

# Assessment Evidence Guide

## For

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Level-2

**Module name**  
(Formative Assessment)

*8<sup>th</sup>-12<sup>th</sup> March 2021*



**National Vocational & Technical  
Training Commission**

<b>Title of Qualification:</b> Heat Treatment-II	CS Code:	Level:4	Version:01
<b>Competency Standard Title:</b>  Perform stress relieving, austempering and martempering	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b>		

Candidate Details	Name: .....  Registration/Roll Number:.....
Guidance for Candidate	<p><b>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration &amp; assessment):</b></p> <p><b>Assessment Task 1:</b> Candidate is required to: Perform stress relieving</p> <p><b>Assessment Task 2:</b> Candidate is required to: Perform Austempering treatment on steel</p> <p><b>Assessment Task 3:</b> Candidate is required to: Perform Martempering treatment of steel</p> <p><b>And complete:</b></p> <ol style="list-style-type: none"> <li><b>1. Knowledge assessment test (Written or Oral)</b></li> <li><b>2. Portfolios at the time of assessment (if any)</b></li> </ol>
Minimum Evidence Required	<p><b>During a practical assessment, under observation by an assessor, you will complete:</b></p> <p><b>Assessment Task 1</b></p> <p><b>P1.</b> Handle the job as per SOP.</p> <p><b>P2.</b> Place the job in the furnace.</p> <p><b>P3.</b> Control the temperature of the furnace as per given job.</p> <p><b>P4.</b> Set standard soaking time of the heat treatment cycle as per given job</p> <p><b>P5.</b> Turn off the furnace, once the required temperature and soaking time is achieved.</p> <p><b>P6.</b> Remove the job from the furnace and cool in the air.</p> <p><b>P7.</b> Clean the job and prepare observation data sheet.</p>

	<p><b>Assessment Task 2</b></p> <p><b>P1.</b> Handle the job as per SOP</p> <p><b>P2.</b> Place the work piece in the furnace</p> <p><b>P3.</b> Adjust the temperature in the austenitic range and soaking time of the furnace according to steel grade and size.</p> <p><b>P4.</b> Turn of the furnace once the required temperature and soaking time is achieved.</p> <p><b>P5.</b> Let the work piece to quench in a salt bath maintained at a temperature above the martensitic start (MS) range.</p> <p><b>P6.</b> Hold the work piece in a salt bath till the complete transformation of bainite.</p> <p><b>P7.</b> Remove the work piece from the salt bath and cool in the air.</p> <p><b>P8.</b> Clean the work piece and referred it to the next section.</p> <hr/> <p><b>Assessment Task 3.</b></p> <p><b>P1.</b> Handle the work piece with appropriate care</p> <p><b>P2.</b> Place the work piece in the furnace</p> <p><b>P3.</b> Adjust the temperature above the upper critical range and soaking time of the furnace according to steel grade and size.</p> <p><b>P4.</b> Turn off the furnace, once the required temperature and soaking time is achieved.</p> <p><b>P5.</b> Remove the work piece from furnace and quenched in a salt bath, kept at a temperature of 150-300°C.</p> <p><b>P6.</b> Hold the work piece in bath, until the temperature becomes uniform throughout the cross section of work piece.</p> <p><b>P7.</b> Remove the work piece from salt bath and cooled in air to room temperature.</p> <p><b>P8.</b> Clean the work piece and referred it to the next section.</p> <hr/> <p><b>Portfolios required at the time of assessment (if any) for</b></p>
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**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)				
<b>Assessment Task 1</b>		<b>Description of assessment task 1</b>		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	<b>P1.</b> Handle the job as per SOP			
	<b>P2.</b> Place the job in the furnace			
	<b>P3.</b> Control the temperature of the furnace as per given job.			
	<b>P4.</b> Set standard soaking time of the heat treatment cycle as per given job.			
	<b>P5.</b> Turn off the furnace, once the required temperature and soaking time is achieved.			
	<b>P6.</b> Remove the job from the furnace and cool in the air.			
	<b>P7.</b> Clean the job and prepare observation data 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
	<b>P1.</b> Handle the job as per SOP			
	<b>P2.</b> Place the work piece in the furnace			
	<b>P3.</b> Adjust the temperature in the austenitic range and soaking time of the furnace according to steel grade and size.			
	<b>P4.</b> Turn of the furnace once the required temperature and soaking time is achieved.			
	<b>P5.</b> Let the work piece to quench in a salt bath maintained at a temperature above the martensitic start (MS) range.			
	<b>P6.</b> Hold the work piece in a salt bath till the complete transformation of bainite.			
	<b>P7.</b> Remove the work piece from the salt bath and cool in the air.			
	<b>P8.</b> Clean the work piece and referred it to the next section.			
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
	<b>P1.</b> Handle the work piece with appropriate care.			
	<b>P2.</b> Place the work piece in the furnace.			
	<b>P3.</b> Adjust the temperature above the upper critical range and soaking time of the furnace according to steel grade and size.			
	<b>P4.</b> Turn off the furnace, once the required temperature and soaking time is achieved.			
	<b>P5.</b> Remove the work piece from furnace and quenched in a salt bath, kept at a temperature of 150-300°C.			
	<b>P6.</b> Hold the work piece in bath, until the temperature becomes uniform throughout the cross section of work piece.			
	<b>P7.</b> Remove the work piece from salt bath and cooled in air to room temperature.			
	<b>P8.</b> Clean the work piece and referred it to the next Section.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

<b>Title of Qualification:</b> Heat Treatment-II	<b>CS Code:</b>	<b>Level:</b>	<b>Version:</b> 01
<b>Competency Standard Title:</b> Perform stress relieving, austempering and martempering	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b> 30 min		

Guidance for Candidate	<b>To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.</b>
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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: .....



<b>Title of Qualification:</b> Heat Treatment-II	CS Code:	Level:	Version: 01
<b>Competency Standard Title:</b>  Perform stress relieving, austempering and martempering	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b> 30 min		

### WRITTEN ASSESSMENT

Question	Candidate's answer
1. What is Tempring?	<ul style="list-style-type: none"> <li>• Phase Diagram of required treatment</li> <li>• Hardness and strength of steel</li> <li>• Change the properties of steel w.r.t application</li> </ul>
2. Describe austempring?	<ul style="list-style-type: none"> <li>• Required temperature</li> <li>• Required soaking time</li> <li>• Required quenching medium</li> </ul>
3. Describe Martempring?	<ul style="list-style-type: none"> <li>• Required temperature</li> <li>• Required soaking time</li> <li>• Required quenching medium</li> </ul>

<b>Title of Qualification:</b> Heat Treatment-II	CS Code:	Level:4	Version:01
<b>Competency Standard Title:</b> Perform Case Hardening process	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b>		

Candidate Details	Name: .....  Registration/Roll Number:.....
Guidance for Candidate	<p><b>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration &amp; assessment):</b></p> <p><b>Assessment Task 1:</b> Candidate is required to: Perform Flame hardening</p> <p><b>Assessment Task 2:</b> Candidate is required to: Perform Induction hardening</p> <p><b>Assessment Task 3:</b> Candidate is required to: Perform pack carburizing</p> <p><b>Assessment Task 4:</b> Candidate is required to: Perform Gas Nitriding</p> <p><b>Assessment Task 5:</b> Candidate is required to: Perform liquid Nitriding</p> <p><b>And complete:</b></p> <p>3. Knowledge assessment test (Written or Oral)</p> <p>4. Portfolios at the time of assessment (if any)</p>
Minimum Evidence Required	<p><b>During a practical assessment, under observation by an assessor, you will complete:</b></p> <p><b>Assessment Task 1</b></p> <p><b>P1.</b> Place the work piece in flame exposed area</p> <p><b>P2.</b> Wear the safety gloves and goggles’.</p> <p><b>P3.</b> Adjust the oxyacetylene flame torch.</p> <p><b>P4.</b> Heat the surface of work piece as per standard time.</p> <p><b>P5.</b> Quench the work piece in quenching media as per job requirement</p> <p><b>P6.</b> Perform tempering of job as per requirement</p> <p><b>P7.</b> Clean the work piece and prepare report of all findings</p>

	<p><b>Assessment Task 2</b></p> <p><b>P1.</b> Install induction coil as per job requirement</p> <p><b>P2.</b> Supply water to induction coil and quenching medium</p> <p><b>P3.</b> Switch on the main power supply</p> <p><b>P4.</b> Check the cooling system of electric panel</p> <p><b>P5.</b> Set the frequency of heating machine as per job requirement</p> <p><b>P6.</b> Place the specimen between the heating coil</p> <p><b>P7.</b> Adjust the vertical movement of attachment as per job requirement</p> <p><b>P8.</b> Adjust water flow of heating coil</p> <p><b>P9.</b> Energize the heating coil</p> <p><b>P10.</b> Control the heat-up time as per job requirement</p> <p><b>P11.</b> Quench the job in quenching media</p> <p><b>P12.</b> Remove the job from attachments</p> <p><b>P13.</b> Perform tempering of job as per requirement</p> <p><b>P14.</b> Clean the job and referred them to the next section.</p>
	<p><b>Assessment Task 3.</b></p> <p><b>P1.</b> Handle the job as per standard</p> <p><b>P2.</b> Pack the job in carbonaceous material in steel box and seal the boxes by suitable method.</p> <p><b>P3.</b> Place the steel box in heating furnace.</p> <p><b>P4.</b> Heat the job for suitable time and temperature.</p> <p><b>P5.</b> Turn off the furnace after standard heat treatment cycle</p> <p><b>P6.</b> Remove the steel box from furnace, and recover the specimen.</p> <p><b>P7.</b> Place the job in heat treatment furnace</p> <p><b>P8.</b> Switch on the furnace</p> <p><b>P9.</b> Carry out heat treatment cycle for hardening</p> <p><b>P10.</b> Allow soaking time as per job requirement</p> <p><b>P11.</b> Quench the job in quenching medium as per requirement</p> <p><b>P12.</b> Perform tempering of job as per requirement</p> <p><b>P13.</b> Clean the job and refer to the next section.</p>

	<p><b>Assessment Task 4.</b></p> <p><b>P1.</b> Energize the furnace as per SOP</p> <p><b>P2.</b> Set the pressure of feed gas(NH<sub>3</sub>,N<sub>2</sub>,H<sub>2</sub>)</p> <p><b>P3.</b> Place the sample in the furnace.</p> <p><b>P4.</b> Adjust the Ammonia (NH<sub>3</sub>) environment in the furnace.</p> <p><b>P5.</b> Adjust the temperature and soaking time of the furnace.</p> <p><b>P6.</b> Turn off the furnace after completion of the process</p> <p><b>P7.</b> Remove the samples from furnace</p> <p><b>P8.</b> Clean the samples and referred them to the next section.</p>
	<p><b>Assessment Task 5.</b></p> <p><b>P1.</b> Energize the furnace as per SOP</p> <p><b>P2.</b> Prepare cyanide salt bath in a suitable container</p> <p><b>P3.</b> Dip the sample in salt bath with appropriate fixtures</p> <p><b>P4.</b> Adjust the required temperature of the salt bath</p> <p><b>P5.</b> Allow soaking time as per job requirement</p> <p><b>P6.</b> Remove the sample from furnace once the temperature reaches to the required range.</p> <p><b>P7.</b> Immerse the sample in salt bath for a prescribed time.</p> <p><b>P8.</b> Remove the sample from salt bath, clean it and referred it to the next section.</p>
	<p><b>Portfolios required at the time of assessment (if any) for</b></p>

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**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
	<b>P3.</b> Place the work piece in flame exposed area.			
	<b>P4.</b> Wear the safety gloves and goggles.			
	<b>P3.</b> Adjust the oxyacetylene flame torch.			
	<b>P4.</b> Heat the surface of work piece as per standard time.			
	<b>P5.</b> Quench the work piece in quenching media as per job requirement			
	<b>P6.</b> Perform tempering of job as per requirement.			
	<b>P7.</b> Clean the work piece and prepare report of all Findings.			
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
	<b>P1.</b> Install induction coil as per job requirement.			
	<b>P2.</b> Supply water to induction coil and quenching medium.			
	<b>P3.</b> Switch on the main power supply.			
	<b>P4.</b> Check the cooling system of electric panel.			
	<b>P5.</b> Set the frequency of heating machine as per job requirement.			
	<b>P6.</b> Place the specimen between the heating Coil.			
	<b>P7.</b> Adjust the vertical movement of attachment as per job requirement.			
	<b>P8.</b> Adjust water flow of heating coil.			
	<b>P9.</b> Energize the heating coil.			
	<b>P10.</b> Control the heat-up time as per job Requirement.			
	<b>P11.</b> Quench the job in quenching media.			
	<b>P12.</b> Remove the job from attachments			
	<b>P13.</b> Perform tempering of job as per requirement.			
	<b>P14.</b> Clean the job and referred them to the next section.			
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
	<b>P1.</b> Handle the job as per standard.			
	<b>P2.</b> Pack the job in carbonaceous material in steel box and seal the boxes by suitable method.			
	<b>P3.</b> Place the steel box in heating furnace.			
	<b>P4.</b> Heat the job for suitable time and temperature.			
	<b>P5.</b> Turn off the furnace after standard heat treatment cycle.			
	<b>P6.</b> Remove the steel box from furnace, and recover the specimen.			
	<b>P7.</b> Place the job in heat treatment furnace.			
	<b>P8.</b> Switch on the furnace.			
	<b>P9.</b> Carry out heat treatment cycle for Hardening.			
	<b>P10.</b> Allow soaking time as per job requirement.			
	<b>P11.</b> Quench the job in quenching medium as per requirement.			
	<b>P12.</b> Perform tempering of job as per Requirement.			
	<b>P13.</b> Clean the job and refer to the next section.			
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
	<b>P1.</b> Energize the furnace as per SOP.			
	<b>P2.</b> Set the pressure of feed gas(NH <sub>3</sub> ,N <sub>2</sub> ,H <sub>2</sub> ).			
	<b>P3.</b> Place the sample in the furnace.			
	<b>P4.</b> Adjust the Ammonia (NH <sub>3</sub> ) environment in the furnace.			
	<b>P5.</b> Adjust the temperature and soaking time of the furnace.			
	<b>P6.</b> Turn off the furnace after completion of the Process.			
	<b>P7.</b> Remove the samples from furnace.			
	<b>P8.</b> Clean the samples and referred them to the next section.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

<b>Assessment Task 5</b>		<b>Description of assessment task 5</b>		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	<b>P1.</b> Energize the furnace as per SOP.			
	<b>P2.</b> Prepare cyanide salt bath in a suitable Container.			
	<b>P3.</b> Dip the sample in salt bath with appropriate fixtures.			
	<b>P4.</b> Adjust the required temperature of the salt Bath.			
	<b>P5.</b> Allow soaking time as per job requirement.			
	<b>P6.</b> Remove the sample from furnace once the temperature reaches to the required range.			
	<b>P7.</b> Immerse the sample in salt bath for a prescribed time.			
	<b>P8.</b> Remove the sample from salt bath, clean it and referred it to the next section.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

<b>Title of Qualification:</b> Heat Treatment-II	CS Code:	Level:	Version: 01
<b>Competency Standard Title:</b> Perform Case Hardening process	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b> 30 min		

Guidance for Candidate	<b>To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.</b>
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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: .....
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	Candidate Signature: .....
Written Assessment Outcome	<p>COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/></p> <p>Name of the Assessor: ..... Assessor's code: .....</p> <p>Signature of the Assessor: .....</p>

<b>Title of Qualification:</b> Heat Treatment-II	CS Code:	Level:	Version: 01
<b>Competency Standard Title:</b> Perform Case Hardening process	<b>Assessment Date (DD/MM/YY):</b>  <b>Assessment Time:</b> 30 min		

## WRITTEN ASSESSMENT

Question	Candidate's answer
4. Describe case hardening?	<ul style="list-style-type: none"><li>• Hard case and tough core</li><li>• Applied on carbon steels</li><li>• Heating time is critical</li><li>• Depth of case is important</li></ul>
5. Describe Carbourising?	<ul style="list-style-type: none"><li>• Wear resistant surface and tough core</li><li>• Applied on low carbon steel parts</li><li>• Carbourising material is used to pack the component.</li></ul>
6. Describe Nitriding?	<ul style="list-style-type: none"><li>• Wear resistant surface and tough core</li><li>• Nitrogen atoms diffuse into the surface of ferrous metal.</li><li>• Nitrogen comes from either gas or liquid salts.</li></ul>