Skills for Employment Investment Program (SEIP)

COMPETENCY-BASED LEARNING MATERIAL

(STUDENT GUIDE)

FOR

ALUMINUM FABRICATION AND INSTALLATION

(CONSTRUCTION SECTOR)

Finance Division, Ministry of Finance
Government of the People's Republic of Bangladesh

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How to Use this Competency-based Learning Material

Welcome to the competency-based learning material for Aluminium Fabrication and Installation for use in construction works. These modules contain training materials and learning activities for you to complete in order to become competent and qualified as a skilled worker.

There are six (6) modules that make up this course which comprises the skills, knowledge and attitudes required to become a skilled worker including:

1. Explain fundamentals of aluminium materials and processes
2. Cut aluminium profile materials
3. Fabricate and install aluminium windows and glass
4. Fabricate and install aluminium doors and glass
5. Fabricate and install aluminium partition and glass
6. Fabricate and install aluminium false ceiling

As a learner, you will be required to complete a series of activities in order to achieve each learning outcome of the module. These activities may be completed as part of structured classroom activities or simulated workplace demonstrations.

These activities will also require you to complete associated learning and practice activities in order to gain the skills and knowledge needed to achieve the learning outcomes. You should refer to **Learning Activity** pages of each module to know the sequence of learning tasks and the appropriate resources to use for each task.

This page will serve as the road map towards the achievement of competence. If you read the **Information Sheets,** these will give you an understanding of the work, and why things are done the way they are. Once you have finished reading the Information Sheets, you will then be required to complete the **Self-Check Quizzes**.

The self-check quizzes follow the Information Sheets in this learning guide. Completing the self-check quizzes will help you know how you are progressing. To check your knowledge after completion of the Self-Check Quizzes, you can review the **Answer Key** at the end of each module.

You are required to complete all activities as directed in the **Learning Activity and Information Sheet**. This is where you will apply your newly acquired knowledge while developing new skills. When working, high emphasis should be laid on safety requirements. You will be encouraged to raise relevant queries or ask the facilitator for assistance as required.

When you have completed all the tasks required in this learning guide, formal assessment will be scheduled to officially evaluate if you have achieved competency of the specified learning outcomes and are ready for the next task.

List of Icons

Icon Name	Icon
Module content	
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Module 1: Explain fundamentals of aluminium materials and processes

MODULE CONTENT

Module Descriptor: This module covers the skills, knowledge and attitudes to explain fundamentals of aluminium materials and processes**.** It specifically includes describing the properties of aluminium materials and identifying the fabrication processes for aluminium profiles. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 24 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

1.1 Describe the properties of aluminium materials
1.2 Identify the fabrication processes for aluminium profiles

Performance Criteria:

1. Properties of aluminium materials are identified.
2. Uses of Aluminium in the construction sector is identified.
3. Advantages and disadvantages of aluminium materials in construction application is explained.
4. Aluminium production by extrusion method is identified.
5. Fabrication processes for aluminium profiles are identified.

Learning Outcome 1.1- Describe the Properties of Aluminium Materials

Contents:

- Properties of aluminium
- Uses of aluminium in the construction sector
- Advantages and disadvantages of aluminium materials in construction application

Assessment criteria:

1. Properties of aluminium materials are identified.
2. Uses of Aluminium in the construction sector is identified.
3. Advantages and disadvantages of aluminium materials in construction application is explained.

Resources required:

Students/trainees must be provided with the following resources:

- Aluminium materials
- Catalogue/magazine related to aluminium profile materials.

Learning Activity 1.1.1

Learning Activity	Resources/Special Instructions/References
▪ Properties of aluminium materials ▪ Advantages and disadvantages of aluminium materials used in construction sector	▪ Information Sheet: 1.1.1 ▪ Self-Check Quiz: 1.1.1 ▪ Answer Key: 1.1.1 ▪ www.aalco.co.uk/.../Aluminium-Alloy_Introduction-to-Aluminium-and-its-alloys_9.a...

Information Sheet 1.1.1

Learning Objective: to identify and describe the properties of aluminium materials in a workplace.

- **Introduction to aluminium and its alloys**
  - Aluminium and its alloys are the most widely used metal after steel.
  - The use of recycled aluminium is economically and environmentally compelling.
  - There is no difference in quality between virgin and recycled aluminium alloys.
  - Aluminium is one of the lightest engineering metals, having a strength to weight ratio superior to steel.

- **Properties of aluminum**
  - Strength to weight ratio: Aluminium has a density around one third that of steel and is used advantageously in applications where high strength and low weight are required.
  - Corrosion resistance: corrosion resistant of Aluminium can be enhanced with surface treatments such as anodizing.
  - Conductivity: Aluminium is an excellent conductor of both thermal and electricity.
  - Light and heat reflectivity: Aluminium is a good reflector of both visible light and heat making.
  - Toxicity: Aluminium is a non-toxic and does not release any odours or taint products.
  - Recycling: when recycled there is no degradation in properties and there is no difference between virgin and recycled Aluminium.

- **Common uses of Aluminium**
  - The aluminium being used in industries as diverse as transport, food preparation, energy generation, packaging, architecture and electrical transmission applications.
  - Depending upon the application, aluminium can be used to replace other materials like copper, steel, zinc, tin plate, stainless steel, titanium, wood, concrete and composites.
  - Aluminium use in buildings covers a wide range of applications which included roofing, foil insulation, windows, cladding, doors, shop fronts, balustrading, architectural hardware and guttering.

- **Uses of Aluminium in construction sector**
  - Frame of glass walls/partition walls
  - Frame for windows
  - Frame for doors
  - Frame for false ceiling
  - Door handles
  - Window catches
  - Staircase
  - Heating and air conditioning system

- **Advantages of Aluminium**
  - Quick to set up
  - Very precise
  - Sturdy and durable
  - Can be re-used
  - Decorative

- **Disadvantages of Aluminium**
  - Expensive compared to steel
  - Not field modifiable
  - Special welding method needed

Did you know?

- *The versatility of aluminium makes it the most widely used metal after steel.*
- *The recyclability of aluminium is unparalleled. When recycled there is no degradation in properties.*

Self-Check Quiz 1.1.1

Read the following statements carefully and state whether they are True or False:

1. Aluminium is a lightest engineering metals, having strength to weight ratio superior to steel.
2. There is no difference in quality between virgin and recycled aluminium alloys.
3. Pure aluminium is hard and has a low electrical conductivity.
4. Aluminium is an excellent conductor of both heat and electricity.
5. Aluminium is toxic and taint products with which it is in contact.

Learning Outcome 1.2 - Identify the Fabrication Processes for Aluminium Profiles

Contents:

- Aluminium extrusion method and process
- Fabrication processes for aluminium profiles

Assessment criteria:

1. Aluminium production by extrusion method is identified.
2. Fabrication processes for aluminium profiles are identified.

Resources required:

Students/trainees must be provided with the following resources:

- Printed materials on aluminium production by extrusion method
- Print copy/drawing of fabrication processes for aluminium profiles
- Video on aluminium production and fabrication process

Learning Activity 1.2.1

Learning Activity	Resources/Special Instructions/References
▪ Aluminium production by extrusion method ▪ Fabrication processes for aluminium profiles	▪ Information Sheet: 1.2.1 ▪ Self-Check Quiz: 1.2.1 ▪ Answer Key: 1.2.1 ▪ http://en.wikipedia.org/wiki/Extrusion

Information Sheet 1.2.1

Learning Objective: to identify the production by extrusion method and fabrication processes of aluminium profiles in a workplace.

Extrusion of aluminium

- Extrusion is defined as the process of shaping material, such as aluminium, by forcing it to flow through a shaped opening in a die.
- Extrusion is a process used to create objects of a fixed cross-sectional profile.
- A material is pushed through a die of the desired cross-section.

- Aluminium extrusion is a technique used to transform aluminium alloy into objects with a definitive cross-sectional profile for a wide range of uses.

Process of aluminum extrusion

- After designing and creating the shape of the die, a cylindrical billet of aluminum alloy is heated to 800°F-925°F.
- The aluminum billet is then transferred to a loader.
- Pressure is applied to a dummy block using a ram.
- The extruded part passes onto a run-out table as an elongated piece.
- It is then pulled to the cooling table.
- After cooling, the extruded aluminum is moved to a stretcher.
- The hardened extrusions are brought to the saw table and cut according to the required lengths.
- After the extrusion process, a variety of options are available to adjust the colour, texture and brightness of the aluminum's finish.

Extruded Aluminium Profiles

Fabrication processes

To perform fabrication processes for aluminium profiles, requirements include the following issues:

- Cutting
- Deburring
- Punching/forming
- Jointing
- Riveting
- Screwing
- Sealing

Individual Activity:

- *Watch the video shows on 'How to produce aluminium by extrusion method' and 'How to fabricate aluminium profiles' and summarize key points (if facilities available).*
- *Identify aluminium profiles and their uses as available.*

Self-Check Quiz 1.2.1

Write the correct answer for the following questions:

1. Where are aluminium ore bauxite deposits found available?
2. What is meant by aluminium extrusion?
3. Is aluminium a metal or a non-metal?
4. What is the main advantage of extrusion process?
5. Which are includes under fabrication process?

ANSWER KEY

Answer Key 1.1.1

1. True
2. True
3. False
4. True
5. False

Answer Key 1.2.1

1. Significant bauxite deposits are found throughout Australia, the Caribbean, Africa, China and South America.
2. Aluminum extrusion is a technique used to transform aluminum alloy into objects with a definitive cross-sectional profile for a wide range of uses.
3. Aluminium is usually considered to be a metal.
4. The main advantage of extrusion process is its ability to create very complex cross-sections.
5. The fabrication process included cutting, deburring, punching/forming, jointing, riveting, screwing, sealing.

Module 2: Cut aluminium profile materials

MODULE CONTENT

Module Descriptor: This module covers the knowledge, skills and attitudes to cut aluminium profile materials**.** It specifically includes preparing machines and work area for safe operation, performing cutting of aluminium materials, finishing cut ends of aluminium materials and cleaning and maintaining tools, equipment and work area. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 40 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

2.1 Prepare machines and work area for safe operation
2.2 Perform cutting of aluminium materials
2.3 Finish cut ends of aluminium materials
2.4 Clean and maintain tools, equipment and work area

Performance Criteria:

1. Machines used for aluminium fabrication works are prepared and checked for operating condition.
2. Tools and personal protective equipment (PPE) are gathered and check for usability.
3. Work area is cleaned and prepared for safe cutting operation.
4. Recommended aluminium cutting equipment and tools are used to cut aluminium profiles safely.
5. Hazards associated when performing aluminium cutting and grinding work is identified.
6. Personal protective equipment is used when cutting aluminium materials.
7. Cutting of aluminium materials is performed in accordance with workplace requirements.
8. Appropriate processes are carried out on an aluminium end after cutting.
9. Cut ends of aluminium materials are finished in accordance with workplace/work plan specification.
10. PPE, tools and equipment are cleaned and checked for usability.
11. Work area is cleaned in accordance with workplace requirements.
12. Tools, equipment and PPE are stored in accordance with workplace policy.

Learning Outcome 2.1 - Prepare Machines and Work Area for Safe Operation

Contents:

- Machines used for aluminium fabrication works
- Uses of tools and personal protective equipment (PPE)

Assessment criteria:

1. Machines used for aluminium fabrication works are prepared and checked for operating condition.
2. Tools and personal protective equipment (PPE) are gathered and check for usability.
3. Work area is cleaned and prepared for safe cutting operation.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plug, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder

Learning Activity 2.1.1

Learning Activity	Resources/Special Instructions/References
▪ Prepare and check machines for operation ▪ Check tools and equipment and PPE for usability ▪ Clean and prepare work area	▪ Information Sheets: 2.1.1, 2.1.2, 2.1.3 ▪ Self-Check Quizzes: 2.1.1, 2.1.2, 2.1.3 ▪ Answer Keys: 2.1.1, 2.1.2, 2.1.3

Information Sheet 2.1.1

Learning Objective: to identify, prepare and check machines for operating condition in a workplace.

Machines used in aluminium fabrication works:

To perform aluminium fabrication and installation works, requirements include the following machines:

- **Pneumatic circular saw:** is a cutting machine used to cut aluminium profile materials.

- **Band saw:** is also cutting machine used mainly in woodworking, metalworking and lumbering, but may cut a variety of materials like aluminium.

- **Aluminium profile cutting machine:** is appreciated for functional precision and consistency. These have trouble free operation and can cut aluminium profiles.

- **Mitering jig: A** mitering jig also known as miter saw is a specialized tool to cut at a variety of angles.

- **Deburring machine:** is used to remove ‘burrs’ with a deburring tool in a process called 'deburring'. There some common deburring methods: manual deburring, electromechanical deburring, thermal deburring, vibratory finishing and barrel tumbling.

- **Work benches:** are sturdy tables at which manual work is done.

- **Drill press:** also called drilling machine is used to cut holes into or through metal like aluminium, wood or other materials.

- **Bending machine:** is a forming machine tool. Its purpose is to assemble a bend on a workpiece.

- **Portable grinder:** or angle grinder also known as a side grinder or disc grinder, is used for grinding (abrasive cutting) and polishing.

- **Electric drill machine:** is a most common power operated tool fitted with a cutting tool attachment, usually a drill bit, used for boring holes in various materials or fastening various materials together.

- **Clean and prepare work area:**
  This is very important that the working area for aluminum fabrication and installation must be clean, plain and level surface which is suitable for quality product.

Did you know?

- *The best quality aluminium profile cutting machine can sufficiently endure the cutting forces without any breaking.*

Individual Activity:

- *Identify machines used for aluminium fabrication works and check their usability.*

Self-Check Quiz 2.1.1

Write the correct answer for the following questions:

1. What is a pneumatic circular saw?
2. What is the advantage of mitering jig?
3. What are the common methods of deburring?
4. What is drill press?
5. What is the use of an angle grinder?

Information Sheet 2.1.2

Learning Objective: to identify, gather and check tools and equipment for usability in a workplace.

Tools and equipment:

Measuring tape: This is a common measuring tool with linear measurement markings on both edges and used to measure distance or length in workplace.	
Steel rule: A steel rule is also a measuring tool. The flat steel rule is usually 6 or 12 inches long, but longer sizes are also available.	
Try square: A steel made try square is used in measuring boards, testing corners and setting the bevel of boards and tools to various angles.	
Marker: This is used to marking out on the material for a required measurement.	
Scriber: A scriber is a hand tool used in metalworking to mark lines on workpieces.	
Adjustable/slide wrench: An adjustable/slide wrench allows to work with many different sizes without having to change tools.	
Hammer: A hammer is a hand tool that delivers a blow to an object. These are used to drive nails, fit parts, forge metal and break apart objects. Hammers vary in shape, size and structure.	

 Ball peen hammer	 Claw hammer	 Wooden (Mallet)	 Plastic hammer
Drill bits: Drill bits are cutting tools used to remove material to create holes, almost always of circular cross-section.			
Hacksaw: This is used in cutting metals like plates, pipes, rods, bars, angles with minimal thickness, width and length. Also used for cutting plastic pipes, channels and other materials.			
Hand drill: A hand drill is used for boring holes in various materials to fasten various materials together.			
Pliers: These are used for gripping something round like a pipe or rod, for twisting wires and for cutting wires. Pliers are made in various shapes and sizes and for many uses.			
 Combination plier	 Nose plier	 Cutting plier	
Files (flat, half round, round): Files are cutting tools used to remove/smooth rough and sharp edges from cut metal. These are available in various shape and size.			
 Flat file	 Half-round file	 Round file	
Screw drivers: Screw drivers used for screwing. These are available in various shapes and sizes.			
Tin snip: Tin snips are designed to cut sheet metal.			
Rivet gun: A rivet gun is used to drive rivets. These are varying in size and shape and have a variety of handles and grips.			
Sealant gun: A sealant gun is used to fill in gaps.			

Did you know?

- *Unusable or improper use of tools may occur accident.*

Individual Activity:

- *Identify hand tools used for aluminium fabrication works and check their usability.*

Self-Check Quiz 2.1.2

Write the name and uses of the hand tools as given below:

No.	Identify the hand tools given below	Name and uses
1.		
2.		
3.		
4.		
5.		

Information Sheet 2.1.3

Learning Objective: to identify, gather and check personal protective equipment for usability in a workplace.

Personal Protective Equipment (PPE):

Safety Helmet/hard hat: A hard hat or safety helmet is used to protect the head from injury due to falling objects.	
Face shield: A face shield is used to protect entire face from impact hazard.	

Safety Glasses/Eye Protector: Safety goggles or eye protector is used to enclose or protect the eye area.	
Dust Mask: Dust mask is necessary for dust protection in workplace.	
Respirator: A respirator is used to protect from inhaling particulate matter, including airborne microorganisms, fumes, vapours and gases.	
Apron (vest): Apron (vest) is designed to protect the body from injury in the workplace.	
Hand gloves: These are used to protect the hands while working and safeguarding of hands.	
Safety shoes: Safety shoes are used to protect the legs/feet from any harms or injuries.	

Individual Activity:

- *Identify personal protective equipment used for aluminium fabrication works and check their usability.*

Self-Check Quiz 2.1.3

Fill in the blanks with the correct answer.

1. _____ is used to protect eyes from flying particles which may cause injury to the worker.
2. _____ is necessary for dust protection in workplace.
3. _____ is a device designed to protect the wearer from inhaling particulate matter, including airborne microorganisms, fumes, vapours and gases.
4. _____ is necessary to protect the wearer from injury in the workplace.
5. _____ is used to protect one's feet from sharp object to fall.

Learning Outcome 2.2 - Perform Cutting of Aluminium Materials

Contents:

- Hazards in aluminium cutting and grinding work

Assessment criteria:

1. Recommended aluminium cutting equipment and tools are used to cut aluminium profiles safely.
2. Hazards associated when performing aluminium cutting and grinding work is identified.
3. Personal protective equipment is used when cutting aluminium materials.
4. Cutting of aluminium materials is performed in accordance with workplace requirements.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder

Learning Activity 2.2.1

Learning Activity	Resources/Special Instructions/References
▪ Recommended aluminium cutting equipment and tools ▪ Hazards associated when performing aluminium cutting and grinding work ▪ Cutting of aluminium materials	▪ Information Sheet: 2.2.1 ▪ Self-Check Quiz: 2.2.1 ▪ Answer Key: 2.2.1

Information Sheet 2.2.1

Learning Objective: to identify the recommended aluminium cutting equipment and tools, hazards associated when cutting and grinding and PPEs used in a workplace.

- **List of recommended aluminium cutting equipment and tools**

  - **Machines:** pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder.

  - **Tools and equipment:** measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch.

  - **Personal protective equipment (PPE):** hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt.

- **Hazards:**

  - A hazard is any source of potential damage, harm or adverse health effects on something or someone.
  - A hazard is an agent which has the potential to cause harm to a vulnerable target.
  - A hazard is an object, situation or behaviour that has the potential to cause harm in terms of injury, ill health or damage to property or the environment.

  When cutting aluminium materials, the following possible hazards should consider for safety measures.
  - Skin burns due to hot aluminium ends after cutting or grinding
  - Aluminium dust is combustible
  - Inhalation of aluminium dust
  - Cuts due to sharp edges after cutting.

- **Side effects of aluminium:**

  - Severe stomach pain or constipation
  - Bloody, black or tarry stools
  - Coughing up blood that looks like coffee grounds
  - Pain when you urinate
  - Extreme drowsiness
  - Tired feeling, loss of appetite and muscle weakness.

- **How to cut aluminium materials?**

  Method 1: Using electric power tools

  - Use a wood-cutting saw with carbide-tipped blades to cut aluminium.
  - Apply cutting lubricants on blades or bits.
  - Reduce the diameter of the cutting blade for better results.
  - Use a C-clamp to secure aluminium piece
  - Feed the aluminium through the blade or the blade through the aluminium.
  - Adjust the blade depth so the blade extends ¼ inch (6 mm).
  - Use a jigsaw if circular cuts need to be made in the aluminium.

  Method 2: Using a cold chisel

  - Use a cold chisel that is one size wider than the aluminium.
  - Sharpen the chisel to a 60- to 70-degree bevel using a honing guide.
  - Place the aluminium piece into the vice and tighten it.
  - Align the chisel with the vice's screw and hammer the aluminium.

  Method 3: Cutting with tin snips

  - Cut circles in aluminium using curve-cutting snips.

- Use large tin snips to make straight cuts in aluminium sheets.
- Use straight-cutting compound snips opened wide for thick metal.

Warning!
- *Use the right blade for the job, incorrect blade can cause irreparable damage to your aluminum.*
- *Cutting aluminum creates a lot of metal shards, which can be hot, sharp or both.*
- *Must wear gloves, long pants and a long-sleeve shirt to protect your skin.*
- *Don't wear narrow safety goggles when cutting aluminum.*
- *Aluminum dust is both toxic and combustible.*

Individual Activity:
- *Watch the video shows on 'How to cut aluminium profile materials' and summarize key points (if facilities available)*

Self-Check Quiz 2.2.1

Write the correct answer for the following questions:

1. What are the machines recommended to cut aluminium profiles safely?
2. What PPE are used when cutting aluminium materials?
3. What is hazard?
4. What are possible hazards should consider for safety measures, when cutting aluminium materials?

Learning Outcome 2.3 - Finish Cut Ends of Aluminium Materials

Contents:

- Appropriate processes

Assessment criteria:

1. Appropriate processes are carried out on an aluminium end after cutting.
2. Cut ends of aluminium materials are finished in accordance with workplace/work plan specification.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools and equipment: files, sand paper, reamer

Learning Activity 2.3.1

Learning Activity	Resources/Special Instructions/References
▪ Appropriate processes ▪ Finishing of cut ends	▪ Information Sheet: 2.3.1 ▪ Self-Check Quiz: 2.3.1 ▪ Answer Key: 2.3.1 ▪ https://en.wikipedia.org/wiki/Burr_(edge) ▪ https://en.wikipedia.org/wiki/Filing_(metalworking) ▪ https://en.wikipedia.org/wiki/Chamfer ▪ https://en.wikipedia.org/wiki/Miter_joint

Information Sheet 2.3.1

Learning Objective: to finish cut ends of aluminium materials in a workplace.

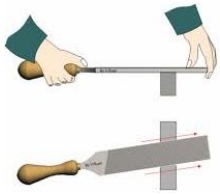
Appropriate processes:

To finish cut ends of aluminium materials, requirements include the following activities.

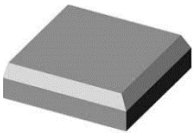
- **Deburring:**

It is a process of removing the unwanted piece of material with a deburring tool. Burrs are commonly created by machining operations, such as grinding, drilling, milling, engraving or turning. The common deburring methods are: manual, brush, robotic, bonded abrasive, abrasive jet.

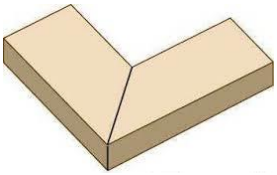
- **Filing:**
  It is a material removal process in manufacturing. Filing operations can be used on a wide range of materials as a finishing operation. Filing helps achieve workpiece function by removing some excess material and deburring the surface.



- **Chamfering:**
  A chamfer is a bevelled edge that connects two surfaces. Chamfering is commonly used for cutting symmetrical and consistent grooves. A chamfer is typically measured as a dimension, as well as an angle.



- **Mitering:**
  A miter is a joint made by bevelling each of two parts to be joined, usually at a 45° angle, to form a corner, usually a 90° angle.



Self-Check Quiz 2.3.1

Write the correct answer for the following questions:

1. How do create burrs?
2. How do filing help to remove deburrs?
3. How can be measured chamfer?
4. What is miter joint?

Learning Outcome 2.4 - Clean and Maintain Tools, Equipment and Work Area

Contents:

- Importance and necessity of cleaning tools, equipment and workplace
- Methods of cleaning, tools and equipment required for cleaning
- Storing of tools and equipment used

Assessment criteria:

1. PPE, tools and equipment are cleaned and checked for usability.
2. Work area is cleaned in accordance with workplace requirements.
3. Tools, equipment and PPE are stored in accordance with workplace policy.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): gloves, dust mask, safety shoes, hard hat, belt/body harness, goggles, working clothes, apron, ear plugs
- Tools and equipment: brooms, dusters, dust pans, cleaning brushes, mops, waste containers and cotton rags
- Materials: water, detergents, abrasives, bleaches

Learning Activity 2.4.1

Learning Activity	Resources/Special Instructions/References
Clean and maintain tools, equipment and work area	▪ Information Sheet: 2.4.1 ▪ Self-Check Quiz: 2.4.1 ▪ Answer Key: 2.4.1 ▪ https://en.wikipedia.org/wiki/Cleaning_agent ▪ https://www.hunker.com/12406192/how-to-store-tools-equipment

Information Sheet 2.4.1

Learning Objective: to clean and maintain tools, equipment and work area and store the same in a workplace.

General information:

After any works cleaning is very important and essential for both tools and equipment used in the workplace. To keep the tools and equipment clean, extra attention and experience required considering

how to remove dirt, including dust, stains, bad smells and clutter on surfaces. For this, we can use some cleaning agents as follows:

- Water (the best cleaning agent)
- Soap or detergent
- Calcium hypochlorite (powdered bleach)
- Sodium hypochlorite (liquid bleach)
- Acetic acid (vinegar)

Methods of cleaning:

Cleaning can be done with following methods:

- Dusting
- Shaking and beating
- Sweeping
- Mopping
- Washing
- Polishing

Rough Cleaning:

- First remove all debris either by hand or use of brushes, brooms, scrapers, squeegees etc.
- Collect and dispose of all debris appropriately
- A warm rinse is recommended to complete the rough cleaning

Tools and equipment for cleaning:

Broom: A broom is a cleaning tool consisting of usually stiff fibres, also known as coconut broom.	
Dusters/Dust protector: A duster/dust protector is a light, loose-fitting long coat.	
Dust pan: A dustpan is used in combination with a broom. It is used to collect dust/waste/small debris.	

Cleaning brushes: Cleaning brushes are tool with bristles, wire or other filaments, used for cleaning, painting and surface finishing, and for many other purposes.	
Mop: A mop is a bundle of coarse strings or a piece of cloth, sponge, or other absorbent material, attached to a stick. It is used to soak up liquid, for cleaning floors and other surfaces, to mop up dust, or for other cleaning purposes.	
Waste container: A waste container is a container for temporarily storing waste and is usually made out of metal or plastic. Some common terms are dustbin, garbage can, trash can and dumpster.	
Cotton rags: A rag is a piece of old cloth which can be used to clean or wipe things.	

Advantages of proper storage of tools and equipment:

- Ensures that tools and equipment remain in good condition and last for a long time.
- Easy to find when needed and are less likely to be lost.
- Productivity is increased because time is not lost looking for tools and equipment.

After cleaning the tools and equipment, you should follow the good habits of inventry, display and/or store the same in accordance with the workplace requirements.

Common types of storage on tool rack

Self-Check Quiz 2.4.1

Write the correct answer for the following questions:

1. What are the methods of cleaning?
2. What is a broom?
3. Write the uses of mops.
4. What is the common type of storage for tools and equipment?
5. What are the advantages of properly storing tools and equipment?

ANSWER KEY

Answer Key 2.1.1

1. A pneumatic circular saw is a power-saw using a toothed or abrasive disc or blade to cut different materials using a rotary motion spinning around an Arbor.
2. A miter jig is a specialized tool that lets you make cuts at a variety of angles.
3. Five of the most common deburring methods are manual deburring, electromechanical deburring, thermal deburring, vibratory finishing and barrel tumbling.
4. A drilling machine also called a drill press, is used to cut holes into or through metal, wood, or other materials.
5. An angle grinder also known as a side grinder or disc grinder, is a handheld power tool used for grinding (abrasive cutting) and polishing.

Answer Key 2.1.2

1. Measuring tape: is a common measuring tool with linear measurement markings on both edges and used to measure distance or length in workplace.
2. Combination pliers: used for gripping something, twisting wires, and others are designed to be used for a combination of tasks including cutting wire.
3. Tin snips: are hand tools specifically designed to cut sheet metal. They can vary in appearance and purpose but are usually defined by short blades and long handles, which allow for extra cutting strength.
4. Rivet gun: also known as pneumatic hammer is a type of tool used to drive rivets. Rivet guns vary in size and shape and have a variety of handles and grips.
5. Sealant gun: helps to apply a nice even line or can be used to fill in gaps. A range of sealant guns suitable for different applications.

Answer Key 2.1.3

1. Safety Glasses
2. Dust mask
3. Respirator
4. Apron (vest)
5. Safety shoes

Answer Key 2.2.1

1. Pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder.
2. Hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes.
3. A hazard is any source of potential damage, harm or adverse health effects on something or someone.
4. The possible hazards are as follows:
   - Skin burns due to hot aluminium ends after cutting or grinding
   - Aluminium dust is combustible
   - Inhalation of aluminium dust
   - Cuts due to sharp edges after cutting.

Answer Key 2.3.1

1. Burrs are most commonly created by machining operations, such as grinding, drilling, milling, engraving or turning.
2. Filing helps achieve workpiece function by removing some excess material and deburring the surface.
3. Chamfer is commonly measured by angle (45°).

4. Miter joint is usually made 45° to form a corner of 90°.

Answer Key 2.4.1

1. Methods of cleaning are: Dusting, Shaking and beating, Sweeping, Mopping, Washing, Polishing.
2. A broom is a cleaning tool consisting of usually stiff fibres, also known as coconut broom.
3. Mops are used to soak up liquid, for cleaning floors and other surfaces, to mop up dust, or for other cleaning purposes.
4. Tool rack is a common type of storage of tools and equipment.
5. The advantages of properly storage of tools and equipment are: ensure good condition, last for a long time, easily find, less likely to be lost and increase productivity.

Module 3: Fabricate and install aluminium windows and glass

MODULE CONTENT

Module Descriptor: This module covers the skills, knowledge and attitudes to fabricate and install aluminium windows with glass. It specifically includes identifying work requirements, preparing for work, fabricating aluminium structure for windows, installing aluminium windows and glass and cleaning and maintaining tools, equipment and work area. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 56 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

3.1 Identify work requirements
3.2 Prepare for work
3.3 Fabricate aluminium structure for windows
3.4 Install aluminium windows and glass
3.5 Clean and maintain tools, equipment and work area

Performance Criteria:

1. Dimensions of aluminium windows are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for window is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for window and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.
5. Tools and equipment are gathered and checked for usability and working conditions.
6. Materials are gathered and checked for quality and compliance to workplace specifications.
7. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
8. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
9. Method of assembly of structure for windows is identified in accordance with workplace plan/drawing specifications.
10. Assembly of aluminium structure for windows is performed in accordance with plans/drawings.
11. Aluminium window frame/structure is installed on location in accordance with workplace requirement.
12. Aluminium window frame/structure is fixed on location in accordance with workplace requirements.

13. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
14. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
15. Glasses are installed into the aluminium window frame/structure safely and in accordance with workplace requirements.
16. PPE, tools and equipment are cleaned and checked for usability.
17. Work area is cleaned in accordance with workplace requirements.
18. Tools, equipment and PPE are stored in accordance with workplace policy.

Learning Outcome 3.1 - Identify Work Requirements

Contents:

- Types/classification of aluminium profile for window
- Shape of aluminium profile for window

Assessment criteria:

1. Dimensions of aluminium windows are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for window is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for window and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Aluminium profile materials for windows

Learning Activity 3.1.1

Learning Activity	Resources/Special Instructions/References
▪ Dimensions of aluminium windows ▪ Types/classification of aluminium profile for window ▪ Shape of aluminium profile for window and glass works	▪ Information Sheet: 3.1.1 ▪ Self-Check Quiz: 3.1.1 ▪ Answer Key: 3.1.1

Information Sheet 3.1.1

Learning Objective: to identify work requirements in a workplace.

- **Dimensions of aluminium windows:**

  To perform aluminium fabrication and installation works, dimensions of aluminium windows are depends on workplace plan/drawing and specifications.

- Standard of window size: Windows are given a special size notation that's simple to understand.
- Size notation is split into four digits, the first two are for width and the second two are for height.
- To give an example of size notation, a 2646 window would be 2'-6″ wide and 4'-6″ tall. The first digit of the notation standards for feet and the second stands for inches.

Types/classification of aluminum profile for window:

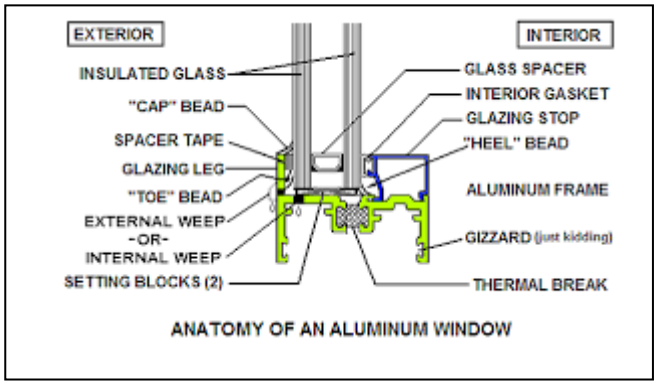
To perform aluminum fabrication and installation works for window, in terms of finish requirements include the following types/classification of Aluminium profile.

- Anodized
- Brite clear
- Brite black
- Brass
- Bronze
- Mill
- Satin black
- Stainless steel brushed
- Painted finish
- Pure protective/bonded finish.

Shape of aluminum profile for window and glass works:

To perform aluminum fabrication and installation works for window, requirements include the following shape of Aluminium profile.

- J-cap
- Divider
- Corner moulding
- Z-clip
- Bottom track-sliding
- Top track
- Gasket
- Shoe
- Wheels
- Channel cap
- Corner bead
- Counter edge
- T-edge
- Finger pulls
- Slot wall
- Header



Self-Check Quiz 3.1.1

Write the correct answer for the following questions:

1. What is meant by window size 3446?
2. Why gasket is used in aluminium window?
3. What is the purpose of window's weep hole?

Learning Outcome 3.2 - Prepare for Work

Contents:

- Tools and equipment
- Aluminium materials

Assessment criteria:

1. Tools and equipment are gathered and checked for usability and working conditions.
2. Materials are gathered and checked for quality and compliance to workplace specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 3.2.1

Learning Activity	Resources/Special Instructions/References
▪ Preparation of tools and equipment ▪ Preparation of PPE ▪ Aluminium materials for windows	▪ Information Sheet: 3.2.1 ▪ Self-Check Quiz: 3.2.1 ▪ Answer Key: 3.2.1

Information Sheet 3.2.1

Learning Objective: to identify, gather and check tools and equipment for usability in a workplace.

- **Tools and equipment:** measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch

- **Personal Protective Equipment (PPE):** hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt

- **Aluminium materials for windows:**

  Same as Information Sheet 1.1.1 and 1.2.1 (page 8-13)

Learning Outcome 3.3 - Fabricate Aluminium Structure for Windows

Contents:

- Cutting of aluminium profile/materials
- Method of assembly of structure for windows
- Assembly of aluminium structure for windows

Assessment criteria:

1. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
2. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
3. Method of assembly of structure for windows is identified in accordance with workplace plan/drawing specifications.
4. Assembly of Aluminium structure for windows is performed in accordance with plans/drawings.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 3.3.1

Learning Activity	Resources/Special Instructions/References
▪ Measurement and cutting of aluminium profile/materials ▪ Method of assembly of structure for windows ▪ Assembly of aluminium structure for windows	▪ Information Sheet: 3.3.1 ▪ Self-Check Quiz: 3.3.1 ▪ Answer Key: 3.3.1 ▪ https://www.wikihow.com/Measure-Your-Windows

Information Sheet 3.3.1

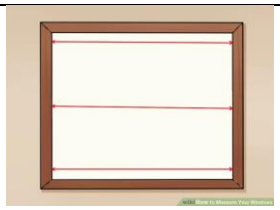
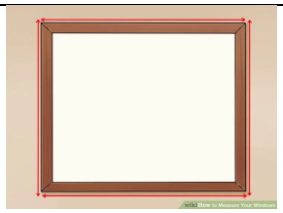
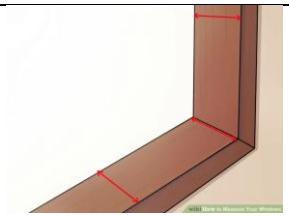
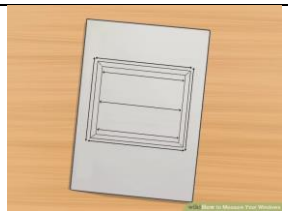
Learning Objective: to measure, cut and assembly of aluminium profile/materials in a workplace.

- **Measurement and cutting of aluminium profile/materials:**

  - Measure the height from the head of the window (top fixed-frame piece) to the windowsill (bottom fixed-frame piece)
  - As with the width, take three measurements: down the left side, right side and the middle.
  - Record the shortest measurement, this ensures that the new window will fit.

- **Measuring for windows or shutters:**

  1. Measure the width at three points and use the smallest measurement.
  2. Account for the lining around the window if present.
  3. Measure the height at three points.
  4. Measure the depth of the window if you are installing replacement windows.
  5. Check whether the window opening is rectangular.
  6. Be clear about where you measured when ordering windows or shutters.

 1	 2
 3	 4
 5	 6

- **Cutting of aluminium profile/materials:**

Step 1: Equipment: Make sure you have all the necessary equipment including safety gear.
Step 2: Cutting tools: **C**hoose the right kind of cutting tool to use.
Step-3: Lubricants: Apply a cutting lubricant on blade**.**
Step-4: Blade size: Careful about the right sized blade for safety reasons.
Step-5: Clamping: Make sure you have a reliable clamping system.
Step-6: Kickback: The kickback is mainly found behind the saw after a cutting of metal.
Step-7: Cutting aluminium: Cut the aluminium in actual shape.

- **Method of assembly of structure for windows:**

  - **Riveting:**
    Riveting is a professional fastening method in which two workpieces are joined *(*riveted) together.

  - **Mechanical interlocking:**
    Mechanical interlocking is a feature system that makes the state of two mechanisms or functions mutually dependent.

- **Metal screwing:**
  The advantage of metal screwing using self-tapping screws for aluminium is that they don't need pre-drilling and are easily removed without damaging the metal.

- **Uses of bolts & nuts:**
  Bolts and nuts are used in several applications with a primary function to hold things or components together.

- **Welding:**
  This is a fabrication process that joins materials by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal.

- **Soldering*:***
  This is a process in which two or more metal items are joined together by melting and putting a filler metal (solder) into the joint, the filler metal having a lower melting point than the adjoining metal.

- **Brazing:**
  Heat the repaired area with a propane or acetylene torch until the aluminium shows an orange bloom. Apply the filler metal by running a brazing rod along the crack or the joint.

 Fabrication tolerances: As per National Productivity and Quality Specification (NPQS)

Window Frame:

- Length ±1.5mm
- Straightness ±1.5mm
- Accuracy on angles ±2°
- Accuracy on sides ±1mm
- Accuracy on diagonals ±2mm

 Assembly of window frame:

- High quality windows can be effectively achieved by fabricating and assembling as many components as possible in the factory.
- Frame assembly could be carried out on elevated workbench.
- Use proper pad to prevent scratches and other physical damages to the frames.
- Assembly of the main and inner frame using a crimping machine produces strong and quality joints.
- Sealant should be applied to the joining edges prior to assembly for enhanced water tightness performance.
- Alternatively, the frame could be secured using screws.
- All screws and screw holes for assembly of components should be sealed with sealant.
- Sealing pads should be provided at frame intersections to ensure water tightness at these locations.

 Sliding:

- For sliding window panel, mole hair and gasket should be inserted to provide additional barrier to water penetration.
- The sliding mechanism, consisting of the rolling mechanism should be inserted into the window panel.
- Capping devices are used to ensure that the sliding mechanism remains in place.

 Protection:

- All exposed parts of the aluminium frame/sections must be protected with suitable protective tapes.
- The tapes used should not leave stains on the surface of the frames nor damage the frame finishes during removal.
- Corrugated cardboard may be used to give additional protection to the frame.
- For slender frame sections, Styrofoam strips can be inserted to maintain the rigidity and prevent deformation of the frame during delivery, storage and handling.
- In addition, corners of frames should be protected to prevent damages during delivery and storage.
- All glazing should also be protected with suitable materials.

- **Labelling:**
  - All fabricated frames, window sashes and glass panels should be properly labelled for ease of identification.
  - The frames should be arranged in batches for delivery to site.
  - Suppliers should plan the delivery of windows in accordance with the installation schedule to minimize storage and handling on site.

Did you know?
- *Sealant should be applied to the joining edges prior to assembly for enhanced water tightness performance.*

Self-Check Quiz 3.3.1

Read the following statements carefully and state whether they are True or False:

1. Riveting is a professional fastening method in which two workpieces are joined *(*riveted) together.
2. Measure the width of window opening at three points and use the largest measurement.
3. Fabrication tolerance for window frame in length: +/- 1.5mm
4. Accuracy on diagonals: +/- 5mm
5. Capping devices are used to ensure that the sliding mechanism remains in place.

Learning Outcome 3.4 - Install Aluminium Windows and Glass

Contents:

- Install and fix aluminium window frame/structure
- Type of glass
- Cut and install glass into the aluminium windows

Assessment criteria:

1. Aluminium window frame/structure is installed on location in accordance with workplace requirement.
2. Aluminium window frame/structure is fixed on location in accordance with workplace requirements.
3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
4. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
5. Glasses are installed into the Aluminum window frame/structure safely and in accordance with workplace requirements.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: fabricated aluminium structure, window glass

Learning Activity 3.4.1

Learning Activity	Resources/Special Instructions/References
▪ Install and fix aluminium window frame/ structure ▪ Type of glass ▪ Cut and install glass into the aluminium windows	▪ Information Sheet: 3.4.1 ▪ Self-Check Quiz: 3.4.1 ▪ Answer Key: 3.4.1 ▪ https://www.youtube.com/watch?v=t9Ty95hZo38

Information Sheet 3.4.1

Learning Objective: to install and fix aluminium windows and glass in a workplace.

- **How to install and fix aluminium window frame/structure?**

Prepare the opening:

- Prepare the rough opening
- Apply sill flashing tape #1
- Tab the sill flashing tape and fold
- Apply sill flashing tape #2
- Ensure the bottom of the opening is level
- Ensure the installation screw will fasten into solid point

Prepare the window for installation:

- Remove packing materials
- Remove the venting sash
- Drill installation screw holes through the frame jambs and head
- Counter drill with a drill guide
- Pre-drill installation screw holes in the sill attachment clips
- Install the sill attachment clips
- Dry fit the window into the opening

Setting and fastening the window:

- Place the window into the opening
- Place shims at each installation screw hole
- Drill pilot holes
- Fasten the window in the opening
- Insert a plastic screw cover
- Replace the sash and check window operation

Interior seal:

- Apply insulating foam sealant
- Check window operation

- **Type of glass:**

Basic type of glass:

- Float glass
- Sheet glass
- Patterned glass
- Wired glass

Hybrid type of glass:

- Reflective glass
- Insulated glass
- Safety glass
- Laminated glass
- Toughened glass
- Tinted glass

- **Glazing:**
  - A suitable tool should be used to knock the frames in place. The tool should come with suitable padding to prevent damage to the frames.
  - The gasket used should be of a continuous length, with splices made at appropriate locations for good fitting around the corners of the glass panel.
  - When assembling the frames, ensure that the gasket fits properly to the glazing and the frames are properly aligned.

- **Tolerance in glass panels:** As per National Productivity and Quality Specification (NPQS)
  - Height ±2mm
  - Width ±2mm
  - Straightness of edges ±1mm
  - Tolerances on insulating glazed units: As allowed by BS 5713.

JOB SHEET 1	
Qualification:	Aluminium Fabrication and Installation
Learning unit:	Install aluminium windows and glass
Learner name:	
Personal protective equipment (PPE):	Hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt.
Materials:	Aluminium profile materials, glass, screws, gasket, sealant.
Tools and equipment:	Measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, tin snip, drill bits, electric drill machine, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch.
Performance criteria:	1. Aluminium window frame/structure is installed on location in accordance with workplace requirement. 2. Aluminium window frame/structure is fixed on location in accordance with workplace requirements. 3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification. 4. Glasses are cut to specified dimension in accordance with work plan/drawing specification. 5. Glasses are installed into the Aluminum window frame/structure safely and in accordance with workplace requirements.
Measurement:	▪ Measurement to be taken from architectural drawing and verify with location. ▪ Make sure to leave a 1/8" gap around the entire window frame to allow for fluctuation and expansion of materials and mortar.
Notes:	Size of window is 1.5m x 1.0m Operation type is sliding Provide locking arrangements **Tolerance in Window Frame:** ▪ Length ±1.5mm ▪ Straightness ±1.5mm ▪ Accuracy on angles ±2° ▪ Accuracy on sides ±1mm ▪ Accuracy on diagonals ±2mm **Tolerance in Glass panel:** ▪ Height ±2mm ▪ Width ±2mm ▪ Straightness of edges ±1mm
Procedure:	1. Collect PPE, tools, equipment and materials for installation of the window and glass. 2. Check the usability of PPE, tools, equipment, aluminium profile materials and glass 3. Carry out measurements, mark and cut aluminium profile materials and glass using appropriate tools 4. Fabricate aluminium frame and fix the glass in the frame to install on selected place 5. Loosely pack insulation around the window frame, on the interior, between the frame and the opening. 6. Check the window that it is centred, plumb, level, square and true in the opening

	7. With the window closed and locked, place temporary shims at each corner of the rough opening 8. Finish off the interior and exterior of the window. 9. Check the window to be sure it operates properly. 10. While working use personal protective equipment for safety 11. Clean tools, equipment and workplace, and restore tools, equipment and excess materials properly.		
Learner signature:		**Date:**	
Assessor signature:		**Date:**	
Quality Assurer signature:		**Date:**	
Assessor remarks:			
Feedback:			

Important:

- *To avoid injury, use at least two people to install.*
- *Do not leave any gaps where water or outside elements can penetrate into the home.*
- *Make certain that the weeps on the outside of the window are open and that water can drain from the sill and out of the weeps.*
- *Fasten windows rated less than DP50 through the nail fin holes 3" - 7" from the corners and 8" apart all the way around the window.*
- *Adequately support the window until completely fastened.*

Group Activity:

- *Watch the video shows on 'How to fabricate and install aluminium window' and summarize key points (if facilities available)*
- *Fabricate and install aluminium window and glass following Job Sheet 1 (see above)*

Self-Check Quiz 3.4.1

Read the following statements carefully and state whether they are True or False:

1. Tinted glass is a _____ type of glass.
2. Sheet glass is a _____ type of glass.
3. The tolerance of window glass panels for height and width is _____.
4. Accuracy on sides of window frame is _____.
5. To ensure the squareness of a window, you should measure the _____ of both directions.

Learning Outcome 3.5 - Clean and Maintain Tools, Equipment and Work Area

Same as Learning Outcome 2.4: Clean and maintain tools, equipment and work area (page 28-30)

ANSWER KEY

Answer Key 3.1.1

1. Window size is 3’-4” x 4’-6”
2. Gasket is used to prevent leakage of water.
3. The purpose of a window's weep hole is to drain water away from the window, keeping the water out of the building and protecting the window sill.

Answer Key 3.3.1

1. True
2. False
3. True
4. False
5. True

Answer Key 3.4.1

1. Hybrid
2. Basic
3. +/- 2mm
4. +/- 1mm
5. Diagonals

Module 4: Fabricate and install aluminium doors and glass

MODULE CONTENT

Module Descriptor: This module covers the skills, knowledge and attitudes to fabricate and install aluminium doors with glass. It specifically includes identifying work requirements, preparing for work, fabricating aluminium structure for doors, installing aluminium doors and glass and cleaning and maintaining tools, equipment and work area. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 56 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

4.1 Identify work requirements
4.2 Prepare for work
4.3 Fabricate aluminium structure for doors
4.4 Install aluminium doors and glass
4.5 Clean and maintain tools, equipment and work area

Performance Criteria:

1. Dimensions of aluminium doors are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for door is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for door and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.
5. Tools and equipment are gathered and checked for usability and working conditions.
6. Materials are gathered and checked for quality and compliance to workplace specifications.
7. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
8. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
9. Method of assembly of structure for doors is identified in accordance with workplace plan/drawing specifications.
10. Assembly of aluminium structure for doors is performed in accordance with plans/drawings.
11. Aluminium door frame/structure is installed on location in accordance with workplace requirement.
12. Aluminium door frame/structure is fixed on location in accordance with workplace requirements.

13. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
14. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
15. Glasses are installed into the aluminium door frame/structure safely and in accordance with workplace requirements.
16. PPE, tools and equipment are cleaned and checked for usability.
17. Work area is cleaned in accordance with workplace requirements.
18. Tools, equipment and PPE are stored in accordance with workplace policy.

Learning Outcome 4.1 - Identify Work Requirements

Contents:

- Types/classification of aluminium profile for door
- Shape of aluminium profile for door

Assessment criteria:

1. Dimensions of aluminium doors are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for door is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for door and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Aluminium profile materials for doors

Learning Activity 4.1.1

Learning Activity	Resources/Special Instructions/References
▪ Dimensions of aluminium doors ▪ Types/classification of aluminium profile for door ▪ Shape of aluminium profile for door and glass works	▪ Information Sheet: 4.1.1 ▪ Self-Check Quiz: 4.1.1 ▪ Answer Key: 4.1.1

Information Sheet 4.1.1

Learning Objective: to identify work requirements in a workplace.

- **Dimensions of aluminium windows:**

  To perform aluminium fabrication and installation works, dimensions of aluminium doors are depends on workplace plan/drawing and specifications.

  - Standard of door size: Doors are given a special size notation that's simple to understand.
  - Size notation is split into four digits, the first two are for width and the second two are for height.

- To give you an example of size notation, a 3470 door would be 3'-4″ wide and 7'-0″ tall. The first digit of the notation standards for feet and the second stands for inches.

Height

Width

Types/classification of aluminum profile for door:

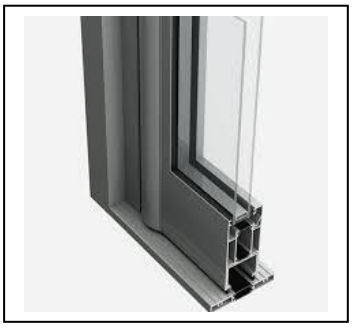
To perform aluminum fabrication and installation works for door, in terms of finish requirements include the following types/classification of Aluminium profile.

- Anodized
- Brite clear
- Brite black
- Brass
- Bronze
- Mill
- Satin black
- Stainless steel brushed
- Painted finish
- Pure protective/bonded finish.

Shape of aluminum profile for door and glass works:

To perform aluminum fabrication and installation works for door, requirements include the following shape of Aluminium profile.

- J-cap
- Divider
- Corner moulding
- Z-clip
- Bottom track-sliding
- Top track
- Gasket
- Shoe
- Wheels
- Channel cap
- Corner bead
- Counter edge
- T-edge
- Finger pulls
- Slot wall
- Header



Self-Check Quiz 4.1.1

Write the correct answer for the following question:

1. What is meant by door size 2670?

Learning Outcome 4.2 - Prepare for Work

Contents:

- Tools and equipment
- Aluminium materials

Assessment criteria:

1. Tools and equipment are gathered and checked for usability and working conditions.
2. Materials are gathered and checked for quality and compliance to workplace specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch.
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 4.2.1

Learning Activity	Resources/Special Instructions/References
▪ Preparation of tools and equipment ▪ Preparation of PPE ▪ Aluminium materials for doors	▪ Information Sheet: 4.2.1 ▪ Self-Check Quiz: 4.2.1 ▪ Answer Key: 4.2.1

Information Sheet 4.2.1

Learning Objective: to identify, gather and check tools and equipment for usability in a workplace.

- **Tools and equipment:** measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch

- **Personal Protective Equipment (PPE):** hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt

- **Aluminium materials for doors:**

  Same as Information Sheet 1.1.1 and 1.2.1 (page 8-13)

Learning Outcome 4.3 - Fabricate Aluminium Structure for Doors

Contents:

- Cutting of aluminium profile/materials
- Method of assembly of structure for doors
- Assembly of aluminium structure for doors

Assessment criteria:

1. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
2. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
3. Method of assembly of structure for doors is identified in accordance with workplace plan/drawing specifications.
4. Assembly of aluminium structure for doors is performed in accordance with plans/drawings.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 4.3.1

Learning Activity	Resources/Special Instructions/References
▪ Measurement and cutting of aluminium profile/materials ▪ Method of assembly of structure for doors ▪ Assembly of aluminium structure for doors	▪ Information Sheet: 4.3.1 ▪ Self-Check Quiz: 4.3.1 ▪ Answer Key: 4.3.1 ▪ https://www.wikihow.com/Measure-Your-Windows

Information Sheet 4.3.1

Learning Objective: to measure, cut and assembly of aluminium profile/materials in a workplace.

- **Measurement and cutting of aluminium profile /materials:**

  - Measure the height from the head of the door (top fixed-frame piece) to the doorsill (bottom fixed-frame piece).
  - As with the width, take three measurements: down the left side, right side and the middle.
  - Record the shortest measurement, this ensures that the new door will fit.

- **Measuring for doors:**

  1. Measure the width at three points and use the smallest measurement.
  2. Account for the lining around the door if present.
  3. Measure the height at three points.
  4. Measure the depth of the door if you are installing replacement doors.
  5. Check whether the door opening is rectangular.

- **Cutting of aluminium profile /materials:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Method of assembly of structure for doors:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Fabrication Tolerances:** As per National Productivity and Quality Specification (NPQS)

  Door Frame:
  - Length ±1.5mm
  - Straightness ±1.5mm
  - Accuracy on angles ±2°
  - Accuracy on sides ±1mm
  - Accuracy on diagonals ±2mm

- **Assembly of door frame:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Sliding:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Protection:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Labelling:**

  Same as Information Sheet 3.3.1 (page 40-4342)

Self-Check Quiz 4.3.1

Read the following statements carefully and state whether they are True or False:

1. Riveting is a professional fastening method in which two workpieces are joined *(*riveted) together.
2. Measure the width of door opening at three points and use the largest measurement.
3. Fabrication tolerance for door frame in length: +/- 1.5mm
4. Accuracy on sides: +/- 5mm
5. Capping devices are used to ensure that the sliding mechanism remains in place.

Learning Outcome 4.4 - Install Aluminium Doors and Glass

Contents:

- Install and fix aluminium door frame/structure
- Type of glass
- Cut and install glass into the aluminium doors

Assessment criteria:

1. Aluminium door frame/structure is installed on location in accordance with workplace requirement.
2. Aluminium door frame/structure is fixed on location in accordance with workplace requirements.
3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
4. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
5. Glasses are installed into the aluminum door frame/structure safely and in accordance with workplace requirements.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: fabricated aluminium structure for doors, door glass

Learning Activity 4.4.1

Learning Activity	Resources/Special Instructions/References
▪ Install and fix aluminium door frame/ structure ▪ Type of glass ▪ Cut and install glass into the aluminium doors	▪ Information Sheet: 4.4.1 ▪ Self-Check Quiz: 4.4.1 ▪ Answer Key: 4.4.1 ▪ https://www.youtube.com/watch?v=t9Ty95hZo38

Information Sheet 4.4.1

Learning Objective: to install and fix aluminium doors and glass in a workplace.

- **How to install and fix aluminium door frame/structure?**

  Prepare the opening:
  - Prepare the rough opening
  - Apply sill flashing tape #1
  - Tab the sill flashing tape and fold
  - Apply sill flashing tape #2
  - Ensure the bottom of the opening is level
  - Ensure the installation screw will fasten into solid point

  Prepare the door for installation:
  - Remove packing materials
  - Remove the venting sash
  - Drill installation screw holes through the frame jambs and head
  - Counter drill with a drill guide
  - Pre-drill installation screw holes in the sill attachment clips
  - Install the sill attachment clips
  - Dry fit the door into the opening

  Setting and fastening the door:
  - Place the door into the opening
  - Place shims at each installation screw hole
  - Drill pilot holes
  - Fasten the door in the opening
  - Insert a plastic screw cover
  - Replace the sash and check door operation

  Interior seal:
  - Apply insulating foam sealant
  - Check door operation

  Sealing the window to the exterior wall cladding:
  - Insert closed cell foam backer rod into the space around the door
  - Apply a bead of high-quality exterior grade sealant
  - Shape, tool and clean excess sealant

- **Type of glass:**

  Same as Information Sheet 3.4.1 (page 44-45)

- **Glazing:**

  Same as Information Sheet 3.4.1 (page 44-45)

- **Tolerance in glass panels:** As per National Productivity and Quality Specification (NPQS)

  Same as Information Sheet 3.4.1 (page 44-45)

JOB SHEET 2	
Qualification:	Aluminium Fabrication and Installation
Learning unit:	Install aluminium doors and glass
Learner name:	
Personal protective equipment (PPE):	Hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt.
Materials:	Aluminium profile materials, glass, screws, gasket, sealant.
Tools and equipment:	Measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, tin snip, drill bits, electric drill machine, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch.
Performance criteria:	1. Aluminium door frame/structure is installed on location in accordance with workplace requirement. 2. Aluminium door frame/structure is fixed on location in accordance with workplace requirements. 3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification. 4. Glasses are cut to specified dimension in accordance with work plan/drawing specification. 5. Glasses are installed into the aluminum door frame/structure safely and in accordance with workplace requirements.
Measurement:	▪ Measurement to be taken from architectural drawing and verify with location. ▪ Make sure to leave a 1/8" gap around the entire door frame to allow for fluctuation and expansion of materials and mortar.
Notes:	▪ Size of door is 1.0m x 2.1m ▪ Operation type is swing/casement/hinged ▪ Provide locking arrangements ▪ Provide handle system ▪ Bottom clearance 10mm
Procedure:	1. Collect PPE, tools, equipment and materials for installation of the door and glass. 2. Check the usability of PPE, tools, equipment, aluminium profile materials and glass 3. Carry out measurements, mark and cut aluminium profile materials and glass using appropriate tools 4. Fabricate aluminium frame and fix the glass in the frame to install on selected place 5. Loosely pack insulation around the door frame, on the interior, between the frame and the opening. 6. Check the door that it is centred, plumb, level, square and true in the opening 7. With the door closed and locked, place temporary shims at each corner of the rough opening 8. Finish off the interior and exterior of the door. 9. Check the door to be sure it operates properly. 10. While working use personal protective equipment for safety 11. Clean tools, equipment and workplace, and restore tools, equipment and excess materials properly.

Learner signature:		**Date:**	
Assessor signature:		**Date:**	
Quality Assurer signature:		**Date:**	
Assessor remarks:			
Feedback:			

Group Activity:

- *Watch the video shows on 'How to fabricate and install aluminium door' and summarize key points (if facilities available)*
- *Fabricate and install aluminium door and glass following Job Sheet 2 (see above)*

Self-Check Quiz 4.4.1

Read the following statements carefully and state whether they are True or False:

1. Tinted glass is a _____ type of glass.
2. Sheet glass is a _____ type of glass.
3. The tolerance of door glass panels for height and width is _____.
4. Accuracy on sides of door frame is _____.
5. To ensure the squareness of a door, you should measure the _____ of both directions.

Learning Outcome 4.5 - Clean and Maintain Tools, Equipment and Work Area

Same as Learning Outcome 2.4: Clean and maintain tools, equipment and work area (page 28-30)

ANSWER KEY

Answer Key 4.1.1

1. Door size is 2’-6” x 7’-0”

Answer Key 4.3.1

1. True
2. False
3. True
4. False
5. True

Answer Key 4.4.1

1. Hybrid
2. Basic
3. +/- 2mm
4. +/- 1mm
5. Diagonals

Module 5: Fabricate and install aluminium partition and glass

MODULE CONTENT

Module Descriptor: This module covers the skills, knowledge and attitudes to fabricate and install aluminium partition/wall with glass. It specifically includes identifying work requirements, preparing for work, fabricating aluminium structure for glass partition/wall, installing aluminium partition/wall and glass and cleaning and maintaining tools, equipment and work area. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 56 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

5.1 Identify work requirements

5.2 Prepare for work

5.3 Fabricate aluminium structure for glass partition/wall

5.4 Install aluminium partition/wall and glass

5.5 Clean and maintain tools, equipment and work area

Performance Criteria:

1. Dimensions of aluminium partition/wall are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for partition/wall is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for partition/wall and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.
5. Tools and equipment are gathered and checked for usability and working conditions.
6. Materials are gathered and checked for quality and compliance to workplace specifications.
7. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
8. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
9. Method of assembly of structure for partition/wall is identified in accordance with workplace plan/drawing specifications.
10. Assembly of aluminium structure for partition/wall is performed in accordance with plans/drawings.
11. Aluminium partition/wall frame/structure is installed on location in accordance with workplace requirement.
12. Aluminium partition/wall frame/structure is fixed on location in accordance with workplace

requirements.

13. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
14. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
15. Glasses are installed into the aluminium partition/wall frame/structure safely and in accordance with workplace requirements.
16. PPE, tools and equipment are cleaned and checked for usability.
17. Work area is cleaned in accordance with workplace requirements.
18. Tools, equipment and PPE are stored in accordance with workplace policy.

Learning Outcome 5.1 - Identify Work Requirements

Contents:

- Types/classification of aluminium profile for partition/wall
- Shape of aluminium profile for partition/wall

Assessment criteria:

1. Dimensions of aluminium partition/wall are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for partition/wall is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for partition/wall and glass works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Aluminium profile materials for partition/wall

Learning Activity 5.1.1

Learning Activity	Resources/Special Instructions/References
▪ Dimensions of aluminium partition/wall ▪ Types/classification of aluminium profile for partition/wall ▪ Shape of aluminium profile for partition/wall and glass works	▪ Information Sheet: 5.1.1 ▪ Self-Check Quiz: 5.1.1 ▪ Answer Key: 5.1.1

Information Sheet 5.1.1

Learning Objective: to identify work requirements in a workplace.

- **Dimensions of aluminium partition/wall:**
  - Standard of partition/wall size: Partition/walls are given a special size notation that's simple to understand.
  - Size notation is split into four digits, the first two are for width and the second two are for height.

- To give you an example of size notation, a 7660 partition/wall would be 7’-6″ wide and 5’-0″ tall. The first digit of the notation standards for feet and the second stands for inches.

Types/classification of Aluminum profile for partition/wall:

To perform aluminum fabrication and installation works for partition/wall, in terms of finish requirements include the following types/classification of Aluminium profile.

- Anodized
- Brite clear
- Brite black
- Brass
- Bronze
- Mill
- Satin black
- Stainless steel brushed
- Painted finish
- Pure protective/bonded finish.

Shape of Aluminum profile for partition/wall and glass works:

- J-cap
- Divider
- Corner moulding
- Z-clip
- Bottom track-sliding
- Top track
- Gasket
- Shoe
- Wheels
- Channel cap
- Corner bead
- Counter edge
- T-edge
- Finger pulls
- Slot wall
- Header

Self-Check Quiz 5.1.1

Write the correct answer for the following questions:

1. What is meant by door size 7050?
2. Why gasket is used in aluminium partition/wall?

Learning Outcome 5.2 - Prepare for Work

Contents:

- Tools and equipment required
- Aluminium materials required for partition/wall

Assessment criteria:

1. Tools and equipment are gathered and checked for usability and working conditions.
2. Materials are gathered and checked for quality and compliance to workplace specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 5.2.1

Learning Activity	Resources/Special Instructions/References
▪ Preparation of tools and equipment ▪ Preparation of PPE ▪ Aluminium materials for partition/wall	▪ Information Sheet: 5.2.1 ▪ Self-Check Quiz: 5.2.1 ▪ Answer Key: 5.2.1

Information Sheet 5.2.1

Learning Objective: to identify, gather and check tools and equipment for usability in a workplace.

- **Tools and equipment:** measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch

- **Personal Protective Equipment (PPE):** hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt

- **Aluminium materials for partition wall:**

  Same as Information Sheet 1.1.1 and 1.2.1 (page 8-13)

Learning Outcome 5.3 - Fabricate Aluminium Structure for Glass Partition/Wall

Contents:

- Cutting of aluminium profile/materials
- Method of assembly of structure for partition/wall
- Assembly of aluminium structure for partition/wall

Assessment criteria:

1. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
2. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
3. Method of assembly of structure for partition/wall is identified in accordance with workplace plan/drawing specifications.
4. Assembly of aluminium structure for partition/wall is performed in accordance with plans/drawings.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 5.3.1

Learning Activity	Resources/Special Instructions/References
▪ Measurement and cutting of aluminium profile/materials ▪ Method of assembly of structure for partition/wall ▪ Assembly of aluminium structure for partition/wall	▪ Information Sheet: 5.3.1 ▪ Self-Check Quiz: 5.3.1 ▪ Answer Key: 5.3.1 ▪ https://www.wikihow.com/Measure-Your-Windows

Information Sheet 5.3.1

Learning Objective: to measure, cut and assembly of aluminium profile/materials in a workplace.

- **Measurement and cutting of aluminium profile /materials:**

- Measure the height from the head of the partition/wall (top fixed-frame piece) to the partition/wall sill (bottom fixed-frame piece)
- As with the width, take three measurements: down the left side, right side and the middle.
- Record the shortest measurement, this ensures that the new partition/wall will fit.

Measuring for partition/wall:

1. Measure the width at three points and use the smallest measurement.
2. Account for the lining around the partition/wall if present.
3. Measure the height at three points.
4. Measure the depth of the partition/wall if you are installing replacement.
5. Check whether the partition/wall opening is rectangular.

Cutting of aluminium profile/materials:

Same as Information Sheet 3.3.1 (page 40-43)

Method of assembly of structure for partition/wall:
Same as Information Sheet 3.3.1 (page 40-43)

Fabrication Tolerances: As per National Productivity and Quality Specification (NPQS)

Partition/wall Frame:

- Length ±1.5mm
- Straightness ±1.5mm
- Accuracy on angles ±2°
- Accuracy on sides ±1mm
- Accuracy on diagonals ±2mm

Assembly of partition/wall frame:

Same as Information Sheet 3.3.1 (page 40-43)

Sliding:

Same as Information Sheet 3.3.1 (page 40-43)

Protection:

Same as Information Sheet 3.3.1 (page 40-43)

Labelling:

Same as Information Sheet 3.3.1 (page 40-43)

Self-Check Quiz 5.3.1

Read the following statements carefully and justify whether they are True or False:

1. Riveting is a professional fastening method in which two workpieces are joined *(*riveted) together.
2. Measure the width of partition/wall opening at three points and use the largest measurement.
3. Fabrication tolerance for partition/wall frame in length: +/- 1.5mm
4. Accuracy on sides: +/- 10mm
5. Capping devices are used to ensure that the sliding mechanism remains in place.

Learning Outcome 5.4 - Install Aluminium Partition/Wall and Glass

Contents:

- Install and fix aluminium partition/wall frame/structure
- Type of glass
- Cut and install glass into the aluminium partition/wall

Assessment criteria:

1. Aluminium partition/wall frame/structure is installed on location in accordance with workplace requirement.
2. Aluminium partition/wall frame/structure is fixed on location in accordance with workplace requirements.
3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification.
4. Glasses are cut to specified dimension in accordance with work plan/drawing specification.
5. Glasses are installed into the aluminum partition/wall frame/structure safely and in accordance with workplace requirements.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: fabricated aluminium structure for partition/wall, partition/wall glass

Activity

Learning Activity 5.4.1

Learning Activity	Resources/Special Instructions/References
▪ Install and fix aluminium partition/wall frame/ structure ▪ Type of glass ▪ Cut and install glass into the aluminium partition/wall	▪ Information Sheet: 5.4.1 ▪ Self-Check Quiz: 5.4.1 ▪ Answer Key: 5.4.1 ▪ https://www.youtube.com/watch?v=t9Ty95hZo38

Information Sheet 5.4.1

Learning Objective: to install and fix aluminium partition/wall and glass in a workplace.

- **How to install and fix aluminium partition/wall frame/structure?**

  Prepare the opening:
  - Prepare the rough opening
  - Apply sill flashing tape #1
  - Tab the sill flashing tape and fold
  - Apply sill flashing tape #2
  - Ensure the bottom of the opening is level
  - Ensure the installation screw will fasten into solid point

  Prepare the partition/wall for installation:
  - Remove packing materials
  - Remove the venting sash
  - Drill installation screw holes through the frame jambs and head
  - Counter drill with a drill guide
  - Pre-drill installation screw holes in the sill attachment clips
  - Install the sill attachment clips
  - Dry fit the partition/wall into the opening

  Setting and fastening the partition/wall:
  - Place the partition/wall into the opening
  - Place shims at each installation screw hole
  - Drill pilot holes
  - Fasten the partition/wall in the opening
  - Insert a plastic screw cover
  - Replace the sash and check partition/wall operation

  Interior seal:
  - Apply insulating foam sealant
  - Check partition/wall operation

  Sealing the partition/wall:
  - Insert closed cell foam backer rod into the space around the partition/wall
  - Apply a bead of high-quality exterior grade sealant
  - Shape, tool and clean excess sealant

- **Type of glass:**

  Same as Information Sheet 3.4.1 (page 44-45)

- **Glazing:**

  Same as Information Sheet 3.4.1 (page 44-45)

- **Tolerance in glass panels:** As per National Productivity and Quality Specification (NPQS)

  - Height ±2mm
  - Width ±2mm
  - Straightness of edges ±1mm
  - Tolerances on insulating glazed units: As allowed by BS 5713.

JOB SHEET 3	
Qualification:	Aluminium Fabrication and Installation
Learning unit:	Install aluminium partition/wall and glass
Learner name:	
Personal protective equipment (PPE):	Hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt.
Materials:	Aluminium profile materials, glass, screws, gasket, sealant.
Tools and equipment:	Measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, tin snip, drill bits, electric drill machine, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, glass cutter (diamond tip), glass file set, glass holder, centre punch.
Performance criteria:	1. Aluminium partition/wall frame/structure is installed on location in accordance with workplace requirement. 2. Aluminium partition/wall frame/structure is fixed on location in accordance with workplace requirements. 3. Type of glass and size to be installed is identified in accordance with work plan/drawing specification. 4. Glasses are cut to specified dimension in accordance with work plan/drawing specification. 5. Glasses are installed into the aluminum partition/wall frame/structure safely and in accordance with workplace requirements.
Measurement:	▪ Measurement to be taken from architectural drawing and verify with location. ▪ Make sure to leave a 1/8" gap around the entire partition/wall frame to allow for fluctuation and expansion of materials and mortar.
Notes:	**Tolerance in partition/wall Frame:** ▪ Length ±1.5mm ▪ Straightness ±1.5mm ▪ Accuracy on angles ±2° ▪ Accuracy on sides ±1mm ▪ Accuracy on diagonals ±2mm **Tolerance in Glass panel:** ▪ Height ±2mm ▪ Width ±2mm ▪ Straightness of edges ±1mm
Procedure:	1. Collect PPE, tools, equipment and materials for installation of the partition/wall and glass. 2. Check the usability of PPE, tools, equipment, aluminium profile materials and glass 3. Carry out measurements, mark and cut aluminium profile materials and glass using appropriate tools 4. Fabricate aluminium frame and fix the glass in the frame to install on selected place 5. Loosely pack insulation around the partition/wall frame, on the interior, between the frame and the opening. 6. Check the partition/wall that it is centred, plumb, level, square and true in the opening 7. With the partition/wall closed and locked, place temporary shims at each corner of the rough opening 8. Finish off the interior and exterior of the partition/wall.

	9. While working use personal protective equipment for safety 10. Clean tools, equipment and workplace, and restore tools, equipment and excess materials properly.		
Learner signature:		**Date:**	
Assessor signature:		**Date:**	
Quality Assurer signature:		**Date:**	
Assessor remarks:			
Feedback:			

Group Activity:

- *Watch the video shows on 'How to fabricate and install aluminium partition/wall' and summarize key points (if facilities available)*
- *Fabricate and install aluminium partition/wall and glass following Job Sheet 3 (see above)*

Self-Check Quiz 5.4.1

Read the following statements carefully and state whether they are True or False:

1. Tinted glass is a _____ type of glass.
2. Sheet glass is a _____ type of glass.
3. The tolerance of partition/wall glass panels for height and width is _____.
4. Accuracy on sides of partition/wall frame is _____.
5. To ensure the squareness of a partition/wall, you should measure the _____ of both directions.

Learning Outcome 5.5 - Clean and Maintain Tools, Equipment and Work Area

Same as Learning Outcome 2.4: Clean and maintain tools, equipment and work area (page 28-30)

ANSWER KEY

Answer Key 5.1.1

1. Partition/wall size is 7’-0” x 5’-0”
2. Gasket is used to prevent leakage of water, flowing of air and insulation of sound.

Answer Key 5.3.1

1. True
2. False
3. True
4. False
5. True

Answer Key 5.4.1

1. Hybrid
2. Basic
3. +/- 2mm
4. +/- 1mm
5. Diagonals

Module 6: Fabricate and install aluminium false ceiling

MODULE CONTENT

Module Descriptor: This module covers the skills, knowledge and attitudes to fabricate and install aluminium false ceiling. It specifically includes identifying work requirements, preparing for work, fabricating aluminium structure for false ceiling, installing aluminium false ceiling and board and cleaning and maintaining tools, equipment and work area. It also includes information sheets, job sheets, self-checking quizzes and answer keys.

Nominal Duration: 48 hours

Learning Outcomes:

Upon completion of the module, the student/trainee will be able to:

6.1 Identify work requirements
6.2 Prepare for work
6.3 Fabricate aluminium structure for false ceiling
6.4 Install aluminium structure false ceiling and board
6.5 Clean and maintain tools, equipment and work area

Performance Criteria:

1. Dimensions of aluminium false ceiling are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for false ceiling is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for false ceiling and board works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.
5. Tools and equipment are gathered and checked for usability and working conditions.
6. Materials are gathered and checked for quality and compliance to workplace specifications.
7. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
8. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
9. Method of assembly of structure for false ceiling is identified in accordance with workplace plan/drawing specifications.
10. Assembly of aluminium structure for false ceiling is performed in accordance with plans/drawings.
11. Aluminium frame/structure of false ceiling is installed on location in accordance with workplace requirement.
12. Aluminium frame/structure of false ceiling is fixed on location in accordance with workplace requirements.

13. Type of ceiling board and size to be installed is identified in accordance with work plan/drawing specification.
14. Ceiling boards are cut to specified dimension in accordance with work plan/drawing specification.
15. Ceiling boards are installed into the aluminium false ceiling frame/structure safely and in accordance with workplace requirements.
16. PPE, tools and equipment are cleaned and checked for usability.
17. Work area is cleaned in accordance with workplace requirements.
18. Tools, equipment and PPE are stored in accordance with workplace policy.

Learning Outcome 6.1 - Identify Work Requirements

Contents:

- Types/classification of aluminium profile for false ceiling
- Shape of aluminium profile for false ceiling

Assessment criteria:

1. Dimensions of aluminium false ceiling are identified in accordance with workplace plan/drawing and specifications.
2. Types/classification of aluminium profile for false ceiling is identified in accordance with workplace plan/drawing and specifications.
3. Shape of aluminium profile for false ceiling and board works is determined.
4. Work requirements are identified in accordance with workplace plan/drawing and specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Aluminium profile materials for false ceiling

Learning Activity 6.1.1

Learning Activity	Resources/Special Instructions/References
▪ Dimensions of aluminium false ceiling ▪ Types/classification of aluminium profile for false ceiling ▪ Shape of aluminium profile for false ceiling and board works	▪ Information Sheet: 6.1.1 ▪ Self-Check Quiz: 6.1.1 ▪ Answer Key: 6.1.1

Information Sheet 6.1.1

Learning Objective: to identify work requirements in a workplace.

- **False ceiling:**
  - False ceiling is a ceiling made beneath the main ceiling of the room or building.
  - It is a second layer of roof suspended from the main roof with the help of metal or wooden frame.
  - It improves the aesthetics of the room.

- **Advantages of false ceiling**
  - It provides a smooth homogeneous surface to the roof.
  - False ceiling helps in acoustical treatment.
  - It conceals all the non-pleasing elements and hides it from the viewer's eyes.

- It also hides the pipelines and the electrical cables running in the room.
- All the ducts of air-conditioning can be hidden under it.

Disadvantages of false ceiling

- The most worrying aspect of having a false ceiling would be pests and can lead to a lot of trouble.
- Be careful while putting up decorations or hangings. Make sure the strength and durability, do's and don'ts with regard to the ceiling.
- The false ceiling would reduce the height of the ceiling considerably.

Materials used in the making of false ceiling:

- Gypsum false ceiling.
- Plaster of Paris ceiling
- Metal false ceiling.
- Wooden false ceiling.
- Fiber false ceiling.
- Glass false ceiling.
- Synthetic leather false ceiling.

Dimensions of aluminium false ceiling:

To perform aluminium false ceiling works, dimensions of aluminium false ceiling are depends on workplace plan/drawing and specifications.

- Standard panel size for false ceiling is 600mm x 600mm.
- There is different size of panel is 1200mm x 600mm.
- The panel size generally use is square but rectangular size is also used.
- Sometime special sizes and designs may use as per desire.

Types/classification of aluminum profile for false ceiling:

To perform aluminum fabrication and installation works for false ceiling, in terms of finish requirements include the following types/classification of Aluminium profile.

- Anodized
- Brite clear
- Brite black
- Brass
- Bronze
- Mill
- Satin black
- Stainless steel brushed
- Painted finish
- Pure protective/bonded finish.

Shape of aluminum profile for false ceiling and board works:

- J-cap
- Divider
- Corner moulding
- Z-clip
- Bottom track-sliding
- Top track
- Gasket
- Shoe
- Wheels
- Channel cap
- Corner bead
- Counter edge
- T-edge
- Finger pulls
- Slot wall
- Header

Self-Check Quiz 6.1.1

Write the correct answer for the following questions:

1. What is false ceiling?
2. What are the materials uses in false ceiling?

Learning Outcome 6.2 - Prepare for Work

Contents:

- Tools and equipment required for false ceiling
- Aluminium materials required for false ceiling

Assessment criteria:

1. Tools and equipment are gathered and checked for usability and working conditions.
2. Materials are gathered and checked for quality and compliance to workplace specifications.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 6.2.1

Learning Activity	Resources/Special Instructions/References
▪ Preparation of tools and equipment ▪ Preparation of PPE ▪ Aluminium materials for false ceiling	▪ Information Sheet: 6.2.1 ▪ Self-Check Quiz: 6.2.1 ▪ Answer Key: 6.2.1

Information Sheet 6.2.1

Learning Objective: to identify, gather and check tools and equipment for usability in a workplace.

- **Tools and equipment:** measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, centre punch

- **Personal Protective Equipment (PPE):** hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt

- **Aluminium materials for false ceiling:**

  Same as Information Sheet 1.1.1 and 1.2.1 (page 8-13)

Learning Outcome 6.3 - Fabricate Aluminium Structure for False Ceiling

Contents:

- Cutting of aluminium profile/materials
- Method of assembly of structure for false ceiling
- Assembly of aluminium structure for false ceiling

Assessment criteria:

1. Aluminium profile/materials are measured in accordance with work plan/drawing specifications.
2. Aluminium profile/materials are cut in accordance with work plan/drawing specifications.
3. Method of assembly of structure for false ceiling is identified in accordance with workplace plan/drawing specifications.
4. Assembly of aluminium structure for false ceiling is performed in accordance with plans/drawings.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: aluminium profile materials (as required)

Learning Activity 6.3.1

Learning Activity	Resources/Special Instructions/References
▪ Measurement and cutting of aluminium profile/ materials ▪ Method of assembly of structure for false ceiling ▪ Assembly of aluminium structure for false ceiling	▪ Information Sheet: 6.3.1 ▪ Self-Check Quiz: 6.3.1 ▪ Answer Key: 6.3.1 ▪ https://www.indiamart.com › ... › Abhi Fabrication

Information Sheet 6.3.1

Learning Objective: to measure, cut and assembly of aluminium profile/materials in a workplace.

- **Taking measurement:**

  - Measure down from the joists at several locations around the room to get enough space above the panel grid at all points across the existing ceiling.
  - If the ceiling joists don't lie on a level plane, make sure to measure down 4 in. from the lowest point on the lowest joist.
  - When the three perimeter lines are level and at the correct height, connect them with a chalk line on the remaining wall.

- **Cutting of aluminium profile /materials:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Method of assembly of structure for false ceiling:**

  Same as Information Sheet 3.3.1 (page 40-43)

- **Assembly of false ceiling frame:**

  - High quality false ceiling can be effectively achieved by fabricating and assembling as many components as possible in the factory.
  - Frame assembly could be carried out on plain surface or elevated surface. The surfaces should be padded to prevent scratches and other physical damages to the frames.
  - Assembly of the false ceiling main and inner frame using a crimping machine produces strong and quality joints.
  - Alternatively, the frame could be secured using screws.
  - All screws and screw holes for assembly of components should be sealed with sealant.

Self-Check Quiz 6.3.1

Read the following statements carefully and state whether they are True or False:

1. Riveting is a professional fastening method in which more than two workpieces are joined (riveted) together.
2. Soldering is a process in which two or more metal items are joined together by melting and putting a filler metal (solder) into the joint, the filler metal having a lower melting point than the adjoining metal.

Learning Outcome 6.4 - Install Aluminium False Ceiling and Board

Contents:

- Install and fix aluminium false ceiling frame/structure
- Type of ceiling board
- Cut and install glass into the aluminium false ceiling

Assessment criteria:

1. Aluminium false ceiling frame/structure is installed on location in accordance with workplace requirement.
2. Aluminium false ceiling frame/structure is fixed on location in accordance with workplace requirements.
3. Type of board and size to be installed is identified in accordance with work plan/drawing specification.
4. Ceiling boards are cut to specified dimension in accordance with work plan/drawing specification.
5. Ceiling boards are installed into the aluminum partition/wall frame/structure safely and in accordance with workplace requirements.

Resources required:

Students/trainees must be provided with the following resources:

- Personal protective equipment (PPE): hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt
- Tools: measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, wrenches, tin snip, drill bits, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, sealant gun, rivet gun, string lines, scriber, centre punch
- Equipment: pneumatic circular saw, band saw, aluminium profile cutting machine, mitering jig, deburring machine, work benches, drill press, bending machine, portable grinder
- Materials: fabricated aluminium structure for false ceiling, ceiling boards

Learning Activity 6.4.1

Learning Activity	Resources/Special Instructions/References
▪ Install and fix aluminium false ceiling frame/ structure ▪ Type of ceiling board ▪ Cut and install board into the aluminium false ceiling	▪ Information Sheet: 6.4.1 ▪ Self-Check Quiz: 6.4.1 ▪ Answer Key: 6.4.1 ▪ https://www.youtube.com/watch?v=t9Ty95hZo38

Information Sheet 6.4.1

Learning Objective: to install and fix aluminium false ceiling and board in a workplace.

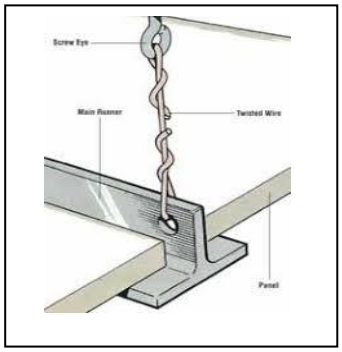
- **How to install and fix aluminium structure for false ceiling?**

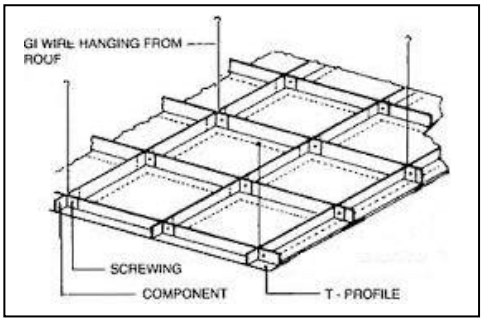
Setting the perimeter:

- The first step is to determine the maximum height of the new suspended ceiling.
- Locate the wall studs and nail the perimeter moulding in place so that the top of the moulding aligns with the perimeter lines.
- When come to an inside corner, install the first length of moulding tight against the corner and butt the second length against the first.
- For outside corners, a mitred joint is more attractive.
- Using a tin snip, cut both mouldings at a 45-degree angle and secure them in place.

Installing the runners:

- Measure across the room parallel to the joists and divide by the panel length to get the number of full panels that will fit in the space.
- To install the main runners, measure out from the starting wall the determined gap distance and snap a chalk line across joists.
- Then, measure 4 ft. from this line and snap a second line. Repeat this procedure in 4-ft. increments until reach the far wall.
- To support the main runners, screw small eyebolts into every third joist along the chalk lines.
- Then, fasten lengths of 16-gauge wire to each eyebolt. Twist the wire at least three times around itself at the top.
- Continue hanging the runners in this fashion until each is supported every 4 ft.
- If the room is longer than the runners, join them end to end, using the slots and tabs built into the ends of each.
- Place an additional wire support near each of these joints.
- If the system has 2 x 4-ft. panels, install the panels in the centre of the grid now to help square the assembly.
- If system has 2 x 2-ft. panels, install the 2-ft. connectors before moving on.
- These connectors parallel the runners and fit slots in the cross tees.
- With the 2-ft. connectors in place, install enough of the centre panels to square the grid.





- **Type of ceiling board:**
  - Gypsum board
  - Mineral fibre
  - Laminated PVC
  - Calcium silicate
  - Fire proof mineral fibre
  - Fibre glass
  - Ply wood
  - Ply board

JOB SHEET 4			
Qualification:	Aluminium Fabrication and Installation		
Learning unit:	Install aluminium false ceiling and board		
Learner name:			
Personal protective equipment (PPE):	Hard hat (helmet), safety eye glass, face shield, face mask, respirator, hand gloves, apron (vest), safety shoes, ear plugs, safety belt.		
Materials:	Aluminium profile materials, ceiling boards, screws, G.I wire.		
Tools and equipment:	Measuring tape, steel rule, tri-square, marking pen/pencil, hacksaw, drill bits, electric drill machine, plastic hammer, combination plier, spirit level, plumb bob, screwdrivers, string lines, scriber, centre punch.		
Performance criteria:	1. Aluminium false ceiling frame/structure is installed on location in accordance with workplace requirement. 2. Aluminium false ceiling frame/structure is fixed on location in accordance with workplace requirements. 3. Type of ceiling board and size to be installed is identified in accordance with work plan/drawing specification. 4. Ceiling boards are cut to specified dimension in accordance with work plan/drawing specification. 5. Ceiling boards are installed into the aluminum false ceiling frame/structure safely and in accordance with workplace requirements.		
Measurement:	▪ Measurement to be taken from architectural drawing and verify with location.		
Notes:	▪ Size of false ceiling: 3.0m x 3.0m ▪ Equal grids @ 0.6m ▪ Suspend 30cm from main roof/ceiling ▪ Easy to replace or repair the ceiling board		
Procedure:	1. Collect PPE, tools, equipment, aluminium profile materials and ceiling board 2. Check the usability of PPE, tools, equipment, aluminium profile materials and ceiling board 3. Carry out measurements, mark and cut aluminium profile materials and ceiling board 4. Fabricate aluminium frame and install on selected place 5. Check level of the aluminium frame 6. Fix the ceiling board in the aluminium frame 7. Report to Assessor for final evaluation 8. While working use personal protective equipment for safety 9. Clean tools, equipment and workplace, and restore tools, equipment and excess materials properly.		
Learner signature:		**Date:**	
Assessor signature:		**Date:**	
Quality Assurer signature:		**Date:**	
Assessor remarks:			
Feedback:			

Important:

- *To avoid injury, use at least two people to install.*
- *Minimum gap between old ceiling and new false ceiling should be 4 inches.*

Group Activity:

- *Watch the video shows on 'How to fabricate and install aluminium structure for false ceiling and boards' and summarize key points (if facilities available)*
- *Fabricate and install aluminium false ceiling and board following Job Sheet 4 (see above)*

Self-Check Quiz 6.4.1

Read the following statements carefully and state whether they are True or False:

1. In setting the perimeter frame of a false ceiling for outside corners, butt joints are more attractive than mitred joints.
2. 16-gauge GI wire is used to hanging the aluminium profile frame from roof or joist.

Learning Outcome 6.5 - Clean and Maintain Tools, Equipment and Work Area

Same as Learning Outcome 2.4; Clean and maintain tools, equipment and work area (page 28-30)

ANSWER KEY

Answer Key 6.1.1

1. False ceiling is a ceiling made beneath the main ceiling of the room or building.
2. The materials use in false ceiling are: gypsum, plaster of Paris, metal, wooden, fibre, glass, synthetic leather.

Answer Key 6.3.1

1. False
2. True

Answer Key 6.4.1

1. False
2. True