

Assessment Evidence Guide

For

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Level-2

Module name
(Formative Assessment)

8th -12th March 2021



**National Vocational & Technical
Training Commission**

Title of Qualification: Senior Caster	CS Code:	Level: 2	Version: 01
Competency Standard Title: Perform Shell Mold Casting	Assessment Date (DD/MM/YY): Assessment Time:		

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) as per the instructions given in Annexure A:</p> <p>Assessment Task 1: Candidate is required to: Arrange pattern for casting</p> <p>Assessment Task 2: Candidate is required to: Create shell mold for casting.</p> <p>Assessment Task 3: Candidate is required to: Assemble mold for casting</p> <p>Assessment Task 4: Candidate is required to: Cast molten metal in mold</p> <p>Assessment Task 5: Candidate is required to: Perform cooling process</p> <p>Assessment Task 5: Candidate is required to: Remove casting from mold</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>Assessment Task 1</p> <ul style="list-style-type: none"> • Handle a two-piece metal pattern in the shape of desired part • Use aluminum for low volume production of patterns / graphite for casting reactive materials
	<p>Assessment Task 2</p> <ul style="list-style-type: none"> • Heat each pattern half to 175-370°C as per standard operating procedures • Coat pattern with a lubricant to facilitate removal process • Clamp the heated pattern to a dump box containing a mixture of sand and a resin binder • Invert the dump box allowing sand-resin mixture to coat the pattern • Create shell around the heated pattern while curing mixture in an oven • Eject the shell from the pattern
	<p>Assessment Task 3</p> <ul style="list-style-type: none"> • Insert cores in the mold as per requirement • Join the two shell halves together • Clamp the halves to form a complete shell mold • Place the shell mold into a flask supported by a backing material
	<p>Assessment Task 4</p> <ul style="list-style-type: none"> • Pour molten metal from ladle into the gating system • Ensure the mold is securely clamped together while the molten metal is poured • Fill the mold cavity completely with the melt
	<p>Assessment Task 5</p> <ul style="list-style-type: none"> • Allow molten metal to cool for standard time in the mold • Carry out solidification of melt into the shape of the final casting
	<p>Assessment Task 6</p> <ul style="list-style-type: none"> • Break the mold after the metal is cool down • Shake out any sand from the mold • Trim any excess metal from the feed system • Carry out visual inspection of casting • Prepare observation data sheet(ODS) and report to concerned department
	<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.	Handle a two-piece metal pattern in the shape of desired part			
2.	Use aluminum for low volume production of patterns / graphite for casting reactive materials			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of assessment task 2		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Heat each pattern half to 175-370°C as per standard operating procedures			
2.	Coat pattern with a lubricant to facilitate removal process			
3.	Clamp the heated pattern to a dump box containing a mixture of sand and a resin binder			
4.	Invert the dump box allowing sand-resin mixture to coat the pattern			
5.	Create shell around the heated pattern while curing the mixture in an oven			
6.	Eject the shell from the pattern			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 3		Description of assessment task 3		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Insert cores in the mold as per requirement			
2.	Join the two shell halves together			
3.	Clamp the halves to form a complete shell mold			
4.	Place the shell mold into a flask supported by a backing material			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 4		Description of assessment task 4		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Pour molten metal from ladle into the gating system			
2.	Ensure the mold is securely clamped together while the molten metal is poured			
3.	Fill the mold cavity completely with the melt			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 5		Description of assessment task 5		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Allow molten metal to cool for standard time in the mold			
2.	Carry out solidification of melt into the shape of the final casting			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 6		Description of assessment task 6		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Break the mold after the metal is cool down			
2.	Shake out any sand from the mold			
3.	Trim any excess metal from the feed system			
4.	Carry out visual inspection of casting			
5.	Prepare observation data sheet(ODS) and report to concerned department			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Senior Caster	CS Code:	Level: 2	Version: 01
Competency Standard Title: Perform Shell Mold Casting	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: Senior Caster	CS Code:	Level:2	Version:01
Competency Standard Title: Perform Shell Mold Casting	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
1. What is shell molding process?	<ul style="list-style-type: none"> • Shell molding or shell mold casting is a casting process that involves the use of resin-covered sand for the mold. • Molten metal is poured into the mold's cavity, at which point the mold vaporizes to create a hard shell.
2. Why we use reusable pattern and disposable molds in shell casting?	<ul style="list-style-type: none"> • Reusable pattern used for higher production rates. • Disposable molds enable complex geometries to be cast
3. Name few items required for shell mold casting?	<ul style="list-style-type: none"> • Shell mold casting requires a metal pattern, oven, sand-resin mixture, dump box, and molten metal.
4. Which metals are used for shell mold casting?	<ul style="list-style-type: none"> • Shell mold casting allows the use of both ferrous and non-ferrous metals, most commonly using cast iron, carbon steel, alloy steel, stainless steel, aluminum alloys, and copper alloys.
5. Name few parts which can be produced specifically by shell mold casting?	<ul style="list-style-type: none"> • Typical parts are small-to-medium in size and require high accuracy, such as gear housings, cylinder heads, connecting rods, lever arms, cylinder heads, connecting rods, engine blocks and manifolds, machine bases
6. Mention main steps involved in shell mold casting?	<ul style="list-style-type: none"> • The shell mold casting process consists of the following steps: <ol style="list-style-type: none"> 1. Pattern creation 2. Mold creation 3. Mold assembly 4. Pouring 5. Cooling 6. Casting removal

Question	Candidate's answer
7. By which material pattern is made of and how much must be its temperature?	<ul style="list-style-type: none"> • Pattern is usually made from cast iron • Pattern is heated to 230 to 315 °C (450 to 600 °F).
8. How much thin cross-section castable we can make in shell molding?	<ul style="list-style-type: none"> • Depending on the material, the thinnest cross-section castable is 1.5 to 6 mm (0.06 to 0.24 in)
9. What is the minimum draft in shell molding?	<ul style="list-style-type: none"> • The minimum draft is 0.25 to 0.5 degrees
10. Mention the typical tolerances and surface finishing in shell molding?	<ul style="list-style-type: none"> • Typical tolerances are 0.005 mm/mm or in/in. • Cast surface finish is 0.3–4.0 μm (50–150 μ-in)

Annexure A: