

Instruction Sheet for the Candidate

Qualification	National Vocational Certificate in Metal Forming & Processing Level 4
Competency Standard	Perform Heat Treatment of Ferrous Materials
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. Perform hardening on carbon steel • CU2. Perform tempering of hardened carbon steel • CU3. Perform annealing on steel • CU4. Perform normalizing of steel • CU5. Perform carburizing of steel • CU6. Perform stress relieving of Metal
Time: 04 Hrs.	During a practical assessment, under observation by an assessor, you are required to
Minimum Evidence Required	<p>CU1. Perform hardening on carbon steel P1. Prepare the samples of required size. P2. Place the sample in the furnace P3. Adjust the temperature of furnace and soaking time of the furnace according to steel grade. P4. Select a suitable quenching media. P5. Quench the samples in quenching media. P6. Interpret the results as per requirement</p> <p>CU2. Perform tempering of hardened carbon steel P1. Take hardened sample (as prepared in above experiment). P2. Place the sample in the furnace P3. Adjust the tempering temperature of furnace and soaking time of the furnace according to require microstructure. P4. Cool the specimen as per SOPs P5. Interpret the results as per requirement</p> <p>CU3. Perform annealing on steel P1. Prepare the samples of required size. P2. Place the sample in the furnace P3. Adjust the temperature and soaking time of the furnace according to steel grade.</p>

	<p>P4. Turn of the furnace and let the samples to cool in the furnace.</p> <p>P5. Remove the samples from furnace once the temperature drops to near room temperature.</p> <p>P6. Interpret the results as per requirement</p> <p>CU4. Perform normalizing of steel</p> <p>P1. Prepare the samples of required size.</p> <p>P2. Place the sample in the furnace</p> <p>P3. Adjust the temperature and soaking time of the furnace according to steel grade.</p> <p>P4. Turn off the furnace</p> <p>P5. Remove the samples from furnace and let them to cool in the air.</p> <p>P6. Interpret the results as per requirement</p> <p>CU5. Perform carburizing of steel</p> <p>P1. Cut and prepare the samples of required sizes.</p> <p>P2. Pack the samples in carbonaceous material in steel box and seal the boxes by suitable method.</p> <p>P3. Place the boxes in the furnace</p> <p>P4. Heat the samples for suitable time and temperature.</p> <p>P5. Turn off the furnace and remove the steel boxes from furnace and recover the specimen.</p> <p>P6. Check hardness of the sample's core and case.</p> <p>P7. Interpret the results of hardness and microstructure.</p> <p>CU6. Perform stress relieving of Metal</p> <p>P1. Prepare the samples of required size.</p> <p>P2. Place the sample in the furnace.</p> <p>P3. Adjust the temperature and soaking time of the furnace as required</p> <p>P4. Turn off the furnace and let the sample to cool in the furnace</p> <p>P5. Remove the samples from furnace once the temperature reaches near room temperature.</p> <p>P6. Check hardness of the sample</p> <p>P7. Interpret the results as per standards</p>
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Self-Assessment Checklist

Candidate Name	
Registration No.	
Qualification	National Vocational Certificate in Metal Forming & Processing Level 4
Competency Standard	Perform Heat Treatment of Ferrous Materials
Purpose of Assessment	Formative Assessment
Assessment Task	<ul style="list-style-type: none"> • CU1. Perform hardening on carbon steel • CU2. Perform tempering of hardened carbon steel • CU3. Perform annealing on steel • CU4. Perform normalizing of steel • CU5. Perform carburizing of steel • CU6. Perform stress relieving of Metal

I can.....

Performance Criteria	Yes	No
P1. Prepare the samples of required size.	<input type="checkbox"/>	<input type="checkbox"/>
P2. Place the sample in the furnace	<input type="checkbox"/>	<input type="checkbox"/>
P3. Adjust the temperature of furnace and soaking time of the furnace according to steel grade.	<input type="checkbox"/>	<input type="checkbox"/>
P4. Select a suitable quenching media.	<input type="checkbox"/>	<input type="checkbox"/>
P5. Quench the samples in quenching media.	<input type="checkbox"/>	<input type="checkbox"/>
P6. Interpret the results as per requirement	<input type="checkbox"/>	<input type="checkbox"/>
P7. Take hardened sample (as prepared in above experiment).	<input type="checkbox"/>	<input type="checkbox"/>
P8. Place the sample in the furnace	<input type="checkbox"/>	<input type="checkbox"/>
P9. Adjust the tempering temperature of furnace and soaking time of the furnace according to require microstructure.	<input type="checkbox"/>	<input type="checkbox"/>
P10. Cool the specimen as per SOPs	<input type="checkbox"/>	<input type="checkbox"/>
P11. Interpret the results as per requirement	<input type="checkbox"/>	<input type="checkbox"/>
P12. Prepare the samples of required size.	<input type="checkbox"/>	<input type="checkbox"/>
P13. Place the sample in the furnace	<input type="checkbox"/>	<input type="checkbox"/>
P14. Adjust the temperature and soaking time of the furnace according to steel grade.	<input type="checkbox"/>	<input type="checkbox"/>
P15. Turn of the furnace and let the samples to cool in the furnace.	<input type="checkbox"/>	<input type="checkbox"/>
P16. Remove the samples from furnace once the temperature drops to near room temperature.	<input type="checkbox"/>	<input type="checkbox"/>

P17. Interpret the results as per requirement	<input type="text"/>	<input type="text"/>
P18. Prepare the samples of required size.	<input type="text"/>	<input type="text"/>
P19. Place the sample in the furnace	<input type="text"/>	<input type="text"/>
P20. Adjust the temperature and soaking time of the furnace according to steel grade.	<input type="text"/>	<input type="text"/>
P21. Turn off the furnace	<input type="text"/>	<input type="text"/>
P22. Remove the samples from furnace and let them to cool in the air.	<input type="text"/>	<input type="text"/>
P23. Interpret the results as per requirement	<input type="text"/>	<input type="text"/>
P24. Cut and prepare the samples of required sizes.	<input type="text"/>	<input type="text"/>
P25. Pack the samples in carbonaceous material in steel box and seal the boxes by suitable method.	<input type="text"/>	<input type="text"/>
P26. Place the boxes in the furnace	<input type="text"/>	<input type="text"/>
P27. Heat the samples for suitable time and temperature.	<input type="text"/>	<input type="text"/>
P28. Turn off the furnace and remove the steel boxes from furnace and recover the specimen.	<input type="text"/>	<input type="text"/>
P29. Check hardness of the sample's core and case.	<input type="text"/>	<input type="text"/>
P30. Interpret the results of hardness and microstructure.	<input type="text"/>	<input type="text"/>
P31. Prepare the samples of required size.	<input type="text"/>	<input type="text"/>
P32. Place the sample in the furnace.	<input type="text"/>	<input type="text"/>
P33. Adjust the temperature and soaking time of the furnace as required	<input type="text"/>	<input type="text"/>
P34. Turn off the furnace and let the sample to cool in the furnace	<input type="text"/>	<input type="text"/>
P35. Remove the samples from furnace once the temperature reaches near room temperature.	<input type="text"/>	<input type="text"/>
P36. Determine the strength of annealed and un-annealed specimen.	<input type="text"/>	<input type="text"/>
P37. Interpret the results as per standards	<input type="text"/>	<input type="text"/>

Candidate's Signature_____ Assessor's Signature_____

Date: _____

Assessors Judgment Guide

Qualification	National Vocational Certificate in Metal Forming & Processing Level 4
Competency Standard	Perform Heat Treatment of Ferrous Materials
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. Perform hardening on carbon steel• CU2. Perform tempering of hardened carbon steel• CU3. Perform annealing on steel• CU4. Perform normalizing of steel• CU5. Perform carburizing of steel• CU6. Perform stress relieving of Metal		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
1.	Prepare the samples of required size.			
2.	Place the sample in the furnace			
3.	Adjust the temperature of furnace and soaking time of the furnace according to steel grade.			
4.	Select a suitable quenching media.			
5.	Quench the samples in quenching media.			
6.	Interpret the results as per requirement			
7.	Take hardened sample (as prepared in above experiment).			
8.	Place the sample in the furnace			
9.	Adjust the tempering temperature of furnace and soaking time of the furnace according to require microstructure.			
10.	Cool the specimen as per SOPs			
11.	Interpret the results as per requirement			
12.	Prepare the samples of required size.			
13.	Place the sample in the furnace			
14.	Adjust the temperature and soaking time of the furnace according to steel grade.			
15.	Turn of the furnace and let the samples to cool in the furnace.			
16.	Remove the samples from furnace once the temperature drops to near room temperature.			

17.	Interpret the results as per requirement			
18.	Prepare the samples of required size.			
19.	Place the sample in the furnace			
20.	Adjust the temperature and soaking time of the furnace according to steel grade.			
21.	Turn off the furnace			
22.	Remove the samples from furnace and let them to cool in the air.			
23.	Interpret the results as per requirement			
24.	Cut and prepare the samples of required sizes.			
25.	Pack the samples in carbonaceous material in steel box and seal the boxes by suitable method.			
26.	Place the boxes in the furnace			
27.	Heat the samples for suitable time and temperature.			
28.	Turn off the furnace and remove the steel boxes from furnace and recover the specimen.			
29.	Check hardness of the sample's core and case.			
30.	Interpret the results of hardness and microstructure.			
31.	Prepare the samples of required size.			
32.	Place the sample in the furnace.			
33.	Adjust the temperature and soaking time of the furnace as required			
34.	Turn off the furnace and let the sample to cool in the furnace			

35.	Remove the samples from furnace once the temperature reaches near room temperature.			
36.	Determine the strength of annealed and un-annealed specimen.			
37.	Interpret the results as per standards			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Knowledge Assessment

Qualification	National Vocational Certificate in Metal Forming & Processing Level 4
Competency Standard	Perform Heat Treatment of Ferrous Materials
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.	What is the purpose of heat treatment?		
2.	What are the five basic heat treatment process?		
3.	What are the 3 stages of heat treatment?		

4.	What is the main purpose of annealing?		

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