



RQF LEVEL 3



MATBC301
MANUFACTURING
TECHNOLOGY

Basic
Sand Casting

TRAINER'S MANUAL

October, 2024



BASIC SAND CASTING



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ACRONYMS

Cm: Centimeter

Hrs: Hours

IC: Indicative content.

Ltd: Limited

MATBC: Manufacturing – Basic Casting.

mm: Millimeter

PH: Potential of Hydrogen.

PPE: Personal Protective Equipment.

PVC: Polyvinyl Chloride

RTB: Rwanda TVET Board

SiO₂: Silicate

SOP: Standard Operating Procedure.

TQUM: TVET Quality Management Project

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Basic Sand Casting.**" Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer trainees opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

MODULE CODE AND TITLE: MATBC301 BASIC SAND CASTING

Learning Outcome 1: Prepare for casting process.

Learning Outcome 2: Carryout Aluminium with its alloys casting.

Learning Outcome 3: Perform post-casting activities.

Learning Outcome 1: Prepare for Casting Process.



Indicative contents

1.1 Introduction to Casting.

1.2 Identification of Safety and Security Measures.

1.3 Identification of Materials, Tools, and Equipment

1.4 Pre-casting activities.

Key Competencies for Learning Outcome 1 : Prepare for Casting Process.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none"> ● Definition of casting key terms ● Identification of workplace hazard types ● Identification of hazards preventions ● Identification of workplace signs and symbols ● Description of casting materials, tools, and equipment's types. 	<ul style="list-style-type: none"> ● Applying of safety signs and symbols. ● Applying casting principles. ● Identifying workplace hazards. ● Cleaning of casting tools and equipment. ● Lubricating casting equipment's ● Adjusting casting materials, tools, and equipment's 	<ul style="list-style-type: none"> ● Being attentive in safety sign and symbols application ● Being obedient during hazard identification ● Having Integrity in cleaning technics ● Having Teamwork spirit during casting process ● Being Flexible in casting tools and equipment adjustment ● Having Self-improvement in casting preparation



Duration: 10 hrs.



Learning outcome 1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe clearly the casting terminologies used in the manufacturing process.
2. Identify correctly safety measures applied at workplace during the casting process.
3. Identify correctly hazards prevention methods used during sand casting process.
4. Identify properly workplace signs and symbols to be use in sand casting
5. Apply correctly safety measures at workplace during casting process.
6. Identify properly the types of materials, tools and equipment used during the casting process.
7. Select correctly casting materials, tools and equipment used in casting process
8. Adjust effectively tools and equipment used in sand casting process.
9. Lubricate appropriately casting tools and equipment to be used in casting process preparation



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> ● PPEs ● Sand Mixer ● Fire fitting equipment's ● Furnace ● First aid kit ● Pattern 	<ul style="list-style-type: none"> ● Tape measure ● Vernier calliper ● Spirit level, Knife? ● Diagonal clamps ● Shovel, mallet ● Strike off bar. ● Blowers / aspirator 	<ul style="list-style-type: none"> ● Sand ● Aluminium ingots ● Additives ● Cloth rags

- | | | |
|--|--|--|
| <ul style="list-style-type: none">• Moulding box | | |
|--|--|--|



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail different Pictures or Videos used as didactic material for casting process.
- Avail all casting materials, tools and equipment are in good condition.
- Avail PPEs and other safety equipment at workplace.
- Have well-arranged manufacturing workshop.



Indicative content 1.1 : Introduction to Casting.



Duration: 2 hrs.



Theoretical Activity 1.1.1: Definition of key terms used in casting process and working principles of casting in manufacturing process



Notes to the trainer:

- While delivering this content you may use small groups of trainees for describing the key terms and working principles of casting process.
- Images, videos, and illustrations can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- What do you understand by the following terms?
 - ✓ Metal casting process
 - ✓ Foundry
 - ✓ Casting
 - ✓ Mould
 - ✓ Pattern
 - ✓ Moulding material
 - ✓ Flask
 - ✓ Mould cavity
- Describe the applications and working principles of basic casting
- State the advantages and disadvantages of basic casting

Step 2: Involve trainees' in-group forming and provide work instructions

Step 3: Ask trainees to write answers provided on flipchart/paper.

Step 4: Involve trainees to present their findings to the whole class.

Step 5: Provide expert view and clarify ideas by using didactic materials.

Step 6: Address any questions or concerns.

Step 7: Ask trainees to read the key reading 1.1.1. In trainee manual.



Points to Remember

- The sand casting terminologies are including: Casting, Foundry , Casting , Mould , Pattern , cavity, Moulding material, Flask, and Mould are the commonly terms must be focused in casting process
- Prepare for casting process have mainly applications such in industrial and home used products
- During working principle of sand casting always pay attention to pattern Making, mold Creation, Core Placement, Metal Pouring, mold removal, cooling and solidification must be focused as steps of casting process



Indicative content 1.2: Identification of Safety and Security Measures.



Duration: 3 hrs.



Theoretical Activity 1.2.1: Identification of safety and security measures used casting process.



Notes to the trainer:

- Trainer may use small groups of trainees for describing the types of hazards and safety precautions used in casting.
- Images, videos, and illustrations can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking trainees to answer to the following questions:

- What do you understand by the term “**Hazard**”?
- Identify the types of hazards found in manufacturing casting processes.
- State safety precautions required in casting process

Step 2: Ask trainees to write answers provided on flipchart/paper.

Step 3: Ask trainees to present their findings to the whole class.

Step 4: Provide expert view and clarify ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 1.2.1 in the trainee manual.



Points to Remember

- Before starting casting process always, wear safety equipment for minimising hazards.
- Make sure that you have a filled fire extinguisher in your workplace room that can you help in case of fire emergency
- Make sure that general safety measures are applied in any environment including industrial like sand casting, to protect personnel, equipment, and the environment.



Practical Activity 1.2.2: Applying safety precaution, security measures in casting process.



Notes to the trainer:

- The trainer should demonstrate to the trainees how to implement safety and security measures in the workplace.
- The trainer should ensure the workshop is well-organized and equipped with casting tools, as well as safety and security kits.
- The trainer should provide personal protective equipment and show how to properly wear PPE.



Key steps:

While delivering this practical activity, pass through the following steps:

Step 1: Introduce the topic by asking trainees do the task described below:

As manufacturing technician. Request trainee to go to the workshop and apply safety and security measures applied in sand casting process.

Step 2: Explain the task and provide clear work instructions

Step 3: Demonstrate how to apply safety and security measures using safety signs and symbols.

Step 4: Ask trainees to apply safety and security measures respecting work instructions.

Step 5: Monitor trainees' activities and provide guidance where necessary.

Step 6: Assess whether safety and security measures are appropriately applied.

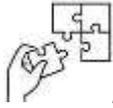
Step 7: Ask trainees to read key readings 1.2.2 in trainee manual.

Step 8: Ask trainees to perform the task provided in application of learning 1.2.



Points to Remember

- When preparing for casting process, it is important to apply safety signs and security measures to ensure that incident is well-being avoided during casting process.



Application of learning 1.2.

Suppose that, the chief of TMC manufacturing workshop request your school a support of training his workers about the appropriate application of safety and security measures in the workshop. Ask trainee to train workers of TMC manufacturing workshop how to apply safety and security measures reflecting on:

- i. Use of PPEs in casting process
- ii. Use of fire extinguishers
- iii. Safety signs and symbols identification
- iv. First aid toolkit concepts identification
- v. Hazard prevention methods

This task is individually based

Performance Checklist/Solution of application:

Assessment Elements	Indicators	Observation	
		YES	NO
1. Personal protective equipment have worn properly.	1.1 Overall is worn		
	1.2 Gloves are worn		
	1.3 Clear safety glass is worn		
	1.4 Safety boots are worn		
	1.5 Head gear helmet is worn		
	1.6 Mouth mask is worn		
	1.7 Workplace is clean		
2. Safety and security measures are properly applied	2.1 Fire extinguisher is allocated		
	2.2 First aid kit is prepared		
	2.3 Materials are labelled		
	2.4 Tools, material and equipment are arranged		
	2.5 Safety signs and symbols are allocated		



Indicative content 1.3 : Identification of Materials, Tools, and Equipment.



Duration: 3 hrs.



Theoretical Activity 1.3.1: Description of Materials, Tools, and Equipment used in casting process.



Notes to the trainer:

- During delivering this content, use small groups to describe casting materials, tools and equipment used for casting process.
- Use pictures or photo of different types of tools, materials and equipment to provide more understanding.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session by asking trainees to answer to the following questions:

- i. What are material, tools and equipment used in casting process?
- ii. State the types of materials, tools, and equipment used in casting process.
- iii. Enumerate four properties of materials used in casting process.

Step 2: Ask trainees to write answers provided on flipchart/paper.

Step 3: Monitor the working activity and provide some clarifications if any

Step 4: Ask trainees to discuss the provided answer and choose correct answers.

Step 5: Provide expert view and clarify ideas by using didactic materials.

Step 6: Address any questions or concerns.

Step 7: Ask trainees to read the key reading **1.3.1**. In the trainee manual.



Points to Remember

- Casted product dimensions and Conditions of work place should be determine the factors to be consider for selecting materials, tools and equipment used in casting



Practical Activity 1.3.2: Selecting tools, materials and equipment used in casting process.



Notes to the trainer

- Trainer may involve trainees individually in selecting tools, materials and equipment used in preparing for casting process.
- Avail adequate Tools, Materials, and Equipment used in preparing for casting process.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and individually ask trainees to:

- i. Perform selection of casting tools, material and equipment used in casting process.

Step 1: Explain the task and provide clear work instructions.

Step 2: Demonstrate how to select tools, materials and equipment used in casting process and explain selection criteria.

Step 3: Ask trainees to apply safety precautions and how to select tools, materials and equipment used in casting process

Step 4: Verify whether safety precautions and selection of tools, materials and equipment are applied appropriately and provide clarifications if any.

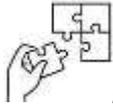
Step 5: Ask trainees to read key reading 1.3.1.

Step 6: Ask trainees to perform the task provided in application of learning 1.3



Points to Remember

- Poor selection of tool , materials and equipment can affect an accurate of cast product
- While Applying the selection of materials, tools, and equipment must be think about purpose of accurate cast product



Application of learning 1.3.

Suppose that you have made a visit at BC manufacturing company Ltd, which is specialized in irrigation by using water pumping system, after that company visited. Trainer ask you to make a visit report after comprehension of selecting materials, tools, and equipment used in casting process and correct submitted report of trainee about how:

- i. Casting Materials identified
- ii. Casting Tools identified
- iii. Casting Equipment identified

Performance checklist/Solution of application:

Indicator	Observation	
	Yes	No
1.1 Sand is selected		
1.2 Sand additives are selected		
1.3 Pattern is selected		
1.4 Mold coating materials are selected		
1.5 Shovel is selected		
1.6 Trowel is selected		
1.7 Mallet hammer is selected		
1.8 Spirit level is selected		
1.9 Strike off bar is selected		
1.10 Spurue pins are selected		
1.11 Draw spikes are selected		
1.12 Gate cutter is selected		
1.13 Blower is selected		
1.14 Materials are arranged		
1.15 Tools are arranged		
1.16 Equipment's are arranged		



Indicative content 1.4 : Pre- Casting Activities.



Duration: 2 hrs.



Theoretical Activity 1.4.1: Description of workplace arrangement and pre-casting activities



Notes to the trainer:

- This content should be delivered in classroom or other learning place and use small groups to describe workplace arrangement during casting process.
- Use pictures or photo of different tool, materials, and equipment for more clarification as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session by asking trainees to answer the following questions:

- i. Discuss on Working principles of casting process
- ii. What mean Sand preparation, Pattern making, Mould preparation and Maintenance technics as the methods of casting process?

Step 2: Ask any trainee to write answers provided on flipchart/paper.

Step 3: Ask trainees to discuss on the provided answers and choose correct answers.

Step 4: Provide expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 1.4.1 in the trainee manual.



Points to Remember

- While preparing casting process of product you must be focused on materials, tools, and equipment related to the casting product.

- While performing casting process do not forget the methods to be follow including sand preparation, Pattern making, Mould preparation and Maintenance technics.



Practical Activity 1.4.2: Performing pre-casting activities used in casting process



Notes to the trainer

- Facilitation of this activity can be individual based, you are supposed to demonstrate how to sand mold should be prepared as required in casting process.
- Trainer Prepare workplace for pre-casting activities by avail all materials, tools and equipment required to perform pre-casting activities.
- Ensure that the casting product design must be complete, accurate, and meets to all specifications.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees do the task described below:

- i Individually ask trainee to go to the workshop to perform the procedures for casting process.

Step 2: Explain the task and provide clear work instructions

Step 3: Demonstrate how casting process to be performed such Sand preparation, Pattern making, Moulding preparation and maintenance technics to applied

Step 4: Ask trainees to draw geometric figures and monitor the procedures.

Step 5: Verify whether the pre-casting activities are correctly performed.

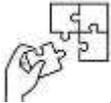
Step 6: Ask trainees to read key reading 1.4.2.

Step 7: Ask trainees to perform the task provided in application of learning 1.4.



Points to Remember

- If you are performing the procedures for casting should be remind the, sand preparation, sand moulding mixture, mixing sand with additives, and materials, tools, and equipment for having a good product.
- While performing casting process must focus on the procedures including: Sand preparation, Pattern making, Mould preparation and Maintenance technics.



Application of learning 1.4.

The manager of AJ. Manufacturing Company wishes to recruit competent technician in casting to give a support to workers during casting activity of 100-vehicle wheel rim. After completion of working principles and process of casting operations including:

- Sand preparation
- Mould preparation
- Pattern making
- Maintenance technics

Individually, ask trainee to give them a support of the activities to be done as you trained both theoretical activity 1.4.1 and practical activity 1.4.2

Performance checklist/Solution of the application

S/N	Element	Indicators	Observation	
			Yes	No
1	The quality of casted product is adequately checked according to the standards	1.1 Moulding is well prepared		
		1.2 Sand and Mix have Selected appropriately		
		1.3 Selection of sand is done correctly		
2	The remaining casting materials are appropriately handled according to the disposal	2.1 Materials, tools, and equipment are well selected		
		2.2 The moisture content or adding additives		

	procedures.	2.3 The preparation of sand mixture is mulled with uniform distribution		
3	Maintenance technics	3.1 Cleaning done correctly.		
		3.2 Lubrication is done appropriately		
		3.3 Adjustment is done appropriately		



Learning outcome 1 end assessment

Written assessment

1. Choose the correct answer

i. The following are the key terms to be used in casting, except:

- a) Metal casting process
- b) Casting
- c) Mould
- d) Molding material
- e) Team casting mould
- f) Pouring cup

iii. The below are the type of hazard except,

- a) Physical hazard
- b) Biological hazards
- c) Injury hazard
- d) Chemical hazards
- e) Electrical hazards

2. Read the following statements and answer by “**TRUE**” if the statement is correct or “**FALSE**” if it is wrong.

- a) **Casting** is a rolling process in which a liquid material usually metal is poured into a mold that has a cavity of the desired shape.
- b) **Metal casting process** is a process in which hot liquid metal is poured into a mould that contains a hollow cut out or cavity of the desired finished shape and the liquid metal is then left to solidify, which is removed from the mould.
- c) **Facing sand** is the small amount of carbonaceous material sprinkled on the inner surface of the mould cavity to give a better surface finish to the castings.
- d) **The working principles of casting is means** is a small funnel shaped cavity at the top of the mould into which the molten metal is poured.
- e) These are the some of applications of metal casting such as airplane marine and cooking rise in mould?

3. Answer the questions below by using “**Yes**” or “**NO**”:

- i. The below are the following methods of casting process (pre-casting activities):
 - a. Properly prepared mould sand means Sand preparation
 - b. Assemble the pattern or core box, which represents the shape of the final

- c. Moulding involves packing the sand mixture around the pattern to create the mold
- d. Cleaning of casted product
- e. Lubrication of tools and equipment is compulsory after every use.
- f. Adjustment of tools and equipment done before and after use

4. Fill in the blank using the appropriate word” **Safety precautions, Hazard prevention, Properties of casting materials” and “Safely”**

- a) Here are somefor casting workplace preparation such as wearing appropriate personal protective equipment (PPE)
- b) Inspect and maintain all equipment and tools before use in order to
.....As the manufacturer’s instructions.
- c) Always operate in a well-ventilated area and don't mix molten metal even with trace amounts of moisture for being

5. Match the definition in column **B** with their corresponding terms in column A and write the letter corresponds to the right answer in the provided space

Answer	Column A	Column B
1.....	A. Materials	1.Is a solid material which is typically shiny, malleable, fusible, and ductile, with good electrical and thermal conductivity
2.....	B. Metals	2.Are typically classified into two main categories: ferrous and non-ferrous metals.
3.....	C. Metal properties	3.Refers to a thing that something else is made from, it can also be used to describe something that is made of matter and exists in the physical world.
4.....	D. Types of metals	4.Are the properties of a metal are those properties that involve a reaction to an applied load.
5.....	E. Mechanical properties	5.Are substances that have various physical, mechanical, and chemical properties
6.....	F. Non-metals	6.Is mechanized foundries where machine molding is employed, to fill the whole molding flask.

7	G. System Sand	7.Are the material are any materials,
---	-----------------------	---------------------------------------

MARKING GUIDE (ANSWERS)

1. Choose the correct answer

- i. The following are the key terms to be used for casting, except:

Answer is E.

2. Choose the correct answer

- ii. The below are the type of hazard, except

Answer is C.

3. Some of the statement below are **“TRUE”** other are **“FALSE”** answer by using **True** or **False**.

- a. **Casting** is a rolling process in which a liquid material usually metal is poured into a mold that has a cavity of the desired shape. **FALSE**
- b. **Metal casting process** is a process in which hot liquid metal is poured into a mould that contains a hollow cut out or cavity of the desired finished shape and the liquid metal is then left to solidify, which is removed from the mould. **TRUE**
- c. **Facing sand** is the small amount of carbonaceous material sprinkled on the inner surface of the mould cavity to give a better surface finish to the castings. **TRUE**
- d. **The working principles of casting is means** is a small funnel shaped cavity at the top of the mould into which the molten metal is poured. **FALSE**
- e. These are the some of applications of metal casting such as airplane marine and cooking rise in mould? **FALSE**

4. Answer the questions below by using **“Yes”** or **“NO”**:

- i. The below are the following methods of casting process (pre-casting activities):
 - a. Properly prepared mould sand means Sand preparation **Yes**
 - b. Assemble the pattern or core box, which represents the shape of the final **Yes**
 - c. Moulding involves packing the sand mixture around the pattern to create the mold **Yes**
 - d. Cleaning of casted product **Yes**
 - e. Lubrication tools, and equipment after use **Yes**
 - f. Adjustment of tools and equipment to be used after **Yes**
 - a. Fill in the blank using the appropriate word **“Safety precautions, Hazard prevention, Properties of casting martials”** and **“Safely”**
 - b. Here are some **Safety precautions** for casting workplace preparation such as wearing appropriate personal protective equipment (PPE)

- c. Inspect and maintain all equipment and tools before use in order to **Safely** As the manufacturer's instructions.
 - d. Always operate in a well-ventilated area and don't mix molten metal even with trace amounts of moisture for being **safely**.
5. Match the definition in column **A** with their corresponding terms in column **B** and write the answer in column **C** of the table below:

Column C	Column B	Column A
1...B....	A.Materials	1.Is a solid material which is typically shiny, malleable, fusible, and ductile, with good electrical and thermal conductivity
2...D....	B.Metals	2.Are typically classified into two main categories: ferrous and non-ferrous metals.
3...A.....	C.Metal properties	3.Refers to a thing that something else is made from, it can also be used to describe something that is made of matter and exists in the physical world.
4...E.....	D.Types of metals	4.Are the properties of a metal are those properties that involve a reaction to an applied load.
5...C.....	E.Mechanical properties	5.Are substances that have various physical, mechanical, and chemical properties
6...G.....	F.Non-metals	6.Is mechanized foundries where machine molding is employed, to fill the whole molding flask.
7...F.....	G.System Sand	7.Are the material are any materials,

Practical assessment

GEMCO casting industries won a tender of casting 14 V8engine pistons of (300 x 200) mm, for the crashed oil motors from auto-repair garage. They want to prepare a mould that will be used in the casting piston using sand. Referring to the previous activities. Ask trainees to prepare sand mould for casting process procedures.

Checklist/Solution of practical assessment:

Assessment Elements	Indicators	Observation	
		YES	NO
Safety and security measures are effectively applied	Overall is worn		
	Gloves are worn		
	Clear safety glass is worn		
	Safety boots are worn		
	Head gear helmet is worn		
	Mouth mask is worn		
	Workplace is clean		
Materials, tools, and Equipment are properly selected	Sand is selected		
	Sand additives are selected		
	Pattern is selected		
	Mold coating materials are selected		
	Shovel is selected		
	Trowel is selected		
	Mallet hammer is selected		
	Spirit level is selected		
	Strike off bar is selected		
	Sprue pins are selected		
	Draw spikes are selected		
	Gate cutter is selected		
	Blower is selected		
	Materials are arranged		
	Tools are arranged		
Equipment's are arranged			
Pre-casting activities are correctly performed	Sand and additives are mixed		
	Position of pattern into cope is done		

	Sand is put into cope		
	Sand is compacted into cope		
	Pattern is removed from cope		
	Sprue pins are positioned in drag		
	Sand is put into drag		
	Sand is compacted into drag		
	Sprue pins are removed in drag		
	Cope and drag are coated		
	Mold cavities are produced		
	Cores are correctly positioned		
	Mold cavities are clean		



Further information to the trainer

Turkeli, A. (2009). *Sand additives and sand properties*.

Parker, R. D., & Sisson, R. D. (2010). *Casting: An introduction to the casting of metals*. Springer.

ME 222 Manufacturing Technology - I (3-0-0-6): Introduction to manufacturing processes.

END

Learning Outcome 2: Carry out Aluminium With Its Alloys Casting.



Indicative contents

2.1. Casting metals for aluminium with its alloys.

2.2. Production of a casting.

Key Competencies for Learning Outcome 2 : Carry-Out Aluminium with Its Alloys Casting.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none">• Identification of low temperature metal for casting aluminium with its alloys• Description of Aluminium with its alloys metal• Description of casting procedures used in production of a casting	<ul style="list-style-type: none">• Making casting for aluminum with its alloys• Identifying Low temperature metal used in casting metals for aluminium with its alloys• Performing sand casting procedures used in manufacturing	<ul style="list-style-type: none">• Being Attentive during carry-out aluminium• Being Obedient while performing casting procedures• Having Teamwork spirit in low metal used in casting• Having Flexibility during sand preparation• Having Self-confident while performing casting procedures



Duration: 30 hrs.



Learning outcome 2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Differentiate properly the Low temperature metal used for casting aluminium with its alloys.
2. Describe appropriately low materials used in casting process based on their properties.
3. Perform clearly the procedures of sand casting as used in manufacturing process.
4. Make correctly casting process for aluminum with its alloys as used in sand casting process
5. Identify correctly the expected object according to the properties of used materials.
6. Describe properly casting procedures used in manufacturing production



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> • PPE • Sand mixer • Furnace • First aid kit • Crucible • Pattern • Molding box 	<ul style="list-style-type: none"> • Casting flasks • Strike bar • Mallet • Sprue pin • Shovel • Draw spike (screw) • Vent rod 	<ul style="list-style-type: none"> • Grease • Sand • Aluminium metals • Ingots • Additives • Lubricants (oil)

<ul style="list-style-type: none"> • Fire fighting equipment 	<ul style="list-style-type: none"> • Hand riddle • Rammer • Vernier caliper • Tape measure • Lifters • Spirit level • Bellows 	
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Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail Pictures, Videos for Carry out aluminium with its alloys casting as didactic materials.
- Avail adequate casting materials, tools and equipment used for describing casting process.
- Have an organized workshop, store , Mould and pattern to be used for casting aluminium.



Indicative content 2.1 : Casting Metals for Aluminium with its Alloys.



Duration: 10 hrs.



Theoretical Activity 2.1.1: Description of low melting temperature metal and Aluminium with its alloys



Notes to the trainer:

- During delivering this content, use small groups of trainees to describing Low melting temperature metal and Aluminium with its alloys based on their melting temperature and their physical properties.
- Trainer may use some videos or pictures about casting metals for aluminium with its alloys as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity by asking trainees to answer the following questions:
- i. Identify the main Low temperature metals used in casting
 - ii. Describe casting metals for aluminium with its alloys as “low temperature metal and Aluminium with its alloys metal
 - iii. State the properties of low temperature metal and aluminum with its alloys metal.
- Step 2:** Ask trainees to write their answers on flipchart/paper.
- Step 3:** Provide expert view and clarify ideas by using didactic materials.
- Step 4:** Address any questions or concerns from the trainees.
- Step 5:** Ask trainees to read the key reading 2.1.1. In trainee manual



Points to Remember

The following are Low temperature metal used in casting object.

- The Low temperature metal are potassium, sodium, indium, lithium, tin, lead must be focused in metal casting for aluminium with its alloys.

- Low density, high strength-to-weight ratio, good conductivity, corrosion resistance, ductility and formability, non-magnetic, reflectivity, recyclability and good machinability are the properties of low temperature metal must be focused.



Indicative content 2.2 : Production of a Casting.



Duration: 20 hrs.



Theoretical Activity 2.2.1: Description on production of a casting.



Notes to the trainer:

- Trainer may delivering this activity, use small groups to discuss about casting procedures required in production of a casting
- videos or pictures of casting procedures as didactic materials for more clarifications



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the session and ask them to answer the following questions:
- i. Discuss on the casting procedures required in production of a casting
- Step 2:** Ask trainees to write their answer on flipchart/paper.
- Step 3:** Provide expert view and clarification if any on discussed contents.
- Step 4:** Ask trainees to read the key reading 2.2.1 in the trainee manual.



Points to Remember

- After comprehension of previous activities, you note that whether casting procedures are appropriately followed such Sand preparation, Molding, Melting of metal, Pouring into mold, Casting, Cleaning and finishing.



Practical Activity 2.2.2: Performing casting procedures.



Notes to the trainer

- The trainer may avail adequate tools, materials and equipment required to perform casting procedures.

- Trainer may deliver this content in workshop. Guide trainees to perform casting procedures required in casting
- Trainer may use videos, or photos shown how to perform casting procedures during casting as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1. Introduce the topic and ask trainees to do the task described below:

As a manufacturing technician, ask trainee to go in the manufacturing workshop/store and perform casting procedures as required in casting process.

Step 2. Demonstrate trainees how to perform the procedures.

Step 3. Ask trainee individually to perform the processes for casting product.

Step 4. Verify whether the casting product is well casted.

Step 5. Ask trainees to read key reading 2.2.2.



Points to Remember

The processes must be focused during casting including sand preparation, moulding, melting of metal, pouring into mould, casting, cleaning and finishing of product.



Application of learning 2.2.

Suppose that, the manager of T&B manufacturing workshop requests your trainer a support of training his workers about the appropriate casting procedures to be followed when you are in production of a casting. Ask trainee to perform the procedures to be followed before training for that workers. As follow:

- Selecting the appropriate material for casting

- ii. Selecting the right sand according to the product specifications.
- iii. Positioning pattern into flask and fill sand into mold.
- iv. Setting up the gating system
- v. Removing the mold pattern from the sand:
- vi. Pouring molten metal into mold cavity
- vii. Waiting for the metal to cool
- viii. Opening mold to remove the metal casting to get casted product.
- ix. Finishing and cleaning casted product and make surface finish for use

Performance Checklist/Solution of application:

Assessment criteria	Indicators	Observation	
		YES (1)	NO (0)
1. Selection of PPEs	1.1 Overall is worn appropriately		
	1.2 Gloves are worn appropriately		
	1.3 Clear safety glass is worn appropriately		
	1.4 Safety boots are worn appropriately		
	1.5 Head helmet is worn correctly		
	1.6 Mouth mask is worn appropriately		
2. Performing Casting processes	2.1 Selecting the appropriate tools for casting		
	2.2 Identifying product specifications.		
	2.3 Positioning pattern into flask		
	2.4 Setting up the gating system		
	2.5 Removing the mold pattern from the sand		
	2.6 Pouring molten metal into mold cavity		
	2.7 Waiting for the metal to cool		
	2.8 Opening mold to get casted product		
	2.9 Finishing casted product and make for use		
	2.10 Cleaning casted product		



Learning outcome 2 end assessment

Written assessment

1. Choose the correct answer,

- i. The following are Low melting temperature metal and Aluminium with its alloys, except:
 - a) Potassium
 - b) Conductivity
 - c) Sodium
 - d) Reactivity
 - e) Indium
 - f) Both B and D (correct answer)**
 - g) None above
- ii. Aluminum with its alloys has some several physical properties, except
 - a) Thermal Conductivity:
 - b) Low Density:
 - c) A and B are correct
 - d) High Corrosion Resistance
 - e) Low Melting Point:
 - f) Aluminum alloys (correct answer)**
 - g) All above are not correct
- iii. The following are the Casting procedures , except
 - a) Good Machinability (correct answer)**
 - b) Creating a mould
 - c) Sand preparation
 - d) Melting of metal
 - e) All above are correct
- iv. These are the cleaning and finishing technics:
 - a) Removal of sand and excess metal from the casting product
 - b) Remove excess metal, in the form of fins, wires, parting line fins, and gates
 - c) All flash and parting line metal must be removed.
 - d) None above
 - e) A, B and C are correct (correct answer)**
- v. The following are steps to be followed when producing good casted product, except
 - a) Select all required materials, tools and equipment needed to produce cast product.
 - b) Produce cast product individually for casting product (correct answer)**
 - c) Choose the right sand according to the product specifications

- d) Positioning pattern into flask and fill sand into mold
 e) All above are not correct
2. Match the definition in column **A** with their corresponding terms in column **B** and write the answer in column **C** of the table below:

Column C	Column B	Column A
1...C....	A.Molding	1.Is referred to as heating metal from a solid state to a liquid state due to an increase in temperature.
2...D....	B.Pouring into mold	2.Is a critical step in the foundry process, High-quality casting sand is essential to ensure that the final castings have a smooth surface finish and accurate dimensions
3...E...	C.Melting of metal	3.This property is important in electrical wiring, heat exchangers, and other applications where efficient heat transfer or electrical conductivity is necessary.
4...A...	D.Sand preparation	4.Is the process of manufacturing by shaping liquid or pliable raw material using a rigid frame,
5...G...	E.Good Conductivity	5.Aluminum has high reflectivity for both visible light and non-visible forms of electromagnetic radiation, which is why it is often used in mirrors, reflectors, and insulation materials.
6...B...	F.Boiling Point	6.This molten material is then poured into a mould cavity that takes the form of the finished part. The molten material then cools, with heat generally being extracted via the mould, until it solidifies into the desired shape.
7.....F...	G.Good Reflectivity	7.Lead has a boiling point of about 1,749 degrees Celsius (3,180 degrees Fahrenheit).

Practical assessment

WHOTECH company Ltd located in NYABIHU District won a tender of making gates. Want to fix aluminium décor on them, but they don't have qualified technician in casting.

As manufacturing technician in casting. Ask trainees to cast a sample décor for them, which are shaped as arrowhead with 50mm width, 100mm length and tail of 50mm.

Performance Checklist/Solution for application:

S/N	Criteria	Indicators	Observation	
			YES (1)	NO (0)
1	Selecting and wearing PPEs appropriately	Overall is worn appropriately		
		Gloves are worn appropriately		
		Clear safety glass is worn appropriately		
		Safety boots are worn appropriately		
		Head gear helmet is worn correctly		
		Mouth mask is worn appropriately		
	Marking sand casting is properly performed according to the required product specifications	Sands are well prepared		
		Sand and additives are mixed correctly		
		Position of pattern into cope is done		
		Sand is put into cope correctly		
		Sand is compacted into cope correctly		
		Pattern is removed from cope correctly		
		Sand is put into drag correctly		
		Sand is compacted into drag correctly		
		Sprue pins are positioned in drag correctly		
		Mold cavities are produced correctly		
		Mold cavities are clean appropriately		
		Molten metals are melted properly		
		Aluminum ingot is well used		
2	Performing casting procedures	Molten metals are poured correctly		
		Prepared mould cavity is appropriately		
		Casting procedures are followed properly		
		Casted product is match to the size required correctly		
3	Casted product is properly removed from the mould as per removing procedures as per removing procedures	Mould is removed properly		
		Risers are removed correctly		
		Final product is correct in size		
		No defect on casted product		
		Unwanted materials are removed to the casted product.		



Further information to the trainer

Kaufman, J. G., & Rooy, E. L. (Eds.). (2004). *ASM handbook: Volume 15, Casting*. ASM International.

Parker, R. D., & Sisson, R. D. (2010). *Aluminium casting: A practical guide*. Springer.

Kaufman, J. G. (2004). *Aluminum alloy castings*. ASM International.

Campbell, J. (2003). *Castings*. Butterworth-Heinemann.

END

Learning Outcome 3: Perform Post Casting Activities.



Indicative contents	
1.1.	Checking of casted product.
1.2.	Product finishing operation.
1.3.	Post-casting activities

Key Competencies for Learning Outcome 3: Perform Post Casting Activities.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none"> • Description of casted product defects • Description of product finishing operations • Description of waste disposal • Identification of Cleaning techniques • Description of the procedures for storing tools and equipment used in casting 	<ul style="list-style-type: none"> • Checking defects on casting product • Finishing operations on product surface • Storing materials, tools and equipment. • Cleaning tools, equipment and workplace 	<ul style="list-style-type: none"> • Being attentive • Having Punctuality • Have Self confidence • Being adaptive • Have critical thinking • Being time manager



Duration: 10 hrs.



Learning outcome 3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Check correctly the quality of casted product as used in casting process.
2. Perform correctly finishing techniques as required in surface operation of casted product.
3. Clean properly tools, equipment and work place after casting process.
4. Store properly materials, tools and equipment for casting.
5. Differentiate correctly casting waste disposal as required for finishing product.



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> •PPEs •First aid kit •Furnace •Sand mixer •Polishing machine •Fire extinguisher 	<ul style="list-style-type: none"> • Casting flasks • tongs • travels • strike bar • mallet • sprue pin • shovel • draw spike (screw) • vent rod • vent wire 	<ul style="list-style-type: none"> • Lugs • pen • sand • aluminium metals • ingots • additives coal dust • corn flour • dextrin • sea coal • pitch

	<ul style="list-style-type: none"> • lifter • hammer • slick • bulb swab 	<ul style="list-style-type: none"> • wood flour
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Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare classroom or workplace.
- Avail tools (Shovel, Vent rod, Spirit level, Screen with hand riddle, Mallet, Strike off bar)
- Avail casting equipment's (Furnace, moulding box, pattern, and sand mixer.)



Indicative content 3.1 : Checking of Casted Product.



Duration: 4 hrs.



Theoretical Activity 3.1.1: Description on casted products defects



Notes to the trainer:

- Trainer may facilitate trainees in groups to describe on casting defects.
- Photos and videos related to casting defects can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Trainer introduce the session and ask trainees to answer the following questions:

- I. Define term” **Casting defects**”
- II. Discuss on casting defects categories
- III. Identify the methods of preventing casting defects

Step 2: Engage Trainees in presentation of findings.

Step 3: Provides expert view and clarification if any on discussed contents.

Step 4: Ask trainees to read the key reading 3.1.1 in the trainee manual



Points to Remember

After delivering casting defects types, causes and remedies, these are the mainly casting defects including: Gas Porosity, Shrinkage defects, Mold material defects, pouring metal defects, Metallurgical defects and Casting shape defects



Practical Activity 3.1.2: Perform defects checking on the casted product.



Notes to the trainer

- The trainer should have casted products to perform this practical activity.
- The trainer may demonstrate to trainees how to check defects on casted products.
- Trainer may avail photos of casted products as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees do the task described below:

Ask trainee to go to the manufacturing workshop/store and pick casted product for checking defects on casted with reference to the previous theoretical activity 3.1.2

Step 2: Demonstrates trainees how to check defects on casted product after casting.

Step 3: Request trainees to check defects of casted products after casting process.

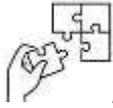
Step 4: Verify product if all defects is well checked.

Step 5: Ask trainees to perform the task provided in application of learning 3.1.



Points to Remember

- After comprehension of previous activities, you must check whether the casted product fulfils the specifications accordingly.
- The following methods: Visual inspection, use checking tools, Documentation, Analysis and making report must be focused when checking casted product.



Application of learning 3.1.

You were recently hired as a manufacturing worker for a wheel company. There are many new cast things you need to do at work. Referring to the previous activities both theoretical 3.1.1 and practical 3.1.2. Ask trainee to go to the workshop and perform defects checking on 100 casted steering wheels. Identify the procedures to be applied during checking and preventing defects on casted steering wheel as remembered below specifications:

- i. Steering wheel diameter 350 mm
- ii. Steering wheel length 95mm

Performance checklist/Solution of application:

S/ N	Criteria	Indicators	Observation	
			YES (1)	NO (0)
1	3.1. Selecting and wearing PPEs appropriately	Overall is worn appropriately		
		Gloves are worn appropriately		
		Clear safety glass is worn appropriately		
		Safety boots are worn appropriately		
		Head gear helmet is worn correctly		
		Mouth mask is worn appropriately		
		Review the casting specifications to be given		
		visually inspection of the casted product is done		
		Utilize appropriate measurement tools to measure critical dimensions		
		Analyze the gathered data and observations		
		Make detailed notes of gathered data of casted product		
2	3.2. Pick casted product and checking defects	reviewing the casting specifications provided by the manufacturer or designer		
		Specific finishing instructions and dimensional tolerances		

		Selecting sandpaper, abrasive wheels, grinding machines and polishing compounds		
		Maintaining the desired dimensions and surface finish.		
		Necessary adjustments are made appropriately.		



Indicative content 3.2 : Product Finishing, Operation.



Duration: 4 hrs.



Theoretical Activity 3.2.1: Description of product finishing operations in casting process.



Notes to the trainer:

- While delivering this content small group can be used for describing surface finishing operation such as polishing and machining in casting
- Trainer avail photos or videos of polishing and machining, as didactic materials which describe surface finishing operations during casting.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the session by asking trainees to answer the following question:
- i. Describe Product finishing operation as elements of surface finishing on casted product.
- Step 2:** Ask trainees to present their findings to their classmates.
- Step 3:** Provides expert view and clarification if any buy using didactic materials.
- Step 4:** Address any questions or concerns.
- Step 5:** Ask trainees to read the key reading 3.2.1 in the trainee manual.



Points to Remember

- Surface finishing operations including: Polishing, Buffing, Honing, Grinding and Machining must be focused while you are product finishing operation during casting.



Practical Activity 3.2.2: Performing product finishing operation.



Notes to the trainer

- The trainer should have casted product, polishing equipment, machining equipment and appropriate tools to perform surface finishing operations.
- Trainer avail more photos or videos, which demonstrate trainees how to perform surface finishing operation on casted product as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees do the task described below:

Ask trainees to go in the manufacturing workshop/store and pick casted product and select required polishing equipment, machining equipment and tools to be used while perform surface finishing of casted product

Step 2: Demonstrates to trainees how to verify and execute finishing operations.

Step 3: Ask trainee to wear PPEs and perform surface finishing operation of casted product.

Step 4: Provide more explanations where necessary.

Step 5: Check whether casted product is well finished correctly.

Step 6: Ask trainees to read key reading 3.2.2.

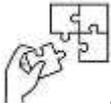
Step 7: Ask trainees to perform the task provided in application of learning 3.2.



Points to Remember

- The product specifications, tools and equipment used should be consider during surface finishing operations of casted product.

- The main steps you should consider when execute surface finishing of casted product are product specifications and right tools and equipment



Application of learning 3.2.

Amina works in a manufacturing repair shop, she sales many cast products such as ring segment castings, industrial furnace doors, fire hydrant housing and Aluminium gearbox etc. After selling them, they ordered new product of selling. Suppose that, trainees are completed activities 3.2.1 and 3.2.2. Ask him to go to shop neighbour and perform surface finishing operations before supplying these products to the seller.

Performance checklist/Solution of application:

S/N	Criteria	Indicators	Observation	
			YES (1)	NO (0)
1	3.1. selecting PPEs and wearing appropriately	Overall is worn appropriately		
		Gloves are worn appropriately		
		Clear safety glass is worn appropriately		
		Safety boots are worn appropriately		
		Head gear helmet is worn correctly		
		Mouth mask is worn appropriately		
		Review the casting specifications provided by designer		
		Selection of tools and equipment is done correctly		
		Properly read Instructional manual provided by the manufacturers		
2	3.2. Perform casted product surface finishing	Finishing operations is based on the casted specifications		
		Finishing operation is completed accurately		
		Remaining defects removed properly if needed.		
		Reporting of casted product is done correctly according to the finishing process report		



Indicative content 3.3 : Post-casting Activities



Duration: 2 hrs.



Theoretical Activity 3.3.1: Description of cleaning technics, waste disposal methods and store tools, materials and equipment for casting



Notes to the trainer:

- Trainer may facilitate trainees to describe cleaning technics, waste disposal methods and store tools, materials and equipment for casting.
- Use videos, pictures, photos and Illustration as didactic materials provide more understanding



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainee to answers the following questions:

- i. Discuss on “**waste disposal management**”
- ii. Identify cleaning techniques of tools, equipment and workplace
- iii. Describe casting tools and equipment storage procedures

Step 2: Ask any trainee to write answers provided on flipchart/paper.

Step 3: Ask trainees to present their findings to their classmates.

Step 4: Provides expert view and clarification if any on presented contents.

Step 5: Ask trainees to read the key reading 3.3.1 in the trainee manual.



Points to Remember

- Waste disposal management, cleaning technics, storing tools, materials and equipment must be focused during post casting activities.



Practical Activity 3.3.2: Perform cleaning, waste disposal management, storage procedures of materials, tools and equipment used in casting



Notes to the trainer

- The trainer should have casted product, tools, and equipment to perform this practical activity.
- Trainer demonstrate trainees how to Perform Cleaning, Waste disposal and Storing tools, and equipment.
- Trainer avail photos or videos of good Storing casted product, tools, and equipment.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

Ask trainees to go in the manufacturing workshop to perform cleaning technics, waste disposal management, storage procedures of materials, tools and equipment used in casting as trainer demonstrated in previous theoretical activity 3.3.1

Step 2: Request trainees to manage waste, store casted product, tools, and equipment used in casting.

Step 3: Facilitates trainees to manage waste disposal, store casted product, tools, and equipment used in casting.

Step 4: Verify if disposal management, storage of casted product, tools, and equipment is well performed.

Step 5: Ask trainees to read key reading 3.3.2.

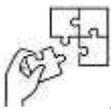
Step 6: Ask trainees to perform the task provided in application of learning 3.3



Points to Remember

Steps to be followed when store tools, and equipment.

- While sand casting has numerous types of waste disposal management, casted product storage and procedures of cleaning materials, tools and equipment must be follow properly.
- During post- casting, activities should have Proper Shelving, Rust Prevention methods and Safety Measures.



Application of learning 3.3.

Suppose that, the manager of B&C manufacturing workshop requests your school a support of invigilating exam of his workers about conducting waste disposal management, cleaning technics and storage procedures of materials, tools and equipment. Referring to the activity 3.3.2.

Ask your trainee to attend the supervision of that practical exam about to:

- Wearing PPE
- Waste disposal management,
- Cleaning technics
- Storage procedures of materials, tools and equipment after carry out casting

Performance checklist/Solution of application:

S/N	Criteria	Indicators	Observation	
			YES (1)	NO (0)
1	3.3. Perform Storing tools, and equipment	Overall is worn appropriately		
		Gloves are worn appropriately		
		Clear safety glass is worn appropriately		
		Safety boots are worn appropriately		

		Head gear helmet is worn correctly		
		Mouth mask is worn appropriately		
		Cleaning of tools, or equipment is done appropriately		
		Inspection for damage are examined appropriately		
		Organization of tools, equipment's is done correctly		
		Shelves capacity of storage is checked accordingly		
		Storing tools and equipment edges safely		
		Storage layout of tools and equipment is done appropriately		
2	Perform cleaning	Shot blasters are used in the first stage of cleaning		
		Air-blast is removed by machining		
		Hammers or drills are commonly used for sand core removal		
		Water blast is cleaned		
3	Waste disposal management	Reducing Waste Generation.		
		Cleaned waste disposed Sanitary		
		Waste cannot be hand reused		



Learning outcome 3 end assessment

Written assessment

1. Some of the statements below are TRUE others are FALSE answer the following statements by writing “True” if the statement is correct or “False” if the statement is not correct.

- i. Grinding is the most common form of abrasive machining. It is a material cutting process which engages an abrasive tool whose cutting elements are grains of abrasive material known as grit. **True**
- ii. Machining is the process of shaping and sizing materials to a specific form and size. **True**
- iii. Buffing is a punching operation like polishing, in which abrasive grains are not glued to the wheel but are contained in a buffing compound that is pressed into the outside surface of the buffing wheel while it rotates. **False**
- iv. Surface finish” refers to a surface's final texture at the end of production. **True**
- v. Runout happens when the mould un-leaks, leaving an inadequate amount of metal to form the desired casting. **False**
- vi. Before storing any casted products, tools, or equipment, make sure they are clean and free from any debris, dust, or contaminants. Clean and dry them as necessary. **True**

2. Choose the correct answer

- i. Which are the below is the casting defects categories?
 - a. Superficial Defects
 - b. A and E both are correct (**Correct Answer**)
 - c. Gas Porosity
 - d. Shrinkage Porosity
 - e. Internal Defects
- ii. The following are many different types of waste are generated, except:
 - a) solid waste
 - b) hazardous waste
 - c) Industrial non-hazardous waste

- d) Dustbin disposal waste **(Correct Answer)**
 - e) Medical waste
- iii. The following are the cleaning techniques of tools, equipment and workplace, except:
- a) Using Air pressure cleaning
 - b) Using cloth rugs
 - c) Using organized and easily accessible things **(Correct Answer)**
 - d) Using Vacuum Cleaners
 - e) Using Brooms
- iv. The following are the steps for storing casting tools and equipment, except:
- a) Keep detailed inventory list of the stored items.
 - b) Clean and add waste on tool and equipment before storing **(Correct Answer)**
 - c) Organize and categorize items based on their type and use
 - d) Use appropriate shelves, racks, and storage units to keep
 - e) Make sure they are clean and free from any debris, dust, or contaminants.

Practical assessment

DUHUZIMBARAGA company ltd located in NYABIHU District won a tender of supplying 4000 aluminium cast door locker handles to fix on doors at ICYEREKEZO modern village located in the same district, before these lockers being supplied must be checked, cleaned, finished, and stored. The company need a competent person for performing the mentioned task. Ask trainees to reach the company for performing the mentioned activities within 8 hours.

Performance checklist/Solution of application:

Criteria	Indicators	Observation	
		YES (1)	NO (0)
3.1. Performing post-casting activities	Overall is worn appropriately		
	Gloves are worn appropriately		
	Clear safety glass is worn appropriately		
	Safety boots are worn appropriately		
	Head gear helmet is worn correctly		
	Mouth mask is worn appropriately		
	Casted product is available		

	Workplace is well cleaned properly		
3.2. Product finishing operation	Finishing tools are well identified		
	Finishing equipment are well identified		
	Finishing tools are well used		
	Finishing equipment are well used		
	Casted product is well positioned		
	Casted product is well fixed		
	Casted product is well finished		
3.3. Checking casted product	Remaining materials are arranged		
	Tools are well arranged		
	Equipment are well arranged		
	Remaining waste materials are well identified		
	Waste materials are well handled		
	Waste materials are well disposed		
3.4. Cleaning of workshop, tools and equipment properly	Workplace is well cleaned		
	Tools are well cleaned		
	Equipment's are well cleaned		
	Tools are properly stored		
	Remaining materials are well stored		
	Equipment's are properly stored		



Further information to the trainer

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END



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