

Assessment Evidence Guide

For

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Level-3

Module name
(Formative Assessment)

8th -12th March 2021



**National Vocational & Technical
Training Commission**

Title of Qualification: Assistant foreman in Metallurgy and Metal casting	CS Code:	Level: 3	Version: 01
Competency Standard Title: Manufacture Pattern on CNC Router Operate Die Casting Perform quenching, annealing and normalizing process Perform Heat Treatment of Non-Ferrous Materials	Assessment Date (DD/MM/YY): Assessment Time: 5 hours		

Candidate Details	Name: Registration/Roll Number:.....
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to: Manufacture Pattern on CNC Router</p> <p>Assessment Task 2: Candidate is required to: Operate Die Casting</p> <p>Assessment Task 3: Candidate is required to: Perform quenching, annealing and normalizing process</p> <p>Assessment Task 4: Candidate is required to: Perform Heat Treatment of Non-Ferrous Materials</p> <p>And complete:</p> <ol style="list-style-type: none"> Knowledge assessment test (Written or Oral) Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Performance Criteria</p> <ol style="list-style-type: none"> Prepare the drawing in CAD system & add allowance as per requirement Send the drawing in CAD/CAM system Take wood block and clamp it on the table of CNC router Select the cutting tool as per material and operation. Enter the raw material detail then check the tool off setting See the simulation before starting the work Locate the pattern and press the push bottom to start the operation Draw out pattern from fixture Practice standard health and safety procedures Handle furnace according to standard operating procedures. Maintain liquid metal as per die operating condition Control furnace temperature at optimum operating condition Ensure safe work practices in handling furnace Clean each die half as per requirement

	<ol style="list-style-type: none"> 15. Lubricate die to facilitate the ejection of part 16. Close two halves of the die and clamp mold together 17. Apply sufficient force to the die to keep it securely closed 18. Transfer molten metal into the chamber as per SOPs 19. Inject the molten metal with required pressure into the die/mold 20. Fill the entire cavity of die 21. Open the die after casting solidification, eject casting out of die cavity 22. Clamp shut the die for the next injection 23. Handle the job as per SOP then place the job in the heating furnace 24. Control the temperature of the furnace as per given job 25. Set standard soaking time of the heat treatment cycle as per given job 26. Turn off the furnace, once the required temperature and soaking time is achieved. 27. Remove the job from the furnace and quench into the quenching media (For quenching) OR Remove the workpiece from the furnace, once the temperature drops to room temperature. (For annealing) OR Remove the job from furnace and let it cool in the air. (For normalizing) 28. Clean the job and refer it to the next section. 29. Place the workpiece in the furnace 30. Adjust the temperature and soaking time of the furnace according to the material type and size. 31. Turn of the furnace once the required temperature and soaking time is achieved. 32. Remove the workpiece from the furnace and quench into the quenching media. (For quenching) 33. Let the workpiece to cool in the furnace. Remove the workpiece from the furnace, once the temperature drops to room temperature. (For annealing) 34. Clean the workpiece and referred it to the next section.
	<p>Portfolios required at the time of assessment (if any) for</p>

Continued on following page

Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Assessment Summary (to be filled by the assessor)							
Activity	Method					Result	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Prepare the drawing in CAD system & add allowance as per requirement			
2.	Send the drawing in CAD/CAM system			
3.	Take wood block and clamp it on the table of CNC router			
4.	Select the cutting tool as per material and operation.			
5.	Enter the raw material detail then check the tool off setting			
6.	See the simulation before starting the work			
7.	Locate the pattern and press the push bottom to start the operation			
8.	Draw out pattern from fixture			
9.	Practice standard health and safety procedures			
10.	Handle furnace according to standard operating procedures.			
11.	Maintain liquid metal as per die operating condition			
12.	Control furnace temperature at optimum operating condition			
13.	Ensure safe work practices in handling furnace			
14.	Clean each die half as per requirement			
15.	Lubricate die to facilitate the ejection of part			
16.	Close two halves of the die and clamp mold together			
17.	Apply sufficient force to the die to keep it securely closed			
18.	Transfer molten metal into the chamber as per SOPs			
19.	Inject the molten metal with required pressure into the die/mold			
20.	Fill the entire cavity of die			
21.	Open the die after casting solidification, eject casting out of die cavity			
22.	Clamp shut the die for the next injection			
23.	Handle the job as per SOP then place the job in			

	the heating furnace			
24.	Control the temperature of the furnace as per given job			
25.	Set standard soaking time of the heat treatment cycle as per given job			
26.	Turn off the furnace, once the required temperature and soaking time is achieved.			
27.	Remove the job from the furnace and quench into the quenching media (For quenching) OR Remove the workpiece from the furnace, once the temperature drops to room temperature. (For annealing) OR Remove the job from furnace and let it cool in the air. (For normalizing)			
28.	Clean the job and refer it to the next section.			
29.	Place the workpiece in the furnace			
30.	Adjust the temperature and soaking time of the furnace according to the material type and size.			
31.	Turn of the furnace once the required temperature and soaking time is achieved.			
32.	Remove the workpiece from the furnace and quench into the quenching media. (For quenching)			
33.	Let the workpiece to cool in the furnace. Remove the workpiece from the furnace, once the temperature drops to room temperature. (For annealing)			
34.	Clean the workpiece and referred it to the next section.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Assistant foreman in Metallurgy and Metal casting	CS Code:	Level:3	Version: 01
Competency Standard Title:	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

Guidance for Candidate	To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.
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Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Written Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Title of Qualification: Assistant foreman in Metallurgy and Metal casting	CS Code:	Level:3	Version: 01
Competency Standard Title:	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
1. What is CNC router?	<ul style="list-style-type: none"> A computer numerical control (CNC) router is a computer-controlled cutting machine which typically mounts a hand-held router as a spindle
2. Which material can be used for cutting on CNC router?	<ul style="list-style-type: none"> Various materials such as wood, composites, Aluminum, Steel, Plastics, glass, foams.
3. Which carpentry task can CNC router perform?	<ul style="list-style-type: none"> CNC routers can perform the tasks of many carpentry shop machines such as the panel saw, the spindle moulder, and the boring machine. They can also cut joinery such as mortises and tenons.
4. Briefly explain die casting process.	<ul style="list-style-type: none"> Die casting is a metal casting process that is characterized by forcing molten metal under high pressure into a mould cavity. The mould cavity is created using two hardened tool steel dies which have been machined into shape and work similarly to an injection mould during the process.
5. Of which material most die casting are made of?	<ul style="list-style-type: none"> Most die castings are made from non-ferrous metals, specifically zinc, copper, aluminium, magnesium, lead, pewter, and tin-based alloys.

Question	Candidate's answer
6. Which geometric features when creating a die casting model?	<p>Following geometric features to be considered when creating a parametric model of a die casting:</p> <ul style="list-style-type: none"> • DRAFT: amount of slope or taper given to cores or other parts of the die cavity to allow for easy ejection of the casting from the die. • FILLET: the curved juncture of two surfaces that would have otherwise met at a sharp corner or edge to remove undesirable edges and corners. • PARTING LINE: represents the point at which two different sides of a mould come together. • BOSSES: are added to die castings to serve as stand-offs and mounting points for parts that will need to be mounted. • RIBS: are added to a die casting to provide added support for designs that require maximum strength without increased wall thickness. • HOLES AND WINDOWS: require special consideration when die casting because the perimeters of these features will grip to the die steel during solidification.
7. Name different types of casting machines.	<ul style="list-style-type: none"> • There are two basic types of die casting machines: hot-chamber machines and cold-chamber machines. These are rated by how much clamping force they can apply. Typical ratings are between 400 and 4,000 st (2,500 and 25,400 kg)
8. Define annealing and its characteristics.	<ul style="list-style-type: none"> • Annealing is a heat treatment process that heats the workpiece to a suitable temperature and then slowly cools with the furnace. • Grains are refined, the structure is adjusted, and the structure defects are eliminated. It can reduce the hardness and improve the machinability. Eliminate the residual stress, stabilize the size, reduce the tendency of deformation and cracks; refine the grain, adjust the structure, and eliminate the tissue defects.
9. Define normalizing and its characteristics.	<ul style="list-style-type: none"> • Normalizing is to heat the object to a suitable temperature and then cooled in the air. • The effect of normalizing is similar to annealing, but the resulting structure is finer, which is often used to improve the cutting performance of materials, and sometimes used for some low requirements.
10. Define quenching and its characteristics.	<ul style="list-style-type: none"> • Quenching is heating the workpiece to a certain temperature at a critical point for a certain period of time, rapidly cooling in a quenching medium such as water, oil or other inorganic salts or organic aqueous solutions to obtain martensite and/or bainite structure. • After quenching, the steel becomes hard but becomes brittle at the same time.
11. How heat treatment of non ferrous metals performed?	<ul style="list-style-type: none"> • Just as ferrous metals, heat treatment of non ferrous metals can be performed in two ways which include: solution heat treating and annealing

