

Instruction Sheet for the Candidate

Qualification	National Vocational Certificate in Metal Forming & Processing Level 5
Competency Standard	Carryout Metal processing with Metallic powder
Purpose of Assessment	Formative Assessment
Candidate Details	Name_____ Registration/Roll Number_____
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within 04 Hrs. time frame (for practical demonstration & assessment):</p> <ul style="list-style-type: none"> • CU1. Select particle size and morphology of powder • CU2. Calculate the required weight of powder and binder • CU3. Prepare metallic powder blend • CU4. Operate hydraulic press • CU5. Set the parameters of sintering furnace • CU6. Perform sintering operation in the furnace • CU7. Carry out the inspection of sintered Component
Time: 04 Hrs.	During a practical assessment, under observation by an assessor, you are required to
Minimum Evidence Required	<p>CU1. Select particle size and morphology of powder</p> <p>P1. Practice PPEs to control chemical hazards.</p> <p>P2. Select the required metallic powder particle size as per job requirement.</p> <p>P3. Select the metallic powder morphology from the material supplier catalogue.</p> <p>CU2. Calculate the required weight of powder and binder</p> <p>P1. Select the density of actual metal</p> <p>P2. Select the volume of the required part</p> <p>P3. Calculate the required mass of powder</p> <p>P4. Calculate the required percentage of binder</p> <p>P5. Weight the amount of powder and binder as per requirement</p> <p>CU3. Prepare metallic powder blend</p> <p>P1. Carry out mixing and blending of powder and binder as per requirement</p>

	<p>P2. Set the time of mixer as per requirement.</p> <p>P3. Fill the die with blended powder and close the die.</p> <p>CU4. Operate hydraulic press</p> <p>P1. Raise the front safety guard of press as per standard</p> <p>P2. Place the die filled with powder on the lower pressing die</p> <p>P3. Lower the front safety guard as per standard</p> <p>P4. Lower the pressing face by turning the screw handle as per SOPs</p> <p>P5. Pull and push the pump handle to smoothly build up required pressure and hold the applied tonnage as required.</p> <p>P6. Release the pressure load as per standard</p> <p>P7. Open the front safety guard and remove die from hydraulic press.</p> <p>P8. Remove the green compact part from the die.</p> <p>P9. Calculate the density of green compact.</p> <p>CU5. Set the parameters of sintering furnace</p> <p>P1. Adjust the controls of the furnace i.e. water flow, heating chamber, heating coils, thermocouple and exhaust system</p> <p>P2. Set the furnace to required temperature</p> <p>P3. Set the heating rate of the furnace</p> <p>P4. Set the holding time of the furnace</p> <p>P5. Select the required inert gas for environmental conditions</p> <p>P6. Connect the gas cylinder with furnace</p> <p>P7. Set the required pressure of gas</p> <p>P8. Connect the vacuum pump to the furnace heating chamber, if vacuum is required</p> <p>CU6. Perform sintering operation in the furnace</p> <p>P1. Place the green compact in the heating chamber of furnace</p> <p>P2. Close the door of heating chamber</p> <p>P3. Set ON the furnace power supply.</p> <p>P4. Carryout sintering cycle as per set parameters</p> <p>P5. Take out the sintered part from the furnace after process completion.</p> <p>CU7. Carry out the inspection of sintered Component</p> <p>P1. Inspect the component visually for any defects</p> <p>P2. Inspect the dimensions of the component by using measuring</p>
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	<p>scale or devices</p> <p>P3. Separate the defected and non-defected components.</p> <p>P4. Make use of grinder to refine tolerance</p> <p>P5. Make use of buffing operation to improve surface finish</p>
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Self-Assessment Checklist

Candidate Name	
Registration No.	
Qualification	National Vocational Certificate in Metal Forming & Processing Level 5
Competency Standard	Carryout Metal processing with Metallic powder
Purpose of Assessment	Formative Assessment
Assessment Task	<ul style="list-style-type: none"> • CU1. Select particle size and morphology of powder • CU2. Calculate the required weight of powder and binder • CU3. Prepare metallic powder blend • CU4. Operate hydraulic press • CU5. Set the parameters of sintering furnace • CU6. Perform sintering operation in the furnace • CU7. Carry out the inspection of sintered Component

I can.....

Performance Criteria	Yes	No
P1. Practice PPEs to control chemical hazards.	<input type="checkbox"/>	<input type="checkbox"/>
P2. Select the required metallic powder particle size as per job requirement.	<input type="checkbox"/>	<input type="checkbox"/>
P3. Select the metallic powder morphology from the material supplier catalogue	<input type="checkbox"/>	<input type="checkbox"/>
P4. Select the density of actual metal	<input type="checkbox"/>	<input type="checkbox"/>
P5. Select the volume of the required part	<input type="checkbox"/>	<input type="checkbox"/>
P6. Calculate the required mass of powder	<input type="checkbox"/>	<input type="checkbox"/>
P7. Calculate the required percentage of binder	<input type="checkbox"/>	<input type="checkbox"/>
P8. Weight the amount of powder and binder as per requirement	<input type="checkbox"/>	<input type="checkbox"/>
P9. Carry out mixing and blending of powder and binder as per requirement	<input type="checkbox"/>	<input type="checkbox"/>
P10. Set the time of mixer as per requirement.	<input type="checkbox"/>	<input type="checkbox"/>
P11. Fill the die with blended powder and close the die.	<input type="checkbox"/>	<input type="checkbox"/>
P12. Raise the front safety guard of press as per standard	<input type="checkbox"/>	<input type="checkbox"/>
P13. Place the die filled with powder on the lower pressing die	<input type="checkbox"/>	<input type="checkbox"/>
P14. Lower the front safety guard as per standard	<input type="checkbox"/>	<input type="checkbox"/>
P15. Lower the pressing face by turning the screw handle as per SOPs	<input type="checkbox"/>	<input type="checkbox"/>
P16. Pull and push the pump handle to smoothly build up	<input type="checkbox"/>	<input type="checkbox"/>

	required pressure and hold the applied tonnage as required.		
P17.	Release the pressure load as per standard	<input type="checkbox"/>	<input type="checkbox"/>
P18.	Open the front safety guard and remove die from hydraulic press.	<input type="checkbox"/>	<input type="checkbox"/>
P19.	Remove the green compact part from the die.	<input type="checkbox"/>	<input type="checkbox"/>
P20.	Calculate the density of green compact.	<input type="checkbox"/>	<input type="checkbox"/>
P21.	Adjust the controls of the furnace i.e. water flow, heating chamber, heating coils, thermocouple and exhaust system	<input type="checkbox"/>	<input type="checkbox"/>
P22.	Set the furnace to required temperature	<input type="checkbox"/>	<input type="checkbox"/>
P23.	Set the heating rate of the furnace	<input type="checkbox"/>	<input type="checkbox"/>
P24.	Set the holding time of the furnace	<input type="checkbox"/>	<input type="checkbox"/>
P25.	Select the required inert gas for environmental conditions	<input type="checkbox"/>	<input type="checkbox"/>
P26.	Connect the gas cylinder with furnace	<input type="checkbox"/>	<input type="checkbox"/>
P27.	Set the required pressure of gas	<input type="checkbox"/>	<input type="checkbox"/>
P28.	Connect the vacuum pump to the furnace heating chamber, if vacuum is required	<input type="checkbox"/>	<input type="checkbox"/>
P29.	Place the green compact in the heating chamber of furnace	<input type="checkbox"/>	<input type="checkbox"/>
P30.	Close the door of heating chamber	<input type="checkbox"/>	<input type="checkbox"/>
P31.	Set ON the furnace power supply.	<input type="checkbox"/>	<input type="checkbox"/>
P32.	Carryout sintering cycle as per set parameters	<input type="checkbox"/>	<input type="checkbox"/>
P33.	Take out the sintered part from the furnace after process completion.	<input type="checkbox"/>	<input type="checkbox"/>
P34.	Inspect the component visually for any defects	<input type="checkbox"/>	<input type="checkbox"/>
P35.	Inspect the dimensions of the component by using measuring scale or devices	<input type="checkbox"/>	<input type="checkbox"/>
P36.	Separate the defected and non-defected components.	<input type="checkbox"/>	<input type="checkbox"/>
P37.	Make use of grinder to refine tolerance	<input type="checkbox"/>	<input type="checkbox"/>
P38.	Make use of buffing operation to improve surface finish	<input type="checkbox"/>	<input type="checkbox"/>

Candidate's Signature _____ Assessor's Signature _____

Date: _____

Assessors Judgment Guide

Qualification	National Vocational Certificate in Metal Forming & Processing Level 5
Competency Standard	Carryout Metal processing with Metallic powder
Purpose of Assessment	Formative Assessment
Candidate Details	Name: _____ Registration/Roll Number: _____ Signature: _____
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor _____ Assessor's code: _____ Signature: _____

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							

Observation Checklist

Assessment Task		<ul style="list-style-type: none"> • CU1. Select particle size and morphology of powder • CU2. Calculate the required weight of powder and binder • CU3. Prepare metallic powder blend • CU4. Operate hydraulic press • CU5. Set the parameters of sintering furnace • CU6. Perform sintering operation in the furnace • CU7. Carry out the inspection of sintered Component 		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Practice PPEs to control chemical hazards.			
2.	Select the required metallic powder particle size as per job requirement.			
3.	Select the metallic powder morphology from the material supplier catalogue			
4.	Select the density of actual metal			
5.	Select the volume of the required part			
6.	Calculate the required mass of powder			
7.	Calculate the required percentage of binder			
8.	Weight the amount of powder and binder as per requirement			
9.	Carry out mixing and blending of powder and binder as per requirement			
10.	Set the time of mixer as per requirement.			
11.	Fill the die with blended powder and close the die.			
12.	Raise the front safety guard of press as per standard			
13.	Place the die filled with powder on the lower pressing die			
14.	Lower the front safety guard as per standard			
15.	Lower the pressing face by turning the screw handle as per SOPs			
16.	Pull and push the pump handle to smoothly build up required pressure and hold the applied tonnage as required.			
17.	Release the pressure load as per standard			
18.	Open the front safety guard and remove die from hydraulic press.			
19.	Remove the green compact part from the die.			
20.	Calculate the density of green compact.			

21.	Adjust the controls of the furnace i.e. water flow, heating chamber, heating coils, thermocouple and exhaust system			
22.	Set the furnace to required temperature			
23.	Set the heating rate of the furnace			
24.	Set the holding time of the furnace			
25.	Select the required inert gas for environmental conditions			
26.	Connect the gas cylinder with furnace			
27.	Set the required pressure of gas			
28.	Connect the vacuum pump to the furnace heating chamber, if vacuum is required			
29.	Place the green compact in the heating chamber of furnace			
30.	Close the door of heating chamber			
31.	Set ON the furnace power supply.			
32.	Carryout sintering cycle as per set parameters			
33.	Take out the sintered part from the furnace after process completion.			
34.	Inspect the component visually for any defects			
35.	Inspect the dimensions of the component by using measuring scale or devices			
36.	Separate the defected and non-defected components.			
37.	Make use of grinder to refine tolerance			
38.	Make use of buffing operation to improve surface finish			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Qualification	National Vocational Certificate in Metal Forming & Processing Level 5
Competency Standard	Carryout Metal processing with Metallic powder
Purpose of Assessment	Formative Assessment
Candidate Details	Name: _____ Registration/Roll Number: _____ Candidate Signature: _____
Assessment Outcome	<div style="display: flex; justify-content: space-around; align-items: center;"> COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> </div> Name of the Assessor: _____ Assessor's code: _____ Signature of the Assessor: _____

Candidate's response is not required to be identical, but similar concepts and/or keywords must be used. Oral questioning may be used to clarify candidate understanding of topic and its application.

Questions (Candidate confidently answered questions correctly and demonstrated understanding of the topics and their application)		Satisfactory	Not Satisfactory
1.	How do you make metallic powder?		
2.	What are the principal methods used to produce metallic powder?		
3.	What is the most common method of producing metal powders?		

4.	What are powdered metal products?		
5.	What are the stages of powder metallurgy?		
6.	What are the stages of sintering?		

Feedback to the Candidate
Candidate's Signature_____ Assessor's Signature _____