

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: Melter	CS Code:	Level: 2	Version: 01
Competency Standard Title: Melt Ferrous Material (Cast Steel) in Cupola Furnace	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: Identify casting Requirement.</p> <p>Assessment Task 2: Candidate is required to: Select melting Materials.</p> <p>Assessment Task 3: Candidate is required to: Melt base iron</p> <p>Assessment Task 4: Candidate is required to: Perform duplexing with control activities</p> <p>Assessment Task 5: Candidate is required to: Perform inoculation procedure</p> <p>Assessment Task 6: Candidate is required to: Conduct gray iron casting inspection.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. 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"> • Select base metal as per ASTM specifications • Identify type of cast iron as per requirement • Determine chemical and physical properties of cast iron from instruction sheet

	Assessment Task 2 <ul style="list-style-type: none"> • Select high-grade raw material consistent with quality • Undertake charge analysis and convert to appropriate furnace charge. • Complete requisitions as required according to standard operating procedures. • Weigh furnace charge according to standard operating procedures..
	Assessment Task 3 <ul style="list-style-type: none"> • Prepare cupola furnace as per standard operating procedures. • Charge cupola furnace as per standard operating procedures. • Monitor cupola melt temperature • Test chemical composition of melt as per standard operating procedures. • Adapt corrective measures to attain required chemical composition. • Conduct wedge chill testing as per standards • Undertake rectification measures to attain desired results. • Transfer molten metal to cupola fore-hearth as per standard operating procedures.
	Assessment Task 4 <ul style="list-style-type: none"> • Desulfurized metal (0.02% max) if making nodular (Ductile) cast iron • Transfer molten metal to an induction furnace/duplexing furnace in accordance with standard operating procedures • Add required alloying elements to the melt as per standard operating procedures. • Undertake chemical composition analysis • Adjust composition of melt if required as per standard operating procedures. • Raise metal temperature to tapping value • Take wedge chill test as per standard operating procedures. • Transfer molten metal to pouring ladle for inoculation • Pour melt as per standard operating procedures.
	Assessment Task 5 <ul style="list-style-type: none"> • Select appropriate inoculants compatible with casting • Perform inoculation to improve metal properties in accordance with recommended inoculation procedures • Take wedge chill value after inoculation as per standard operating procedures. • Control dead melt time as per standard operating procedures. • Control pouring time as per standard operating procedures. • Transport ladle to pouring station to pour metal into molds.
	Assessment Task 6 <ul style="list-style-type: none"> • Conduct visual inspection using color check • Perform file test to determine chills on casting edges. • Lead scrap diagnosis in coordination with process engineering personnel.
	Portfolios required at the time of assessment (if any) for

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.	Select base metal as per ASTM specifications			
2.	Identify type of cast iron as per requirement			
3.	Determine chemical and physical properties of cast iron from instruction sheet			
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.	Select high-grade raw material consistent with quality			
2.	Undertake charge analysis and convert to appropriate furnace charge.			
3.	Complete requisitions as required according to standard operating procedures.			
4.	Weigh furnace charge according to standard operating procedures.			
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.	Prepare cupola furnace as per standard operating procedures.			
2.	Charge cupola furnace as per standard operating procedures.			
3.	Monitor cupola melt temperature			
4.	Test chemical composition of melt as per standard operating procedures.			
5.	Adapt corrective measures to attain required chemical composition.			
6.	Conduct wedge chill testing as per standards			
7.	Undertake rectification measures to attain desired results.			
8.	Transfer molten metal to cupola fore-hearth as per standard operating procedures.			
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.	Desulfurized metal (0.02% max) if making nodular (Ductile) cast iron			
2.	Transfer molten metal to an induction furnace/duplexing furnace in accordance with standard operating procedures			
3.	Add required alloying elements to the melt as per standard operating procedures.			
4.	Undertake chemical composition analysis			
5.	Adjust composition of melt if required as per standard operating procedures.			
6.	Raise metal temperature to tapping value			
7.	Take wedge chill test as per standard operating procedures.			
8.	Transfer molten metal to pouring ladle for inoculation			
9.	Pour melt as per standard operating procedures.			
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.	Select appropriate inoculants compatible with casting			
2.	Perform inoculation to improve metal properties in			
3.	accordance with recommended inoculation procedures			
4.	Take wedge chill value after inoculation as per standard operating procedures.			
5.	Control dead melt time as per standard operating procedures.			
6.	Control pouring time as per standard operating procedures.			
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.	Conduct visual inspection using color check			
2.	Perform file test to determine chills on casting edges.			
3.	Lead scrap diagnosis in coordination with process engineering personnel.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Melter	CS Code:	Level: 2	Version: 01
Competency Standard Title: Melt Ferrous Material (Cast Steel) in Cupola Furnace	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: Melter	CS Code:	Level:2	Version: 01
Competency Standard Title: Melt Ferrous Material (Cast Steel) in Cupola Furnace	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
1. Name few equipment and tools used for ferrous (cast steel) material casting?	<ul style="list-style-type: none"> • Cupola Melting Furnace • Immersion type thermocouple (1300 C) • Charging hoist • Degasser • Grain refiner • Optical pyro meter • Handling tools • PPE kits
2. Name few standards used in industry?	<ul style="list-style-type: none"> • JIS (Japanese Industrial Standards) • ASME (American Society of Mechanical Engineers) • ASTM (American Society of Testing Materials) • SAE (Society of Automotive Engineers) • DIN (Deutsches Institut für Normung / German) • BS (British Standards)
3. What types of metals/materials can be melted in cupola furnace melt/heat?	<ul style="list-style-type: none"> • A cupola or cupola furnace is a melting device used in foundries that can be used to melt cast iron, Ni-resist iron and some bronzes.
4. How does a cupola furnace work?	<ul style="list-style-type: none"> • The Cupola furnace works on the principle of combustion of coke generates (carbon dioxide and heat) and therefore it causes iron to melt. The melted iron gets a downgrade. • The Cupola furnace works when electricity applies to the coil and therefore it causes iron to melt.
5. How does a melting furnace work?	<ul style="list-style-type: none"> • Melting furnaces are used to overheat solid materials until they liquefy. • A melting furnace generates overhot temperatures that exceed the metal's melting point and cause decomposition of its physical structure which leads to liquefaction.
6. Why is sand bed prepared for melting of metal in cupola furnace?	<ul style="list-style-type: none"> • A sand bed needs to be prepared because it provides a necessary refractory bottom for molten metal and coke

Question	Candidate's answer
7. What should the height of a cupola furnace?	<ul style="list-style-type: none"> • Generally 6m
8. What is the range of efficiency of cupola?	<ul style="list-style-type: none"> • The efficiency of cupola is decided by factors like heat used in preheating, heat used in coke, heat used in oxidation and heat in the air blast • Efficiency is usually 30% to 50%
9. What is a cupola made of?	<ul style="list-style-type: none"> • Cupolas are usually one of two shapes: square or octagon. • Material: The highest quality cupolas are made from cellular PVC (polyvinyl chloride) vinyl, cedar wood, pine wood and/or copper. These materials tend to be maintenance-free.
10. What is purpose of Cupola?	<ul style="list-style-type: none"> • Cupolas were originally designed to add natural light and ventilation to the area under a roof. They sit on the ridge of a roof and can be found in many shapes, including square, round, and octagonal. On barns, they're meant to allow a continuous flow of air into the hayloft, helping to dry the hay.

Annexure A: