oak and white oak are most noted for this characteristic.



Bird's eye

Bird's-Eye is a small area in the wood where fibers are contorted to form circular figures that resemble birds' eyes on the surface of the board. It is common in hard maple.



Cat's paw

It is a wood characteristic that has the shape of a cat's paw caused by pin knots. It is most common in cherry.



3.3.5 Defects of wood

One of the biggest challenges of working with wood is to work within the constraints of wood. Various abnormal conditions and features of wood reduce the economic value of wood. These features are termed as defects. These defects in wood may either just reduce its utility or render it entirely valueless. Some present a serious structural weakness in the wood, others do little more than spoil its appearance.

Defects in wood can be broadly classified into two categories which are as follows:

- (1) Natural defects
- (2) Seasoning defects

3.3.5.1 Natural defects —

Knots

Knots are common types of natural defects. Knots vary in size, shape, structure, and color. Knots spoil the appearance and reduce the strength properties of wood. It also raises the seasoning defects and makes difficulties during wood working.



Sound knot

A sound knot, also known as a tight knot, is completely solid with no portion of the knot movable. It is as hard as the surrounding wood and shows no sign of decay.



Unsound knot

An unsound knot, also known as a loose knot, has a portion that will move readily.



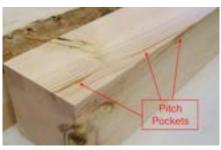
Pin knot

A pin knot is a small, sound, and tight knot.



Knot cluster

A knot cluster is a grouping of usually small knots.



Pitch pocket

Pitch pocket is sometimes referred to as gum spot. These are openings that run parallel to the growth rings containing resin. Cherry is the most common hardwood species with this characteristic.



Worm hole

Voids in the wood caused by the burrowing action of certain wood-infesting worms.

Rot

Rot (also known as decay) is the decomposition of a substance by fungi. Incipient rot is rot in its early stages and usually noticeable only by slight wood discoloration or bleaching of the wood. Advanced decay causes the wood to become soft and punky.



Heart shakes

Heart shakes are usually the result of disease or over-maturity of the tree. The shakes radiate from the centre of the log and are caused by internal shrinkage.



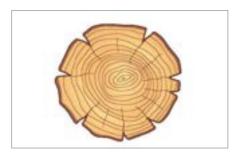
Cup or ring shakes

Cup shakes, also known as ring shakes, are caused by a separation of the annual rings and are usually due to a lack of nutrient or twisting of the tree in high winds. In bad cases economic conversion of the log is very difficult.



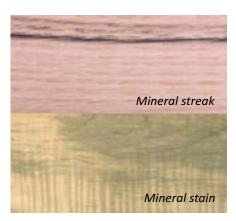
Star shakes

Star shakes are radial cracks which occur around the outside of the log. They are caused by shrinkage at the outside of the log whilst the middle remains stable. This is usually because the log has been left too long before conversion.



Mineral streak

A darkened or discolored wood area, caused by minerals which the tree extracts from the soil, can be mineral streak. Mineral streak appears as a blackish-blue, running parallel with the grain.

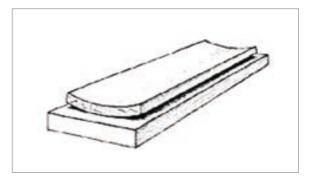


Mineral stain

Mineral stain appears as a dark, blotchy area with undefined boundaries. It can turn an entire board darker in color.

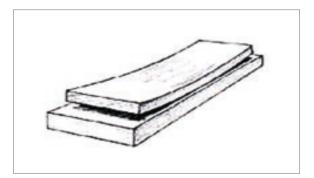
3.3.5.2 Seasoning or drying defects _

Poor seasoning can cause wrapping in wood. Warp means any defect in lumber that deforms a board's shape. A board may be distorted in one of four ways: cupped, sprung, bowed or twisted.



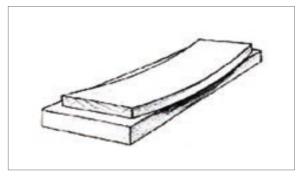
Cup

The board remains flat in length and on edge but curves across its width, away from the heart.



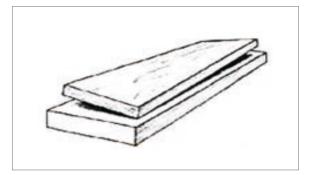
Bow

The board remains flat in width and on edge but curves in length, like a straight road descending a hill.



Spring

The board remains flat in width but curves in length, like a river going around a bend.



Twist

The board curves in length and width like a propeller.

3.3.6 Conversion of wood -

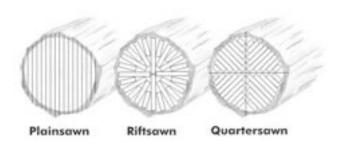
Conversion is the sawing of a log into boards or planks ready for use by the carpenter. How the wood is converted directly affects its usefulness. Mainly there are three types of methods to saw the wood log which determine the grain pattern of the board –

Plain Sawing (Flatsawn)

Plain sawing is the most common method of sawing and consequently most timber is plain sawn. This method provides the widest boards and least waste; therefore, it is the most economical. Flatsawn timber has growth rings at angles of 0 to 45 degrees to the wide surface of the timber.

Quarter Sawn

This method of sawing produces relatively narrow boards and creates more waste. For these reasons (and the additional handling involved) quarter sawn lumber is much more expensive than plain sawn. Quartersawn timber has growth rings at angles of 45 to 90 degrees to the wide surface of the timber.



Rift Sawing

Rift sawing is very similar to quarter sawing, and has the same advantages and limitations. This method of sawing accentuates the vertical grain and minimizes the flake. Riftsawn timber has growth rings at angles of 30 to 60 degrees to the wide surface of the timber.

3.3.7 Seasoning of wood

Wood from newly felled trees contains a high proportion of moisture in the form of sap, which is made up of water and minerals drawn from the soil. Most of this water has to be removed by some form of drying, which is called seasoning. The main reasons for seasoning are—

- To make sure that shrinkage occurs before the wood is used
- To make sure that the moisture content of the wood is below the 'dry rot' safety line of 20 per cent
- To make sure that dry wood is used
- Dry wood is stronger
- Seasoned wood is less likely to split or distort
- Wet wood will not accept glue, paint or polish

The wood should be dried to a moisture content that is similar to the surrounding atmosphere in which it will be used. There are two main methods of seasoning wood –

Air seasoning

For air drying the wood is stacked in a pile in open-sided, covered sheds, which protect the wood from rain but still allow a free circulation of air. A moisture content of 18–20 per cent can be achieved in a period of 2–12 months.

Kiln seasoning

Most wood that is used is kiln seasoned. If done correctly the moisture content of the wood can be reduced without causing any wood defects. Depending on the size of the wood, the length of time the wood needs to stay in the kiln varies between two days and six weeks.

3.3.8 Types of hardwood and their characteristics _



Mahogany -

- It is reddish-brown colour wood.
- It is very strong and durable.
- It resists to warping, shrinkage and swelling.
- It is used for making cabinets, dining table sets, tables, desks, and other items.



Oak -

- It comes in two basic varieties red and white.
- It is strong and bends easily.
- It resists to warping, shrinkage and swelling.
- It is used for making cabinets, book shelves, desks, outdoor furniture.



Maple-

- It has immense strength and hardness.
- It shrinks moderately.
- It is used for making solid wood furniture like bedside tables, console tables and wall shelves.



Sheesham-

- It is known as Indian Rosewood.
- It has a golden-brown colour.
- It is highly durable and resistant to termites.
- It is mostly used for making solid wood furniture like wardrobes, cabinets, bedroom furniture, coffee tables, console tables, etc.



Beech-

- It is light colour wood.
- It is hard, close grained and durable with a fine texture.
- It works fairly well by both hand and machine.
- It takes glue, stains and polish well.
- It is used for Furniture, kitchen utensils, wood block floors, etc.



Teak-

- It comes in shades of medium-dark brown or in a pale yellow colour.
- It is a hard and moisture-resistant wood.
- It is resistant towards warping, cracking, decay and termites
- It is high in durability and stability.
- it is an ideal choice for making furniture.
- It comes in many variety Ghana Teak, Ivory Teak, Burma Teak, etc.
- It is used for making cupboards, cabinets, bed, tables, chairs, paneling, door-window frames, doors, flooring, outdoor furniture.



Ash-

- It is whitish in colour.
- It is straight grained, very tough and flexible.
- Although tough, ash works with machines quite well, and has a reasonably smooth finish.
- It can be glued, stained, and polished and takes nails and screws well.
- It is used for Furniture, boat building, sports equipment, tool handles, etc.



Rosewood-

- It is dark reddish-brown to more golden-brown hues.
- It is close grained, strong and durable.
- It is hard to work with.
- It has an appealing fragrance.
- It is used for making solid wood furniture like cabinets, tables, desks, cupboards, etc.



Walnut -

- It has a rich brown colour.
- It is highly durable and resistant towards warping and shrinking.
- It is easy to work with.
- It is used for making coffee tables, side tables, dining tables, book shelves, wall paneling.





- It has slight reddish hue, to richer shades of reds and browns over time.
- It has a close grain pattern.
- It is easy to work with.
- It is strong, durable and resistant towards warping.
- It is used for making solid wood furniture like shelves, cabinets, tables, etc.



Miranti -

- It requires little maintenance.
- It is easy to work with.
- It is durable and resistant to termites.
- It is used for making door/window frames, shutters, etc.



Sapele-

- It is harder than mahogany with similar strength properties to oak.
- It works fairly well with hand and machine tools, but the interlocked grain is often troublesome in planing and moulding.
- It is used for furniture, veneer, etc.



Mango-

- It is lighter than most other hardwoods, such as oak or teak.
- It is strong and dense.
- It has an attractive grain pattern.
- It is used for making bedroom furniture, cupboards, tables, entertainment units, book shelves, kitchen cabinets, console tables.



Salwood -

- It looks like teakwood and heavier than teakwood.
- It is quite resistant to termites.
- It is strong and durable.
- It is avoidable for furniture making.
- It is used for making door-window frames.

3.3.9 Types of softwood and their characteristics _



Cedar-

- It is a reddish wood with aromatic smell.
- It is a light-weight and highly durable wood.
- It is very easy to work with.
- It has uniform texture.
- It is resistant to insects and decay.
- It is used for making storage chests, decorative panels,



Pine-

- It is extremely popular wood.
- It varies from cream to yellow-brown.
- It has uniform grains.
- It is easy to work with.
- It is not as durable as other types of wood.
- It is resistant to shrinkage, swelling and warping.
- It is widely used for making indoor and outdoor furniture, moldings, and paneling.



Redwood-

- It has a reddish tint.
- It is a light-weight and durable wood.
- It is easy to work with.
- It is resistant to towards insects and decay.
- It is used for making indoor and outdoor furniture, fencing, paneling, etc.



Larch-

- It varies from yellow to a medium reddish brown.
- Its grain is generally straight or spiraled.
- It is moderately durable regarding decay resistance.
- It is used for veneer, utility poles, fence posts, flooring, boat building, and construction timber.

3.3.10 Manufactured wood _

Wood is also available in the form of sheets, which are manufactured in factories and are less expensive than the boards of wood. These sheets are available in different sizes and thicknesses.

Let us take a look at them -



Plywood -

- It is widely used for making shelves, cupboards, cabinets, doors, paneling and partitions.
- It is made by bonding together a number of thin layers of softwood or hardwood.
- There are always an odd number of layers, like 3, 5, 7.
- Each layer is at right angle to the grain of the other layer.
- Available size 8'x4', 8'x3', 7'x4', 7'x3', 6'x4', 6'x3'.
- Thickness 2.5 mm, 4 mm, 6 mm, 8 mm, 10 mm, 12 mm, 19 mm, 25 mm.
- It can be finished by pasting wood veneer or formica on it or by painting it.
- One-side or two-side pre-finished plywood is also available.
- It comes in many grades water and boil proof (exterior grade), interior plywood, shuttering ply and marine ply.



Blockboard or commercial board -

- It is used for making shelves, cupboards, cabinets, doors, paneling and partitions.
- It is composed of softwood strips (up to about 25mm wide) placed edge to edge and sandwiched between two layers of hardwood, and then bonded under high pressure.
- Available size 8'x4', 8'x3', 7'x4', 7'x3', 6'x4', 6'x3'.
- Thickness 19 mm, 25 mm.
- One-side or two-side pre-finished blockboard is also available.
- It is not suitable for outdoor.



MDF-

- It is made from powdered wood bonded with glue and compressed to form the sheets.
- It is quite soft and very easy to work with.
- It is also known as pressed wood or reconstructed wood.
- Thickness 3 mm to 25 mm.







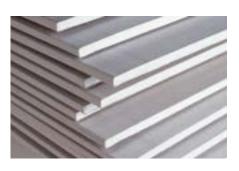
Chipboard –

- It is made by bonding together wood particles with an adhesive under heat and pressure to form a rigid board.
- It is available in a number of densities normal, medium and high-density.
- Normal density is fairly soft and is used for making pinup boards.
- It is not suitable for outdoor because it tends to soak up water.
- Available size 8'x4'.
- Thickness 12 mm to 25 mm.
- Pre-finished chipboard is also available.

Veneer-

- It is made up of narrow (25 to 100 cm) strips of wood glued edge to edge on 4 mm thick plywood.
- Some veneers have no backing on them and are called raw veneers.
- It is a good alternate of wood.
- Available size normally 8'x4'.
- Thickness 4 mm and 6 mm.
- It is used to give finish to a piece of furniture.
- There are many various types of veneer raw veneer, paperback veneer, natural veneer, dyed veneer, recon veneer, artificial veneer.

3.3.11 Other materials —



Drywall-

- It is also known as plasterboard, wallboard, or gypsum board.
- It is a panel made of gypsum plaster pressed between two thick sheets of paper.
- It is used to make interior walls and ceilings.
- Available size 6'x4', 8'x4', 10'x4', 12'x4'.
- Thickness 6 mm and 25 mm.



Decorative laminate or Formica -

- It is artificially made and looks like wood.
- It is also available in fancy designs.
- It is easy to maintain but exposure to water may result in warping or ballooning.
- It is pasted on plywood or blockboard by using glue.
- Available size −8'x4.
- Thickness 0.8 mm to 1.5 mm.



Fiber glass sheet -

- It is a fiber reinforced plastic sheet, in which glass fiber is used.
- It is available in plain, corrugated, coloured, pattern sheets.
- It is highly strong and durable, and light in weight.

— Notes 📃 ———————————————————————————————————	

- Scan the QR codes to watch the related videos



Wood and Other Materials

UNIT 3.4: Furniture Fittings and Accessories

- Unit Objectives 🥝



After completing this unit, you will be able to:

- 1. Know about different types of nails and screws
- 2. Know about the adhesive used in furniture
- 3. Know about different types of hinges and channels
- 4. Know about other hardware used in furniture

3.4.1 Fasteners —

To give extra strength to joint, some fasteners are used, such as nails, screws etc. Always remember to choose right nails and screw for good results. When choosing a fastener you must consider certain factors, which include:

- What strength must the fastener have?
- Where will the fastener be used?
- Will the fastener need to be removed at a later stage?

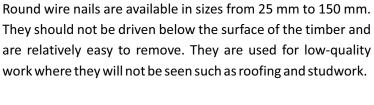
3.4.1.1 Nails ——

Nails consist of a head and shank and are inserted by a hammer or mechanical tool. There are several types, made from either ferrous or non-ferrous metal. Ferrous metals contain iron and will therefore rust unless protected. The furniture installer must decide on the most appropriate nail for the required application.





Round wire nail



Oval wire nail

Oval wire nails are available in sizes from 25 mm to 150 mm. They are manufactured from ferrous metal and can be punched below the surface of the timber. They are less likely to split the grain of the timber and are usually used for higher-quality work than the round wire nail.



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Angular ring nail

Annular ring nails are available in sizes from 20 mm to 75 mm and are also sherardised to prevent rusting. These nails are similar to round wire nails but feature a series of rings along the shank that makes them much harder to remove, and also provides a stronger hold.



Headless nail

Lost head or headless nails are available in sizes from 40 mm to 75 mm. The head can be punched below the surface of the timber for concealment.



Panel nail

Panel pins are available in sizes from 20 mm to 40 mm. They are easy to punch below the surface, causing little damage to the face of the work. They are used for fine applications. Variations include sherardised and brass versions that resist rust, and veneer pins for extra fine work.



Tack

Tack nails are mostly used in upholstery work. They are used to fix fabric, leather, rexin, etc.





3.4.1.2 Screws _

Most modern screws are computer designed. Like a nail, screws consist of a head and a shank. However, the shank is threaded and designed to pull the fastener into the material into which it is being inserted. Screws are manufactured from both ferrous and non-ferrous materials and are defined by:

- Head type
- Length, measured from the tip to the part of the head that will be flush with the work surface, ranging from 12 mm to 150 mm
- Gauge (the diameter of the shank), ranging from 2 mm to 6.5 mm

Once again, it is the furniture installer's responsibility to choose the correct screw for the application in which it is being used.

Countersunk screw

Screws with countersunk heads are used when the screw has to be flush with the work or below it.

Raised head screw

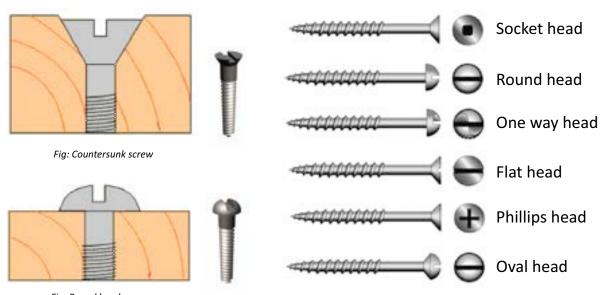
Raised head screws are usually used for attaching metal components such as door handles.

Round screw

Round heads are usually used for attaching sheet material to timber that is too thin to countersink.

Mirror screw

Mirror screws have a thread within the head to which a decorative dome can be attached. As the name suggests, these are used mainly for fixing mirrors.



3.4.2 Fittings -

There are some fittings which are used to assemble the ready wood structures together. These fittings hold structure in such a way that one structure can be opened or closed. They are hinges, drawer runner, sliding fittings, etc.

3.4.2.1 Hinges -

Butt hinges

These hinges have two flaps joined together by a pin. They are mostly used in doors and windows.

Fig: Butt hinge

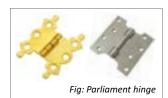
Piano hinges

They are thin-stripped hinges and the width of the flaps is less. They are long and can be cut as per requirement. These hinges are used in wardrobes, cabinets, beds etc.



Parliament/Butterfly hinges

The shape of these hinges resemble the English letter "H". By using these hinges, the doors and windows can be opened at a length from the frame.



Thinges

The shape of these hinges resembles the English letter "T". One flap of this hinge is like the Butt Joint and the other flap is long and oblique. These hinges are used in flapped or planked doors or in heavy doors.



Concealed hinges

These hinges are widely used in the modern age. They are mostly used in wardrobes, cabinets, modular furniture etc. After using this, wall catchers and magnets are not required.



3.4.2.2 Runner -

Generally Drawer runners/ channels are known as Telescopic runners. The runner is mounted on the drawer for smooth operation. The runners are mounted on the side of the drawer and also on the base of the drawer. The application of the drawer are 1) Part Extension runner, where only partial drawer is openable, 2) Full Extension runner, the whole drawer is openable and 3) Over Extension runner, the drawer is openable beyond the carcase.

Ball bearing runner

These runners are mounted on the side wall of the drawers. The runner have ball bearings for the

smooth operations and are visible on opening of the drawer. These runners are available in different size from 250 mm to 900 mm. The runner requires 25.4 mm on the side while fixing.

Roller runner

These runners are comparatively cheaper thus are used in the furniture especially office furniture. These runners are mounted on the side base of the drawers and are visible on opening of the drawer. These runners are available in the market 250 mm to 900 mm.

Under mount runner

These drawer runners are mounted under the base and are not visible during the movement of the drawer. The runners are available in part extension and full extension and are auto closing. These runners are available in soft close mechanism.







Fig: Boll Bearing Runner

Fig: Roller Runner

Fig: Undermount Runner

3.4.2.3 Sliding channel





These sliding mechanism is used for sliding doors and windows. These runners are top hung and a guide rail in bottom for smooth mechanism. These channels are available for different weight carrying capacity.

3.4.2.4 Plug fixings -



Nails and screws can be used to fix components to masonry. However, the furniture installler must first plug the masonry, which can either be done using a plugging chisel or an electric drill. If a plugging chisel is used furniture installler can make their own plugs from wood, but this is time-consuming and not commonly done now. When using an electric hammer drill to plug a wall, several plug types are available. All of these work on the same principle. A plastic segmented sleeve fits snugly into a hole that has been pre-drilled. A screw is then inserted into the plastic sleeve that pushes the segments apart to grip the side of the hole.

3.4.3 Accessories

3.4.3.1 Door bolts (Tower bolts) -

Door bolts are used to close doors and windows from inside. They are available in different designs.

Tower bolt

It is made of metal. It has a totally straight bar called Shute, which closes the door bolt. It is bent on one end. This bar or Shute slides on a strip. One end of the door bolt is fitted on the side of the frame. This is called a staple. The other end is fitted on the door, which is the main part of the door bolt. They are available from 4 inches to 24 inches in length.

Flush Bolt

This bolt is fit equally as per the surface of the door or window. It is available from 2 inches to 8 inches in length.

Slide Bolt

This bolt is small in size and used in small doors and ventilators.



3.4.3.2 Locks ———

To close a door temporarily, different types of locks are used. For securing the house, it is necessary to put locks on the doors. There are different types of locks:

Pad lock

These locks are of the hanging types. This type of lock is used in doors having L Drop, J Bolt and Hasp & Staple.

Mortise Lock

It is a lock which is set within the body of a door in a recess or mortise, as opposed to one attached to the door surface. It has a separate handle that controls the lock's latch bolt through a hole. The keyhole is also in the handle.

Cylinder lock

A cylindrical lock is designed to be installed through the door with a knob or lever on either side that retract the latch when turned or depressed.







Rim Lock

These locks are fitted inside the room. Mainly it is used on main door of the house. These locks are similar to Mortise Locks, but they don't have handles.



Drawer Lock

In these kinds of locks, a slot is cut in the upper side of the surface. From the outside only the keyhole is visible.



3.4.3.3 Handles & Knobs



Handle

Handles are used to open doors and windows. Basic handles are available in sizes ranging from 4 inches to 12 inches in length. They are made of iron, steel, brass or other metals. They are available in different designs. They are of different types like chest handles, drawer handles, flush handles etc. They can be customized also.

Knob

Often knobs are used in place of handles. They look very nice. They are used in wardrobe doors, drawers and cabinet doors. These screws are tightened twice. They are made of iron, brass, glass or other metals.



3.4.3.4 Catchers and Stoppers -

Catchers

They are used to keep wardrobe or cabinet doors closed. They are of different types, like magnet catcher, ball catcher.

Door stoppers & Window stoppers

They are used to keep door or window open. They hold the door or window at their places.



3.4.3.5 Other accessories





D-Bracket

This bracket is used for fixing glass shelves and is available in different sizes

3.4.4 Adhesives

There are many woodworking joints which can be made without using adhesives. For example, mortise and tenon joint, dovetail joint. But the use of adhesive can reinforce the joint.

Poly-vinyl adhesive emulsion (PVA)

It is a synthetic resin adhesive in the form of a milky white viscous paste and is ready to use. It gives very strong bond and it is resistant to water and heat. It is used to bond wood, plywood, laminates, veneers, particle board, block board/hard board, MDF to each other. This adhesive is available in the market under the brands named Fevicol, Vemicol, etc. It can be applied with brush, roller or spreader.



Solvent Rubber Adhesive (SR)

It is synthetic rubber based adhesive. It is used to bond the surfaces where it is difficult to apply pressure. It is used specially for bonding vertical laminates to wood and plywood. It is also used for bonding rubber, rexine, leather, foam, fibre, metal, glass, ceramic, canvas, etc. It is applied using a brush or a spatula.

Always keep in mind that adhesive should be used in correct way. All adhesives are neither suitable for exterior job nor for all types of materials. Follow the instructions of manufacturer while using adhesive.



─ Notes 🗐

UNIT 3.5: Tools, Machines and Equipment

- Unit Objectives 🏻 🌀



After completing this unit, you will be able to:

- 1. Know about hand tools used in furniture making and their usage
- 2. Know about power tools used in furniture making and their usage
- 3. Use and maintain tools in correct and safe manner

3.5.1 Tools and machines —

Like every trade, woodworking has its tools. Any good Furniture Installer knows that the right tool for the project is very critical in manufacturing a quality end product in a timely manner. These tools help to make furniture in easier, faster, and more accurate manner.

There are mainly two types of tools –

- Hand tools
- Power-operated tools

A Furniture Installer should have full knowledge of these tools to become an efficient wood furniture carpenter. Let us know about these tools

3.5.2 Measuring tools ——



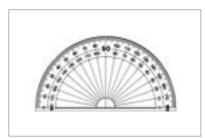
Measuring tape -

- It is an important hand tool for the woodworker.
- It is used to measure big pieces of wood.
- You should have a retractable one that is at least 25 feet long. Any longer than that, and you will start having problems getting it to roll back up.
- You should make sure that the "hook" or tab at the end of tape is firmly attached, with no give. When it gets loose, you will have at least 1/8" variation in your measurements. This can add up to some severe accuracy problems in the long run.



Rule-

- Rule is the most common and the best-known piece of measuring equipment, for measuring linear distance.
- Least count for Rule is normally 1 millimeter and 1/8 inch (normally one side has Centimeters and other side has inch scale).



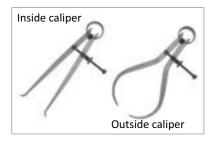
Protractor -

 A protractor is a circular or semicircular tool for measuring an angle or a circle.



Wing compass -

- It is a two-legged tool and the ends of these legs are pointed.
- It is used to mark arcs and circles etc.
- It is made up of steel.



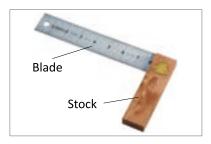
Caliper-

- This tool is required to take indirect measurements.
 Measurements taken by this tool is read on the steel rule or steel tape. They are of two types
 - **1. Outside caliper:** With this caliper, the outside measurement of wood or any object, such as the diameter of the round object, length and width etc. of the flat object is measured. It has rounded end points.
 - **2. Inside caliper:** With the help of this caliper, the internal measurements such as the diameter of the holes, slits etc. are taken. It has two legs, which are twisted outside.



Vernier Calliper -

 Vernier Calliper is in instrument which is used to calculate even 0.01 difference in the wood working.



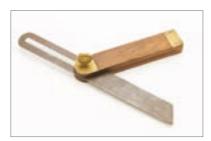
Try square -

- It is a L-shaped tool used to mark or check the right angle (90°) of the wood.
- It is made of steel or wood.
- It has two main parts 1) Blade 2) Stock



Miter square -

It looks like a try square but instead of 90°, the angles of 45° and 135° angle can be measured from this.



Bevel square -

- It is used to check or move not only the right angle but also different angle.
- It is used to make the layout or move the angles of the dovetail, side rails of the chairs, louvered door, chamfer, etc.

3.5.3 Marking tools —



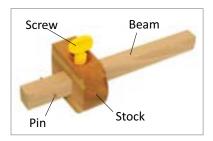
Pencil-

- It is used to mark cutting lines on wood.
- It is also used to make drawing and write measurements.
- Normally 2H pencils are used, which are very hard and can write or mark almost on any surface.



Scratch awl -

- It is a tool, which is used for layout and point making.
- It is used to scribe a line.
- It is a steel spike which marks a fine groove on wood.



Marking Gauge -

- It is used for marking parallel lines on wood.
- Stock and beam are its main parts. Stock is made of wood. It has a sqaure hole in which wooden beam is sliding. Stock has hole at one end. A thumb screw is fitted in it which controls heam
- There is a pin at one end of beam which makes marking on wood.



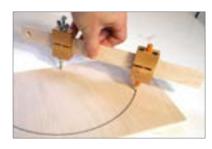
Mortise Gauge -

- It is a very common tool for marking on beam.
- It is made of a fence like support, which can be locked and moved on a beam for marking.



Divider -

- It is a two-legged tool and the ends of these legs are pointed.
- It is used to lay out an arc circle or step off division on a line.
- It is made up of steel.



Trammel point -

- The Trammel point is used to draw big circles and to mark big
- It is a long thin wooden baton or steel rod on which there are two pointed sliding points.
- These pointed sliding points are tightened at the length according to the radius of the circle or arc by knurled screw.
- An arc or circle is drawn by keeping one point at the center.



Marking Knife -

- A good utility knife is another asset for the woodworker.
- There are many different kinds, but the kind that uses disposable blades is the most common.
- The woodworker uses the utility knife when cleaning out mortise joints or scribing wood, as well as many other uses.



Chalk Line or Marking Thread

- This is used to mark the straight line.
- Since sometimes the wall size is bigger where marking cannot be done by hand then this marking thread is used.

3.5.4 Planing tools

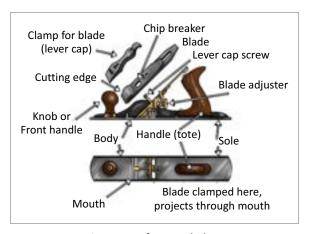


Fig: Parts of a metal plane

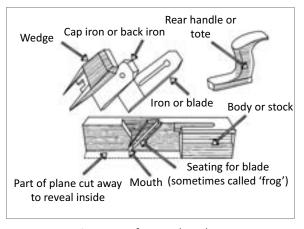


Fig: Parts of a wooden plane



Jack plane -

- This is a common type of planer and with the help of this planer only the surface of the wood is planed.
- Its length varies from 14 inch to 18 inch and the width of its cutter blade is 1^{3/4} inch to 2^{1/4} inch and over the cutter blade, there is a cap iron which is fixed with a bolt.
- Cutter blade is fixed at an angle of 45° to 48°.



Smoothing Plane

- It is also known as cleaning planer.
- It is used on the wood after jack planer has done planning.
- The wood looks neater after it is used for planing.
- Its length is from 6 inches to 9 inches. The width of its cutter blade is from 1^{3/4} inches to 2 inches.
- Its blade is set from 45° to 50° angle.



Trying plane -

- This planer is also known as the Jointer planer.
- It is used to plane the edge of the long wood.
- Its length ranges from 20 inches to 28 inches.
- All of its parts are similar to those of Jack planer.



Plough plane -

- It is also known as grooving plane.
- Its length varies from 6 inches to 10 inches. The width of its cutter blade is from 1/8 inch to 5/8 inches, which can be adjusted according to the size of grooving.
- This planer is used to make a slot or a groove parallel to the wood.



Rabbet plane -

- This planer is used to make rabbet in the wood.
- The length of this planer is from 7 inches to 9 inches, the width of cutter blade is from ½ inch to 1½ inch.



Spokeshave -

- The spokeshave, is held horizontally by two symmetrical handles in line with the cutting edge of the iron.
- It has a very short sole, either flat, concave, or convex.
- It is used for smoothing curved surfaces.

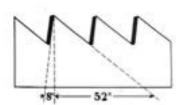


Moulding Planer

- The moulding planer shape is similar to smoothing plane.
- The bottom sole of this moulding plane is designed so as the cutter blade is also designed to create moulding in the wood.

3.5.5 Cutting tools _

Rip saw



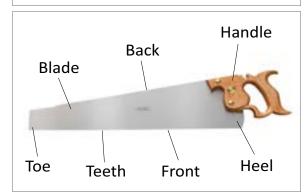
Rip saw teeth

The rip saw is designed for cutting with the grain and cuts on push stroke. The front face of rip teeth has an angle of 8° ; the back angle is 52° . Rip teeth are filed straight across the face and give the appearance of a series of chisel edges.



How a rip saw cuts

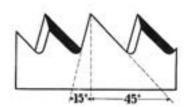
Rip teeth cut like vertical chisels. First on one side of the set small pieces of wood are cut loose across the grain and pushed out. Then on the other side, the tooth following plows out a similar particle.



Rip Saw -

- It is used to cut the wood along the grain.
- The length of these saw ranges from 24 inches to 28 inches.
- In these saws, there are 4 to 7 teeth in an inch.

Cross-cut saw



Cross-cut saw teeth

The cross-cut saw is designed for cutting across the grain and cuts on the push stroke. The front face of cross-cut teeth have an angle of 15°; the back angle is 45°. The beveling of the edges of the teeth of about 15° gives the appearance of a series of knife-like points which makes for easy identification of a cross-cut saw.



How a cross-cut saw cuts

The teeth first score the wood like points of two parallel knife blades as the saw is drawn across the grain. Then the edges of the teeth begin paring the groove which is formed and clear the sawdust from the kerf.



Cross cut saw -

- It is used to cut the wood across the grain.
- The length of these saw ranges from 24 inches to 28 inches.
- In these saws, there are 4 to 7 teeth in an inch.



Hand saw or Panel saw -

- It is a combination of Rip Saw and Cross Cut Saw.
- It is a small saw in length. Its length normally ranges from 12 inches to 18 inches.
- There are 6 to 9 teeth in one inch. It works more precisely since teeth per inch are more.



Back or Tenon saw -

- These saws are commonly used to cut tenon or shoulders of tenon.
- Its blade has equal front width and back width. There is an iron or metal strip at the back of these saws, which does not allow it to fold.
- These saws are 10 inches to 16 inches long.
- There are 8 to 10 teeth in an inch.



Dovetail Saw -

- It is used to cut the dovetail joint and socket.
- This saw is similar to the Tenon saw but the blade of this saw is very thin.
- The length of this saw is less than the length of Tenon saw. Its length is from 8 inches to 12 inches.
- There are 14 to 16 teeth in an inch.



Compass Saw -

- This saw is used to cut wood pieces spherically.
- The blades of this saw have lesser width. In one inch there are 8 to 12 teeth.
- The length of these saws ranges from 10 inches to 14 inches and the width of the blades is less at the toe end.



Fret saw -

- The width of the blade of this saw is very less (about 5 millimeter) and the length is from 5 inches to 6 inches.
- This saw can cut small curves in wood very easily. This saw is mostly used in carving.
- The teeth are very fine.
- This saw has a straight handle.



Coping Saw -

- This saw is used to make curves in the wood.
- The blade of this saw is very thin and of a lesser width. The blade is screwed on the frame at both ends and can be replaced if broken.
- The length of the blade is about 6 inches.



Key Hole Saw-

- This saw is used to cut keyholes in wooden doors.
- The width of the blade ranges from 3 millimeter to 10 millimeter and the length is from 6 inches to 8 inches.
- This is very rarely used nowadays.



Bow Saw-

- This is a saw with a frame and a straight handle.
- The shape of this saw resembles the English alphabet "H".
- The width of the blade is from 3 millimeter to 10 millimeter and the length ranges from 12 inches to 16 inches.
- This saw is used to make the curve in the wood.

3.5.6 Chipping tools -



Firmer Chisel -

- It is used by applying pressure or hitting lightly with the Mallet.
- This chisel is used to clean already created mortise, holes or grooves.
- Its Blade is about 6 inch long and 1/8 inch to 1.5 inch wide.
- The cutting angle of its blade is 30°.



Bevel chisel -

- It is similar to Firmer chisel. The difference is only that the edges of this chisel are tapered.
- They are used to clean groove, mortise and to make dovetail.
- The width of its blade is about 1/8 inch to 1.5 inch.



Paring chisel (long chisel) -

- The length of this chisel is 8 inch to 10 inch.
- This chisel is similar to Firmer Chisel or Bevel Chisel. The difference is only that this chisel is long.
- The width of its blade is ½ inch to 1.25 inch.
- They are used to clean long and deep mortise.



Chopping Chisel (wider chisel) -

- These chisels are wider.
- The width of the blade is 1.5 inch to 2.25 inch.
- All its parts are similar to those of Firmer Chisel.



Mortise Chisel -

- These chisels are used to cut the mortise.
- The width of its blade is less at cutting edge and more towards shoulder. It is tapered in shape.
- The handles of these chisels are very strong. A metal ring is attached to the ends of these handles so that the handle does not break on applying a heavy blow.
- The thickness of its blade is more than its width. Its width is 1/8 inch to ¾ inch.



Socket Chisel -

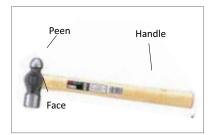
- It is used to make big mortise.
- There is a socket instead of a tang attached to its shoulder, into which the handle is fitted.
- This chisel is longer and stronger than Mortise Chisel.
- The width of its blade is 1/8 inch to 1.5 inch.



Gouges -

- Gouges are used to make round or curved mouldings.
- Its blades are curved inside and its cutting angle is inside or outside. Its cross section is circular.

3.5.7 Striking tools _____



Ball Peen Hammer -

- The peen of this hammer is like a ball.
- It is used to drive the nail on wooden surface.



Claw Hammer -

- It is used to drive and pull out nails on wooden surfaces.
- On one end of its head are claws, therefore, it is called Claw Hammer.



Cross Peen Hammer -

- The peen of this hammer is V-shaped towards head.
- This hammer is used to drive the nail in the corners of wood.



Straight Peen Hammer -

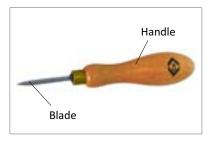
- The peen of this hammer is parallel to the handle.
- It can be used where cross peen hammer cannot be used.
- It is used more in sheet metal works.



Mallet-

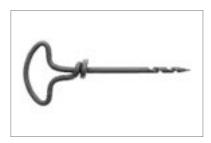
- This is a type of hammer made of wood or rubber.
- It is used to drive other tools like chisel or adjust the blade of plane.

3.5.8 Boring and Drilling tools _____



Brad Awl -

- It has only two parts Blade and Handle.
- It is used on soft wood to make shallow holes and screw holes. By applying pressure to the handle, holes are made.



Gimlet-

- It is used to make deep holes of 10 millimeter to 50 millimeter diameter.
- It has a handle. It is around 2 feet long. Its tip is helical and then shack has twists up to 3 inch to 5 inch.



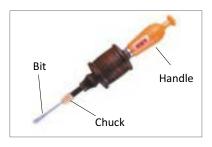
Auger-

- It is used to make big and deep holes to insert bolt etc.
- The shack is twisted up to considerable length. Its tip is also helical.
- To make a hole in the wood, wood is kept on the ground and Auger is moved towards a single direction. As hole is cut, wood filings come out automatically.



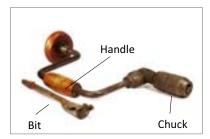
Hand Drill -

- It is used to make holes up to 12 mm in wood.
- It is made of iron and there is a gear wheel attached to it having teeth. It has a handle, by moving which, drill chuck is rotated. It has two handles. One handle is held firmly and another handle is rotated.



Country Drill -

- It is used only in India.
- A wooden stick with a rope attached to it.
- It is made of wood.



Plain Brace -

- There is a crank in this hand drilling chuck. By rotating the crank the drill chuck rotates.
- Its U crank is made of iron or steel.
- There is a handle in the middle and a head knob at the top. This knob is pressed with one hand and the handle is rotated with the other hand. Drill bit is fixed in the jaws of drill chuck.

Drill Bits -

- Drill bits are cutting tools used to remove material to create holes, almost always of circular crosssection.
- Drill bits come in many sizes and shape and can create different kinds of holes in many different materials.
- In order to create holes drill bits are attached to a drill, which powers them to cut through the workpiece, typically by rotation.
- The drill will grasp the upper end of a bit called the shank in the chuck.

Drill bits come in standard sizes,



Expansion Bit -

- There is an adjustable cutter. By adjusting it, holes of many shapes can be made.
- There is a helical centre point which makes footing for making a hole.
- Holes of 12 millimeter to 75 millimeter diameter can be made on the wood with it.



Countersunk Bit -

- It is used to make a hole to fit countersunk bit.
- To get the head of the screws in the same level of the wood, its cutting edge is conical in shape and cutting flutes are made on it.
- They are available in 6 to 20 millimeter size.



Hole cuter -

 This is used for install circular lock and is fixed in drill chuck of Drill machine.



Hinge boring drill bit -

- This bit is used for fixing concealed hinges.
- This is used with dia 35 millimeter.



Auger bit -

- It is used to make shallow wide holes.
- In the centre of the bit there is a helical point, which becomes footing for making a hole in the wood.
- Its spur or scriber which is on the edge of the hole to be made makes a marking. Then the cutter completes the hole.
- It is available in sizes varying from 3 to 50 millimeter.



Frostener bit -

- It makes precise, flat-bottomed holes in wood, in any orientation with respect to the wood grain.
- The bit includes a center point which guides it throughout the cut.
- The cylindrical cutter around the perimeter shears the wood fibers at the edge of the bore, and also helps guide the bit into the material more precisely.

3.5.9 Testing tools



Spirit level -

- It is used to check level of vertical and horizontal surfaces.
- When this is placed on a vertical or horizontal surface, if the bubble is at the center position, it means that the surface is perfectly level.



Plumb bob -

- It is used to check level of vertical surfaces.
- It is conical in shape and made of iron or metal.



Try square -

• It is used to check flatness and squareness of a wood piece.



Miter square -

■ This is used to measure the 45° angles of wood piece.



Water level pipe -

- This is a transparent ½ inch thick long pipe, which is filled with water.
- It is used to check the level of a horizontal surface.



Straight edge -

- This is used to check the straightness of long wood pieces.
- It also helps to give guideline to cut straight.

3.5.10 Holding tools _____



Bench Vice -

- This vice is always fitted in the working bench.
- It is used to hold the wood in place while sawing, cutting, splitting and planing, chiseling etc.
- It has two jaws, one of which is fixed and the other is movable.



G-Clamp -

- The frame of it resembles the English alphabet 'G'.
- It is used for small tasks.
- It is used to hold pieces of wood together while working. It is also used to hold the wood on workbench while working with chisel.



Bar Clamp -

- This clamp is long. Its length is from 2 feet to 7 feet.
- Big frames and models are glued and clamped in it.
- It is made of bar steel and there are equidistant holes in it.

3.5.11 Other helping tools -



Miter box -

It is used to cut wood at an angle.



Pincer-

- It is used to pull out nails from wood and cut wires and nails.
- It is made of iron. Before using it to pull out nails from a wooden surface, a piece of wood should be kept below the nose of it so that the wooden surface does not get damaged.



Screwdriver-

- It is used to drive or loosen the screws.
- The head of the Philips screws are of the shape of the plus sign (+).





Phillips









Pozidriv

Security T

Hexagon



Slotted

Nail set -

• It is used to set the head of a nail lower than the surface of the wood.



Saw Setter -

• This is the instrument, which is used for tuning of saw blades.



Oil Stone -

This is used to sharpen chisels and the blades of smoothing planes.



File-

■ It is used to smoothen surfaces and edges.



Cabinet scraper -

■ It is used to make surface flat and smooth.



Wrecking bar -

It is used to pull out nails from wooden surfaces.



Bench hook

 A bench hook holds a piece of wood firmly in position on a workbench while it is cut.



Work bench-

- It is a waist height table and is used to give support while cutting, chiseling, or planing the wood.
- Generally, bench vice is attached to it.
- It has a lower shelf where tools or material can be kept.
- The length of this bench is 8 feet. Its width is 3 feet and height is 2' 6". Its size can be reduced or increased as per nature of the work.



Saw horse -

- It is used to support the wood or board while cutting with saw.
- It can be used as a base of a worktable on sites.

3.5.12 Portable power-operated tools _____



Jigsaw-

- It is used for straight cutting as well as round and zig zag cuttings.
- This machine has thin and long blades which move up and down when the machine is powered on. The teeth are bent downwards and there is a strong handle for gripping the machine.



Circular saw -

It is used to cut large piece of wood or board straight.



Power drill -

■ It is used to drill holes in the wood.



Router -

It is used to shape surfaces and edges of wood piece.



Planer-

- This machine can be used in smoothing of wooden blocks as well as in taking out the fillings.
- This can be used in smoothing woods as well as in rebating and chamfering.



Nail Gun -

A nail gun or nailer is a type of tool used to drive nails into



Palm Sander -

- It is used to make surface smooth using sand paper.
- They usually move in a circular pattern, or back and forth.



Random Orbital Sander -

- A random orbital sander is improved version of 'palm sander'.
- The random orbital sander uses hook and loop (Velcro) to fasten the sanding disks to the sanding pad.



Compound Miter Saw -

It is used to cut the wood at an angle.

3.5.13 Table power-operated tools-



Table saw –

- This is a permanent fixture in wood working shop.
- It is used to rip, miter, shape, square, groove, and join.





Band saw -

- It is used for cutting precise shapes and curves.
- It is a powerful tool when cutting rabbets and tenons.
- You can also rip small pieces of wood and even make your own laminate strips with a band saw.



Drill Press -

- The drill press delivers the precise and accurate large-diameter holes.
- The depth of the hole can be set. This is especially useful when a number of holes are needed to drill, all to the same depth.
- The drill press also allows to use forstner bits, hole saws, and spade bits.



Surface Planer -

It is used to cut the wood at an angle.



Workshop Vacuum Cleaner –

You may not think of a Vacuum Cleaner as a woodworking tool, but as soon as you start working with saws, sawdust will start flying in air and into your eyes. This is much like the home vacuum cleaner. You just take a hose with you from one room to the other, plug it in, and the vacuum does its job, taking everything to the central vacuum receptacle.

3.5.14 Safety precautions while working with tools _

Do's-

- ✓ Always use the right tool for the job.
- ✓ Always use personal protective equipments.
- ✓ While giving a sharp tool to anybody, hold the edge in your hand and the handle to other person.
- √ Keep the sharp tools in designated place only.
- ✓ Check power tools before using them for broken plug or poor condition of the cord.
- ✓ Always sharpen the blades of plane or chisel before using them.

Don'ts-

- X Do not keep hand tools on machine.
- X Do not keep sharp tools in your pocket.
- X Do not use caliper as tongs.
- X Do not wipe off edges of the steel pull-push rule with bare hands to avoid injury.
- X Do not use power tools near water, inflammable gas, or oil.
- X Do not touch power tools while they are working.
- X Do not use power tools with wet hands.
- X Do not talk while working with tools.

3.5.15 Handling of tools

- Keep the tools in their designated place.
- After completing the job, clean the tools properly before storing them.
- Oil the movable parts of the measuring tools, such as calipers, divider, compass to avoid stock-up.
- Ensure that sand do not get inside the case of pull-push rule to avoid wearing off of the graduations.
- Keep chisels in the plastic end cover.
- All metal tools should be kept free of rust. Rub them occasionally with an oiled cloth.
- Follow the manufacturer's instructions to clean power tools.



Fig: Toolbox with proper arrangement of tool & equipment

3.5.16 How much power do power tools require? _

Power tools fed on amps. The amps, or amperage, reflect the amount of electricity the motor draws. Though most power tools use 15 amps, some require more. The nameplate on the tool body or motor housing indicates how much the tool will need or draw the electricity under full load. The nameplate also indicates, if any, that can be wired to run on 240 volts instead of 120.

Tool	Typical Current Draw (Amps)		
Circular saw	15		
Random-orbit sander	3		
Shop vacuum	10		
Router	12		
Mitre saw	15		
Jointer	8		
Planer	15		
Table saw	13		
Bandsaw	9		
Drill press			
Dust collector	13		
Mortiser	5 13		
Drum sander			
Belt/ disk sander	9		
6-gal. air compressor	18		
Electric heater (220v)	20		

Fig: list of power tools with their power (Amps) requirement

— Notes 🔲	

UNIT 3.6: Woodworking Benches

- Unit Objectives 🏻



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

- 1. Know about the importance of working benches in the woodworking processes
- 2. List different parts of a woodworking bench
- 3. Understand different types of woodworking benches and their usage
- 4. Understand the design and manufacturing considerations for a woodworking bench
- 5. Know the basic of woodworking vises and their different types

3.6.1 Introduction

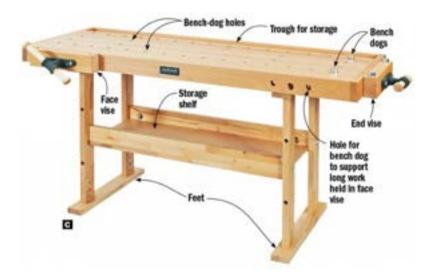
Woodworking Workbenches are essential pieces of furniture for any woodworker. They provide a stable and secure surface for cutting, sanding, drilling, and all other woodworking projects. A workbench must be strong and durable, with features to make woodworking easier and more efficient. Depending on the user's specific needs, it can be customized with various features, such as adjustable heights, drawers, shelves, and clamps. With a good quality workbench, the user can produce reliable, professional-looking results and increase productivity. The type of workbench chosen will depend on the project size and the workshop size.

There are a variety of styles available, from basic workbenches to specialized benches designed for specific types of projects. No matter what type of workbench gets chosen, it should be designed with the highest quality materials and construction techniques to ensure it will last for many years.



Fig: Carpentry using Woodworking Bench

3.6.2 Parts of a Workbench



A woodworking workbench is the foundation of any woodworker's shop. It provides a stable, secure surface to work on, and the right components can make the difference between success and failure on a project. Here's a look at the different parts of a woodworking workbench:

- 1. **Top:** The top of the workbench should be thick, flat, and solid. It should be made from solid hardwood, such as maple or oak, and at least 2" thick. The top should also be reinforced with plywood or masonite backing for added rigidity.
- 2. **Legs:** The legs of the workbench should be solid and stable, typically made from 4x4s or 2x4s. The legs should be securely fastened to the top of the workbench with screws or bolts.
- 3. **Apron:** The apron is the frame that connects the legs of the workbench. It should be made from solid hardwood and securely fastened to the legs with screws or bolts.
- 4. **Drawers:** Drawers are a great way to store tools and supplies. The drawers should be made from solid wood and fit snugly in the apron of the workbench.
- 5. **Vises:** A vise is an essential part of a workbench. There are several types of vises, including the front, end shoulder.
- 6. **Holdfasts:** Holdfasts are metal pins that can hold a piece of wood in place while working on it. They should be securely fastened to the top of the workbench.
- 7. **Dogs:** Dogs are metal pins that hold a workpiece while you work. They should be securely fastened to the top of the workbench.
- 8. **Tool Tray:** A tool tray is a great way to keep your tools organized and easily accessible. The tool tray should be securely fastened to the top of the workbench.
- 9. **Bench Stop:** A bench stop is a wood or metal piece that can hold a workpiece in place while you work. It should be securely fastened to the top of the workbench.
- 10. **Lighting:** Proper lighting is essential for any woodworking project. A good overhead light can be installed over the workbench.

3.6.3 Different Types of Woodworking Benches

Working on delicate projects in the incorrect environment may be unpleasant, especially when a little room or the wrong kind of space has a detrimental impact on the outcome of your project. Finding the correct type of workbench is critical for woodworkers. Not only will a suitable workbench allow you to spread out, but it will also store your tools and materials in one place.

Workbenches are not all the same, and many are custom-made for a specific hobby or industry of woodworking. Let's take a look at the various types of workbenches available for various hobbies and crafts below.

Woodworker's Bench

It is one of the most common styles of workbenches used in woodworking. A woodworker's bench typically has a hardwood surface at least two inches thick. The top might be made of a single piece of wood or several pieces linked together.

A woodworker's bench usually has two vises, one at the front and one at the back. It also has evenly spaced holes known as "dog holes," which are holes for "bench dogs," which are clamps used to hold jobs on a workbench. They can be used to line the front or rear of the workstation. Four legs support the bench, and drawers and shelves can be installed for storage.



Fig: Woodworker's Bench

Cabinetmaker's Bench

The top of a cabinetmaker's bench is similar to that of a woodworker's bench. There are normally two vises, one at the back and one at the front. Bench dog holes, aligned with the tail vise, punctuate the front of the bench.

The casework beneath the working surface characterizes the cabinetmaker's bench: drawers and cupboards used to store tools and supplies. New benches are typically more expensive than traditional woodworker's benches (the casework involved in drawers and cabinets requires much added time and materials). Old ones are quite difficult to come across.

A good cabinetmaker's bench is ideal for a small-scale workshop where the bench must serve numerous functions. The tabletop serves as the work area, while the space beneath it serves as effective storage for a variety of tools.



Fig: Cabinetmaker's Woodworking Bench

Backboard Workbench

This simple workbench design may be found in houses worldwide and has long been considered a household workbench alternative. A backboard workstation typically comprises a simple, long table supported by at least four legs. The table has a flat metal or wood surface and is sometimes built with plain plywood.

The back of the bench has a backboard commonly made of pegboard. The backboard can be customized with holsters and hooks to provide enough tool storage. This bench style is typically preferred by those who use their workbench to repair rather than develop new projects.



Fig: Backboard Woodworking Bench

Portable Bench

If space is an issue where you work, portable benches are the ideal alternative. Portable benches that are quite adaptable are commercially available. The portable benches can collapse the entire structure into a small, compact bundle.



Fig: Portable Woodworking Bench

Custom-made Bench

You can create your custom-made bench from scratch if you have the time, patience, and resources. You can also integrate a few important characteristics that you find handy for the type of work that you do.

The significant advantage of creating your personalized desk is that you may tailor the proportions to your environment. If you make your workbench, you will obtain a perfect fit and will be able to maximize the dimensions of your workbench.

Aside from that, making your personalized workstation saves you a lot of money.



Fig: Custom-made Woodworking Bench

3.6.4 Designing and Manufacturing a Workbench

Designing and manufacturing a woodworking workbench is no simple task. The workbench must suit the user's needs, withstand the forces of woodworking, and be ergonomically sound. In addition, the materials used in the workbench construction must be of the highest quality, and the entire structure must be built to last.

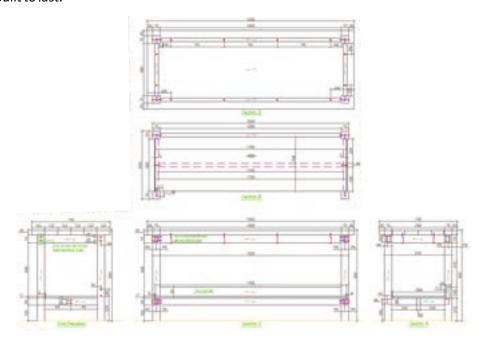


Fig: A Design of a Woodworking Bench

The key steps involved in fabricating a woodworking bench are:

1. Determine the size of the workbench:

Determine the dimensions of the workbench based on the size of the room, the type of work to be done on the workbench, the tools to be used on the workbench, and the type of materials and lumber that will be used.

2. Choose the type of wood:

Select the type of wood that will be used to build the workbench. The materials used must be able to withstand the forces of woodworking and be aesthetically pleasing.

Common materials used in constructing a woodworking workbench include hardwoods such as maple, cherry, oak, walnut, plywood, particle board, and MDF.

3. Design the workbench:

Using measurements from the first step, create a detailed design for the workbench that includes all components.

When designing a woodworking workbench, the designer must consider the user's size, the type of woodworking they will be doing, and the type of workbench they need.

4. Cut the lumber:

Cut the lumber to the desired sizes for the workbench components based on the design.

5. Fabricate the parts of the workbench:

This process involves cutting, sanding, and assembling the components of the workbench. The workbench must be built to exact specifications, as any errors can lead to costly repairs down the road.

6. Assemble the workbench:

Assemble the workbench components according to the design.

7. Sand and finish the workbench:

Sand down the workbench components and apply a finish, such as a stain or paint, to the workbench. The workbench must be appropriately finished to protect it from the elements and to give it a professional look.

8. Install hardware:

Install hardware such as vises, clamps, and other accessories according to the design.

9. Test the workbench:

Test the workbench to make sure it is stable and functions correctly.

3.6.5 Considerations for Selecting an Ideal Workbench

Measurements Considerations

There are a few measurements to consider so that your workstation is precisely designed for you and fits your needs as a woodworker.

- Works space in your wood shop
- Workbench height
- Space required for primary wood projects
- Space required for tools you'll want to store on the workbench
- · Depth of workstation and woodworker's ability to reach across

Standard Sizes:

Standard sizes of woodworking benches vary depending on the purpose and type of work. Generally, a

woodworking bench should be at least 48 inches (1.2m) long, 24 inches (0.6m) wide, and about 36 inches (0.9m) high. The height should be adjustable to allow for comfortable working for people of different heights.

A bench of around 10 inches (0.25m) thick for light work will suffice. A thicker bench is better for more strenuous activities such as planing and sawing. A bench of 12-14 inches (0.3m-0.35m) thick is suitable for heavier work. The thickness of the bench will also depend on what sort of tools will be used on the bench, as heavier tools require a thicker and more sturdy surface.

Height And Depth of Workbench

The ideal height and depth for your workbench can be determined using various techniques. It is pretty straightforward when you look at the fundamentals. You must ensure the workstation is at a height and depth that will let you use the entire area without endangering your back.

Workbench's Height

Some people like to measure the height between your elbows when your arm is bent. Others will measure your height by positioning your elbow at a certain height and placing your fist on top of your arm. The best height is what works for you because everyone's height and what works for them is different.

The ideal workbench height is about above your waist. This will allow you to get to your desk while reducing the strain on your back.

· Workbench's Depth

The appropriate depth is decided by the amount of space available in your woodshop, the type of wood you need for your projects, and your reach. The depth of most workbenches ranges from 24 to 30 inches. However, depending on your requirements, this can be larger or lower.

Another thing to consider is whether your workbench will be against a wall or in the center of your woodshop. Some woodworkers prefer the workbench in the woodshop's center because it allows them to work with more considerable wood resources.

If you're dealing with more extensive wood materials, the depth of your workstation should be increased to suit the more extensive wood materials.

Material For a Workbench Top

When deciding on the ideal material for a workbench top, keep in mind what you intend to use it for and your budget. This is an essential concern because if you have an expensive workbench top and use it for solvents (such as stain or sealer), you don't want to destroy it.

Purpose

Most of your woodworkers are weekend workers who don't require an expensive workbench top and don't need to spend much money on a functional workbench top. Consider the primary function of your workstation. Will it primarily be used for woodworking, or will it serve numerous functions?

Purpose

Most of your woodworkers are weekend workers who don't require an expensive workbench top and don't need to spend much money on a functional workbench top. Consider the primary function of your workstation. Will it primarily be used for woodworking, or will it serve numerous functions?

Medium Density Fibreboard (MDF) is the best workstation top material:

- · It is very robust and will hold a lot of weight
- Available in various thicknesses, though 3/4 is ideal
- It resists solvents
- Sandable if needed to resurface workbench if you need to refresh
- It is not as pricey as your more expensive woodworker workbench tops



Fig: Selecting suitable material for a Woodworking Bench

Location of Workbench

There are various factors to consider when deciding where to put your workstation for woodworking. They are significant in terms of the practicality of your woodworking workbench.

- Workbench space available
- What woodworking projects will you use the workstation for
- Do you necessitate a mobile workbench
- Do you need or have access to power for any power equipment you use
- Do you need storage

These factors should be considered when deciding where to position your workbench. If you have little space in your woodshop, the location of your workbench is critical since it affects everything else.



Fig: Worksite consideration for selecting a Woodworking Bench

Storage Options for Workbench

If you have a woodshop, you probably have a lot of products that need to be stored. Tools, saws, cans, brushes, grips, clamps, and other items may be included. When shopping for the best workstation, you should think about storage possibilities.

- Make some room for a vise.
- Use Mason jars to store nails, screws, and other small objects.
- Use PVC to house drills and other power tools.
- Use spice racks to store small goods you frequently use.
- Draws for storing tools and other items.
- · Hooks for hanging aprons and masks.



Fig: Storage considerations alongside a Woodworking Bench

3.6.6 Woodworking Vises

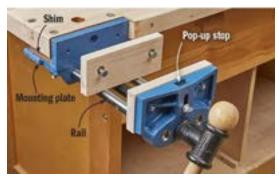
Woodworking vises are tools used to securely hold a piece of wood in place while it is being worked on. They can be used to securely hold a piece of wood to a workbench or clamp two pieces together in preparation for joining. Woodworking vises are available in many different styles and sizes, allowing for a wide range of applications.

1. Face vise

A face vise is an essential tool used in woodworking for clamping and securing wood pieces for sawing, drilling, planing, sanding, and other tasks. It is a specialized clamping device attached to the top or side of a workbench, allowing the user to secure a workpiece with various configurations. A face vise is typically installed on the top of the bench but can also be mounted on the side or a leg. The face plate of the vise is adjustable, and the jaws can grip different thicknesses of wood.

Face vises are available in various styles, including those with a single jaw and two jaws. The single jaw is best suited for light-duty clamping and is typically used for smaller pieces of wood. The double jaw is better suited for heavier-duty clamping and can be used for larger pieces of wood.

Face vises are also available with different mechanisms, such as a cam-action or a lever-action, which provide different levels of clamping force.



Fia: Face Vise

2. End Vise

It is mounted onto the end of a workbench and holds the wood in place while the user is cutting, sawing, drilling, or shaping it.

The end vise is composed of two parts: the jaw, which holds the material, and the screw, which adjusts the jaw to fit the size of the material. The jaw is typically made of wood or metal and is fitted with protrusions that grip the material when the screw is tightened. The screw is usually made of hardened steel and attached to an adjustable handle that allows precise adjustments.



Fig: End Vise

3. Leg Vise

A leg vise is a handy tool for woodworking and carpentry. It is a device mounted on the leg of a workbench and is used to hold a workpiece in place while it is being worked on. The most common type of leg vise is a screw vise, which uses a large screw to clamp the workpiece in place. The screw vise has a large, flat base that is secured to the leg of the workbench. The vise has a movable jaw connected to the base by a long screw. The screw can be adjusted to increase or decrease the hold on the workpiece. The adjustable jaw can also be angled to help hold the workpiece in the best position for the task at hand. Leg vises are incredibly useful for various woodworking and carpentry tasks, including cutting and shaping wood, drilling, mortising, and more.



Fig: Leg Vise

4. Engineer's vise

The engineering vise is typically constructed from cast iron and consists of two jaws that open and close via a rotating handle. The jaws can be adjusted to fit the workpiece and are lined with smooth surfaces to prevent marring or damage. The vise also has two vertical guides, which help to keep the jaws parallel and in the correct position.

The primary use of the engineering vise is to hold the workpiece securely while it is being worked on. This can include sawing, planning, drilling, sanding, and more. It is beneficial for intricate and detailed woodworking tasks, as it can firmly hold the workpiece.

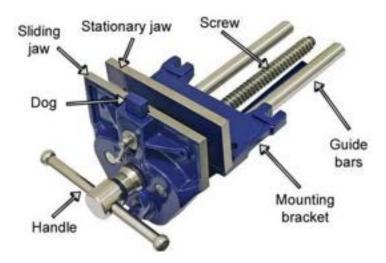


Fig: Engineer's Vise

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Notes 🗀	

Unit Exercise _____

Choose the correct answer

1.	Wri	rite four types of furniture based on materials:			
	a.		b.		
	C.		d.		
2	\ \ /ri	to four types of office furniture.			
۷.		te four types of office furniture:			
	a.		b.		
	C.		d.		
3.	Wh	ich of the following is not an exam	ple of m	odular furniture?	
	a.	Wardrobe	b.	Cabinet	
	c.	Chair	d.	Dresser	
4.	In ti	ne first angle projection method, a	an obiect	t is assumed to be placed in the:	
••	a.	First quadrant	b.	Second quadrant	
	c.	Third Quadrant	d.	Fourth quadrant	
	.	Tima Quadrant	u.	Tourtinguature	
5.	The	isometric projection of a circle is	a:		
	a.	Circle	b.	Ellipse	
	C.	Hyperbola	d.	Parabola	
6.	Wh	ich of the following is not a Hardw	ood?		
	a.	Teak	b.	Mahogany	
	c.	Walnut	d.	Redwood	
7	\	ich of the fallowing is not a Coffee	2 d 2		
7.		ich of the following is not a Softwo		Descripted	
		Cedar	b.	Rosewood	
	c.	Redwood	d.	Pinewood	
8.	Wh	ich type of board can be used out	doors?		
	a.	Exterior grade	b.	Chipboard	
	c.	Interior grade	d.	MDF	
9	Wh	ich of the following is an accessor	v?		
٦.	a.	Padlock	b.	Hammer	
		Jack plane	d.	Chisel	
	c.	заск ріапе	u.	CHISCI	

	ncealed hinge is used in:			
a.	Cabinet		b.	Window
C.	Main door		d.	None of the above
11.Wh	nich type of screw is widel	y used a	as a wood	d screw?
a.	Counter-sunk screw		b.	Round head screw
c.	Philips head screw		d.	All of the above
12.Wh	ich of the following tools	is used	to check	the accuracy of wood?
a.	Chisel		b.	Compass saw
c.	Jack planner		d.	Try Square
13.Wh	ich of the following is not	atype	of power	rtool?
a.	Band saw		b.	Coping saw
c.	Circular saw		d.	Zig saw
14.Wh	iich plane should be used	for god	ıd finishir	ng on the wooden surface?
a.	Trying plane		b.	Jack plane
c.	Smoothing plane		d.	Compass plane
		bench		used to carry out repair work?
a.	Cabinetmaker's bench		b.	Blackboard bench
	Portable bench		d.	None of the above
C.	r or table bellen			none or the above
	ich factors contribute to	the sele		
16.Wh			ection of	an ideal workbench
16.Wh	iich factors contribute to		ection of a Mater	an ideal workbench
16.Wh a.	nich factors contribute to the Location	b.	ection of a Mater	an ideal workbench rials to be used
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4. Assist in organizing and maintaining a worksite

Unit - 4.1. Introduction to the Job Cards

Unit - 4.2. Organizing and Maintaining the workplace



Key Learning Outcomes



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

- 1. Understand the various elements of a job card.
- 2. Read and interpret a given job card.
- 3. Plan the resources per the job card and instructions received from the supervisor.
- 4. Prepare a sample Job card based on job work done.
- 5. Understand the importance of efficient worksite management.
- 6. Perform cleaning of the worksite using appropriate housekeeping tools and equipment.
- 7. Know the usage of various stacking techniques for efficient material storage.
- 8. Demarcate the appropriate containers concerning the type of raw materials.
- 9. Know the various methods for handling and transporting materials, tools, and equipment.
- 10. List the importance of safety precautions to avoid any work hazards.
- 11. Properly store your tools and machine.
- 12. Maintain your workplace by keeping it tidy, neat, and clean.
- 13. Minimize waste during the work process.
- 14. Dispose of waste safely and correctly.

UNIT 4.1: Introduction to the Job Cards

Unit Objectives 6



After completing this unit, you will be able to:

- 1. Know basic methods of calculation
- 2. Know about the different shapes
- 3. Calculate area and perimeter of different shapes

4.1.1 What Is A Job Card?

A job card is used to track the progress of a woodworking project. It is used to record the start and finish time of each task and the name of the person responsible for each task.

Job cards are typically created as part of a process for managing work orders to ensure that tasks are completed promptly and efficiently. Job cards can be used for any job, from simple tasks such as cleaning a room to more complex tasks such as building a house.

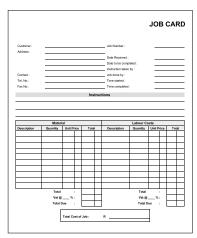


Fig: Sample Job Card

4.1.2 Benefits Of Using Job Cards For Employee Management

Job cards are an important tool for employee management as:

1. Track the duties and responsibilities:

They help organizations better track the duties and responsibilities of their employees. Job cards provide a clear record of an employee's job responsibilities and performance, making it easier for managers to assess an employee's job performance.

2. Track the employee performance:

Job cards are also beneficial for organizations as they provide a formal document for tracking employee performance over time. This helps managers better understand each employee's progress and development and can be used as a reference when evaluating performance reviews and making decisions regarding employee promotions or salary increases.

3. Identity Employee skill set:

Job cards also make it easy to identify any gaps in an employee's skill set. By documenting an employee's duties and goals, job cards can help managers identify areas where an employee may need additional training or development to reach their full potential. This can benefit both employers and employees, as employers can use job cards to help create a more effective and productive workforce, and employees can see the areas where they need to improve their skills.

4. Compliance with company policies and procedures:

Job cards can also be used to help ensure that employees are working in compliance with company policies and procedures. By tracking each employee's job responsibilities and performance, managers can quickly identify discrepancies and take the appropriate corrective action.

Overall, job cards provide several benefits for organizations and employees alike. By providing a clear record of employee performance and job duties, job cards can help foster a more productive and effective workforce and ensure compliance with company policies and procedures.

4.1.3 Types of Job Cards

There are a few different types of Job Cards, each with its distinct purpose.

1. Production Job Card:

- This type of card is used to track the progress of a job and provide documentation of work performed. Production Job Cards typically include job descriptions, labor costs, material costs, start and end times, and other relevant details.
- They are often used in manufacturing environments where tracking production progress is essential.

2. Service Job Card:

- This card is used to document service jobs, such as repairs, maintenance, and installations. Service Job Cards typically include the customer name, job description, start and end times, labor cost,
- materials cost, and other relevant details.
- They are often used in service-oriented businesses, where tracking service work is essential.

3. Non-Production Job Card:

- This card type documents non-production jobs, such as research and development, marketing, sales, and other administrative tasks. Non-Production Job Cards typically include the customer name, job description, start and end times, labor cost, and other relevant details.
- They are often used in offices and other non-production settings.

No matter what type of Job Card is used, they are all essential tools for any organization to track and control the work being done. Job Cards provide detailed information on jobs and can be used to document progress, costs, and other essential details.

4.1.4 Elements of A Job Card —

A job card is a document that contains all the information that is needed to complete a job. It includes the following elements-

- 1. **Job Number:** A job number is an identification number assigned to the job. It is used to reference and track the progress of the job efficiently.
- **2. Date:** The date the job was recorded on the card. This can be used to track the progress of the job over time.
- **3. Description:** A brief description of the job or work order. This should be detailed enough to identify the task clearly but not too long.
- **4. Priority:** The priority given to the job. This can range from low to high, with high being the most urgent jobs that must be completed first.
- **5. Location:** The location where the job is taking place. This is important for tracking and scheduling purposes.
- **6. Assigned To:** The person or team responsible for completing the job. This helps with accountability and ensuring the job is done on time.
- **7. Estimated Time:** The estimated time that the job will take to complete. This helps with scheduling and ensuring the work is done on time.
- **8. Materials and Tools Required:** A list of materials and tools needed to complete the job. This helps to ensure that everything is ready when the job is due to start.
- **9. Notes:** Any additional notes or information that may be useful. This could include details about the job or any other information that may be relevant.
- **10. Status:** The current status of the job. This could range from open to closed and is used to track the job's progress.

4.1.5 How To Create And Use Job Cards Effectively?

Creating a job card is a straightforward process that can be done using a digital or paper-based system.

- 1. The first step is to identify the job that needs to be done and record relevant information such as the job name and description, date, time, customer contact information, project manager, and any notes.
- 2. Next, list the materials and equipment that will be used to complete the job. This can include tools, supplies, parts, and other materials. Include the quantity, cost, and supplier for each item.
- 3. Then, list the labor associated with the job. This can include the job title, hours worked, and any additional notes. The job card can also be used to track any overtime costs associated with the job.
- 4. Finally, include any quality control measures that will be used to ensure the job is done correctly. This can include a checklist of tasks that need to be completed and any special instructions.

Once the job card is created, it is important to use it effectively.

- 1. When the job is started, update the job card with the date and time the job began. This will help to track any delays or issues that may arise.
- 2. As the job progresses, update the job card with relevant information such as materials and labor used, and quality control measures taken, and notes about the job. This will help to ensure that the job is completed correctly and on time.
- 3. At the end of the job, review the job card and record any additional notes or information. This will help to ensure that the job was completed correctly and that any issues have been addressed.

4.1.6 Strategies for using job cards to organize workloads

A job card is important for organizing workloads and helping teams stay organized and on track. It is an index card or sheet of paper containing information about a specific task or project. It can track progress and ensure that tasks are completed on time.

- The first step in using job cards to organize workloads is to create a master list of tasks that need to be completed. This can include tasks assigned to a specific individual or tasks assigned to the entire team. Each task should be identified with a unique identifier (e.g., job number, task name, etc.). Once the list is complete, each task should be assigned to a job card.
- The next step is to assign deadlines to each task. This will help ensure that tasks are completed on time and will also aid in tracking progress. It is also important to assign a priority level to each task.
 This will help ensure that important tasks are completed first before moving on to less important ones.
- The job cards should then be organized into a system allowing easy tracking and updating. This could include a spreadsheet, a dashboard, or a physical filing system. Whichever system is chosen, it should be easy to update and access.

• Finally, the job cards should be updated regularly. This will help to ensure that tasks are completed on time, and that progress is tracked. It is also important to ensure that any changes or updates to the job cards are communicated to the team on time.

In summary, job cards are a great tool for organizing workloads and helping teams stay on track. By creating a master list of tasks, assigning deadlines, assigning priority levels, and organizing the job cards into a system, teams can ensure that tasks are completed on time, and that progress is tracked. Regular job card updates are also important to ensure that the team is kept informed of any changes.

4.1.7 Troubleshooting Job Cards Issues

Troubleshooting job cards is an important skill for anyone in a customer service or technical role. Job cards are used to document how technicians or other service personnel are troubleshooting a customer's issue.

When troubleshooting job cards, it is essential to be systematic and organized. Here are some tips to help troubleshoot job cards more effectively:

- 1. Read the job card thoroughly: Read all the information in the job card, including any notes that may have been added. This will help ensure that all the information provided is considered when troubleshooting.
- 2. Check the customer's history: Look through the customer's past job cards to see if the issue has been encountered before. This can help to identify recurring issues and provide insight into the best way to proceed.
- **3. Gather all relevant information:** Make sure to collect all the necessary information about the customer and their issue. This includes anything from the customer's contact information to any relevant product information, such as the serial number.
- **4. Identify the problem:** Once all the relevant information is gathered, it is important to identify the problem. This can be done by asking the customer questions to determine what is wrong and to pinpoint the exact issue.
- 5. Follow the manufacturer's instructions: Many products come with user manuals or documents that provide detailed instructions for troubleshooting their products. Make sure to follow these instructions, as they can help to identify the problem guickly.

- **6. Test the product:** If the issue cannot be identified through reading the manual or asking the customer questions, it might be necessary to test the product. This can help to identify the exact issue and provide a better understanding of the problem.
- **7. Document all steps taken:** Make sure to document all the steps when troubleshooting the job card. This will help provide a record of the issue and possible solutions.

Troubleshooting job cards can be challenging, but following these tips makes it possible to troubleshoot any customer's issue effectively.

- Notes	

UNIT 4.2: Organizing and Maintaining the workplace

- Unit Objectives 🧖



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

- 1. Kow about the importance of worksite management
- 2. Discuss the importance of cleaning the work area to ensure hazard-free work
- 3. Demonstrate how to organize and maintain the worksite effectively
- 4. Demonstrate the safe storage and maintenance of tools and equipment
- 5. Explain the importance of gathering all the tools and equipment, and remove from the site
- 6. List all the processes involved in cleaning the worksite after work
- 7. Explain the process of wiping and cleaning the work area
- 8. Practice how to remove debris and dispose of waste appropriately after work completion

4.2.1 Worksite Management

Worksite management in a woodworking workshop organizes the work environment so that all work is done safely and efficiently. It involves organizing the workspace, the tools and machines, and the personnel. It also ensures that suitable materials and supplies are available and that the right safety procedures are followed.

Worksite management starts with the layout of the workshop. This includes deciding where machines and tools should be placed, how much space should be allocated to each workstation, and how to ensure the workflow is efficient and safe. It also involves deciding which tools and machines need to be accessible and which need to be secured.

The next step is to develop and implement safety protocols. This includes ensuring that all staff is adequately trained and that safety equipment is used correctly. It also ensures that the work area is well-lit, ventilated, and free from hazards.

The next step is to purchase and store suitable materials and supplies. This includes ensuring that the correct type of lumber is ordered and that suitable fasteners and adhesives are available. It also involves monitoring inventory levels and ensuring that the correct items are ordered.

Finally, it is important to ensure that communication is effective and that workloads are distributed evenly. This includes ensuring that the right people are informed about deadlines and that everyone clearly understands the tasks they need to complete. It also involves making sure that feedback is provided promptly.

4.2.2 Benefits of an Organized and Clean Workshop

Different activities in a wood workshop generate a lot of dust and waste. Keeping the workshop neat, clean, and organized daily is essential.

The benefits of a clean and organized workshop are-

- · Prevention from hazards
- Healthy work environment
- Ease of work
- Timely completion of work in an efficient manner
- Time-saving
- Reduction of the waste of material

A good workshop should have-

- Clean and even floors
- Fresh air and adequate light
- Good ventilation
- Comfortable temperature
- Free from hazards
- · Arrangements for disposing of waste
- Clean toilet and washbasin
- · Clean drinking water
- Fire extinguisher
- First Aid Box

4.2.3 Considerations while Organizing a Workshop

Organize the workshop in such a way that you get-

- · Enough space to move around safely
- Enough space for storage of materials and tools
- Enough space to work and use materials and tools efficiently

Always remember

- Keep your workshop neat and clean.
- Stack the material neatly so it will not fall when taken from the stock.
- Do not store any material in the way so that there is no hindrance in walking or working.
- Do not allow clutter to get accumulate at the workplace.
- Store the tools in their right place.
- · Keep the fire extinguisher where anyone can reach it easily.

4.2.4 Keeping a Workshop Clean _

Due to various cutting and finishing activities, the wood carpentry workshop is full of dust. Dust will accumulate on the cleaned surface even if you clean the place immediately after working. Despite this, we should regularly clean the work area. The workshop must be cleaned in the morning before starting the work and before leaving the work in the evening.

Regular cleaning will limit dust accumulation, and cleaning machines and tools will ensure their long and trouble-free life. One of the cleaning methods could be making a checklist of all the places to be cleaned along with the frequency of cleaning. It will ensure regular cleaning of the places we want to clean.



Fig: An example of clean and organized workstation

4.2.5 Safe Storage of Materials, Tools, and Equipment

Storage of wood

- Do not keep wood in direct contact with the floor.
- Keep wood in a rack or shelves horizontally.
- Store offcut wood pieces according to their sizes.
- If space is limited, build overhead storage.



Fig: Storing large wood pieces in rack or selves



Fig: Storing small cut wood pieces in open boxes

Storage of plywood / board

- Do not keep sheets of plywood/ board in direct contact with the floor.
- If possible, stack sheets horizontally.
- Do not lean sheets against the wall, as it makes them bow.
- If space is limited, they can be stored in racks against the backboard.
- There should be enough space around the sheet for easy loading and removal.
- For sheet materials with decorative sides, the face sides should be placed against each other.
- Store all leftover pieces separately from the main stock.
- Store offcut pieces according to their sizes.





Fig: Storing small offcut plywood pieces in open boxes

Storage of tools:

Tool storage is totally up to the furniture installer's style. But, it is always good to build locking cabinets or open shelves. A toolbox may be an excellent solution to store hand tools, and a tackle box can be used for fasteners.

However, you can choose any method to organize your tools and accessories; only remember one thing your time on task is aided when you can find all of your tools on time. Keeping the fasteners sorted and easily accessible may save precious time during the project. It's also easier to take care of expensive tools and machines with easy access.





Fig: Safe storage of Tools, Equipment and Fastners

Always remember

- Sharp tools such as chisels should be stored in a plastic cover.
- All tools should be stored in a box or cupboard.
- When not in use, tools should be securely locked away to avoid theft.
- Tools should be cleaned and oiled with appropriate lubricant before storing. It will keep them safe from rust.
- Ensure the tool storage location is free from water ingress, which may cause rust to metal parts and damage to wood also.



Fig: Storage of Chisels in a Chisel Box

4.2.6 Importance of Maintenance of Tools

A furniture installer's work becomes very difficult if tools are not appropriately maintained. Poorly maintained tools can damage wood or other materials, costing time and money. Properly maintained tools reduce the risk of accidents for you and your co-workers. Besides knowing the best and safest techniques for using tools, a General Assistant must know how to maintain and store tools to get the most out of them so that they can make your work more professional and efficient.

The condition of woodworking tools is essential to the quality of your work. If tools are working correctly and efficiently, they not only add to the satisfaction of your efforts but also ensure your safety. It is very important to set up a routine maintenance program to ensure everything is running correctly, tools are correctly sharpened, instrument calibration is true, and tools are clean. Proper care will keep them running efficiently, help maintain their new tool look, and increase their life span.

4.2.7 Safety and Maintenance of Tools

General tips:

- Keep the tools in their designated places
- After completing the job, clean the tools properly before storing them

- Oil the movable parts of the measuring tools, such as calipers, divider, and compass, to avoid stockup
- Ensure that sand does not get inside the case of the pull-push rule to avoid wearing off the graduations
- Keep chisels in the plastic end cover
- Rub metal tools occasionally with an oiled cloth to keep them free of rust
- Follow the manufacturer's instructions to clean power tools

Dos:

- Always use the right tool for the job
- Always use personal protective equipment
- While giving your colleague a sharp tool, hold the edge in your hand and the handle to another person
- Keep the sharp tools in the designated place only
- Check power tools before using them for broken plugs or poor condition of the cord
- Always sharpen the blades of the plane or chisel before using them

Don'ts:

- Do not keep hand tools on the machine
- Do not keep sharp tools in your pocket
- Do not use a caliper as tongs
- Do not wipe off the edges of the steel pull-push rule with bare hands to avoid injury
- Do not use power tools near water, flammable gas, or oil
- Do not touch power tools while they are working
- Do not use power tools with wet hands
- Do not talk while working with tools

4.2.8 Handle Tools and Equipment Safely -

Every organization where a General Assistant- Furniture and Fittings Installer would work has a few predefined Standard Operating Procedures (SOPs) for safely handling the various tools and equipment. Adherence to these organizational procedures is crucial for ensuring the safety of the individual and others.

A. Safe Handling of Power Tools

Before Using

Appropriate measures should be taken to inspect the tool and the power supply. If the tool or any

part/accessory is found defective, it must be either replaced immediately or removed from service and tagged appropriately as "Out of Service for Repair."

- Care should be taken that no defective tool must be used at any point of time.
- All repair and maintenance work must be accomplished by licensed and experienced persons.
- Before operating Powered Tools, the Instruction Manual must be read thoroughly.
- The guidelines and recommendations (by manufacturer) must be stringently followed per the instruction manual or directions of use.
- The tools must be grounded adequately with the help of a three-pronged plug (equipped with a relevant 3-wired color-coded cord) and double insulation. This helps in preventing electric shocks.
- For effective grounding, all powered tools must be checked with a continuity tester or a Ground Fault Circuit Interrupter (GFCI).
- Powered tools must be switched off before connecting them to a power supply

While Using

- Issues like a tool getting heated too soon or sparks' appearance must be inspected and rectified by a licensed electrician only.
- All power cords must be clear of tools and the path along which the tool will operate.
- Approved extension cords, with proper specifications, power requirement (for the tool), and dimensions, must be used to prevent overheating and fraying of the cord.
- Outdoor work must be done with the help of outdoor extension cords labeled "W-A" or "W."
- Cords must be suspended over the work area to mitigate trips and falls.
- Octopus connections must be avoided by deploying a power bar or power distribution comprising multiple receptacle plugs.
 - o While unplugging the tool from the socket, the plug must be pulled gently, not the cord. Forcibly pulling the cord leads to fraying and subsequent risk of electric shocks.
 - o To avoid insulation damage, the work area must be kept dry and away from heat, sharp edges, and oil.
 - o Cords, instead of knots, may be looped using a twist lock plug.

Ensure use of Insulated tape for connecting wires and avoid using masking tape.



Fig: Avoid loose chords in the work area

B. Safe Handling of Hand Tools

- The user must ensure that they are adequately trained in the secure usage of hand tools.
- Appropriate and accurate choice of the right tool for the task must be made.
- The user must deploy the correct techniques of handling and using the hand tools thus selected for the task.
- The user must operate hand tools by keeping the wrist straight.
- Hand tools must be thoroughly inspected before use and repaired immediately or replaced whenever necessary.
- The user must ensure that handles of axes, hammers, saws, and chisels must fit tightly into the head of the tool to avoid accidental injuries.
- One must always pull on pliers or a wrench.
- Worn jaws of pliers, pipe tools, and wrenches must be replaced immediately.
- All hand tools must be kept in a robust, clean, dry toolbox away from the work area.
- While using hand tools, one must wear appropriate PPE, according to the hazards involved in the task. This includes protective gloves of appropriate material, heavy aprons, safety goggles, and face shields.
- When not in use, sharp and cutting tools must be covered with appropriate sheaths to avoid injuries.

Perform basic safety checks before the operation of all machines, tools, and electrical equipment

A General Assistant must perform basic safety checks before operating all equipment as a part of the Standard Operating Procedures.

- Before starting the basic safety checks, one must thoroughly review the Instruction Manual, Manufacturer's Recommendations, and Directions of Use. These documents are essential because one can find detailed and stepwise instructions about the maintenance and operating procedures and emergency shutdown and tag-out mechanisms.
- A machine or tool must not be removed or used if it is marked with a lock or tag.
- Machines and floor or bench-mounted tools must be anchored or firmly clamped to a robust foundation before maintenance operations.
- If a machine does not have safety valves or guards, one must not operate that for maintenance purposes.
- Check out for frayed electric cables or loose live prongs in plugs.
- Ensure that the power supply is off before one starts maintenance operations.

4.2.9 Remove all the Tools and Equipment from _____ the site after work

After completing the work, a General Assistant must always remember to gather all the tools and remove them from the site. This is to ensure that the site remains clean and uncluttered after the work is completed. Such an attitude reflects that a General Assistant is responsible and pays attention to small details, creating a good impression on the client.



4.2.10 Packing Finished Furniture after work

Finished furniture should be packed to keep it safe during transportation while moving from one place to another place. Packing material should be chosen according to transportation conditions and distance of transportation.

Packing Material

- 1. Corrugated paper
- 2. Bubble sheet
- 3. Foam sheets
- 4. Thermocol Sheets
- 5. Poly bags
- 6. Stretch Wrap sheet
- 7. PVC Strap Rolls
- 8. Cello Tapes

Customer requirements should also be kept in mind while packing the furniture.



Fig: Packaging materials after work using wrap sheets





Fig: Packing in Corrugated Box

4.2.11 Keeping material safe after work

All materials required for any woodworking project should be kept very safe so that the project can be completed on time. The project can be delayed if any cut sheet, part, or consumable gets misplaced or damaged. It will also cause monetary loss to the company.

Good practices for keeping material safe

- 1. All the cut parts should be numbered, and the same number should be written on the drawing or sketch. This will help identify the parts while assembling, and any missing parts can also be easily identified.
- 2. All small parts should be kept in transparent polybags. Polybags can be marked with a number, and that detail can be written on a piece of paper.
- 3. Similarly, all consumables, like nails, handles, etc., should also be kept in transparent or original bags, making it easier to locate the desired item.
- 4. All material should be kept in one place so that it is easier to locate all material at one attempt
- 5. The material should be away from the working area and preferably in some rack. If not possible, the same corner area should be used for this purpose.





Fig: Ways of Storing Cut Sheets

4.2.12 Wipe the Installation and Clean the Work Area after work

The responsibility of a General Assistant continues after project delivery. After completing work at the site, a General Assistant must clean the tools and the work area. A soft piece of fabric must be used to wipe off the area. Appropriate cleaning solutions, which are not corrosive and would not harm the work area, may be used with the wiping fabric. A moping rod may be used if a large area has to be wiped. Cleaning must be done by wearing appropriate gloves and other PPE, as the Lead recommends.



Fig: Clean and Organized workstation after work completion

4.2.13 Remove the Debris and Dispose of the Waste Appropriately after Work

A. Essentials of Debris Removal:

- After installation is done, ensure that you clear all the debris or waste materials from the site
- Separate the recyclable wooden pieces from the waste particles
- Gather damaged nails or screws on the ground and remove them from the site
- Check for sharp wooden bits on the floor and remove them from the site
- Use a broom to clear the sawdust from the area.
- Dump all the wooden pieces in a plastic bag and put it in the dustbin



Fig: Dumping wood pieces and sawdust in a plastic bag



Fig: saw dust

B. Steps in debris removal and waste disposal:



Step 1:

Use a broom to sweep the sawdust and other waste generated during assembling and installation



Step 2:

Collect waste from different parts of the workstation and sweep them in a particular direction



Step 3:

Dump the collected waste in a particular bin/place to dispose

C. Appropriate Waste Disposal:

- Solid waste, once accumulated, must be labeled appropriately.
- Solid waste on the site mainly comprises debris and sharps.
- Debris in a furniture workshop comprises wood and timber splinters, sawdust, and metal and glass sharps.
- Wood, timber, and sawdust can be treated at Landfill or the Incinerator.
- Metal and Glass sharps are collected in appropriate sharp containers.
- Metal sharps are melted for recycling.
- Glass sharps are pulverized for recycling.
- If contaminated, sharps must be autoclaved and deactivated before being disposed into containers.
- Ferro-magnetic debris is separated using magnetic filters and treated according to its nature.



Fig: Waste collection for sharp objects



Fig: Saw dust collector

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Unit Exercise _____

Cho	020	tha	corre	ct a	ncw	۵r

Choose the correct answer							
1.	. The card which displays the work details to be carried out in each operation is:						
	a.	Labor card	b.	Wage card			
	c.	Credit card	d.	Job card			
2.	The	e requirements of a particular job a	re knov	vn			
	a.	Job description	b.	Job specifications			
	C.	Job evaluation	d.	Both a & b			
	3.	is maintained to know how the worker's time shown by the time card is spent on					
		various jobs.					
	a.	Daily time sheets	b.	Weekly time sheets			
	c.	Job cards	d.	None of the above			
4.	Allr	oower tools should be:					
•	a.						
	c.	Kept in their cases when they are					
	•	,					
5.	Afte	ter completing the job, you should:					
	a.	Keep the chisel in the plastic end	cover	b. Leave all the tools on the working table			
	c.	Keep all the tools in a cupboard o	r a box	d. Both (a) and (c)			
6.	OSH	SHA has a regulation that requires keeping the workplace clean					
	a.	True	b.	False			
7.	The	process of burning non-biodegradable solid waste is called?					
	a.	Composting	b.	Incineration			
	C.	Segregation	d.	Sanitary landfilling			
8.	Ide	entify the following ones which can be recycled many times.					
	a.	Plastic	b.	Wood			
	c.	Organic materials	d.	Aluminum			













5. Assist in fabrication, assembly and installation work at the site

Unit - 5.1. Fabrication Activities

Unit - 5.2. Assembly and Installation Activities



Key Learning Outcomes



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

- 1. Understand the various steps involved in furniture fabrication, from design to packaging and installation.
- 2. Perform the measurement and marking on wood using appropriate tools.
- 3. Cut and trim the materials using different cutting tools.
- 4. Use different hand and power tools to mark, measure, cut, and fabricate wood pieces.
- 5. Make different types of woodworking joints.
- 6. Make a wooden structure by joining different workpieces together.
- 7. Perform assembly and installation appropriately and safely.
- 8. Join two perpendicular panels using cam lock fittings.
- 9. Join two perpendicular panels using a cress dowel and bolt.
- 10. Install shutter or door to cabinet/wardrobe using European hinge.
- 11. Attach the drawer to the cabinet using ball-bearing slides and roller slides.
- 12. Assemble the drawer box using knock-down fittings.
- 13. Assemble the cabinet box using knock-down fittings.
- 14. Assemble the aluminum profile glass shutter and mount it onto the cabinet.
- 15. Paste the PVC tape on the sheet panel's raw edges.

UNIT 5.1: Fabrication Activities

- Unit Objectives



After completing this unit, you will be able to:

- 1. Mark the dimensions on the wood piece using different methods
- 2. Cut the wood on marked lines using handsaw and power saw
- 3. Make the wood smooth using hand planers and power-operated planers
- 4. Inspect the ready wood work pieces for level, smoothness, flatness, etc.
- 5. Know about different types of woodworking joints
- 6. Know how to make woodworking joints
- 7. Know about the right joint for right application

5.1.1 Overview: Steps involved in Furniture Fabrication _

Furniture fabrication is the process of designing and creating furniture from raw materials. It is an art form that requires skill, expertise, and knowledge of the design and manufacturing processes. The steps in fabricating furniture can vary depending on the furniture being made. Generally, furniture fabrication begins with designing the furniture, selecting the materials, cutting the pieces to size, joining them together, and finishing them.

Design and Review:

This step involves creating a design for your furniture and reviewing it to ensure it meets all your needs. You may use software such as SketchUp or AutoCAD to create a 3D model of your design and review it for accuracy and aesthetic appeal. You'll need to consider the dimensions of the pieces, the type of wood, and the style of the furniture.



Prototyping:

This step involves building a furniture prototype to ensure the design works. You can create a physical prototype or a 3D model of the pieces. This allows you to ensure all the pieces fit together correctly and that the design works in practice.



Wood Selection:

This step involves selecting the type of wood to use for the furniture. You'll need to consider the wood's grain, color, and durability when making your selection. Consider the cost of the wood and how it will affect the overall cost of the furniture.



Wood Transformation:

This step involves transforming the wood into the desired shape for the furniture. Depending on the type of wood and the furniture design, you may need to use tools such as saws, planes, and sanders to achieve the desired shape and size of the pieces.



Wood Splitting and Cutting:

This step involves splitting and cutting the wood into the desired pieces for the furniture. You'll need to use saws, chisels, and other tools to achieve the desired size and shape of the pieces.



Assembly:

This step involves assembling the pieces of wood into the final furniture. You'll need to use screws, nails, glue, and other tools to join the pieces together.



Packaging:

This step involves packaging the furniture for transport. You'll need to use various materials such as bubble wrap, cardboard, and foam to protect the pieces adequately during transport.



Installation:

This step involves installing the furniture in its intended location. You'll need to consider the weight of the piece, the size of the room, and the type of flooring to ensure the piece is securely installed.



5.1.2 Preparing the wood workpieces

To make any piece of furniture, the first step is preparing the wood. There are certain basic steps of this activity –

- 1. Marking of the dimensions on wood
- 2. Cutting the wood

- 3. Planing or shaving the wood
- 4. Inspecting the prepared wood

5.1.3 Measuring and marking the wood -

Measuring is the first step in wood-working. The second step is to make a mark on the measured point. The combination of the two processes—measuring and marking—forms the foundation of accurate work. If either is done incorrectly, much effort and material are wasted. Here are a few pointers that can improve the quality of your work by reducing the chance for error.

How to hold pencil while marking on workpiece

- A wood folding ruler, a tape measure and a few steel bench rulers meet most measuring needs.
- To mark from any one of these rulers, use a sharp 2H pencil, the best general marking device for woodworking. These pencils have a medium-hard lead and when properly sharpened leave a fine line that's readily visible on most surfaces.
- When marking a line with a ruler, be sure to hold the pencil at an angle so that its point meets the workpiece at the same place the ruler does. Holding the pencil perpendicular to the work surface results in the center of the pencil point being inaccurately positioned.

5.1.3.1 How to mark straight line - method 1

- Measuring tape
- Pencil
- Try square









- **STEP 1:** Set the wood or plywood/board on a flat work surface or work bench.
- **STEP 2:** Place the hook end of the measuring tape on the end of the wood.
- **STEP 3:** Extend the measuring tape out to the desired length.





STEP 4: Mark the length by drawing an arrow with the pencil.





STEP 5: Place the try square across the wood and line it up with the arrow.

STEP 6: Draw a line through the arrow, following try square.

STEP 7: Draw a line on the side face of wood following the previous line. It will help to cut straight.

5.1.3.2 How to mark straight line - method 2

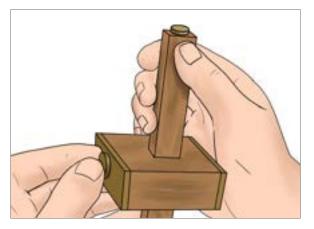
This method is used to mark on small pieces of wood, or mark lines for rabbet or mortise.

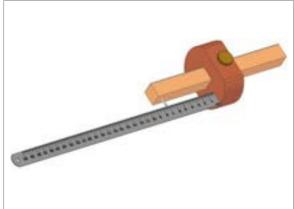
- Measuring tape
- Marking gauge, or
- Mortise gauge





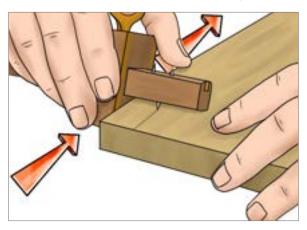






STEP 1: Place the workpiece on a flat surface and clamp with G clamp.

STEP 2: Set fence measurement. Turn the thumb screw anti-clockwise to release the fence and stem, then move the fence along the stem until it is at the correct measurement. Turn the thumb screw clockwise to secure it in place.





STEP 3: Curl your hand around the fence and tilt it slightly in the direction you are going to mark. Then simply drag the fence along the workpiece, applying very little pressure.

Marking with Mortise gauge

Method to mark on wood with mortise gauge is same as marking with marking gauge. The distance between the fixed spur and the adjustable spur of mortise gauge is set so that it matches the width of the mortise chisel.

5.1.3.3 How to mark circle/arc using compass

This method is used to scribe a circle or an arc on smaller pieces of wood.

- Pencil
- Compass





STEP 1: Secure a sharp pencil in the clamp of a compass. Align the pencil lead with the compass's needle.





STEP 2: Adjust the angle of the arms so that they span the full desired radius.

STEP 3: Put the sharp end of a compass down firmly on wood wherever you want the centre of the circle to be. Put the pencil point gently down on the wood. Press down the needle and turn the top of the compass to draw a circle.

- 5.1.4 Cutting the wood -

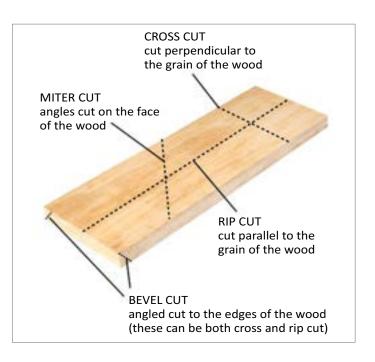
When wood is procured, it comes in sleepers or blocks. To start any type of woodwork, you need to cut these wood blocks or sleepers into smaller ones. For straight cut, there are mainly two types of cut—

Rip cut

When wood is cut along the grains (parallel to the grain), it is called rip cut.

Cross cut

When wood is cut across the grains (perpendicular to the grain), it is called cross cut.



5.1.4.1 How to cut straight using hand saw

- Measuring tape
- Pencil
- Try square
- Handsaw
- Sawhorse or Workbench
- Personal protective equipments –
 Dust mask and Safety goggles



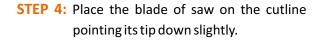


STEP 1: Clamp the wood to workbench / sawhorse.

STEP 2: Mark on the wood using try square and pencil.



STEP 3: Score along the guide line using a utility knife.





STEP 5: Hold the wood steady with your other hand.

STEP 6: Pull the saw toward you two-three times. This way you will have a notch in the wood edge.



STEP 7: Begin to saw through the wood, back and forth, using long strokes.

STEP 8: Blow the sawdust, if you lose sight of the cutline in the sawdust.

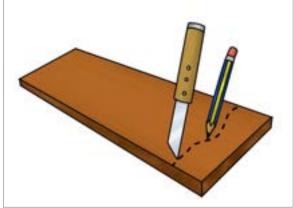
5.1.4.2 How to cut using compass saw

Tools needed -

- Pencil
- Scribing knife
- Compass saw
- G clamp & Workber...
- PPE Dust mask and Safety gob

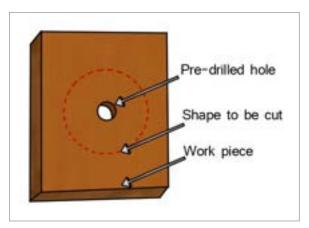


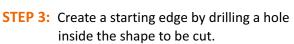




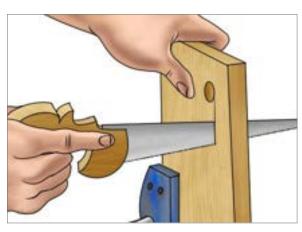
STEP 1: Secure the wood to be cut in a clamp.

STEP 2: Mark out the lines with pencil and then run a scribing knife along them.





STEP 4: Hold the blade against the work surface.



STEP 5: Pull the saw back towards you gently in one long, slow stroke to make a notch.

STEP 6: After first cut is made continue sawing back and forth with long strokes.

5.1.4.3 How to cut at an angle using miter box

Tools needed -

- Miter box
- Tenon saw
- Workbench
- PPE Dust mask and Safety goggles









STEP 1: Secure the miter box on workbench.

STEP 2: Place the wood to be cut in the miter box.

STEP 3: Position the saw in the slot made in the miter box and cut the wood.

5.1.4.4 How to cut using circular saw

STEP 1: Unplug the saw and hold it alongside the workpiece with the blade guard retracted.

STEP 2: Loosen the depth-adjusting lever or knob and pivot the saw's base until the blade extends about ¼ to ½ inch below the workpiece.

STEP 3: Tighten the lever or knob and it is ready to saw.



- **STEP 4:** Support the workpiece on a bench or two strong sawhorses, overhanging enough so that the cut piece will fall.
- **STEP 5:** Mark the side of the workpiece, then line up the blade to just leave the pencil line on the keep side.
- STEP 6: Support the front of the saw shoe on the work piece, but keep the blade about an inch from the material.
- **STEP 7:** Start the saw and allow the blade to come up to full speed before carefully pushing the saw into the workpiece.



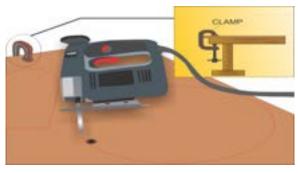


Plywood cutting technique

Crosscutting plywood without supporting it across its entire length can cause the saw to bind or the plywood veneer to tear or splinter as the cutoff piece drops. If you're using sawhorses, simply span them with a pair of 2x4s. This will provide the support needed.

5.1.4.5 How to cut using jigsaw –

- **STEP 1:** Determine the size and position of the circle on the board. Use a compass and a pencil to draw the circle.
- STEP 2: Place the board with the cutting area extending beyond the end of the work surface, and clamp securely in place. Drill a 3/8-inch starter hole just inside the scribed circle.
- STEP 3: Position the jigsaw with the blade inside the starter hole and with the saw's shoe plate flush with the board. Making sure the blade is not touching the board, start the saw and cut an arc to reach just inside the waste side of the scribed circle. Continue until you cut about half of the circle.
- **STEP 4:** Find a comfortable position to avoid an unsafe or awkward cutting angle, and finish cutting the remainder of the circle.
- **STEP 5:** Use a sanding sponge, which works well on curved surfaces, to clean up the edges.









5.1.5 Jigs

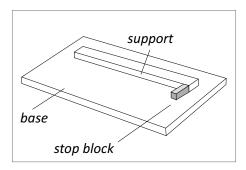
A jig is a work holding device that holds, supports and locates the workpiece and at the same time guides the cutting tool for a specific operation. A good workshop jig will hold the work accurately and safely so you can make consistent, repeatable cuts quickly. Wood working jigs are useful for creating intricate wooden profiles.

Benefits of using jigs -

- Jigs accurately manufacture duplicate parts in mass with uniform quality.
- The workpiece and tool are relatively located at their exact positions before the operation. So it reduces product cycle time.
- Jigs increase the production rate by eliminating the time and effort spent in individual marking, measuring, and positioning of workpiece on a machine and frequent checking.

Jigs can be made from 3/4 inch plywood or medium-density fiberboard (MDF), some hardwood pieces, and glue and fasteners. A jig has three parts 1) jig base 2) support and 3) stop block.

Below is given an example of a jig made to cut the tapered legs of a chair. Tapering has become a simple and safe operation with this jig.



5.1.5.1 How to make a jig and cut the workpiece



STEP 1: Make a base for the jig from 3/4 inch plywood. Rip and crosscut the base to size so it is at least 6 inch wide and about 6 to 8 inches longer than the leg you want to taper.



STEP 2: Draw the taper cut on the leg workpiece, extending the line across the
adjacent face and end of the leg. You
need to determine exactly where the
blade will enter and leave the wood.
Clamp the leg to the jig base and to the
workbench in a way that the taper line
aligns with the edge of the base.



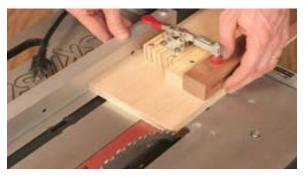
STEP 3: Cut a straight, flat piece of scrap to make the support the same length as the leg. Set the support against the leg, and fasten it to the base with a few countersunk wood screws.



STEP 4: Attach a stop block to the jig that butts against the end of the leg. Fasten it with a couple of screws.



step 5: Make two mounting blocks for the toggle clamps from scrap the same thickness as the leg. Fasten the blocks behind the support and near the ends of the leg.

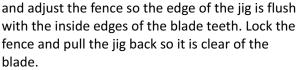


STEP 6: To prepare for cutting, set the jig on the saw and raise the blade until the teeth are about 1/4 inch above the top of the leg. Hold the jig against the rip fence,

Screw the clamps to the blocks and adjust the rubber bumpers on the clamps.



STEP 7: Start the saw, and feed the jig along the fence to rip the taper. Keep your hands behind the jig support throughout the cut.





STEP 8: To taper the other face, tape the cutoff piece back in place, and flip the leg in the jig so the offcut face is up. Adjust the clamp bumpers and clamp the piece, and make the second taper cut.



STEP 9: Now run the tapered faces over the jointer to remove the blade marks, and scrape or sand them smooth.

Tips

Be sure to hang this jig on the wall safely where it is easy to find and modify the next time you need it.

5.1.6 Planing the wood -

Jointing and planing -

these two are the necessary steps in any furniture making process. Planing means shaving thin and uniform strips from a piece of rough wood using hand plane or power-operated planer.

It is done to flatten, reduce the thickness of the wood workpiece, and create a smooth, level surface by removing high spots. It is also done to clean the edges of the wood and make sure the edges of the wood workpiece are squared.

5.1.6.1 How to plane the wood using hand plane

Tools needed -

- Oilstone
- Marking gauge
- Jack/Smoothing plane
- Workbench
- PPE Dust mask and Safety goggles





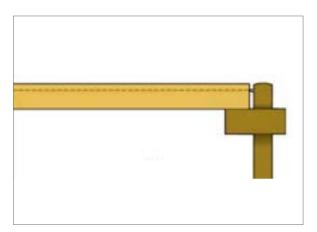




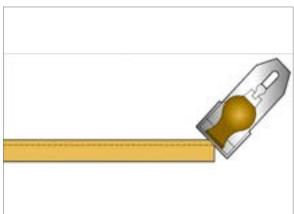
STEP 1: Sharpen the blade of plane on oilstone.



STEP 2: Adjust the angle of the blade with the help of mallet.



STEP 3: Mark on the side of the wood using marking gauge.

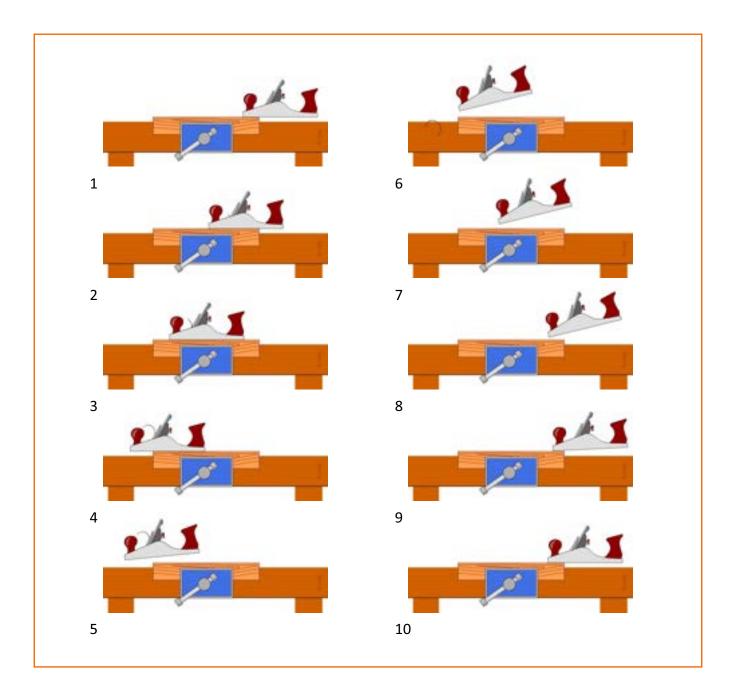


STEP 4: Chamfer to mark.

STEP 5: Fix the wood tightly into a vise.

STEP 6: Hold the plane with both hands. Push the plane forward smoothly over the surface of the wood.

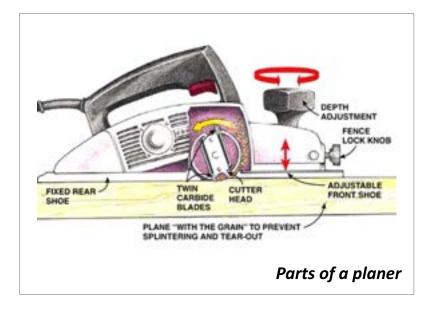
STEP 7: Continue the smooth, forward motion of the stroke right to the end of the piece of wood. Tilt the front of the plane up and away from the wood when drawing it back to make the next stroke. Repeat it until chamfer disappears.



5.1.6.2 How to plane the wood using power planer

- **STEP 1:** Begin by resting the front shoe of the planer flat on the wood without letting the blade touch the work.
- **STEP 2:** Start the tool, let the motor reach full speed, then ease the plane into contact with the work and push it steadily forward.



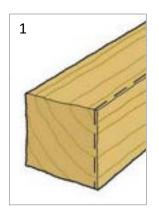


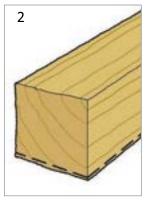
STEP 3: Keep your initial pressure on the front grip as the planer enters the workpiece.

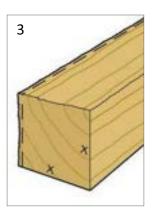
STEP 4: Balance hand pressure between the tool handle and front knob as both planer soles contact the work.

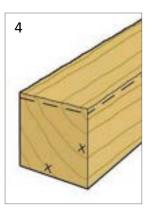
STEP 5: As you push the tool off the work, apply greater control to 'catch' the rear handle. Avoid overreaching at the end of a pass; the front shoe will drop off the wood and let the blades take an uneven bite off the end of the wood (called 'snipe').

5.1.6.3 How to prepare a square wood workpiece –









STEP 1: Joint one surface.

STEP 2: Joint an adjoining surface square to the first.

STEP 3: Mark the both jointed surfaces.

STEP 4: Plane the remaining surfaces parallel to the jointed surfaces. Plane both remaining surfaces with the same thickness adjustment. Do not change thickness.

5.1.7 Working with wood chisel

A sharp wood chisel can cut mortises, shave rough surfaces, chop out corners and scrape off glue. Below are given different techniques to use the chisel.

Technique 1: Mortise cuts

- Start mortises by outlining the area with a mortise gauge.
- Face the bevel side down.
- Push or tap the back of chisel by hammer to remove thin slices.

Technique 2: Paring cut

- Pare thin slices of wood to flatten the bottom of an open mortise.
- Keep the unbeveled back of the chisel flat on the wood.
- For easier slicing, pivot the chisel as you cut to move the blade in an arc.





DE VEL OUT

Technique 3: Chopping cut

- Chop out large amounts of wood by slicing off small amounts with each cut.
- Strike the chisel with a hammer and chop down about ½ inch.
- Chisel from the end to remove the piece before continuing.



Technique 4: Chop and pare

- Cut a groove, or dado by first sawing along both edges to the desired depth.
- Break out the wood in the middle with the chisel.
- Space the chisel cuts about ½ inch apart.

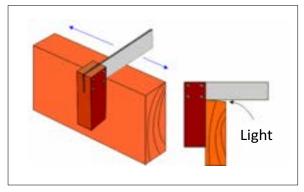


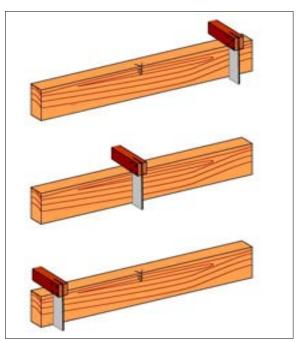
Technique 5: Scraping

- Scrape glue joints or other imperfections from wood by holding the blade at a right angle to the wood with the back of the chisel facing you.
- To remove thin shavings, support the blade with your fingers and press down while you draw the chisel towards you

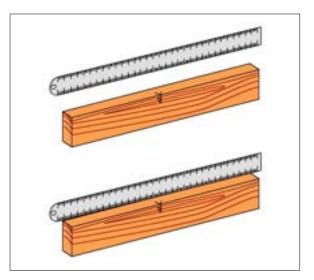
5.1.8 How to check the square and flatness





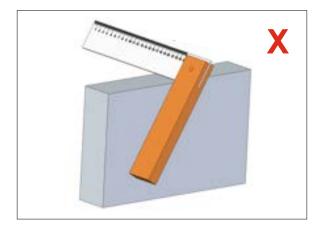


STEP 2: If you can see the light between try square and surface of the wood, it means that wood is not properly planed.



STEP 1: Check the accuracy of planing by placing **STEP 3:** To check the accuracy of planing, steel try square on all sides.

ruler can also be used.



Always hold the try square or steel ruler straight.

5.1.9 What are woodworking joints?



Woodworking joints is the spot where two or more pieces of wood are joined together to form a structure. Each joint has its own strength and appearance. That is why different types of joint are used for different purpose. Adhesive, glue, or fasteners such as nails, screws, bolts are used to increase the strength.

A joint must -

- Support the weight of the structure, or external weight
- Not make wood weak
- Let the wood move to expand and contract
- Provide enough surfaces for glue and fasteners

There are many types of woodworking joints; some can be made easily and the others are quite difficult to make, but the practice will make you perfect.

Woodworking joints can be divided into three categories, depending on the functions they perform-

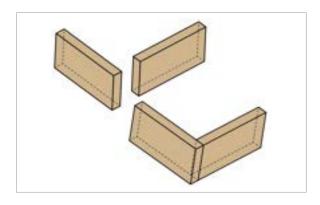
- Lengthening To increase the length
- Widening To increase the width
- Framing To terminate or to change direction

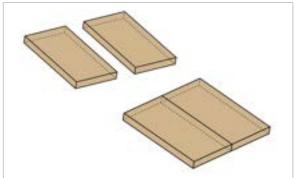
Always remember –

- Know the right joint to use
- Know how to make that joint in the correct way

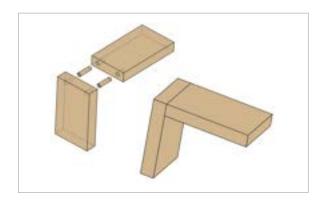
5.1.9.1 Butt joint ———

- This joint is the easiest and the weakest joint.
- Use of dowel pins, biscuits, splines or pocket holes can reinforce this joint.
- It is used to make simple boxes or structures.



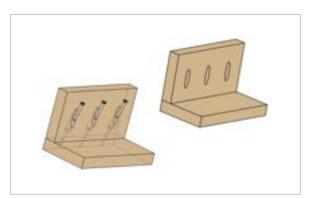


Dowel butt joint



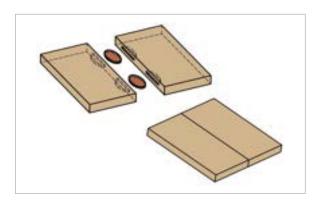


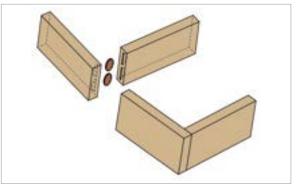
Pocket hole joint





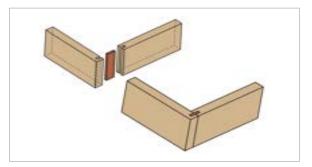
Biscuit butt joint





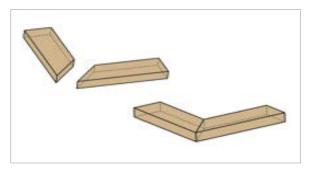
Spline butt joint

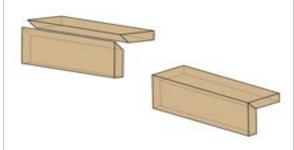




5.1.9.2 Miter joint

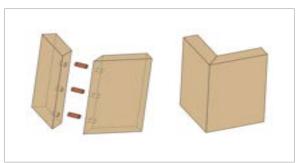
- This joint is similar to butt joint, except that two pieces of wood are joined together at an angle of 45°.
- Dowel pins, biscuits, Splines or pocket holes can be used to reinforce this joint.





Dowel miter joint





Biscuit miter joint

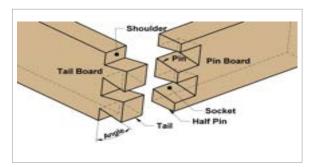


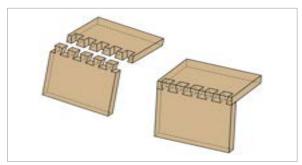
Spline miter joint



5.1.9.3 Dovetail joint _____

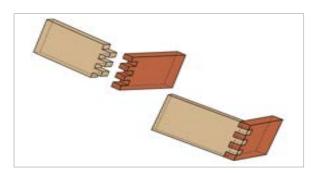
- This joint is probably the strongest joint.
- Two parts of wood are interlocked.
- It is mostly used in making drawers or boxes.

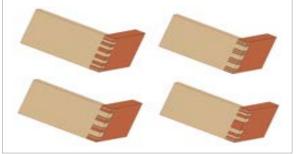




5.1.9.4 Finger joint -

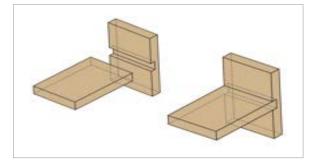
- This joint is also called box joint.
- It is similar to a dovetail joint except that the pins are square and not angled.

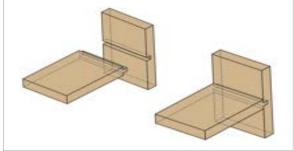


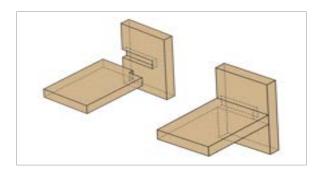


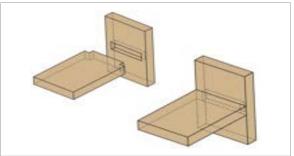
5.1.9.5 Dado joint -

- A rectangular groove is cut in one piece into which the end of another piece fits.
- Dado is cut across the grains of wood. It is mostly used to make shelves.



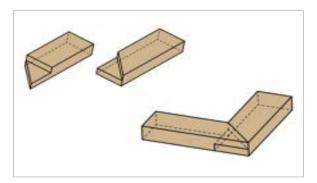


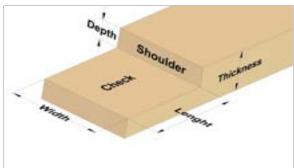


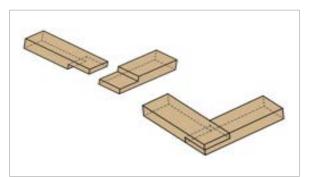


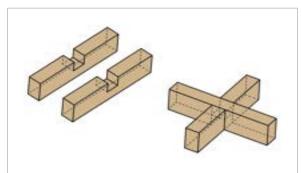
- 5.1.9.6 Half lap joint ——————

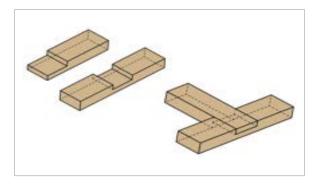
- A half lap joint consists of two members notched to half thickness and lapped on each other with the face flush.
- It can be done in different ways.

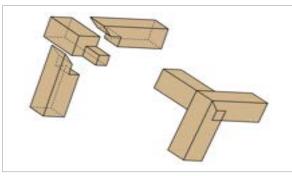






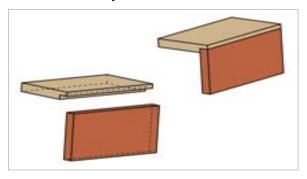


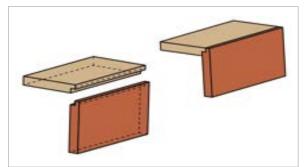


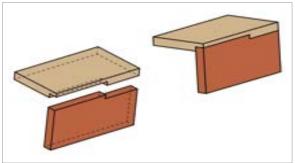


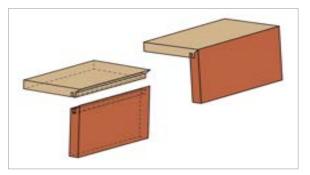
5.1.9.7 Rabbet joint ______

• A rabbet is a recess cut out of the end or edge of a board. When a piece is butted into a rabbet, it is called a rabbet joint.



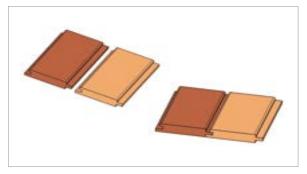


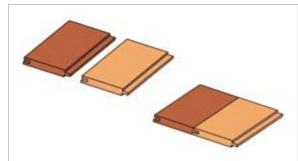


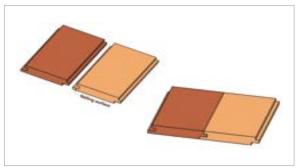


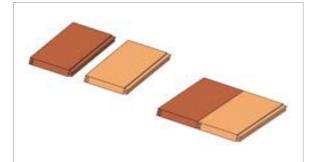
5.1.9.8 Tongue and groove joint —

• A rectangular groove is cut in one piece into which the projection of another piece fits. It is used to make table tops, flooring.



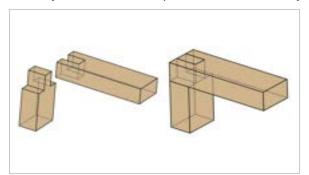


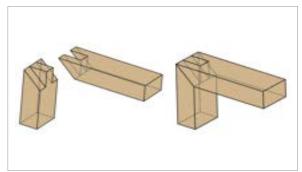


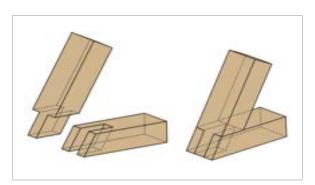


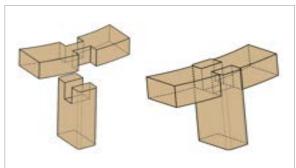
5.1.9.9 Bridle joint _____

• This joint is also called open mortise and tenon joint. It is very easy and quick to make.



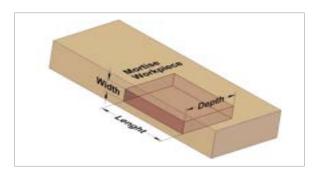


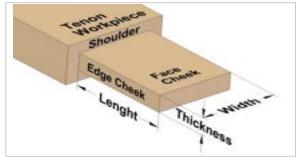


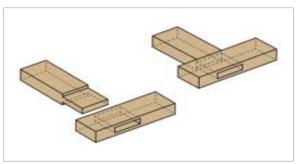


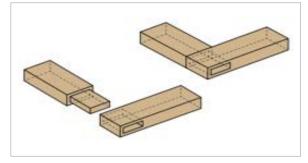
5.1.9.10 Mortise and Tenon joint

• This joint is one of the strongest joints. it is used to make door and window frames.





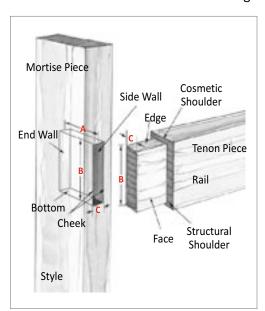


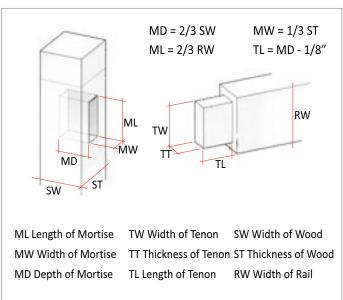


5.1.9.11 How to make a mortise and tenon joint

STEP 1: Laying Out the Joint

- Proper layout is just as important as the cutting and shaping to follow. A perfectly shaped tenon that's the wrong size or shape is no accomplishment at all.
- The tenon should be between one third and one half of the thickness of the stock from which it is made.
- Set mortise gauge to the chosen tenon thickness, positioning the points so that it will score a pair of lines that distance apart. Then set the block on the gauge so that the lines will be drawn equidistant from the sides of the stock. Mark off the shoulder lines, too, where the stock is to be trimmed above and below the tongue.











STEP 2: Cutting the Tenon

Cut the tenon using back saw.













STEP 3: Cutting the Mortise

- The mortise depth should be roughly three times the thickness of the tenon. Cut it using mortise chisel and mallet.
- Make sure the workpiece is properly secured to the table with a clamp. In cutting accurate mortises, it is essential that the sides of the chisel be square to the stock.

STEP 4: Fastening the Joint

- Glue is often used to connect mortise-and-tenon joints, as are dowels driven through the joint. A combination of both is the strongest.
- Before applying the glue, clamp the joint together dry to be sure the fit is just right. Drill out the holes for the pins or dowels, disassemble, and apply the glue. Clamp the pieces together, and insert the dowels, leaving them protruding from both sides of the joint. Scrape off any visible excess glue from the surface of the wood being joined.
- After the glue has set, remove the clamps and cut off the dowels, using a sharp chisel or a flush saw.

5.1.10 Procedure of making furniture –

Let us see these basic steps to make the furniture

STEP 1: Reading technical drawings

STEP 2: Estimating the quantity of materials as per drawing

STEP 3: Measuring and cutting the workpieces as per drawing

STEP 4: Shaving the wood workpieces

STEP 5: Assembling the prepared workpieces using woodworking joints, and fasteners and adhesive

STEP 6: Giving finish to the ready structure by pasting veneer or

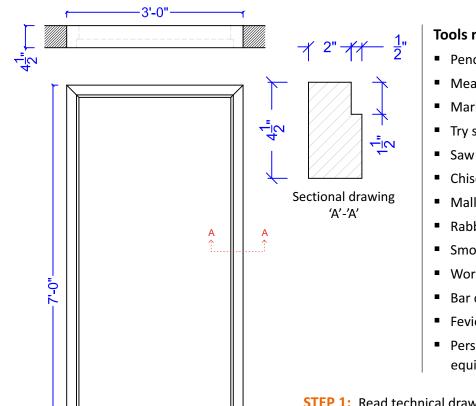
laminate and edge banding

STEP 7: Inspecting the ready item for any error or damage

STEP 8: Installing the furniture at site



5.1.10.1 Example: Chaukhat of door (single rabbet chaukhat) _



Tools needed -

- Pencil
- Measuring tape
- Marking gauge
- Try square
- Chisel
- Mallet
- Rabbet or shoulder plane
- Smoothing plane
- Workbench
- Bar clamp
- Fevicol
- Personal protective equipments

STEP 1: Read technical drawing.

STEP 2: Estimate the quantity of wood.

Size to be prepared -

3'-0" x 4 ½" x 2 ½" x 1 no.

7'-0" x 4 ½" x 2 ½" x 2 nos.

Quantity of wood (C. Ft.) -

 $3'-0'' \times 4\%'' \times 2\%'' \times 1 = 0.24 \text{ c. ft.}$

 $7'-0" \times 4 \%" \times 2 \%" \times 2 = 1.1 c. ft.$

Total = $1.34 \, \text{c.}$ ft.

STEP 3: Mark the required sizes on wood and cut them with saw.

STEP 4: Plane all pieces of wood using smoothing plane.

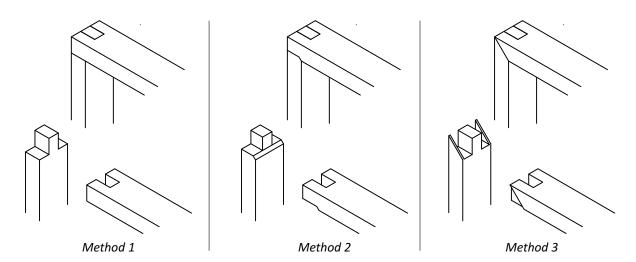
STEP 5: Check the accuracy of pieces of wood using try square.





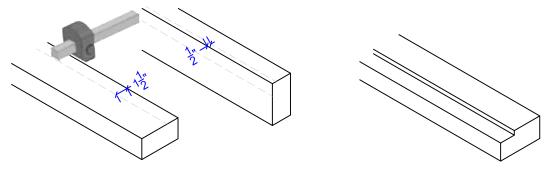


STEP 6: Assemble all three pieces together using bridle joint and check.



STEP 7: Mark on pieces for rabbet using marking gauge.

STEP 8: Make rabbet using rabbet plane and check the accuracy using try square.



STEP 9: Assemble them again and check using try square.

STEP 10: Apply fevicol and tighten them in bar clamp.

STEP 11: Fix a temporary support at the open side of chaukhat, so that it remains in right angle.

STEP 12: Finish the joints using plane.

STEP 13: Install ready chaukhat in wall using hold fast.





Temporary

Notes

Scan the QR codes to watch the related videos



Wood Working Joints

UNIT 5.2: Assembly and Installation Activities

Unit Objectives



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

- 1. Perform assembly and installation of modular furniture in appropriate and safe manner
- 2. Join two perpendicular panels using cam lock fitting
- 3. Join two perpendicular panels using cross dowel and bolt
- 4. Install shutter or door to cabinet/wardrobe using European hinge
- 5. Attach drawer to cabinet using ball bearing slides and roller slides
- 6. Assemble drawer box using knock-down fittings
- 7. Assemble cabinet box using knock-down fittings
- 8. Assemble aluminium profile glass shutter and mount onto the cabinet
- 9. Paste the iron-on PVC tape on raw edges of sheet panel

5.2.1 Pre and post assembly and installation activities

5.2.1.1 Preparatory Activities for Assembling and Installing the Product

Organize work area

- Ensure that the work area is clean and free from hazards.
- While working at client's location, assemble the furniture close to its final position to avoid having to move the assembled furniture.
- Clear enough space to work in. For example, tall items may need to be assembled flat on the floor and then tipped into place, so it is a good idea to remove bedroom furniture before starting to assemble a large wardrobe.
- Ensure that the floor guard or any other floor safety material is spread on the floor to prevent damage to the floor and product.

Unpack the box

- Unpack the boxes, inventory and layout all parts and hardware in an orderly manner.
- Do not use any sharp tools to open the carton, as the contents might get scratched.
- Remove assembly instructions from the box.
- Ensure that everything needed is present. Identify the parts and fittings against the instructions.

• Keep all small fittings in their plastic bags and do not open them until you need them. It will prevent them from misplaced.

Read and follow assembly instructions

- Ensure that you read assembly instructions thoroughly before starting to assemble. This will guide you how the item is constructed overall.
- After installation is complete, handover the assembly guide to client for future reference.
- Follow the assembly instructions exactly step-by-step.

Gather the tools

- Assemble all the tools necessary to complete the job.
- Most instruction manuals will specify the tools you need and even include Allen wrenches and small screwdrivers.
- Identify the appropriate power sockets to be used for different tools.
- Ensure that the power sockets are working properly and safely.
- Conduct a test run of all the electrical tools before starting the actual work.
- Report to your supervisor, in case of unsafe electrical tools and power socket.

Take help

If the instructions state that two people are required to assemble the item, make sure that you take help from your assistant.

5.2.1.2 During Assembly and Installation –

- Take measurement of the area and the corresponding fittings to be installed; report to the supervisor in case of any errors in measurement.
- Assemble the product according to the sequence laid out in the assembly instructions.
- Identify the slots for placing each part of the product as per the design specification.
- Attach parts such that they are flush, level and/or square as appropriate as you go through the assembly process.
- The use of a spirit level from the early stages of assembly will ensure that the product is properly square when complete.
- Avoid tightening hinges fully until you have checked that doors are on straight and open and close nicely.
- Use an appropriate amount of wood adhesive.

- Avoid using a drill to insert screws, bolts and cams. It often results in the damage or distortion of the parts and of the pre-drilled holes in those parts used in furniture.
- Ensure that the safety procedures are followed while operating powered tools.
- Follow the correct and safe lifting techniques.
- Remember to wear personal protective equipment.
- If any doubt regarding any fitting, seek clarifications from your supervisor.

5.2.1.3 Post Assembly and Installation Activities —

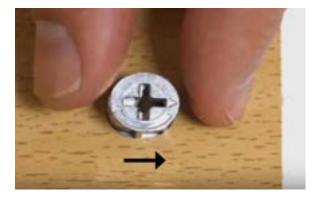
- Ensure that assembled parts function properly and smoothly.
- Check and confirm that the doors, falls and drawers fit to within the specified tolerances for alignment and movement.
- Ensure that the installed product is free from dust and scratches or any other damages.
- If required, polish the surfaces of the product as per the instructions of the supervisor.
- Clean the work area after completing the job.
- Segregate materials into reusable and waste; dispose the waste as per the procedures of your organization.
- Ensure that all the tools and equipment are collected and placed accordingly

5.2.2 Installation of Basic Knock-down Fittings

5.2.2.1 How to Install Cam Lock Fitting -

Tools & equipment needed:

- Screwdriver
- · Cam nut and boltw





STEP 1: Insert the cam nut into the hole at the bottom of the side panel. Make sure that the arrows marked on the cam nut point towards the end of the panel.

STEP 2: Using a screwdriver, fasten the cam bolt into the pre-drilled hole of base panel.

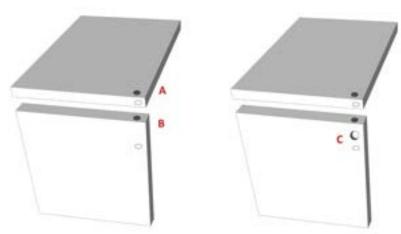




STEP 3: Bring both the panels together, perpendicular to each other.

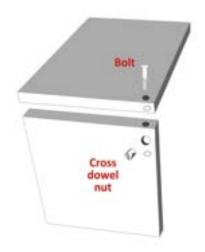
STEP 4: Use a screwdriver to turn the cam nut clockwise to tighten it.

5.2.2.2 How to Install Cross Dowel Fitting



Tools & equipment needed

- Screwdriver
- Drill machine and bits
- Cross dowel and bolt
- **STEP 1:** Using drill machine, drill pilot hole 'A' slightly bigger than the diameter of the bolt across the surface of the top panel.
- STEP 2: Drill pilot hole 'B' along the edge of the vertical panel extending beyond hole 'C'.
- **STEP 3:** Drill hole 'C' across the surface of the vertical panel. The hole should be wide enough to let the nut slide through.
- STEP 4: The depth of hole 'A' and 'B' put together should be slightly more than the length of the bolt.
- STEP 5: 'A' and 'B' should be in line and perpendicular to 'C' and should approximately run through the center of 'C'





STEP 6: Insert the nut into hole 'C'. Now insert the bolt through holes 'A' and 'B' in such a way that it slides through the nut placed in hole 'C'.

STEP7: As the bolt is tightened through the nut, it brings both the panels together and holds them tight and secure.

5.2.2.3 How to Install and Adjust Concealed Hinges

Tools & equipment needed:

- Try square/combination square
- Pencil
- Screwdriver
- · Drill machine
- 35mm Hinge Boring bit & Brad Point bit
- · Concealed hinges and screws
- PPE Safety glasses

Opening Angle of Concealed Hinges

When selecting concealed hinges, pay attention to the opening angle. Standard hinges have an opening angle of 950 or 1100. Some furniture, like TV cabinet, require wide angle hinges with opening angles of up to 1650.





Cup Diameters of Concealed Hinges

Concealed hinges are available in two diameters. Small hinges have cup diameter of 26 mm, while larger hinges have cup diameter of 35 mm. Furniture, like wardrobes and kitchen cabinets are fitted with larger hinges.

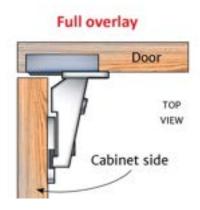




Mounting Options for Concealed Hinges

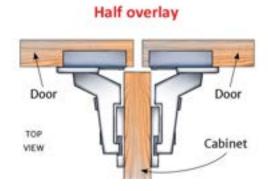
Furniture doors or shutters can be mounted in three different positions in relation to the carcass. These are known as the mounting options.





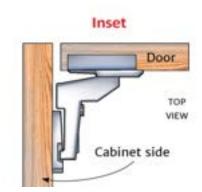
1. **Full overlay:** This is the most common option in furniture making. Overlay shutters cover entire carcass. Zero crank hinges are used in this option.





2. **Half overlay:** Shutters can also be mounted to the carcass such that partial carcass is visible. This mounting option is known as half overlay. This style is also used to fix two shutters with partition panels inside the carcass. 9.5 crank hinges are used in this option.





3. **Inset:** If cabinet carcass surrounds the shutters, the mounting style is referred to as inset. 16 crank hinge is used in this option.

How to Mount Concealed Hinges





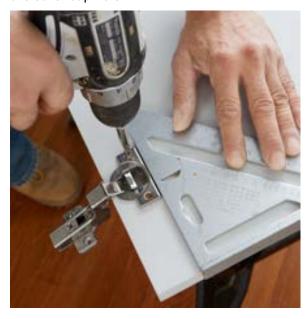
STEP 1: Mark the shutter

Using a try square or combination square, mark a line on the back of the shutter, parallel with the hinge-side edge and inset 22 mm. Then make marks across this line 90 mm from the top and bottom edges, as shown. The point, where the lines intersect, marks the centre of the hole for the hinge cup, the part that recesses into the shutter.

STEP 2: Drill the cup holes

To drill the flat-bottomed hole for the cup, you'll need a 35 mm Hinge Boring bit. Mark a depth line 12 mm up the side of the bit, position it on the centre point, and bore into the shutter until you hit the line.

Blow out the shavings and test-fit the cup to make sure the hinge flanges touch the shutter surface. Drill the other cup hole.





STEP 3: Install the hinge cups

Press the hinge cups into the holes. Position the try square to keep the hinge aligned. Using self-centring drill bit, drill pilot holes through the screw holes in the flanges on both sides of the cup. Drive wood screws into these holes to secure each cup.

STEP 4: Mark the cabinet

Shim the shutter in place with an even gap all around, and measure the gap; 1.5 mm is standard. Remove the shutter, and use a try square or combination square to mark a vertical line on the cabinet's side panel, 37 mm from the front edge. If you are using 16 crank hinges, add shutter thickness (19 - 20 mm is standard) in this measurement. Now, make a horizontal line, 90 mm-plus the gap-from the top and bottom of the opening.





STEP 5: Install the mounting plate

Remove the mounting plate from the hinge. Align its three screw holes with the intersecting layout lines on the side panel. Using the self-centring bit, drill pilot holes through the plate's holes, then attach the plate with the wood screws. Do the same for other hinge.

STEP 6: Mount the shutter

Hold the shutter in the open position and hook the hinges onto their mounting plates. Press on the bars to snap them in place against the plates. Now close the door and check the reveal.

Ways of Adjusting Concealed Hinges





Adjust side to side

Problems: Uneven or insufficient gap between adjacent shutters, or shutter doesn't align with cabinet frame.

Solution: Door overlay can be adjusted by turning the front screw. Turn front screw clockwise to push hinge edge of door closer to cabinet side, counterclockwise to pull hinge end away from side





Adjust in and out

Problems: shutter swings open, or doesn't close flush against cabinet opening.

Solution: The gap between door and cabinet can be adjusted by turning rear screw which is also located in hinge arm.

Turn rear screw clockwise to pull hinge edge of door toward cabinet, counterclockwise to push hinge edge away from cabinet.





Adjust up and down

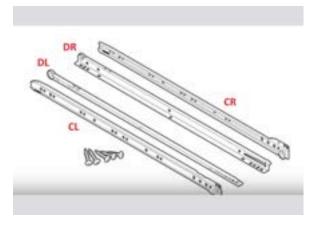
Problem: Top and bottom of shutter do not align horizontally with adjacent door or cabinet edge.

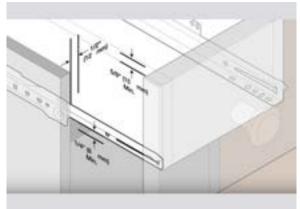
Solution: Door position can be adjusted by releasing mounting plate from the cabinet. Releasing the mounting plate allows the door to move up and down by 2 mm.

5.2.2.4 How to Install Roller Slides -

Tools & equipment needed:

- Measuring tape
- Pencil
- Try square or Spirit level
- Screwdriver
- A set of roller slides and screws
- PPE Safety glasses





STEP 1: Open the package containing a set of roller slides. Each slide consists of two pieces -1) cabinet member (CL and CR), and 2) drawer member (DL and DR). The slide marked 'CL' (Cabinet Left) fits on the left side of the cabinet and the slide marked 'CR' (Cabinet Right) fits on the right side of the cabinet. The slide marked 'DL' (Drawer Left) fits on the left side of the drawer and the slide marked 'DR' (Drawer Right) fits on the right side of the drawer. Roller runners are mounted in two stages -1) mounting of drawer members, and 2) mounting of cabinet members. It is very easy to install roller runners as they will only fit one way. In case of any confusion, refer to the installation guide provided with the roller slides.

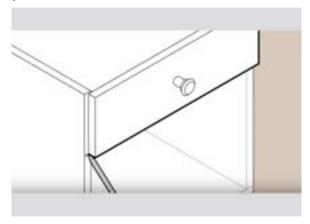
STEP 2: To avoid binding, the drawer must be 12 mm narrower than the cabinet opening on each side. The drawer should have 6 mm minimum clearance from the bottom of the drawer and the 15 mm clearance on the top of the drawer.

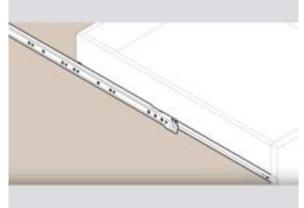




STEP 3: Keeping the drawer front on your right, place the drawer upside down. Take the slide that is marked 'DR'. Now, position the slide 'DR' such that the wheel is at the back with the front of the slide tight against the back of the drawer front. Secure the slide 'DR' to the base of the drawer using a screwdriver and screws provided.

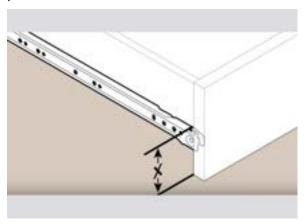
STEP 4: Now, place the drawer such that drawer front is on your left. Take the slide that is marked 'DL' and place it in position. Repeat the same procedure to secure slide 'DL' to the base of the drawer as you did with the slide 'DR'.

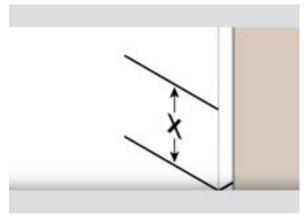




STEP 5: Now, position the drawer in the desired location. Make a mark on the cabinet at the bottom of the drawer front on both side.

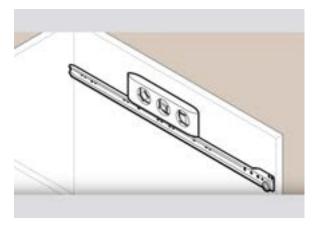
STEP 6: Slide the cabinet member completely onto the drawer member. Make sure that the wheel is positioned at the front and it should be at the bottom of the slide.



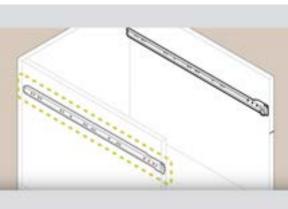


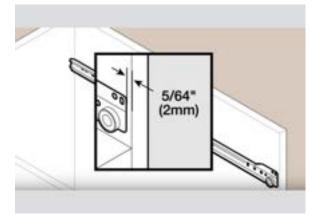
STEP 7: Measure the distance from the bottom of the drawer front to the top of the cabinet member. This will be 'X'. Remove the cabinet member from the drawer member.

STEP 8: Measure the distance 'X' from the previously marked line. Make a mark on the inside of the cabinet wall.



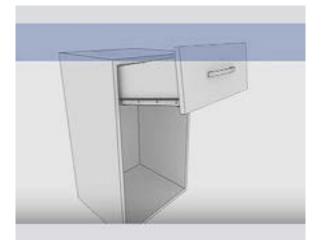


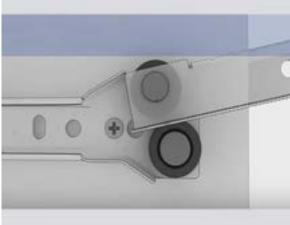


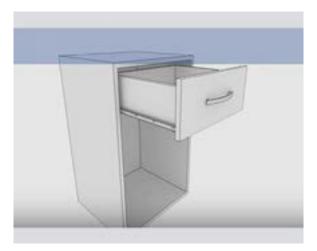


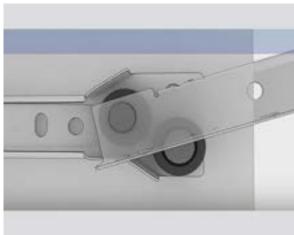
STEP 9: Align the top of the cabinet member with the mark. Allow 2 mm from the front edge of the cabinet.

STEP 10: Make sure that the cabinet member is levelled and secure it to the cabinet wall by fastening screws in the front and back holes of the slide. Do not drive other screws at this stage. Repeat the same procedure to secure the other cabinet member.









STEP 11: Once both the parts of roller runners are screwed in place, slide the drawer into the cabinet by placing the wheels of the drawer members into the channels of the cabinet members. Tip the front of the drawer down at 30 degrees to get the wheels to fit into the channels. When the wheels engage the channels, tilt the drawer down and slide it into the carcass.

STEP 12: Slide the drawer in and out of the cabinet several times to test proper functionality. If it binds, rubs or sticks, remove the drawer and adjust the cabinet members as needed until the drawer slides in and out smoothly. When the drawer moves freely, place screws in all the remaining holes of the cabinet members and tighten them to secure the slides permanently.

5.2.2.5 How to Install Side-Mounted Ball Bearing Drawer Slides

Tools and equipment needed:

- Tape measure
- Try square/combination square
- Pencil
- Screwdriver
- A set of ball bearing slides and screws
- PPE Safety glasses









STEP 1: Before you mount the drawer slides you need to separate them, so that one part can be mounted onto the side of the carcass and the other onto the drawer. There is no right or left unit, so select either unit to begin. To separate the slide, press down the black plastic release lever on the inside of the smallest section of the slide, and pull until this small section separates from the unit. This small section is the drawer member. The large section is the cabinet member.





STEP 2: Using try square and pencil, draw a centerline on the center of drawer side.

STEP 3: Aligning the drawn centerline with the center of the drawer member, place it in position. Set

1/8 inch from the front of the drawer box.





STEP 4: First drive the screws into the first and last holes, and then finish by driving rest of the screws. Make sure that the screws are mounted flush with the steel surface to prevent any sticking or catching





STEP 5: Now, take a piece of scrap wood and place it below the mounted drawer member. Mark a point on it where the bottom of the drawer meets and cut it.

STEP 6: Place this piece of wood on the other side of the drawer, aligning with the bottom.





STEP 7: Set the other drawer member against this piece of wood. Set the 1/8 inch offset from the front of the drawer. Fasten the drawer member with the screws.

STEP 8: To attach the cabinet member, lay the carcass on its side, if possible. It makes easier to layout and position the cabinet member





STEP 9: Set the gauge at 7/8 inch offset (1/8 inch setback $+ \frac{3}{4}$ inch drawer face) and mark a line along with the side edge of the carcass.

STEP 10: Mark the center of the drawer on the carcass side and draw a line along with the depth of the carcass.

STEP 11: Place the cabinet member in position, aligning with the 7/8 inch offset line and centerline. Fasten the cabinet member with screws provided. Move the cabinet member back and forth to access the screw holes. Make sure that center of hole is aligned with the centerline marked on carcass side. Also, check that both cabinet members are vertically and horizontally parallel.









STEP 12: Slide the inner member attached to the drawer into the outer member attached to the carcass and close the drawer. The drawer slide release lever will automatically lock as the drawer is closed.

STEP 13: Make sure drawer aligns properly and rides smoothly on the side mount drawer slides. With the drawer closed, check the alignment of drawer relative to the case. If necessary, adjust it. Fasten the remaining screws into the holes to secure the cabinet member.

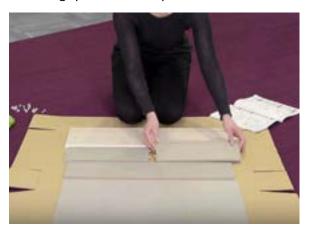
5.2.3 Assembly and Finishing of Basic Structures

5.2.3.1 How to Assemble a Drawer Box -

Tools & equipment needed:

- · Tape measure
- Screwdriver
- Hammer
- A pair of scissors/Utility knife

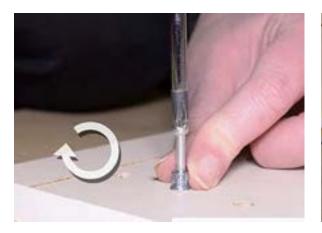
- PVA wood adhesive
- Parts of drawer box
- · Fittings provided with product

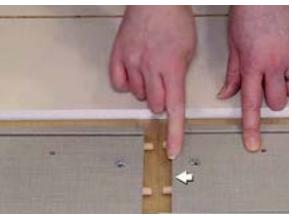




STEP 1: Start by laying all the drawer parts in front of you on the floor. Make sure that packaging is used to protect them from scratches. Note that each drawer is made up from a left and right hand side panel. Read the manufacturer's assembly instructions carefully.

STEP 2: Squeeze a little of the PVA wood adhesive on one end of wooden dowels. Then insert them into pre-drilled holes at the front of the drawer side panels. Tap lightly the dowels into place with a hammer. Take care not to damage the end of the dowels





STEP 3: Screw the cam bolt into the slotted hole on the drawer front panel. Tighten it using a screwdriver in a clockwise direction. Repeat the process on the other side.

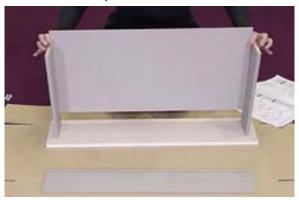
STEP 4: Insert the cam barrel (nut) into the relevant holes on the drawer side panel. Ensure that arrow marked on cam barrel points towards the end of the panel. Insert the cam barrel into holes of both side panels.





STEP 5: Now, take a side panel and line up with the hole of front panel. Push the side panel onto the front until it is flush. Tighten the cam barrel clockwise with a screwdriver, ensuring it is locked in place.

STEP 6: Repeat the process for other side panel. Make sure that the small grooves line up ready for the drawer base panel.





STEP 7: Carefully slide the base panel down the grooves on the side panels. Ensure that the base drops fully into the groove on the front panel and the base panel is in the correct orientation. 192Participant Handbook Fitter - Modular Furniture 193

STEP 8: Place the back panel onto the base panel, making sure it engages onto the groove. Now turn the drawer box over.





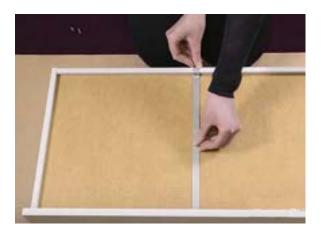
STEP 9: Ensure the holes of back panel and side panels are aligned. Carefully drive the screw or plastic nail into the holes. Turnover the drawer box and repeat the process with the other side.

STEP 10: Using a tape measure, check the assembled drawer box is square. Measure both diagonals. Both should be the same. If any adjustment is needed, tap the drawer box and re-measure





STEP 11: Take the wedges and slide the flange into the groove. Tighten the screw clockwise using a screwdriver. Repeat the process for the remaining wedges.





STEP 12: If the drawer is too wide, use metal brace under the drawer back. Take the metal drawer box brace. Note that there are two fixings required. Hook the brace over the drawer back and position it at centre. Fix the brace at the back and front of the drawer box. Now, the drawer box is ready!

5.2.3.2 How to Assemble a Cabinet Box

This example is about making a basic cabinet structure. Drawers, a shelf and/or a shutter can be added to make it into a cupboard or storage cabinet.

Tools & equipment needed:

- · Tape measure
- Screwdriver

- Hammer
- A pair of scissors/Utility knife
- PVA wood adhesive
- · Parts of cabinet
- Fittings provided with product





STEP 1: Start by laying the panels out on the floor so you can easily see each part. Use the packaging to protect the panels from scratches.

STEP 2: Push the legs into the pre-drilled holes underneath the base panel. If you're using decorative legs as per client's choice, use the fixing instructions that come with them.





STEP 3: Turn the base panel over so it's standing on the legs. Using a screwdriver, screw four cam bolts (studs) into the pre-drilled holes closest to each corner.

STEP 4: Insert the cam bolts into the slotted holes. Now, squeeze a little of the PVA wood adhesive on one end of the four wooden dowels. Then slot them into the pre-drilled holes on either side of the base panel.





STEP 5: Tap the dowels into place with a small hammer (they should fit snugly). Take care not to damage the end of the dowels; a light tap should do the trick.

STEP 6: Put a cam nuts (barrels) into each of the larger holes at the bottom of the side panels. When you do this, make sure the arrows marked on the cam nuts point towards the end of the panel.





STEP 7: Now, put a dab of PVA wood adhesive on the end of each dowel that's sticking out.

STEP 8: Fit the first side panel to the base - it should slide neatly onto the dowels you have already glued. Take care to keep the panel at right angles to the base; otherwise you might risk damaging the dowels. Then make sure the grooves in the base and side panels line up.





STEP 9: Secure the first side panel by tightening the two cam nuts. Use a screwdriver to turn them clockwise.

STEP 10: You're now ready to fit the back panel. Run a bead of glue along the grooves in the side and base panel you've already put together, and slide the back panel into place.





STEP 11: Slide the second side panel into position and tighten both the cam nuts.

STEP 12: Put four cam nuts into the slotted holes on the top of the side panels. Make sure that the arrows point towards the end of the panel.

STEP 13: Glue four wooden dowels and fit them into the top panel.

STEP 14: Now, put four cam bolts into the pre-drilled holes and run a bead of glue into the groove. You can now fit the top panel. Finish by tightening the cam nuts. Fix cam covers to all the exposed cam nuts.

Now, the basic structure of a cabinet is ready!

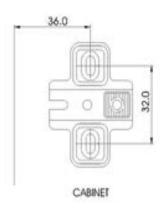
5.2.3.3 How to Assemble and Install an Aluminium - Profile Glass Shutter

Aluminium profile shutter is made up with 2 to 2.5 inch wide aluminium section which supports the glass panel and only a thin aluminium border is seen on finished side. This shutter is attached to the cabinet with European hinges.

Tools & equipment needed:

- Tape measure
- Screwdriver
- Hacksaw
- Jig to cut profile at 450
- · Aluminium profile & glass
- Fittings provided with profile





Example 1: Aluminium profile glass shutter (with cover)

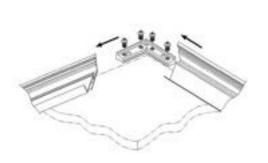
STEP 1: Cut the aluminium profile to desired length and the both ends should be cut in 45° to form a miter joint.

STEP 2: Fit the mounting plate of hinge to the cabinet as per given dimensions.



STEP 3: Insert the hinges in the track and tight the screws properly.

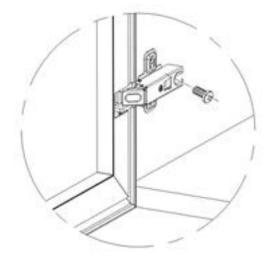
STEP 4: Insert the PVC profiles on the edges of the glass and slide it into the track.





STEP 5: Insert the glass panel in the track and join the aluminium profiles with corner connectors.

STEP 6: Place the cover on the aluminium profile and press to lock. Cut the cover to suit the length of aluminium profile and make the slots where hinges are fitted.



STEP 7: Screw the hinge to the mounting plate. By loosening the bracket screws, the shutter can slide horizontally and also be pivoted for varying pressure.

Example 2: Aluminium profile glass shutter (plain)

STEP 1: Cut the aluminium profile to desired length and both the ends should be cut in 450 to form a miter joint.

STEP 2: Drill ø5.5mm hole to fix corner connectors.

STEP 3: Insert the glass panel in the track and join the aluminium profiles with corner connectors provided and screw it with the screws provided. These aluminium profile comes with two different types of connectors – double hole and single hole connector.

5.2.3.4 Pasting PVC Edge Band Manually -

Tools & equipment required:

- · Tape measure
- · Utility knife
- Edge banding trimmer/end trimmer/
- Chisel & Mallet
- Wooden block
- Workbench
- PVC edge band roll to be matched with shutter finish
- · Clothes iron





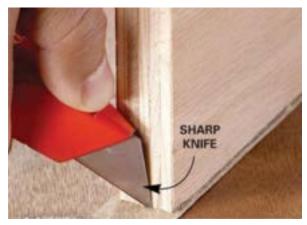


STEP 1: Using a utility knife, cut a piece of PVC edge band about 1" longer than the length of the panel that you are banding.

STEP 2: Turn on the clothes iron and set the temperature to the "medium" or "cotton" setting. If possible clamp the panel in the upright position so the clothes iron can be held horizontally.

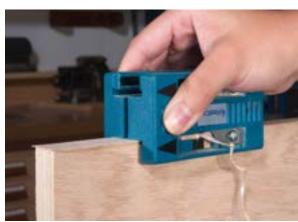
STEP 3: Starting at one end of the banding and work towards the opposite end. Move the iron slowly along the banding while applying downward force.

STEP 4: Using a wooden block, apply pressure on the edge band until the adhesive cools and hardens. Hold the wooden block at a 45 degree angle and press the edge of PVC edge band onto the panel.









STEP 5: To cut the ends of band, stand the panel with the banded edge against a workbench. Hold a 1" chisel tightly against the side edge of the panel and strike the chisel handle with a mallet. It can be done with the help of end trimmer.

STEP 6: When the edge banding has cooled off, you can flush trim the top and bottom edges of the banding with either an edge band flush trimmer or a chisel. If you are using flush trimmer, simply press the trimmer against on to the face of the panel and slide it forward so that the blade cuts off the excess banding. A sharp chisel can also be used to trim the edges. Be sure to skew the chisel so that the pressure forces the banding against the wood edge.

STEP 7: Now lightly sand the top and bottom faces of the plywood where it meets the edge banding. This will smooth out any irregularities left from the edge trimming tool or chisel.

MOLES

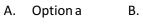


Unit Exercise _____

Choose the correct answer

1. Which tools get used to perform marking on the wood?







 $Option\,b$



C. $Option\,c$



 $Option\,d$ D.

2. Which tool gets used to cut a gypsum board?



A. Option a



B. Option b

3. How should a rip saw be held while cutting with it?



A. Option a



B. Option b

- 4. Which joint should get used in making a picture frame?
 - A. Dovetail joint
- B. Butt joint
- C. Biscuit miter joint
- D. Bridle joint
- 5. Which joint should get used in making the door frame?
 - A. Bridle joint

- B. Butterfly joint
- C. Dowel miter joint
- D. Tongue and groove joint
- 6. What type of tools gets typically used to assemble modular furniture?
 - A. Screwdrivers
- B. Wrench

C. Hammer

- D. All of the above
- 7. What is the most common type of installation for modular furniture?
 - A. Wall mounted
- B. Floor standing
- C. Freestanding
- D. Ceiling mounted
- 8. When assembling modular furniture, what is the recommended order of operations?
 - A. Attach feet and legs, add panels, secure frames
 - B. Secure frames, attach feet and legs, add panels
 - C. Add panels, attach feet and legs, secure frames
 - D. Secure frames, add panels, attach feet and legs













6. Follow health, safety, and greening practices at the worksite

- Unit 6.1. Personal Protective Equipment (PPE)
- Unit 6.2. Personal Health and Hygiene
- Unit 6.3. Safe Material Handling Practices and Correct Body Postures
- Unit 6.4. Workplace hazards
- Unit 6.5. Dealing with worksite Emergencies
- Unit 6.6. Housekeeping Practices and Waste

Management System



Key Learning Outcomes



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

- 1. Know about personal protective equipment used in a workshop or site.
- 2. Properly use personal protective equipment.
- 3. Know the correct ways of maintaining and storing PPE.
- 4. Understand the importance of personal health and hygiene.
- 5. Maintain a clean and hygienic personal appearance and health.
- 6. Recall the importance of safe lifting practices.
- 7. Recognize the correct body postures.
- 8. Recall and practice the correct lifting, loading, unloading, and handling procedures.
- 9. Identify potential hazards and risks at the workshop or site.
- 10. Take preventive measures to minimize potential hazards and risks.
- 11. Discuss the common health and safety standards.
- 12. Identify the various causes of fire.
- 13. Discuss the different types of fire extinguishers and their use.
- 14. Practice the technique of using different fire extinguishers.
- 15. Identify the various types of safety signs and what they mean
- 16. Describe the benefits of good housekeeping practices.
- 17. Discuss the different ways of minimizing waste.
- 18. Practice the correct ways of waste disposal.
- 19. Understand the usage of housekeeping tools, materials, and equipment.

UNIT 6.1: Personal Protective Equipment (PPE)

- Unit Objectives



After completing this unit, you will be able to:

- 1. Explain the meaning and objective of Personal Protective Equipment
- 2. Identify the different types of PPE and discuss their use
- 3. Demonstrate the safety usage of personal protective equipment as needed
- 4. Discuss the safe storage and maintenance of PPE

6.1.1 Personal Protective Equipment (PPE) -

Meaning:

Personal Protective Equipment, commonly known as PPE, denotes protective clothing and apparatus designed to protect the user's body from hazards, injuries, and infection. Such clothing protects different body parts, like hands, eyes, ears, face, feet, head, etc. These are worn or explicitly used to stay protected against occupational safety and health hazards.

Objective:

The objective behind using personal protective equipment is to reduce employee exposure to hazards when internal controls are not adequate to reduce these risks to acceptable levels.



Fig: Personal Protective Equipment (PPE)

6.1.2 Importance of PPE _____

For the Employee:

- Personal Protective Equipment (PPE) protects from workplace hazards, such as sharp objects, hazardous chemicals, machinery, and electrical hazards
- It reduces the risk of injury, illness, and death by reducing employee exposure to dangerous elements
- It also provides comfort and security, allowing employees to focus on their work and confidently perform their tasks

For the Employer:

- PPE helps protect the employer from costly lawsuits and other legal liabilities resulting from employee injuries or illnesses
- It also keeps the workplace safe and compliant with occupational safety and health standards and regulations
- It reduces the costs associated with workers' compensation claims, sick leave, and lost productivity due to injury, illness, or death
- PPE also helps maintain a safe and productive workplace, leading to higher employee satisfaction and better job performance

6.1.3 Types of PPE _____

Different jobs require different types of PPE – the protection needed while using a circular saw differs from the protection needed for building a gable end. Some body parts need more protection than others. Each piece of PPE must be suitable for the job and used correctly.

Head protection

- The most commonly used PPE in woodworking is the safety helmet
- This protects the head from falling objects, knocks, and head bumping risks
- It has an adjustable strap to ensure a snug fit
- Some safety helmets come with attachments for ear defenders or eye protection
- Safety helmets are meant to be worn directly on the head and must not be worn over any other type of hat



Fig: Helmet

Hand protection

- Safety gloves are used to protect hands from cuts
- There are several safety gloves, and the correct type must be used for the task
- To ensure you wear the most suitable type of glove for the task, you must look first at what will be done and then match the type of glove to that task



Fig: Gloves

• For example - wearing lightweight rubber gloves to move glass will not offer much protection, so leather gauntlets must be used. Plastic-coated gloves will protect you from certain chemicals.

Eye protection

- Eye protection is used to protect the eyes from wood dust and wood fragments
- They must be used with a saw, chisel, or plane
- The three main types are:

a) Safety goggles -

They are made of durable plastic and used when there is a danger of dust getting into the eyes or a chance of impact injury.



Fig: Safety Goggles

b) Safety spectacles -

These are also made from durable plastic but give less protection than goggles. This is because they do not fully enclose the eyes and only protect them from flying debris.



Fig: Safety Spectacles

c) Facemasks-

It is also made of durable plastic. Facemasks protect the entire face from flying debris.



Fig: Face Mask

Hearing protection

- · Hearing protection prevents damage to the ears caused by very loud noise
- There are several types of hearing protection available, but the two most common types are earplugs and ear defenders
- a) Ear Plugs These are small fiber plugs inserted into the ear and used when the noise is not too severe. Before inserting earplugs, make sure that your hands are clean. Never use plugs that have been used by somebody else.



Fig: Ear Plug

b) Ear defenders - these are worn to cover the entire ear and connected to a band that fits over the top of the head. They are used when there is excessive noise. They must be cleaned regularly.



Fig: Ear Defender

Foot protection

- Safety boots or shoes protect the feet from falling objects and prevent sharp objects such as nails from injuring the foot
- · They also protect feet from slipping



Fig: Safety Shoe

Respiratory protection

- Respiratory protection is used to prevent the worker from breathing in any dust or fumes that may be hazardous
- The main type of respiratory protection is the dust mask
- Dust masks are used when working in a dusty environment
- They are lightweight, comfortable, and easy to fit
- They should be worn by only one person and must be disposed of at the end of the working day



Fig: Dust Mask

6.1.4 Maintaining and Storing PPE —

PPE must be well maintained. The effectiveness of the protection it offers will be affected if the PPE is damaged. The key factors affecting the maintenance of PPE include –

- Cleaning
- Examination
- Replacement
- · Repair and testing

The wearer may be able to carry out simple maintenance (such as cleaning), but a competent person must only carry out more intricate repairs. Where PPE is provided, adequate storage facilities for PPE must also be provided for when it is not in use unless the employee may take PPE away from the workplace (e.g., footwear or clothing).

Storage may be simple (e.g., pegs for safety helmets), and it must not be fixed (e.g., a case for safety glasses). Storage should be adequate to protect the PPE from contamination, loss, damage, dampness, or sunlight. Where PPE may become contaminated during use, storage should be separate from any storage provided for ordinary clothing. PPE must be maintained regularly.

You must remember

- · After completion of work, PPE should be stored in its place
- Make sure PPE is suitable for the work's nature and any associated hazards
- The PPE must be inspected for defects before using them
- Report its loss or any fault in it to your supervisor



Notes	

Scan the QR codes to watch the related videos



Personal Protective Equipment

UNIT 6.2: Personal Health and Hygiene

- Unit Objectives



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

- 1. Understand the importance of maintaining personal health and hygiene
- 2. List the essential practices involved in maintaining personal health and hygiene
- 3. Practice maintaining a clean and hygienic personal appearance and health
- 4. Practice healthy habits to stay away from diseases
- 5. Discuss the importance of maintaining a healthy diet
- 6. Equip appropriate dress code at the workplace

6.2.1 What is Personal hygiene?

Personal hygiene is an important part of overall health and safety in any industry, from healthcare to woodworking. It is "the practice of keeping oneself and one's surroundings clean to prevent the spread of infectious diseases." Good personal hygiene requires regular hand washing, keeping surfaces and work areas clean, and wearing protective clothing such as gloves and face masks. It is essential for preventing the spread of germs, bacteria, and other contaminants in the workplace.

For instance, in the woodworking industry, personal hygiene is particularly important due to the presence of dust and other particles in the air. Wood dust can cause respiratory problems and other health issues if it is not controlled correctly. Therefore, workers should wear appropriate protective clothing, such as dust masks, face shields, and gloves, to protect themselves from inhaling or coming into contact with dust. Additionally, workers should practice regular hand washing and maintain a clean and tidy workspace to prevent the spread of germs and bacteria.



Fig: Personal Hygiene Practices

6.2.2 Importance of Personal Hygiene

The importance of personal hygiene cannot be overstated. Good hygiene is essential for a healthy life and plays a key role in preventing disease and infections. Here are some key points about the importance of personal hygiene:

- 1. **Improved Health:** Good Hygiene reduces the risk of developing illnesses, infections, and diseases. Regularly washing hands and bathing helps to remove bacteria and germs that can cause illnesses.
- 2. **Prevention of Body Odor:** Regular bathing and using products such as deodorants, antiperspirants, and body sprays help to reduce body odor.
- 3. **Improved Self-Esteem:** Taking good care of your body can help to boost self-esteem and confidence.
- 4. **Social Acceptance:** Maintaining personal hygiene is essential for social acceptance. Good hygiene habits will help people be better accepted in social situations.
- 5. **Good Habits:** Developing good hygiene habits from a young age helps children grow up with healthy habits they can carry through life.

Ultimately, good personal hygiene is essential for improving overall health and preventing the spread of disease. It also helps to boost self-esteem and confidence and ensures social acceptance.

6.2.3 Wash Your Hands

Hand hygiene is essential for being healthy. The most standard way we establish contact with things around us is by using our hands. Dirty hands can lead to skin allergies, food poisoning, etc. Washing hands can prevent the spread of germs from one person to another or from one part of your body to another. One must take special care to keep them neat, clean, and bacteria-free.



Fig: Wash your hands

Always remember

- Wash your hands with soap and water.
- Do not clean hands with white spirit, thinner, petrol, or turpentine.
- Wash thoroughly and in the gaps between your fingers.
- · After visiting the toilet
- · After coughing or sneezing
- Blowing your nose
- · Before handling food
- After handling food
- After disposing of trash
- After touching a wound
- · After touching or playing with pets or any animal

6.2.4 Good Hygiene Practices –

Maintaining personal hygiene is very important for you. Your hygiene not only affects you, but it also affects others too. Good hygiene practices include regular and thorough washing of the person's body, hair, and hands, brushing and flossing teeth, caring for gums, and keeping the feet clean. These are undoubtedly easy day-to-day routines, which, when incorporated, help improve one's cleanliness.

Oral Hygiene

Accumulating food in the mouth can cause problems ranging from bad breath to dental caries. For the removal of food particles and oral hygiene, specific steps are to be followed –

- · Brush your teeth at least twice a day
- Floss at least once each day for inter-dental care
- · Use a tongue scraper to keep your tongue clean
- Use mouthwash whenever you go out
- Drink a lot of water to keep the mouth moist and to remove any foul odour.



Skin hygiene

You are exposed to dust, smoke, pollution, bacteria, road grime, workplace dust, and dirt daily. If you carry dirt on your body or have not showered for some time, bacteria will start growing on you in this dirt. The bacteria on your skin makes your body stale, and your body begins to give out a bad odor, which is unpleasant for you or your co-workers.

- · Shower, bath, or wash your body thoroughly with soap and water
- Take a bath once or twice a day
- Use a moisturizer or oil to keep the skin supple and well-oiled
- Avoid sharing towels



Hair hygiene

When considering personal hygiene, the hair is neglected. The hair gets dirtier than the body. For this reason, attention must be given to the hair.

- · Wash your hair every day with soap or shampoo
- Comb your hair
- Oil your hair regularly

Nail hygiene

- Clean your nails by thoroughly removing dirt from them.
- Trim your nails often and, preferably, keep them short.

Feet hygiene

The most neglected part of the body is the feet. Ways to keep your feet clean are as follows:

- · Wash your feet with warm water and soap.
- Scrub the heel of your foot with a pumice stone to prevent it from cracking
- Powder your feet before putting on socks to prevent sweat and the resultant smell.

Your clothing hygiene

- Change your clothes regularly
- Do not re-wear your clothes without washing them. It is harmful to people who sweat profusely.
- Wash your clothing in a good detergent with lukewarm water.
- Dry your clothing, perhaps in the sun
- Do not share underwear with anyone

Use Clean Bed Linen

Be sure to change your bed linen each week. Your linen doesn't need to be costly, but your sheets and pillows should be kept clean. Clean your bedding regularly at least once per week.

6.2.5 Keep Yourself Fit-

Furniture installer work is physically demanding. A carpenter has to lift and pull heavy materials. Prolonged standing, climbing, bending, and kneeling often is necessary. A carpenter often has to stand on ladders. So carpenter has to be physically fit and strong. Keeping the weight in check and ensuring proper exercise will keep you fit and happy. To become fit and strong, you should -

- · Do cycling
- · Do swimming
- Do yoga
- Do weight-lifting
- Go for a morning-evening walk
- · Exercise regularly



6.2.6 Eat Healthy Food -

Apart from personal cleanliness and regular exercise, one should have a balanced and healthy diet to become fit. A balanced and healthy diet gives energy to the body and keeps muscles working.

Follow healthy eating habits -

- · Always eat home-made food
- · Avoid oily food
- · Always eat freshly cooked food
- Avoid junk food like burgers, cold drinks, etc.
- Eat a lot of vegetables and fruits
- Drink a lot of water



Fig: Healthy Diet

6.2.7 Avoid Bad Habits —

Bad habits like smoking, drinking alcohol, and addiction to tobacco and gutkha have a negative effect on your health and appearance.

- Drinking alcohol leads to cancer, heart disease, and kidney failure.
- Smoking causes bad odors, stained teeth, chronic coughing, yellow fingernails, and mouth cancer. For a healthy life, keep yourself away from these bad habits.









6.2.8 Follow Work Place Dress Code

This workplace dress code is designed to ensure that employees maintain a professional and safe working environment.

- All employees are expected to wear neat and comfortable clothing that is appropriate for the job and within the guidelines of this dress code. This includes t-shirts, jeans, and closed-toe shoes. Additionally, safety gear such as safety glasses, gloves, and hard hats must be worn at all times.
- Employees should also keep their hair neatly trimmed and avoid wearing excessive jewelry or other accessories that could be a hazard in the workplace.
- Following this dress code will help ensure the safety and productivity of our production environment.
- The dress code helps a person identify as an inseparable component of the organization.
- Maintaining the dress code helps strengthen the security of the organization. The dress code mandates that only authorized persons can access and control the premises.



Fig: Workplace Attire: Male and Female

— Notes 🔲 —————	

UNIT 6.3: Safe Material Handling Practices and Correct Body Postures

- Unit Objectives



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

- 1. Demonstrate how to lift weights Manually
- 2. Demonstrate how to use different material handling equipment
- 3. Demonstrate how to load /unload material from the vehicle
- 4. Identify precautions to be taken while loading / unloading material from the Truck
- 5. Demonstrate how to lift, carry or move heavy wooden furniture and accessories
- 6. Demonstrate how to maintain and work in the correct body posture

6.3.1 Lifting of Weight - Manually

While working at a carpentry shop, we have to lift various kinds of weight in the form of wood cut pieces, tools, woodworking equipment, etc. It is essential to lift the weight properly to ensure the safety of equipment and tools and us.

If manual lifting is the only option, then several things can be done to reduce the risk, including:

- Making the load smaller or lighter and easier to lift,
- Breaking up large consignments into more manageable loads,
- Modifying the workstation to reduce carrying distances, twisting movements, or the lifting of things from floor level or above shoulder height,
- Improving the environment e.g., better lighting, flooring or air temperature can sometimes make manual handling easier and safer.

There is no limit on the weight of manual lifting since it varies because of people's different body builds. Still, we should use not lift weights of more than 15 kg.

The safe way of lifting weight manually is to bend your knee and pick the weight from the floor (do not bend back). If we bend back to lift the weight, the whole weight will act on the back, and there are chances of hurting the back.



Fig: Correct method of Lifting Weights

For lifting weights more than this, we should take help from others or use hoists. For moving around heavy weights, we should use Trolleys and Hoists.



Fig: Trolley for Moving Heavy Material

6.3.2 Hazards Associated with Handling Heavy Loads

- The weight of the heavy materials leads to stress on muscles, discs, and vertebral column
- Bad and awkward postures, like bending while lifting and carrying a load on one shoulder or with one arm
- Frequent and prolonged lifting and carrying of heavy materials
- Inadequate Handholds, like boxes without or with inappropriately shaped handles
- Environmental factors like extremely hot conditions, where the carrier gets easily fatigued by perspiration, and extremely cold conditions, where the cold leads to lower muscle flexibility

6.3.3 Safe Lifting Practices

Dos

- Check the exact weight of an object before moving it.
- Always size up the load. Get help from others for heavy objects
- Choose the flattest, straightest, and clearest route before lifting the object.
- If the load is wet or slippery, wipe it off before lifting.
- Make sure the object's weight is stable and distributed evenly, if possible.
- Stand close to the object with legs at shoulder-width stance.
- Check your footing before you pull the load close to your body. Lift with your legs, not your back.
- Use material handling equipment whenever possible.
- When unloading, face the chosen spot and slowly lower the load by bending your knees.

DON'Ts

- Never lift more than you can easily handle or without knowing the weight.
- Avoid twisting your body while lifting or carrying.
- Never lift with a rounded back and straight legs.

- Never lift from an unbalanced position.
- Never carry a load that blocks your view or is big enough for the path you are following.
- · Never look down while lifting.
- Never reach over your shoulders to lift. Instead, use a step stool or platform if possible.
- Avoid heavy lifting if you have had previous joint injuries.
- Do not bend over to load or unload a heavy object; it may hurt your back.ed handles
- Environmental factors like extremely hot conditions, where the carrier gets easily fatigued by perspiration, and extremely cold conditions, where the cold leads to lower muscle flexibility

6.3.4 Maintain Correct Body Posture –

While prescribing the correct body postures for furniture installer's, we must discuss the differences between Neutral and Awkward body postures.

- In Neutral body posture, a person's body is aligned and balanced at sitting, working, or standing positions, thus imposing minimal stress on the body and keeping the joints aligned. Neutral postures lessen the stress exerted on the musculoskeletal system, thus promoting maximum control over the task and efficiency.
- On the contrary, Awkward body postures move away from the neutral body postures, away from the comfort zone, towards the extremes in the range of motion. This exerts greater stress on the body's musculoskeletal system.





Fig: Improper lifting may cause back injury

6.3.5 Lift, Carry or Move Heavy Wooden Furniture and Accessories from One Place to Another

The steps involved in correct lifting, loading, unloading, and handling procedures are:

A. Preparation:

One must prepare for lifting and handling the load, keeping in mind the following points:

The heaviness of the load

- If mechanical means like Hand Trucks are required to lift the load
- If the load can be broken into small parts
- The destination of the load and if the path is free of obstacles
- If there are closed doors on the way
- If PPE must be worn while handling the load
- If another person is needed to help with the load

B. Lifting:

Lifting should be done by considering the following factors:

- Staying as close to the load as possible to ensure better grip
- Keeping elbows and arms close to the body
- Keeping the back straight by tightening the stomach muscles
- Avoiding twisting and jerking motions while lifting
- Asking for assistance if the load is too heavy for one person to lift

C. Carrying:

Carrying should be accomplished by considering the following factors:

- One should turn by moving the feet around but not by twisting or turning the body
- The carrier's hips, shoulders, toes, and knees should face the same direction
- Rest and short breaks should be taken for some time if the carrier is too exhausted and stressed out

D. Settling Down:

Settling down needs considering these factors:

- The load must be put down in the same way it was picked up, but in the reverse order
- The carrier must bend at the knees but not at the hips
- The load must be kept close to the body to ensure a firm grip till it is completely set down
- Hold should be released only when the load is securely set down



Lift, Carry and Move Accessories

6.3.6 Loading / Unloading material from the vehicle

All the wood required for woodworking comes from outside. Which usually comes in big trucks. Unloading material from the vehicle is a significant activity for below reasons -

- 1. Material is expensive; any damage during unloading can cause monetary loss.
- 2. If the material is damaged, it may delay the project for which the material is required.
- 3. Any accident during the unloading of material could cause personal injury.

6.3.7 Precautions For Loading / Unloading of material –

- 1. Do not use hoisting equipment for lifting people.
- 2. Do not pass a load over workers.
- 3. Do not tip a load. The load is unstable and harms the hook and hoist.
- 4. Do not raise loads higher than necessary to clear objects.
- 5. Do not exceed a equipment limit.
- 6. Do not leave suspended loads unattended.











Fig: Various Ways of Unloading Material

Notes 🗀		

- Scan the QR codes to watch the related videos



Safe Lifting Practices

UNIT 6.4: Workplace hazards

Unit Objectives



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

- 1. Differentiate between Risk, Hazard and Threat
- 2. Interpret the meaning of Occupational Hazards
- 3. Identify the common health and safety hazards
- 4. Identify the other categories of hazards
- 5. Demonstrate the use of pictograms and symbols in identifying hazards
- 6. Discuss the common methods of identifying hazards
- 7. Identify the potential hazards and risks associated with
- 8. Discuss how to get acquainted with common hazardous substances
- 9. Apply safety measures while handling glass, heavy wood, materials, chemicals etc.
- 10. Comply with recommended material handling procedure to control damage and personal injury
- 11. Identify the common health and safety practices at workplace for Assemblers of Modular Furniture

6.4.1 Difference between Risk, Hazard and Threat -

Hazard is defined as a factor, which may cause harm to people and properties alike, like electricity, inflammable products, explosive material, corrosive chemical, using heavy ladders at workplace, etc. Simply put, a Hazard is simply a condition or a set of circumstances that present a potential for harm. Risk is defined as the likeliness or the chance that a hazard can actually cause harm to somebody. For example, smokers of cigarettes run the risk of developing Cancer. The potential or imminent danger that Risks and Hazards expose the concerned premises to, is known as threat.

The steps involved in Risk Management are:

- 1. Identifying Hazards
- 2. Assessing Risks
- 3. Controlling and mitigating Risks

6.4.2 Understanding Occupational Hazards

Any job role and any occupation in this world has some hazards, in varying severity, associated with it. These are called Occupational Hazards. Occupational Hazard can be defined as "a risk accepted as a consequence of a particular occupation". According to the Collins English Dictionary, it is defined as "something unpleasant that one may suffer or experience as a result of doing his or her job".

Occupational Hazards are caused by the following:

A. Hazardous Working Ambience

- Unsafe and unguarded machinery and tools
- Hazardous and unmonitored processes
- Inappropriate and inadequate ventilation
- Inappropriate and inadequate illumination
- Inappropriate and unsafe dress

B. Hazardous Behaviour and Acts

- Using unsafe and unguarded machinery and tools
- · Neglecting safety guidelines while working
- Ignoring the Instruction Manual or Directions for Use
- · Unsafe lifting, loading, staging, assembling and installing
- Not adopting the prescribed ergonomic postures
- Handling Personal Protective Equipment (PPE) and safety devices dysfunctional

6.4.3 Common Health and Safety Hazards

On the basis of effects on individuals, Occupational Hazards can be broadly categorized into: Health and Safety Hazards.

Examples of Health Hazards are:

- Carcinogenic factors
- Corrosive
- Toxic
- Irritant
- Factors that may lead to chronic and adverse effects on one's health

Examples of Safety Hazards are:

- Spills on floors
- Tripping hazards like loose cords and cluttered workplace Working from high or raised areas like ladders, cranes, scaffolds, rooftops etc.
- Unsafe and unguarded machinery and their moving parts
- Electrical hazards like live wires, lack of earthing, loose cables, frayed cords, wet and poorly insulated devices, etc.
- Inadequate space
- Unsafe and unguarded machinery and their moving parts
- Electrical hazards like live wires, lack of earthing, loose cables, frayed cords, wet and poorly insulated devices, etc.

Results in illness physical harm

Lead to measurable changes in the exposed individual, which are understood by signs and symptoms

Fig: Differences between Health & Safety Hazards

Safety Hazard

Results in physical harm or injuries

Affect the safety or individuals, usually having an injury or immediate fatality as the result of an incident

6.4.4 Other Categories of Hazards -

Apart from the ones mentioned above, Hazards can also be categorized on the basis of the Source of Energy. The types of hazards, according to the Source of Energy, are:

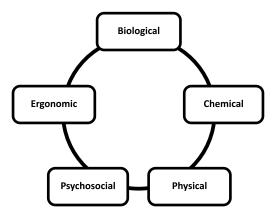


Fig: Various types of hazards

- **1. Biological** These hazards are associated with working with animals, plants and their products, as well as contagious or infectious materials. Examples are:
- Body fluids like Blood, Saliva, Sweat and Semen
- Bacteria, Fungi and Viruses
- Insect bites
- Human and animal waste

- **2. Chemical -** These hazards occur, if, the inherent properties of materials pose harm to animal life, property or the environment as a whole. Severity of chemical hazards depends on the dosage and amount of the harmful components in a given chemical. Typical examples are:
- Chemicals in unlabeled container
- Various types of cleaning products, chemical agents, solvents, solutions, paints, acids, etc.
- Vapours and fumes resulting from welding and gas cutting operations, as well as from strong solvents and solutions
- Harmful gases like CFCs, Acetylene, Carbon Monoxide, Sulphur Monoxide, Propane, Helium
- Insecticides and pesticides
- **3. Ergonomic -** These hazards occur, when the nature of work, body postures and working conditions exert strain on one's body. Common examples are:
- Inappropriately set up workstations and seats
- Frequent lifting by inappropriate techniques
- Repetitive and exhaustive movement
- Exertion of excessive force
- Excessive mechanical vibration
- **4. Physical -** These hazards result from natural disasters, like earthquakes, floods, storms, etc., which cause massive loss of life and property. The hazardous factors are generally:
- Radiation
- Noise
- Dust and Debris
- Extreme temperatures (extremely high or low)
- **5. Psychosocial** These hazards mainly result from stress in one's social and professional life. These include:
- Excessive workload
- Violence at workplace
- Sexual Harassment
- Lack of respect at workplace
- · Lack of flexibility at workplace
- Poor work relations
- Grapevine gossips

6.4.5 Common Methods of Identifying Hazards

Identification implies, that, the job is half done. In order to take adequate precautionary measures against hazards, one needs to identify the hazards commonly found in the workplace.

The common methods of hazard identification are:

Job Hazard Analysis (JHA): This is a popular technique to identify the perils associated with specific tasks in a job role, in order to lessen the risk of injuries to employees. The steps involved in successfully conducting JHA are:

A. Divide the entire job role into small tasks or steps

Let us understand the concept with the help of an example, where JHA is being conducted on Carpentry work.

Steps	HazardsAssociated	Recommendations
1. Loading job with tools and equipment		
2. Framing and Sheathing		
3. Prepping up and Painting		

B. Spot out the hazards associated with each step by asking questions like:

- What can go wrong with this task?
- What would be the consequences if the task went wrong?
- How could the task go wrong?
- What are the other contributing factors?
- What are the chances that this hazard will take place?

Steps	HazardsAssociated	Recommendations
1. Loading job with tools and equipment	Injury from lifting, carrying, possible trip and fall	
2. Framing and Sheathing	 Injury from lifting, carrying, possible trip and fall Injury from power tools Injury from sharp objects, metal studs, wood splinters Lungs getting affected by dust and debris 	
3. Prepping up and Painting	 Eye and skin injury Accidentally touching the wet paint Paint fumes affecting the lungs 	

- C. Review and discuss the scope of the hazards with the employees, who would actually do the tasks on hand.
- D. Find out strategies and ways to mitigate or avoid the hazards

Steps	HazardsAssociated	Recommendations
1. Loading job with tools and equipment	Injury from lifting, carrying, possible trip and fall	Abide by the recommended lifting guidelines
2. Framing and Sheathing	 Injury from lifting, carrying, possible trip and fall Injury from power tools Injury from sharp objects, metal studs, wood splinters Lungs getting affected by dust and debris 	 Abide by the recommended lifting guidelines Follow instruction manual for individual power tools, use GFCI (Ground Fault Circuit Interrupter) Use appropriate PPE
3. Prepping up and Painting	 Eye and skin injury Accidentally touching the wet paint Paint fumes affecting the lungs 	 Use appropriate PPE, including safety glasses, aprons and gloves Use "Wet Paint" sign

- E. Review and revise JHA periodically: JHA can be periodically reviewed and revised (if needed) by:
- **1. Hazard and Operability (HAZOP) Study:** This technique involves a structured and systematic examination of an existing method / procedure, thus, in turn, identifying and assessing the associated hazards. These hazards can be easily identified in the form of Deviations in the process parameters (physical conditions and elements like flow, pressure, temperature, humidity, etc. The severity of Deviation can be illustrated with the help of specific and predetermined Guide Words. A Deviation is a manner in which the process conditions stray away from the expected values.

Guide Word + Process Condition / Parameter = Deviation. For example, No + Signal = No Signal

The steps involved in conducting HAZOP are:

- · Segregating the entire system or process into sections or components
- · Select a study node or point
- Define the expected outcome or consequence
- Choose a process parameter, based on the expected consequence
- Implement a suitable Guide Word
- Determine the Cause behind the deviation
- Start with the cause that may lead to the worst possible consequence
- · Assess the deviations thus detected

- Devise and prescribe action
- · Record and document information
- Repeat the process from B

Common examples of process conditions / parameters are:

- Temperature
- Pressure
- Flow
- pH value
- Viscosity
- Time
- Addition
- Reduction
- Separation
- Signal
- Mixing
- Communication
- Sequence
- Control

Common examples of Guide Words and their meanings are:

GuideWord	Meaning	Example
No (Not, None)	None of the desired consequence is achieved	No flow of gas through the gas cutting nozzle due to accumulated dirt
More (Higher than, More of)	Quantitative increase in a certain process parameter	More heat generated and higher temperature achieved than expected, during sawing operations
Less (Lesser than, Less of)	Quantitative reduction in a certain process parameter	Lower pressure than expected
As well as (In addition to)	All the design intentions are achieved and an additional activity takes place	All valves closed at the same time
Reverse	The logical opposite of the design intention takes place	The Power Drill continues drilling even after shutting down the power supply
Other Than	An unexpected activity takes place	Presence of liquid fuel in Gas Cylinder

6.4.6 Potential Hazards and Risks Associated with Furniture & Fittings Related Workplace

A Furniture Installer is exposed to multiple Occupational Health Hazards. Potential hazards and risks are the ones, which are likely to occur, but have not occurred yet. The knowledge on the same is essential so that the trainees stay aware and alert while working hands on live assignments.

These are:

- Injury (of varying severity) hazards and risks from the use of different equipment, machinery and tools
- Ergonomic injuries, fatigue and muscle stress arising from working in long shifts, in awkward and inconvenient positions, exposure to repetitive tasks and lifting as per inappropriate methods
- Biologically and chemically toxic hazards like prolonged exposure to toxic pathogens (harmful microorganisms like bacteria, fungi and moulds, viruses and their vectors and carriers), corrosive, harmful and radioactive chemicals
- Exposure to extreme temperatures and the resulting risks like Heat Stroke and Hypothermia (the condition of having fatally low body temperature)
- Prolonged or repetitive exposure to carcinogenic (causing cancer) materials like radioactive materials, radiations and waste like wood dust and formaldehyde in pressed wood
- Exposure to toxic fumes from chemical solvents and hydrocarbons
- Exposure to highly combustible materials like wood debris, straw and hay, gas cylinders, etc.
- Exposure of the eye to sharps, debris and flying splinters
- Exposure to climbing heights (trolleys, ladders, scaffolding and cranes) and the resultant risk of falling from them

6.4.7 Reporting of Accidents/Incidents to Authorized Persons —

Reporting an accident / incident to an authorized person can be best done with the help of the Hazard Reporting form. The common format of the Hazard Reporting form is given below:

Part A:

To be completed by the Worker Details Required:

- Name of Worker
- Designation
- · Date of filling up the form
- Time of incident / accident
- Supervisor / Manager Name

- Work Location/Address
- Description of the hazard/what happened (Includes area, task, equipment, tools and people involved)
- Possible solutions to prevent recurrence (Suggestions)

Part B:

To be completed by the Supervisor/Manager

Details Required: Results of Investigation (Comment on if the hazard is severe enough to cause an injury and mention the causes of the incident/accident)

Part C:

To be completed by the Supervisor/Manager

Details Required: Actions taken/Measures adopted (Identify and devise actions to prevent further injury, illness and casualty

Action	Responsibility	Completion Date

6.4.8 Storage and Handling of Hazardous Substances

Follow recommended material handling procedure to control damage and personal injury In order to ensure appropriate safety practices at the workplace, one must understand the importance of following recommended material handling procedure to control damage and personal injury. The essentials of the same have been discussed below:

A. Biological

- Infectious and potentially infectious materials must be inactivated by bleaching or Autoclave Sterilization during storage and before disposal.
- Infectious waste must be inactivated within 24 hours and marked with "Biohazard" symbol.
- Appropriate PPE must be worn or used while procuring, handling and disposing of infectious materials.
- Non-infectious biological waste do not need inactivation but must be put away separately in biological waste box, lined with red garbage bag.

- Non-infectious biological waste include used but uncontaminated laboratory utensils, disposable clothing and gloves
- Sharps waste (including metal lancets, hypodermic needles, scalpel blades, medical instruments for cutting and piercing), used and unused, must be placed in red sharp boxes.
- Sharps boxes must be closed, when they get 3/4 full.
- Closed Sharp boxes must not be stored for more than 30 days.
- Contaminated sharps must be autoclaved and inactivated before storing for disposal.
- Penetration-resistant gloves must be worn for handling and storing contaminated sharps.

B. Chemicals

- One must read all information stated in the Material Safety Data Sheet (MSDS), before handling chemically toxic materials, so that the user is aware of the hazards involved and the necessary precautions
- All storage containers must be appropriately and accurately labelled.
- Any incident of damaged container or illegible label must be reported to the concerned authority.
- One must ensure that incompatible materials (like acetone and concentrated nitric acid, molten wax and water) are stored and used separately.
- To avoid destruction of containers, corrosive chemicals must never be stored in containers made of inappropriate materials.
- Containers of corrosive materials must be closed tightly.
- Appropriate PPE must be worn while handling toxic and corrosive chemicals.
- One must never consume anything while handling toxic chemicals and can do so only after thoroughly cleansing oneself with appropriate soap and solutions
- Chemicals that produce a lot of fumes must be used carefully, enclosed in a Fume Hood.
- Flammable chemicals like alcohol, benzene, gasoline, carbon disulphide, etc. must be handled only after turning off all sources of flame (burners, ovens, heaters, etc.)
- Flammable liquids must be only heated in a flask fitted with a Reflux Condenser; they must never be heated in open containers over open flames.
- While working with acids, one must wear acid resistant chemical gloves and clothing.
- One must keep emergency eye wash solutions handy.
- Dilution of acids must be done very carefully, by gradually stirring the concentrated acid into the water
- Ethers must not be kept open and exposed to open air, because, this would create peroxides, which are highly unstable and may lead to violent explosions.
- All chemicals must be treated as a potential toxin and hence, one must keep appropriate antidotes nearby.

C. Radioactive

- Containers for storing radioactive materials or items contaminated with radioactivity must be labelled with "Nuclear" or "Radioactive Hazard" sign and the Radioactive tape.
- Severely contaminated items must be stored and handled under specially designated Fume Hoods and Radioactive Materials (RAM) Hood.
- Lead is considered the most appropriate material to store and contain radioactive materials.
- One must never pipette radioactive materials by mouth.
- Radioactive waste cans must remain covered at all times and must be placed in enclosed, secluded areas, away from the working premises.
- Radioactive waste cans, if contaminated with substantial external radiation levels, must be provided with additional shielding.
- While handling or storing radioactive materials, the work surface must be covered with Absorbent Paper sheet to capture contamination.
- A separate set of equipment must be dedicated to handling and storing radioactive materials and must be labelled carefully with radioactive tape.
- Radioactive materials must never be left unsecured and unattended, even for a short span of time.
- One must never leave edible items open near radioactive materials.
- One must keep on surveying the skin of the wrists while handling radioactive materials.
- Long gloves and lead-lined protective clothing must be worn.

D. Flammable and Explosive

- Appropriate PPE, like disposable gloves (generally lead-lined latex or nitrile gloves) and closetoed shoes must be worn while handling radioactive materials.
- Flammable materials must be contained, stored or transported in vapour-proof, metal or plastic containers and must be equipped with welded seams, spark / flame arrestors, pressure release valves, spring closing lids with spout covers, etc.
- Care must be taken that the flammable material does not react with the container material.
- Containers must be labelled with "Flammable" sign.
- The labeling comprises the following information:
- Name of the flammable material
- Disclaimer that the contents are flammable
- Precautions to be taken, like the fact that the container should be kept away from open flames, spark and other sources of ignition
- Storage and transportation containers for flammable substances must remain closed, when not in use.
- Flammable gas cylinders must be stored in a separate room

- Cylinders must be fitted with appropriate valves so that they do not run the chances of leakage
- Parts of the cylinder, like valves, hoses and container, must be checked regularly for damages.
- Compressed gases must never be stored along with or near bulk storage containers for flammable materials.
- Pieces of wood, straw and hay, saw dust, paper, cardboard etc. must be cleared off as soon as they are procured during the Furniture & Fittings operations.
- Adequate care must be adopted to ensure that the entire work area is a non-smoking zone.

6.4.9 Common Health and Safety Practices at Workplace

A. Work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines

- Ensure that all emergency route maps are on display, in publicly accessible places, on all floors of the workplace
- Ensure that appropriate Fire Extinguishers are available on all the floors of the workplace
- Ask your supervisor how you may retrieve PPE and how to maintain and store the same
- Stay aware that confined spaces must bear appropriate signs, to restrict claustrophobic people from accessing them
- Learn and abide by company policy and procedures for dealing with security risks in your workplace
- Learn and abide by Company policies and procedures for making sure that security will be maintained when you go on your breaks and when you finish work

B. Ensure that health and safety instructions applicable to the work place are being followed

- Lighting should be adequate in all areas and replacement bulbs should be kept handy
- Ensure that all manual cutting tools must be honed in advance, because blunt tools can slip and lead to deep cuts
- Ensure that, while using cutting tools, the direction of cutting is always away from your body
- Arrange for frequent Safety Drills and Trainings for employees to promote safety awareness
- Have clear idea of how much authority and responsibility you have to deal with security risks, including your legal rights and duties
- Learn and abide by company policies and procedures for maintaining security while you work

C. Check the worksite for any possible health and safety hazards

- Appoint a safety supervisor in workshop
- This safety supervisor will stay responsible for checking the worksite for potential health and safety hazards

 Have your employer develop a daily checklist for all areas, delegated to appropriate employees

D. Follow manufacturers' instructions and job specifications relating to safe use of materials specifically chemicals and power equipment

- Ensure that all chemical solutions, used on display shelves or for Housekeeping purposes, must be used only after referring to the relevant MSDS (Material Safety Data Sheets) or instruction manuals
- Loosely fitted clothes must be completely avoided because the loose ends may get caught in powered machinery and tools and may be fatal
- Ensure that you read the instruction manual thoroughly before handling powered tools and equipment.

E. Follow electrical safety measures while working with electrically powered tools & equipment

- Powered tools and equipment must be inspected for any damage, before and after every use.
- The power cord must be checked carefully for any fraying, faults, cracks or loss of insulation.
- Damaged switches must be reported to supervisor and repaired immediately.
- Plugs must be checked for missing or faulty prongs / pins.

F. Ensure safe handling and disposal of waste and debris

- All walkways should be cleared of clutter and debris, to avoid trips and falls.
- Any spill should be cleared off immediately and 'Wet Floor' or 'Work in Progress' signs should be used in appropriate places.
- Store equipment, tools and chemicals should be stored appropriately, abiding by all instructions provided in the Instruction Manual and 'Directions for Use'.

G. Follow emergency and evacuation procedures in case of accidents, fires, natural calamities For Fire Outbreak:

The emergency and evacuation procedures are:

- A clear passageway must be present to all escape routes.
- Signage like escape routes should be clearly marked.
- Enough exits and routes must be there for all people to escape
- Emergency doors, that open easily, must be present.
- Emergency lighting (Infrared lights for night and blurred vision) must be present.
- All people at the workplace must be given brief instructions about the positions of the escape routes.
- Brief instructions must also be given regarding the availability and use of fire extinguishers.

- The workplace must have a safe meeting point or assembly area for the staff.
- Nobody should use the elevator during fire.

Correctly demonstrate rescue techniques applied during fire hazard:

A. Responding to Fire

- The Fire Alarm System must be initiated and an alert must be raised.
- A safe evacuation path must be identified before dealing with the fire.
- The appropriate class of fire extinguisher must be chosen.
- The P.A.S.S technique must be adopted for extinguishing the fire.
- Immediate evacuation must be initiated if the extinguisher is exhausted and the fire still exists.
- Call the workplace security or the local emergency services.
- Summon the fire fighting services at the earliest.
- Stay as far as possible from smoke, because smoke may comprise toxic gases.
- Cover your mouth and nose with a damp cloth to protect yourself. If possible, help your colleagues (those who are with you) to repeat the same.
- Look out for the nearest emergency exit routes and call out for people, who you can take along with you.
- While opening a door, first touch the door with the back side of your palm.
- Keep doors open, after you open them.
- Start moving out of the building and ask your colleagues to do so.
- Always use a staircase and not the elevator.
- Do not rush.
- As you move out of the building, gather people, whoever you come across.
- Always move downstairs and avoid returning to the burning premises, till the firefighters arrive.

B. Initiate Evacuation

- Stop your work but safely and without spreading panic.
- Gather and carry only the most important items like cell phone.
- Leave the workplace through the nearest door bearing an "Exit" sign.
- Report to the designated Assembly Area.
- Await instructions from the Safety Committee.
- Incorporate first aid treatment to anyone in need.

For Natural Calamities / Disasters:

A. Earthquake

The emergency and evacuation procedures are:

- Quickly shutdown any hazardous operations or processes and render them safe.
- Notify others in the area by raising an alarm if they have not heard it while you are evacuating yourself.
- Exit the room.
- Take jackets or other clothing needed for protection from the weather.
- If possible, close windows and doors as you leave, but do not lock the doors and emergency exit routes.
- Exit the building, walk to the nearest safe exit route. Do not run. Do not use elevators.

B. Flood and Storms

The emergency and evacuation procedures are:

- Stay alert, avoid panicking and monitor the surroundings with eyes and ears open.
- Move to the high grounds and help others move before the flood strikes.
- Accumulate disaster supplies like:
 - Canned, dry, ready-to-eat and packaged food, which do not require refrigeration or cooking
 - o Liquid cash
 - o Drinking water in clean containers
 - o First Aid Kit
 - o Essential clothing
 - o Flashlights
 - Adequate batteries
- Instruct people around you not to drive
- Do not walk or swim through flooded water
- Shut off the Mains Supply (electricity) at the circuit breakers
- Stay alert for evacuation calls and help people identify alternate routes of getting there

For Accidents:

The emergency and evacuation procedures are:

- Summon emergency medical help by calling up the Safety Committee officials or the toll-free number.
- Check and examine the site, to gather as much information (location, nature and severity of injuries, casualty if any, hazards present, etc.) as possible, so that the same can be provided to the emergency team, once it arrives.
- One must inform the immediate supervisor about an injury or illness.
- If possible, workers may treat themselves to first aid or ask colleagues to do so.

- If possible, workers may treat themselves to first aid or ask colleagues to do so.
- One must extend help and assistance to others.

The general steps involved in carrying out an evacuation are:

- Stop your work but safely and without spreading panic.
- Gather and carry only the most important items like cell phone.
- Leave the workplace through the nearest door bearing an "Exit" sign.
- Report to the designated Assembly Area.
- Await instructions from the Safety Committee.
- Incorporate first aid treatment to anyone in need.

Evacuation and emergency procedures for the specially-abled:

- The Visually Impaired
 - o Announce the type of emergency
 - o Offer your arm for help
- With Impaired Hearing
 - o Turn lights on/off to gain the person's attention, or indicate directions with gestures, or write a note with evacuation directions
- People with Prosthetic Limbs, Crutches, Canes, Walkers, etc.
 - o Evacuate these individuals along a route specially designated as injured persons.
 - o Assist and accompany to evacuation site if possible.
 - o Use a sturdy chair, or a wheeled one, to move the person to an enclosed stairwell.
 - o Notify emergency crew of their location

HazardReport Form		
Name:	Date:	
Location:		
Tool/Equipment:		
Description of the hazard:		

Suggested corrective action:	
Signature:	
Supervisor's remarks:	
Corrective action taken:	
Signature of Supervisor:	Date:

Fig: Sample form of reporting hazards

6.4.10 Various types of Safety Signs and What they Mean -

Various Types of Safety Signs and What They Mean

Safety Signs are aimed at alerting people on the existing hazards and imminent risks involved with them. The various safety signs are given below:

Emergency escape route signs: to display emergency exits

Fire equipment safety signs: to indicate the location of fire equipment and convey compliance with fire precaution regulations

Prohibition safety signs: to indicate prohibited actions Supplementary safety signs: to indicate additional information to be followed by employees Safety equipment signs: to emphasize on the protective equipment to be worn

Prohibition Signs

Image	Significance
Say We	This is a sign to signify "No access for unauthorized per son(s)" beyond a particular point
	This is a sign which indicates "Smoking and Naked Flaming" is disallowed in that particular area

Image	Significance
	This is a "No Smoking" sign. No one should smoke in an area where this signboard is put up by the authority.
	This sign symbolizes "No pedestrian is allowed beyond this point".
	This symbol refers to the water which is not drinkable. The symbol, in short, implies "Not Drinkable Water".
	There are different classes of fire and each class of fire requires different extinguisher. The class of fire which are not extin- guishable by water is denoted by this sign which signifies "Do not extinguished with water".

Image	Significance
	This symbol signifies "High Temperature or Flammable Mate- rials".
	This particular symbol refers to the materials which are poten- tial explosive. This symbol is called "Explosive Material" sym- bol.
	This is a symbol which is labelled on "Toxic Materials" as a pre-caution.
	This symbol refers to the substances which are corrosive and harmful to us. It damages the skin severely. This sign is em- balmed on "Corrosive Materials".

Image	Significance			
	This is a sign to signify the "Radioactive Materials". Radioactive materials are very harmful and can even cause death.			
	This is "Overhead Load" symbol. In case of overloaded box/ crane/ crate, this sign is used.			
	This sign refers to "Industrial Vehicle". The vehicles which are used only for the industrial purposes (for example transporta- tion of goods) are labelled with the "Industrial Vehicle" symbol.			
4	This sign implies to "Electricity Danger". In case of high voltage, this sign is commonly used to beware the passers-by/ users/ workers.			
	This is a "General Danger" sign. In case of "work in progress"/ "men at work", this symbol is used.			

Image	Significance		
	This is a sign to denote "Laser Beam Danger". Laser beams are harmful for us and exposure to laser beams may cause blind- ness.		
	This sign refers to "Danger Drop". If a landing/floor abruptly ends or in case of low height of balcony wall/grill, this sign is used.		
<u>~</u>	If there is any obstacle laid on the floor, the "Obstacle Ahead" sign is used.		

Mandatory Signs

Here is a table of signs which are commonly used as a precaution for the workers. The utility of the signs are described in the "Significance" column beside the images.

Image	Significance		
	Eye protection must be worn		

Image	Significance
	Safety helmet must be worn
	Ear protection must be worn
	Respiratory equipment must be worn
	Safety boots must be worn
	Safety gloves must be worn

Image	Significance		
	Safety harness must be worn		
	Face protection must be worn		
	Safety overalls must be worn		

Emergency Escape Signs

There are certain situations which are considered to be emergency situations. Fire, earthquake, flood, tsunami, civilian disturbance, riot, bomb threat are the examples of emergency situations. In these cases, people are prone to panicking. However, panic deteriorates the situation. Therefore, every organization plans for emergency evacuation. At the time of emergency, workers should adjourn at the safe evacuation place. There are different signs (directions) used to guide the employees to safe place.

The signs used for this purpose are as follows:



Fig: Go to the left for safee vacuation



Fig: Go to the right for safe evacuation



Fig: Go down for safe evacuation



Fig: Goup for safe evacuation

First Aid Signs

In every organization, first aid is a mandatory. Especially, in the organizations that deal with different types of hand and power tools, first aid is a compulsory. In the following table, the symbols and their significance are discussed.

Image	Significance			
0	This is a general symbol for first aid. Generally, this sign is used to denote first aid room, first aid box.			
	This is the "First Aid Stretcher" symbol. In case of accidents, where the victim is unable to stand up on feet and walk, first aid stretcher is used.			
+	This symbol signifies "Eye wash".			
	This is a "Safety Shower" sign.			
C +	This is the "Emergency Telephone" sign. In case of accidents, when the first aid is required on an immediate basis, this tele- phone is used.			

— No	tes						
		 . =	 	 	. = = = = =	 	

UNIT 6.5: Dealing with worksite Emergencies

- Unit Objectives



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

- 1. Identify potential hazards and risks at workshop or site
- 2. Practise dealing with potential hazards and risks
- 3. Practise preventive measures to minimize the potential hazards and risks
- 4. Practise treating common injuries by giving first-aid

6.5.1 Potential Hazards at the Workshop -

Woodworking involves various activities, such as sawing, chiseling, etc. Many sharp tools, saws, electric-powered tools are used to carry out these activities. Hence, level of safety hazards is high in woodworking. It is very easy to recognize those hazards that cause immediate and traumatic injury – blades that cut fingers and limbs, wood chips and fragments that fly into eyes, loose clothing or long hair that catches in whirling machinery, muscle strains from heavy lifting. But there are also hidden dangers in woodworking. These include wood dust, sap and oils, mold and fungus, vibration, and noise.

As an efficient carpenter, it is your duty to try and avoid accidents from occurring at workshop or site. You should be aware of the hazards and risks and preventive measures work practices. Using safe work practices will lower the frequency of accidents and serious injuries.

Some common hazards and risks are given below

6.5.2 Slips, Trips and Falls —

Causes







- Water, grease, or spillage on the floor
- Tools or material lying in walkways and passageways.
- Cables across the way
- Improper use of equipment. For example placing ladder on uneven floor

- Poor maintenance. For example broken ladder
- Bad lighting
- Not using personal protective equipment. For example not wearing rubber or non-slip sole shoes
- Working without safety belt at heights
- Not reporting your supervisor about faulty equipment.

Preventive Measures



Wear safety belt and helmet while working at heights



Never use broken or faulty equipments



Follow correct and proper way of using ladder



Do not wear slippers or sandals; wear shoes.



Avoid stretching cables across the way



Never leave tools or materials in walkways or passageway



Never leave floor wet



Clean the floor immediately aver anything spills



Keep workshop organized and clean



Never leave big openings unsecured on sites



Secure big openings by blocking them with wood



Report maintenance faults to your supervisor

6.5.3 Eye Injury _____

Causes

- Not wearing personal protective equipment while working with saw or chisel. For example not wearing safety glasses
- Not disposing of of wood dust regularly in correct way

Preventive measures





Always wear safety goggles while Clean workshop at intervals and dispose wood dust regularly sawing or cutting with chisel

6.5.4 Electrical Shocks —



Causes

- Using power tools with wet hands
- Using power tools near water Socket is in ON position when plugging anything into it
- Damaged cables or wires Pulling the cord to remove plug from socket

Preventive measures



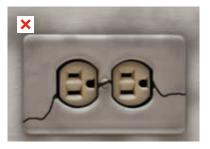
Never use frayed cords or wires



Make sure socket is in OFF position when plugging in



Never use power tools near water or with wet hands



Check for broken plug or broken socket



Do not put wires directly into socket; use plug



Do not pull the cord to remove plug from socket

6.5.5 Fire ____

Fire is the result of a reaction primarily involving the oxidation of combustible substances. Heat and light are produced when combustible substances are oxidized, leading to fire.

Causes

Fire is one of the most powerful and destructive forces in nature. It can both create and destroy, and the consequences of its misuse can be catastrophic.

- Poor housekeeping. For example not disposing of wood dust or wood fragments regularly
- Smoking inside the workshop
- Broken sockets and plug or frayed wires of power tools
- The use of one socket for many plugs
- The practice of not reporting your supervisor for faulty tools and equipment

Preventive measures

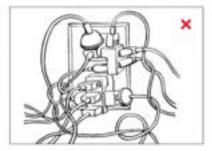
Fire safety is a critical component of disaster preparation and prevention. It is essential that people understand the basics of fire safety and how to prevent and respond to fires to keep themselves and their property safe.



Do not smoke within working environment



Do not use broken sockets and plugs or frayed wires



Do not insert many plugs in one socket



Do not block emergency or exit doors



Dispose wood dust regularly



Report your supervisor for faulty tools/equipments

6.5.5.1 Types of Fire

Not all fires are the same. Different fuels create different fires and require different types of fire extinguishing agents. You should know the different classes or types of fire to deal with fire accidents. Mainly fire is classified into five classes-





Class A

Class A fires are fires in ordinary combustibles such as wood, paper, cloth, trash, rubber, and plastics.





Class B

Class B fires are fires in flammable liquids such as gasoline, petroleum oil, and paint. Class B fires also include flammable gases such as propane and butane. Class B fires do not include fires involving cooking oils and grease.



Class C

Class C fires involve energized electrical equipment such as motors, transformers, and appliances. Remove the power, and the Class C fire becomes one of the other classes of fire.



Class D

Class D fires are in combustible metals such as potassium, sodium, aluminium, and magnesium.



Class K

Class K fires are in cooking oils and greases such as animal and vegetable fats.

6.5.5.2 Types of Fire Extinguishers —



Water Fire Extinguisher

- Utilisation of these is on Class A fires
- These have RED labels
- Lift the extinguisher, aim it at the fire's base and use it in a sweeping motion



Fig: Foam Fire Extinguisher

Foam Fire Extinguisher

- Utilisation of these is on Class A and B fires
- These have CREAM labels
- Lift the extinguisher, aim it at the fire's base and use it in a sweeping motion for class A and at the top of the burning liquid for class B.



Fig: Co2 Fire Extinguisher

CO2 Fire Extinguisher

- Utilisation of these is on Class B fires
- These have BLACK labels
- Lift the extinguisher, aim it at the fire's base and use it across the area; otherwise, your skin can freeze



Fig: Dry Powder Fire Extinguisher

Dry Powder Fire Extinguisher

- Utilisation of these is on Class D fires
- These have BLUE labels
- Lift the extinguisher and aim it at the fire's base

6.5.5.3 How to use Fire Extinguishers

Remember PASS



Pull the pin at the top of the extinguisher. The pin releases a locking mechanism, allowing you to discharge the extinguisher.

Aim at the base of the fire, not the flames. This is important - to put out the fire, you must extinguish the fuel.

Squeeze the lever slowly. This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.

Sweep from side to side. Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out. Operate the extinguisher from a safe distance, several feet away, and then move towards the fire once it diminishes. Be sure to read the instructions on your fire extinguisher - different fire extinguishers recommend operating them from different distances.

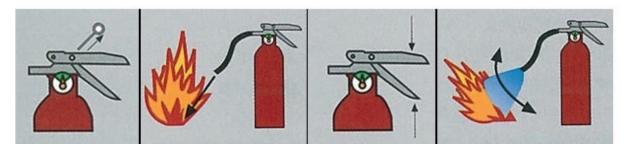


Fig: PASS Mechanism

6.5.5.4 Know your Fire Extinguisher Code

Different types of fire require different types of fire extinguishing agents. Some fire extinguishing agents can be used on more than one fire class. Others have warnings where it would be dangerous for the operator to use a particular fire extinguishing agent.

Fire Extinguisher Chart Type of Fire Extinguisher Solids Flammable Flammable Electrical Cooking Colour Type (wood, paper Liquids Gasses Equipment Oils & Fats cloth, etc) Foam Dry Powder Carbon (CO2)

Fig: Fire Extinguisher Chart

6.5.5.5 Handling Fire Emergencies

When fires do occur, the role of a person is to minimize the damage

- 1. The Fire Alarm System must be initiated, and an alert must be raised.
- 2. A safe evacuation path must be identified before dealing with the fire.
- 3. The appropriate class of Fire extinguishers must be chosen.
- 4. The PASS technique must be adopted to extinguish the fire.
- 5. Immediate evacuation must be initiated if the extinguisher is exhausted and the fire still exists.
- 6. Call workplace security or local emergency services.
- 7. Summon the firefighting services at the earliest.
- 8. Stay as far as possible from smoke because the smoke may comprise toxic gases.
- 9. Cover your mouth and nose with a damp cloth to protect yourself. If possible, help your colleagues (those with you) to repeat the same.
- 10. Look out for the nearest emergency exit routes and call out for people you can take along with you.
- 11. While opening a door, first touch the door with the back side of your palm.
- 12. Keep doors open after you open them.
- 13. Start moving out of the building and ask your colleagues to do so.
- 14. Always use a staircase and not an elevator.
- 15. Do not rush.
- 16. As you move out of the building, gather people, whoever you come across.
- 17. Always move downstairs and avoid returning to the burning premises until the firefighters arrive.

6.5.6 First-Aid —

First-Aid is used in accidents to help an injured person until he receives medical treatment.

- In case an accident does occur, you should know the location of the First Aid Box and be able to use it.
- In case of an accident where someone requires first aid, you should contact the designated "first aid person," i.e., the person who is trained to give first aid treatment.



Fia: FIRST AID Symbol

 You should know the basic treatments for minor injuries if you have to treat someone or yourself.

- 6.5.6.1 Principles of First Aid $\,-$

- Act calmly and logically.
- Be in control both of yourself and the problem.

- · Be gentle but firm.
- Speak to the casualty kindly but purposefully.
- Build up trust by talking to the casualty throughout the examination and treatment.
- Avoid giving any misleading information
- Never leave the casualty alone and continue to talk to them until the ambulance or doctor arrives.
- Continuously reassure the casualty.
- Send the casualty to a hospital or doctor by the quickest means.
- Always inform the police about serious accidents.
- Inform relatives of the casualty.

6.5.6.2 Components of a First Aid Kit _____

The essential contents of a First Aid Kit are:

- · Basic first aid notes
- Disposable gloves
- Resuscitation mask
- · Individually wrapped sterile adhesive dressings
- Sterile eye pads (packet)
- · Sterile coverings for serious wounds
- Triangular bandages
- · Safety pins
- · Small, medium, and large sterile non-medicated wound dressings
- Non-allergenic tape
- Rubber thread or crepe bandage
- Scissors
- Tweezers
- · Suitable book for recording details of first aid provided
- · Sterile saline solution
- Plastic bags for disposal
- The name and telephone number of workplace first aid officers and the phone number and address of the emergency services should be either in or near each first aid kit
- Reusable items, like scissors and tweezers, must be thoroughly cleaned using warm soapy water or an alcohol swab after each use.

Besides these, adequate and medically prescribed Oxygen supply must be held in hand at the workplace.





Fig: FIRST AID BOX

Fig: Essential First aid item

6.5.6.3 Appropriate Basic First Aid Treatment — Relevant to the Condition

The importance of First-Aid in emergency management can be elaborated through the following points:

For heavy bleeding

- Put pressure on the wound with whatever is available to stop or slow down blood flow.
- Call the Emergency Toll Free number or get someone else to do it as soon as possible.
- Keep pressure on the wound until help arrives.



Treating heavy bleeding (put pressure on the wound)

For burns

- Cool the burn under cold running water for at least ten minutes.
- Loosely cover the burn with cling film or a clean plastic bag.
- Call and summon the Emergency Services if needed.

Treating heavy bleeding (put pressure on the wound)

For broken bones

- Encourage the person to support the injury with their hand or use a cushion or items of clothing to prevent unnecessary movement.
- Continue supporting the injury until help arrives.
- Call and summon the Emergency Services if needed.



Treating broken bones (use a cushion to heal the fracture)

For Heart Attack / Stroke

- Think FAST.
 - o Face: is there weakness on one side of the face?
 - o Arms: can they raise both arms?
 - o Speech: is their speech easily understood?
 - o Time: to call the Emergency helpline.
- Provide CPR (Cardiopulmonary resuscitation) as applicable.
- Immediately call the medical/ambulance helpline or get someone else to do it.



Fig: Cardiopulmonary Resuscitation

For Head Injury -

- Ask the victim to rest and apply a cold compress to the injury (e.g., an ice bag).
- If the victim becomes drowsy or vomits, call the Medical helpline or get someone else to do it.
- Call and summon the Emergency Services if needed.



Fig: Apply a cold compress to the injury

For Electric Shocks -

- Switch Off the Main Power Supply immediately
- Free the victim of his clothes
- · Give artificial respiration and oxygen if needed
- In case of Burns, apply ice and burn cream and rush to the hospital, depending on the severity of the burn
- Call and summon the Emergency Services if needed.



Fig: Do not touch the victim of a electric shock directly, use non-conducting materials

For Eye Injuries -

- In case of chemical exposure, the eyes must not be rubbed.
 Instead, the eyes must be washed with lots of water. If the irritation/pain does not subside even after flushing the eyes continuously for 15 20 minutes, medical help must be sought.
- In case of a blow to the eye, the injured eye must be treated with a cold compress without exerting any pressure.
- If the pain persists, accompanied by bleeding, bruising, or impaired vision, one must seek medical help immediately.



Fig: Wash the injured eye cleanly and use proper eye rinsing elements

- In case of a foreign particle in the eye, it must not be rubbed. Instead, the upper lid must be pulled down, and blinking must be repeated briskly.
- If the foreign particle persists, one must rinse the affected eye with an eyewash.

• If pain persists even after rinsing, the eye must be closed gently and bandaged lightly, and medical help must be sought.

6.5.6.4 Common injuries in carpentry and how to deal with them-



Abrasions and small cuts

Clean the wound with soap and water. Apply antibiotic cream or Providoneiodine solution. Bandage and check to dress daily. See your doctor if there are signs of infection: increased redness, pus, or red lines from the wound.



Splinters

Remove with sharp, pointed tweezers. (They should be sharp enough to pick up a single hair.) If the splinter is completely under the skin, expose the splinter end with a sewing needle doused in alcohol, and then remove it with tweezers



Lacerations

Clean the wound with soap and water. Assess the damage: If the laceration is gaping or more than 1/4 in deep, seek emergency help. Otherwise, apply pressure to stop bleeding. Close the wound with butterfly closures or adhesive strips. Check to dress daily.



Fractures

Signs include extreme pain, swelling, bruising, and an inability to move an adjacent joint. If you have any of these signs, you should be seen by a doctor to see whether you need an X-ray to evaluate for a fracture.



Amputations

Apply pressure to the wounded area with a clean bandage. Don't panic and call for help. Raise the wounded area above the heart. Wrap the amputated appendage in a plastic bag. Keep appendage cool, not directly on ice. Sit in a chair near the door, and await help.



Eve injuries

Look in the mirror to assess the eye. If foreign matter is embedded in the eye, go to the emergency room. If foreign matter is on the surface, flush it with water, or use an eye wash and cup. For chemical splashes, flush with running water for five to 10 minutes. If it hurts too much to open your eye, go to the emergency room.



Fumes and dust

If you feel dizzy or are having trouble breathing, leave the area, and go to fresh air. If normal breathing doesn't return in 15 minutes, go to the emergency room.

- Notes

Scan the QR codes to watch the related videos



<u>Dealing with worksite Emergencies</u>

UNIT 6.6: Housekeeping Practices and Waste Management System

- Unit Objectives



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

- 1. Explain why one should apply good housekeeping practices at all times
- 2. Discuss good housekeeping to prevent fire hazards
- 3. Identify the different types of cleaning equipment & substances and learn their use
- 4. Identify the common types of waste in the workplace
- 5. Identify the common types of contaminants in the workplace
- 6. Use materials to minimize waste
- 7. Discuss the Waste Management System and its importance
- 8. Demonstrate how to dispose of waste safely in the designated locations
- 9. Discuss the proper procedure for cleaning the work site and tools and equipment comply with the standard waste disposal procedures

6.6.1 Importance of good housekeeping _____

Apply good housekeeping practices at all times

Housekeeping in a furniture workshop involves operations related to the maintenance and cleaning of the work area, tools and equipment.

• Good housekeeping practices include, but are not limited to:

- Clean / tidy work areas
- o Removal / disposal of waste products
- o Protect surfaces from erosion, corrosion, discolouring, disfiguring, tarnishing, molding, etc.

• Good housekeeping is required to avoid accidents like:

- o Tripping over and stumbling across loose objects on cluttered floors, stairs and platforms
- o Bumping against unattended objects on raised platforms
- Slipping on wet, dirty and greasy surfaces
- o Getting burnt with corrosive chemicals
- Getting punctured and cut with sharps, jagged edges (like cut tin), unsheathed cutting tools, protruding nails, etc.

• Good housekeeping is associated with the following benefits:

- o Easy flow of materials
- o Reduced chances of workplace accidents
- o Reduced employee exposure to dust, fumes and debris
- o Enhanced control over tools, equipment and other elements of inventory
- o Optimized productivity due to efficient maintenance and timely repair
- o Improved workplace hygiene, leading to improved employee health and, in turn, productivity
- o Efficient space management by eliminating clutters
- Improved preventive maintenance and subsequent decrease in chances of property damage

Good housekeeping in order to prevent fire hazards

- o The workplace must be freed from clutter and debris, since these can act as fuels and are fire hazards.
- o The entire workplace must be a "No Smoking" zone, thus designated with the help of "No Smoking Signs".
- o Only designated areas, outside and far from the main work area, must be allowed for smoking.
- o Fire Extinguishers must be maintained properly and refilled after use.
- o Electrical faults may lead to fire and hence, any electrical hazards must be reported and attended to, immediately.
- o There must be easy access to the Main Power Supply Control Panel, so that electrical power can be switched off in case of electrical fires.
- All powered tools, machinery and equipment must be maintained and inspected regularly by trained professionals, to prevent fire outbreak from overheating and friction sparks.
- o Fuel containers, like Gas Cylinders and flammable oils, must be enclosed and stored separately, away from the main work area.
- o Emergency exits, sprinklers, fire fighting apparatus, emergency exits etc. must never be blocked.
- o Materials must never be stacked in a manner, so that clearances and exit routes are blocked.
- o All fire alarm systems and fire fighting equipment must be inspected regularly.



Fig: Do not stack the waste material at a place; dispose it regularly



Fig : Do not store the waste material digging a hole



Fig : Good housekeeping is an essential thing



Fig: Always keep the tools at a safe place



Fig: Use waste bins to collect and dispose the waste material



Fig: Always keep the sharp objects like nails, screws at the allotted box: don't leave them scattered

6.6.2 Different Types of Cleaning Equipment & Substances and their Use

Different Types of Cleaning Equipment & Substances and their Use

The various materials to be used by the housekeeping staff for cleaning are:

- Cleaning Agents
- Manual Equipment
- Powered Equipment

A. Cleaning Agents

Solvents: A solvent is a liquid that dissolves a solid or liquid solute, resulting in a solution. The most common solvent used in everyday life is water. Water can be used to dilute any cleaning solution for easy use. Warm water dissolves soap more readily than cold water.

Detergents & Soaps: Detergents and soaps are used for cleaning because pure water cannot remove oily, organic soiling. Soap allows oil and water to mix so that oily grime can be removed during rinsing. Detergents are similar to soap, but they are less likely to form films (soap scum) and are not as affected by the presence of minerals in water (hard water).

Detergents to be used depend on:

- Material to be cleaned
- · Cleaning equipment to be used
- Type of dirt

Liquid Cleaning Agents: Liquid cleaning agents can be either diluted in a little water or used directly with a dry cloth.

Washing Soda: It is useful for emulsifying grease on drainpipes, gutters or stone surfaces. In strong concentration, it could be an irritant and injurious to skin, fabrics brushes, wood and paint. Washing soda is useful as a water softener.

Soda bars, Powders and Flakes: Nowadays soaps have been replaced by excellent synthetic soap less detergents, which are unaffected by hard water. They give instant lather. When used, care should be taken that they are thoroughly dissolved. Should know the right concentration for best results. Should be stored on open shelves in a dry storage area.

Acid: Acids are used for the removal of metal stains. Vinegar and lemon are used for the removal of tarnish of copper and brass and of mild water stains on bathtubs, etc. More resistant water stains may be removed with stronger acids such as oxalic acid or hydrochloric acid. This should be only used under strict and experienced supervision so that it is used carefully and not in excess.

Alkali: Caustic soda, sodium hydroxide and ammonia are alkalis and are used as grease emulsifiers and stain removal agents. Strong alkaline cleaning agents based on caustic soda in flakes or in liquid form are available for the cleaning, of blocked drains, and other large industrial equipment. Extreme care is to be taken in their use as they are very strong and are highly corrosive.

Absorbents: These perform the cleaning action by absorbing the stain or grease; for example starch, French chalk powders, and besan or gram flour. Their constituents vary and many are of vegetable origin. Unlike abrasives, they are not manufactured.

Toilet Disinfectants & Antiseptics: Disinfectants & Antiseptics are not strictly cleaning agents but are often used during cleaning operations. Disinfectants kill bacteria. Antiseptics prevent bacterial growth.

B. Manual and Powered Equipment

Manual cleaning tools and equipment are operated by hands while powered equipment are connected to a power supply or battery.

- Funnel
- Rubber Spatula
- Floor Mop
- Bowl Swab
- Plastic Caddie
- Spray Bottle
- Cobweb Cleaner

- Dry Vacuum Cleaner (Commercial)
- Suction Dryer
- Dust Pan and Brush
- Bucket and Mug
- Squeegees
- Scrubbing Brush
- Sponge
- Scraper

6.6.3 Waste Management System

The waste management system in the woodworking industry is a crucial part of any successful business. It is important to have an efficient system in place to properly handle and dispose of any waste generated from the production process. Waste management is an important part of the overall sustainability of the business and plays a key role in helping to reduce the environmental impact of the industry.

The waste management system should include:

- Comprehensive plan for collecting, storing, and disposing of all waste produced. This includes sawdust, wood chips, and other wood-based materials generated during production. Proper collection, storage, and disposal of these materials will help reduce the industry's environmental impact and reduce the amount of waste that needs to be disposed of.
- Plan for recycling and reusing materials that can be salvaged from the production process. This can
 include wood shavings, sawdust, and other materials that can be reused in the production process
 or sold as scrap. This can help reduce the amount of waste sent to landfills and help to reduce the
 industry's overall environmental impact.
- Plan for properly disposing of any hazardous materials generated in the production process.
 This includes chemicals, solvents, and other materials that can be hazardous to both the environment and human health. Proper disposal of these materials is essential for the health and safety of workers and the environment.

6.6.4 Common types of waste in the workplace

The most common waste materials procured in a furniture workshop can be categorized in the following:



Fig: Liquid Furniture Waste

Liquid Waste- This inclueds sludge, dirty water, organic liquids, waste water after washing. **Solid Waste-** This includes industrial slag, plastics waste, wood waste, paper waste, metals, ceramics

Organic Waste- This includes biodegradable food waste, animal waste, vegetable waste, garden waste, rotten meat of animals; these can be deposited at Landfills or converted into Manure and Biogas.



Fig: Solid Waste Bin

Recyclable Waste- Paper, metals, wood, organic waste, etc., can be recycled. These must be placed in appropriate Recycling Bin and treated according to the nature of the waste. For example, organic waste can be converted into manure and Biogas.

and glass.

Hazardous Waste- Such waste may be flammable, corrosive, radioactive, toxic, etc. These can potentially harm the environment, and must be placed in legibly labelled bins for appropriate treatment and disposal.



Fig: Metal Waste

6.6.5 Common Types of Contaminants in the Workplace

A Contaminant can be defined as "a substance that adversely affects the environment and its elements, through breathable air, soil, water and food". The most common types of contaminants that one comes across in daily life are:

Biological Contaminants- These include microorganisms, rodents and harmful insects.

Chemical Contaminants- These comprise salts, soluble metals, toxins, pesticides, etc. These are naturally occurring or man-made.

Physical Contaminants- These include sediment and other organic matter. These can alter the physical appearance and properties of water and air.

Radioactive Contaminants- These comprise materials like Uranium, Plutonium, Radium, etc. These are extremely hazardous for the environment due to the presence of an unbalanced amount of neutrons and protons, which may result in emission of harmful radiations.

6.6.6 Use materials to minimize waste

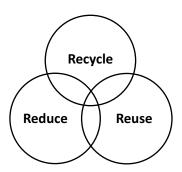


Fig: The 3 Rs of Waste Minimization

- Resource Optimization- Raw materials must be used to the fullest, so that minimal waste is
 procured while converting the raw materials into finished products.
- **Recycling of Scrap Material**—Scraps, when created, must immediately be incorporated in the manufacturing process, so that they get reused completely as raw material.
- **Enhanced Quality Control** This can be implemented by minimizing the number of rejects per batch. This is easily achievable with a higher frequency of careful inspection, accompanied with constant monitoring.
- Exchange of Waste— Some wastes cannot be completely eliminated from the manufacturing process. Such waste can be effectively managed via Waste Exchange techniques, where the waste procured in a certain process becomes the raw material of another, and vice versa.

Landfill

 Waste, that cannot be recycled, is deposited and a layer of soil is added on top of it Incineration

- · Involves controlled combustion of waste
- 90% volume of waste gets reduced and converted into incombustible, light-weight materials like ash, gases and heat
- Gases are released into the environment while the heat is utilized in power generation
 Biogas Generation
- Organic waste are biodegradable and can be converted into Biogas in Biogas Plants, with the help of certain fungi and bacteria
- The residue, after generation of Biogas, is used as Manure
- Manure Generation and Composting
- Organic waste are often left buried under soil beds
- They decompose into rich manure, full of nutrients and minerals

Vermicomposting

- Involves the degradation of organic waste into manure, with the help of worms
- The worms feed on the organic waste and convert them into manure

6.6.7 Proper Procedure of Cleaning the Work Site and Tools and Equipment

Cleaning the workshop / site, as the cabinet maker proceeds with the assembly and installation processes, is extremely crucial. The following aspects must be taken care of while cleaning the site, tools and equipment:

A. Procedure of choosing cleaning tools and equipment

- Powered tools, meant for cleaning the floor, must be equipped with guards and filters.
- Powered scrubbing machines should come with appropriate control methods, to regulate the flow of cleaning fluids.
- Cleaning equipment, powered with Propane, are recommended for use only when the site is vacant and unoccupied, thus allowing for adequate ventilation and air circulation.
- Propane-powered cleaning tools should be equipped with eco friendly, low-emission engines.
- All cleaning equipment, especially the powered ones, must not operate at a sound level exceeding 70 decibels.

B. Procedure of choosing cleaning agents

• Cleaning agents and fluids must have a neutral pH value (7 or closer to 7) so that they do not corrode the surfaces.

- Cleaning agents should be ecofriendly and biodegradable.
- Cleaning agents with dyes must be avoided, in order to prevent discolouration and staining of surfaces and products. In case such materials cannot be avoided, the cabinet maker should resort to dyes, which are approved for food and cosmetics.
- Cleaning agents should have a high Ignition Point and the Ignition Point must be clearly mentioned in the Material Safety Data Sheet (MSDS).
- Cleaning agents should have minimum hazard rating (HMIS Rating). The Hazardous Materials Identification System comprises four colour codes, each representing a hazard category.

Colour Code	Meaning	Rating Scale
Blue	Health	
Red	Flammability	0 - 4, with 4 being the most
Orange	Physical Hazard	hazardous
White	Personal Protection	

- For cleaning wood and stone surfaces, cleaning agents should ideally contain water and epoxy based (comprising epoxides) ingredients.
- For stain and spot removal, the recommended ingredients are citrus-based materials like d-Limonene and Methyl esters.
- Recommended ingredients for scale removal agents are citric, acetic and lactic acids.
- Hydrogen peroxide is the most common ingredient in Disinfectants.

6.6.8 Common waste disposal procedures

Disposal of Solid Waste

- Solid waste, once accumulated, must be labelled appropriately.
- Solid waste on the site mainly comprise debris and sharps.
- Debris in a furniture workshop comprises wood and timber splinters, saw dust, metal and glass sharps.
- Wood, timber and saw dust can be either treated at Landfill or at the Incinerator.
- Metal and Glass sharps are collected in appropriate sharp containers.
- · Metal sharps are melted for recycling.
- Glass sharps are pulverized for recycling.
- Sharps, if contaminated, must be autoclaved and deactivated before disposing of into containers.
- Ferro-magnetic debris are separated using magnetic filters and treated according to their nature.

Disposal of Chemical Waste

- Common chemical wastes include:
 - o Paint
 - Batteries
 - Motor Oil, Oil Filters and Antifreeze
 - o CFCs and HCFCs in Aerosol Sprays and Coolants
- Paints of all categories must be recycled to the full extent.
- Empty paint containers may comprise sediments and debris, which can be separated by allowing the material to settle for some time, so that the remaining paint can be poured out from the top and the sediment at the bottom removed and treated as per norms.
- Batteries should never be treated at Landfills because they contain toxic chemicals, which may pollute the environment.
- Batteries are generally incinerated, which is a safer option as compared to Landfill.
- Hammer mills are used to break the batteries and the electrolytes are treated chemically for neutralization.
- Motor Oil and other oil-based products can be recycled into lubricating oil.
- Mercury must be isolated chemically and recycled into:
 - Thermometers
 - Paints
 - Metal halide lamps
 - o Mercury Vapor Lamps
- Lead from batteries can be recovered through controlled temperature processes and later on, refined for resale.
- Batteries containing unknown levels of Mercury are treated at Mercury Retorts.
- CFCs (Chlorofluorocarbons) and HCFCs (Hydro-chlorofluorocarbons) are either recycled or destroyed. Destruction involves one or more of the following techniques:
 - Superheated Steam
 - o Submerged Combustion
 - o Arc Plasma
 - o Solid Alkali Reaction
 - Incineration
 - Electric Furnace

Notes			

Scan the QR codes to watch the related videos

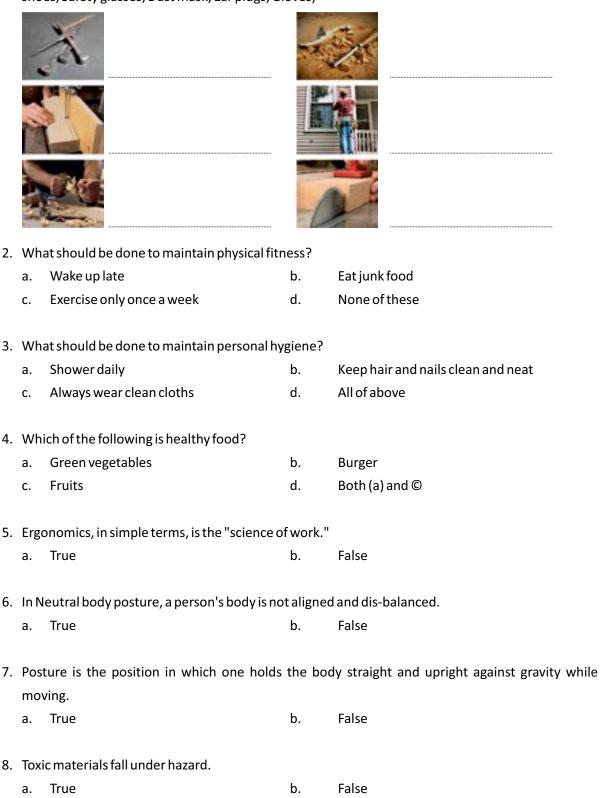


Material Conservation and Optimization Practices

Unit Exercise _____

Choose the correct answer

1. Choose the correct personal protective equipment and write in the blank: (Safety helmet, Safety shoes, Safety glasses, Dust mask, Ear plugs, Gloves)



- 9. HAZOP can be defined as risk estimation, evaluation, and mitigation.
 - a. True

- b. False
- 10. PPE is optional for the workers in a factory.
 - a. True

b. False

11. Identify the causes of fire:

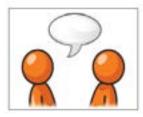






- a. Option a
- c. Option c

- b. Option b
- d. All of above
- 12. What should be done when an accident happens:







- a. Option a
- c. Option c

- b. Option b
- d. All of above
- 13. In case of fire in the wood, which fire extinguisher should be used?
 - a. Sand Type

b. Water Type

c. CO2 Type

- d. Any other Type
- 14. What are the benefits of ensuring the effective utilization of resources?
 - a. Cost-Effective

- b. Ease in time management
- c. Ease in resource management
- d. All of the above
- 15. Which kind of materials are to be collected in blue-colored bins?
 - a. Plastics

b. Metals

c. Glass

d. Materials that can be used again













7. Work effectively with the co-workers, supervisor, and others

Unit - 7.1. Workplace policies and procedures

Unit - 7.2. Communication Skills

Unit - 7.3. Organizational Reporting Protocol

Unit - 7.4. Gender Inclusive Practices at the worksite



Key Learning Outcomes



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

- 1. Know about workplace policies and procedures.
- 2. Maintaining the confidentiality of the organization.
- 3. Perform the work using defined Standard Operating Procedures (SOP).
- 4. Practice workplace etiquette and disciplinary behavior at the workplace.
- 5. Know about different methods of communication.
- 6. Have skills to communicate effectively.
- 7. Know the hierarchy and escalation procedure in an organization.
- 8. Follow the organization's rules and policies.
- 9. Understand the importance of working effectively with others to achieve organizational goals.
- 10. Understand the importance of effective communication and good working relationships.
- 11. Know the importance of standards and guidelines for all genders and PwD.
- 12. Understand the importance of gender difference and gender diversity.
- 13. List health and safety requirements for PwD and genders at the worksite.
- 14. Use inclusive language irrespective of the gender or disability of the person.
- 15. Demonstrate the use of appropriate verbal and non-verbal methods of communication with a PwD in an organization.
- 16. Demonstrate the ways to assist PwD at the worksite.
- 17. Employ gender-sensitive practices while working at the worksite.

UNIT 7.1: Workplace policies and procedures

Unit Objectives



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

- 1. Know about workplace policies and procedures
- 2. Understand the importance of developing and implementing workplace policies and procedures
- 3. List all the significant policies and procedures applicable at the workplace
- 4. Know about the Standard Operating Procedure (SOP) and its implementation benefits
- 5. Know about different workplace etiquette and their importance
- 6. Apply the basic etiquette at the workplace

7.1.1 Policies and Procedures -

A policy and procedure is a business document that describes the framework of techniques and numerous rules that an organization's employees, stakeholders, and management implement to maintain smooth operations. Policies and processes are the backbones of a business, allowing it to produce high-quality goods and services for its clients.



Fig: Workplace Policies & Procedures

7.1.1.1 What is a Workplace Policy?

A workplace policy is a set of guidelines, rules, and standards that governs how employees in an organization should behave and conduct themselves. It gets designed to promote a safe, healthy, and productive work environment and ensure that all employees get treated fairly.

A workplace policy typically covers topics such as workplace safety, attendance, harassment, discrimination, drug and alcohol use, and other vital issues related to the workplace. Companies need to have a workplace policy in place as it helps to ensure that all employees are aware of the expectations and boundaries that are in place. Additionally, having a clear workplace policy can help reduce the organization's legal risks and liabilities.

7.1.1.2 Benefits of having workplace policies -

The key benefits of workplace policies are:

- 1. Workplace policies provide a framework to guide employees in their daily tasks and roles
- 2. They ensure that everyone is aware of the expectations of their job and the consequences of not following them
- 3. They help to create a safe and productive environment for employees and protect them from unfair treatment
- 4. They help to prevent and address conflicts between workers and management and among employees themselves
- 5. They create a sense of trust and respect between the employees and the company
- 6. They ensure the company complies with all relevant laws and regulations
- 7. They help to ensure consistency in the way the company is run and the decisions that are made
- 8. They can help increase productivity and efficiency in the workplace, as everyone knows the expectations and standards

7.1.1.3 Types of workplace policies _____

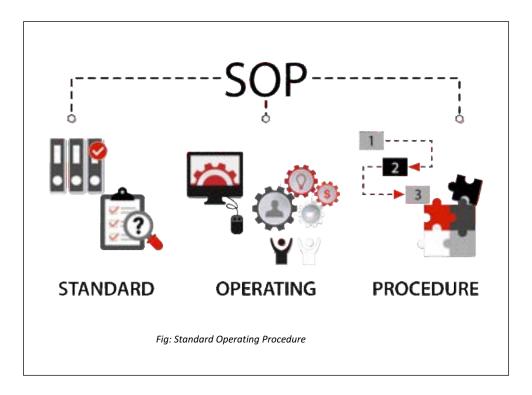
Examples of standard workplace policies:

- Code of Conduct Policies: A code of conduct establishes workplace norms for behaviour and appearance. These criteria will differ depending on the industry, the employee's function, and the work performed by your personnel. A code of conduct may include workplace email and internet usage guidelines.
- **2. Health and Safety Policies:** These policies are designed to protect the health and safety of employees in the workplace and to prevent workplace accidents.
- **3. Anti-harassment Policies:** Anti-harassment policies protect employees from discrimination, harassment, and other inappropriate behaviour.
- **4. Workplace Diversity Policies:** Workplace diversity policies are designed to promote a diverse and inclusive work environment where all employees are treated with respect and dignity.
- **5. Attendance and Punctuality Policies:** These policies ensure that employees are punctual and compliant with the organization's attendance policy.

- **6. Leave Policies:** Leave policies are designed to provide employees with reasonable time off for vacation, illness, or other personal needs.
- **7. Technology Policies:** Technology policies are designed to set guidelines for using technology in the workplace, such as using computers, mobile devices, and internet access.
- **8. Performance Management Policies:** Performance management policies are designed to ensure that employees are held accountable for their performance in the workplace.

7.1.2 Standard Operating Procedures

A Standard Operating Procedure (SOP) is a written instruction outlining how a task, process, or activity should be performed consistently. It is a document that outlines step-by-step instructions and procedures for completing a specific task or activity, which can help to ensure that the job is completed correctly and consistently. SOPs are commonly used in the furniture industry, where they can provide a significant benefit by helping to ensure the quality and consistency of the products produced.



7.1.2.1 Scope of SOP in the Furniture Industry

In the furniture industry, SOPs can help to ensure that furniture is manufactured and assembled safely, effectively, and efficiently. A well-written SOP can provide detailed information about the processes and steps required to produce a quality piece of furniture, from selecting materials to assembling components. The SOP should include safety considerations, such as the use of protective equipment. It should outline the various steps that must be taken to ensure the furniture is of the highest quality.

In addition, SOPs can help ensure that furniture is manufactured according to industry standards. By providing a comprehensive overview of the steps necessary to produce a quality piece of furniture, the SOP can help ensure that the product meets the customer's expectations. SOPs can also help to ensure that any changes made to the process are documented, which can provide valuable insight into the effectiveness of the process and allow for changes to be made if necessary.

7.1.2.2 Example- SOP of Product Design Development

A product design development Standard Operating Procedure (SOP) is a set of instructions that outlines the process for developing a product design. An SOP for a product design development can have following critical steps:

Step 1- Define the scope of the project

The project's scope includes defining the objectives, the target audience, the timeline, and the budget. It will help ensure that the project is organized and the resources are appropriately allocated.

Step 2- Research and brainstorm ideas for the product design

This includes researching the target audience's needs, researching the competitors' products, and gathering input from stakeholders. Developing a product design that meets the target audience's needs is crucial.

Step 3- Create a sketch or prototype of the product design

This is a crucial step to better understanding the product design and getting feedback from stakeholders.

Step 4- Develop the product design

This includes designing the structure, interface, and functionality of the product. This step can be done in-house or outsourced to a design firm.

Step 5- Test the product design

This includes conducting user testing, usability testing, and performance testing. This helps to ensure that the product design meets the desired outcomes.

Step 6- Make any necessary changes to the product design

This includes making changes to the product's structure, interface, and functionality.

Step 7- Launch the product design

This includes creating marketing materials, launching the product, and monitoring the success of the product.

Step 8- Review the product design

This includes evaluating the product's performance, gathering feedback from stakeholders, and making any necessary changes.

Following an SOP for product design development helps to ensure that the product design process is organized, efficient, and effective. It also helps to ensure that the product design meets the target audience's needs and that the product launch is successful.

7.1.2.3 Benefits of SOP in a workplace -

- 1. **SOPs provide clear guidance:** Standard operating procedures provide employees with a clear set of instructions on how to complete a task, eliminating any confusion and ensuring that all personnel have the same understanding of how to perform a given task.
- 2. SOPs ensure quality: By providing detailed instructions on how to perform a task, SOPs ensure that all personnel is performing the job in the same way, leading to greater consistency in the quality of work.
- **3. SOPs improve efficiency:** By providing clear guidance, SOPs help reduces the time needed to complete a task. This leads to increased productivity and improved efficiency.
- **4. SOPs promote safety:** By ensuring that all personnel follows the same set of instructions, SOPs help reduces the risk of accidents and ensure that all personnel works safely.

- **5. SOPs enable onboarding:** By providing a clear set of instructions, SOPs can help to facilitate the onboarding process for new employees, as they can quickly learn how to perform a given task.
- **6. SOPs can increase customer satisfaction:** By ensuring that all personnel is performing the same task in the same way, SOPs can help to ensure that customers receive a consistent level of quality, leading to increased customer satisfaction.

7.1.3 What are Etiquettes? ———

Etiquettes are rules of behavior that allow people to interact politely and respectfully. They help create an environment of mutual respect and understanding and can make social situations more comfortable for everyone. Etiquette can include how to dress for specific occasions, respond to different types of greetings, address people, and introduce yourself. Etiquettes also guide how to behave in different situations, such as business meetings, job interviews, and other social settings.

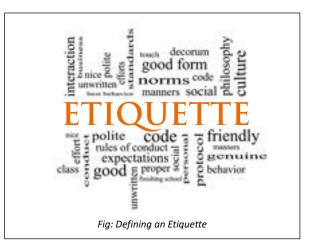
7.1.3.1 Workplace Etiquette —

Workplace etiquette is a set of guidelines for employees to create a respectful, productive, and harmonious work environment. It encompasses everything from how you interact with co-workers to how you dress and conduct yourself at work.

The basics of workplace etiquette include:

- **Respect:** Respect your co-workers and your superiors by being courteous and polite. This includes being mindful of your words, not gossiping, and avoiding offensive language or behavior.
- Professionalism: Always strive to maintain a professional demeanor while at work. Refrain from
 engaging in personal conversations and activities unrelated to work. Dress appropriately for the
 office and avoid distracting behavior.
- **Communication:** Communicate effectively and clearly with your co-workers and management. Speak up when you have a question or concern, and listen attentively when others speak.
- **Courtesy:** Offer help when possible, be punctual to meetings, and avoid negative comments or gossip about others.
- **Diversity:** Respect and value the differences among your co-workers and embrace the variety of backgrounds and opinions.

- Technology: Be mindful of how you use technology in the workplace. Refrain from using your devices for non-work-related activities, and be sure to follow the company's policies for the use of technology.
- Feedback: Give constructive feedback when necessary and accept feedback from others graciously.



7.1.3.2 Employee Etiquette



Employee etiquette refers to an individual's code of conduct while at work. Let us go through some common etiquette's related to employees:

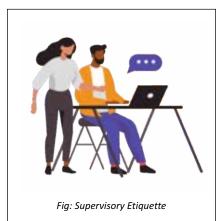
- Respect your organization's workplace policies and procedures
- Reach the office on time
- Leave all your problems out the moment you step into the office
- Greet your fellow workers with a smile
- Follow the professional dress code
- Never enter the office under the influence of alcohol

- Keep personal telephone conversations and emails brief and at a minimum
- Keep your workstation free of unwanted documents and files
- Learn to own your mistake
- Respect your fellow workers
- Never take undue advantage of your position
- Do not ask for personal favours from your subordinates or supervisors
- Respect each other's privacy
- Do not spread rumours around

7.1.3.3 Supervisory Etiquette

Workplace etiquette is just as important as social politeness. Good workplace etiquette can help you model appropriate behavior for your employees and increase your success as a manager. Understanding a few basic supervisory etiquette norms will help you avoid difficulties and gain the respect of your employees.

- Don't Raise Your Voice
- Treat Employees with Respect
- Be Friendly
- Deliver Bad News in Person



Notes				

Scan the QR codes to watch the related videos



Workplace policies and procedures

UNIT 7.2: Communication Skills

- Unit Objectives 🏻 🏻



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

- 1. Understand the importance of communicating effectively
- 2. Know about different methods of communication
- 3. Demonstrate skills to communicate effectively
- 4. Identify the components of effective communication
- 5. Demonstrate how to communicate effectively with clients
- 6. Explain the importance of establishing good working relationships
- 7. List the importance of active listening
- 8. Identify the barriers affecting active listening
- 9. Understand the importance of reading in a timely and attentive manner

7.2.1 What is communication?—

'Communication is the two way process of exchanging of thoughts, messages or information.'



In simple words, communication is a way of passing on information from one person to another. Communication is very important in all areas of life. One will need to communicate well at work. What would happen, if someone could not understand something you had written or said? For example – If you do not have right communication between you and client, or supervisor, or co-workers, the work will not get finished in time, or you can choose wrong materials.

7.2.2 Methods of communication –

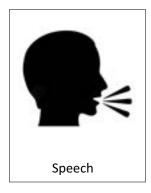
There are many different ways of communicating with others. Each method has some good points and some bad points. Generally, these methods fit into four categories –

Verbal communication

- Written communication
- Non-verbal communication
- Electronic communication

- 7.2.2.1 Verbal communication -

Verbal communication can be carried out by -









 $Carpenters \, face \, situations \, requiring \, verbal \, communication. \, For \, example \, - \, in the communication \, communicat$

- Talk to suppliers to order materials or compare prices
- Interact with other carpenters to discuss work schedule, safety concerns, and to share new ideas related to job
- Communicate with clients, architects, or design consultants to receive direction on new project plans
- Communicate with your supervisor or client to report on work progress and troubleshoot problems
- Speak with manufacturer representatives, in person and by phone, to discuss problems with equipment and materials
- Interact with clients, architects, or design consultants to discuss new ideas and potential changes.

Speech has certain characteristics which affect the message that is being spoken –

- Volume loud speech may sound bossy, very quiet speech cannot be heard.
- Tone use warm tones without sounding over-friendly. Cool tones are very un-welcoming.
- Pace fast speech is not easy to follow. Speak at a reasonable pace so that the other person has a chance to understand.

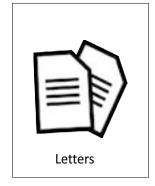
Always Remember

- Maintain positive relationships with professionals in the furniture industry, such as other carpenters, suppliers, etc.
- Keep your clients informed of work progress to prevent stressful situations.
- Ensure that your oral communication is positive and professional. Avoid using inappropriate language or slang terms when communicating with other professionals and with your clients.

7.2.2.2 Written communication -

Written communication can be carried out by:-









A carpenter faces some situations at work requiring written communication. For example –

- Project plans
- Job estimates
- Purchase orders for materials
- Work diaries
- Records of hours worked
- Accident reports
- Meeting notes

For example - After examining a potential project, write a job estimate that includes the description of material to be used, cost of materials and labor, estimated time to complete the job, etc. Check all figures and details carefully. Errors can result in expensive mistakes. Give a copy of written estimate to a potential client and keep a copy for yourself. If the client gives you the job, the job estimate will help you create a contract with the client.

7.2.2.3 Non-verbal communication –

Non-verbal communication does not include speaking or writing. The two major types of non-verbal communication are-

- Signs and symbols
- Gestures and expressions

Signs and symbols -

For example - Pictures, or notices, or signboards, or even photographs, sketches and paintings.









Gestures and expressions -

Hand signs, facial expressions, body postures or body language help to convey a message. It is said that when we talk to someone face to face, only 10 percent of our communication is verbal, the rest of communication is body language and facial expressions.

If you are aware of your own body language and know how to use it effectively, you can add extra meaning to what you say.



While talking to client or supplier -

- Smiles gently; do not frown.
- Do not keep your legs or hands crossed.
- Do not keep your hands in pockets.
- Do not stroke your fingers on chin.
- Do not scratch your head.
- Stand straight; do not lean against wall.
- Do not fidget with mobile phone or pencil.
- Face the other person and make eye contact.
- Do not stand very close to other person; maintain the distance.
- Dress in clean clothes, comb your hair, do not use strong perfume.
- Do not speak loud.









7.2.2.4 Electronic communication -



Electronic communication is becoming more and more common and easy with the advances in technology. Electronic communication can take many forms such as text messages, e-mail, voice mail and fax. It is now even possible to send and receive e-mails via mobile phones anywhere in the world.



Messages can be relayed instantly between you and client through electronic communication. Electronic communication can be effective for submitting job estimates and progress reports to clients, or send purchase order for material supplies.

Although electronic communication is fast and convenient, it's not always appropriate when dealing with clients. Make the effort to speak with clients regularly, because it communicates your desire to deliver high-quality work.

7.2.3 Active listening -

Active listening is an important aspect of effective communication. It is about forming better relations with co-workers, clients, and suppliers and providing better quality service to your clients.

While talking to clients, suppliers, or co-workers –

- Give your full attention to the speaker.
- Do not let your mind wander or get distracted by things happening around you.



Active Listening

- Show interest in what the speaker is saying.
- Avoid interruptions or attempts to disagree with the speaker.
- Take action on what he has been saying.
 If necessary, make notes.
- Do not yawn while someone is speaking.
 It might suggest that you are bored or tired.
- Do not look at the time repeatedly, as it might suggest you are bored or in a hurry.





7.2.3.1 Importance of Active Listening -

- 1. **Enhances Understanding:** Active listening enables the listener to comprehend the speaker's message. It allows the listener to ask questions and clarify the subject matter.
- 2. **Promotes Mutual Respect:** Active listening encourages mutual respect between the listener and the speaker. The listener respects the speaker's opinion, and the speaker values the listener's presence and attention.
- 3. **Enhances Problem-Solving Skills:** Active listening allows the listener to identify problems and brainstorm solutions. It also helps in resolving conflicts and reaching a consensus.
- 4. **Improves Relationships:** Active listening helps to build strong relationships between the listener and the speaker. It also helps to create a sense of understanding and trust.

7.2.3.2 Barriers to Active Listening -

- 1. **Preconceived Notions:** Preconceived notions can prevent active listening. If the listener is biased or predisposed to a certain point of view, they may not be able to listen objectively.
- Lack of Attention: If the listener is distracted, they may be unable to focus on the speaker's
 message. The listener may also be preoccupied with their thoughts, preventing them from
 actively listening.
- 3. **Emotional Barriers:** If the listener gets emotionally invested in the conversation, they may need help objectively listening to the speaker. The listener may also be too wrapped up in their own emotions to be able to hear the speaker's message.
- 4. **Physical Barriers:** Physical barriers such as noise, distance, or an uncomfortable environment can prevent active listening. If the listener cannot hear or see the speaker clearly, they may not be able to listen actively.

7.2.4 Reading _____

During carpentry work, there are many situations when you need reading. For example –

- Reading project specifications to understand what is required for a project
- Reading manual books of tools and machines
- Reading installation manuals of furniture hardware and fittings
- Reading safety manuals
- Reading magazines to learn about furniture technological advancements, such as new materials and methods



Notes			

- Scan the QR codes to watch the related videos



<u>Communication Skills</u>

UNIT 7.3: Organizational Reporting Protocol

Unit Objectives



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

- 1. Understand the Organization structure and its various types
- 2. Practice the 6cs of reporting protocol
- 3. Identify the importance and rules of the team working
- 4. Understand the working and implementation of an escalation matrix
- 5. Identify how to handle conflict
- 6. List the process and factors involved in writing an effective escalation matrix
- 7. Demonstrate the steps involved in expressing and addressing grievances appropriately
- 8. Demonstrate how to manage interpersonal conflicts in an organization

7.3.1 Organizational Structure

In its simplest form, an organizational structure is how an organization is organized, including its hierarchy, roles and responsibilities, and job titles. An organization's structure helps it function properly by providing a clear chain of command, encouraging teamwork and collaboration, and ensuring that each individual's job is completed promptly and efficiently.

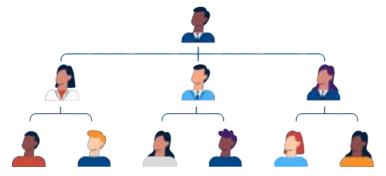


Fig: Organization Structure

7.3.1.1 Types of Organizational Structures

The most common type of organizational structure are:

1. Hierarchical structure:

In this type of structure, there are typically multiple layers of management and reporting lines, each responsible for a different area of the organization's operations.

For Example, in a large company, the hierarchical structure might be divided into departments or divisions, each headed by a manager or executive responsible for that particular organization's operations. Corporations and other large organizations often use this type of structure.

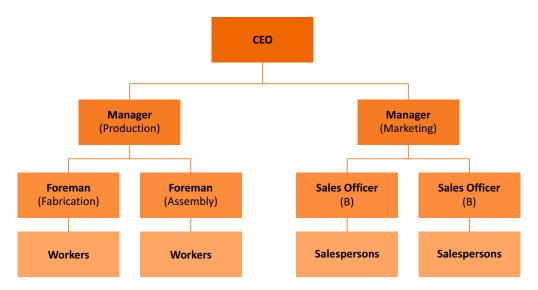


Fig: Hierarchical Organization Structure

2. Flat structure:

This type of structure is characterized by fewer layers of management, with each employee having direct access to the top-level executives. This type of structure is typically used by smaller organizations, such as start-ups, to reduce overhead costs and increase efficiency.

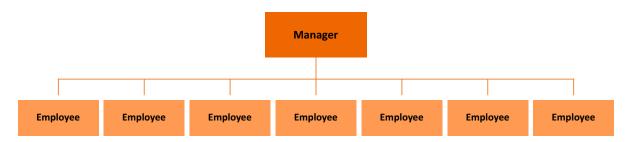


Fig: Flat Organization Structure

3. Matrix structure:

It combines aspects of both hierarchical and flat structures. In a matrix structure, employees may have multiple reporting lines, depending on the project or task they are working on.

This structure is commonly used in companies with multiple departments working on different projects and tasks.

This structure is commonly used in companies with multiple departments working on different projects and tasks.

CHIEF EXECUTIVE OFFICER

RES. ENGR. MKTING SALES MFG. Q.C.

PRODUCT A MANAGER

PRODUCT B MANAGER

Fig: Matrix Organization Structure

7.3.1.2 Example

An interior designing and installation firm comprises three main departments:



- The Design Department is responsible for creating interior designs for clients and developing plans and sketches for project execution. This team is typically composed of interior designers, architects, drafters, and other professionals who specialize in creating aesthetically pleasing environments.
- The Installation Department is responsible for the actual installation and execution of the designs. This team is typically composed of experienced contractors, electricians, plumbers, and other skilled tradespeople adept at installing interior design components.
- The Administration Department oversees the entire operation and ensures that the project is executed on time and within budget. This team is typically composed of project managers, bookkeepers, and other personnel responsible for the job's financial and administrative aspects.

Defining a clear organizational structure will enable the company to offer quality services and quickly respond to customer needs based on the area of operation and chain of command.

-7.3.2 The 6Cs of reporting protocol

The general highlights of the Organizational Reporting Protocol, commonly known as the 6Cs, are:

- **1. Communicate First-** The first source of information during emergency is the preferred source. Crises are time-bound and hence it is important to communicate promptly.
- **2. Communicate Rightly-** Distortion of information due to panic must be avoided. Proper, accurate information must be provided to concerned authorities and this can save lives.
- 3. Communicate Credibly- Integrity and truthfulness must never be forgotten during emergencies.
- **4. Communicate empathetically-** One must wear the shoes of the victims while communicating emergencies.
- **5. Communicate to instigate appropriate action-** Communicating to the right authorities help in taking the necessary action.
- **6. Communicate to promote respect -** Communicating with the victims with respect help in earning their trust and thus eases the disaster management process.

7.3.3 Working in a Team ______

Working in a team is a great way to collaborate and progress towards a common goal. It allows each individual to bring their unique skills and talents to the table while allowing others to help and offer support. Teamwork encourages and fosters communication, problem-solving, and creative thinking. It also provides an opportunity to learn from each other and develop stronger relationships and trust. With everyone working together, the result is often a greater success than any individual could have achieved.

7.3.3.1 Effective Ways of Working in Team -

Since there are many Carpenters or Installers in the team, it is very important to interact effectively

- Use a positive or neutral tone of voice
- Focus on the issue, not the person
- Find the areas of agreement as the basis for collaboration
- · Back up your opinions with a few important key points
- Show an interest in the other person's views and feelings
- Ask other's opinions about a subject before you present yours
- Don't hide your feelings, but keep your emotions under control
- Keep your cool and don't lose your temper.
- Avoid a hidden agenda and the potential to politicize an issue
- Follow organisation's rules and procedures to become example for team
- Address one issue at a time
- Present concrete specifics instead of overriding generalizations
- Avoid blanket, know-it-all statements, loaded words and hyperbole
- Be prepared; think things out before speaking

7.3.3.2 Importance of Team Working

There are many advantages of working in a team:-

- The work gets done on time. Big projects get completed easily.
- There is always something new to be learned.
- The possibility of getting more work in future increases.
- Customer satisfaction is increased, by delivering better quality products on time.
- Mutual skill and work efficiency increases.
- There is an opportunity of understanding one's own strengths and weaknesses.

7.3.4 Escalation Matrix

Like any other job role in any other industry, a General Assistant- Furniture and Fittings Installer is required and expected to abide by a specific reporting procedure in case non-compliance or non-conformity occurs in any of the standard operating methods. Non-compliance or Non-conformity occurs through **Protocol Violations** and **Protocol Deviations**.

A **Protocol Deviation** is said to have occurred when there is a minor or moderate divergence from the organization's sanctioned design, blueprint, and processes. Under such circumstances, one must alert certain personnel holding designated positions, arranged and organized in a hierarchy known as the "**Escalation Matrix.**" This Escalation Matrix is segregated into multiple levels and a case of deviation

7.3.4.1 How an Escalation Matrix Works









TECHNICIAN

SUPERVISOR

SHIFT-INCHARGE

MANAGER

Fig: Escalation Matrix

An escalation matrix is a tool for managing the flow of work. It's also known as a process map, and it helps you understand what happens when a problem emerges or something goes wrong in your organization.

For instance, If you have five employees working together in one area and all require support on their projects simultaneously, this could cause problems if there needs to be more time for them all to access the resources required by each employee.

This could cause delays, affecting overall production. As a result, it is critical for managers who oversee large teams (such as marketing) to understand how best practices may differ based on the situation.

7.3.4.2 How to write an escalation matrix -

To write an effective escalation matrix, the following steps should be followed:

- **1 Establish the time frames:** Establish the time frames for responding to customer service requests and escalating unresolved issues. The time frames should be realistic and achievable based on the company's customer service standards.
- **2. Define the escalation levels:** Define the levels of escalation that are appropriate for the company. Typically, an escalation matrix will involve three levels of escalation, with each level referring to a different team or individual.

- **3. Set responsibilities:** Set clear responsibilities for each level of escalation. This should include a description of the tasks that each team or individual is responsible for during each level of escalation.
- **4. Define the criteria for escalating:** Define the requirements that must be met for an issue to escalate. This should include a description of the type of issue that requires escalation, as well as the severity of the issue.
- **5. Define the process for escalating:** Define the process for escalating an issue to the next level. This should include a description of steps that must be taken to escalate the issue and information that must be provided.
- **6. Document the escalation matrix:** Once all the above steps have been completed, document it and make it available to all staff. This will ensure that everyone is aware of the process and can use it correctly.

By following these steps, companies can ensure that they have an effective escalation matrix in place, which will help them to manage customer service issues in a timely and efficient manner.

7.3.4.3 Levels of Escalation Matrix

The escalation matrix consists of a number of levels, each with different criteria that help determine the appropriate response to customer issues.



Fig: Levels of Escalation Matrix: Bottom to Top

7.3.4.4 Expressing and Addressing Grievances – Appropriately and Effectively

Grievance, according to the Dictionary, is "a complaint or a strong feeling that one has been treated unfairly".

A. Follow the escalation matrix in case of any grievance

- 1. Before complaining and expressing a grievance, be very clear about the objectives, i.e., why do you require to complain and what you want to achieve in the long run
- 2. Follow the Escalation Matrix for Internal Grievance Resolution
- 3. At each matrix level, write an email to the designated official according to the guidelines and formats provided.
- 4. Follow up with the concerned official if the complaint or grievance needs to be addressed within the standard TAT at that escalation level.
- 5. Document all emails and phone calls records until the issue is duly addressed and closed.
- 6. If the concerned official, at a certain level, does not address the grievance within the TAT, "escalate" and carry forward the issue to the next level.
- 7. Repeat the process from 2-6.
- 8. On the resolution of the grievance, thank the concerned authority over the phone or email, whichever is applicable.

B. Addressing Client's Grievance

- 1. Do not contradict or prevent the client from talking.
- 2. Listen actively and patiently
- 3. Apologize (even if you are not wrong) and empathize with the client.
- 4. Listen to the grievance/complaint with an open mind.
- 5. Promise that you will get back to them with a permanent solution soon.
- 6. Keep your promise and respond to the client with a solution within the standard TAT.
- 7. If you cannot resolve the issue, escalate the same to the next level.
- 8. Follow up with the concerned officials till the grievance is addressed and the issue resolved.
- 9. Inform the client over email or phone that their grievance has been taken care of.

7.3.4.5 Importance and Ways of Managing Interpersonal - Conflict Effectively

Interpersonal conflict can be defined as a serious quarrel or disagreement between two or more persons. Conflict Management is crucial in maintaining a good work environment and the standard productivity of the organization.

The five stages involved in resolving a conflict are:

- 1. Clarifying individual perceptions involved in the conflict
- 2. Arranging for a discussion with witnesses, if required
- $3. \quad Adopting \, an \, active \, and \, empathetic \, listening \, approach$
- 4. Searching for options with the aim of a win-win outcome
- 5. Arriving at a conclusion agreed upon by all parties in the conflict

The common strategies involved in managing Interpersonal Conflict are:

- Accommodating
- Avoiding
- Collaborating
- Forcing
- Compromising
- Competing

Notes	

UNIT 7.4: Gender Inclusive Practices at the worksite

- Unit Objectives 🧖



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

- 1. Understand the importance of gender sensitization inclusivity in the workplace
- 2. Understand various strategies for creating a gender-inclusive workplace culture
- 3. List the benefits of ensuring gender inclusivity in the workplace
- 4. Know the difference between gender equality and gender equity
- 5. Analyze the various factors leading to sexual harassment in the workplace
- 6. Understand the role of the POSH act in protecting gender discrimination at the workplace
- 7. Know about PwD sensitization and its impact on a workplace
- 8. Understand the role of Gender and PwD sensitization in the skill revolution

7.4.1 Gender sensitization –

Gender sensitization at the workplace is the process of making employees aware of the various gender issues that exist in the workplace.

It is a way to create an inclusive and equitable work environment free of gender discrimination, harassment, and other forms of gender-based violence.



Fia: Gender Sensitization

7.4.1.1 Achieving Gender Sensitization ——

Gender sensitization can be achieved through various methods, including education, policy development and training.

1. Education: Education is a key component of gender sensitization. It can include providing information on the various gender issues that exist in the workplace, such as pay disparities, unequal access to promotion opportunities, and gender-based harassment. Education can also include teaching employees about the principles of respect, inclusion, and fairness regarding gender.

- **2. Policy Development:** Companies can develop policies and procedures to protect employees from gender discrimination and harassment. These policies should be tailored to the specific workplace and should clearly define what constitutes discrimination, harassment, and other forms of gender-based violence. They should also outline the consequences of any violations.
- **3. Training:** Training is an important part of creating a gender-sensitive workplace. Employees should be trained on recognizing and addressing gender issues, understanding their rights and responsibilities, and responding respectfully and professionally to any issues or complaints. Training can also include role-playing scenarios and other activities to help employees understand and apply the principles of gender sensitivity.

7.4.2 Gender and Sex

"Sex" refers to the biological and physiological features that distinguish men and women.

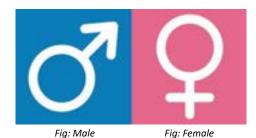
Following are some examples of sex characteristics:

- The reproductive organs of men and women are not the same
- Men do not menstruate, although women do
- Men have beards, whereas women do not
- Women can breastfeed their children, but men cannot

"**Gender**" refers to the socially constructed roles, behaviours, activities, and characteristics that a particular society believes are proper for men and women.

Following are some examples of gender traits:

- Women tend to perform more housework than males
- Women's clothing saree and his men wore Lungi
- Men have short hair, and women have long hair
- For comparable labour, women earn less than men
- Women are discouraged from going out late at night



Difference between Gender and Sex

Gender and sex are often interchangeable, but they are not the same. Gender is a socially constructed term that refers to the attitudes, feelings, and behaviours associated with a particular sex. It is a set of social and psychological characteristics that a specific culture or society considers appropriate for men

and women. Sex, on the other hand, is a biological concept that refers to the biological and physiological characteristics associated with being male or female. Sex is determined by a person's chromosomes, hormones, and anatomy. Sex is related to biological factors, while gender is associated with the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women.

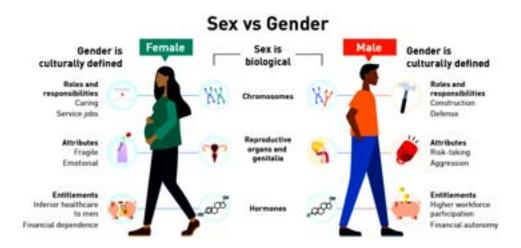


Fig: Difference between Gender and Sex

7.4.3 Gender Equality and Gender Equity

Gender equality occurs when girls and boys, or women and men, have equal social, economic, and political rights, opportunities, services, and resource entitlements. Gender equality exists when men and women have equal opportunities to exercise their rights and abilities to contribute to society's social, economic, and political growth and profit equally from the outcomes. Equality is comprised of two major components:



Fig: Gender Equality vs Gender Equity

· Equal opportunity and equal results

Gender equity entails treating men and women equally regarding rights, rewards, and opportunities. Gender equity refers to the process of treating women and men equally to achieve gender equality.

Why is it vital to provide equal chances for men and women? (Affirmative Action)

Women frequently lack the information, expertise, and decision-making ability required to participate in public dialogue fully. To maintain fairness and justice, steps must be implemented to compensate for

historical and social obstacles that hinder men and women from sharing a level playing field. Women are repressed both culturally and socially. Men have always had equal social rights and opportunities. However, women are constantly discriminated against by society and their families. In terms of education and employment, women lag substantially behind men. Women have less mobility and decision-making authority than men. In this country, women confront more significant challenges than men in moving forward in the socio-cultural structure.

7.4.4 Sexual Harassment _____

Sexual harassment is any unwelcome sexual advance, request for sexual favours, and other verbal or physical conduct of a sexual nature that has the purpose or effect of creating a hostile and intimidating environment for the person being targeted. It is a form of gender discrimination and is illegal under the Protection of Women against Sexual Harassment at Workplace (Prevention, Prohibition and Redressal) Act 2013, commonly known as the POSH Act.

Sexual harassment can occur in a variety of settings:

- The harasser might be anyone, including a customer, co-worker, parent, legal guardian, or teacher
- The location of harassment might range from school to business
- Other witnesses or attendees may or may not be present
- The harasser may be ignorant that their actions are objectionable or constitute sexual harassment
- The harassment could be a one-time occurrence, or it could be repeated
- Both the victim and the harasser can be male or female
- The harasser does not have to be of the same gender as the victim

Common consequences for victims

Sexual harassment has the following expected psychological, professional, financial, and societal consequences:

- Psychological stress
- Work performance decline as a result of stressful situations
- Increased absenteeism due to repeated harassment
- Loss of work or career, loss of income
- Having one's personal life exposed to public scrutiny—the victim becomes the "accused," and their dress, lifestyle, and private life are frequently attacked
- Character and reputation defamation

- Loss of trust in places similar to where the harassment occurred
- Effects on sexual life and relationships can cause significant stress in partnerships
- Loss of support network or being despised in professional circles (friends, colleagues, or family may distance themselves from the victim or shun them altogether)

Sexual infiltration (done by a superior)

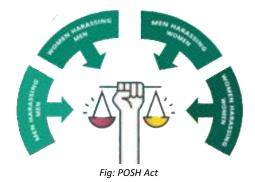
When the harasser is a superior or someone with authority over the victim's work, threats, insisting on private invitations, and requesting sexual interactions in exchange for promotions are all threats. It might be either explicit or implicit.

Sexual harassment in a hostile setting (among colleagues)

Hostile surroundings Sexual harassment occurs when individuals in a workplace are subjected to a pattern of unwelcome sexual behaviour by someone other than an employee's immediate supervisor, and supervisors or managers do nothing to discourage or stop such behaviour.

- Consistently delivering "dirty" jokes or stories where all employees in the work area may hear them has been judged to constitute a hostile atmosphere
- Tolerating employees who make sexually suggestive statements about other employees in public

7.4.5 POSH Act



- The Protection of Women from Sexual Harassment at Workplace (POSH) Act, 2013, is a law that provides legal protection to women from sexual harassment at their workplace. It was passed by the Indian Parliament in 2013 and applied to all public and private organizations with more than ten employees.
- The POSH Act defines sexual harassment as any unwelcome act or behaviour, either directly or by implication, such as physical contact, a demand or request for sexual favours, making sexually coloured remarks, showing pornography, or any other physical, verbal, or non-verbal conduct of a sexual nature.

- The POSH Act provides for establishing Internal Complaints Committees (ICC) in organizations responsible for receiving, investigating, and resolving complaints of sexual harassment. The ICCs are to be headed by a female senior-level employee of the organization, and should have at least half of its members as women.
- The POSH Act also contains provisions for protecting the complainant from victimization and retaliation. It also provides interim relief to the complainant, such as transfer of the respondent or grant of leave.

7.4.6 Case study on gender sensitization in the furniture industry

Background

Gender sensitization is a vital part of any workplace, and the furniture industry is no exception. This case study looks at how one furniture company, Agrawal & Sons Furniture, is taking steps to ensure gender sensitization in its workplace.

Objective

The objective of this case study is to understand how Agrawal & Sons Furniture is implementing gender sensitization in its workplace and assess their efforts' effectiveness.

Methodology

This case study was conducted through interviews with Agrawal & Sons Furniture employees and an analysis of the company's policies and procedures related to gender sensitization.

Findings

Agrawal & Sons Furniture has implemented several gender sensitization policies and procedures.

These include:

- Ensuring there is gender balance on the board of directors and in executive positions
- Establishing gender sensitization training for all employees
- Establishing gender-neutral hiring practices
- Establishing a complaint process for employees who experience gender discrimination
- Establishing a zero-tolerance policy for any gender-based discrimination

Impact

The implementation of gender sensitization policies and procedures at Agrawal & Sons Furniture has had a positive impact on the company. Employees report feeling more respected and valued, and there

has been an increase in morale and productivity. In addition, the company has seen an increase in diversity, with more women and other minority groups represented in the workforce.

Conclusion

Gender sensitization is an important part of any workplace, and Agrawal & Sons Furniture has taken steps to ensure that gender sensitization is a priority in their business. By establishing policies and procedures to address gender discrimination, they have created a more inclusive and respectful environment for their employees. The positive impact of these efforts can be seen in their workforce's increased morale, productivity, and diversity.

7.4.7 PwD Sensitization

In an increasingly competitive global market, businesses must recognize the importance of an inclusive workplace accommodating people with disabilities (PWDs). Building an inclusive workplace is essential for creating a diverse and productive work environment.

PWD sensitization is educating staff on how to interact with PWDs and how to create an environment that accommodates their needs.



Fig: PwD Sensitization

7.4.7.1 Steps to Achieve PwD Sensitization –

- The first step in creating an inclusive workplace through PWD sensitization is to ensure that the
 physical workplace is accessible. This includes providing adequate space for wheelchair users; all
 physical spaces are easily navigable, and proper accommodations for those with hearing and/or
 visual impairments. PWDs should also be consulted during the design and layout of the workplace
 to ensure their needs are met.
- The second step in PWD sensitization is training employees on interacting with PWDs in the
 workplace. This includes learning how to communicate effectively with people with hearing and/or
 visual impairments and providing proper assistance to those with physical disabilities. Staff should
 also be trained to create an inclusive environment for all employees, regardless of their abilities.
- The third step in PWD sensitization is to provide employees with access to the necessary tools and equipment that allow PWDs to do their job effectively. This includes providing appropriate assistive technology, such as voice recognition software, special keyboards, and other adaptive tools.

• Finally, employers should strive to create a positive work culture that is welcoming and accommodating of PWDs. This can be accomplished by offering flexible hours, job coaching, and other accommodations to help PWDs succeed. Additionally, employers should provide support and resources to help PWDs develop valuable skills and advance in their careers.

7.4.7.2 Need for PwD Sensitization

- To create an inclusive and safe environment for Persons with Disabilities (PWDs) in the workplace:
 Sensitizing the workplace about PWDs helps employees understand the difficulties and challenges faced by PWDs and how best to provide support to them in a respectful, understanding, and compassionate manner.
- 2. To Increase Awareness about PWDs: Sensitization can help to create a better understanding of the challenges faced by PWDs and how their work environment can be tailored to their needs. This can also help to reduce any stigma or prejudice against PWDs.
- **3. To Promote Inclusivity:** PWD sensitization can help promote inclusivity in the workplace and ensure that all employees feel like they are valuable and respected team members, regardless of their physical or mental disabilities.
- **4. To Increase Productivity:** PWD sensitization can help to reduce stress among PWDs, as they will be more comfortable and feel accepted in the workplace. This can lead to increased productivity and higher morale in the workplace.
- **5. To Comply with Laws and Regulations:** It is essential to comply with all laws and regulations related to PWDs in the workplace. Sensitization can help to ensure that all policies and procedures are being followed to avoid any legal issues.

7.4.8 The skills revolution _____

Due to the adoption of new technologies and the unparalleled pace of change, the life cycle of skills at the workplace is shorter than ever before (which will continue to accelerate).

The professional profiles in demand linked to technologically related knowledge and abilities are changing due to the development of new employment and the elimination of others. According to a World Economic Forum report, the vocations that will be most in demand in the future will be related to data, AI, and machine learning, where problem-solving abilities will become important. The new job paradigm also prioritizes social and personal skills over specific expertise (the value of which cannot be substituted by technical procedures). Critical thinking, analytical ability, emotional intelligence, and cognitive flexibility may all become necessary in this new reality.

In this context, ensuring that persons with disabilities have adequate skills will become even more relevant. It will need to address both those seeking to enter the labour market and those in the labour market which might be at risk of losing their jobs. Integrating gender and PwD sensitization practices into the Skill Revolution is essential to create a more level playing field for all individuals. This includes developing gender-responsive skill training and including Persons with Disabilities (PwD) in the training process.

- Gender-responsive skill training involves developing skills tailored to the needs of individuals of both genders. This could include developing gender-specific skills, such as those related to health, finance, and technology, or creating gender-neutral skills related to communication and problem-solving.
- Including Persons with Disabilities (PwD) in the skill, training process is also important. This involves creating an environment that is inclusive and accessible to all individuals, regardless of their disability. This could include the provision of assistive technology, the use of sign language interpreters, and the provision of accessibility training for trainers.

Integrating gender and PwD sensitization practices into the Skill Revolution is necessary to ensure that everyone has access to quality skills training and the opportunity to reach their potential. By providing gender-responsive and accessible skill training, all individuals can benefit from the Skill Revolution, regardless of gender or disability. This is essential to create an equal and inclusive society.

Notes ————————————————————————————————————	

Scan the QR codes to watch the related videos



Gender Inclusive Practices at the worksite

Unit Exercise _____

Choose the correct answer

1.	1. Which of the following is an example of an organizational policy?						
	a.	Dress code	b.	Employee compensation			
	c.	Conflict resolution procedures	d.	Employee training			
2.	Org	anizational policies and standard operat	ing proc	edures are essential because they:			
	a.	Ensure compliance with laws and regul	ations				
	b.	Allow for more efficient decision-making	ng				
	c.	Improve employee morale					
	d.	All of the above					
3.	Wh	ich activities get typically included in an	organiza	ation's standard operating procedures?			
	a.	Designing employee benefits	b.	Establishing guidelines for customer service			
	c.	Determining safety protocols	d.	Scheduling vacation time			
4.	Wh	at are the types of communication?					
	a.		b.				
	c.		d.				
5.	Ver	bal communication can be carried out b	y:				
	a.	E-mail	b.	Phone conversation			
	c.	Letters	d.	Fax			
6.	A G	eneral Assistant should have writing skil	ls so tha	at he can:			
	a.	Submit job estimate to the client	b.	Write purchase orders for material supply			
	c.	Keep a record of hours worked	d.	All of these			
7.	Wh	ich of the following is an effective way to	o work e	efficiently with teams?			
	a.	Assigning tasks to team members and e	expectin	ng them to complete them independently			
	b.	Having regular team meetings to discus	ss progr	ess			
	c.	Working in isolation and never commu	nicating	with others			
	d.	Not delegating tasks and doing them a	ll by you	rself			
8.	Wh	en working in a team environment, it is	essentia	Il to:			
	a.	Remain quiet and let the team lead tak	e contro	l			
	b.	Communicate and collaborate with oth	er team	n members			
	c.	Rely on your knowledge and experienc	e				
	d.	Avoid asking questions and seeking hel					

9. '	9. What is the purpose of the escalation matrix?									
;	a.	To define roles and responsibilities in a company								
	b.	To provide a structured approach to escalating problems								
(c.	To document all customer complaints								
(d.	To identify areas of potential risk								
10.	Wh	ich of the following is a key component o	of the es	scalation matrix?						
;	a.	Communication plan	b.	Escalation process						
(c.	Decision tree	d.	Risk management						
11.'	Wh	at is the goal of the escalation matrix?								
;	a.	To create an efficient communication sy	ystem							
I	b.	To quickly resolve customer complaints	i							
(c.	To reduce risk in the organization								
(d.	To facilitate the resolution of conflict								
12.	In c	ase of sexual harassment, what should a	person	should do:						
;	a.	Inform POSH Committee	b.	Inform Supervisor						
(c.	Report a case against the accused	d.	All of the above						
13.	Beir	ng fair to both men and women is referre	ed to as							
;	a.	Gender Equity	b.	Gender Sensitivity						
(c.	Gender Awareness	d.	Gender Equality						
14.	The	term "PwD" concerning sensitive practi	ces stan	ds for:						
;	a.	People with Disability	b.	Person with Designation						
(c.	Person with Disability	d.	None of these						



Annexure - I

Chapter No.	Unit No.	Topic Name	Page No.	Link to QR Code	QR Code
Chapter -1 Introduction	UNIT 1.3 Introduction to Furniture and Fittings sector	1.3.2 Furniture Industry- A Sunrise sector of India	30	https://www.youtu be.com/watch?v= WFaWstWPyDQ&li st=PLxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=2	Introduction to Furniture and Fittings Sector
Chapter -2 Assist in conducting the recce of the worksite	UNIT 2.1 Basic Mathematical Skills	2.1.2 Methods of calculation	52	https://www.youtu be.com/watch?v=E Ut4ueyRE- &list=PLxzdeSsoG- c0yv3DzIYzQaqYm W-8TVt-&index=4	Basic Mathematical Stills.
Chapter -2 Assist in conducting the recce of the worksite	UNIT 2.2 Measuring and Calculating the Wood	2.2.10 Measuring Tools and Equipment	64	https://www.youtu be.com/watch?v=e MfLNazKRMg&list= PLxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=11	Measurement & Markina Tools
Chapter -2 Assist in conducting the recce of the worksite	UNIT 2.4 Conducting Site Survey and Recce Operation	2.4.6 Process of Conducting Site Survey	85	https://www.youtu be.com/watch?v=b wixDXv5aFg&list=P LxzdeSsoHG- cQyv3DzlYzQaqYm W-8TVt-&index=14	Site Survey and Recce at on-site
Chapter -3 Assist in material management at the site	UNIT 3.1 Introduction to Furniture	3.1.5. Modular Furniture- Defining and Explaining Modularity	104	https://www.youtu be.com/watch?v=ff ymPz4Zkvg&list=PL xzdeSsoHG- c0yv3DzlYzQaqYm W-8TVt-&index=8	Introduction to Modulor Furniture
Chapter -3 Assist in material management at the site	UNIT 3.2 Technical Drawings of Furniture	3.2.2. Technical Drawing of a Furniture	125	https://www.youtu be.com/watch?v=P uUI3O1rIEQ&list=P LxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=9	Introduction to Technical Drawing.
Chapter -3 Assist in material management at the site	UNIT 3.2 Technical Drawings of Furniture	3.2.4 Drawing Instruments	125	https://www.youtu be.com/watch?v=4 GpkXSo91Ck&list= PLxzdeSsoHG- c0yv3DzlYzQaqYm W-8TVt-&index=6	Dravina Instruments
Chapter -3 Assist in material management at the site	UNIT 3.3 Wood and Other Materials	3.3.3 Types of wood	141	https://www.youtu be.com/watch?v=v FYreI5xC8E&list=PL xzdeSsOHG- c0yv3DzIYzQaqYm W-8TVt- &index=15&t=51s	Wood and Other Materials

Chapter -5 Assist in fabrication, assembly, and installation work at the site	UNIT 5.1 Fabrication Activities	5.1.9 What are woodworking joints?	247	https://www.youtu be.com/watch?v=C mmknyNiaBo&list= PLxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=16	Wood Working Joints
Chapter -6 Follow health, safety, and greening practices at the worksite	UNIT 6.1 Personal Protective Equipment (PPE)	6.1.1 Personal Protective Equipment (PPE)	284	https://www.youtu be.com/watch?v=- ddKVULhVgc&list= PLxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=12	Personal Protective Equipment
Chapter -6 Follow health, safety, and greening practices at the worksite	UNIT 6.3 Safe Material Handling Practices and Correct Body Postures	6.3.3 Safe Lifting Practices	297	https://www.youtu be.com/watch?v= m3coXr8Kc8U&list =PLxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=13	Safe Ultina Practices
Chapter -6 Follow health, safety, and greening practices at the worksite	UNIT 6.5 Dealing with worksite Emergencies	6.5.1 Potential Hazards at the Workshop	337	https://www.youtu be.com/watch?v=k ultg3ZGpGk&list=P LxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=5	Dealing with worksite Emergencies
Chapter -6 Follow health, safety, and greening practices at the worksite	UNIT 6.6 Housekeeping Practices & Waste Management System	6.6.3 Waste Management System	348	https://www.youtu be.com/watch?v=9 BSj8- xTZuA&list=PLxzde SsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=10	Material Conservation and Optimization Practices
Chapter -7 Work effectively with the co-workers, supervisor, and others	UNIT 7.1 Workplace policies and procedures	7.1.1 Policies and Procedures	362	https://www.youtu be.com/watch?v= mR-bu4i- c3k&list=PLxzdeSso HG- c0yv3DzIYzQaqYm W-8TVt-&index=17	Warkplace policies and procedures
Chapter -7 Work effectively with the co-workers, supervisor, and others	UNIT 7.2 Communication Skills	7.2.1 What is communication?	372	https://www.youtu be.com/watch?v=f Xa3hZok_nE&list=P LxzdeSsoHG- c0yv3DzIYzQaqYm W-8TVt-&index=3	Communication Skills
Chapter -7 Work effectively with the co-workers, supervisor, and others	UNIT 7.4 Organizational Reporting Protocol	7.4.1 Gender sensitization	392	https://www.youtu be.com/watch?v=t KwfKdHgOFk&list= PLxzdeSsoHG- cOyv3DzIYzQaqYm W-8TVt-&index=7	Gender Inclusive Practices at the worksite















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